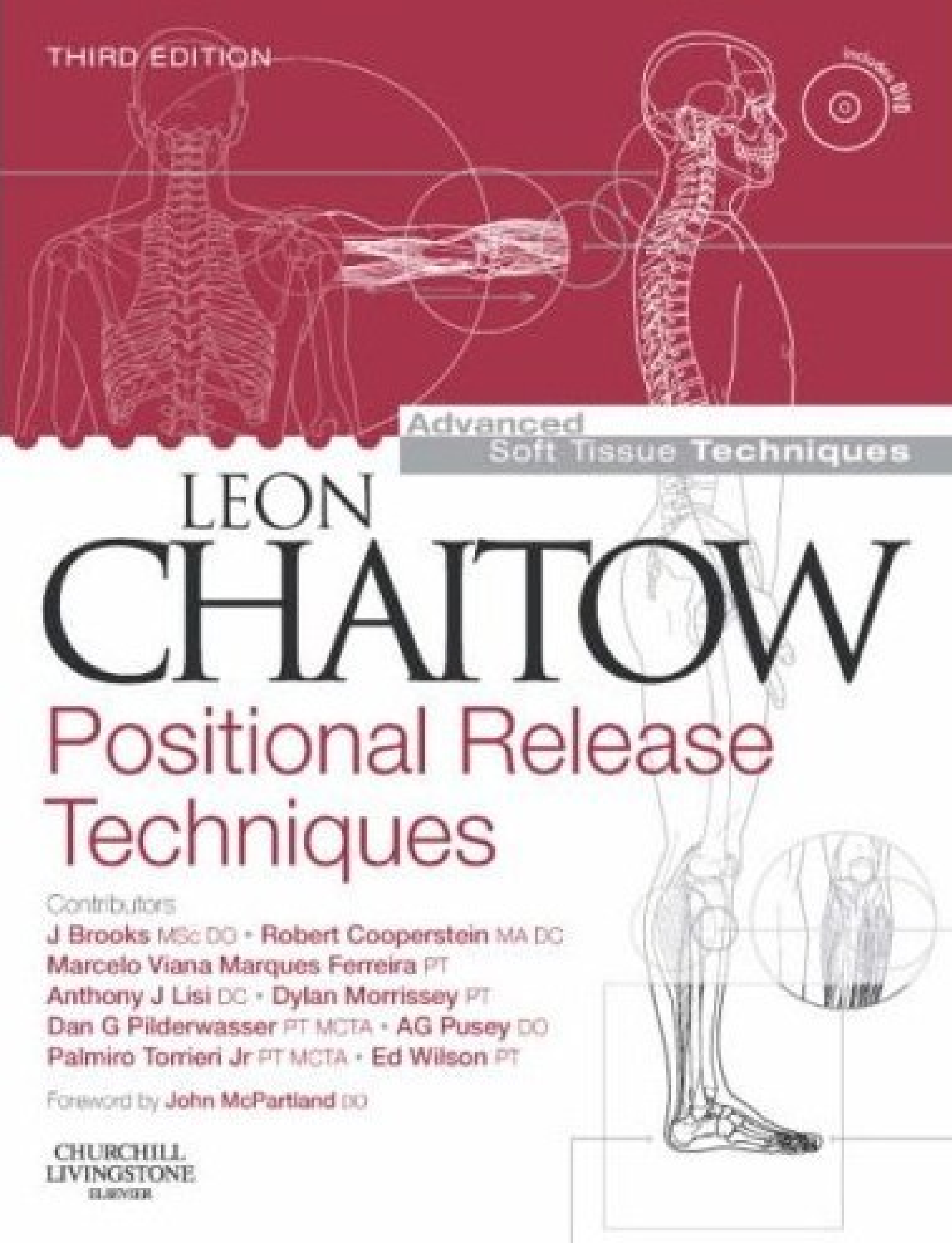
THIRD EDITION



Advanced Soft Tissue **Techniques**

LEON
CHAITOW

Positional Release Techniques

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Positional Release Techniques

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Positional Release Techniques

With accompanying DVD-ROM

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Contents

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Abbreviations

A

ACh: acetylcholine
AIIS: anterior inferior iliac spine
AK: applied kinesiology
AS anterior, superior
ASIS: anterior superior iliac spine

C

CCP: common compensatory pattern
CMRT: chiropractic manipulative reflex technique
CNS: central nervous system
CRI: cranial rhythmic impulse
CSRM: cranial-sacral respiratory mechanism
CT: cervicothoracic

E

EMG: electromyographic

F

FMS: fibromyalgia syndrome
FPR: facilitated positional release

G

GAS: general adaptation syndrome

H

HVLA: high-velocity low amplitude
HVT: high-velocity thrust

I

INIT: integrated neuromuscular inhibition technique

L

LAS: local adaptation syndrome
LS: lumbosacral

M

MET: muscle energy technique
MFR: myofascial release
MPS: myofascial pain syndrome
MRI: magnetic resonance imaging
MWM: mobilization with movement

N

NAGs: natural apophyseal glides
NMT: neuromuscular technique

O

OA: occipito-atlantal
OMT: osteopathic manipulative therapy

P

PI: posterior, inferior
PNF: proprioceptive neuromuscular facilitation
PRT: positional release technique
PSIS: posterior superior iliac spine

Q

QL: quadratus lumborum

S

SBIS: silicone breast implant syndrome
SCS: strain and counterstrain
SE: scanning evaluation
SIJ: sacroiliac joint
SMWLM: spinal mobilization with limb movement
SNAGs: sustained natural apophyseal glides
SOT: sacro-occipital technique
SRC: static resisted contraction

T

TART: texture, asymmetry, range of motion, tenderness
TFL: tensor fascia lata
TL: thoracolumbar
TMJ: temporomandibular joint
TP: tender point
TPPS: tender point palpation scale

W

WDR: wide dynamic range

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Foreword

With this 3rd edition of *Positional Release Techniques*, Leon Chaitow forges along a path established by Lawrence H. Jones, DO, FAAO. Larry Jones assembled ideas from his teachers Bill Sutherland, Harold Hoover, and Fred Mitchell, culminating in the Strain-Counterstrain technique. Similarly, Chaitow's genius is synthesis—he puts together ideas from an ecumenical panoply of practitioners, including DOs, DCs, PTs, NDs, and MDs. With his fresh eye, he extracts pearls from articles that I had read but misunderstood. Re-reading this literature has imbued me with new enthusiasm.

Positional Release Techniques is more than a techniques manual. The book also delves into biomechanics and pathophysiology (making it an excellent textbook), and probes many of our clinical hypotheses that remain unproven. At the new School of Osteopathy at Unitec in New Zealand, the 2nd Edition served as a foundation text for our research programme. I'd like to highlight some of that work. What are tenderpoints and triggerpoints? Our research suggested everyone has tenderpoints, but some have more than others. Tenderpoints are indicators of body-mind-spirit fatigue. When the bodycount of tenderpoints becomes excessive, we diagnosis "fibromyalgia". This label, however, is labile; Dunnett (2006) tested a population of healthy young women, and a significant percentage of subjects "changed" fibromyalgia diagnosis during the course of a menstrual cycle, fulfilling the criterion (≤4 kg pressure at ≥11 points) during the luteal phase or menstrual phase, but never during the follicular phase. Thus the perception of endogenous pain may be modulated by cyclical hormonal changes, as well as the hypothalamic-pituitary-adrenal (HPA) axis. HPA axis dysfunction may blunt endogenous pain modulation pathways, such as the endorphin and endocannabinoid systems. As noted by Chaitow, the bodywork treatment of tenderpoints may not involve the endorphin system. We researched the endocannabinoid system. Anandamide, the best-known endocannabinoid, is associated with pain relief; serum levels of anandamide double after the administration of osteopathic treatment (McPartland et al., 2005). If tenderpoints truly represent a "sum of stress," their treatment truly requires a holistic approach. Walker (2003) used the methods outlined in this book to treat patients with forearm tenderpoints, a common and recalcitrant problem. Walker's holistic approach proved successful. Notably, forearm pain is shared by many bodyworkers (Peat, 2004), so you, the reader, are directed to the self-treatment guide in this book.

Biomechanically, a tenderpoint is a bad intersection, a collision of fascial cleavage planes and nociceptors, with poor circulation (McPartland, 2004). In this 3rd Edition, Chaitow highlights research by Langevin et al. (2006), who came to the same conclusion. Langevin associated tenderpoints with acupuncture points. Indeed Jones's tenderpoint charts show a substantial overlap with acupuncture maps. However, Johns (2004) showed that comparisons of point locations based on two-dimensional (2-D) charts may overestimate correlations. Johns compared Jones's tenderpoints with Chapman's reflexes. Chapman was an osteopath who described a series of neurolymphatic points as markers of visceral dysfunctions. Thirty years later the chiropractor George Goodheart discovered Chapman's reflexes also served as indicators of conditionally inhibited muscles, leading to the development of Applied Kinesiology. In a comparison of charts, 87% of Chapman's reflexes correlated with the location of at least one Jones tenderpoint, but when Chapman's and Jones's points were mapped upon a person, their 3-D locations correlated only 21% (Johns, 2004).

Triggerpoints, unlike tenderpoints, are palpable nodules located in a taut band of muscle. They give rise to referred pain, motor dysfunction, and autonomic phenomena. Simons et al. (1999) associated trigger points with an excessive release of acetycholine (ACh) at the motor endplate. We expanded this molecular etiology to include presynaptic, synaptic, and postsynaptic mechanisms, such as excessive release of ACh, defects of acetylcholinesterase, and upregulation of nicotinic ACh receptors, respectively (McPartland and Simons, 2006). This theory has altered our treatment of triggerpoints. Heavy ischemic compression upon triggerpoints is out. Positional release is in! We need to think molecularly, and use techniques that modulate gene regulation and gene expression. Our research suggests "…the formative and regenerative forces that organize embryological development are present throughout our life span… In other words, the forces of embryogenesis become the forces of healing after birth" (McPartland and Skinner, 2005). Gene regulation and regenerative forces arise when we modulate sensory afferents and autonomic efferents, and this may be the mechanism by which cranial biodynamic treatment works (Cardy, 2004).

Positional Release Techniques is filled with concrete examples, fine line drawings, and careful guidelines, which make the techniques easy to learn and apply. The text illustrates a plethora of tutorial exercises. The methods described in this book are powerful. The diagnostic techniques are accurate. Leon Chaitow is to be congratulated, once again, for combining his tireless scholarship and seamless composition into an outstanding book of pearls.

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Preface

The ideas that permeate positional release technique (PRT) methodology can be equated with non-invasive, non-interventionist, passive and gentle approaches that 'allow' change to emerge, rather than forcing it do so. Despite the apparently general nature of PRT methods, clinical experience within the osteopathic profession shows that they can be intensely practical and specific.

Two main themes emerge from PRT in its original form. The strain/counterstrain approach derives from the original work of osteopathic physician Lawrence Jones. It uses a pain monitor to find optimal positioning (i.e. when pain is no longer felt at the monitoring point). Functional technique also emerged out of osteopathic medicine; this PRT approach is based on positioning whilst sensing/palpating the tissues involved, so that they achieve their greatest degree of comfort or ease, without using pain as a guide.

In order to gain a sense of the underlying concepts involved in PRT application it is necessary to accept that the self-regulating mechanisms of the body are always the final determinants as to what happens following any form of intervention. For example, a high velocity, low amplitude thrust adjustment (HVLA), or application of a muscle energy technique (MET) or myofascial release (MFR), or almost any other procedure, acts as a catalyst for change. If the treatment is appropriate the body produces an adaptive response that will allow enhanced function and therapeutic benefit. The adaptive response is the key to whether or not benefit follows treatment. Excessive adaptive demands simply load the system more heavily, and symptoms are likely to worsen, while if there is inadequate therapeutic stimulus little value emerges from the exercise. The methods mentioned above (HVLA, MET and MFR) are all 'direct', that is to say, a barrier (or several barriers) will have been identified, and the therapeutic objective will be to push the barrier(s) back, in order to mobilise a restricted joint, or to lengthen shortened myofascial structure (for example).

Consider another way of addressing the restriction problem – an indirect one: reflect on whether, if the barrier is 'disengaged', the inherent tendency towards normality, demonstrated in the natural propensity for dysfunction to normalise (broken bones mend, tissues heal), is capable of restoring functionality to the types of dysfunction to which HVLA MET and MFR (as examples) are being applied.

Is it possible for self-regulating, homeostatic mechanisms to be encouraged to act when the load on dysfunctional tissues is temporarily eased?

- Can a restricted joint release without force?
- Can an excessively tight, muscular condition release spontaneously?
- And can pain sometimes be relieved instantaneously, merely by holding the painful tissues in an 'eased' position?

Clinical PRT evidence shows that all these questions can be answered affirmatively, at times. If restriction – whether of joint or soft tissue – involves hypertonicity and relative circulatory deficit (ischaemia, etc.), then is it possible that an opportunity for spontaneous change may occur by holding these same restricted tissues in a way that reduces the tone and allows (albeit temporarily) enhanced circulation through the tissues, and a chance for neural resetting (involving proprioceptors and nociceptors), to take place?

PRT methodology suggests that this is the case and a number of variations have evolved that incorporate the concept of 'offering an opportunity for change', as distinct from 'forcing a change', as is the case with HVT and MET for example.

There are particular settings and contexts in which PRT is probably the treatment method of first choice – as in extreme pain, recent trauma (for example whiplash, or immediately following a sporting or everyday strain), post surgery, extreme fragility (for example advanced osteoporosis). In addition, PRT is sufficiently versatile, with numerous variations, to be useful as a part of a sequence involving other interventions, for example before or following HVLA application, or as part of a sequence involving MET and neuromuscular technique, in trigger point deactivation, or as a means of easing hypertonicity during a massage therapy treatment.

The ideas that underpin PRT are also to be found in craniosacral methodology, in which disengagement of restrictions, moving away from restriction barriers, is a common approach.

Positional release variations, based on traditional osteopathic methodology are detailed in Chapters 1 through 7 inclusive, and are demonstrated on the accompanying DVD.

Of particular interest in this third edition is the inclusion of chapters that discuss a number of physiotherapy-derived systems, (Mulligan's Mobilisation with Movement, Unloading taping, and McKenzie-type exercises) as well as from chiropractic methodology (Sacro-occipital Technique - SOT) that have strong links to the underlying concepts of PRT.

Robert Cooperstein has outlined and illustrated the useful 'positional release' concepts and methods used in sacro-occipital technique (SOT), in Chapter 8. SOT derives from the work of Major deJarnette, whose early work with cranial osteopathic pioneer Sutherland demonstrates how osteopathic and chiropractic ideas and methods that evolved in the early to mid-20th century, had a great deal in common.

Anthony Lisi has presented some of the core McKenzie methods in Chapter 9. The concepts of exercises being employed guided by 'preferred directions of movement', is pure positional release, although used in quite distinctive and original ways.

In Chapter 10 Ed Wilson presents a description of those aspects of the work of Brian Mulligan, the innovative New Zealand physiotherapist, whose mobilisation with movement (MWM) concepts have been so widely adopted in physiotherapy settings. There are specific variations within MWM that have close similarities with PRT ideas and Wilson has performed the invaluable task of moving beyond descriptions of methods to evaluation of underlying mechanisms.

The elegant approach that 'proprioceptively unloads' dysfunctional joints and tissues and then tapes the structures into their 'ease' state, for hours or days, in contrast to the minutes of 'ease' used in osteopathic PRT methodology is described by Dylan Morrissey in Chapter 11.

Finally in Chapter 12 Julia Brooks and Anthony Pusey illustrate the remarkably successful use of osteopathic positional release in treatmernt of animals, including dogs and horses. No clearer examples can be offered of the true breadth of usefulness of these most gentle of methods.

The cross-fertilisation and interdisciplinary possibilities that are exemplified by the coming together of osteopathic, chiropractic and physiotherapeutic methods and ideas, highlight the potential for the future, as barriers and rivalries give way to cooperation, collaboration and ultimately integration, for the benefit of all.

Leon Chaitow
Corfu, Greece 2007

Acknowledgements

My sincere thanks go to the many osteopathic, chiropractic and physiotherapeutic practitioners whose work has resulted in positional release methods coming to the forefront of safe and effective integrative bodywork approaches.

The authors of various chapters illustrating different settings in which positional release methods are employed deserve my profound thanks :

Julia Brooks DO, Robert Cooperstein DC, Anthony J Lisi DC, Dylan Morrissey PT, Anthony G . Pusey DO and Ed Wilson PT, for contributing their specialised knowledge to this book. Sadly, Anthony Pusey DO passed away before publication of this book. His pioneering work with animals, and his influence on his profession, are major elements of his legacy. Chapter 12, which Anthony, (together with his wife Julia Brooks DO) coauthored, offers a glimpse of his remarkable work.

My sincere thanks also to John McPartland DO for his help over the years in expanding my perceptions, and for his Foreword to this book.

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1

Spontaneous positional release

CHAPTER CONTENTS

Positional release (PR)

This introductory chapter contains a review of a variety of ways in which the practical application of positional release methodology can be used therapeutically. The idea behind the techniques is very simple indeed, although the application itself can require great skill and delicacy of touch.

If tissues are inappropriately tense, indurated, hypertonic, shortened or contracted, the therapeutic intent is usually to release these undesirable states in order to encourage a retreat of restriction barriers.

The methods that can achieve this are commonly of a direct nature. The soft tissue in question may be stretched, massaged, mobilized and manipulated using any of dozens of perfectly appropriate techniques. However, if the tissues are painful, in spasm, inflamed, or have recently been traumatized, or if the available manual method induces discomfort, then an alternative approach is called for.

Ideally, an approach is required that causes little discomfort while allowing a spontaneous resolution of the tense, dysfunctional state of the tissues. The cluster of methods that can be grouped as *positional release techniques* (PRTs), and which this text attempts to describe, offer precisely these opportunities.

Positional release techniques belong mainly (not entirely as will be explained) to that class of modalities that *invite* change, rather than *forcing* change, when treating dysfunctional tissues.

Consider a muscle that has shortened due to overuse or misuse, and that harbors within it active trigger points.

A direct approach that enforces lengthening might involve – as examples – myofascial release, or muscle energy/proprioceptive neuromuscular facilitation (PNF) type stretching. These methods might well be appropriate and helpful in restoring a degree of normality to the tissues. There might also be circumstances when such methods would be inappropriate – for example, if the condition involved inflammation or tissue damage.

A positional release approach to treating a hypertonic, contracted dysfunctional condition would not enforce lengthening or stretching, but would attempt to find a way (depending on which PRT variation was selected) of offering an 'opportunity for change' to the tissues. This might involve disengaging from the barrier and holding or supporting the hypertonic, contracted tissues in a painless but even more shortened state, 'allowing' a spontaneous change to take place.

An even more obvious example would be to compare use of a high-velocity thrust to 'release' a blocked joint, with a positional release method that simply holds the joint in a balanced, unstressed position waiting for a change to occur.

Examples of these methods of the application of positional release methods to soft tissues and joints are described in Chapters 3, 4 and 5.

As will become clear, there are a number of different ways of incorporating such indirect, extremely gentle, methods into a treatment protocol.

- Osteopathic medicine has contributed three of the main positional release approaches – strain/counterstrain, functional technique and facilitated positional release (Johnstone 1997, McPartland & Zigler 1993). These are discussed extensively in Chapters 6 and 7.
- Chiropractic has developed its own positional release variations, many of them to be found in what is known as sacro-occipital technique; see Chapter 8.
- Physical therapy has produced a number of innovative concepts and methods that incorporate positional release methodology, such as aspects of Mulligan's mobilization with movement (MWM) approaches (NAGs, SNAGs, etc.) as discussed in Chapter 10.
- Also emerging largely from the physical therapy world are methods that unload soft tissues and joints, and support them in this unloaded state by taping them. These approaches are described in Chapter 11.
- The important work of McKenzie in managing some forms of back pain also has a background in physical therapy, and those aspects of the work that relate to positional release are to be found in Chapter 9.
- And, finally, a combination of these methods have been successfully applied to animals, most effectively in treatment of horses. Equine positional release is detailed in Chapter 12.

As this (growing) list of variations suggests, there are a number of different methods involving the positioning of an area of the body, or the whole body, in such a way as to evoke a therapeutically significant physiological response which helps to resolve musculoskeletal dysfunction.

The means whereby these beneficial changes occur seems to involve a combination of the neurological and circulatory changes that take place when a distressed area is placed into its most comfortable, its most 'easy', most pain-free position. The theoretical basis for the efficacy of positional release will be outlined in Chapter 3.

Terminology

The developer of functional technique, one of the major methods of spontaneous positional release (discussed in this chapter and in Chapter 6), was Harold V. Hoover. He used the term 'dynamic neutral' (Hoover 1969) to describe what was being achieved as the tissues relating to a structurally disturbed joint or area were positioned into a state of 'ease'. Charles Bowles (1969) has discussed 'dynamic neutral' further. He states:

> *Dynamic neutral is a state in which tissues find themselves when the motion of the structure they serve is free, unrestricted and within the range of normal physiological limits ... Dynamic neutral is not a static condition ... it is a continuing state of normal, during living motion, during living activity ... it is the state and condition to be restored to a dysfunctional area.*

As explanations and descriptions are offered for the spontaneous physiological responses that take place when tissues are placed into a balanced state, in this and later chapters, the terms 'ease' and 'bind' will frequently be used to describe the extremes of restriction and freedom of movement. The term 'dynamic neutral' may be considered as being interchangeable with 'maximal ease'.

Jones's contribution

The impetus towards the use of this most basic and noninvasive of treatment approaches in a coherent, rather than a hit-and-miss, manner lies in the work of Lawrence Jones, who developed an approach to somatic dysfunction (Jones 1981) that he termed 'strain and counterstrain' (SCS) (described in detail in Chapter
discovery in these words:

> *Jones's initial observation of the efficacy of counterstrain was with a patient who was unresponsive to treatment. The patient had been unable to sleep because of pain. Jones attempted to find a comfortable position for the patient to aid him in sleeping. After 20 minutes of trial and error, a position was finally achieved in which the patient's pain was relieved. Leaving the patient in this*

position for a short time, Jones was astonished when the patient came out of the position and was able to stand comfortably erect. The relief of pain was lasting and the patient made an uneventful recovery.

The position of 'ease' that Jones identified for this patient was an exaggeration of the position in which spasm was holding him, and this provided Jones with an insight into the mechanisms involved.

Over the years since Jones first made his observation that a position that exaggerated a patient's distortion could provide the opportunity for a release of spasm and hypertonicity, many variations on this basic theme have emerged, some building logically on that first insight, with others moving in new directions.

The positional release methods summarized in this chapter, and in Box 1.2, are as comprehensive as possible at the time of writing; however, new versions are regularly appearing, and the author acknowledges that it has been impossible to exhaustively detail all variations.

Common basis

One of the commonalities of many of these approaches is that they move the patient, or the affected tissues, away from any resistance barriers and towards positions of comfort.

The shorthand terms used for these two extremes are 'bind' and 'ease' – which anyone who has handled the human body will recognize as extremely apt descriptors.

The need for the many variations to be understood should be obvious.

Different clinical settings require the availability of a variety of therapeutic approaches.

An example described in more detail in Chapter 4 involves a group of severely ill pre- and post-operative, bed-bound patients who were treated for their current pain and discomfort, without leaving their beds. In such a setting, no rigid application of procedures can be adhered to, and flexibility can best be achieved by the practitioner/therapist having available a variety of ways of reaching the same ends (Schwartz 1986).

Jones's approach uses verbal feedback from the patient as to tenderness in a 'tender' point which is being used as a monitor, and which the practitioner/therapist is palpating while attempting to find a position of ease.

It is possible to imagine situations in which the use of Jones's 'tender points as a monitor' method (Chapter 3) would be inappropriate or actually impossible, for example, in the case of someone who had lost the ability to communicate verbally, or who did not speak the same language, or who was too young or too ill to offer verbal feedback. In such a case a need would be apparent for a method that allowed the practitioner/therapist to achieve the same ends without verbal communication.

This is possible, as will be demonstrated, using either 'functional' methods or facilitated positional release approaches, which involve the practitioner/therapist finding a position of maximum ease by means of palpation alone, assessing for a state of 'ease' in the tissues. This approach is described in later chapters in more detail.

As we examine a number of the variations on the same theme of positional release, release by placing the patient, or area, into 'ease', the diverse clinical and therapeutic potentials for the use of this approach will become clearer.

It is important to note that if positional release methods are being applied to chronically fibrosed tissue the result may well be expected to produce a reduction in hypertonicity, but would not result in any reduction in fibrosis.

Pain relief or improved mobility may therefore be only temporary or partial in such cases. This does not nullify the usefulness of PRT in chronic settings, but emphasizes the need to use PRT methods as part of an integrated approach. This will be seen to be of particular value in deactivation of myofascial trigger points, using a combination of manual methods in a sequence known as integrated neuromuscular inhibition technique – INIT (see below, and Chapter 5).

'Unlatching' restrictions

Upledger & Vredevoogd (1983) give a practical explanation of indirect methods of treatment, especially as related to cranial therapy. The idea of moving a restricted area in the direction of ease is, they say, 'a sort of "unlatching" principle. Often in order to open a latch we must first exaggerate its closure'. The application of positional release methods in cranial structures is explored further in Chapter 4.

In normal tissues there exists in the midrange of motion an area of 'ease' or balance, where the tissues are at their least tense.

When there is a restriction in the normal range of motion of an area, whether of osseous or soft-tissue origin, the now limited range will almost always still have a place, a moment, a point, which is neutral, of maximum comfort, or ease, usually lying somewhere between the new restriction barrier in one direction, and the physiological barrier in the other. Finding this balance point, also known as 'dynamic neutral', is a key element in PRT. Staying in this 'ease' state for an appropriate length of time (see below) offers restrictions a chance to 'unlatch', release, normalize.

In this way it can be seen that the positioning element of the process is the preparation for the treatment to commence, and that the 'treatment' itself is self-generated by the tissues (nervous system, circulatory system, etc.), in response to this careful positioning. This helps to explain Jones's original name for what became strain/counterstrain, which he first termed 'spontaneous release by positioning' (Greenman 1996).

All of the variations on the theme of positional release, described briefly below and in the summary at the end of this chapter (Box 1.2), are discussed in greater detail in later chapters.

What are 'tender points'?

Jones (1981) described the localized areas associated with distressed and dysfunctional tissues as 'tender points. The characteristics of these are discussed in Box 1.1.

PR VARIATIONS

1. Exaggeration of distortion

This is one aspect of SCS methodology.

Take the example of an individual bent forward in psoas spasm/lumbago. This would involve someone in considerable discomfort or pain, who was also posturally distorted – bent forward into flexion, together with rotation and side-bending. Any attempt by the person (or the practitioner) to straighten the individual towards a more physiologically normal posture would be met by increased pain and a great deal of resistance. Movement toward, or engagement of, the resistance barrier would therefore not be an ideal first option.

However, moving the area *away from* the restriction barrier in such a situation is not usually a problem. Clinical experience has shown that the position required to find the position of 'ease' for someone in this state normally involves painlessly increasing the degree of distortion displayed, placing the person (in the example given) into some variation based on forward bending (possibly supine or while side-lying rather than weight-bearing – see examples in Chapter 3) until pain is found to reduce or resolve.

After 60 to 90 seconds in this 'position of ease', a slow return to neutral would be carried out and theoretically – and commonly in practice – the patient would be somewhat or completely relieved of pain and spasm.

Box 1.1 What are 'tender points?

As tissues adapt and modify due to the effects of age, overuse, misuse, disuse, etc. (see Chapter 2 for discussion of the evolution of soft-tissue dysfunction), localized areas of ischemic, sensitized tissues develop.

A variety of biomechanical, biochemical, neurological, circulatory and psychological influences are associated with such changes, which gradually evolve from sensitivity to discomfort, and eventually pain (Mense & Simons 2001).

A general term that can be applied to such tissues, whatever level of the spectrum of dysfunction happens to be operating, is hyperalgesia (Lewit 1999).

A simpler, more user-friendly word, is 'tender' (Jones 1981).

Whether such points are in their early embryonic formative stages, or have reached the state of being active myofascial trigger points, they are tender, and this is the term given in SCS methodology to points used in the protocol of assessment and treatment (see Chapter 3).

2. Replication of position of strain

This is another element of SCS methodology.

Let us take an example of someone who is bending to lift a load when an emergency stabilization is required, as strain, and perhaps spasm, results (the person slips or the load shifts – see notes on the mechanisms involved in SCS in Chapter 3). The patient would then be locked into the same position of 'lumbago-like' antalgic distortion as described in variation 1 above.

If, as SCS suggests, the position of ease commonly equals the position of strain – then the patient needs to go back into flexion – in slow motion – until tenderness vanishes from the monitored tender point and/or a sense of ease is perceived in the previously hypertonic shortened tissues. Adding small 'fine-tuning' positioning to the initial position of ease achieved by flexion usually achieves a situation in which there is a maximum reduction in pain.

This position is held for 60 to 90 seconds before slowly returning the patient to neutral, at which time, as in example 1 above, a partial or total resolution of hypertonicity, spasm and pain should be noted.

It should be obvious that the position of strain, as just described, is probably going to be an exact duplication of the position of exaggeration of distortion – as in variation 1.

These two elements of SCS – 'exaggeration of existing distortion' and 'replication of the position of strain' –

are of limited clinical value, and are described as examples only, since patients can rarely describe precisely the way in which their symptoms developed. Nor is obvious spasm such as torticollis or acute anteflexion spasm ('lumbago') the norm.

Note: It is strongly recommended that attention be paid to chronic distortion patterns, where adaptive shortening and crowding have occurred over a period of years, rather than as a result of acute strains, as positional release of chronic holding patterns can be a valuable approach in patient management.

Alternative methods, other than 'exaggerated distortion' and 'replication of position of strain', are needed in order to be able to easily identify probable positions of ease.

3. Using Jones's tender points as monitors

(Jones 1981)

Over many years of clinical experience Jones compiled charts and lists of specific tender point areas, relating to every imaginable strain, involving most of the joints and muscles of the body.

These are his 'proven' (by clinical experience) points. The tender points that he described are usually found in tissues that were in a shortened state at the time of strain, rather than those that were stretched, and in tissues that have become chronically shortened over time.

New points – outside of the Jones lists and charts – are periodically reported in the osteopathic literature; for example, a group of sacral foramen points relating to sacroiliac strains were identified and described by Ramirez et al (1989); see Chapter 3.

Jones and his followers have also provided strict guidelines for achieving ease in any tender points which are being palpated (the position of ease usually involving a 'folding' or crowding of the tissues in which the tender point lies).

This method is described in detail elsewhere in the text (Chapter 3) and involves maintaining pressure on the monitor tender point, or periodically probing it, as a position is achieved in which:

- there is no additional pain in whatever area is symptomatic, and
- pain in the monitored point has reduced by at least 70%.

This is then held for an appropriate length of time (90 seconds, according to Jones; however, there are marked variations in the suggested length of time that tissues need to be held in the position of ease, as will become apparent in the discussions of the many variables available in positional release methodology).

In the example of the person with acute low back pain who is locked in flexion, the tender point will usually be located on the anterior surface of the abdomen, in the muscle structures that were short at the time of strain (when the patient was in flexion), and the position that removes tenderness from this point will, as in previous examples, usually require flexion and probably some fine-tuning involving rotation and/or side-bending.

If there is a problem with Jones's formulaic approach it is that, while he is frequently correct as to the position of ease recommended for particular points, he is sometimes wrong. Or, to put it differently, the mechanics of the particular strain with which the practitioner/therapist is confronted may not coincide with Jones's guidelines.

A practitioner/therapist who relies solely on Jones's 'menus' or formulae could find difficulty in handling a situation in which use of the prescribed tender points fails to produce the desired results. Reliance on Jones's menu of points and positions can therefore lead to the practitioner/therapist becoming dependent on them, and it is suggested that use of palpation skills, and other variations on Jones's original observations, offers a more rounded approach to dealing with strain and pain.

Fortunately, Goodheart and others have offered less rigid frameworks within which to work using positional release mechanisms.

4. Goodheart's approach

(Goodheart 1984, Walther 1988)

George Goodheart (the chiropractor who developed applied kinesiology) has described an almost universally applicable formula that relies more on the individual features displayed by the patient, and less on rigid formulae, as used in Jones's approach.

Goodheart suggests that a suitable tender point be sought in the tissues *antagonistic to* those active when pain or restriction is noted. If pain or restriction is reported, or is apparent on any given movement, the *antagonist* muscles to those operating at the time pain is noted will be those that house the tender point(s).

Thus, for example, pain (wherever it is felt) that occurs when the neck is being turned to the left will require that a tender point be located in the muscles that would turn the head to the right.

In the earlier example of a person locked in forward bending with acute pain and spasm, using Goodheart's approach, pain and restriction would be experienced as the person attempted to straighten up (i.e. moving into extension) from the position of enforced flexion.

The action of straightening up would usually cause pain in the back but, irrespective of where the pain is noted, the tender point would be sought (and subsequently treated by being taken to a state of ease) in the muscles *opposite those working when pain was experienced* – i.e. it would lie in the flexor muscles (probably psoas) in this example.

It is important to emphasize that tender points that are going to be used as 'monitors' during the positioning phase of this approach are not sought in the muscles opposite those where pain is experienced, but in the muscles opposite those that are actively moving the patient, or area, when pain or restriction is noted.

Goodheart has added a number of modifications to the application of SCS that will be elaborated on in later chapters. These relate primarily to the confirmation of a muscle's 'suitability' for treatment by assessing its response to a short isometric contraction – if the muscle is likely to benefit from SCS, Goodheart suggests that it should 'weaken' following an isometric contraction. They also relate to the use of a neuromuscular stretch technique applied to the tissues around the apparently dysfunctional muscle spindle during the holding of the position of ease (see Chapter 5).

5. Functional technique *(Bowles 1981, Hoover 1969)*

Osteopathic functional technique ignores pain as its guide to the position of ease and relies instead on a reduction in palpated tone in stressed (hypertonic/spasmed) tissues as the body (or part) is being positioned, or fine-tuned, in relation to all potential directions of movement in a given region.

A position of combined ease is achieved using what is known as a 'stacking' sequence, explained and described in detail in a later chapter (Chapter 6).

One hand palpates the affected tissues (molded to them, without invasive pressure). This is described as the 'listening' hand, since it assesses changes in tone as the practitioner/therapist's other hand guides the patient (or part) through a sequence of positions that are aimed at enhancing ease and reducing bind.

A sequence of evaluations is carried out, each involving different directions of movement (flexion/extension, rotation right and left, side-bending right and left, etc.) with each new movement starting at the point of maximum ease revealed during the previous evaluation, or combined points of ease of a number of previous evaluations. In this way, one position of ease is 'stacked' onto another, until all directions of movement have been assessed for ease.

If the same patient with the low back problem, as previously discussed, was being treated using functional technique, the tense tissues in the low back would be the ones being palpated.

Following a sequence of flexion/extension, side-bending and rotating in each direction, translation right and left, translation anterior and posterior, and compression/distraction (so involving all available directions of movement of the area) a position of maximum ease would be arrived at. If this 'stacked' position of ease is held for 30 to 90 seconds, a release of hypertonicity and reduction in pain should result.

The precise sequence in which the various directions of motion are evaluated seems to be irrelevant, as long as all possibilities are included.

Theoretically (and usually, in practice) the position of palpated maximum ease (reduced tone) in the distressed tissues should correspond with the position that would have been found were pain being used as a guide, as in either Jones's or Goodheart's approach, or if the more basic 'exaggeration of distortion' or 'replication of position of strain' were being used as guides to positioning.

An exercise in this form of palpation (which, when complete, produces the 'combined' position of ease) will be found in Chapter 6.

6. Any painful point as a starting place for SCS *(McPartland & Zigler 1993)*

All areas that palpate as painful are responding to, or are associated with, some degree of imbalance, dysfunction or reflexive activity that may well involve acute strain or chronic adaptation. However, whether we can identify the complex strain pattern is an open question.

The Jones approach identifies the likely position of tender points relating to particular strain patterns (everted ankle, lumbar flexion strain, etc.).

However, it makes just as much sense to consider that any painful point identified during soft-tissue evaluation, massage or palpation (including a search for trigger points) can be treated by positional release, whether we know what strain produced it or not, and whether the problem is acute or chronic.

Experience, and simple logic, tells us that the response to positional release of a chronically fibrosed area will be less dramatic than from tissues held in simple spasm or hypertonicity. Nevertheless, even in chronic settings, a degree of release and ease can be produced, allowing for easier access to the deeper fibrosis.

This approach, of being able to treat any painful tissue using positional release, is valid whether the pain is being monitored via feedback from the patient (using reducing levels of pain in the palpated point as a guide – i.e. strain/counterstrain) or whether the functional technique concept of assessing a reduction in tone in the tissues is being used.

A period of 60 to 90 seconds is recommended as the time for holding the position of maximum ease – although some (such as Marsh Morrison – see variation 8 below) suggest just 20 seconds.

7. Facilitated positional release (FPR)

(Schiowitz 1990)

This variation on the theme of functional and SCS methods involves the positioning of the distressed area into the direction of its greatest freedom of movement, starting from a position of 'neutral' in terms of the overall body position.

To start with, the seated patient's sagittal posture might be modified to take the body or the part (neck for example) into a more 'neutral' position – a balance between flexion and extension – following which, an application of a facilitating force (usually a crowding of the tissues) would be introduced. No pain monitor is used but rather a palpating/listening hand is applied (as in functional technique) which senses for changes in ease and bind in distressed tissues as the body/part is carefully positioned and repositioned.

The final 'crowding' of the tissues, to encourage a 'slackening' of local tension, is the facilitating aspect of the process, according to its theorists. This 'crowding' might involve compression applied through the long axis of a limb, perhaps, or directly downwards through the spine via cranially applied pressure, or some such variation.

The length of time the position of ease is held is usually suggested at around 5 seconds. It is claimed that altered tissue texture, either surface or deep, can be successfully treated in this way.

FPR will be evaluated and discussed in greater detail in Chapter 7.

8. Induration technique

Texan chiropractor Marsh Morrison (1969) suggested very light palpation, using extremely light touch, as a means of feeling a 'drag' sensation (see notes on palpation in Chapter 3) alongside the spine (as lateral as the tips of the transverse processes).

Drag palpation identifies areas of increased hydrosis, which is a physiological response to increased sympathetic activity and is an invariable factor in skin overlying trigger points, and other forms of reflexively induced or active myofascial areas ('hyperalgesic skin zones') (Lewit 1999). Once drag is noted, pressure into the tissues normally results in a report of pain.

- The practitioner/therapist stands on the side of the prone patient opposite the side in which pain has been discovered in these paraspinal tissues.
- Once located, tender or painful points (lying no more lateral than the tip of the transverse process) are palpated for the level of their sensitivity to pressure.
- Once confirmed as painful, the point is held by firm thumb pressure while, with the soft thenar eminence of the other hand, the tip of the spinous process most adjacent to the pain point is very gently eased towards the pain (ounces of pressure only), so crowding and slackening the tissues being palpated, until pain reduces by at least 70% (Fig. 1.1).
- Direct pressure of this sort (lightly applied) towards the pain should lessen the degree of tissue contraction and the sensitivity.
- If it does not do so, then the angle of push on the spinous process towards the painful spot should be varied slightly so that, somewhere within an arc embracing a half circle, an angle of push towards the pain will be found to abolish the pain totally and will lessen the objective feeling of tension.
- This position is held for 20 seconds, after which the next point is treated.
- A full spinal treatment is possible using this extremely gentle approach which incorporates the same principles as SCS and functional technique, the achievement of ease and pain reduction as the treatment focus.

9. Integrated neuromuscular inhibition technique (INIT)

INIT (Chaitow 1994) uses a 'position of ease' involving tissues housing a trigger point, as part of a sequence

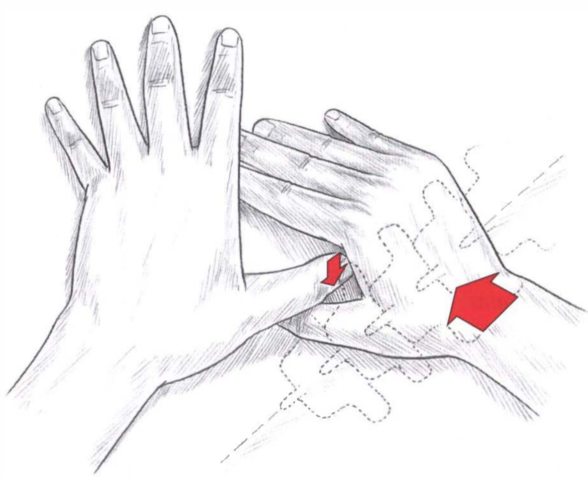


Figure 1.1 Induration technique hand positions. Pressure used on the spinous processes is measured in ounces (grams) at most.

for its deactivation ('trigger point release') (Mense & Simons 2001).

Note: A precise INIT protocol is given in Chapter 5; the outline below offers only a framework.

- The sequence commences with the location of a tender/pain/trigger point.
- This is followed by application of ischemic compression (this is optional and is avoided if pain is too intense or the patient too fragile or sensitive).
- Following the period of intermittent or constant pressure a positional release of the tissues is introduced (as in the SCS methodology described above).
- After an appropriate length of time, during which the tissues are held in 'ease', the patient is asked to introduce an isometric contraction into the affected tissues (muscle energy technique) for approximately 7 seconds.
- After the contraction the local tissues surrounding the trigger point are stretched for not less than 30 seconds.
- An isometric contraction and stretch involving the whole muscle is then performed – again for not less than 30 seconds.
- Methods to facilitate activation of the antagonists to the muscles involved are then introduced.

10. Proprioceptive taping

A quite different approach, practical aspects of which will be touched on in Chapter 11, is 'unloading' taping; a physiotherapy variant on PRT (Fig. 1.2).

This is a method that seems to incorporate many of the principles associated with PRT.

In recent years, for example, physiotherapists have treated specific conditions, commonly involving knee and/or shoulder dysfunction, by applying supportive taping to 'unload' the affected joints (spinal unloading is also used at times). Morrissey (2000) explains:

> *Proprioception is a critical component of co-ordinated shoulder movement with significant deficits having been identified in pathological and fatigued shoulders (Carpenter 1998). It is an integral part of rehabilitation programs to attempt to minimize or reverse these proprioceptive deficits. Taping is a useful adjunct to a patient-specific integrated treatment approach aiming to restore full pain-free movement to the shoulder girdle. Taping is particularly useful in addressing movement faults at the scapulo-thoracic, gleno-humeral and acromio-clavicular joints. The exact mechanisms by which shoulder taping is effective is not yet clear but the suggestion is that the effects are both proprioceptive and mechanical.*

It is interesting to note that some of the methods used in taping deliberately place distressed joints and tissues into ease positions for hours, or even days, with marked benefit. Additional information regarding this approach will be found in Chapter 11.

11. Mobilization with movement (MWM)

In Chapter 10, Ed Wilson et al have outlined the features of mobilization with movement (MWM) and its variants, as developed by New Zealand physiotherapist Brian Mulligan (1992).

The methodology of MWM has elements that equate closely with positional release principles. Features of the MWM methods as used in treatment of cervical and upper thoracic facet joint dysfunctions are as follows:

- The methods carry the acronym SNAGs, for 'sustained natural apophyseal glides'.
- SNAGs are used to treat restriction or pain experienced on flexion, extension, side-flexion or rotation of the cervical spine, usually from C3 and lower.
- It is essential to be aware of the facet angles of the segments being treated.
- Patient is weight-bearing, usually seated.
- Movements are actively performed by the patient, in the direction of restriction, while the practitioner passively holds an area (in the cervical and thoracic spine it is the segment immediately cephalad to the restriction) in anterior translation.
- This passive light pressure represents the positional release element of the method.

Figure 1.2 Proprioceptive taping for serratus anterior facilitation and inferior angle abduction.

- In the cervical spine the facet plane is towards the eyes.
- Residual stiffness/soreness is to be anticipated on the following day.
- The patient may usefully apply 'overpressure' to reinforce movement towards the restriction barrier.
- The same procedure is performed several times.
- Instant functional improvement is likely.
- At no time should pain be experienced.

The mechanisms whereby MWM methods achieve their effects are as yet uncertain.

Wilson hypothesizes that all joint abnormalities create afferent output which sensitizes (facilitates) the central nervous system (CNS), particularly the wide dynamic range (WDR) cells of the dorsal horn (Korr 1976). This creates efferent discharge to, and alters tone in, muscles controlling the joint, creating a vicious circle.

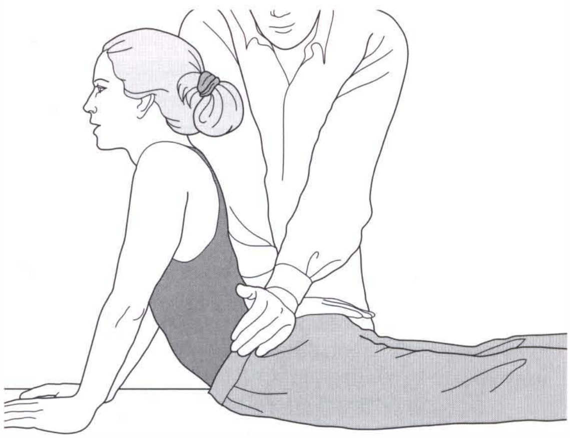
In the absence of intra- or extra-articular pathology, if the CNS can be offered normal afferent input for a period, muscle contractile power may alter, realigning joint biomechanics and helping to break into the cycle of dysfunction. By halting the excitatory barrage, a previously painful movement may become pain-free. Additionally, normal mechanoreceptor input from active muscles (as in SNAGs) should enhance normal function.

12. McKenzie's methods

By careful assessment of the effects of different movements and positions on existing pain (commonly involving extension of the spine), the McKenzie method attempts to identify those that effectively centralize pain (Fig. 1.3A, B).

Those movements or positions that centralize peripheral or extremity symptoms are prescribed as self-treatment (McKenzie 1990). For example, in a patient with sciatica (referred symptoms in the leg coming from the spinal S1 nerve root), movements or positions are explored in the hope of finding those which 'centralize' symptoms towards the low back. Symptom centralization is seen to be a good prognostic sign (Timm 1994).

The McKenzie concept is fully described in Chapter 9.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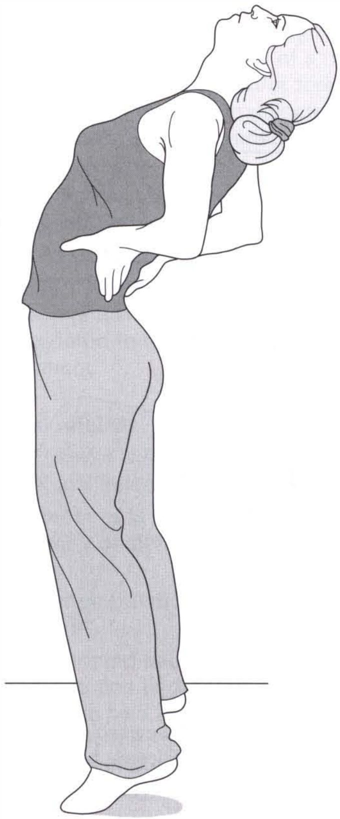
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Figure 1.3 (A) McKenzie extension position with practitioner adding overpressure. (B) Patient self-application of extension.

13. Sacro-occipital 'blocking' techniques (SOT)

In 1964 DeJarnette (1967) introduced the use of pelvic wedges (padded blocks, made from foam or wood) to allow gentle repositioning of the pelvis or spine.

The supine or prone patient (this is decided based on establishment of 'categories' of dysfunction) is positioned and supported by the blocks to allow changes to take place spontaneously (Fig. 1.4A, B, C).

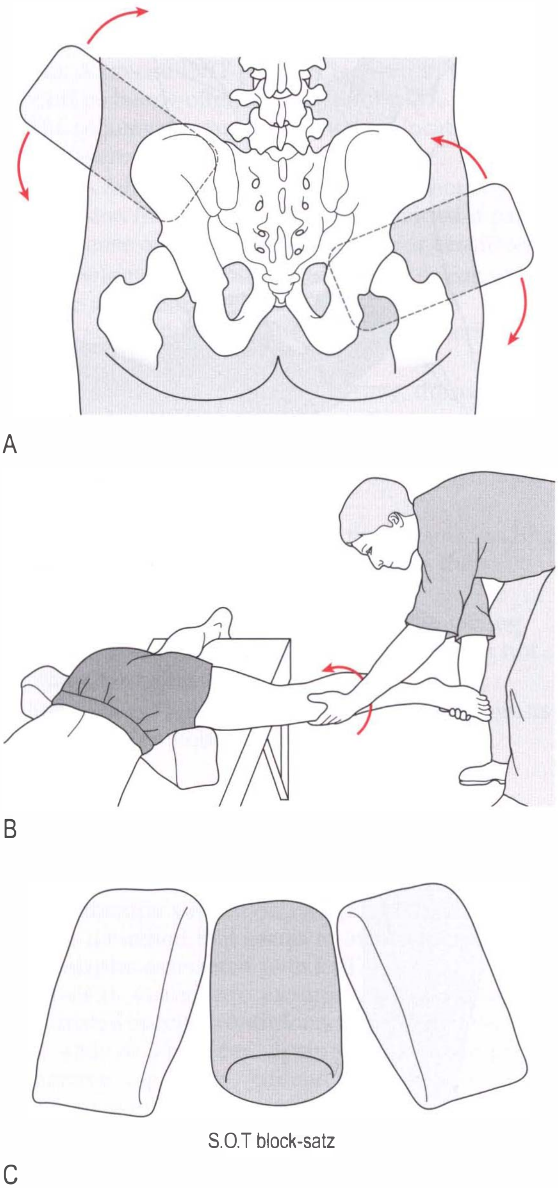

Figure 1.4 (A) Placement of blocks for particular positioning. (B) Treatment or assessment while positionally blocked. (C) Various solid and 'air' blocks.

DeJarnette is reported as saying that: 'the tableboard provided the foundation for the blocks, so that when the patient breathes this energy can be transmitted to motion for correction of the subluxation dysfunction' (Heese 1991).

Unger (1998) has demonstrated positive effects on muscle strength following use of 'blocking' techniques. These methods are described fully in Chapter 8.

14. Other approaches

There are a variety of methods involving positional release that do not quite fit into any of the categories listed above. These range from an effective rib-release technique devised by the founder of cranial osteopathy, W. G. Sutherland, and described by P. E. Kimberley (1980) to various cranial techniques described by John Upledger (Upledger & Vredevoogd 1983) and others, as well as fascial restriction techniques described by Jerry Dickey (1989) and variations modified by George Goodheart (Walther 1988). Some of these methods will be described in later chapters.

Commonalities and differences

Many of the PRT methods have in common an objective of reduction in the tone of distressed tissues associated with the dysfunction being treated.

The means whereby this is achieved vary, some (strain/counterstrain) using reduced pain levels as a guide to the comfort/ease position, and others using variations on palpated change (functional and facilitated positional release methods).

Some methods are entirely passive (SCS, functional, FPR, SOT blocks, taping), while some are active (McKenzie methods), and a few involve a combination of active and passive activity (mobilization with movement).

Apart from the technical differences of application, the differences between the various methods relate largely to details concerning how long the ease position should be held, including guideline timings such as:

- under 5 seconds for facilitated positional release
- 90 seconds for strain/counterstrain and functional technique
- 3 minutes or more for treatment of neurological conditions (Weiselfish 1993)
- up to 20 minutes with some aspects of positional release therapy (D'Ambrogio & Roth 1997)
- hours or days in physiotherapy taping.

These issues will be explored in later chapters.

In the next chapter an outline is offered of the ways in which dysfunction evolves as a process of (failed?) adaptation, and how positional release methods can offer some solutions.

Box 1.2 Summary of PR variations

All positional release methods require that positioning should be performed slowly, without introducing any additional pain to the patient.

In all variations, a slow return to neutral is advised following the holding of the position of ease.

Most of the positional release methods involve motion into ease, away from bind, using a slackening, crowding or 'folding' of dysfunctional tissues, in order (it is thought) to facilitate muscle spindle resetting and improved function.

Despite the gentleness of the methods there is commonly a reaction involving stiffness and possibly discomfort on the day following treatment, as tissues adjust to their new situation and adaptation processes accommodate these changes.

Strain–counterstrain (SCS)

- Seeks tender points that are then used (by being pressed) to monitor discomfort in tissues shortened at the time of acute or chronic strain.
- Tender points are used as guides to the 'ease' position, as pain reduces during positioning.
- SCS normally uses flexion to ease strains on the front of the body and extension to ease pain on the back of the body (see specific guidelines in Chapter 3).
- The position of ease once established (by achieving at least 70% reduction in pain from tender point) is held for 90 seconds as a rule.
- This position of ease commonly replicates the position of strain in order to find the position of ease.
- It also commonly exaggerates existing deviations, distortions, in order to achieve ease in tender palpated tissues.
- Tender points are usually situated in muscles antagonistic to those involved in movements that are painful or restricted.
- Goodheart (1984) adds various facilitating methods in order to reduce the time required for tissue release.
- Positional release therapy (D'Ambrogio & Roth 1997) suggests holding ease positions for up to 20 minutes to achieve enhanced tissue changes, but agree with Jones's '90-second rule' for simple musculoskeletal dysfunction treatment.

Functional techniques

- With one hand monitoring (listening) and the other acting to introduce movement, the tissues are taken to a position of maximal ease in all available directions of motion – a point of dynamic neutral – in which one position of ease has been 'stacked' on another.
- The process of stacking involves subsequent assessments for ease in different directions of movement, commencing at the point of ease revealed by the previous assessment.
- Following the holding of the position of dynamic neutral until a sense of warmth or pulsation or greater ease is noted (90-second minimum suggested), the whole sequence is repeated at least once more, with variations in the positions of ease being evident as a consequence of changes resulting from the previous 'treatment'.

Facilitated positional release

- In treating soft-tissue dysfunction, FPR uses a sequence involving neutralizing the anteroposterior curve, followed by creation of a position of ease, followed by crowding and/or torsion to produce a sense of greater ease in palpated tissues (note: this sequence can be varied).
- In treating joint restriction the same approach is used, but the joint involved is also guided towards its directions of most-free motion.
- The time the position of ease is held in FPR is 3 to 4 seconds only before retesting.
- If no improvement is noted, the condition is considered to require more direct approaches of treatment.

Fascial release

- Soft tissues are held in the direction of greatest ease until 'release' occurs.
- The process is repeated until there exists symmetry of motion in all directions.

Cranial manipulation (applicable anywhere on the body)

- The restricted structure/tissues are taken towards their direction of greatest ease, at which time this position is held until there is a sense of an attempt by the structure/tissues to return towards the direction from which they have been moved. This is resisted.
- Subsequently, the barrier usually retreats and the tissues are taken into greater ease. The process is repeated.

Proprioceptive taping

- Use of supportive taping to unload dysfunctional, stressed tissues and joints, for long enough to

Box 1.2 Continued

allow re-education processes to take place, as a result of proprioceptive modifications.

Mobilization with movement (MWM) including SNAGs

- Gentle short-term positioning of joints (involving involuntary ranges of joint play), including spinal (sustained natural apophyseal glides – SNAGs), in order to allow active pain-free movement to be performed by the patient, in order to restore normal function.

McKenzie's methods

Use of positioning or movement to establish an ideal protocol to assist in centralizing pain from periphery towards the spine. Once identified, home-management exercises are prescribed.

Sacro-occipital technique (SOT): blocks and wedges

Precisely determined use of padded wedges (blocks) to support pelvic and spinal tissues as the patient lies prone or supine, allowing the repositioning to encourage normalization of dysfunction.

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2

The evolution of dysfunction

CHAPTER CONTENTS

Dysfunction variables

Biomechanical changes sometimes occur dramatically, suddenly, traumatically. Strains, sprains, twists and blows are incidents that, depending on the degree of force involved and the resilience and adaptability of the tissues affected, have largely predictable consequences (tears, breaks and/or inflammation as examples).

By far the majority of somatic dysfunctional conditions, however, occur gradually. They evolve over time as the tissues locally, and the body generally, adapt to and absorb the load (stresses) being imposed.

Selye (1956) described both a local and a general adaptation model.

GAS and LAS

Selye called stress the nonspecific element in disease production. He described the general adaptation syndrome (GAS) as comprising phases, or stages:

1. alarm reaction phase – brief and acute
2. resistance (adaptation) phase – a process that can last many years, followed by
3. exhaustion phase (when adaptation finally fails) – where frank disease or serious dysfunction becomes obvious – leading on to stage of collapse (Fig. 2.1).

GAS affects the organism as a whole, while the local adaptation syndrome (LAS) affects a specific stressed area of the body – say a shoulder – when it has been repetitively stressed playing tennis.

Selye demonstrated that stress (defined as anything to which the body is obliged to adapt) results in a pattern of adaptation, individual to each organism. He also showed that when an individual is acutely alarmed, stressed or aroused, homeostatic (self-normalizing) mechanisms are activated.

The alarm reaction of Selye's general adaptation syndrome and local adaptation syndrome is equivalent to the 'fight-or-flight' response, and to sympathetic arousal.

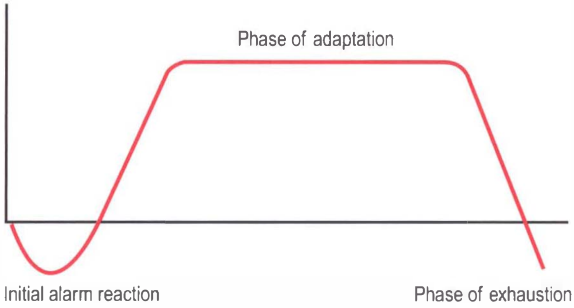


Figure 2.1 GAS/LAS.

If the alarm status is prolonged, or if repetitive defensive adaptation processes commence, long-term chronic changes take place.

The results of the repeated postural and traumatic insults of a lifetime, combined with the effects of emotional and psychological distress, as well as the unique biochemical status of the individual, will often present a confusing pattern of tense, contracted, bunched, fatigued and ultimately fibrous tissue.

Researchers have shown that the type of stress involved in producing adaptive changes can be entirely biomechanical in nature (Wall & Melzack 1989), for example a single injury or repetitive postural strain, or purely psychic in nature (Latey 1996), for example chronically repressed anger.

More often than not, though, a combination of emotional and physical stresses will so alter neuromusculoskeletal structures as to create a series of identifiable physical changes that will themselves generate further stress, such as pain, joint restriction, general discomfort and fatigue.

Predictable chain reactions of compensating changes will evolve in the soft tissues in most instances of this sort of chronic adaptation to biomechanical and psychogenic stress (Lewit 1999). Such adaptation will be seen almost always to be at the expense of optimal function as well as also being an ongoing source of further physiological embarrassment.

It is worth considering that a great deal of adaptation is deliberately initiated – where it is known as 'training'.

In order to adapt to perform particular tasks in athletics (lifting weights, pitching a ball, running specific distances, jumping long or high, etc.) adaptation to imposed demands, in the form of training, ensures adaptation to that task – often to the detriment of other functions (Norris 1999).

Similar adaptive changes occur in response to occupational and recreational demands.

Injury superimposed on chronic change

A combination commonly occurs in which stress is suddenly applied to already adaptively compromised tissues, for example when an action such as bending or lifting, which would 'normally' be well coped with, results in injury, due to the chronically modified (fibrosed, shortened, weakened, etc.) state of the tissues involved.

Therapeutic interventions need to take account of these variables, since it is patently undesirable to perform the same manual methods which might be suitable for chronic indurated tissues on acutely irritated ones.

Positional release methods are applicable to both acute and chronic dysfunctional states. However, as will become clear, some PRT variations are more useful in acute, painful conditions, or for frail, sensitive, compromised individuals, than in chronic situations.

Signs of dysfunction

In Box 2.1 there is a description of what has been termed the common compensatory pattern (CCP), deviations from which are seen to suggest poor adaptation potential, and the probability of a poor response to whatever treatment is received (Zink & Lawson 1979).

Local and general indications of dysfunction

Obviously it is necessary and useful to assess individual joints for their ranges of motion, and individual muscles, and groups of muscles, for flexibility, strength, stamina, shortness, etc., as well as for the presence of myofascial trigger points within them. Some such assessment methods are described later in this chapter.

All such assessments and evaluations are necessary in specific circumstances; however, it is also useful to have – along with the Zink sequence (Box 2.1) – a number of more general screening tools which indicate current levels of functionality and can be repeated over time to evaluate progress.

Amongst those that offer rapid, clinically useful indications of function/dysfunction, are:

- postural alignment – particularly crossed syndrome patterns (Janda 1986)
- specific functional evaluations such as hip extension test, hip abduction test, and the scapulohumeral rhythm test (Janda 1996)
- assessment of one-legged balance, eyes open and eyes closed (Bohannon et al 1984)
- evaluation of core stability (Norris 1999).

Most of these are described in Box 2.2.

Box 2.1 Postural compensation patterns (Zink & Lawson 1979)

Fascial compensation is seen as a useful, beneficial and above all functional (i.e. no obvious symptoms result) response on the part of the musculoskeletal system, for example as a result of anomalies such as a short leg, or overuse.

Decompensation describes the same phenomenon where adaptive changes are seen to be dysfunctional, to produce symptoms, evidencing a failure of homeostatic mechanisms (i.e. adaptation and self-repair).

Zink & Lawson (1979) have described a model of postural patterning resulting from the progression towards fascial decompensation.

By testing the tissue 'preferences' (tight–loose) in different areas, Zink & Lawson maintain that it is possible to classify patterns in clinically useful ways:

- ideal patterns (minimal adaptive load transferred to other regions)
- compensated patterns, which alternate in direction from area to area (e.g. atlanto–occipital–cervicothoracic–thoracolumbar–lumbosacral) and which are commonly adaptive in nature
- uncompensated patterns which do not alternate, and which are commonly the result of trauma.

Zink & Lawson described four transitional crossover sites where fascial tension patterns can most easily be assessed for rotation and side-bending preferences:

- occipito-atlantal (OA)
- cervicothoracic (CT)
- thoracolumbar (TL)
- lumbosacral (LS).

Zink & Lawson's research showed that most people display alternating patterns of rotatory preference, with about 80% of people showing a common pattern of L–R–L–R (termed the 'common compensatory pattern' or CCP) (Fig. 2.2A).

Zink & Lawson observed that the 20% of people whose compensatory pattern did not alternate (Fig. 2.2B) had poor health histories.

Treatment of either CCP, or uncompensated fascial patterns, has the objective of trying, as far as is possible, to create a symmetrical degree of rotatory motion at the key crossover sites.
The methods used range from direct muscle energy approaches to indirect positional release techniques.

Assessment of tissue preference in the Zink & Lawson sequence

Occipito-atlantal area

- Patient is supine.
- Practitioner/therapist sits at head, slightly to one side facing the corner of the table.
- One hand (caudal hand) cradles the occiput with opposed index finger and thumb controlling the atlas.
- The neck is flexed so that rotatory motion is focused into the upper cervical area only.
- The other hand is placed on patient's forehead.
- The contact on the occipito-atlantal joint evaluates the tissue preference as the area is slowly rotated left and right.

Cervicothoracic area

- Patient is supine in relaxed posture.
- Practitioner sits at head of table and slides hands under the patient's scapulae.

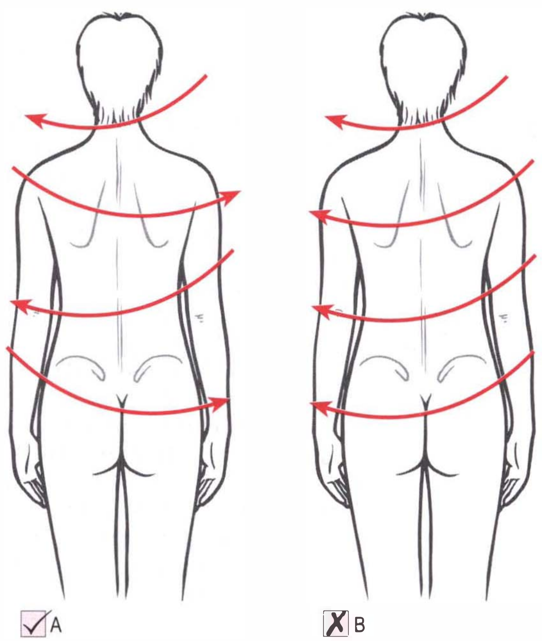


Figure 2.2 (A) Compensated pattern of alternating crossover patterns indicates minimal adaptive load transferred to other regions. (B) Uncompensated patterns do not alternate and may be the result of trauma.

Box 2.1 Continued

- Each hand independently assesses the area being palpated for its 'tightness–looseness' preferences by easing first one and then the other scapula area towards the ceiling.
- By holding tissues in their 'loose' or ease, directions (or by holding tissues in their 'tight' or bind directions – and introducing isometric contractions), changes can be encouraged.

Thoracolumbar area
- Patient is supine, practitioner/therapist at waist level faces cephalad and places hands over lower thoracic structures, fingers along lower rib shafts laterally.
- Treating the structure being palpated as a cylinder the hands test the preference this has to rotate around its central axis, one way and then the other.
- As an additional assessment, once this has been established, the preference to side-bend one way or the other is evaluated, so that combined ('stacked') positions of ease, or bind, can be established.
- By holding tissues in their 'loose' or ease positions (or by holding tissues in their 'tight' or bind positions and introducing isometric contractions, or by just waiting for a release), changes can be encouraged.

Lumbosacral area
- Patient is supine, practitioner/therapist stands below waist level facing cephalad and places hands on anterior pelvic structures, using the contact as a 'steering wheel' to evaluate tissue preference as the pelvis is rotated around its central axis and seeking information as to its 'tightness–looseness' (see above) preferences.
- Once this has been established, the preference to side-bend one way or the other is evaluated, so that combined ('stacked') positions of ease, or bind, can be established.
- By holding tissues in their 'loose', or ease, positions (or by holding tissues in their 'tight' or bind positions and introducing isometric contractions, or by just waiting for a release), changes can be encouraged.

These general evaluation approaches, which seek evidence of compensation and of global adaptation patterns involving loose and tight tissues, offer a broad means of commencing rehabilitation, by altering structural features associated with dysfunction.

Palpatory literacy

Skilful palpation allows for discrimination between the various states and stages of dysfunction, with some degree of accuracy. Lord & Bogduk (1996) state:

> *There have been many claims regarding the accuracy of manual diagnosis but few data. Only one study (Jull & Bogduk 1988) compared manual diagnosis to the criterion standard of local anaesthetic blocks. The authors found the sensitivity and specificity of the manual examination technique to be 100%. The manual therapist correctly identified all patients with proven joint pain, the symptomatic and asymptomatic segments. The ability of other manual examiners to replicate these results has not been tested.*

This study of the skills of (albeit) one (physio)-therapist's ability to localize dysfunction suggests that isolating a segment or joint that is dysfunctional is well within the potential of manual therapists, if palpation skills are adequately refined.

The application of positional release methodology requires a high degree of palpatory literacy, since the ability to 'read' tissue responses to positioning is critical, especially in application of functional methodology.

Osteopathic assessment of somatic dysfunction

Gibbons & Tehan (2001) explain the basis of osteopathic palpation when assessing for somatic dysfunction (particularly spinal dysfunction) as follows (using the acronym ARTT).

- *A relates to asymmetry*. DiGiovanna (1991) links the criteria of asymmetry to a positional focus stating that the 'position of the vertebra or other bone is asymmetrical'. Greenman (1996) broadens the concept of asymmetry by including functional in addition to structural asymmetry.

- *R relates to range of motion*. Alteration in range of motion can apply to a single joint, several joints or a region of the musculoskeletal system. The abnormality may be either restricted or increased mobility and includes assessment of quality of movement and 'end-feel'.

- *T relates to tissue texture changes*. The identification of tissue texture change is important in the diagnosis of somatic dysfunction. Palpable changes may be noted in superficial, intermediate and deep tissues. It is important for clinicians to differentiate normal from abnormal (Fryer & Johnson 2005).

Box 2.2 Three key indicators

Three general indicators of functionality will be briefly outlined:

- crossed syndrome patterns – indicators of relative postural alignment (Janda 1982)
- assessment of one-legged balance, eyes open and eyes closed – an indicator of neurological integration between intero- and exteroceptor input, central processing efficiency and motor control (Bohannon et al 1984)
- evaluation of core stability – an indicator of relative efficiency of core muscles in protection of the spine.

Crossed syndrome patterns

Upper crossed syndrome (Fig. 2.3)
This pattern is characterized by the following features:

- shortness and tightness of pectoralis major and minor, upper trapezius, levator scapulae, the cervical erector spinae and suboccipital muscles, along with
- lengthening and weakening of the deep neck flexors, serratus anterior, lower and middle trapezii.

As a result, the following features develop:

1. The occiput and C1/C2 become hyperextended, with the head pushed forward ('chin-poke').
2. The lower cervical to fourth thoracic vertebrae become posturally stressed as a result.
3. The scapulae becomes rotated and abducted.
4. This alters the direction of the axis of the glenoid fossa, resulting in the humerus needing to be stabilized by additional levator scapula and upper trapezius activity, together with additional activity from supraspinatus.

The result of these changes is greater cervical segment strain plus referred pain to the chest, shoulders and arms. Pain mimicking angina may be noted plus a decline in respiratory efficiency.

The solution, according to Janda, is to be able to identify the shortened structures and to release (stretch and relax) them, followed by re-education towards more appropriate function. Positional release alternatives are described in later chapters.

Lower crossed syndrome (Fig. 2.3)
This pattern is characterized by the following features:

- shortness and tightness of quadratus lumborum, psoas, lumbar erector spinae, hamstrings, tensor fascia lata and possibly piriformis, along with
- lengthening and weakening of the gluteal and the abdominal muscles.

The result of these changes is that the pelvis tips forward on the frontal plane, flexing the hip joints and producing lumbar lordosis and stress at L5–S1 with pain and irritation. A further stress commonly appears in the sagittal plane leading the pelvis to be held in increased elevation, accentuated when walking, resulting in L5–S1 stress in the sagittal plane. One result is low back pain. The combined stresses described produce instability at the lumbodorsal junction, an unstable transition point at best.

Part of the solution for an all too common pattern such as this is to identify the shortened structures and to release them, possibly using variations on the theme of MET, followed by re-education of posture and use.

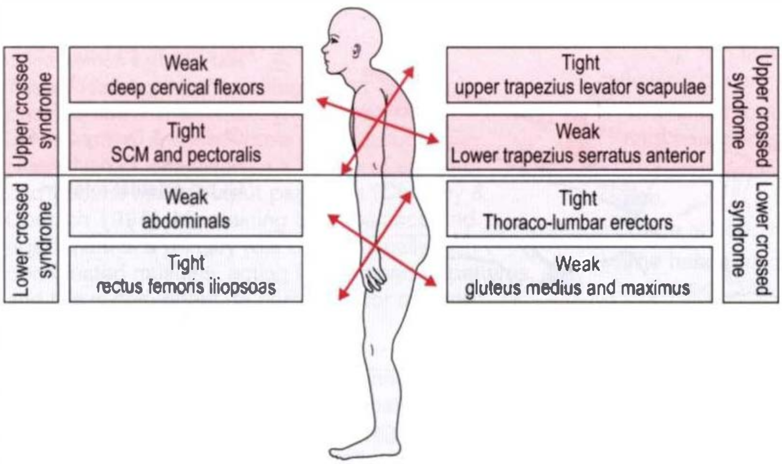


Figure 2.3 Upper and lower crossed syndromes.

Box 2.2 Continued

Positional release alternatives are described in later chapters.

Specific functional assessments of crossed pattern syndromes

Hip abduction test (Janda 1982)

The patient lies on the side, ideally with head on a cushion, with the upper leg straight and the lower leg flexed at hip and knee, for balance (Fig. 2.4).

The practitioner, who is observing not palpating, stands in front of the person and toward the head end of the table.

The patient is asked to slowly raise the leg into abduction.

Normal is represented by pure hip abduction to 45°

Abnormal is represented by:

- hip flexion during abduction, indicating tensor fascia lata (TFL) shortness
- the leg externally rotating during abduction, indicating piriformis shortness
- hip hiking', indicating quadratus lumborum shortness (and gluteus medius weakness)
- posterior pelvic rotation, suggesting short antagonistic hip adductors.

Palpation

- The practitioner stands behind the side-lying patient, with one or two finger pads of the cephalad hand on the tissues overlying quadratus lumborum, approximately 2 inches (5 cm) lateral to the spinous process of L3.
- The caudad hand is placed so that the heel rests on gluteus medius and the finger pads on tensor fascia lata (TFL).
- The firing sequence of these muscles is assessed during hip abduction.
- If quadratus lumborum (QL) fires first (indicated by a strong twitch or 'jump' against the palpating fingers), it is overactive and short.
- The ideal sequence is TFL contracting first, followed by gluteus medius and finally QL (but not until about 20–25° of abduction of the leg).
- If either TFL or QL is overactive (fire out of sequence) then they will have shortened, and gluteus medius will be inhibited and weakened (Janda 1986).

Hip extension test

- The patient lies prone and the therapist stands to the side, at waist level, with the cephalad hand spanning the lower lumbar musculature and assessing erector spinae activity, left and right (Fig. 2.5).
- The caudal hand is placed so that its heel lies on the gluteal muscle mass, with the fingertips resting on the hamstrings on the same side.
- The person is asked to raise that leg into extension as the therapist assesses the firing sequence.
- Which muscle fires (contracts) first?
- The normal activation sequence is (1) gluteus maximus, (2) hamstrings, followed by (3) contralateral erector spinae, and then (4) ipsilateral erector spinae.
- Note: not all clinicians agree that this sequence is correct; some believe the hamstrings should fire first, or that there should be a simultaneous contraction of hamstrings and gluteus maximus – but all agree that the erector spinae should not contract first.

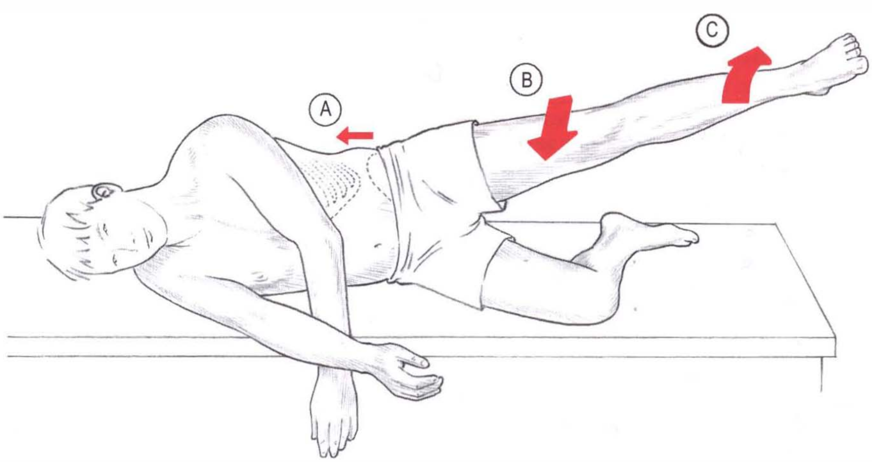


Figure 2.4 Hip abduction test which, if normal, occurs without 'hip hike', hip flexion or external rotation. (From Chaitow & Delany 2004.) A: hip hike; B: hip flexion; C: hip external rotation

Box 2.2 Continued

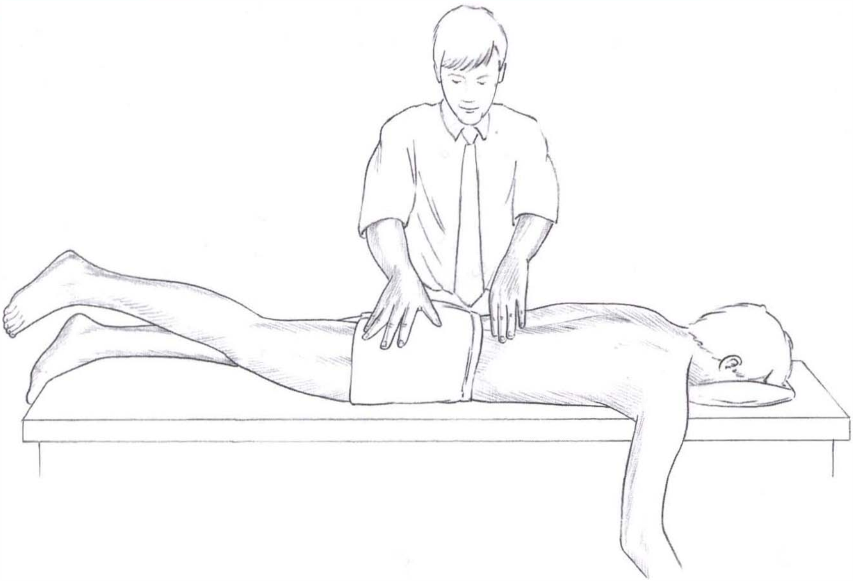


Figure 2.5 Hip extension test. The normal activation sequence is gluteus maximus, hamstrings, contralateral erector spinae, ipsilateral erector spinae. (From Chaitow 2003b.)

- If the erectors on either side fire (contract) first, and take on the role of gluteus maximus as the prime movers in the task of extending the leg, they will become shortened and will further inhibit/ weaken gluteus maximus.

Janda (1996) says, 'The poorest pattern occurs when the erector spinae on the ipsilateral side, or even the shoulder girdle muscles, initiate the movement and activation of gluteus maximus is weak and substantially delayed … the leg lift is achieved by pelvic forward tilt and hyperlordosis of the lumbar spine, which undoubtedly stresses this region.'

Assessment of balance

The extremely complex relationship between balance and the nervous system (with its interoceptive, proprioceptive and exteroceptive mechanisms) also involves a variety of somatic and visceral motor output pathways (Charney & Deutsch 1996). Maintaining body balance and equilibrium is a primary role of functionally coordinated muscles, acting in task-specific patterns, and this is dependent on normal motor control (Winters & Crago 2000).

Single leg stance balance tests (Bohannon et al 1984)
This is a reliable procedure for information regarding vulnerability and stability as well as regarding neurological integration and efficiency (Fig. 2.6).

Procedure:

- The barefoot patient is instructed to raise one foot up without touching it to the support leg.
- The knee can be raised to any comfortable height.
- The patient is asked to balance for up to 30 seconds with eyes open.
- After testing standing on one leg, the test should be repeated with the other leg.
- When single leg standing with eyes open is successful for 30 seconds the patient is asked to 'spot' something on a wall opposite, and to then close the eyes while visualizing that spot.
- An attempt is made to balance for 30 seconds.

Scoring: The time is recorded when any of the following occurs:

- The raised foot touches the ground or more than lightly touches the other leg.
- The stance foot changes (shifts) position or toes rise.
- There is hopping on the stance leg.
- The hands touch anything other than the person's own body.

By regularly (daily) practicing this balance exercise, the time achieved in balance with eyes closed will increase.

More challenging balance exercises can also be introduced, including use of wobble boards and balance sandals.

Box 2.2 Continued

Figure 2.6 Single-legged stance for balance assessment.

As relative imbalances between antagonist muscle groups are normalized ('tight–loose'), eyes closed balance as a function dependent on proprioceptive input and interpretation should improve spontaneously. Positional release methods can assist in this process.

Core stability assessment

Core stabilization assessment and exercises
Both the abdominal musculature and the trunk extensors are important in offering stability to the spine (Cholewicki & McGill 1996).

A variety of exercises have been developed to achieve core stability involving the corset of muscles which surround, stabilize and, to an extent, move the lumbar spine, such as transversus abdominis, the abdominal oblique muscles, diaphragm, erector spinae, multifidi, etc. (Liebenson 2000).

In order to evaluate the current efficiency of stabilization the following method can be used (it can also be turned into a training exercise if core stability is deficient).

Basic 'dead-bug' exercise/test
A 'coordination' test that assists in evaluating the patient's ability to maintain the lumbar spine in a steady state during different degrees of loading has been developed by Hodges & Richardson (1999).

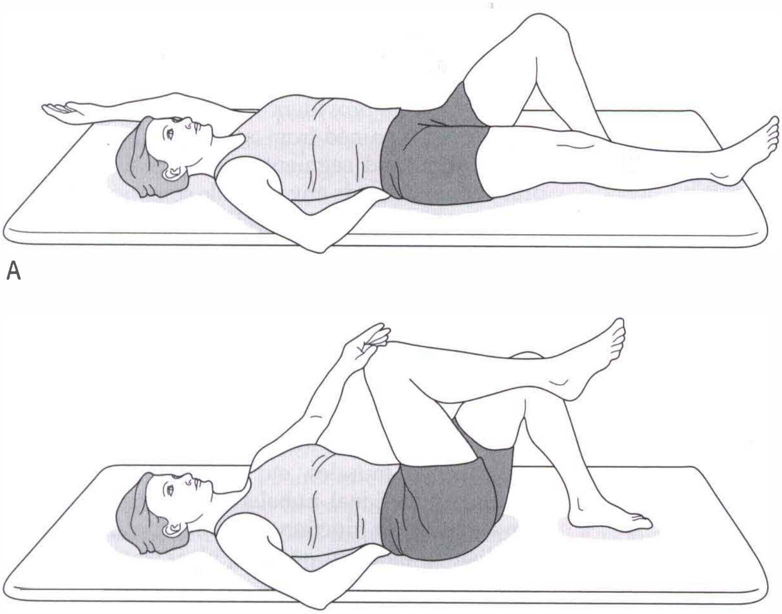
This 'dead-bug' exercise (Fig. 2.7) easily becomes a core stability exercise if repeated regularly:

- The patient adopts a supine hook-lying position.
- One of the patient's hands can usefully be placed in the small of the back so that the patient is constantly aware of the pressure of the spine towards the floor – an essential aspect of the exercise.
- The patient is asked to hollow the back, bringing the umbilicus toward the spine/floor, so initiating co-contraction of transversus abdominis and multifidus, and to maintain this position as increasing degrees of load are applied using the following method (or the more advanced stabilization exercises mentioned below).
- Gradually straightening one leg by sliding the heel along the floor. This causes the hip flexors to work eccentrically and, if this overrides the stability of the pelvis, it will tilt. Therefore, if a pelvic tilting/increased lumbar lordosis is observed or palpated before the leg is fully extended, this suggests *deep abdominal muscular insufficiency* involving transversus abdominis and internal obliques.
- Once the basic stabilization exercise of hollowing the abdomen, while maintaining pressure to the floor, is achievable without the breath being held, more advanced stabilization exercises may be introduced.
- These involve, in a graduated way, introducing variations on lower limb or trunk loading, for example raising one leg from the floor, then when this is easily achieved, both legs; then when this is easily achieved raising these further and 'cycling' – all the while maintaining a braced core abdominal region, with the lumbar spine pressed toward the floor (confirmed by observation) while breathing normally.

As well as abdominal tone and stability, it is necessary to encourage extensor function to be optimal and coordinated with abdominal muscle function.

Box 2.2 Continued

All these toning and stabilizing activities are enhanced by normalizing the imbalances demonstrated in the crossed syndrome patterns (above), and positional release methodology can be a key element in those processes.



A

B

Figure 2.7 Basic 'dead-bug' exercise to test and enhance core stability.

- *T relates to tissue tenderness.* Undue tissue tenderness may be evident. Pain provocation and reproduction of familiar symptoms are often used to localize somatic dysfunction.

Comparing SCS palpation with standard methods

McPartland & Goodridge (1997) tested the value of osteopathic palpation procedures (modifying the acronym ARTT to TART) specifically to evaluate the accuracy of positional release palpation, using Jones's strain/counterstrain (SCS) methodology.

This study addresses five questions:

1. What is the inter-examiner reliability of diagnostic tests used in SCS technique?
2. How does this compare with the reliability of the traditional osteopathic examination ('TART' examination)?
3. How reliable are different aspects of the TART examination?
4. Do positive findings of Jones's points correlate with positive findings of spinal dysfunction?
5. Are osteopathic students more reliable with SCS diagnosis or TART tests?

In this study examiners palpated for tender points which corresponded to those listed by Jones (1981) for the first three cervical segments (Fig. 2.8). These points were located by means of their anatomical position as described in Jones's original SCS textbook, and were characterized as being areas of 'tight' nodular myofascial tissue.

The TART examination comprised assessment for:

- tender paraspinal muscles
- asymmetry of joints
- restriction in range of motion
- tissue texture abnormalities.

Of these, zygapophyseal joint tenderness and tissue texture changes were the most accurate.

In Jones's methodology the location of the tender point is meant to define the *nature* of the dysfunction.

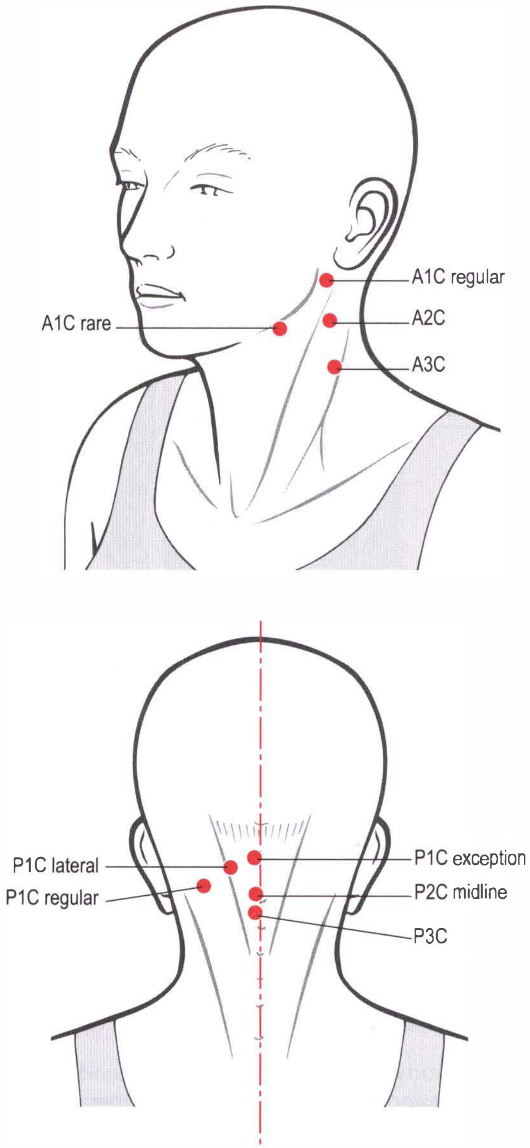


Figure 2.8 Location of left-sided tender points. Right-sided tender points are located at mirror-image positions. A = anterior; P = posterior.

However, McPartland & Goodridge (1997) found that: 'Few Jones points correlated well with the cervical articulations that they presumably represent'. They did find, though, that overall use of Jones's tender points (i.e. soft-tissue tenderness) was a more accurate method of localizing dysfunction in symptomatic patients than use of joint tenderness evaluation in the TART examination, and that 'students performed much better at SCS diagnosis than TART diagnosis'.

In manual medicine it is vital that practitioners and therapists have the opportunity to evaluate and palpate normal individuals, with pliable musculature, mobile joint structures and sound respiratory function, so that dysfunctional examples can be more easily identified.

Apart from standard functional examination it is important that practitioners and therapists acquire the abilities to assess by observation and touch, relearning skills familiar to older generations of 'low-tech' healthcare providers.

Information gained from a thorough history, clinical examination and segmental analysis will direct the practitioner towards any possible somatic dysfunction and/or pathology. This depth of diagnostic deliberation is essential if we are to assess which treatment approach might be the most effective.

Is there an optimal posture and function?

If structural modifications (restricted joints, shortened or weakened muscles, etc.) result from, as well as reinforce, functional imbalances in posture, respiration and in other functions, it is of some importance to establish whether an optimal, ideal state is a clinical reality.

Kuchera & Kuchera (1997) describe what they see as an 'optimal posture':

Optimal posture is a balanced configuration of the body with respect to gravity. It depends on normal arches of the feet, vertical alignment of the ankles, and horizontal orientation (in the coronal plane) of the sacral base. The presence of an optimum posture suggests that there is perfect distribution of the body mass around the center of gravity. The compressive force on the spinal disks is balanced by ligamentous tension; there is minimal energy expenditure from postural muscles. Structural and functional stressors on the body, however, may prevent achievement of optimum posture. In this case homeostatic mechanisms provide for 'compensation' in an effort to provide maximum postural function within the existing structure of the individual. Compensation is the counterbalancing of any defect of structure or function.

This concise description of postural reality highlights the fact that there is hardly ever an example of an optimal postural state, and by implication of respiratory function. However, there can be a well-compensated mechanism (postural or respiratory) which, despite asymmetry and adaptations, functions adequately. This is clearly the ideal, that systems and mechanisms should 'work' effectively.

Unless due notice is taken of emotional states, gravitational influences, proprioception and other neural inputs, inborn characteristics (such as short leg), as well as habitual patterns of use (upper chest breathing, for example) and wear and tear, whatever postural and functional anomalies are observed will remain signs of 'something' abnormal happening, of ongoing compensation or adaptation, but the chance of understanding just what the 'something' is will be remote.

It is useful to be able to evaluate and assess patterns of function, which indicate just how close, or far, the individual is from an optimal postural state.

A wider perspective

Whatever efforts are directed towards removal of the causes of any functional imbalance (dysfunction), whether this involves medication, surgery, or manual rehabilitation strategies, there is likely to be a benefit if identifiable biomechanical, structural constraints can be modified towards normal.

While specific restrictions (such as shortened muscles, restricted joints, etc.) may be identified and treated, a wider perspective may also be employed in order to determine the presence of global restriction patterns.

There are few local biomechanical problems that are not influenced by distant features. A fallen arch, for example, may impact via a chain of interacting influences on a stiff neck.

Murphy (2000) discusses the work of Moss (1962), who demonstrated that temporomandibular joint and cranial distortion, including nasal obstruction, was commonly associated with, 'forward head carriage, abnormal cervical lordosis, rounded shoulders, a flattened chest wall and a slouching posture'. The question might well be asked as to where such a chain begins – with the facial and jaw imbalance, or in the overall postural distortion pattern that impacted on the face and jaw?

Making sense of dysfunction on a global, whole-body scale requires that particular features be evaluated and in some coherent way formed into a rationale for whatever is being observed and presented, in terms of symptoms.

In other words a 'story' needs to be constructed out of the evidence available. In relation to positional release, a useful construct relates to the relative freedom of movement, or lack of it, as noted by palpation and assessment.

Tight–loose concept

The so called 'tight–loose' concept is one way of visualizing the three-dimensionality of the body, or part of it, as it is palpated and assessed (Ward 1997). This might involve seeking evidence for large or small areas in which interactive asymmetry exists, involving structures that are inappropriately 'tight' or 'loose', relative to each other.

For example:

- a 'tight' sacroiliac/hip is commonly noted on one side, while the contralateral side is 'loose'
- a 'tight' sternocleidomastoid and 'loose' scalenes are frequently noted ipsilaterally
- one shoulder may test as 'tight' and the other as 'loose'.

Areas of dysfunction commonly involve vertical, horizontal and 'encircling' (also described as cross-over, or spiral, or 'wrap-around') patterns of involvement.

Ward (1997) describes a 'typical' wrap-around pattern associated with a tight left low back area (which ends up involving the entire trunk and cervical area) as 'tight' areas evolve to compensate for loose, inhibited areas (or vice versa).

'Tightness' in the posterior left hip, sacroiliac joint (SIJ), lumbar erector spinae and lower rib cage are associated with:

- looseness on the right low back
- tightness of the lateral and anterior rib cage on the right
- tight left thoracic inlet, posteriorly, as well as
- tight left craniocervical attachments (involving jaw mechanics).

Clinical choices

Treatment choices involve a wide range of possibilities when addressing tightness in settings such as those described by Ward.

In bodywork in general the most common approach is to attempt – using one means or another – to push back the boundary, to engage the restriction barrier in order to force it to retreat, whether by means of stretching, or articulation, or direct manual pressure, or massage, or by reflex influences on restricted tissues.

Positional release methodology calls for *disengagement* from the restriction barrier, moving towards the point of balance between the tight and the loose structures (see Chapter 1). As tight areas are freed or loosened, even if only to a degree, at any given treatment session, so will inhibiting influences on 'loose', weak areas diminish, allowing a restoration of more normal tone and therefore relative balance.

In positional release terminology, terms and words are used which describe relative balance, including 'dynamic neutral', 'position of ease', 'comfort zone', 'position of comfort' and 'tissue preference'.

D'Ambrogio & Roth (1997) suggest that the range within which such a balanced state can be achieved, in dysfunctional tissues, is very small, within 2 to 3 degrees:

It may be speculated that positioning beyond its ideal range places the antagonistic muscles or opposing fascial structures under increased stretch, which in turn causes proprioceptive/ neural spill-over, resulting in reactivation of the facilitated segment.

See later in this chapter for discussion of facilitation.

Pain and the 'tight–loose' concept

Paradoxically, pain is often noted in the 'loose' rather than the 'tight' areas of the body, which may involve hypermobility and ligamentous laxity at the 'loose' joint or site. More commonly pain is associated with tight and bound, tethered structures, resulting from local overuse/misuse/abuse factors, with scar tissue, or with reflexively induced influences or centrally mediated neural control.

Myofascial trigger points may exist in either 'tight' or 'loose' structures, but the likelihood is that they will appear more frequently, and be more stressed, in those that are tethered, restricted and tight and where tissues are therefore relatively ischemic.

It is axiomatic that unless these myofascial trigger points are deactivated they will help to sustain the dysfunctional postural patterns which emerge. Also axiomatic is the fact that myofascial trigger points will continue to evolve if the etiological factors that created and maintained them are not corrected (Simons et al 1999).

Such deactivation may involve removing the biomechanical and other stress patterns that create and maintain trigger points, or direct manual intervention.

A sequence of integrated methods for trigger point deactivation is described in Chapter 5 that involves positional release as a key element of the protocol (see also description of INIT in Chapter 1).

Barriers, bind, ease, and other terminology

In osteopathic positional release methodology (SCS, functional technique, etc.) the terms 'bind' and 'ease' are often used to describe what is noted as unduly 'tight' or 'loose' (Jones 1981).

In manual medicine, when joint and soft tissue 'end-feel' is being evaluated, a similar concept is involved in the area being evaluated and it is common practice to make sense of such findings by comparing sides (Kaltenborn 1985).

The characterization of features described as having a soft or hard end-feel, or as being 'tight or loose', or as demonstrating feelings of ease or bind, may be one deciding factor as to which therapeutic approaches are introduced, and in what sequence.

These findings (tight–loose, ease–bind, etc.) have an intimate relationship with the concept of barriers, which need to be identified in preparation for direct (i.e. where action is directed towards the restriction barrier, towards bind, tightness) and indirect techniques (where action involves movement away from barriers of restriction, towards ease, looseness).

Ward (1997) states, 'tightness suggests tethering, while looseness suggests joint and/or soft tissue laxity, with or without neural inhibition'.

However, it is worth recalling that the tight side may be the more normal side, and also that clinically it is possible that tight restriction barriers may best be left unchallenged, in case they are offering some protective benefit.

As an example, van Wingerden (1997) reports that both intrinsic and extrinsic support for the SIJ derives in part from the hamstring (biceps femoris) status. Intrinsically the influence is via the close anatomical and physiological relationship between biceps femoris and the sacrotuberous ligament (which frequently attaches via a strong tendinous link).

Force from the biceps femoris muscle can lead to increased tension of the sacrotuberous ligament in various ways, and since increased tension of the sacrotuberous ligament diminishes the range of sacroiliac joint motion, the biceps femoris can play a role in stabilization of the SIJ (Vleeming 1989).

van Wingerden (1997) also notes that in low back pain patients, forward flexion is often painful as the load on the spine increases. This happens whether flexion occurs in the spine or via the hip joints (tilting of the pelvis). If the hamstrings are tight and short they effectively prevent pelvic tilting. 'In this respect, an increase in hamstring tension might well be part of a defensive arthrokinematic reflex mechanism of the body to diminish spinal load.'

If such a state of affairs is long-standing the hamstrings (biceps femoris) will shorten, possibly influencing sacroiliac and lumbar spine dysfunction.

The decision to treat tight ('tethered') hamstrings should therefore take account of why they are tight, and consider that in some circumstances they are offering beneficial support to the SIJ or reducing low back stress.

Chain reactions and 'tight–loose' changes

Vleeming et al (1997) connect gravitational strain with changes of muscle function and structure, which lead predictably to observable postural adaptive modifications and functional limitations.

Janda (1986) said something similar: 'Postural muscles, structurally adapted to resist prolonged gravitational stress, generally resist fatigue. When overly stressed, however, these same postural muscles become irritable, tight, shortened.'

The antagonists to these shortened postural muscles demonstrate inhibitory characteristics described as 'pseudoparesis' (a functional, non-organic weakness) or 'myofascial trigger points with weakness' when they are stressed.

General treatment options

Ward (1997) has described methods for restoration of 'three-dimensionally patterned functional symmetry'.

Identification of patterns of ease–bind or loose–tight, in a given body area, or the body as a whole, should emerge from sequential assessment of muscle shortness and restriction, or palpation, or any comprehensive evaluation of the status of the soft tissues of the body.

- Appropriate methods for release of areas identified as tight, restricted or tethered might usefully involve soft-tissue manipulation methods such as myofascial release (MFR), muscle energy techniques (MET), neuromuscular technique (NMT), positional release technique (PRT), singly or in combination, plus other effective manual approaches.
- Identification and appropriate deactivation of myofascial trigger points contained within these soft-tissue structures should be a priority.
- If joints fail to respond adequately to soft-tissue mobilization, the use of articulation/mobilization or high-velocity thrust (HVT) methods may be incorporated, as appropriate to the status (age, structural integrity, inflammatory status, pain levels, etc.) of the individual.
- It is suggested, however, that in sensitive or acute situations positional release methods offer a useful first line of treatment with little or no risk of exacerbating the condition.
- Re-education and rehabilitation (including homework) of posture, breathing and patterns of use, in order to restore functional integrity and prevent recurrence, as far as is possible.
- Exercise (homework) has to be focused, time-efficient, and within the patient's easy comprehension and capabilities, if compliance is to be achieved.

The question of why tissues become 'functionally and structurally three-dimensionally asymmetrical' needs some consideration, since out of the reasons for the development of somatic dysfunction emerge possible therapeutic strategies.

Musculoskeletal–biomechanical stressors

(Basmajian 1974, Dvorak & Dvorak 1984, Janda 1983, Korr 1978, Lewit 1999, Simons et al 1999)

The many forms of stress affecting the body in the sort of sequential manner discussed below can be categorized as falling into general classifications of physiological, emotional, behavioral and/or structural.

These might include:

- congenital factors such as short or long leg, small hemipelvis, fascial influences (e.g. cranial distortions involving the reciprocal tension membranes due to birthing difficulties such as forceps delivery) (Simons et al 1999)
- overuse, misuse and abuse factors such as injury or inappropriate or repetitive patterns of use involved in work, sport or regular activities (Lewit 1999)
- immobilization–disuse: irreversible changes can occur after just 8 weeks (Lederman 1997)
- postural stress pattern that may be related to emotional states (Latey 1996)
- inappropriate breathing patterns (Lewit 1980)
- chronic negative emotional states such as depression, anxiety, etc. (Barlow 1959)
- reflexive influences (trigger points, facilitated spinal regions) – see later in this chapter for discussion of this important aspect of somatic dysfunction.

A biomechanical stress sequence

When the musculoskeletal system is 'stressed' (overused, used inappropriately, traumatized, underused, etc.) a sequence of events occurs that can be summarized as follows:

- 'Something' (see list above) occurs leading to increased muscular tone.
- If this is anything but short-term, retention of metabolic wastes commences.
- Increased tone simultaneously results in a degree of localized oxygen deficit resulting in relative ischemia.
- Ischemia does not produce pain but an ischemic muscle which contracts rapidly does (Lewis 1942, Liebenson 1996).
- Increased tone may lead to a degree of edema.
- Retention of wastes/ischemia/edema all contribute to discomfort or pain, which in turn reinforces hypertonicity (Mense & Simons 2001).
- Inflammation or at least chronic irritation may evolve
- Neurological reporting stations in the distressed tissues will bombard the central nervous system

(CNS) with information regarding their status, resulting in neural sensitization and the evolution of facilitation – a tendency to hyperreactivity (Ward 1997).

- Macrophages are activated and there is increased vascularity and fibroblastic activity.
- Connective tissue production increases with cross-linkage leading to shortened fascia.
- Chronic muscular stress (a combination of the load involved and the number of repetitions, or the degree of sustained influence) results in the gradual development of hysteresis in which collagen fibers and proteoglycans are rearranged to produce an altered structural pattern (Norkin & Levangie 1992).
- This results in tissues that are more easily fatigued than normal and more prone to damage if strained.
- Since all fascia/connective tissue is continuous throughout the body, any distortions or contractions developing in one region can create fascial deformations elsewhere, so negatively influencing structures supported by, or attached to, the fascia, e.g. nerves, muscles, lymph structures, blood vessels (Myers 1997).
- Hypertonicity in muscles leads to inhibition of antagonist(s) and aberrant behavior in synergist(s).
- Chain reactions evolve in which some muscles (postural) shorten while others (phasic) weaken (Lewit 1999).
- Because of sustained increased muscle tension ischemia in tendinous structures occurs, leading to the development of periosteal pain, and also in localized areas of muscles leading to myofascial trigger point evolution. Ischemic influences, and trigger points, are discussed later in this chapter (Simons et al 1999).
- Compensatory adaptations evolve, leading to habitual, 'built-in' patterns of use emerging, as the CNS learns to compensate for modifications in muscle strength, length and functional behavior.
- Abnormal biomechanics result, involving malcoordination of movement (for example, erector spinae tighten while rectus abdominis is inhibited) (Janda 1996).
- The normal firing sequence of muscles involved in particular movements alters, resulting in additional strain (Janda 1982).
- Joint biomechanics are directly influenced by the accumulated influences of such soft-tissue changes and can themselves become significant sources of referred and local pain, reinforcing soft-tissue dysfunctional patterns (Schiable 1993).
- Deconditioning of the soft tissues becomes progressive as a result of the combination of simultaneous events involved in soft-tissue pain: 'spasm' (guarding), joint stiffness, antagonist weakness, overactive synergists, etc. (Mense & Simons 2001).
- Progressive evolution of localized areas of neural hyperreactivity occurs (facilitated areas) paraspinally, or within muscles (myofascial trigger points) (Korr 1978).
- Within these trigger points increased neurological activity occurs (for which there is electromyographic evidence) which is capable of influencing distant tissues adversely (Hubbard 1993, Simons 1993).
- Energy wastage due to unnecessarily sustained hypertonicity and excessively active musculature leads to generalized fatigue.
- More widespread functional changes develop – for example affecting respiratory function and body posture – with repercussions on the total body economy (Chaitow 2004).
- In the presence of a constant neurological feedback of impulses to the CNS/brain from neural reporting stations indicating heightened arousal (a hypertonic muscle status is the alarm reaction of the flight/fight alarm response) there will be increased levels of psychological arousal and a reduction in the ability to relax, with consequent reinforcement of hypertonicity (Balaban & Thayer 2001).
- Functional patterns of use of a biologically unsustainable nature emerge.
- At this stage restoration of normal function requires therapeutic input that addresses both the multiple changes that have occurred and the need for re-education as to how to use one's body, to breathe, and to carry oneself, in more sustainable ways.

The chronic adaptive changes that develop in such a scenario lead to the increased likelihood of future acute exacerbations as the increasingly chronic, less supple and resilient biomechanical structures attempt to cope with additional stress factors resulting from the normal demands of modern living.

In this sequence it is not difficult to see how any technique that offers the chance for enhanced circulation and drainage, more normal tonal balance and reduction of pain will help to minimize dysfunctional tendencies. Positional release procedures achieve these effects, so reducing the negative sequelae of somatic dysfunction, while at the same time enhancing the adaptation potentials of the tissues involved.

At some point, if stresses are constant or mounting, all adaptation potentials reach a stage of exhaustion, as in an elastic band that snaps when stretched too far. How is the practitioner to know when an individual, or a particular region, joint or area, has reached that elastic limit?

Zink & Lawson's (1979) compensation patterns (Box 2.1), as well as other functional tests (Box 2.2), can provide accurate indications of just how far advanced decompensation has progressed.

The discussion in Box 2.1 focused largely on gross, global patterns of adaptation, compensation and dysfunction. In the notes below a summary is provided of aspects of local dysfunction, much of it reflexogenically derived, involving, among other features, myofascial trigger points.

This is a particularly rewarding therapeutic area, in which positional release methods have much to offer.

Facilitation and the evolution of trigger points

(Korr 1976, Patterson 1976)

Facilitation is the osteopathic term for what happens when neural sensitization occurs. There are at least two forms of facilitation, spinal (also known as segmental) and local (e.g. trigger point).

Visceral disease and dysfunction results in sensitization and ultimately facilitation of paraspinal neural structures at the level of the nerve supply to that organ.

- In cardiac disease, for example, the muscles alongside the spine at the upper thoracic level, from which the heart derives its innervation, become hypertonic (Korr 1976, 1978, 1986).
- The area becomes facilitated, with the nerves of the area, including those passing to the heart, becoming hyper-irritable. Electromyographic readings of the upper thoracic paraspinal muscles show greater activity than surrounding tissues, as well as palpating as hypertonic and more painful to pressure.
- Once facilitation occurs, all additional stress impacting the individual, of any sort, whether emotional, physical, chemical, climatic or mechanical, leads to an increase in neural activity in the facilitated segments, and not to the rest of the (unfacilitated) spinal structures.

Korr (1978) has called such an area a 'neurological lens', since it concentrates neural activity to the facilitated area along with a local increase in muscle tone at that level of the spine. Similar segmental (spinal) facilitation occurs in response to any visceral disease, affecting the segments of the spine from which neural supply to that organ derives.

Other causes of segmental (spinal) facilitation may include other forms of biomechanical stress:

- trauma
- overactivity
- repetitive patterns of use
- poor postural habits
- structural imbalances (short leg for example).

Korr tells us that when people who have had facilitated segments identified 'were exposed to physical, environmental and psychological stimuli, similar to those encountered in daily life, the sympathetic responses in those segments was exaggerated and prolonged. The disturbed segments behaved as though they were continually in, or bordering on, a state of "physiologic alarm"' (Korr 1978).

How to recognize a facilitated area

A number of observable and palpable signs indicate an area of segmental (spinal) facilitation.

Beal (1983) reports that such an area will usually involve two or more segments, unless traumatically induced, in which case single segments are possible. The paraspinal tissues will palpate as rigid or board-like.

With the patient supine and the palpating hands under the patient's paraspinal area to be tested (standing at the head of the table, for example, and reaching under the shoulders for the upper thoracic area) any ceilingward 'springing' attempt on these tissues will result in a distinct lack of elasticity, unlike more normal tissues above or below the facilitated area (Beal 1983) (Fig. 2.9).

Palpable or observable features

Gunn & Milbrandt (1978) and Grieve (1986) have all helped to define the palpable and visual signs that accompany facilitated areas:

- A gooseflesh appearance is observable in facilitated areas when the skin is exposed to cool air – as a result of a facilitated pilomotor response.
- A palpable sense of 'drag' is noticeable as a light touch contact is made across such areas, due to increased sweat production resulting from facilitation of the sudomotor reflexes (Lewit 1999).
- There is likely to be cutaneous hyperesthesia in the related dermatome, as the sensitivity (e.g. to a pinprick) is increased due to facilitation.
- An 'orange peel' appearance is noticeable in the subcutaneous tissues when the skin is rolled over the affected segment, due to subcutaneous trophedema.
- There is commonly localized spasm of the muscles in a facilitated area, which is palpable

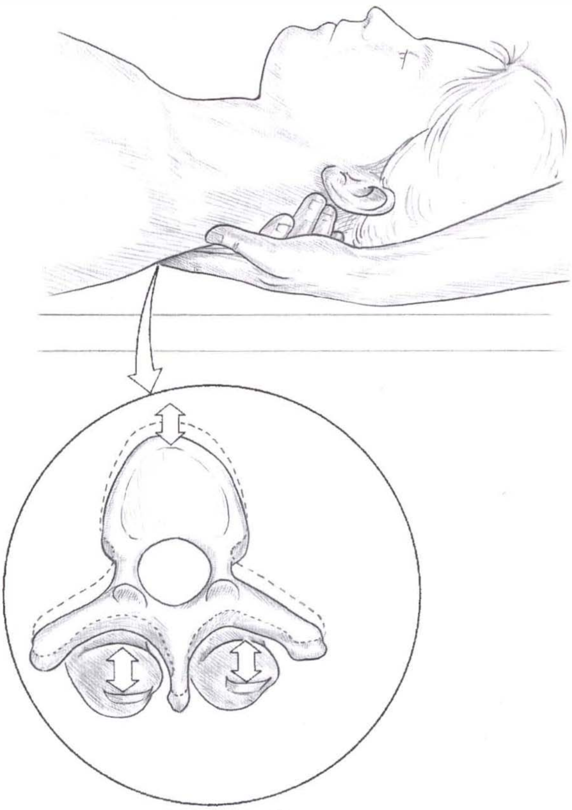


Figure 2.9 Beal's 'springing' assessment for paraspinal facilitation rigidity associated with segmental facilitation. (From Chaitow 2003a.)

segmentally as well as peripherally in the related myotome. This is likely to be accompanied by an enhanced myotatic reflex due to the process of facilitation.

Local (trigger point) facilitation in muscles

A process of local facilitation occurs when particularly vulnerable sites of muscle (origins and insertions, for example) are overused, abused, misused or disused. Localized areas of hypertonicity develop, sometimes accompanied by edema, sometimes with a stringy feel – but always with sensitivity to pressure.

Many of these palpably painful, tender, sensitive, localized, facilitated points are myofascial trigger points, which are not only painful themselves when pressed, but when active will also transmit or activate pain (and other) sensations some distance away from themselves, in 'target' tissues (Wolfe & Simons 1992).

Melzack & Wall (1988) have stated that there are few, if any, chronic pain problems that do not have trigger point activity as a major part of the picture, perhaps not always as a prime cause, but almost always as a maintaining feature.

In the same manner as the facilitated areas alongside the spine, trigger points will become more active when stress, of *whatever type*, makes adaptive demands on the body as a whole, not just on the area in which they are found.

When not actively directing pain (recognizable to the patient as part of their symptom picture) to a distant area, trigger points (locally tender or painful to applied pressure) are said to be 'latent'. The same signs as described for spinal, segmental facilitation can be observed and palpated in these localized areas (Gerwin & Dommerholt 2002).

Trigger points – the Travell and Simons model

A great deal of research has been conducted since the first edition of *Myofascial Pain and Dysfunction: The Trigger Point Manual*, Volume 1, was published (Travell & Simons 1983). In the second edition (Simons et al 1999), the authors have, to a large extent, validated their theories with research findings, and present evidence which suggests that what they term 'central' trigger points (those forming in the belly of the muscle) develop almost directly in the center of the muscle's fibers, where the motor endplate innervates it, at the neuromuscular junction. They suggest the following:

- Dysfunctional endplate activity occurs, commonly associated with a strain, causing acetylcholine (ACh) to be excessively released at the synapse, along with stored calcium.
- The presence of high calcium levels apparently keeps the calcium-charged gates open, and the ACh continues to be released.
- The resulting ischemia in the area creates an oxygen/nutrient deficit, which in turn leads to a local energy crisis.
- Without available ATP, the local tissue is unable to remove the calcium ions which are 'keeping the gates open' for ACh to keep escaping.
- Removing the superfluous calcium requires more energy than sustaining a contracture, so the contracture remains.
- The resulting muscle-fiber contracture (involuntary, without motor potentials) needs to be distinguished from a contraction (voluntary with motor potentials) and spasm (involuntary with motor potentials).
- The contracture is sustained by the chemistry at the innervation site, not by action potentials from the cord.

- As the endplate keeps producing ACh flow, the actin/myosin filaments attenuate to a fully shortened position (a weakened state) in the immediate area around the motor endplate (at the center of the fiber).
- As the sarcomeres shorten, they begin to bunch and a contracture knot forms.
- This knot is the 'nodule', which is the palpable characteristic of a trigger point.
- As this process occurs the remainder of the sarcomeres (those not bunching) of that fiber are stretched, creating the taut band, which is usually palpable.

This model currently represents the most widely held understanding as to the etiology of trigger points. Recent techniques of microanalysis of the tissues surrounding trigger points have validated the Travell and Simons model (Shah et al 2005).

There is further discussion of the trigger point phenomenon in Chapter 5, particularly relating to treatment options that incorporate positional release methodology.

Positional release and trigger points

The taut, localized, palpable, painful contracture that lies at the nidus of a trigger point can be used in positional release, as a monitor, to guide the tissues towards a state of optimal ease or comfort, where tissues are least stressed.

This is the objective of that aspect of positional release methodology known as strain/counterstrain, because during that 'ease' state, circulatory enhancement flushes previously congested and ischemic tissues (see below), allowing neurological resetting to occur, and helping to restore some degree of normality to the functions of the region. This is discussed further in Chapter 3.

Additionally, the trigger point deactivation approach known as integrated neuromuscular inhibition technique (INIT – briefly described in Chapter 1 and more fully explained in Chapter 5) involves a logical sequence that incorporates PRT, together with ischemic compression, muscle energy technique and subsequent toning of weak antagonists.

Simons et al (1999) discuss a variety of what they term 'trigger point release' procedures, ranging from direct pressure to various stretching possibilities, and including PRT routines (such as SCS), which they refer to as 'indirect techniques'. They conclude that the most successful use of PRT in treating trigger points is likely to be for those points that are close to attachments, rather than the triggers found in the belly of muscles, which Simons and Travell suggest are likely to benefit from more robust treatment methods.

Ischemia and muscle pain

(Lewis 1931, 1942, Rodbard 1975, Shah et al 2005)

When the blood supply to a muscle is inhibited, pain is not usually noted unless or until that muscle is asked to contract. In such a case, pain is likely to be noted within 60 seconds (as in intermittent claudication). The precise mechanisms are open to debate, but are thought to involve one or more of a number of processes, including lactate accumulation and potassium ion build-up.

Pain receptors are sensitized under ischemic conditions, it is thought due to bradykinin influence. This has been confirmed by the use of drugs that inhibit bradykinin release, allowing an active ischemic muscle to remain relatively painless for longer periods (Digiesi 1975). Shah et al (2005) have shown definitively that the environment of a trigger point is extremely acidic. They note that an acidic pH is well known to stimulate the production of bradykinin during local ischemia and inflammation and may explain the cause of pain in patients with active myofascial trigger points.

Trigger point activity itself may induce relative ischemia in target tissues (Simons et al 1999) and this suggests that any appropriate manual treatment – such as positional release – that encourages normal circulatory function is likely to modulate these negative effects and reduce trigger point activity.

Ischemia and trigger point evolution

Hypoxia (apoxia) can occur in a number of ways, most obviously in ischemic sites, where circulation is impaired, possibly due to a sustained hypertonic state.

If hypertonia is a major etiological feature in the evolution of trigger points then those muscles that have the greatest propensity towards hypertonia – the postural type 1 muscles – should receive closest attention (Jacobs & Falls 1997, Liebenson 1996).

Trigger points can be used as monitors for improving oxygenation leading to the following thoughts:

- As oxygenation improves, reducing hypoxia, trigger points are likely to become less reactive and painful.
- Enhanced breathing function represents a reduction in overall stress, reinforcing the concepts associated with facilitation: that as stress of whatever kind reduces, trigger points react less acutely.
- Direct deactivation tactics are not the only way to handle trigger points.
- Trigger points can be seen to be acting as 'alarm' signals, virtually quantifying the current levels of adaptive demand being imposed on the individual.

As will be noted in Chapter 3, one of the influences that derives from tissues being held in ease during PRT treatment is enhanced circulation, which is bound to reduce ischemia.

Trigger point deactivation possibilities include (Chaitow 2003a, Kuchera 1997):

- inhibitory soft-tissue techniques including neuromuscular therapy/massage
- chilling techniques (spray, ice)
- acupuncture, injection, etc.
- positional release methods – such as SCS
- muscle energy (stretch) techniques
- myofascial release methods
- correction of associated somatic dysfunction possibly involving HVT adjustments and/or osteopathic or chiropractic mobilization methods
- education and correction of contributory and perpetuating factors (posture, diet, stress, habits, etc.)
- self-help strategies (stretching, etc.)
- combination sequences such as INIT (see Chapter 5).

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3

The clinical use of SCS techniques

CHAPTER CONTENTS

The best known and most widely used positional release variation is the method developed from the clinical research of Laurence Jones, strain/counterstrain (SCS). Jones's pioneering work in developing SCS evolved this into a method of treatment of joint and soft-tissue dysfunction of supreme gentleness (Jones 1981).

Modifications (by the author and others) of Jones's counterstrain methods will be described in this chapter, as will a further variant, known as positional release therapy (D'Ambrogio & Roth 1997).

Is there evidence that SCS works?

Despite its widespread clinical use there has only been a limited amount of research into the efficacy of SCS. Four examples derived from the limited available evidence are summarized below.

Example 1

In a pilot study (Lewis & Flynn 2001), four case of low back pain were treated with SCS as the sole treatment. The SCS intervention phase for each case took approximately 1 week and consisted of two to three treatment sessions to resolve perceived 'aberrant neuromuscular activity'. Outcome measures were derived from the McGill Pain Questionnaire and the Oswestry Low Back Pain Disability Questionnaire. *All patients registered reductions in pain and disability following SCS intervention.* No experimental evidence for the effectiveness of SCS was offered; however, outcomes suggested that a controlled study was warranted to examine the effectiveness of SCS for the treatment of low back pain.

Example 2

In a randomized, controlled study, the reliability and validity of a tender point palpation scale (TPPS) and the effect of SCS on painful tender points (TPs) was evaluated (Wong & Schauer 2004).

The experimental design employed a convenience sample of 49 volunteers with bilateral hip tender points, randomly assigned to three groups each receiving SCS, exercise (EX), or SCS and EX.

Pain before and after intervention was assessed with the TPPS and visual analog scale (VAS).

Interventions were performed twice over 2 weeks. By study end, all groups demonstrated significant pain decreases in both muscle groups demonstrated with the VAS and TTPS.

The SCS groups tended toward greater pain reductions than the exercise group for hip abductors and adductors. However, low TPPS reliability and validity preclude any conclusions based on this assessment method.

Example 3

In a randomized, controlled study, the effects of SCS on TPs and the strength of hip musculature were evaluated (Wong & Schauer-Alvarez 2004).

The convenience sample included 49 volunteers (15 men, 34 women; 98 limbs), aged 19–38 years, with hip weakness and corresponding tender points.

A VAS was used to assess pain; a digital handheld dynamometer was used to assess strength.

Participants were randomly assigned to three intervention groups: SCS, EX, and SCS + EX.

All interventions were performed twice over 2 weeks; pain and strength were measured three times, both before and after intervention began.

The SCS and SCS + EX groups demonstrated increased strength ($P < 0.001$, 2-tailed t-tests), which when analyzed statistically was significantly greater than in the exercise group ($P < 0.001$). All groups reported reduced pain and increased strength 2-4 weeks after intervention ($P < 0.001$). The results supported the hypothesis that SCS reduces TP pain and demonstrated that SCS positively affects strength.

Example 4

In an outcomes-based research study, the authors randomly assigned six patients with pancreatitis to receive standard care plus daily osteopathic manipulative therapy (OMT) for the duration of their hospitalization or to receive only standard medical care (eight patients) (Radjieski et al 1998).

Osteopathic treatment involved 10 to 20 minutes daily of a standardized protocol, using myofascial release, soft tissue, and SCS techniques.

Attending physicians were blinded as to group assignment.

Results indicated that patients who received osteopathic treatment averaged significantly fewer days in the hospital before discharge (mean reduction, 3.5 days) than control subjects, although there were no significant differences in time to first food intake after operation or in use of pain medications. These findings suggest the possible benefit of OMT in reducing length of stay for patients with pancreatitis.

How does SCS work?

It is important to state at the outset that the various theories as to how positional release achieves its effects remain as tentative assumptions.

The basic scientific research has, as yet, not been performed to validate the hypotheses discussed below, and the reader is advised to adopt a robustly critical frame of mind, while attempting to evaluate the mechanisms described that *might* be functioning.

Some of the assumptions made are based on animal models (see Chapter 12).

Certainly some of the evidence emerging from research into unloading taping and mobilization with movement (MWM) methods (see Chapters 10 and 11) is supportive of the neurological hypothesis of SCS mechanisms (see later in this chapter).

Other concepts emerge from a combination of assumption and deduction, based on clinical evidence, an understanding of basic physiology and experience.

Very little concrete certainty exists, apart from the reality that positional release methods are safe and effective. How they achieve their benefits remains for future research.

Theories

Jones's (1981) concept as to how SCS works is based on the predictable physiological responses of muscles in particular situations, most notably in relation to acute or chronic strains. He describes how, in a balanced state, the proprioceptive functions of the various muscles supporting a joint will be feeding a flow of information, derived from the neural receptors in those muscles and their tendons, to the higher centers.

For example, the Golgi tendon organs will be reporting on tone, while the various receptors in the spindles will be firing a constant stream of information (slowly or rapidly depending upon the demands being placed on the tissues) regarding their resting length and any changes that might be occurring in that length.

In a dysfunctional state (see descriptions below under 'Neurological concepts') inappropriately excessive degrees of tone may be sustained, leading to chronic imbalances between agonists, antagonists and associated muscles. In some instances excessive tone might relate to some degree of segmental, or local (i.e. trigger point), facilitation as discussed in Chapter 2.

D'Ambrogio & Roth (1997) state that:

> *Positional release therapy appears to have a damping influence on the general level of excitability within the facilitated [see Chapter 2] segment. Weiselfish (1993) has found that this characteristic of PRT is unique in its effectiveness, and has utilized this feature to successfully treat severe neurologic patients, even though the source of the primary dysfunction arose from the supraspinal level.*

It is the dampening, calming, influence on the neurological features (including pain receptors) of hyperreactive and stressed tissues that seems to characterize many of the results observed following appropriate use of PRT.

Circulatory and fascial influences are also considered possible mechanisms for PRT's benefits, as outlined below.

Neurological concepts

The proprioceptive hypothesis

(Korr 1947, 1975, Mathews 1981)

Jones first observed the phenomenon of spontaneous release when he 'accidentally' placed a patient who was in considerable pain, and some degree of compensatory distortion, into a position of comfort (ease) on a treatment table (Jones 1964).

Despite no other treatment being given, after just 20 minutes resting in a position of relative ease, the patient was able to stand upright and was free of pain. The pain-free position of ease into which Jones had helped the patient was one which exaggerated the degree of distortion in which his body was being held.

Jones had taken the patient into the direction of 'ease' (as opposed to 'bind'), since any attempt to correct or straighten the body would have been met by both resistance and pain. In contrast, moving the body further into distortion was acceptable and easy, and seemed to allow the physiological processes involved in resolution of spasm, etc., to operate. This position of ease is the key element in what later came to be known as strain/counterstrain.

Example

The events that take place at the moment of strain may provide the key to understanding the mechanisms of neurologically induced positional release.

Take, for example, an all too common instance of someone bending forwards from the waist. At that time the flexor muscles would be short of their resting length, and the neural reporting structures (muscle spindles) in the flexor muscles would be firing slowly, indicating little or no activity and no change of length taking place.

At the same time, the antagonist group of muscles – the spinal erector group in this example – would be stretched or stretching, and firing rapidly.

Any stretch affecting a muscle (and therefore its spindles) will increase the rate of reporting, which will reflexively induce further contraction (myotatic stretch reflex) as well as an increase in tone in that muscle, along with an instant inhibition (reciprocal) of the functional antagonists, so further reducing the already limited degree of reporting from the antagonists' spindle cells.

This feedback link with the central nervous system is the primary muscle spindle afferent response, and it is thought to be modulated by an additional muscle spindle function that involves the gamma-efferent system, which is controlled from higher (brain) centers. In simple terms, the gamma-efferent system influences the primary afferent system: for example, when a muscle is in a quiescent state, when it is relaxed and short with little information coming from the primary receptors, the gamma-efferent system might fine-tune and increase ('turn up') the sensitivity of the primary afferents to ensure a continued information flow (Mathews 1981).

It is important to acknowledge that these neurological concepts are largely based on animal studies, and that definitive basic science studies to validate them have not yet been performed in humans.

Crisis

Now imagine an emergency situation arising (a person loses his footing while stooping, or the load being lifted shifts), which creates immediate demands for stabilization on both sets of muscles (the short, relatively 'quiet' flexors and the stretched, relatively actively firing extensors), even though they are in quite different states of preparedness for action.

- The flexors would be 'unloaded', relaxed and providing minimal feedback to the control centers, while the spinal extensors would be at stretch, providing a rapid outflow of spindle-derived information, some of which ensures that the relaxed flexor muscles remain relaxed, due to inhibitory activity.
- The central nervous system would at this time be receiving minimal information as to the status of the relaxed flexors and, at the moment when the demand for stabilization occurs, these shortened/relaxed flexors would be obliged to stretch quickly to a length that will balance the already stretched extensors.
- Meanwhile these stretched extensors will most probably be contracting rapidly, also to achieve stabilization.
- As this happens, the annulospiral receptors in the short (flexor) muscles will respond to the sudden stretch demand by contracting even more – the stretch reflex.
- The neural reporting stations in these shortened muscles would be firing impulses as if the muscles were being stretched, even though the muscle remains well short of its normal resting length.
- At the same time, the extensor muscles, which had been at stretch and which, in the alarm situation, were obliged to rapidly shorten, would remain longer than their normal resting length as they attempt to stabilize the situation (Korr 1976).

Korr has described what he believes happens in the abdominal muscles (flexors) in such a situation. He says that because of their relaxed status, short of their resting length, there occurs in these muscles a silencing of the spindles; however, due to the demand for information from the higher centers, *gamma gain is increased reflexively*, and as the muscle contracts rapidly to stabilize the alarm demands, the central nervous system will receive information that the muscle, which is actually short of its neutral resting length, was being stretched.

In effect, the muscles would have adopted a restricted position as a result of inappropriate proprioceptive reporting. As DiGiovanna explains (Jones 1964):

> *With trauma or muscle effort against a sudden change in resistance, or with muscle strain incurred by resisting the effects of gravity for a period of time, one muscle at a joint is strained and its antagonist is hypershortened. When the shortened muscle is suddenly stretched the annulospiral receptors in that muscle are stimulated causing a reflex contraction of the already shortened muscle. The proprioceptors in the short muscle now fire impulses as if the shortened muscle were being stretched. Since this inappropriate proprioceptor response can be maintained indefinitely a somatic dysfunction has been created.*

In effect, the two opposing sets of muscles will have adopted a stabilizing posture to protect the threatened structures, and in doing so would have become locked into positions of imbalance in relation to their normal function. One would be shorter and one longer than its normal resting length (Fig. 3.1).

At this time, any attempt to extend the area/joint(s) would be strongly resisted by the tonically shortened flexor group. The individual would be locked into a forward-bending distortion (in this example).

The joint(s) involved would not have been taken beyond their normal physiological range, and yet the normal range would be unavailable, due to the shortened status of the flexor group (in this particular example). Going further into flexion, however, would present no problems or pain.

Walther (1988) summarizes the situation as follows:

> *When proprioceptors send conflicting information there may be simultaneous contraction of the antagonists ... without antagonist muscle inhibition, joint and other strain results [and in this manner] a reflex pattern develops which causes muscle or other tissue to maintain this continuing strain. It [strain dysfunction] often relates to the inappropriate signaling from muscle proprioceptors that have been strained from rapid change that does not allow proper adaptation.*

This situation would be unlikely to resolve itself spontaneously and is the 'strain' position in Jones's SCS method.

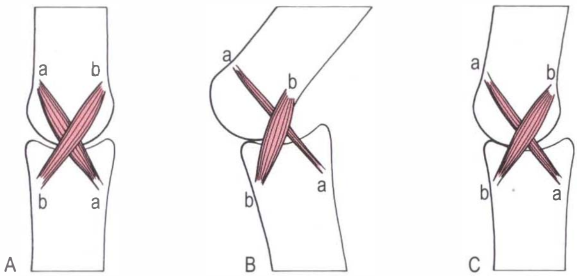

Figure 3.1A Normal unstrained joint in normal position with muscles a and b in a non-stressed state.
Figure 3.1B Normal joint in an extreme position in which stress occurs which will result in strain, as illustrated in Figure 3.1C.
Figure 3.1C Joint in a strained state in which muscle a, which had been excessively stretched, is splinted/contracted and resists movement, and muscle b, short at the time of the stress, is slightly stretched and is neither splinted nor contracted. Any attempt at returning to the situation as illustrated in Figure 3.1A would meet with resistance, while a return to the position of stress, 3.1B, would be easily and painlessly achieved and could allow for a spontaneous positional release of the hypertonicity and splinting in muscle a.

We can recognize it in an acute setting in torticollis, as well as in acute lumbago. It is also recognizable as a feature of many types of chronic somatic dysfunction in which joints remain restricted due to muscular imbalances of this type, occurring as part of an adaptive process (as discussed in Chapter 2).

This is a time of intense neurological and proprioceptive confusion, and is the moment of 'strain'. SCS offers a means of quietening the neurological confusion and the excessive, or unbalanced, tone.

The nociceptive hypothesis

(Bailey & Dick 1992, Van Buskirk 1990)

In order to appreciate a second possible neurological influence involved in strain we need a different example.

Let's consider someone involved in a simple whiplash-like neck stress as a car came to an unexpected halt:

- The neck would be thrown backwards into hyperextension, provoking all of the factors described above involving the flexor group of muscles in the forward-bending strain.
- The extensor group would be rapidly shortened and the various proprioceptive changes leading to strain and reflexive shortening would operate.
- At the time of the sudden braking of the car, there would occur hyperextension of the flexors of the neck, scalenes, etc., which would be violently stretched, inducing actual tissue damage.
- Nociceptive responses would occur (which are more powerful than proprioceptive influences) and these multisegmental reflexes would produce a flexor withdrawal, dramatically increasing tone in the flexor group.
- The neck would now display hypertonicity of both the extensors and the flexors; pain, guarding and stiffness would be apparent and the role of the clinician would be to remove these restricting influences layer by layer.
- Where pain is a factor in strain this needs to be considered as producing an overriding influence over whatever other more 'normal' reflexes are operating.

In the simple example of neck strain described, it is obvious that, in real life, matters are likely to be even more complicated, since a true whiplash would introduce both rapid hyperextension and hyperflexion as well as a multitude of layers of dysfunction.

More complex than described

The proprioceptive and nociceptive reflexes that might be involved in the production of strain are also likely to involve other factors, including chemically mediated changes.

D'Ambrogio & Roth (1997) elucidate:

Free nerve endings are distributed throughout all of the connective tissues of the body with the exception of the stroma of the brain. These receptors are stimulated by neuropeptides produced by noxious influences, including trauma ... Impulses generated in these neurons spread centrally and also peripherally along the numerous branches of each neuron. At the terminus of the axons, peptide neurotransmitters such as substance P are released. The response of the musculoskeletal system to these painful stimuli may thus play a central role in the development [and maintenance] of somatic dysfunction.

As Bailey & Dick (1992) explain:

Probably few dysfunctional states result from a purely proprioceptive or nociceptive response. Additional factors such as autonomic responses, other reflexive activities, joint receptor responses, [biochemical features] or emotional states must also be accounted for.

It is at the level of our basic neurological awareness that understanding of the complexity of these problems commences.

Safe solution

Fortunately, the methodology of positional release does not demand a complete understanding of what is going on neurologically, since what Jones and his followers, and those clinicians who have evolved the art of SCS to newer levels of simplicity, have shown is that by means of a slow, *painless* return to the position of strain, aberrant neurological activity currently locked into place in the strained tissues can frequently resolve itself, irrespective of the mechanisms involved.

Making sense of garbled information

(DiGiovanna 1991, Jones 1964, 1966)

The reaction of the body to this confusing and stressed situation apparently varies with the time available to it.

Should a deliberate and controlled response be possible, allowing the stretched muscles to slowly return to normal, then resolution of the potential problem might take place with no dysfunction arising. This can happen only if a controlled and not a panic return towards the neutral position is achieved.

All too often, however, the situation is one of an almost-panic response, as the body makes a rapid attempt to restore stability to the region and finds the neural reporting information incoherent (one moment the abdominal muscles are saying, 'all is well, we are relaxed and short', and the next they are firing rapidly and lengthening, while there is a sudden change imposed on already stretched spinal extensors, which are trying to shorten at the same time in order to produce balance).

Restriction

The result is likely to involve the shortened muscles being 'fixed' in a position short of their normal resting length, from which they cannot easily be lengthened without pain (Fig. 3.2).

The person bending, as described in our earlier example, would be locked in flexion, with an acute low back pain. The resulting spasm in tissues 'fixed' by this or other similar neurologically induced 'strains' causes the fixation of associated joint(s), and prevents any attempt to return to neutral. Any attempt to force the distorted spine (in this example) towards its anatomically correct position, would be strongly resisted by the shortened fibers.

It would, however, not be difficult, or indeed painful, to take the joint(s) further towards the position in which the strain occurred, effectively shortening the spasmed fibers even further, so reducing tension on affected tissues, and calming excessive proprioceptive reporting.

It is also possible when held at 'ease', that enhanced vascular and interstitial circulatory function in previously tense and probably ischemic tissues would moderate the activity of inflammation-enhancing chemical mediators.

Towards 'ease'

Jones found that by taking the joint/area close to the position in which the original strain took place an interesting phenomenon was observed, in which the proprioceptive functions were given an opportunity to reset themselves, to become coherent again, during which time pain in the area lessened.

This is the 'counterstrain' element of the system.

If the position of ease were held for a period (Jones suggests 90 seconds – see discussion of 'timing' in Box 3.4) the spasm in hypertonic, shortened tissues commonly resolves, following which it is usually possible to return the joint/area to a more normal resting position, as long as this action is performed extremely slowly.

The muscles that had been overstretched might remain sensitive for some days, but for all practical considerations the joint would be normal again.

Jones had found that by carefully positioning the joint, whether this be a small extremity joint, or a spinal segment, into a position of neutral or 'ease' (which is frequently an exaggeration of the distorted position in which the body is holding the area, or is a close replica of the position in which the original strain took place), a resolution of spasm/hypertonia takes place.

Since the position of ease achieved during Jones's therapeutic methods is the same as that of the original strain, the shortened muscles are repositioned in such a manner as to allow the dysfunctioning proprioceptors to modulate their activity.

Korr's explanation for the physiological normalization of tissues brought about through positional release (Korr 1976) is that:

> *The shortened spindle nevertheless continues to fire, despite the slackening of the main muscle, and the CNS is gradually able to turn down the gamma discharge and, in turn enables the muscles to return to 'easy neutral', at its resting length. In effect, the physician has led the patient through a repetition of the dysfunctioning process with, however, two essential differences. First it is done in slow motion, with gentle muscular forces, and second there have been no surprises for the CNS; the spindle has continued to report throughout.*

Circulatory concepts

There exists yet another mechanism that positional release can usefully modify in strained tissues – circulatory embarrassment.

We know from the research of Travell and Simons that in stressed soft tissues there are likely to be localized areas of relative ischemia – lack of oxygenated blood – and that this can be a key factor in production of pain and altered tissue status and hence the evolution

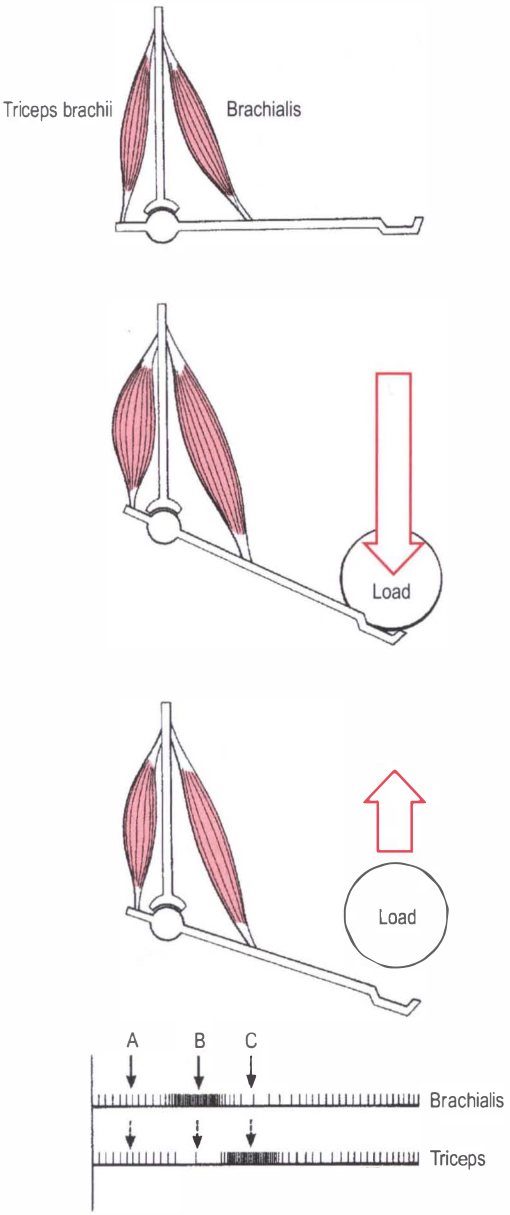

Figure 3.2 (A) The arm flexor (brachialis) and extensor (triceps brachii) muscles in an easy, normal position, as shown by the rate of firing indicated on the scale for each muscle.

(B) A sudden force is applied which results in the flexors being stretched while the extensors protect the joint by rapidly shortening. The firing rate relating to hyperextension and hypershortening is indicated on the scale.

(C) Flexor stretch receptors have been excited by this sudden demand and these continue to fire as though stretch were continuing even though a relatively normal position has been achieved. The rate of firing of both flexors and extensors continues to be maintained at an inappropriately high rate. This is the situation in a strained joint. DiGiovanna (1991) explains: 'The joint is restricted within its physiological range of motion [and is prevented] from achieving its full range of motion. It is therefore an active process rather than a static injury usually associated with a strain.'

of myofascial trigger points (Simons et al 1999, Travell & Simons 1992).

Studies on cadavers have shown that when a radiopaque dye is injected into muscles, this is more likely to spread into the vessels of the muscle when a 'counterstrain' position of ease is adopted than when the muscle is in a neutral position (Rathbun & Macnab 1970). This was demonstrated by injecting a suspension into the arm of a fresh cadaver while the arm was maintained at the side. No filling of blood vessels occurred. When the other arm, following injection of a radiopaque suspension, was placed in a position of flexion, abduction and external rotation (position of 'ease' for the supraspinatus muscle), there was almost complete filling of the blood vessels by the dye, as a result.

Jacobson and colleagues (1989) suggest that, 'unopposed arterial filling may be the same mechanism that occurs in living tissue during the 90-second counterstrain treatment.'

Connective tissue and counterstrain concepts

Connective tissue aspects of PRT are discussed in Box 3.1.

Key elements of SCS

The elements that need to be kept in mind as SCS methods are learned, and which are major areas of emphasis in programs that teach it (Jones 1981) are summarized in Boxes 3.2 and 3.3.

Conventional SCS training

The focus of this chapter is Jones's SCS, and how to use it. In order to do so the phenomenon of the 'tender point' needs to be thoroughly grasped.

The usual method for learning SCS methodology involves learning the locations, and practicing the finding, of tender points, followed by practice of the positioning of the body/associated area, in order to take the pain away from the palpated tender point.

Finding tender points depends upon palpation skills which can be learned, and which practice can refine into a practical ability that allows for the very rapid location of areas of localized soft-tissue dysfunction.

Box 3.1 Connective tissue and fascial concepts

Fascia offers a unifying medium, a structure that literally 'ties everything together', from the soles of the feet, to the meninges surrounding the brain. This ubiquitous material offers support, separation and structure to all other soft tissues and because of this produces distant effects whenever dysfunction occurs in it.

Levin (1986) has described fascia as comprising innumerable building blocks, shaped as icosahedrons (20-sided structures), that produce, in effect, kinetic chains in which tensions are transmitted everywhere in the body, partly by hydrostatic pressure.

Dean Juhan (1987) expands on this:

Besides this hydrostatic pressure (which is exerted by every fascial compartment, not just the outer wrapping), the connective tissue framework – in conjunction with active muscles – provides another kind of tensional force that is crucial to the upright structure of the skeleton. We are not made up of stacks of building blocks resting securely upon one another, but rather of poles and guy-wires, whose stability relies not upon flat-stacked surfaces but upon proper angles of the poles and balanced tensions on the wires. Buckminister Fuller coined the term 'tensegrity' to describe this principle of structure, and his inventive experiments with it have clarified it as one of nature's favorite devices for achieving a maximum of stability with a minimum of materials.

Juhan continues:

This principle of tensegrity describes precisely the relationship between the connective tissues, the muscles, and the skeleton. There is not a single horizontal surface anywhere in the skeleton that provides a stable base for anything to be stacked upon it. Our design was not conceived by a stonemason. Weight applied to any bone would cause it to slide right off its joints if it were not for the tensional balances that hold it in place and control its pivoting. Like the beams in a simple tensegrity structure, our bones act more as spacers than as compressional members; more weight is actually borne by the connective system of cables than by the bony beams.

With these models in mind, of stacked and packed icosahedrons, as well as tensegrity structures (Fig. 3.3) which easily comply with compressive and tension forces, and the unique plastic and elastic properties of connective tissue, we have the possibility of visualizing a structure capable of absorbing and accommodating to a variety of forces and adaptations.

The beneficial effects of holding tissues *at ease* when stressed also emerges.

As D'Ambrogio & Roth (1997) explain:

A perceived condition in one area of the body may have its origin in another area and therapeutic action at the source will have an immediate effect on all secondary areas, including the site of symptom manifestation. It may also account for some of the

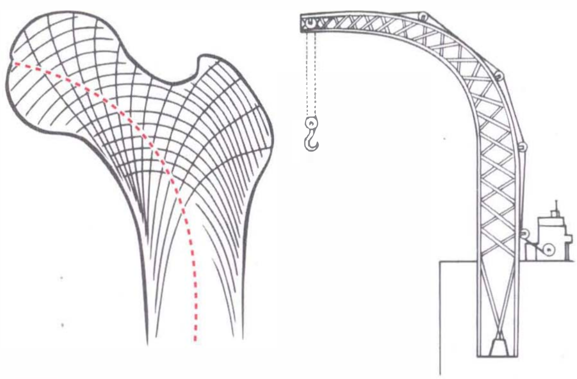

Figure 3.3 The head of the femur and a crane are both tensegrity structures, as they employ both compression and tension-resisting elements.

Box 3.1 Continued

physiologic effects that produce the [spontaneous] release phenomenon.

In Chapter 5 (Box 5.4) clinically relevant evidence is presented that links acupuncture research (Langevin & Yandow 2002) with connective tissue cleavage planes, suggesting that this provides a medium for the transmission of sensations including pain.

This goes a long way to offering an explanation for a variety of apparently unconnected elements, such as:

- the similarity between acupuncture points and trigger points
- the means whereby patterns of pain emerge from such points
- how distant effects may be achieved by stimulation of such points (needling or manual)
- the nature of acupuncture meridians
- how positioning of tissues can modify the behavior of pain-generating 'points'.

The information below, indicating the ubiquitous interconnectedness of fascia, adds support to these concepts.

Anatomy trains

Myers (1997) has described a number of clinically useful sets of myofascial chains – the connections between different structures ('long functional continuities') which he terms 'anatomy trains'. These are not distinct from tensegrity features, but are more specific linkages that may be seen to be connected when some positional release methods are performed.

In particular, SCS methods for normalizing rib restrictions can involve some bizarre positioning of the entire body, with remarkable effects (see later in this chapter).

If the 'trains' that Myers describes (see below) are considered, these 'positions of ease' will be seen to be quite logical.

The five major fascial chains (Myers 1997)

The superficial back line (Fig. 3.4) involves a chain which starts with:

- plantar fascia, linking the plantar surface of the toes to the calcaneus
- gastrocnemius, linking calcaneus to the femoral condyles
- hamstrings, linking the femoral condyles to the ischial tuberosities
- sacrotuberous ligament, linking the ischial tuberosities to the sacrum
- lumbosacral fascia, erector spinae and nuchal ligament, linking the sacrum to the occiput

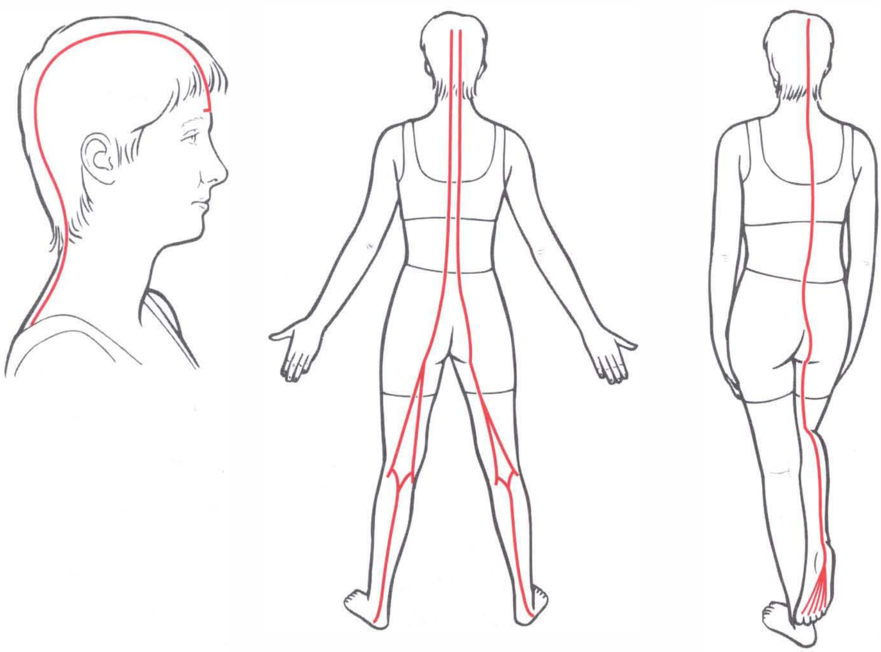

Figure 3.4 The superficial back line.

Box 3.1 Continued

- scalp fascia, linking the occiput to the brow ridge.

The superficial front line (Fig. 3.5) involves a chain which starts with:

- the anterior compartment and the periosteum of the tibia, linking the dorsal surface of the toes to the tibial tuberosity
- rectus femoris, linking the tibial tuberosity to the anterior inferior iliac spine and pubic tubercle
- rectus abdominis as well as pectoralis and sternalis fascia, linking the pubic tubercle and the anterior inferior iliac spine with the manubrium
- sternocleidomastoid, linking the manubrium with the mastoid process of the temporal bone.

The lateral line (Fig. 3.6) involves a chain which starts with:

- peroneal muscles, linking the first and fifth metatarsal bases with the fibular head
- iliotibial tract, tensor fascia lata and gluteus maximus, linking the fibular head with the iliac crest
- external obliques, internal obliques and (deeper) quadratus lumborum, linking the iliac crest with the lower ribs
- external intercostals and internal intercostals, linking the lower ribs with the remaining ribs

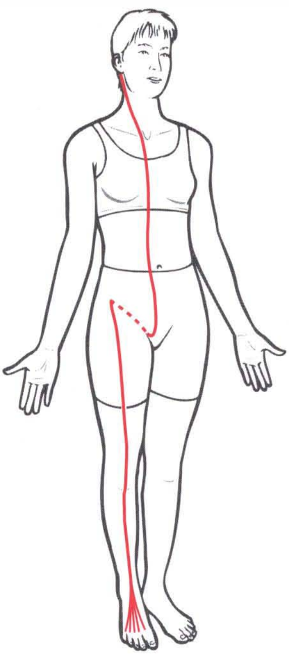

Figure 3.5 The superficial front line.

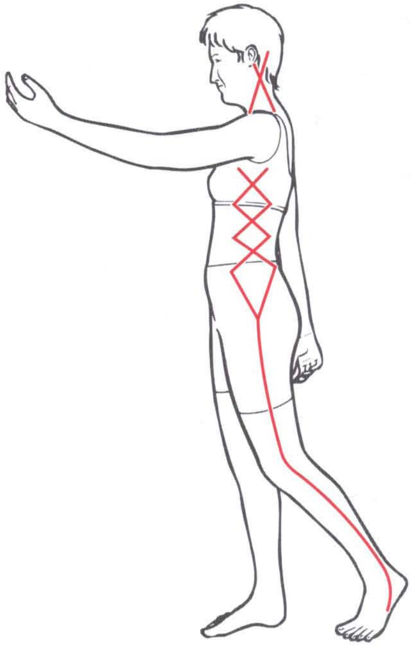

Figure 3.6 The lateral line.

- splenius cervicis, iliocostalis cervicis, sternocleidomastoid and (deeper) scalenes, linking the ribs with the mastoid process of the temporal bone.

The spiral lines (Fig. 3.7) involve a chain which starts with:

- splenius capitis, which wraps across from one side to the other, linking the occipital ridge (say on the right) with the spinous processes of the lower cervical and upper thoracic spine on the left
- continuing in this direction the rhomboids (on the left) link by means of the medial border of the scapula with serratus anterior and the ribs (still on the left), wrapping around the trunk by means of the external obliques and the abdominal aponeurosis on the left, to connect with the internal obliques on the right and then to a strong anchor point on the anterior superior iliac spine (right side)
- from the ASIS, the tensor fascia lata and the iliotibial tract link to the lateral tibial condyle
- tibialis anterior links the lateral tibial condyle with the first metatarsal and cuneiform
- from this apparent end-point of the chain (first metatarsal and cuneiform), peroneus longus rises to link with the fibular head

Box 3.1 Continued

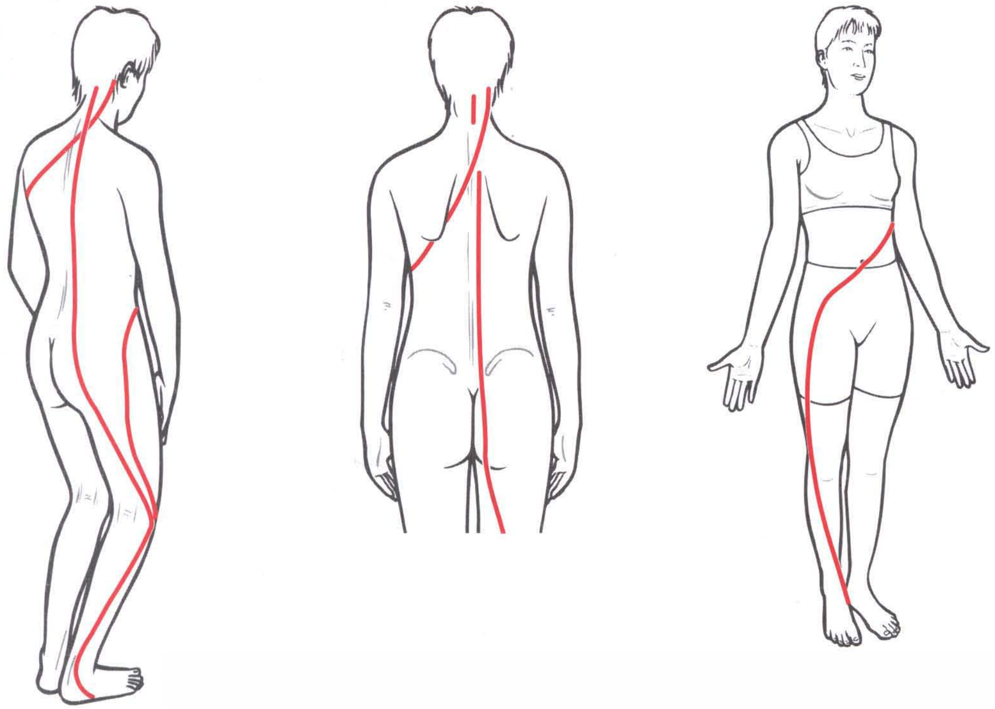

Figure 3.7 The spiral line. Outlines taken from Calais-Germain (1993).

- biceps femoris connects the fibular head to the ischial tuberosity
- the sacrotuberous ligament links the ischial tuberosity to the sacrum
- the sacral fascia and the erector spinae link the sacrum to the occipital ridge.

The deep front line describes several alternative chains involving the structures anterior to the spine (internally, for example):

- the anterior longitudinal ligament, diaphragm, pericardium, mediastinum, parietal pleura, fascia prevertebralis and the scalene fascia, which connect the lumbar spine (bodies and transverse processes) to the cervical transverse processes, and by means of longus capitis to the basilar portion of the occiput
- other links in this chain might involve a connection between the posterior manubrium and the hyoid bone by means of the subhyoid muscles
- the fascia pretrachealis between the hyoid and the cranium/mandible, involving the suprahyoid muscles
- the muscles of the jaw linking the mandible to the face and cranium.

Myers includes in his chain description structures of the lower limbs that connect the tarsum of the foot to the lower lumbar spine, making the linkage complete.

Additional smaller chains involving the arms are described as follows.

Back-of-the-arm lines (Fig. 3.8):

- the broad sweep of trapezius links the occipital ridge and the cervical spinous processes to the spine of the scapula and the clavicle
- the deltoid, together with the lateral intermuscular septum, connects the scapula and clavicle with the lateral epicondyle
- the lateral epicondyle is joined to the hand and fingers by the common extensor tendon
- another track on the back of the arm can arise from the rhomboids, which link the thoracic transverse processes to the medial border of the scapula
- the scapula in turn is linked to the olecranon of the ulna by infraspinatus and the triceps
- the olecranon of the ulna connects to the small finger by means of the periosteum of the ulna

Box 3.1 Continued

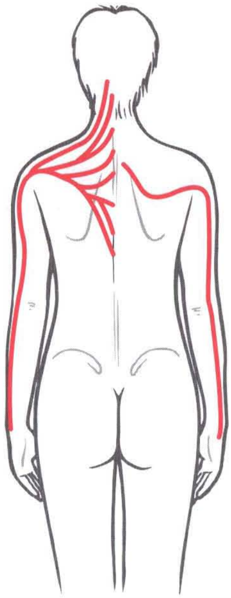

Figure 3.8 The back-of-the-arm lines.

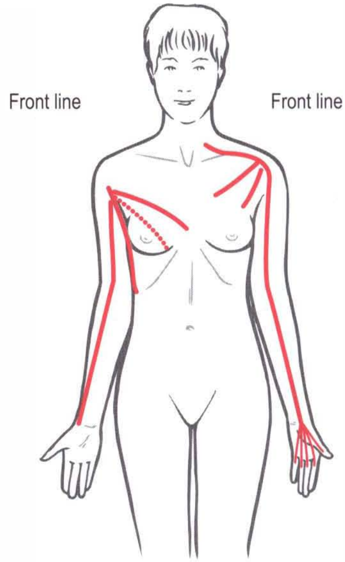

Figure 3.9 The front-of-the-arm lines.

- a 'stabilization' feature in the back of the arm involves latissimus dorsi and the thoracolumbar fascia, which connects the arm with the spinous processes, the contralateral sacral fascia and gluteus maximus, which in turn attaches to the shaft of the femur
- vastus lateralis connects the femur shaft to the tibial tuberosity and (by means of this) to the periosteum of the tibia.

Front-of-the-arm lines (Fig. 3.9):

- latissimus dorsi, teres major and pectoralis major attach to the humerus close to the medial intramuscular septum, connecting it to the back of the trunk
- the medial intramuscular septum connects the humerus to the medial epicondyle, which connects with the palmar hand and fingers by means of the common flexor tendon
- an additional line on the front of the arm involves pectoralis minor, the costocoracoid ligament, the brachial neurovascular bundle and the fascia clavipectoralis, which attach to the coracoid process
- the coracoid process also provides the attachment for biceps brachii (or brachialis) linking this to the radius and the thumb by means of the flexor compartment of the forearm
- a 'stabilization' line on the front of the arm involves pectoralis major attaching to the ribs, as do the external obliques, which then run to the pubic tubercle, where a connection is made to the contralateral adductor longus, gracilis, pes anserinus, and the tibial periosteum.

As discussed above, it is possible that in taking a distressed, strained (chronic or acute) muscle or joint painlessly into a position that allows for a reduction in tone in the tissues involved, some modification takes place of neural reporting, as well as local circulation being improved.

D'Ambrogio & Roth (1997) summarize what is thought to happen to the fascia during PRT as follows:

It is hypothesized that PRT, by reducing the tension on the myofascial system, also engages the fascial components of dysfunction. The reduction in tension on the collagenous cross-linkages appears to induce a disengagement of the electrochemical bonds and a conversion back [from the gel-like] to the sol [solate] state.

Many researchers into positional release and SCS who discuss tender point characteristics speak of *sudomotor changes* as a primary feature, usually associated with increased or decreased temperature as compared with surrounding tissues (Lewit 1999). Phenomena such as blanching, erythema and sweating of the skin which overlies tense, tender and often edematous tender points are all used as a means of identification when

Box 3.2 Ideal settings for application of SCS/PR (see also Box 3.8 for contraindications and Box 3.9 for indications)

- For reduction of stiffness (hypertonia) in pre- and postoperative patients
- In cases involving muscle spasm – where more direct methods would not be tolerated
- Where contraction is a feature – reducing tone before stretching tissues after use of muscle energy or other techniques
- In cases of acute and multiple strain – whiplash, for example
- As part of any treatment of chronic soft-tissue dysfunction
- As part of a sequence (INIT) of treating trigger points – after NMT and before MET
- In treatment of sensitive, frail, delicate individuals or sites
- In treatment of joint dysfunction where hypertonia is the prime restricting factor

Box 3.3 SCS guidelines

The four keys which allow anyone to apply SCS efficiently are:

1. An ability to localize by palpation soft-tissue changes related to particular strain dysfunctions, acute or chronic
2. An ability to sense tissue change as it moves into a state of ease, comfort, relaxation and reduced resistance
3. The ability to guide the patient as a whole, or the affected body part, towards a state of ease with minimal force
4. The ability to apply minimal palpation force as the changes in the tissues are evaluated.

Application guidelines:

1. Locate and palpate the appropriate tender point
2. Use minimal force
3. Use minimal monitoring pressure
4. Achieve maximum ease/comfort
5. Produce no additional pain anywhere else.

manual palpation is used (Chaitow 2003, Jones 1964, 1981, Lewit 1999, Schwartz 1986).

- The simplest method of palpation involves a light passage across the skin involving one digit, which seeks a sense of 'drag' in which the elevated sympathetic, sudomotor activity becomes apparent, as the finger or thumb feels a momentarily retarded passage over the skin, due to increased hydrosis – as fully described in Chapter 2.
- Pressure applied into the tissues below such localized skin changes (described as 'hyperalgesic skin zones' by Dr Karel Lewit (1999) usually evinces an increased degree of sensitivity or pain.
- Whether this or some other form of soft-tissue palpation is used, the tender points, which Jones has catalogued, need to be identified. They frequently differ from myofascial trigger points inasmuch as Jones's tender points may refer pain elsewhere when compressed, whereas active trigger points always refer pain elsewhere.
- They commonly lie in those tissues that were shortened at the time of strain, or which are chronically shortened in response to chronic strain, and are seldom in areas where the patient was previously aware of pain.

SCS guidelines

The general guidelines that Jones gives for relief of the dysfunction with which such tender points are related (pain, restriction, etc.) involves directing the movement of these tissues towards ease, which commonly involves using the protocols listed in Box 3.4.

Suggestions regarding the length of time positions of ease should be maintained will be found in Box 3.5.

Using these guidelines, it is possible to begin to practice the use of SCS on a model, fellow student, a willing volunteer, or even oneself.

Once in a 'position of ease', the optimal amount of time this position should be maintained has been subject to different opinions. The key suggestions are listed in Box 3.5.

Further clinical guidelines

A consensus has emerged, out of the clinical experience of thousands of practitioners, over the past 40 years, of a number of simple yet effective ways of selecting which of many areas of discomfort and 'tenderness' should receive primary attention (McPartland & Klofat 1995).

The advice is summarized in Box 3.6.

Where to look for tender points

- Use of Jones's 'maps' (or D'Ambrogio & Roth 1997) offers one way of deciding where to palpate for a tender point (Figs 3.10A, B).
- If the patient can identify a movement in which tissues were strained, the concept of 'replicating the

Box 3.4 Positioning guidelines

- For tender points on the anterior surface of the body, flexion, side-bending and rotation is most commonly towards the side of the palpated point, followed by fine-tuning to reduce sensitivity by at least 70%.
- For tender points on the posterior surface of the body, extension, side-bending and rotation is most commonly away from the side of the palpated point, followed by fine-tuning to reduce sensitivity by at least 70%.
- The closer the tender point is to the midline the less side-bending and rotation is usually required, and the further from the midline the more side-bending and rotation may be required, in order to effect ease and comfort in the tender point (without any additional pain or discomfort being produced anywhere else).
- The direction towards which side-bending is introduced when attempting to find a position of ease often needs to be away from the side of the palpated pain point, especially in relation to tender points found on the posterior aspect of the body.
- Despite the previous comment, there are many instances in which ease will be noted when side-bending towards the direction of the painful point. These guidelines therefore offer a suggestion as to the likeliest directions of ease and not 'rules'. Individual tissue characteristics will ultimately determine the ideal directions that will achieve comfort/ease for the point being monitored.

Box 3.5 Timing and SCS

- Jones (1981) suggests a 90-second hold of the position of ease.
- Goodheart (in Walther 1988) suggests that if a facilitating crowding, or neuromuscular manipulation of the spindle, is utilized, a 20–30-second holding of the position of ease is usually adequate.
- Morrison (induration technique – see Chapter 1) suggests a 20-second hold in the position of ease.
- Weiselfish (1993) recommends not less than 3 minutes for neurological conditions to benefit.
- Schiowitz (1990) reduces the holding time to just 5 seconds when employing facilitated positional release (Chapter 6).
- D'Ambrogio & Roth (1997) suggest that between 1 and 20 minutes may be needed to achieve fascial release.
- Others (Chaitow 1996) suggest that the times recommended above are approximate at best, since tissues respond idiosyncratically, depending on multiple factors which differ from individual to individual.
- As the tissues release, palpation should reveal these changes, at which time a slow return to neutral is called for. However, the basic idea of a 90-second hold as a minimum for using Jones's methodology is endorsed.

Box 3.6 Which points to treat first?

- Choose the most painful, the most medial and the most proximal tender points for primary attention, within the area of the body that demonstrates the greatest aggregation of tender points.
- If a chain, or line, of tender points is identified, treat the most central of these.
- No more than five tender points should receive attention at any one treatment session, even if a relatively robust individual is involved.
- The more dysfunctional, ill, adaptively exhausted (see Zink & Lawson evaluation in Chapter 2), pain-ridden and/or fatigued the patient, the fewer the number of tender points that should be treated at any one session (between one and three in such cases).

position of strain' (see Chapter 1) may be used, with the tender point likely to be located in tissues *short at the time of strain.*

- If the patient displays obvious distortion, or a marked imbalance in terms of 'loose–tight' tissues, the tender points most likely to be useful as monitors will be found in the tight (i.e. short) tissues, and the ease position is likely to be an exaggeration of the presenting distortion (see Chapter 1), as tissues that are short are shortened and crowded (painlessly) even more, during the positioning and 'fine-tuning' process.
- If the patient demonstrates a movement that is painful, or that is restricted, then Goodheart's guidelines (see Chapter 1) suggest that the tender points most useful for monitoring will be located in the muscles that would perform the opposite movement to that which is painful or restricted, i.e. seek tender points in antagonists to muscles active when pain or restriction is reported or observed.
- Any area of local tenderness probably represents a response to some degree of imbalance, chronic

strain or adaptive change. Using such a point as a monitor while local or general positioning is introduced to remove the sensitivity from the point will almost certainly help to modify whatever stress pattern is causing or maintaining it.

Tender points and the position of ease

Jones's discovery that almost all somatic dysfunction has associated areas of palpable tenderness, that are frequently only tender when palpated or probed led to the realization that when the joint or area is suitably positioned to ease the tenderness in these points, associated hypertonia or spasm usually diminished.

He called these points 'tender points'. (See Box 1.1 in Chapter 1.)

Describing his methods, Jones (1981) states:

> *Finding the myofascial tender point, and the correct position of release, will probably take a few minutes at first. Watching a skilled physician find a tender point, in a few seconds, and a position of release in a few seconds more, may give a false impression of simplicity to the beginner.*

It may take longer than a few minutes to locate tender points initially; however, accurate palpation methods, such as the 'drag' method (see above, and Chapter 2), can usually be rapidly learned if practiced regularly.

What happens next?

- Once located, the tense tender point should be palpated, with just less than sufficient pressure to cause pain in normal tissue.
- The pain/sensitivity should be apparent to both the physician and the patient.
- By careful guiding of the joint (or other tissue) while constantly palpating the tender point (or by intermittently probing it), a monitoring of progress towards the ideal neutral (reduced or no pain in the palpated point) position is eventually achieved.
- The practitioner senses and evaluates reducing (desirable) or increasing (undesirable) levels of muscle tension in the palpated tissues, as well as the patient's report of either increasing or diminishing levels of sensitivity/pain in the point.
- These indicators are used to guide ('fine-tuning') the practitioner/therapist to the position where eventually there is a feeling of relative ease in the soft tissues, together with markedly reduced pain in the tender point (by 70% at least, ideally).
- An absence of 'bind' and also, most importantly, the patient's report that pain has significantly lowered are the desired indicators.

Jones (1981) states:

> *The point of maximum relaxation accompanied by an abrupt increase in joint mobility, within a very small arc, is the mobile point.*

After holding this position for 90 seconds (see Box 3.5) the practitioner/therapist slowly returns the area to its neutral position.

What are the tender points?

Jones equates tender points with trigger points (Simons et al 1999, Travell & Simons 1992) and with Chapman's neurolymphatic reflexes (Owens 1982). However, this comparison cannot be strictly accurate despite an inevitable degree of overlap in all reflexively active points on the body surface.

There are differences in the nature, if not in the feel, of these different point systems (Kuchera & McPartland 1997). For example, myofascial trigger points will refer sensitivity, pain or other symptoms to a target area when pressed, which is not usually the case with Chapman's (neurolymphatic) reflex points, which are found in pairs and not singly, as are Jones's tender points and most trigger points.

Osteopathic physician Eileen DiGiovanna (1991) states:

> *Today many physicians believe there is a relationship among trigger points, acupuncture points and Chapman's reflexes. Precisely what the relationship may be is unknown.*

She quotes from a prestigious osteopathic pioneer, George Northrup (1941), who stated:

> *One cannot escape the feeling that all of the seemingly diverse observations [regarding reflex patterns of surface 'points'] are but views of the same iceberg, the tip of which we are beginning to see, without understanding either its magnitude or its depth of importance.*

Felix Mann, one of the pioneers of acupuncture in the West, has entered the controversy as to the existence, or otherwise, of acupuncture meridians (and indeed acupuncture points). In an effort to alter the emphasis which traditional acupuncture places on the specific charted positions of points, he stated (Mann 1983):

> *McBurney's point, in appendicitis, has a defined position. In reality it may be 10cm higher, lower, to the left or right. It may be 1cm in diameter, or occupy the whole of the abdomen, or not occur at all. Acupuncture points are often the same, and hence it is pointless to speak of acupuncture points in the classical traditional way. Carefully performed electrical resistance measure-*

ments do not show alterations in the skin resistance to electricity corresponding with classical acupuncture points. There are so many acupuncture points mentioned in some modern books, that there is no skin left which is not an acupuncture point. In cardiac disease, pain and tenderness may occur in the arm; however, this does not occur more frequently along the course of the heart meridian than anywhere else in the arm.'

Hence, Mann appears to conclude, meridians do not exist, or – more confusingly perhaps – that the whole body is an acupuncture point! Leaving aside the validity of Mann's comment, it is true to say that if all the multitude of points described in acupuncture, traditional and modern, together with those points described by Travell and colleagues, Chapman and Jones were to be placed together on one map of the body surface, we would soon come to the conclusion that the entire body surface is a potential acupuncture point.

The discussion in Chapter 2 on the evolution of soft-tissue dysfunction in general (along with the tight–loose concept), and trigger points in particular, offers a representation in which some areas are seen to become short, tight and bunched, while others become lax, stretched or distended.

If the broad guideline of 'exaggerating the distortion' (see Chapter 1) is brought into consideration in such situations, this suggests that whatever is short, tight and bunched is likely to benefit by having these characteristics amplified, reinforced and held, as part of a treatment approach that attempts to offer these tissues an opportunity to change, to release.

Using a tender point (whether or not it is also a trigger point, or plays some other role in relation to reflex activity) to guide the tissues towards the precisely balanced degree of crowding, folding and compression describes SCS methodology simplistically but accurately.

Are ah-shi points and tender points the same?

It is worth remembering that, in acupuncture, there exists a phenomenon known as the 'spontaneously sensitive point'. These 'points' arise in response to trauma, or joint dysfunction, and are regarded, for the duration of their existence, as 'honorary' acupuncture points (Academy of TCM 1975).

Most acupuncture points that receive treatment by means of needling, heat, pressure, lasers, etc., are clearly defined and mapped. The only exception to this rule relates to these spontaneously arising (ah-shi) points, associated with joint problems, which become available for treatment for the duration of their sensitivity.

In an earlier text (Chaitow 1991), I make the following comment: 'Local tender points in an area of discomfort may be considered as spontaneous acupuncture points. The Chinese term these ah-shi points, and use them in the same way as classical points, when treating painful conditions.'

It is worth recalling that in Chinese medicine, as well as use of acupuncture, manual acupressure of ah-shi points is also considered an appropriate form of treatment.

It would seem that Jones's points are in many ways the same, if not identical, to ah-shi points.

Positioning to find ease

As we have seen, Jones discovered a further use for tender points, apart from pressing or puncturing them.

Maintaining a sufficient degree of pressure on such a point allows the patient to be able to report on the level of pain being produced as the joint is (re)positioned, becoming a monitor and guide for the practitioner. The disappearance, or at least marked reduction of pain noted on pressure, after holding the joint in the position of ease for the prescribed period, is instant evidence as to the success of the procedure.

The holding, or periodic probing, of the point during the 90-second period recommended by Jones, leads to a further question, one which Jones acknowledges as being asked of him quite frequently. This queries whether the pressure on the tender point is not in itself therapeutic? Jones answered:

The question is asked whether the repeated probing of the tender point is therapeutic, as in acupressure, or Rolfing techniques [or ischemic compression as used in neuromuscular technique]. It is not intentionally therapeutic, but is used solely for diagnosis and evidence of accuracy of treatment.

This answer could be thought of as being equivocal for it does not address the possibility of a therapeutic end-result from the use of pressure on the tender point, but states only the intention of such pressure.

It may be assumed that some therapeutic effect does indeed derive from sustained inhibitory (also known as 'ischemic') pressure on such a spontaneously arising tender point, for the reasons described in Box 3.7.

Applied pressure and positioning

Since acupuncture authorities both in China and the West include spontaneously tender (ah-shi) points (which seem to be in every way the same as Jones's points) as being suitable for needling or pressure techniques, the avoidance of a clear answer on this point by Jones may be taken to indicate that he has not really addressed himself to the possibility that the applied pressure aspect of SCS contributes to the results.

Box 3.7 Some of the effects of sustained compression

- Ischemia is reversed when pressure is released (Simons et al 1999).
- Neurological 'inhibition' results from sustained efferent barrage (Ward 1997).
- Mechanical stretching occurs as 'creep' of connective tissue commences (Cantu & Grodin 1992).
- Piezoelectric effects modify hardened 'gel-like' tissues, towards a softer more 'sol-like' state (Barnes 1997).
- Mechanoreceptor impulses resulting from applied pressure interfere with pain messages ('gate theory') (Melzack & Wall 1988).
- Analgesic endorphin and enkephalins are released in local tissues and the brain (Baldry 1993).
- 'Taut bands' associated with trigger points release due to local biochemical modifications (Simons et al 1999).
- Traditional Chinese medicine concepts associate digital pressure with altered energy flow.
- In the use of acupuncture there is clear evidence of a pain-reducing effect when pressure methods are applied to acupuncture points.

That his method has other mechanisms which achieve release of pain and spasm in injured joints is beyond doubt. The total effect of SCS would seem to derive from a combination of the positioning of the joint in a neutral position, and the pressure on the tender point.

The process of positioning used in SCS is similar, but not identical, to that described in functional technique by Harold Hoover (see Chapter 6). Hoover's methods involved the positioning of a joint or tissues which display a limited range of motion in what he called a 'dynamic neutral' position. He sought a position in which there was a balance of tensions, fairly near the anatomical neutral position of the joint.

Jones also aims at a position of ease, but he relates more to the identical position in which the original strain occurred, or by exaggeration of existing distortions.

By combining the position of ease, in which the shortened muscle(s) are able to release themselves, while simultaneously applying pressure (which, despite Jones's doubts, appears almost certainly to involve a therapeutic effect), dramatic improvements in severe and painful conditions are possible.

Jones's conclusions regarding joints

Jones came to a number of conclusions as a result of his work, which may be summarized as follows:

- The pain in joint dysfunction is related very much to the position in which the joint is placed – varying from acute pain in some positions, to a pain-free position which would be almost directly opposite the position of maximum pain.
- The dysfunction in a joint that has been strained is the result of something which occurs in response to the strain – a reaction to it. The palpable evidence of this is found by searching not in the tissues that were placed under strain, but by searching for tenderness in the (usually shortened) antagonists of these overstretched tissues.
- These painful structures in joint problems are usually not those which were stretched at the time of the injury, but which were in fact shortened, and which have remained so.
- It is in these shortened tissues that the tender points will be found.

Jones's technique

Jones described the use of 'tender points' as follows:

> *A physician skilled in palpation techniques will perceive tenseness and/or edema as well as tenderness. The tenderness, often a few times greater than that for normal tissue, is for the beginner the most valuable sign.*

Jones suggested maintaining the palpating finger over the tender point, to monitor expected changes in tenderness, while with the other hand he positioned the patient into a posture of comfort and relaxation.

Jones reported that he might proceed successfully just by questioning the patient as to comfort, reduction in pain, etc., as he probed intermittently, while moving towards the position of ease. If the correct position is arrived at, the patient would report diminished tenderness in the palpated area.

By intermittent deep palpation, as he fine-tuned the positioning, he monitored the tender point, seeking the ideal position at which there was at least a 70% reduction in tenderness. This degree of pressure stimulus is similar to that applied in the treatment of similar tender points by acupressure or tsubo techniques.

The key to successful normalization by means of these methods seems to be the achievement of the position of maximum ease of the joint, in which the tender point becomes markedly less sensitive to palpation pressure.

Most importantly, the subsequent return to the neutral resting position, after the maintenance of the joint in this position of ease for not less than 90 seconds, is achieved very slowly. Without this slow repositioning, the likelihood exists of a sudden return to a shortened state of the previously disturbed structures.

The geography of SCS

Tender points, relating to acute and chronic strain, can be found in almost all soft-tissue locations which have come under adaptation stress.

Although Simons et al (1999) indicate that trigger points close to attachments are the ones most likely to benefit from positional release methods (see previous chapter), D'Ambrogio & Roth (1997) observe:

> *Tender points are found throughout the body, anteriorly, posteriorly, medially, and laterally ... on muscle origins or insertions, within the muscle belly, over ligaments, tendons, fascia and bone.*

Jones has identified a large number of conditions that are related to predictable tender points and from his vast clinical experience, and a lengthy process of trial and error, he has concluded that when tender points are found on the anterior surface of the body they are (with a few exceptions) indicative of the associated joint requiring a degree of forward-bending during its treatment (see Box 3.4). The location (in this case on the anterior aspect of the body) also indicates that the joint was probably initially injured in a forward-bending position.

Thus, information as to the original injury position (or observation of the direction in which adaptation is directing distortion) helps to direct the search for the tender points to the likeliest aspect of the body.

The exception to this rule is that the tender point related to the fourth cervical vertebra, when injured in flexion, is not necessarily treated with the neck in flexion, but may require side-bending and rotation, away from the side affected. Reduction in pain from the tender point during positioning, and fine-tuning, will produce the guide to the best position.

Tender points found on the posterior aspect of the body indicate joint dysfunction which calls for some degree of backward-bending in the treatment (see Box 3.4). There are also exceptions to this rule, notably involving the piriformis muscle, and the third and fifth cervical vertebrae. These exceptions may involve a degree of flexion on treatment.

Maps

Figures 3.10A–H will guide the reader to the most common tender point positions, as noted by Jones. Proprioceptive skills, and the use of careful palpation, will enable the required technique to be acquired – as described later in this chapter.

Reading of Jones's (1981) book, or that of D'Ambrogio & Roth (1997) is suggested, for greater detail and understanding of his approach for those who wish to work in this structured manner.

The examples that follow are adapted from Jones's text (Jones 1981) and are not recommendations but are for general information only.

Settings in which SCS/positional release might ideally be applied are given in Box 3.2.

The suggested positions of ease relate to the findings of Jones and his followers over many years, and while they are largely accurate, the author is critical of formulae which prescribe a set protocol for any given joint or muscular strain, and encourages the use of 'Goodheart's guidelines', described later in this chapter, as well as the development of palpation skills that allow for sensing of ease in the tissues, rather than reliance on verbal feedback from the patient as to the current level of discomfort as tissues are being positioned and repositioned.

Reminder about positioning (see Box 3.4)

Remember that when positioning/fine-tuning the body as a whole or just the part in question (elbow, knee, etc.) it is normally found that tender points on the anterior aspect of the body require flexion, and those on the posterior aspect require extension as a first part of the process of easing pain or excessive tone.

The more lateral the point is from the midline the greater the degree of side-bending and/or rotation required to achieve ease.

Notes on prioritizing points for treatment (see Box 3.6)

When selecting a tender point for use as a monitor in SCS treatment, there are often a confusing number of possibilities. The consensus among clinicians (McPartland & Klofat 1995) experienced in use of SCS is that choice should be based on the following priorities:

- First, the most sensitive point found in the area with the largest accretion of tender points should be treated.
- If there are a number of similarly tender points, the most proximal and/or medial of these should be chosen.
- If there exists an apparent 'line' of points, one close to the center of the chain should be chosen to 'represent' the others.
- Clinical experience suggests that no more than five points should be treated at any one session to avoid adaptive overload, and that one treatment weekly is usually adequate.

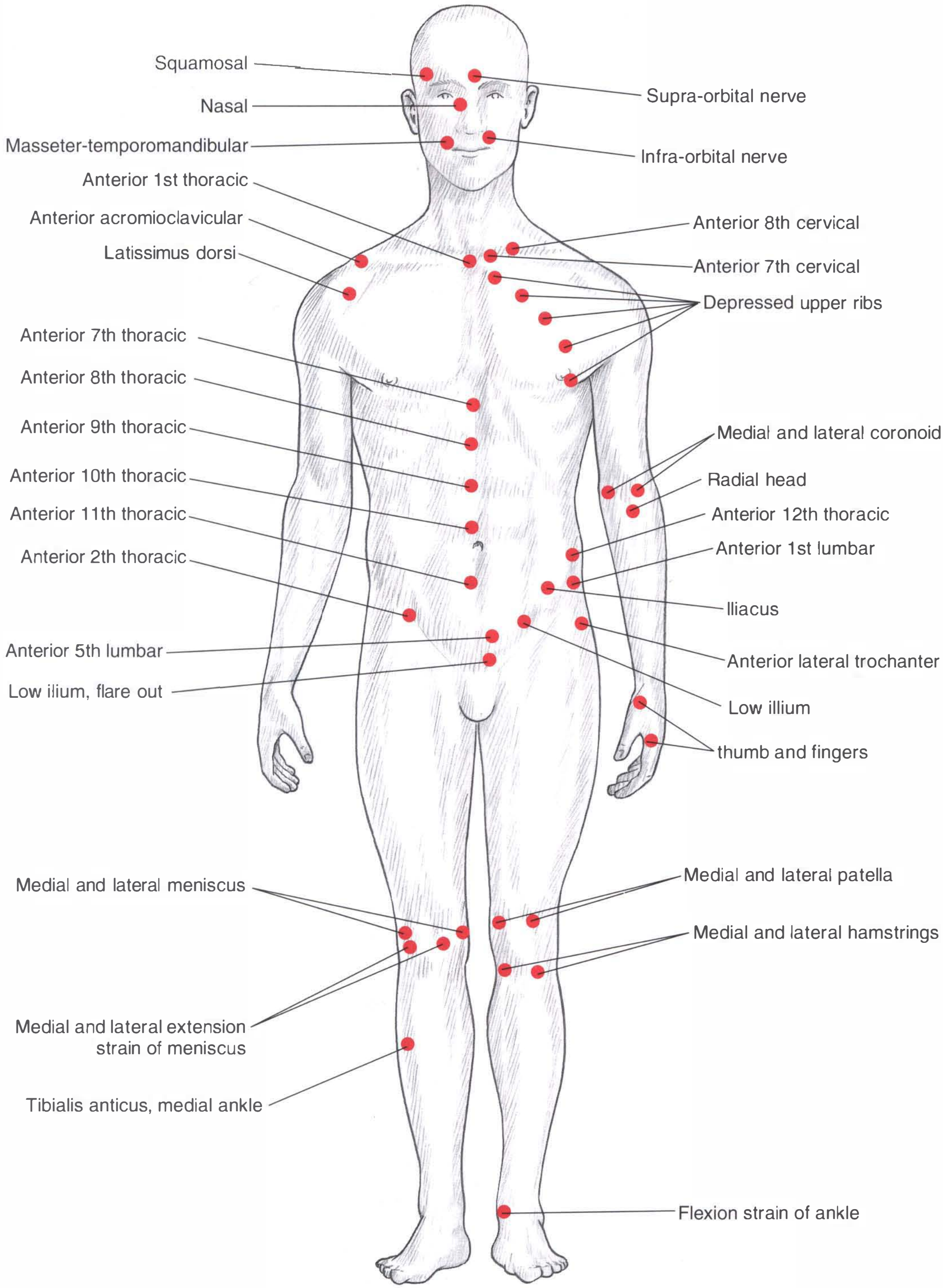

Figure 3.10 Location of Jones's tender points, which are bilateral in response to specific strain (acute or chronic) but are shown on only one side of the body in these illustrations. The point locations are approximate, and will vary within the indicated area, depending upon the specific mechanics and tissues associated with the particular trauma or strain.
Figure 3.10A Jones's tender points on the anterior body surface, commonly relating to flexion strains.

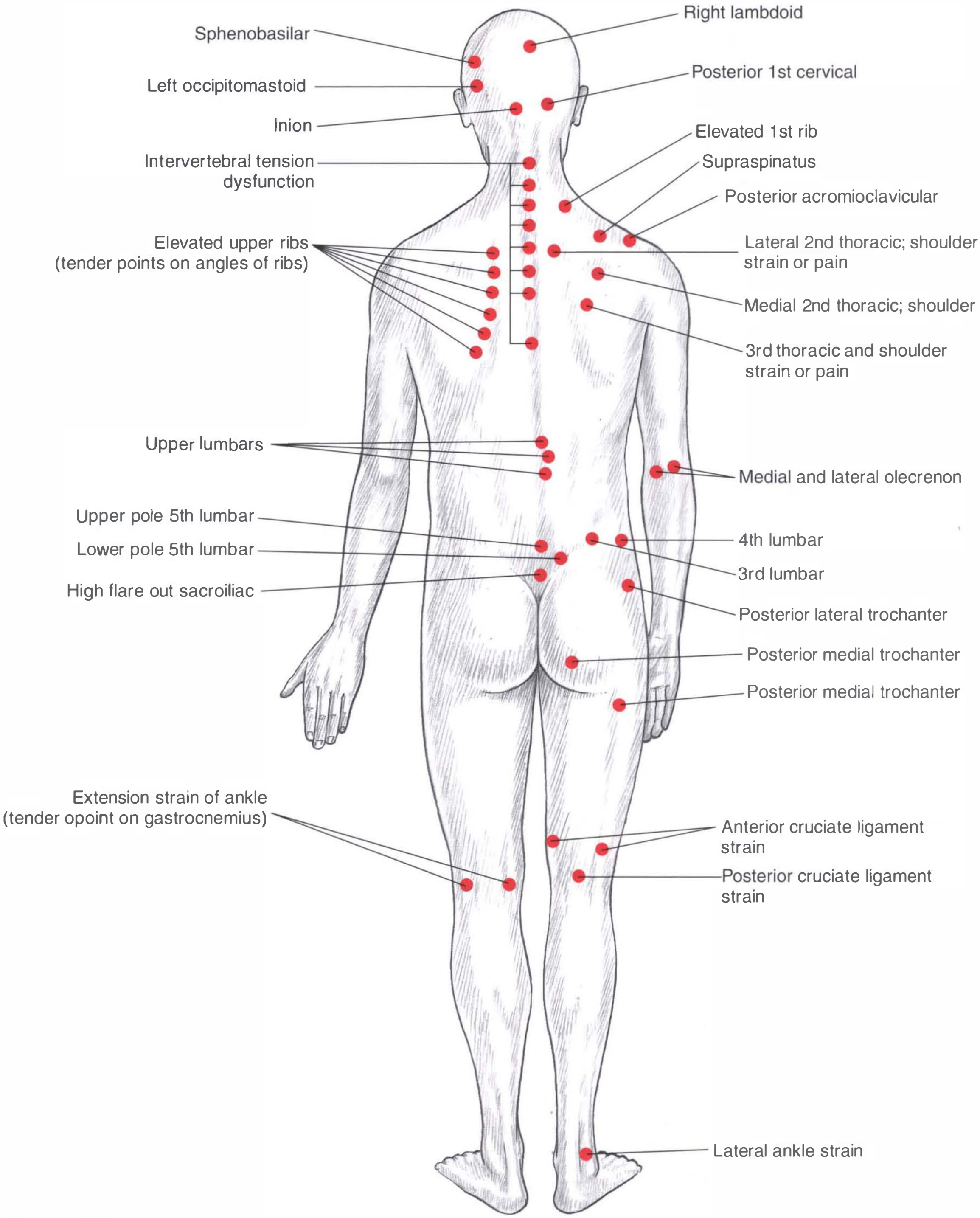

Figure 3.10B Jones's tender points on the posterior body surface, commonly relating to extension strains.

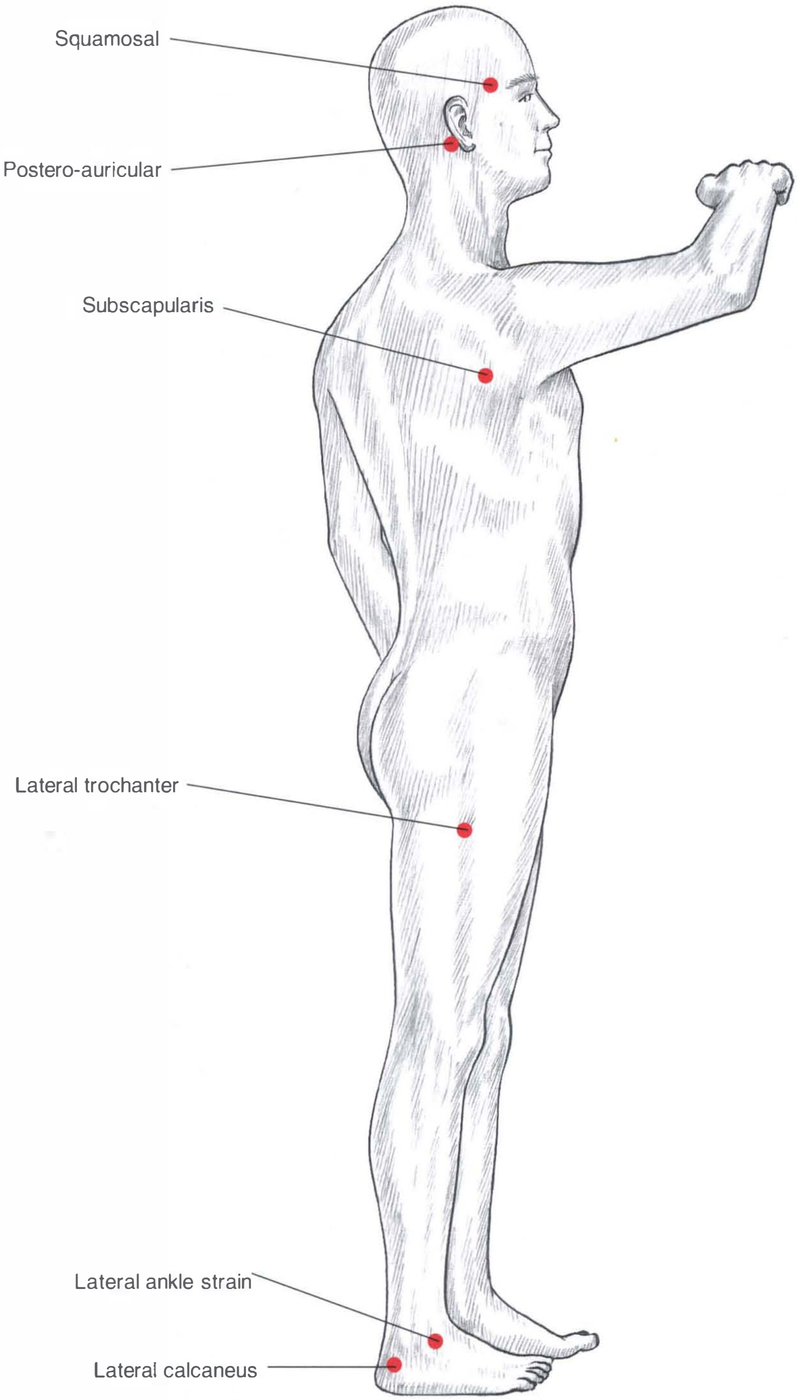

Figure 3.10C Jones's tender points on the lateral body surface, commonly relating to strains involving side-bending or rotation.

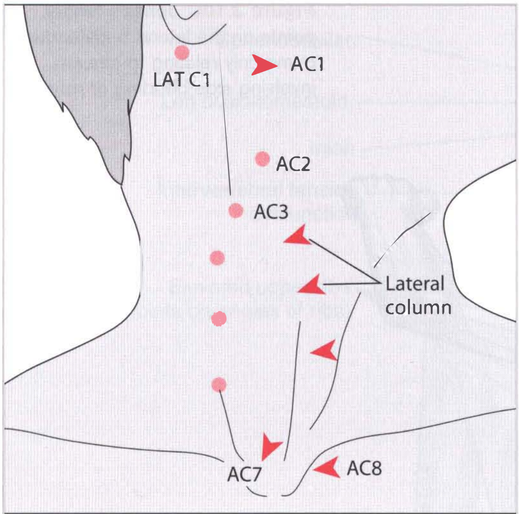

Figure 3.10D Anterior cervical extension strain tender point sites.

These 'rules' are based on experience rather than research.

An example might be where tender points of similar intensity are noted in the low back as well as the hip region. The low back point would receive primary attention (i.e. the most proximal point treated first). However, if tender points were found in the low back and hip, but the hip point was more sensitive, this would receive primary attention (i.e. most sensitive point treated first). If a row of points was noted between the low back and the hip and these were equally sensitive, the most central point in the row would receive primary attention (i.e. treat middle of a line of points first).

Notes on patient feedback

In order to have instant feedback as to the degree of pain/sensitivity/discomfort being felt as the tender point is palpated, it is useful to ask the patient to 'grade' the pain out of 10 (0 = no pain) and to give frequent reports as to the 'value' of the pain being noted during the process of fine-tuning.

A reduction to a score of 2 or 3 (approximately 70% reduction in pain) is regarded as adequate to achieve the release required.

In the USA a method commonly suggested is to say to the patient, 'The amount of pain you feel when I press this point is a dollar's worth. I want you to tell me when there is only 30 cents worth of pain.'

Whichever approach is chosen it is important to instruct the patient that a conversation is not what is needed, but simple indications as to the benefits or otherwise, in terms of pain felt in the point being palpated and monitored, of the various changes in position that are being made.

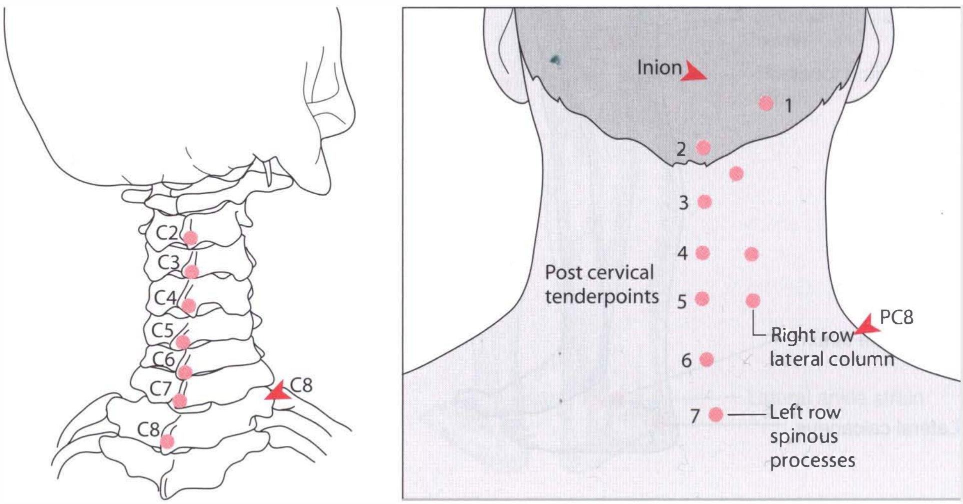

Figure 3.10E Posterior cervical flexion strain tender point sites.

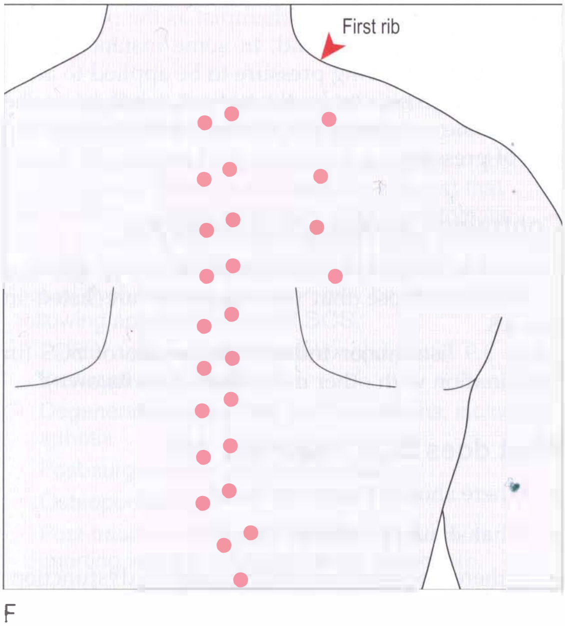

Figure 3.10F Posterior thoracic spine extension strain tender point sites.

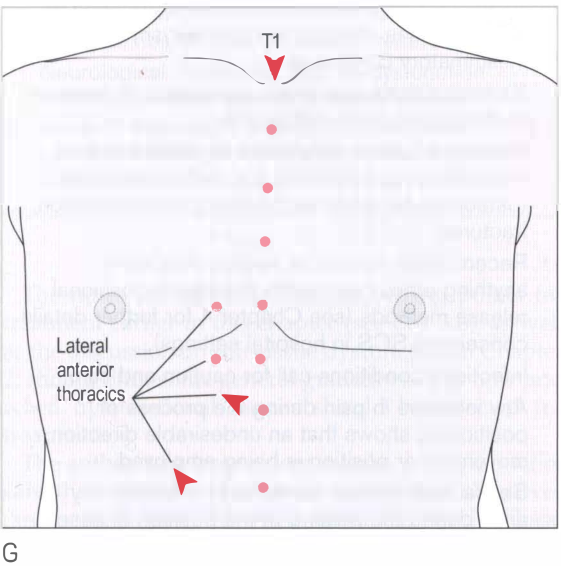

Figure 3.10G Anterior thoracic spine flexion strain tender point sites.

Notes on fine-tuning the ease position

A crowding of the tissues to induce slackness in the affected tissues is a usual final aspect of the 'fine-tuning' once initial pain reduction has been achieved.

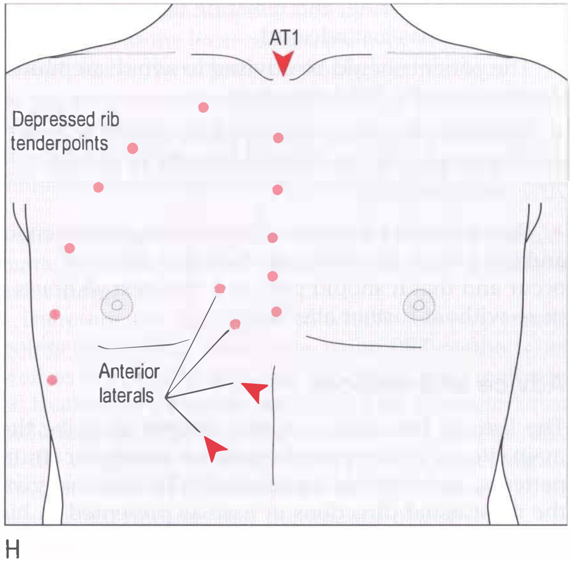

Figure 3.10H Tender points relating to depressed upper ribs (2 to 7).

Additional ease can often be achieved by asking the patient to fully inhale or exhale to evaluate which phase of the breathing cycle reduces pain (or which reduces increased tone) the most.

Eye movements (visual synkinesis) can also be used in this way, always allowing the patient's report of pain levels and/or your palpation of a sense of ease in the tissues to guide you towards the 'comfort zone' (Lewit 1999).

Tips and comments about positioning into ease

1. There should be NO increase in pain elsewhere in the body during the treatment process.
2. It is not necessary to maintain possibly painful pressure on the tender point throughout, although this almost certainly has an 'acupressure' effect (ischemic compression/inhibition/ endorphin release, etc.).
3. Intermittent pressure applied periodically, to evaluate the effects of a change in position in order to ascertain the degree of sensitivity still present, is the preferred Jones method.
4. The amount of time the position of ease should be maintained is discussed in Box 3.6.

After the 90-second hold

- It is necessary for a slow return to be made to the neutral start position, in order to avoid ballistic proprioceptors firing, and restoring the dysfunctional pattern that has just released.

- The patient should be advised to avoid strenuous activity over the following days.
- Reassessment of the tender point should indicate that a reduction in previous sensitivity of at least 70% has taken place.
- Post-treatment soreness is a common phenomenon and the patient should be warned that this may occur and that it should pass over the next 48 hours or so without further attention.

Advice and choices

The listings that follow in this chapter describe the main sites of tender points relative to particular strain patterns, as identified by Jones (1981), and also give the most usual directions of ease as presented in his writings and teachings. The author suggests that these should not be taken as absolute, for the reasons explained above, and should be used as a starting point in guiding you towards identifying the desired position of ease.

If ease (as judged by pain reduction in the palpated tender point) is not achieved in the position suggested by Jones, then that which emerges by careful fine-tuning is the 'correct' position. The body and its tissues, in other words, are being 'consulted' during the positioning phase, and the answer comes in the form of a reduction in pain in the palpated point.

As will become clear in Chapters 6 and 7, which describe functional technique and facilitated positional release, the use of pain in a point as a guide to the state of 'ease' is not the only way of arriving at the point of tissue balance – palpated reduction in 'bind' can be used as an equally clear message from the tissues to indicate that 'ease' is being approached.

Pressure – constant or intermittent?

The author suggests that at times it may be useful to maintain pressure on the tender point throughout the repositioning process, rather than using the intermittent probing urged by Jones. The reasoning for this is explained in Box 3.7.

Patient's assistance

A final variation which the author feels worthy of restating involves having, where convenient, the patient apply pressure to the tender point sufficient to register pain.

In many instances, especially in intercostal areas, this has proved very useful, allowing freedom of movement for the practitioner/therapist as the positioning process is carried out and, in some instances more significantly, allowing pressure to be applied to areas of extreme sensitivity by the patient, when he or she was unable to tolerate practitioner/therapist application of pressure.

Contraindications and indications

There are very few contraindications to the use of SCS, but those that are suggested are listed in Box 3.8.

Box 3.9 lists major indications for use of SCS (in combination with other modalities or on its own).

What does SCS treatment do?

- Where should treatment start?
- What should be treated first?
- Is there a way of prioritizing areas of dysfunction and choosing 'key' locations for primary attention?

Box 3.8 SCS: contraindications and cautions

- Particular care should be taken in application of SCS in cases of malignancy, aneurysm and acute inflammatory conditions.
- Skin conditions may make application of pressure to the tender point undesirable.
- Protective spasm should not be treated unless the underlying conditions are well considered (osteoporosis, bone secondaries, disc herniation, fractures).
- Recent major trauma or surgery precludes anything other than gentle superficial positional release methods (see Chapter 4 for further details concerning SCS in hospital settings).
- Infectious conditions call for caution and care.
- Any increase in pain during the process of positioning shows that an undesirable direction, movement or position is being employed.
- Sensations such as numbness or aching may arise during the holding of the position of ease, and as long as this is moderate and not severe the patient should be encouraged to relax and view the sensation as transient and part of the desirable changes taking place.
- Caution should be exercised when placing the neck into extension. It is as well to maintain verbal communication with the patient at all times and to ask them to keep the eyes open so that any signs of nystagmus are observable.

Box 3.9 Indications for SCS (alone or in combination with other modalities)

See also Box 3.2, which lists 'ideal settings' for use of SCS, and the list of contraindications in Box 3.8.

Note: The fact that conditions are included in the partial listing below is not meant to suggest that SCS/PRT could do other than offer symptomatic relief in some of them. Alleviation of pain, enhanced mobility and, in some instances, resolution of the actual dysfunctional condition may be anticipated following appropriate use of SCS.

- Painful and restricted muscles and joints, irrespective of cause
- Degenerative spinal and joint conditions, including arthritis
- Post-surgical pain and dysfunction
- Osteoporosis
- Post-traumatic pain and dysfunction, such as sporting injuries, whiplash, ankle sprain, etc.
- Repetitive strain conditions
- Fibromyalgia pain (see Chapter 4)
- Headache
- Pediatric conditions such as torticollis
- Respiratory conditions that might benefit from normalization of primary and accessory breathing muscles, ribs and thoracic spinal restrictions
- Neurological conditions such as dysfunction following cerebrovascular accidents (stroke), spinal or brain injury or degenerative neural conditions such as multiple sclerosis (Weiselfish 1993)

The notes on selecting and prioritizing points for treatment earlier in this chapter (see Box 3.6), as well as the discussion on soft-tissue dysfunction in Chapter 2, should offer some general guidelines as to how and when dysfunctional tissues should be selected for treatment.

The author, to a large extent, works with a model of care that attempts to achieve one of two objectives (and sometimes both) when treating general or local (e.g. soft tissue) dysfunction.

It can be argued that all potentially beneficial therapeutic interventions depend for the manifestation of that benefit on the response of the body and tissues being treated. In other words the treatment (involving any technique whatsoever) has a catalytic influence, but is of itself not capable of 'curing' anything.

The objectives, relating to the two areas of influence within which all therapeutic interventions operate, can be summarized as follows:

- reduction of the adaptive load to which the organism as a whole, or the local tissues, are adapting (or failing to adapt), i.e. the objective is to 'lighten the load'
- enhancement of the ability of the organism as a whole, or of the local tissues, to adapt to whatever stress load is being coped with, i.e. the objective is to 'enhance homeostatic self-regulating functions'.

An additional emphasis needs to be, 'don't make matters worse', by overloading adaptive functions even more.

Therefore, the decision as to which, and how many, points to treat at a given time, using PRT methods, as well as whether to combine this with other methods of treatment, depends on individual characteristics including age, vulnerability, the chronicity or acuteness of the condition, as well as the specific objectives in the case, with all these considerations being related to assessment findings and therapeutic objectives.

Scanning

Clinicians such as D'Ambrogio & Roth (1997) argue for a 'scanning evaluation' (SE) that records tender points, as well as their severity, when the entire body is evaluated. Just as a postural evaluation will provide a number of pointers that might relate to the patient's symptoms, or the palpation and eliciting of active trigger points might show patterns that explain the pain being experienced by the patient, or testing for shortness, weakness or malcoordination in muscles might correlate with somatic dysfunction, so might a grid, or map, of areas of tenderness ('tender points') and their severity be seen to contribute to the formulation of a plan of therapeutic action.

A major element in this mapping approach is identification of what have been termed 'dominant tender points' (DTPs), the deactivation of which can lead to a chain reaction in which less tender areas will normalize. This concept is not dissimilar to that of Simons et al (1999) who maintain that chains of active trigger points can be 'switched off' in much the same manner.

As D'Ambrogio & Roth (1997) explain:

Several patients may have the same complaint (e.g. knee pain, shoulder pain, or low back pain) but the source of the condition, as revealed by the scanning evaluation [and the 'dominant tender points'], may be different for each ... By identifying the location of key dysfunctions and treating restrictive muscular and fascial barriers, the pain may begin to subside.

For details of the complex mapping and charting exercise, as recommended by D'Ambrogio & Roth (1997), the reader is referred to their book.

The mapping and charting exercise is a useful procedure, albeit time-consuming; for busy therapists the guidelines offered earlier in this chapter (see Box 3.6) will suffice and should provide good clinical results.

A number of exercises are described below that offer the reader a chance to experiment with SCS methodology, and to become familiar in a 'hands-on' way with the mechanics of its use. These exercises are followed by a series of descriptions of SCS in clinical use, covering most of the muscles and joints of the body.

SCS exercises

1. The SCS 'box' exercise *(Woolbright 1991)*

Colonel Jimmie Woolbright (1991), Chief of Aeromedical Services at Maxwell Airforce Base, Alabama, devised a teaching tool that enables SCS skills to be acquired and polished. This is not designed as a treatment protocol but is an excellent means of acquiring a sense of the mechanisms involved.

'Box' exercise guidelines

Note As the head and neck are positioned during this exercise (Figs 3.11A, B and 3.12) no force at all should be used.

- Each position adopted is not the furthest the tissues can be taken in any given direction but rather it is where the first sign of resistance is noted.
- Thus, an instruction to take the patient/model's head and neck into side-bending and rotation to the right would involve the very lightest of guidance towards that position, with no force and no effort, and no strain or pain being noted by the patient/model.
- As each position described below in this 'box exercise' is achieved, three key elements require consideration:
  1. Is the patient/model comfortable and unstressed by this position? If not, too much effort is being used, or they are not relaxed.
  2. In this position, are the palpated tissues (in this exercise those on the upper left thoracic area) less sensitive to compression pressure in this particular head/neck position?
  3. In this position, are the palpated tissues reducing in palpated tone, feeling more at 'ease', with less evidence of 'bind'?

The information derived by the palpating hand (left hand in this example) should, at the end of the exercise, allow the practitioner/therapist to judge which of the various head/neck positions offered the most 'ease' to the palpated tissues (Fig. 3.12).

It will be found that while only one position of the head and neck (in this particular application of the exercise) offers the greatest reduction in palpated tension or reported pain, there are other secondary positions that also offer some reduction in these two key elements (pain and palpated hypertonicity), just as a number of

Figure 3.11A The second head/neck position of the 'box' exercise as pain and tissue tension is palpated and monitored (in this instance in the left upper pectoral area).

Figure 3.11B The fourth and final head/neck position of the 'box' exercise as pain and tissue tension is palpated and monitored.

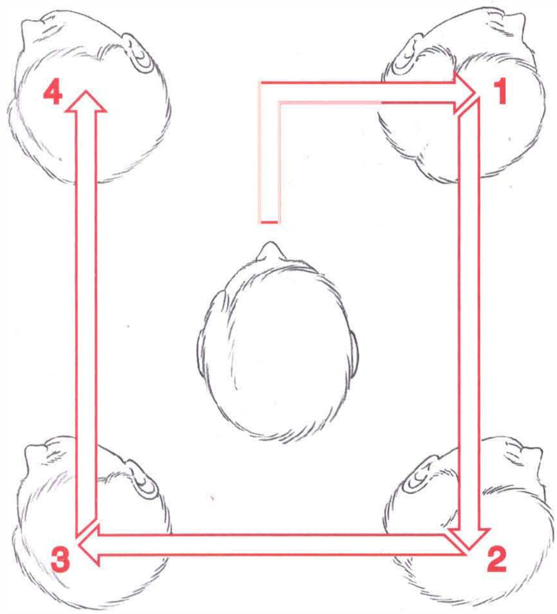

Figure 3.12 Box exercise. The head is taken into four positions: flexion with side-bending and rotation right (1), extension with side-bending and rotation right (2), extension with side-bending and rotation left (3), flexion with side-bending and rotation left (4). As these positions are gently adopted, tenderness and/or tissue tension is monitored.

the positions adopted during application of the 'box' exercise will demonstrably *increase* tension and/or pain.

Woolbright (1991) notes that there are what he terms 'mirror-image' points which are 'directly diagonally across from the anticipated position of release', and that these may at times offer a better position of ease than that designated as the likeliest by virtue of Jones's research.

Method

Note As each position is reached you should pause to evaluate the tissue response to the position, as well as inquiring of the patient/model what the 'score' is for the pain/discomfort being produced by the palpating digit. Try to be constantly vigilant to changes in tone as the head and neck move through the sequence of positions around the 'box'.

- The patient/model is seated with the practitioner/therapist standing behind.
- The practitioner/therapist's right hand rests very lightly on the crown of the patient/model's head (palm on head, fingertips touching forehead, or the hand can be transversely placed on the head so that the heel of the hand is on one side and the fingertips on the other) while the left hand/fingertips palpate an area of tenderness and tension a little below the left clavicle, in the pectoral muscles (Fig. 3.11).
- Sufficient pressure should be applied for a report to be made by the patient/model of discomfort or pain.
- This is given a value of '10' and it is explained that whenever a request is made for the level of pain to be reported, a number (out of '10') should be given.
- The discomfort/pain will change as the head and neck alter their positions, and it is the primary objective of the exercise that you should be able to sense – by virtue of changes in the palpated tension in the tissues – whether the 'score' is going to go up or down.
- As the patient/model exhales, the head should be guided, *with minimal effort*, into flexion and it is then gently side-flexed and rotated to the right to go to position 1 (Fig. 3.12).
- Pausing momentarily to assess changes in the palpated tissues and/or to obtain feedback as to reduction or otherwise in sensitivity, the practitioner/therapist then takes the head out of right rotation (while maintaining a slight right side-bend) and as the patient inhales, the practitioner/therapist introduces a slight pressure on the brow which allows the head to 'float' up out of flexion and into slight extension.
- When the easy limit of extension is reached, rotation to the right is again introduced taking it to position 2 (Fig. 3.11A).
- After a brief pause for evaluation of both tone and reported levels of pain/discomfort, the head is then moved gently to the left, losing the right side-bending/rotation as the head crosses the midline.
- First side-bending and finally some rotation to the left should be introduced, to an easy end-point, as the head comes to rest in position 3, still in slight extension.
- The head/neck is then, after a momentary pause, eased out of left rotation and into flexion (during an exhalation) while left side-bending is maintained.
- Rotation to the left is again introduced as the head/neck comes to rest in flexion, as in position 4 (Fig. 3.11B).
- Taking the head back to the right and losing the side-bending/rotation at the midline returns it to the starting, neutral, position.
- Continuation to the right past the midline, again introducing flexion side-bending and subsequent rotation to the right, takes it back to position 1.

- The head and neck are moved around the box (as described above) a number of times, in order to assess for any additional relaxation (or increased bind) in the tissues under the palpating and monitoring hand.
- It is useful to try to note whether additional assistance to the process can be gained by having the patient/model, with eyes closed, 'look' up or down or sideways in the direction in which the head is moving, as it moves.
- Very often, experimenting with eye movements in this way allows for increased ease to be achieved, if the direction in which the eyes are looking is synchronized with the direction of movement.
- It is suggested that the practitioner/therapist can make the process of moving the model/patient around the box more fluid by duplicating the movements of the patient's eyes and breathing, as well as by leaning in the direction, and at the speed, of the movement that the patient is being directed to follow, by the hand on the head.
- The whole exercise should be repeated a number of times (with different people) until the practitioner/therapist feels comfortable in using the 'box' approach to palpation of a specific tender point – noting the changes in tissue tone and reported pain under the listening/monitoring/palpating hand/finger.
- When palpating a posterior (extension) tender point, the box should be entered from neutral by first going into extension (on inhalation) with the addition of side-bending and rotation towards the side of the tender point followed by progressing around the box.
- When palpating an anterior (flexion) tender point, the box should be entered from neutral by flexing the head/neck (on exhalation) and then side-bending and rotating away from the side being palpated, before progressing around the box.
- If, as the head and neck are being guided around the circuit of the box, there seems to be a resistance to release of the tissues, a light muscle energy approach (a weak isometric contraction held for 7–10 seconds) can be usefully introduced to involve whichever tissues seem restricted and resistant, followed by a continuation of the movement through the box until a position of maximum ease is identified and held for 90 seconds.

Note Before continuing with this series of exercises and clinical treatment protocols it is suggested that you review all the boxes of information in this chapter, particularly Box 3.4, that describes the general guidelines regarding positioning, derived from the clinical experience of Jones and many others, including the author.

2. SCS cervical flexion exercise

(See also Figs 2.8 and 3.10D.)

- The patient/model is supine and the practitioner/therapist sits or stands at the head of the table.
- An area of local dysfunction is sought using an appropriate form of palpation such as a 'feather-light', single-finger, stroking touch on the skin areas overlying the tips of the transverse processes of the cervical spine.
- Using this method, a feeling of 'drag' is being sought for, which indicates increased sudomotor (sympathetic) activity and therefore a likely site of dysfunction, local or reflexively induced (Lewit 1991), as described in Chapter 2.
- When drag is noted, light compression is introduced to identify and establish a point of sensitivity, a tender point, which in this area represents (based on Jones's findings) an anterior (forward-bending) strain site.
- The patient is instructed in the method required for reporting a reduction in pain during the positioning sequence which follows.
- The author's approach is to say, 'I want you to score the pain caused by my pressure, before we start moving your head (in this example) as a "10" and to not speak apart from giving me the present score (out of 10) whenever I ask for it'.
- The aim is to achieve a reported score of 3 or less before ceasing the positioning process.
- In the example illustrated in Figure 3.13 an area of sensitivity/pain will have been located just anterior to the tip of a transverse process, on the right, and this is being palpated and monitored by the practitioner/therapist's right thumb.
- The head/neck is then taken lightly into flexion until some degree of ease is achieved based on the score reported by the patient. At this stage of the process this is being constantly compressed
- When a reduction of the pain score of around 50% is achieved, fine-tuning is commenced, introducing a very small degree of additional positioning (side-flexion, rotation, etc.) in order to find the position of maximum ease, at which time the reported 'score' should be reduced by at least 70%.
- Remember that in Box 3.4 the guidelines for SCS suggest that anteriorly situated pain requires (as a rule, but not always) flexion together with side-flexion and rotation toward the side of pain.
- Once relative 'ease' has been achieved, the patient may be asked to inhale fully and exhale fully, while observing for changes in the level of pain, in order to evaluate which phase of the cycle reduces it still more.

Figure 3.13 Learning to use strain/counterstrain for the treatment of a cervical flexion strain.

- The phase of the breathing cycle in which the individual senses the greatest reduction in sensitivity is maintained for a period that is tolerable (holding the breath in or out or at some point between the two extremes), while the overall position of ease continues to be maintained, and the tender/tense area monitored.
- This position of ease is held for 90 seconds in Jones's methodology, although there exist mechanisms for reducing this, which will be explained later in this chapter.
- During the holding of the position of ease, the direct compression can be reduced to a mere touching of the point, along with a periodic probing to establish that the position of ease has been maintained.
- After 90 seconds, the neck/head is very slowly returned to the neutral starting position. This slow return to neutral is a vital component of SCS, since the neural receptors (muscle spindles) may be provoked into a return to their previously dysfunctional state if a rapid movement is made at the end of the procedure.
- The tender point/area may be retested for sensitivity at this time and should be found to be considerably less hypertonic.

3. SCS cervical extension exercise

(See also Figs 2.8 and 3.10E.)

- With the patient/model in the supine position and with the head clear of the end of the table, fully supported by the practitioner/therapist, areas of localized tenderness are sought by light palpation alongside or over the tips of the spinous processes of the cervical spine.
- When a point that is unusually tender is located, compression is applied to elicit a degree of sensitivity or pain.
- The model/patient is asked to ascribe a score of '10' to this tenderness.
- The head/neck is then very slowly taken into light extension, along with side-bending and rotation, as in Figure 3.14 (usually away from the side of the pain – see guidelines for positioning in Box 3.4), until a reduction of at least 50% is achieved in the reported sensitivity.
- The compression can be constant or intermittent, with the latter being preferable, if sensitivity is great.
- Once a reduction in sensitivity of at least 70% has been achieved, inhalation and exhalation are monitored by the patient/model to see which phase reduces sensitivity even more, and this is maintained for a comfortable period.
- If intermittent compression of the point is being used, this needs to be applied periodically during the 90-second holding period, in order to ensure that the position of ease has been maintained.

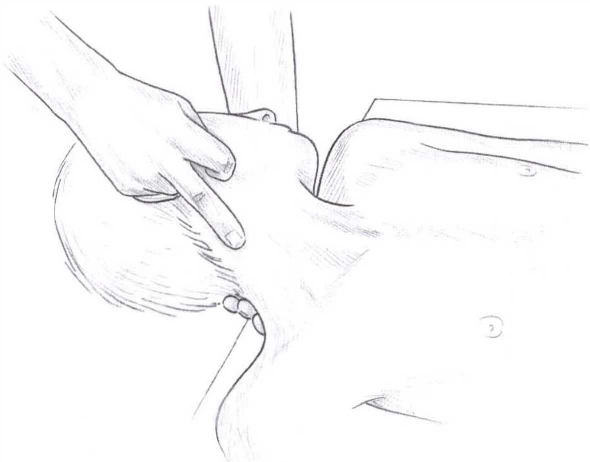

Figure 3.14 Learning to use strain/counterstrain for the treatment of a cervical extension strain.

- After 90 seconds, a very slow and deliberate return to neutral is performed and the patient is rested for several minutes.
- The tender point should be repalpated for sensitivity, which may have reduced markedly, as should excessive hypertonicity in the surrounding tissues.

4. SCS 'tissue tension' exercise

(Chaitow 1990)

- SCS exercises 2 and 3 should be performed again; however, this time, instead of relying on feedback from the patient as to the degree of sensitivity being experienced in the tender point and using this feedback as the guide which takes the practitioner/therapist towards the ideal position of ease, the practitioner/therapist's own palpation of the tissues and their movement towards ease becomes the guide.
- A light contact should be maintained on the previously treated tender point, while positioning of the head and neck is carried out, to achieve maximum 'ease'.
- Ideally, a final position should be achieved which closely approximates the position in which reduction of the pain was achieved in the previous exercises.
- This is an exercise that begins a process of palpatory skill acquisition and enhancement, which will be carried further in exercises involving functional technique described in Chapter 6.

5. SCS exercise involving compression

- Exercises 1, 2 and 3 should be performed again, but this time when pain/sensitivity and/or hypertonicity has reduced by 70% by means of positioning, and after the breathing element has been carried out to aid this process, a light degree of 'crowding' or compression is introduced by means of pressure onto the crown of the head through the long axis of the spine.
- No more than 1 lb (0.5 kg) of pressure – more usually less than half of that – should be involved.
- This can be achieved by use of pressure from the practitioner/therapist's abdomen, or from the hands that are holding and supporting the neck and head.
- This additional element of crowding/slackening the tissues should not increase the sensitivity from the palpated point or cause pain anywhere else.
- If the addition of crowding does cause any additional pain/discomfort, it should be abandoned.
- The more usual response is for the patient to report an even greater degree of pain relief, and for the practitioner/therapist to sense greater 'ease' in the palpated tissues.
- This addition of crowding to the procedures reduces the time required during which the position of ease needs to be held, and mimics a major feature of facilitated positional release (FPR – see Chapter 7).
- The time-scale for SCS when crowding is a feature is commonly given as between 5 and 20 seconds.

These first five exercises – starting with the box exercise – offer an initial opportunity to become familiar with SCS methodology.

The skills that should be enhanced by use of these exercises include:

1. A greater sense of the delicacy of the SCS process.
2. The ability to locate tender points and, depending on their location, to be able to position the area into flexion plus fine-tuning (anterior aspect) or extension plus fine-tuning (posterior aspect) until sensitivity reduces, or palpated tone reduces, by at least 70%.
3. A sense of the changes that occur in response to light 'crowding' of the tissues once they have been taken into their initial ease position.

Before moving on to a series of clinically useful examples of SCS, two more exercises will be described, and should be practiced.

These involve:

- a low back exercise (exercise 6)
- a small joint (elbow) exercise (exercise 7).

In both of these, processes such as those used in the box exercise (above) will be described.

Note that, although these are 'training exercises', meant to familiarize you with SCS assessment and treatment methodology, they are in fact perfectly usable in clinical settings to treat the areas being focused on.

These are authentic SCS protocols.

6. SCS low back/lower limb exercise

- With the patient prone, one of the lower limbs can be used as a 'handle' with which to modify tone and tension and/or tenderness in the low back, as an area of this is palpated (Fig. 3.15).
- The practitioner palpates an area of the lumbar musculature as a systematic evaluation is carried out of the effects of moving the *ipsilateral* and then the *contralateral* limb into (slight) extension, adduction and internal rotation.

Figure 3.15 SCS low back lower limb exercise.

- Once the effects of these different positions have been assessed, take the limb to a neutral position and introduce abduction and external rotation, while still in extension.
- A further experiment to assess the effects on low back tenderness (palpating a tender point) and hypertonicity should involve taking the abducted limb into flexion (over the edge of the table) and then introducing external rotation.
- Following this, with the hip still in flexion, remove the rotation and take the limb into adduction and, at its easy end-of-range, introduce a little internal rotation.
- In this way an approximation of a 'box' movement will have been created while a low back area is palpated for changes in perceived pain or modifications of tone.
- Assess which positions offer the greatest ease in low back areas as this sequence is repeated several times.
- Evaluate whether greater influence is noted in the tissues being palpated when the ipsilateral or contralateral leg is employed as a lever.
- Repeat these processes but this time, at the end of the fine-tuning, add long-axis compression, by easing the limb towards the pelvis using no more than 1 pound (half kilo) of pressure.
- Evaluate the effects of this on tenderness and tone.

Best position?

According to SCS theory and clinical experience the likeliest positions of 'ease' will be found with the *contralateral leg in extension.*

Other variables will influence which parts of the low back eases most when the limb is adducted, or abducted, and internally or externally rotated. Refer to Box 3.4, which provides the model that should produce optimal results.

As the limb is eased into extension (but only a very small amount – avoiding hyperextension of the spine!), and is adducted and slightly rotated, a tender point on the *right low back area* would be placed into its greatest degree of ease when there is:

- extension of the contralateral (left) leg
- adduction of that limb (so rotating the lumbar spine slightly to the left, i.e. away from the side of palpated pain on the right side of the posterior aspect of the patient)
- some fine-turning involving rotation of the limb one way or the other to achieve 70% reduction in tenderness or tone
- long-axis compression.

7. SCS upper limb (elbow) exercise

- The concept and methodology of the box exercise can be used to introduce a series of movements, while palpating tenderness and tension in the lateral epicondyle area.
- The patient lies supine while one hand palpates an area of tenderness on the lateral epicondyle.
- The other hand holds the wrist as the elbow is placed into extension with side-bending and rotation towards the side of the palpated tender point (i.e. externally rotated).
- Assess changes of palpated tone and reported pain with the arm in this position, and then introduce side-bending and rotation internally (still in extension).
- Now introduce flexion, and while in flexion assess the changes in palpated tone and reported discomfort and then introduce first internal and then external rotation with side-bending to assess changes in reported sensitivity, and changes in tissue tone.
- Identify the position in which the greatest reduction in tone and sensitivity is achieved.
- Then introduce long-axis compression, from the wrist towards the elbow, using no more than a few ounces (grams) of pressure (Fig. 3.16).

The most probable position of ease for an anterior lateral epicondyle tender point is flexion with side-bending and external rotation. However, as in all tender points, the particular mechanisms involved in the dysfunctional strain pattern can make such predictions meaningless. In the end it is the position that achieves the maximum degree of ease which produces the most beneficial effects.

This and the previous exercises offer a useful starting point for anyone new to SCS.

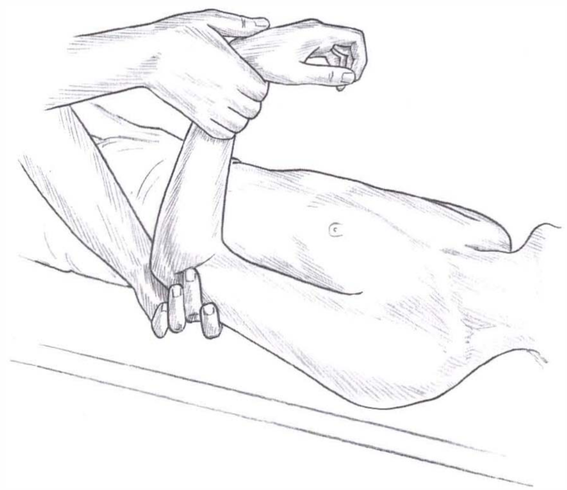

Figure 3.16 The lateral epicondyle is palpated as various positions of the lower arm (flexion, extension, rotation) are introduced to evaluate their influence on the palpated tissues.

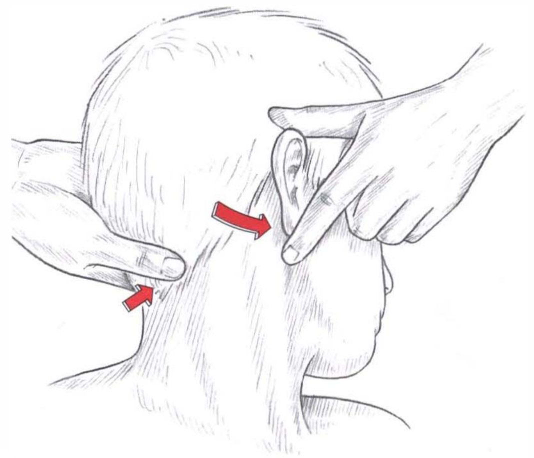

Figure 3.17 First cervical flexion strain tender point lies between the styloid process and the angle of the jaw. A likely position of ease is as illustrated. However, alternative positions of ease can sometimes involve movement of the head and neck into different positions.

SCS techniques

The remainder of this chapter comprises descriptions of protocols for the treatment of many of the joints and muscles of the body.

Many are derived from the work of Jones (1981), while others are either modifications developed by the author, or are modifications of protocols described by Deig (2001) or D'Ambrogio & Roth (1997).

The descriptions of these clinical applications of SCS will follow a descending pathway, starting at the neck and working inferiorly to the feet – with the exception of descriptions of cranial and temporomandibular joint (TMJ) methods that are located in Chapter 4, which contains advanced and specialized SCS methods.

Cervical flexion strains

(See Fig. 3.10D.)

Anterior strain of C1:

- The tender point for anterior strain is a C1 joint is found in a groove between the styloid process and angle of the jaw.
- Treatment usually involves rotation of the head of the supine patient away from the side of dysfunction, either maintaining pressure or repetitively probing Jones's point (Fig. 3.17).
- Fine-tuning is usually by side-flexing away from the painful side.

An alternative or second point for C1 flexion strain lies half an inch (1cm) anterior to the angle of the mandible. This is usually treated by introducing flexion and rotation, approximately 45° away from the side of pain.

Remaining *cervical anterior (flexion) strain tender points* are located on or about the tips of the transverse processes of the involved vertebrae (Figs 3.18A and B).

- These spinal segments are usually treated by positioning into forward-bending and rotation, to remove pain from the tender point.
- In general, the more cephalad the palpated tender point the more rotation away from it is needed in fine-tuning (Fig. 3.18A).
- The more caudad the point the more flexion, and the less rotation, is usually required.
- See Box 3.11 for Schwartz's (1986) suggestions regarding treating these points in a bed-bound patient.

Note Whenever the suggestion is given that rotation should be towards the tender point, this is the *likeliest* beneficial direction that will take the area towards ease; however, if this fails to achieve results, it is quite possible that rotation away from the side of pain would provide greater ease.

In the end, each strain pattern is unique, and while guidelines as to likely directions of positioning are usually accurate, this is not always so, and the feedback from palpated tissues and the patient is the true guideline.

Cervical side-flexion strains

Tender points relating to side-flexion strains of the cervical spine are located as follows:

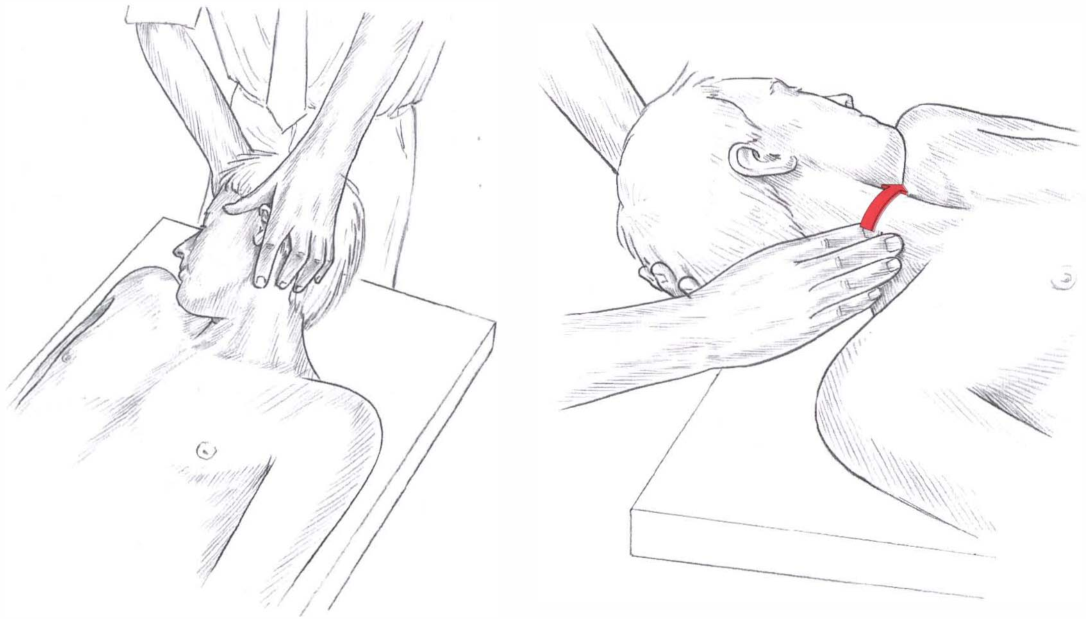

Figure 3.18A and B A flexion strain of a mid to lower cervical vertebra, with the tender point close to the tip of a transverse process. The position of ease is often as illustrated – flexed and rotated away from the side of palpated pain – however, as noted in the text, alternative positioning may be called for.

- for C1 side-flexion restriction – tip of transverse process of C1
- for C2–C6 side-flexion restriction – on the lateral aspects of the articular processes (Fig. 3.19), close to the spinous process.

Treatment involves pressure being applied to the tender point and side-flexion *towards or away from* the side being treated, depending on the tissue response and patient's reports as to pain levels.

Fine-tuning might involve slight increase in flexion, extension or rotation.

Clinical tip Don't forget to use drag palpation in order to *rapidly* identify localized areas of dysfunction (hyperalgesic skin zones) – as described in Chapter 2.

Suboccipital strains

(See Figs 3.10A and 3.10D.)

The tender points associated with upper cervical/suboccipital strains are located on the occiput, or in the muscles attaching to it, such as rectus capitis anterior, obliquus capitis superior and rectus capitis posterior major and minor.

Treatment involves either localizing cranial flexion or cranial extension to the C1 area, while applying precisely focused flexion or extension procedures that markedly reduce the tenderness from the palpated tender point.

Figure 3.19 Treatment for C2–C6 side-flexion strain.

For example:

- If a tender point is located on rectus capitis anterior, just medial to the insertion of semispinalis capitis, inferior to the posterior occipital protuberance, it is said by Jones (1981) to relate to flexion strain of the region.
- The ease position involves localized flexion of the suboccipital region.
- The patient is supine with the practitioner seated or standing at the head of the table.
- One hand palpates the tender point while simultaneously applying light distraction to the occiput, in a cephalad direction.
- The other hand rests on the frontal bone and applies *light* caudad pressure, inducing upper cervical flexion, bringing the chin close to the trachea (Fig. 3.20), until an appropriate tissue response is noted, accompanied by a reduction in perceived tenderness.
- Fine-tuning may also be required, possibly involving rotation towards and side-flexion away from the treated side.

Alternatively:

- If a tender point is located on obliquus capitis superior, approximately 1.5 cm medial to the mastoid process, it is said by Jones (1981) to relate to an extension strain of the region.
- The ease position involves localized extension of the tissues.
- The patient is supine and the practitioner is at the head of the table with one hand supporting the head, and with one finger of that hand localizing the tender point (Fig. 3.21).
- The other hand is on the crown of the head applying light pressure to induce upper cervical extension (as the occiput extends on C1).
- This position, together with fine-tuning involving side-flexion and/or rotation, should establish the position of ease.

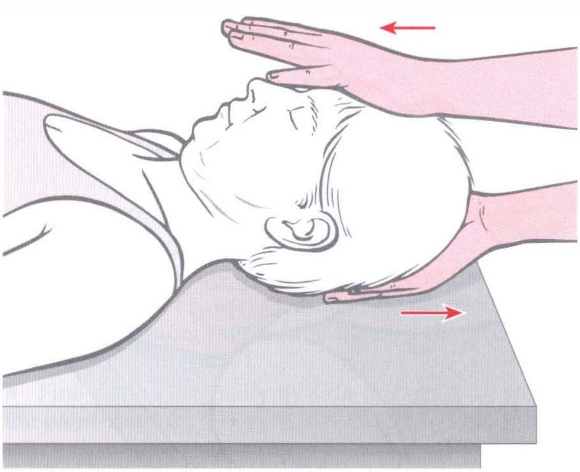

Figure 3.20 Treatment for first cervical flexion strain.

Or:

- If a tender point is located on the occiput (when cephalad and medial pressure is applied), just lateral to the insertion of semispinalis capitis, or on the superior surface of the second cervical transverse process, the dysfunctional tissues may involve rectus capitis posterior major or minor (commonly traumatized through whiplash injuries or stressed through a forward-head posture).
- The ease positions for either point involve upper cervical extension.
- The treatment position is almost identical to that suggested in the previous description (Fig. 3.21).

Other cervical extension strains

These tender points are found on or about the spinous processes (see Fig. 3.10D).

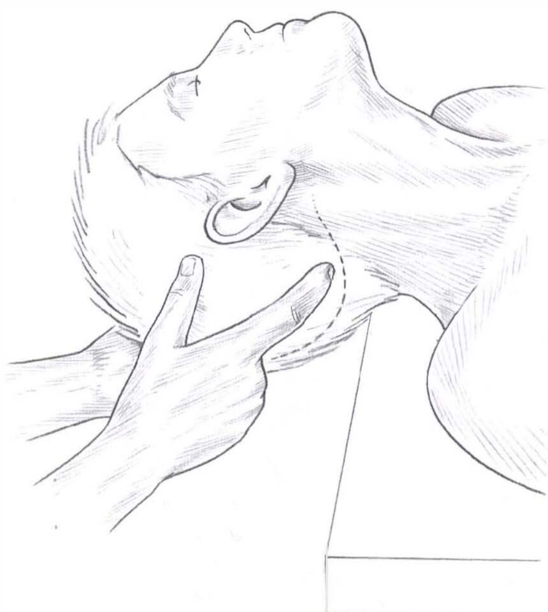

Figure 3.21 First cervical extension strain. The position of ease requires extension of the neck and (usually) rotation away from the side of pain.

Treatment should commence by introduction of increased extension.

- Extension strains in the lower cervical and upper thoracic areas are usually treated by taking the pain out of the palpated tender point, by means of extension of the head on the neck.
- In a bed-bound patient, the patient lies on the side with the painful side uppermost, so that fine-tuning can be accomplished by means of slight side-bending and rotation towards the side of the dysfunction (Fig. 3.22A). See Box 3.11 for Schwartz's (1986) suggestions regarding treating these points in a bed-bound patient.
- Exceptions to the positioning suggestions given above include those applying to C3/4 extension strains, which can usually be treated in either flexion or extension.
- C8 extension strain may also need to be treated in slight extension, with marked side-bending and rotation away from, rather than towards, the side of strain (C8 point lies on the transverse process of C7).

Extension strains of the lower cervical and upper thoracic spine

(See Figs 3.10A and 3.10E.)

The patient should be prone. Jones states:

The head is supported by the doctor's left hand holding the chin. The practitioner/therapist's left forearm is held along the right side of the patient's head for better support. The right hand monitors tender points on the right side of the spinous processes. The forces applied are mostly extension, with slight side-bending and rotation left [Fig. 3.22B].

The tender points of the posterior thorax are located interspinally, paraspinally and at the rib angles, when there exist extension dysfunctions of intervertebral joints, side-bending dysfunction, and ribs that are more comfortable when elevated.

The simplicity of Jones's methods is obvious.

- The shortened fibers relate to the areas where tender points are to be found, and the positioning is such as to increase the already existing shortening, while palpating the tender point(s).
- 90 seconds of holding the position of ease is suggested.
- The skill required lies in locating and localizing the tender point, and identifying and duplicating the nature of the original strain or injury.
- There are few exceptions to Jones's directions in this region, for extension strains.

Treating bed-bound patients

Recommendations for use of SCS methodology in hospital or home (bed-bound) situations are given in Box 3.11.

Additional functional approaches that may be useful for fragile patients, or in acute situations, are discussed in Chapter 6.

Clinical tip Be aware that it is commonly necessary to use alternative positions to achieve ease, if the directions given in this text fail to produce ease and relief from pain in the tender point.

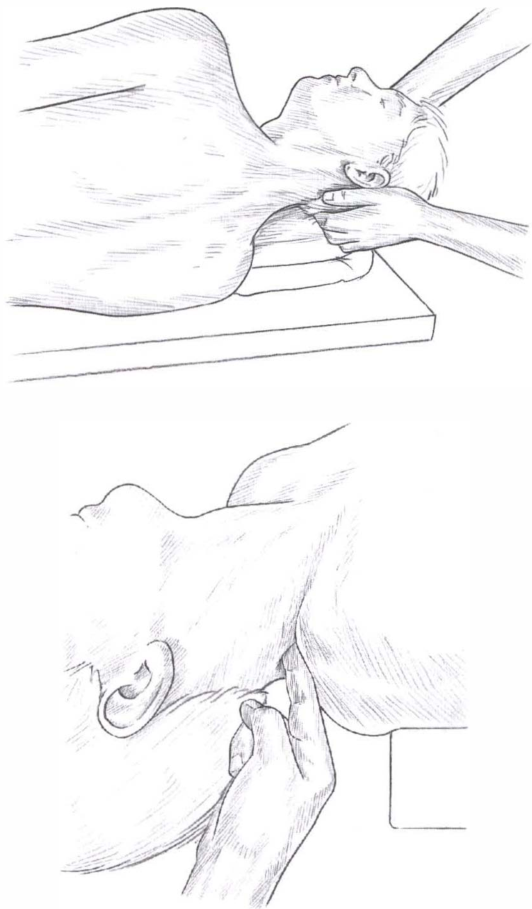

Figure 3.22A and B Extension strains of the lower cervical and upper thoracic spine usually require extension and slight side-bending, and rotation away from the painful side.

The Spencer shoulder sequence protocol

Note The Spencer sequence is extremely useful clinically as either an assessment or a treatment approach.

It should be obvious that instead of positional release methods, as described below, muscle energy techniques (MET), or other modalities can also be used to good effect.

The Spencer sequence derives from osteopathic medicine in the early years of the 20th century (Spencer 1916), and is taught at all osteopathic colleges in the USA. Over the years it has been modified to include treatment elements other than the original intent to achieve articulation and mobilization.

Research evidence (Knebl 2002)

A study involved 29 elderly patients with pre-existing shoulder problems. The patients were randomly assigned to a Spencer sequence osteopathic treatment or a control group.

The placebo group were placed in the same seven positions as those receiving the active treatment, but without MET ('corrective force') as part of the protocol.

Over 14 weeks there were a total of eight 30-minute treatment sessions during which time both groups demonstrated significantly increased ranges of motion and a decrease in perceived pain. However, following the end of the treatment period: 'Those subjects who had received OMT demonstrated continued improvement in ranges of motion, while that of the placebo group decreased.'

Choice

What has become clear is the clinical fact that the Spencer sequences, as described, can be transformed from assessment and articulation into a muscle energy approach, or into a positional release (SCS or functional) method, as the situation demands.

One key factor that would determine the choice of using articulation, or MET or SCS would be the relative acuteness of the condition, and the relative sensitivity of the patient. The more acute, and the more fragile and sensitive the individual, the more the choice would tilt towards SCS or functional positional release methodology.

Spencer sequence method

A number of the Spencer positions are described below (shoulder flexion, extension, internal rotation, circumduction – with compression and with distraction, as well as adduction and abduction).

Note There is no individual description of external rotation of the shoulder, although this movement is a part of the adduction sequence.

Method (Patriquin 1992)

- When assessing and treating the shoulder, the scapula is fixed firmly to the thoracic wall to focus on involvement of the glenohumeral joint, as a variety of movements are introduced, one at a time.
- In all Spencer assessment and treatment sequences, the patient is side-lying, with the side to be assessed uppermost, arm lying at the side with the elbow (usually) flexed.
- In all assessments the practitioner stands facing the patient, at chest level.

Assessment and PRT treatment of shoulder extension restriction

- The practitioner's cephalad hand cups the shoulder, firmly compressing the scapula and clavicle to the thorax while the patient's flexed elbow is held by the practitioner's caudad hand, as the arm is taken into passive extension towards the optimal 90° (Fig. 3.23).
- Any restriction in range of motion is noted, ceasing movement *at the first indication of resistance* or if any pain is reported resulting from the movement.
- When restriction is noted during movement towards extension of the shoulder joint, the soft tissues implicated in maintaining this dysfunction would be the shoulder flexors – anterior deltoid, coracobrachialis and the clavicular head of pectoralis major.
- Palpation of these (using drag or other evaluation methods) should reveal areas of marked tenderness.
- The most painful tender point (painful to digital pressure) elicited by palpation is used as a monitoring point.

Figure 3.23 Spencer sequence treatment of shoulder extension restriction.

- Digital pressure on the point, sufficient to allow the patient to give this a value of '10' is followed by the arm being moved into a position that reduces that pain by not less than 70% – without creating any additional pain elsewhere.
- This position of ease usually involves some degree of flexion and fine-tuning to slacken the muscle housing the tender point.
- This ease state should be held for 90 seconds, before a slow return to neutral and a subsequent re-evaluation of the range of motion.

Assessment and PRT treatment of shoulder flexion restriction

- The patient and practitioner have the same starting position as in the previous test (Fig. 3.24).
- The practitioner's non-table-side hand grasps the patient's forearm while the table-side hand holds the clavicle and scapula firmly to the chest wall.
- The practitioner slowly introduces passive shoulder flexion in the horizontal plane, as range of motion toward 180° is assessed, by which time the elbow is fully extended.
- At the very first indication of restriction (or a report of pain as a result of the movement) the movement into flexion ceases.
- When a restriction towards flexion of the shoulder joint is noted, the soft tissues implicated in maintaining this dysfunction would probably be the shoulder extensors – posterior deltoid, teres major, latissimus dorsi, and possibly infraspinatus, teres minor and long head of triceps.
- Palpation of these (drag palpation or any other appropriate method) should reveal areas of marked tenderness.
- The most painful tender point (painful to digital pressure) elicited by palpation should then be used as a monitoring point by application of digital pressure that the patient registers as having a 'value' of '10'.
- The arm is then moved into a position that reduces the tender point pain by not less than 70%.
- This position of ease will probably involve some degree of extension and fine-tuning to slacken the muscle housing the tender point.
- This ease state should be held for 90 seconds before a slow return to neutral and a subsequent re-evaluation of range of motion.

Shoulder articulation and assessment of circumduction capability with compression or distraction

- The patient is side-lying with elbow flexed while the practitioner's cephalad hand cups the shoulder firmly, compressing the scapula and clavicle to the thorax (Fig. 3.25).
- The practitioner's caudad hand grasps the elbow and takes the shoulder through a slow clockwise (and subsequently an anticlockwise) circumduction, while adding compression through the long axis of the humerus.
- Subsequently the same assessment is made with light distraction being applied.
- If restriction or pain is noted in either of the sequences involving circumduction of the shoulder

Figure 3.24 Spencer sequence treatment of shoulder flexion restriction.

Figure 3.25 Spencer sequence assessment of circumduction capability with compression.

joint (clockwise and anticlockwise, utilizing compression or distraction), evaluate which muscles would be active if precisely the opposite movement were undertaken.

- For example, if on compression and clockwise rotation, a particular part of the circumduction range involves either restriction or discomfort/pain, cease the movement and evaluate which muscles would be required to contract in order to produce an active reversal of that movement (Chaitow 1996, Jones 1981, Walther 1988).
- In these antagonist muscles, palpate for the most 'tender' point and use this as a monitoring point as the structures are taken to a position of ease which reduces the perceived pain, or increased tone, by at least 70%.
- This is held for 90 seconds before a slow return to neutral, and retesting.

Assessment and PRT treatment of shoulder abduction restriction

- The patient is side-lying as the practitioner cups the shoulder and compresses the scapula and clavicle to the thorax with his cephalad hand, while cupping the flexed elbow with his caudad hand.
- The patient's hand is supported on the practitioner's cephalad forearm/wrist to stabilize the arm (Fig. 3.26).
- The elbow is abducted towards the patient's head as range of motion (and/or discomfort relating to the movement) is assessed.

Figure 3.26 Spencer sequence assessment and treatment of shoulder abduction restriction.

- Some degree of external rotation is also involved in this abduction.
- Pain-free easy abduction should be close to 180°.
- Note any restriction in range of motion, or report of pain/discomfort on movement.
- At the position of very first indication of resistance or pain, the movement is stopped.
- If there is a restriction towards abduction of the shoulder joint, the soft tissues implicated in maintaining this dysfunction would be the shoulder adductors – pectoralis major, teres major, latissimus dorsi, and possibly the long head of triceps, coracobrachialis, short head of biceps brachii.
- Palpation of these muscles (using drag palpation or other appropriate method) should reveal areas of marked tenderness.
- The most painful tender point (painful to digital pressure) elicited by this palpation should be used as a monitoring point by applied digital pressure, sufficient to allow the patient to ascribe a value of '10' to it.
- The arm is then moved and fine-tuned into a position that reduces the tender point pain by not less than 70%.
- This position of ease will probably involve some degree of adduction and internal or external rotation, to slacken the muscle housing the tender point.
- This ease state should be held for 90 seconds, before a slow return to neutral and a subsequent re-evaluation of range of motion.

Assessment and PRT treatment of shoulder adduction (and external rotation) restriction

- The patient is side-lying and the practitioner cups the shoulder and compresses the scapula and clavicle to the thorax with his cephalad hand, while cupping the elbow with his caudad hand.
- The patient's hand is supported on the practitioner's cephalad forearm/wrist to stabilize the arm.
- The elbow is taken in an arc, anterior to the chest, so that the elbow moves both cephalad and medially as the shoulder adducts and externally rotates.
- The action is performed slowly and any signs of resistance, or discomfort, are noted.
- If there is a restriction towards adduction of the shoulder joint, the soft tissues implicated in maintaining this dysfunction would be the shoulder abductors – deltoid, supraspinatus.
- Since external rotation is also involved, other muscles implicated in restriction or pain may include internal rotators such as subscapularis, pectoralis major, latissimus dorsi and teres major.

- Palpation of these, using drag palpation or other suitable method, should reveal areas of marked tenderness.
- The most painful tender point (painful to digital pressure) elicited by palpation should be used as a monitoring point.
- Apply digital pressure sufficient to allow the patient to ascribe a value of '10' to the discomfort.
- Then slowly move the arm into a position which reduces the tender point pain by not less than 70%.
- This position of ease will probably involve some degree of abduction together with fine-tuning involving internal rotation, to slacken the muscle housing the tender point.
- This ease state should be held for 90 seconds before a slow return to neutral and a subsequent re-evaluation of range of motion.

Assessment and PRT treatment of internal rotation restriction of the shoulder

- The patient is side-lying and her arm is flexed in order to evaluate whether the dorsum of the hand can be painlessly placed against the dorsal surface of the ipsilateral lumbar area (Fig. 3.27).
- This arm position is maintained throughout the procedure.
- The practitioner cups the shoulder and compresses the scapula and clavicle to the thorax with his cephalad hand, while cupping the flexed elbow with the caudad hand.

Figure 3.27 Spencer sequence assessment and treatment of internal rotation restriction.

- The practitioner slowly brings the elbow (ventrally) anteriorly, and notes any sign of restriction or reported pain resulting from the movement, as increasing internal rotation of the shoulder joint, proceeds.
- At the position of the very first indication of resistance, or reported pain, movement is stopped.
- If there is a restriction towards internal rotation, the soft tissues implicated in maintaining this dysfunction would be the shoulder external rotators – infraspinatus and teres minor – with posterior deltoid also possibly being involved.
- Palpation of these, using drag or other suitable assessment methods, should reveal areas of marked tenderness.
- The most painful tender point (painful to digital pressure) elicited by palpation should be used as a monitoring point.
- Digital pressure to the point should be sufficient to allow the patient to ascribe a value of '10' to the discomfort.
- The arm should then be moved into a position that reduces the tender point pain by not less than 70%.
- This position of ease will probably involve some degree of external rotation to slacken the muscle housing the tender point.
- This ease state should be held for 90 seconds before a slow return to neutral and a subsequent re-evaluation of range of motion.

Note All Spencer assessments should be performed passively in a controlled, slow, manner.

Specific muscle dysfunction – SCS applications

The description of SCS treatment methods for those muscles described below should be seen as representative, rather than comprehensive.

It is assumed that once the basic principles of SCS application have been understood, and the exercise methods already described in this chapter have been practiced, the following selection of muscles should present few problems.

In all descriptions it is assumed that a finger or thumb will be monitoring the tender point.

In some instances it is suggested that the practitioner should encourage the (intelligent and cooperative) patient to apply the monitoring pressure on the tender point, if two hands are needed by the practitioner to efficiently and safely position the patient into 'ease'.

The tender points may be used to treat the named muscles if these are hypertonic, painful or are in some way contributing to a joint dysfunction.

It is worth re-emphasizing that where chronic changes have evolved in muscles (e.g. fibrosis), positional release may be able to ease hypertonicity and reduce pain, but cannot of itself modify tissues which have altered structurally.

In all instances of treatment of muscle pain using SCS, the position of ease should be held for not less than 90 seconds, after which a very slow return is made to neutral.

No 'new' or additional pain should be caused by the positioning of the tender point tissues into ease.

Upper trapezius

The tender points are located approximately centrally in the posterior or anterior fibers (Fig. 3.28).

Method

- The supine patient's head is side-flexed towards the treated side while the practitioner uses the positioning of the ipsilateral arm to reduce reported tender point pain by at least 70%.
- The position of ease usually involves shoulder flexion, abduction and external rotation (Fig. 3.29).

Subclavius

The tender point lies inferior to central portion of clavicle, on its undersurface (Fig. 3.30A).

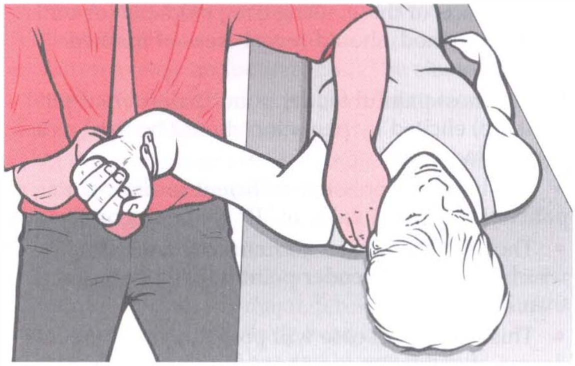

Figure 3.29 Treatment of trapezius tender point.

See the fiber direction of the muscle, and the structural layout, in Figure 3.30B. This should offer an awareness of the way 'crowding' of the tissues, to ease tenderness in the palpated point, requires that the clavicle be taken inferiorly and medially. Consider also tensegrity factors, as described in Box 3.1.

Method

- The patient is side-lying, with ipsilateral shoulder in slight extension, forearm behind patient's back.
- The practitioner applies slight compression to the ipsilateral shoulder in an inferomedial direction, with fine-tuning possibly involving protraction until

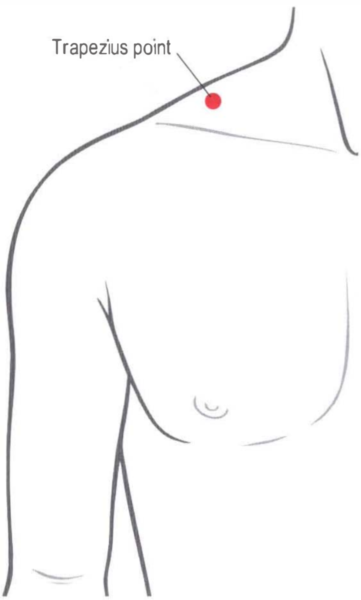

Figure 3.28 Trapezius tender point.

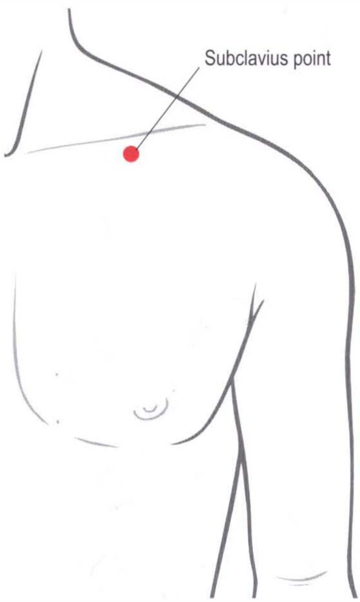

Figure 3.30A Subclavius tender point.

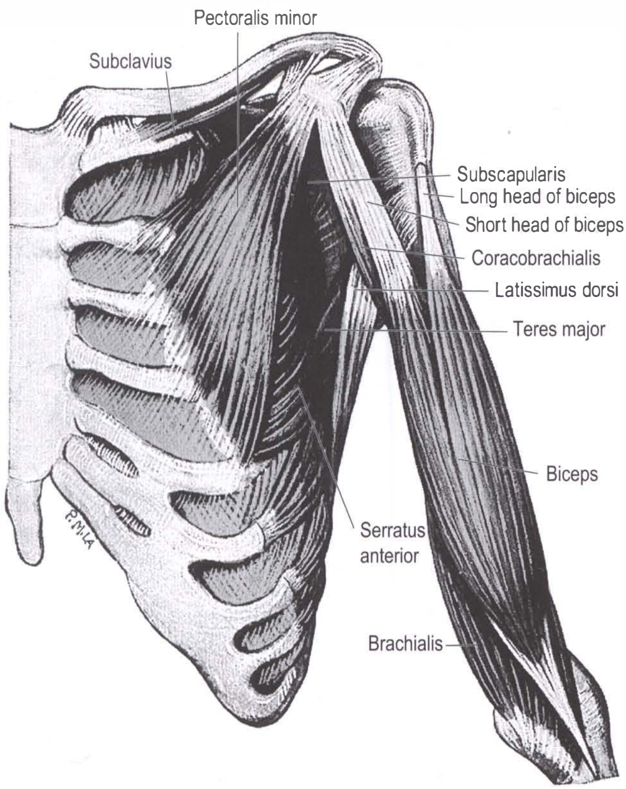

Figure 3.30B Deep muscles of the front of the chest and left arm. (From *Gray's Anatomy*, 39th edn.)

reported sensitivity in the palpated point drops by at least 70% (Fig. 3.31).

Subscapularis

The tender point lies close to the lateral border of the scapula, on its anterior surface (Fig. 3.32).

Method

- The patient lies close to the edge of the table with the arm held slightly (≈30°) in abduction, extension and internal rotation at the shoulder (Fig. 3.33).
- Slight traction on the arm may be used for fine-tuning, if this significantly reduces reported sensitivity.

Pectoralis major

The tender point lies on the muscle's lateral border close to the anterior axillary line (Fig. 3.34).

Method

- The patient lies supine as the ipsilateral arm is flexed and adducted at the shoulder, taking the arm across the chest (Fig. 3.35).

Figure 3.31 Treatment of subclavius tender point.

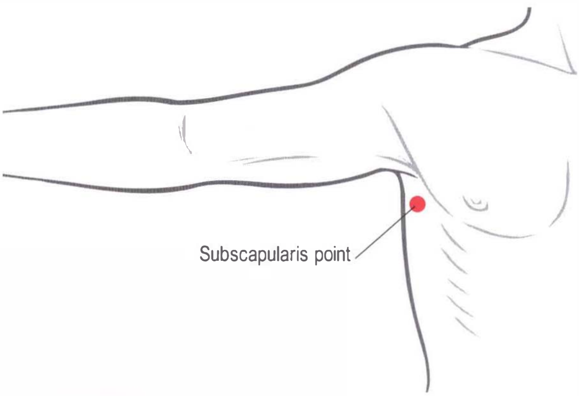

Figure 3.32 Subscapularis tender point.

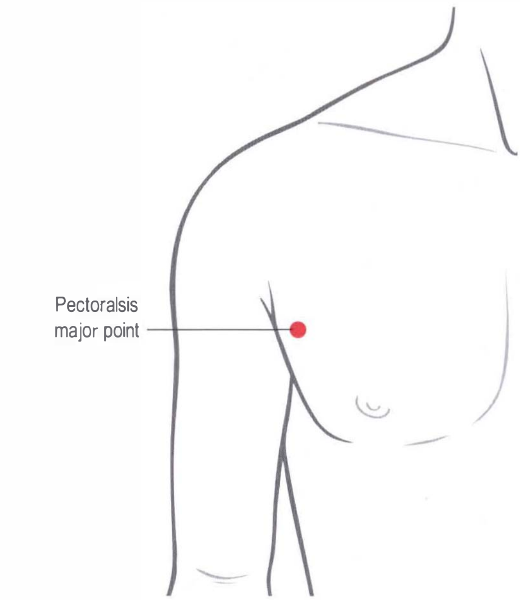

Figure 3.34 Pectoralis major tender point.

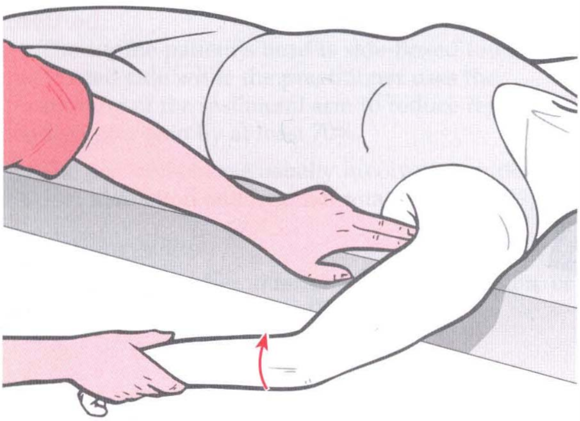

Figure 3.33 Treatment of subscapularis tender point.

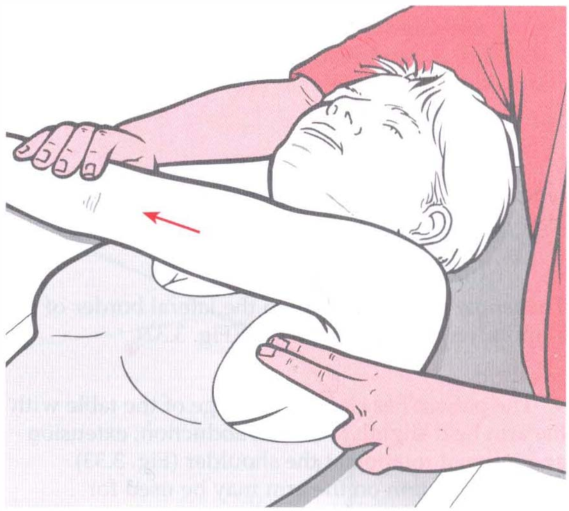

Figure 3.35 Treatment of pectoralis major tender point.

- Fine-tuning involves varying the degree of flexion and adduction, which can at times usefully be amplified by applied traction to the arm (but only if this reduces the reported sensitivity in the tender point).

Pectoralis minor

The tender point is just inferior and slightly medial to the coracoid process (and also on the anterior surfaces of ribs 2, 3 and 4 close to the mid-clavicular line) (Fig. 3.36).

Method

- The patient is seated and the practitioner stands behind. The patient's arm is taken into extension and internal rotation, bringing the flexed forearm behind the back (Fig. 3.37).
- The hand which is palpating the tender point is used to introduce protraction to the shoulder while at the same time compressing it anteromedially to fine-tune the area and reduce reported sensitivity by at least 70%.

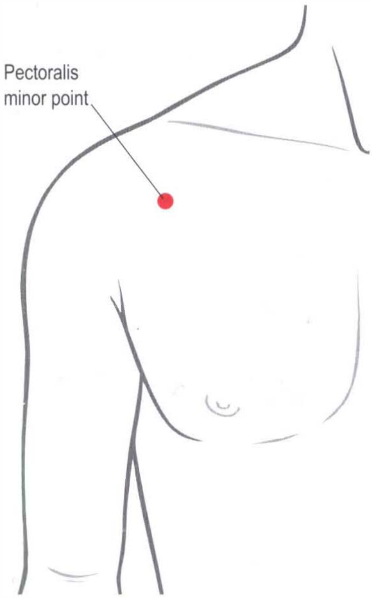

Figure 3.36 Pectoralis minor tender point.

Figure 3.37 Treatment of pectoralis minor tender point.

Rib dysfunction

Assessment of elevated first rib

Among the commonest rib dysfunctions is that of an elevated first rib (see Fig. 3.10B). Assessment of this is as follows:

- The patient is seated and the practitioner stands behind (Fig. 3.38).

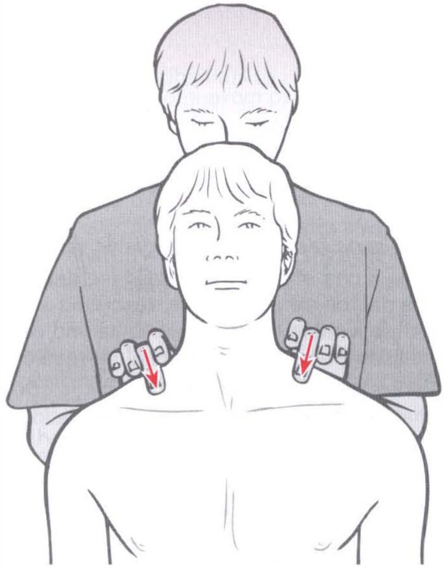

Figure 3.38 Position for assessment of elevated first rib.

- The practitioner places his hands so that the fingers can draw the upper trapezius fibers lying superior to the first rib, posteriorly.
- The tips of the practitioner's middle and index, or middle and ring fingers, should be eased caudally until they rest on the superior surface of the posterior shaft of the first rib.
- Symmetry should be evaluated as the patient breathes normally.
- The commonest dysfunction relates to one of the pair of first ribs becoming 'locked' in an elevated position (i.e. it is locked in inhalation phase, unable to fully exhale).
- The superior aspect of this rib will palpate as tender and attached scalene structures are likely to be short and tight (Greenman 1996). (The various ways in which rib dysfunctions are described are summarized in Box 3.10.)

Or:

- The patient is seated and the practitioner stands behind.
- The practitioner places his hands so that the fingers can draw the upper trapezius fibers lying superior to the first rib, posteriorly.
- The tips of the practitioner's middle and index, or middle and ring fingers, should be eased caudally until they rest on the superior surface of the posterior shaft of the first rib.

Box 3.10 The semantics of rib dysfunction descriptions

A rib that is unable to move into full exhalation can be described as being:

- *locked in its inhalation phase*
- *elevated* – unable to move to its exhalation position
- an *inhalation restriction* (osteopathic terminology).

Therefore, if one of a pair of ribs fails to descend as far as its pair on exhalation, it is described as an elevated rib, unable to move fully to its end of range on exhalation ('inhalation restriction' or 'restricted in inhalation').

A rib that is unable to move into full exhalation can be described as being:

- *locked in its exhalation phase*
- *depressed* – unable to move to its inhalation position
- an *exhalation restriction* (osteopathic terminology).

Therefore, if one of a pair of ribs fails to rise as far as its pair on inhalation, it is described as a depressed rib, unable to move fully to its end of range on inhalation ('exhalation restriction' or 'restricted in exhalation').

To avoid confusion the two shorthand terms *elevated* and *depressed* are most commonly used to describe these two possibilities.

- The patient exhales fully, and shrugs his shoulders and as he does so the palpated first ribs should behave symmetrically.
- If they move asymmetrically (one moves superiorly more than the other), this suggests either that the side that moves most cephalad is elevated, or that the side that does not rise as far as the other is locked in a depressed (exhalation phase) position.
- The commonest restriction of the first rib is into elevation and the likeliest soft-tissue involvement is of shortness of the anterior and medial scalenes (Goodridge & Kuchera 1997).

Notes on rib dysfunction

- Unless direct trauma has been involved in the etiology of dysfunctional rib restriction patterns, it is very unusual for a single rib to be either elevated or depressed.
- Most commonly groups of ribs are involved in any dysfunctional situation of this sort.
- As a general rule, based on clinical experience, the most superior of a group of depressed ribs, or the most inferior of a group of elevated ribs, is treated first.
- If this 'key rib' responds to treatment (using positional release or any other form of mobilization), the remainder of the group commonly release spontaneously.
- Positional release methods, as described in this chapter, are remarkably effective in normalizing rib restrictions, often within a matter of minutes.
- As with almost all musculoskeletal problems, whether such normalization is retained depends largely on whether the cause(s) of the dysfunction is ongoing (breathing pattern disorders, asthma, repetitively imposed stress – as examples) or not.

Treatment of elevated first rib

- The patient is seated and the practitioner stands behind with his contralateral foot on the table, patient's arm draped over practitioner's knee (Fig. 3.39).
- The practitioner's ipsilateral hand palpates the tender point on the superior surface of the first rib.
- Digital pressure to the point should be sufficient to allow the patient to ascribe a value of '10' to the discomfort.

Figure 3.39 Position for treatment of elevated first rib.

- Using body positioning, the practitioner induces a side-shift (translation) of the patient *away* from the treated side.
- At the same time, using his contralateral hand, the practitioner eases the patient's head into slight extension, side-flexion away from, and rotation towards, the tender point, in order to fine-tune until tenderness in the palpated point reduces by at least 70%.
- This is held for not less than 90 seconds.

Assessment and treatment of elevated and depressed ribs (2 to 12)

Identification of rib dysfunction is not difficult.

Restrictions in the ability of a given rib to move fully (as compared with its pair) during inhalation indicates a *depressed* status, while an inability to move fully (as compared with its pair) into exhalation indicates an *elevated* status as discussed in Box 3.10 (Fig. 3.40).

Assessment of rib status – ribs 2 to 10

- The patient is supine, and the practitioner stands at waist level facing the patient's head, with a single finger contact on superior aspect of one pair of ribs.
- The practitioner's dominant eye determines the side of the table from which he is approaching the observation of rib function – right eye dominant calls for standing on the patient's right side.
- The fingers are observed as the patient inhales and exhales fully (eye focus is on an area between the palpating fingers so that peripheral vision assesses symmetry of movement).
- If one of a pair of ribs fails to rise as far as its pair on inhalation it is described as a depressed rib, unable to move fully to its end of range on inhalation ('exhalation restriction'). See Box 3.10.
- If one of a pair of ribs fails to fall as far as its pair on exhalation it is described as an elevated rib, unable to move fully to its end of range on exhalation ('inhalation restriction'). See Box 3.10.

Assessment of rib status – ribs 11 and 12

- Assessment of the eleventh and twelfth ribs is usually performed with the patient prone, with a hand contact on the posterior shafts in order to evaluate the range of inhalation and exhalation motions (Fig. 3.41).
- The eleventh and twelfth ribs usually operate as a pair, so that if any sense of reduction in posterior motion is noted on one side or the other, *on inhalation*, the pair are regarded as depressed, unable to fully inhale ('exhalation restriction'). See Box 3.10.
- If any sense of reduction in anterior motion is noted on one side or the other, *on exhalation*, the pair are regarded as elevated, unable to fully exhale ('inhalation restriction'). See Box 3.10.
- Depressed rib strains produce points of tenderness on the anterior thorax, commonly close to the

Figure 3.40 Position for assessment of rib status – ribs 2 to 10.

Figure 3.41 Position for assessment of rib status – ribs 11 and 12.

anterior axillary line while elevated ribs produce points of tenderness posteriorly, in the intercostal spaces close to the angles of the ribs.

Treatment of elevated ribs 2 to 10 (See Figs 3.10B and 3.10F.)

- Elevated ribs produce tender points on the posterior thorax, commonly in the intercostal space above or below the affected rib, at the angle of the ribs posteriorly (see Fig. 3.10B).
- In order to gain access to these for palpation or treatment purposes, the scapula requires distraction or lifting.
- This is done by the arm of the affected side of the supine patient being pulled across the chest, or the shoulder being raised by a pillow (Fig. 3.42A).
- The practitioner/therapist stands on the side of the disorder, and palpation of the tender point, once identified, is continuous, as positional change is engineered.
- The patient's knees should be in a flexed position during treatment of elevated ribs, and should be allowed to move toward the side of the dysfunction.
- If this fails to achieve ease (perceived either as palpated change or a reduction in sensitivity of the palpated tender point), the knees are moved towards the opposite side, in order to evaluate the effect on palpated pain, and tissue tone.
- As a rule, reported pain from the tender point will reduce by around 50% as the knees fall to one side or the other.
- The head may then be turned towards, or away, from the affected side to further fine-tune and release the stress in the palpated tissues.
- Additional fine-tuning for elevated ribs may be accomplished by raising the arm or shoulder cephalad, in effect exaggerating the positional deformity.
- The influence of respiratory function should also be used to evaluate which stage of the breathing cycle reduces discomfort (in the tender point) most.
- If identified the patient is asked to maintain that phase for as long as is comfortable.

Figure 3.42A Positional release of an elevated rib while monitoring a tender point on the posterior surface close to the angle of the ribs in an interspace above or below the affected rib. The ease position may involve the flexed knees being allowed to fall to one side or the other, with fine-tuning involving positioning of the head, neck and/or the arms. Assessment of the influence of respiratory function on the tender point pain is also used.

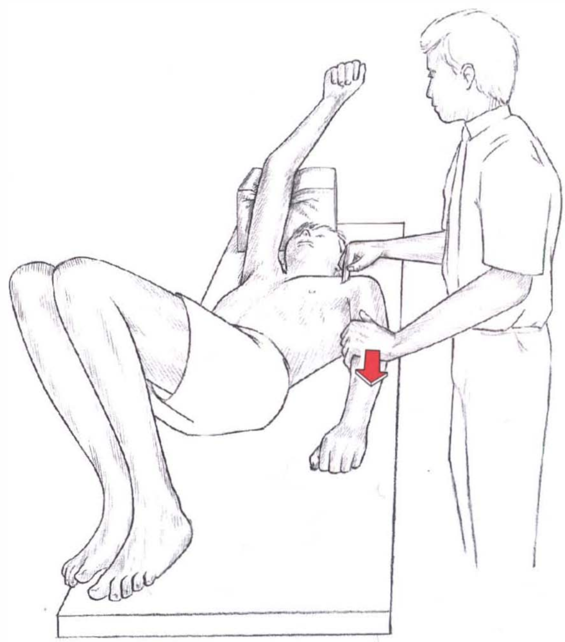

Figure 3.42B Positional release of a depressed rib involves the monitoring of a tender point on the anterior axillary line, in an interspace above or below the affected rib. Ease is achieved by positioning of flexed legs, head and/or arms, as well as use of the respiratory cycle, until a position is found in which the palpated pain eases by at least 70%, or vanishes from the tender point.

Treatment of depressed ribs 2 to 10

- The tender points for a depressed rib are located in the intercostal spaces above or below the affected rib, on the anterior axillary line (see Figs 3.10A and 3 10H).
- For treatment of depressed ribs, the patient may be supine or in a partially seated, recumbent position.
- If supine, the knees are flexed and falling to one side or the other, whichever produces better release in the tissues being palpated at the anterior axillary line.
- Depending on the response of the tissues and the reported levels of discomfort in the tender point, the head may be turned towards, or away from, the affected side to further fine-tune and release the stress in the palpated tissues.
- For additional fine-tuning, the practitioner/therapist stands on the side of dysfunction and draws the patient's arm, on the side of dysfunction, caudad until release is noted.
- In some cases the other arm may need to be elevated, and even have traction applied, to enhance release of tender point discomfort (Fig. 3.42B).
- Once the tender point being monitored reduces in intensity by 70% or more, this is held for not less than 90 seconds.

Alternatively:

- The patient may be seated (Fig. 3.43) and resting against the support offered by the practitioner's flexed leg (foot on table) and trunk.
- The practitioner palpates the tender point with one hand and uses the other to support the head, guiding it into rotation for fine-tuning, as a combination of flexion and side-flexion/rotation is encouraged by modification of the position of the supporting leg.
- Once the tender point being monitored reduces in intensity by 70% or more, this is held for not less than 90 seconds.
- A notable improvement in respiratory function is commonly noted after this simple treatment method, with an obvious increase in the excursion of the thoracic cage and subjective feelings of 'ease of breathing' being reported.

Interspace dysfunction

(See Figs 3.10G and 3.10H.)

- Tender points for strains of the interspace tissues lie between the insertions of the contiguous ribs into the cartilages, close to the sternum.

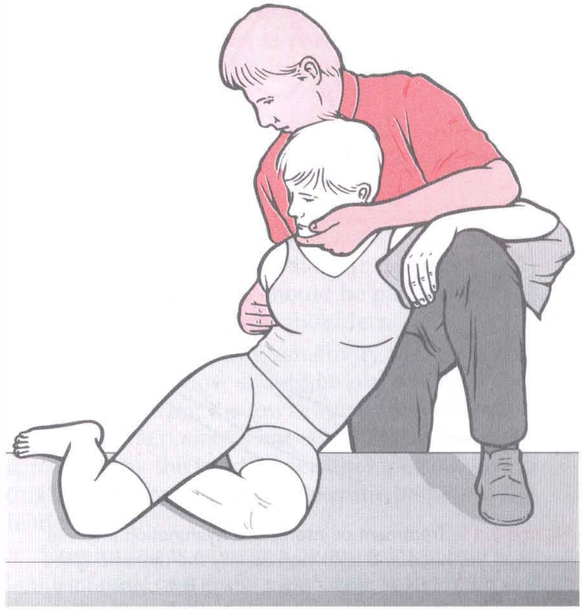

Figure 3.43 Alternative position for treatment of depressed ribs (see text).

- Ribs may be noted to be over-approximated, and the pain reported when the tender points are palpated may be very strong.
- The more recent the strain (frequently a sequel of excessive coughing), the more painful the points.
- Edema and induration may be palpable.
- In chronic conditions, pressure on these soft tissues produces a reactivation of the extreme tenderness noted in more recent strains.
- These strains are found in costochondritis, the persistent pain noted in cardiac patients.
- Tenderness in these points may well relate to respiratory dysfunction, and their release assists (together with breathing pattern rehabilitation) in normalization.
- These areas of tenderness are common in people with asthma and following bronchitis, as well as the all-too-common pattern of upper chest breathing relating to patent or incipient hyperventilation, which produces major stress of the intercostal structures and the likelihood of such tender points being located on palpation (Perri & Halford 2004, Sachse 1995).

Treatment of interspace dysfunction and discomfort

- Treatment involves placing the patient supine while the tender point is contacted by the practitioner/therapist, *or the patient* (Fig. 3.44).

Figure 3.44 Treatment of interspace dysfunction involves flexion of the head and neck and usually the thoracic spine towards the palpated tender point, which lies close to the sternum. A seated position (not illustrated) offers an alternative for achieving this positioning.

- The practitioner/therapist should be on the side of dysfunction with his caudad hand providing contact on the point, unless the patient is performing this function.
- The cephalad hand cradles the patient's head/neck and flexes this, and eases it towards the side of dysfunction, at an angle of approximately 45° towards the foot of the bed.
- If fine-tuning is efficient, the pain on palpation will ease rapidly, and the position of ease should then be maintained for 90 seconds.

Alternatively:

- This same procedure for release of interspace dysfunction tender points can be achieved in a seated position, and can be taught as a home treatment to the patient.
- The point is located and the patient – on her own, or with assistance – is flexed gently towards the side of pain until it vanishes.
- This position is held for 90 seconds, after which another point can be located and treated.

It is hard to envisage a simpler protocol.

Additional rib techniques are described in Chapter 4, especially where thoracic function has been disturbed by surgical procedures.

A note on induration technique

Chapter 1 contains a description of Morrison's 'induration' technique, a superb method using SCS concepts for treatment of the spine, particularly in the care of fragile, sensitive individuals. See Figure 1.1.

That method can usefully accompany the various SCS treatment applications for spinal dysfunction described in this chapter.

Flexion strains of the thoracic spine

- According to Jones et al (1995), the tender point for a flexion strain of the first thoracic segment is located on the superior surface of the manubrium, on the midline (see Fig. 3.10G).
- Tender points for flexion strains of the second to the sixth thoracic segments lie on the sternum approximately $\frac{1}{2}$ to $\frac{3}{4}$ of an inch (1 to 2 cm) apart (see Fig. 3.10G).
- Anterior T7 point lies close to the midline, bilaterally under the xiphoid. Other anterior T7 tender points are found on the costal margin close to the xiphoid.
- T8 to T11 anterior (flexion strain) dysfunction produces tender points which lie in the abdominal wall, approximately 1 inch (2.5cm) lateral to the midline (see Fig. 3.10A).
- A horizontal line $\frac{1}{2}$ inch (1cm) below the umbilicus locates the 10th thoracic anterior (flexion) strain tender point.
- 1 and 3 inches (2.5 to 7.5cm) above T10 lie the points for T9 and T8 respectively.
- $1\frac{1}{2}$ inches (3cm) below the T10 point is T11.
- The T12 point lies on the crest of the ilium at the mid-axillary line (see Fig. 3.10A).

Note In a rotation strain of the mid-thoracic region, it is possible for extension and flexion strains to coexist, say flexion (anterior) strain on the left and extension (posterior) strain on the right.

Treatment for anterior thoracic flexion strains

Upper thoracic flexion strains, semi-seated or supine:

- Treatment of upper thoracic flexion strains (T1 to T6) may be carried out with the patient semi-seated or supine on the treatment table.
- The patient should be supported by cushions to enhance upper thoracic flexion, while the tender point is monitored by one hand, and the practitioner's other hand assists in fine-tuning to the position of ease (Fig. 3.45A).

Alternatively:

- If treated without cushions for support, the supine patient's head is flexed towards the chest while

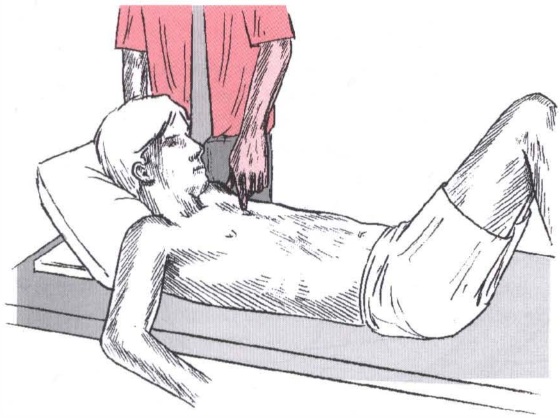

Figure 3.45A Treatment of upper thoracic spinal flexion strain. Fine-tuning may involve positioning of the head-neck in rotation and or side-flexion in addition to flexion.

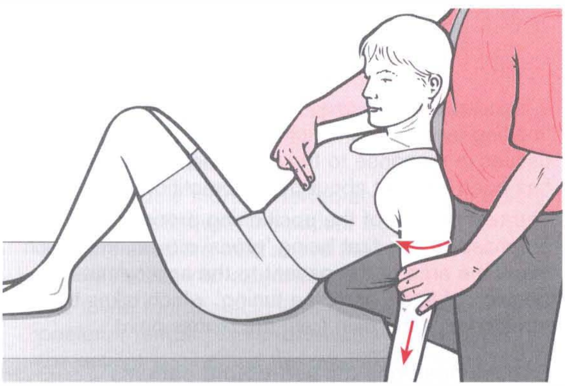

Figure 3.45B Semi-seated position for assessment and treatment of T2 to T6 flexion strain.

the tender point is contacted as a monitor of ease. (This is a very similar position to that used to treat interspace dysfunction – Fig. 3.44.)

- Fine-tuning is usually by slight rotation of the chin towards or away from the side of dysfunction. The head may be supported in flexion by the practitioner/therapist's thigh for the necessary 90 seconds of release time.

Semi-seated:

- Jones's method for dealing with flexion strain of the upper thoracic spine, in non-bed-bound patients, had the patient seated on a treatment table, leaning back onto the practitioner/therapist's chest/abdomen, so that forced flexion of the upper body can easily be achieved as shown in Figure 3.45B.
- A variety of changes in the position of the patient's arms may then be used as part of the fine-tuning process in order to introduce 'ease' into different thoracic segments.
- The practitioner palpates the tender point with one hand and utilizes the other to add fine-tuning variations.

Lower thoracic flexion strains:

- For treatment of lower thoracic flexion strains (Fig. 3.46A, B), a pillow should be placed under the supine patient's neck and shoulders.
- If helpful in reducing sensitivity in the tender point, another pillow should be placed under the buttocks, allowing the lower spine to move into flexion, or the patient's knees should be flexed and supported by the practitioner/therapist's (hand or thigh), standing at waist level while palpating the tender point.
- Fine-tuning is achieved by movement into side-bending and/or rotation, one way or the other, using the patient's legs as a lever (for treatment of T8).
- T9 to T12 flexion strains involve the same position – patient's head and buttocks on a pillow, or the patient's flexed knees supported by the practitioner/therapist, while the practitioner's caudad hand palpates abdominal tender point.
- Fine-tuning is by means of a movement that introduces slight side-bending, or which slightly alters the degree of flexion (Figs 3.46A and B).
- The tender point should be constantly monitored and tenderness should reduce by at least 70%.
- T12 treatment requires more side-bending than other thoracic strains.
- Once a position has been found where tenderness reduces by 70% or more, this is maintained for 90 seconds

See Box 3.11 for Schwartz's (1986) suggestions regarding treating these points in a bed-bound patient.

Jones describes the treatment of lower thoracic flexion strains as follows:

This one procedure is usually effective for any of this group. To permit the supine patient to flex at the thoracolumbar region, a table capable of being raised at one end is desirable [Fig. 3.46]. A flat table may be used if a large pillow is placed under the patient's hips, raising them enough to permit flexion to reach the desired level of the spine. With the patient supine, the physician raises the patient's knees and places his own thigh below those of the patient [as in Fig. 3.48]. By applying cephalad pressure on the patient's thighs, he produces marked flexion of the patient's thoracolumbar

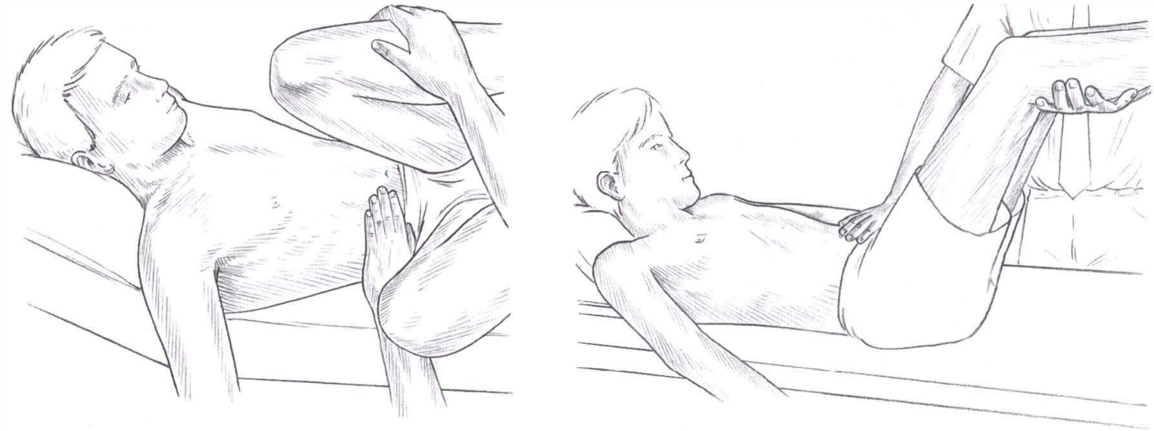

Figure 3.46A and B Lower thoracic flexion strains involve positioning the supine patient into flexion while the tender point on the abdominal wall is palpated.

Box 3.11 SCS and the bed-bound patient

The use of SCS in hospital settings is described in Chapter 4.

Schwartz's description of the tender point

Schwartz (1986) described the tender points used as monitors in SCS application as being:

Pea-sized bundles or swellings of fascia, muscle tendrils, connective tissue and nerve fibers as well as some vascular elements.

Interestingly, unlike many other authors, he notes that:

Generally, but not always, pressure on the tender point will cause pain at a site distant to the point itself.

This description of course defines such a point as a trigger point, as well as a tender point (see Chapter 5).

He acknowledges that: '"Tender points" resemble both Chapman's neurolymphatic reflexes and Travell's myofascial trigger points' (Owens 1982, Travell & Simons 1983).

Schwartz highlights the difference between SCS and other methods that use such points in treatment by saying:

Other methods invade the point itself, for example by needle in acupuncture, injection of lidocaine into the point, or the use of pressure or ultrasound to destroy the tender point.

He suggests that when using SCS, if a position of ease is achieved and tenderness vanishes from the palpated point, one of a number of sensations may become apparent to the practitioner/therapist, a 'sudden release', or a 'wobble', or a 'give', or a 'melting away', all of which indicate a change in the tissues in response to the positional change which has been brought about by the practitioner/therapist.

The two phases of the positioning process are emphasized, the first being 'gross' movement, which takes the area or the patient to the approximate position of ease, and 'fine-tuning', which takes the remainder of the pain from the tender point.

Special positions for bed-bound patients

Many spinal structure tender points have already been described in detail in this chapter, therefore in the summary (below) of Schwartz's suggestions for bed-bound patients, only the particular modifications necessary in such a setting are emphasized.

Anterior cervical

- The anterior cervical points located around the tips of the transverse processes are easily accessible in a bed-bound patient, as are the positions of ease (Fig. 3.18A), which almost all require a degree of flexion and side-bending rotation, usually away from the side of pain.

Note The author suggests that rotation *toward* the pain is commonly more useful, and urges readers to experiment with what offers best results.

Posterior cervical

- The posterior cervical points lie on or around the tips of the spinous processes and require extension of the head on the neck, and/or the neck as a

Box 3.11 Continued

whole (Fig. 3.22A), which is more easily achieved in bed-bound patients if they are side-lying, with – it is suggested – the painful side uppermost, since (according to Schwartz's guidelines) the main side-bending and rotation into 'ease' needs to be towards the pain side, which would be difficult were the patient lying on that side.

- The C3 posterior point may require extension or flexion to create ease and both directions should be gently attempted until the greatest reduction in sensitivity is achieved.

Posterior thoracic and lumbar spinal

- Posterior thoracic and lumbar spinal tender points lie close to the spinous processes in the upper thoracic area, and become increasingly lateral, lying on or around the transverse processes in the lower thoracic and lumbar vertebrae.
- The upper four thoracic segments are best treated with the patient side-lying with the arms resting, if possible, at the level of the shoulders (Fig. 3.47B) and with the upper arm supported by a pillow in order to avoid the introduction of rotation.
- The patient should bend backwards to the level of the tender point in order to remove the palpated tender point pain.
- For the middle thoracic vertebrae, posterior points are also treated with the patient side-lying, but this time the arms are held above the head as the patient moves into extension.
- The lower four thoracic vertebrae are treated for posterior tender points (extension strains) with the patient supine and the practitioner/therapist standing on the dysfunctional side, with one hand under the patient to palpate the point.
- The patient's hand on the side opposite the pain is held, and the arm drawn across the chest towards the practitioner, so that the shoulder on that side lifts 30–45° from the bed, at which time fine-tuning should remove residual pain.
- If the patient's condition means that turning onto the side is not possible, then the method suggested for the lower thoracic vertebrae can be substituted for the side-lying posture outlined above.

Posterior lumbar tender points

- Posterior lumbar tender points which are described and illustrated in this chapter, and which are usually treated with the patient prone, can also be efficiently dealt with in the side-lying position.
- L1, L2, L3 and L4 involve the side-lying patient, dysfunction side uppermost.
- L1 and L2 (Fig. 3.49B) require the upper leg being taken into straight extension and then either abduction or adduction, and/or rotation (of the leg) one way or the other, whichever combination provides the greater ease.
- In treatment of L3 and L4, as well as upper-pole L5 (lying between the fifth lumbar spinous process and the first sacral spinous process – see Fig. 3.10B) and the lower-pole L5 point (located midway on the body of the sacrum – see Fig. 3.10B), abduction and extension of the leg is introduced, and fine-tuning is achieved by variations in the degree of extension, as well as by the introduction of rotation internally or externally of the foot.
- For treatment of what is known as the middle-pole L5 tender point (in the superior sulcus of the sacrum), the side-lying patient's upper leg (dysfunction side) is flexed at hip and knee and this rests on the practitioner/therapist's thigh.
- This is fine-tuned by movement of the leg into greater or lesser degrees of hip flexion (Fig. 3.49C) and by the degree of abduction or abduction needed to produce ease.
- The patient's ipsilateral arm may then be used in fine-tuning by having it hang forward and down over the edge of the bed.

Anterior thoracic strains

Anterior thoracic tender points lie on the anterior or surface of the thorax, the first six on the midline and the lower ones slightly lateral to it, bilaterally at approximately 1–2 cm (half to 1 inch) intervals, so that from T8 onwards the tender points lie in the abdominal musculature.

- These points relate directly to respiratory dysfunction and respond dramatically quickly to SCS methodology.
- The improvement in breathing function is commonly immediately apparent to the patient.
- In bed-bound patients, the patient is supine and there is usually a need for pillows or bolsters to assist in supporting them as flexion is introduced (Fig 3.45A).
- For the first six anterior thoracic tender points (lying on the sternum) the patient's arms are allowed to rest slightly away from the body, and the knees and hips are flexed, feet resting on the bed. The only movement usually needed to ease tenderness is flexion of the head and neck towards the chest (the lower the point the greater the degree of flexion).
- Fine-tuning involves movement of the head slightly towards or away from the palpated pain site.

Box 3.11 Continued

- For tender point treatment from T7 onwards, the patient's buttocks are rested on a pillow so that the segment involved is unsupported, allowing it to fall into flexion.
- Alternatively, the practitioner/therapist can support the flexed knees and bring them towards the head, so flexing the lumbar and thoracic spine (Fig. 3.46B).
- Fine-tuning may involve crossing the patient's ankles or side-bending to or away from the side of palpated tenderness, whichever combination reduces sensitivity more.

Anterior lumbar
Anterior lumbar (see Fig. 3.10A) tender points require a similar positioning to that called for by the thoracic points.

Rib dysfunction and interspace dysfunction
The appropriate treatment for rib dysfunction and interspace dysfunction are described in this chapter and can be applied to bed-bound patients without any modification.

Schwartz (1986) reports that:

Interspace dysfunctions are implicated in costochondritis, the persistent chest pain of the patient who has suffered acute myocardial infarction, 'atypical' angina and anterior chest wall syndrome. They are strongly implicated along with depressed and elevated ribs in restricted motion of ribs … and thus contribute to the etiology and morbidity of many respiratory illnesses.

spine. Usually, the best results come from rotation of the knees moderately towards the side of tenderness. These joint dysfunctions account for many low-back pains that are not associated with tenderness of the vertebrae posteriorly. The pain is referred from the anterior dysfunction, into the low lumbar, sacral and gluteal areas. Treatment directed to the posterior pain sites of these dysfunctions, rather than to the origins of the pain, has been disappointing. (Jones et al 1995)

To summarize:

- Treatment for flexion strains involving the ninth thoracic to first lumbar level is usually achieved by placing the patient supine in flexion, using a cushion for the upper back and flexing the knees and hips, which are usually rotated towards the side of dysfunction (see Figs 3.46A,B and 3.48).
- Tender points will be found close to the abdominal midline, or slightly to one side (see Fig. 3.10A), and should be palpated during this maneuver.
- The practitioner/therapist's cephalad hand palpates the tender point while the patient's position is modified until tenderness in the point reduces by 70% or more.
- This position is held for 90 seconds, after which a slow return is made to a neutral position.
- The position of ease usually involves marked flexion through the joint, as well as appropriate side-bending and rotation, resulting in reduction of sensitivity in the tender points on the anterior body surface.

Extension strains of the thoracic spine

- These strains are treated in a similar manner to that used for extension strains of the cervical spine.
- Tender points are usually found on, or close to, the spinous processes, bilaterally, or in the lateral paravertebral muscle mass.
- It is usual to find that the lower the strain, the closer is the tender point to the transverse process (see Fig. 3.10F).
- Direct extension (backwards-bending) is the usual method used for SCS treatment of this region, with the patient side-lying, seated, supine or prone.

Prone:

- Figure 3.47A illustrates SCS treatment of an extension strain in the upper thoracic region, with the patient prone.

Side-lying:

- If the patient is side-lying the patient's arms should be placed resting on a pillow to avoid rotation of the spine (Fig. 3.47B).
- See Box 3.11 for Schwartz's (1986) suggestions regarding treating these points in relation to a bed-bound patient.
- For the T5 to T8 thoracic spine levels the arms are usually placed slightly above head level, to increase extension.

Seated:

- Any thoracic spine extension strains may be treated with the patient seated, either on the treatment table or on a stool, with the therapist standing to one side (Fig. 3.47C).

- Ideally, the patient's feet should be on the floor for stability.
- One of the practitioner's hands palpates the tender point located in relation to a particular segmental strain area, while the other hand fine-tunes the patient into a position where 'ease' is achieved, and tenderness in the point drops by at least 70%.
- After 90 seconds a slow return to a neutral position should be made.

Flexion strains of the lumbar spine

- Gross positioning is virtually the same as for thoracic flexion strains, with tender points on the anterior surface (abdomen mainly) and the ease position involving taking the patient into flexion. (See Fig. 3.10A for the positions of these points.)
- L1 has two tender points: one is at the tip of the anterior superior iliac spine and the other on the medial surface of the ilium just medial to the anterior superior iliac spine (ASIS).
- The tender point for second lumbar anterior strain is found lateral to the anterior inferior iliac spine (AIIS).
- The tender point for L3 is not easy to find but lies on the lateral surface of the AIIS, pressing medially.
- L4 tender point is found at the insertion of the inguinal ligament on the ilium.

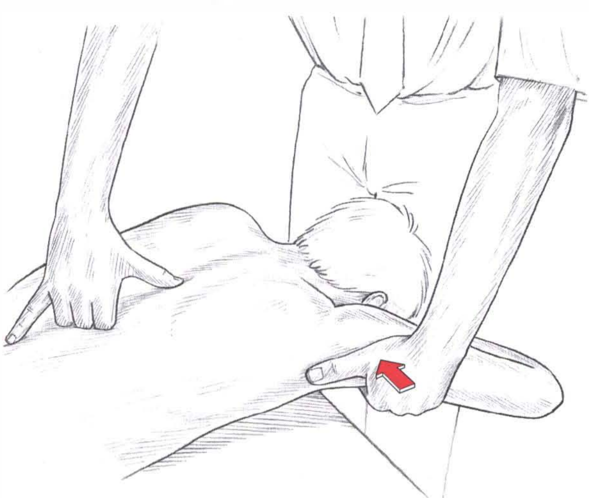

Figure 3.47A Position of ease for tender points relating to extension strains of the upper thoracic region of the spine when treating prone patient.

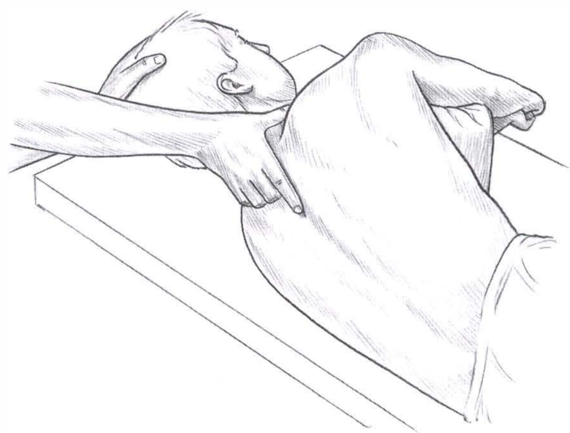

Figure 3.47B Side-lying position for treatment of thoracic extension strains.

Figure 3.47C Seated patient with practitioner to one side.

- L5 points are on the body of the pubes, just to the side of the symphysis.

SCS method

- Treatment for all of these points is similar to that used for thoracic flexion strains except that the patient's knees are placed together (Fig. 3.48).

- In bilateral strains both sides should be treated.
- L3 and L4 usually require greater side-bending in the fine-tuning process.

Extension strains of the lumbar spine

See also various treatment options for this region, described in Chapter 7 on facilitated positional release and Chapter 6 on functional technique.

L1, L2

- L1 and L2 tender points are located close to the tips of the transverse processes of the respective vertebrae (see Fig. 3.10B).
- Extension strains relating to these joints may be treated with the patient prone, seated or side-lying, using the tender points to monitor changes of discomfort as the ease position is sought.

Prone (Fig. 3.49A):

- If the patient is prone, the practitioner/therapist stands on the side opposite the strain, grasping the leg on the side of the dysfunction/tender point, just above the knee, bringing it into extension and adducting it towards the practitioner/therapist, in a scissor-like movement.

Side-lying (Fig. 3.49B):

- If the patient is side-lying, with the side of dysfunction uppermost, the upper leg can be extended to introduce extension into the region of the strain, while fine-tuning is accomplished by slightly adducting or abducting the leg.
- When an ease position has been established with the palpated tender point less painful by at least 70%, or when a marked degree of tissue change is noted, this should be maintained for 90 seconds, before a slow return to neutral.

See Box 3.11 for Schwartz's (1986) suggestions regarding treating these points in a bed-bound patient.

Side-lying alternative (Fig. 3.49C):

- In some cases of low-back dysfunction relating to extension strains, a tender point is located on the sacral sulcus (see Fig. 3.10B).
- Rather than using hip extension (as in Figs 3.49A and B) hip flexion may be helpful in achieving ease (Fig. 3.49C).
- Fine-tuning to achieve ease may involve adduction or abduction of the leg, or altering the degree of rotation in the upper body.

L3, L4

- The tender point for extension strain of L3 is found about 3 inches lateral to the posterior superior iliac spine, just below the superior iliac spine. L4 tender point lies an inch or two lateral to this following the contour of the crest (see Fig. 3.10B).
- Treatment of L3 and L4 extension strains is accomplished with the patient prone, practitioner/therapist on the side of dysfunction, or in side-lying (Figs 3.49A, B and C).
- The practitioner/therapist's knee or thigh can be usefully placed under the raised thigh of the patient to hold it in extension while fine-tuning it, accomplished usually by means of abduction and external rotation of the foot.
- This procedure can also be performed with the patient side-lying, dysfunction side uppermost.
- The practitioner/therapist's foot should be placed on the bed behind the patient's lower leg.
- The patient's uppermost leg is raised and the extended thigh of this leg can then be supported on the practitioner/therapist's thigh.
- Rotation of the foot and positioning of the patient's leg in a more anterior or posterior plane, always in a degree of extension, is the fine-tuning mechanism to reduce or remove pain from the palpated tender point during this process.

Figure 3.48 Position of ease for flexion strain of segments from T9 to the lower lumbar regions usually require positioning into flexion, side-bending and rotation, until ease is achieved in monitored tender point on the lower abdominal wall or the ASIS area.

Figure 3.49A Position of ease for a tender point associated with an extension strain of the lumbar spine usually requires use of the legs of the prone patient as means of achieving extension and fine-tuning.

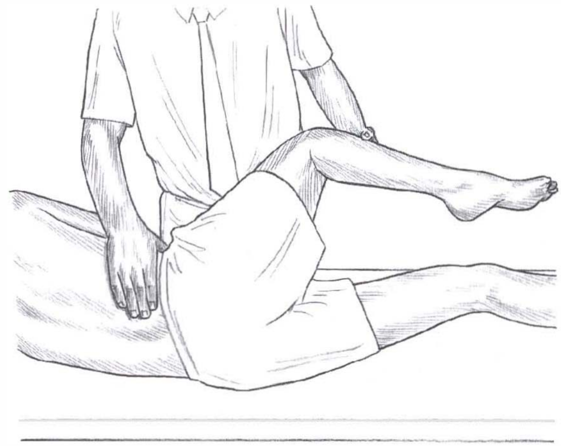

Figure 3.49C Some lumbar extension strains, where, for example, the tender point lies in the superior sacral sulcus, may ease if the hip is flexed in the side-lying position as illustrated.

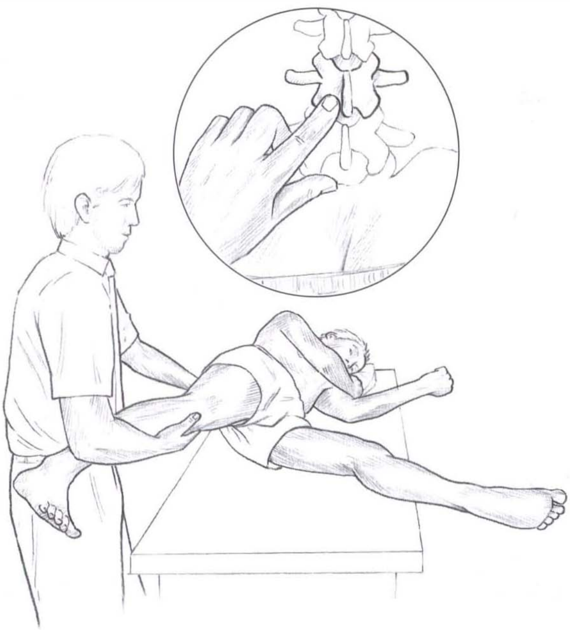

Figure 3.49B Side-lying position for treatment of lumbar extension strains.

L5

- There are various L5 tender points for extension strain as shown in Figure 3.10B.
- These are all treated as in extension strains of L1 and L2 (Figs 3.49A, B and C) using scissor-like extension of the prone patient's leg on the side of the dysfunction, and fine-tuning by variation in position (or treated in side-lying).
- In some cases the contralateral leg may be placed in flexion (over the edge of the table) to achieve ease of the tender point.
- As in all SCS protocols, once a 70% reduction in sensitivity of the tender point has been achieved, this should be held for 90 seconds before slowly returning to neutral.

SCS for psoas dysfunction (and for recurrent sacroiliac joint problems)

- The tender point for iliopsoas is located approximately 2 inches (5cm) medial, and slightly inferior, to the anterior superior iliac spine.
- The practitioner stands on the side contralateral to that being treated.
- With the widely separated knees of the supine patient (Fig. 3.50) flexed, and the ankles crossed, the limbs are raised by flexing the hips – supported by the practitioner's leg.
- The process involves finding the amount of hip flexion that reduces palpated pain in the tender point markedly, at which time fine-tuning is introduced in which small amounts of side-flexion or rotation are introduced to assess the effects on tenderness.
- When tenderness drops by at least 70% the position is maintained for not less than 90 seconds, before slowly returning the patient to neutral.

Jones reports:

Any time there is a knee complaint place that leg's foot on top [in the leg crossing stage]. This treatment produces flexion, marked external rotation and abduction of the femoral joint. Whenever you have a patient with a sacro-iliac problem that keeps recurring, be sure to check for this dysfunction. It is also common when there are no sacro-iliac dysfunctions. (Jones et al 1995)

In Chapter 4 a variation for treating a dysfunctional psoas is outlined, based on the work of Goodheart (1985).

Sacral foramen tender points and low back pain

In 1989 osteopathic physicians Ramirez, Hamen and Worth identified a series of 'new' tender points, collectively known as medial sacral tender points. These tender points were found to relate directly to low back and pelvic dysfunction and were found to be amenable to very simple SCS methods of release (Ramirez et al 1989).

A few years later Cislo et al (1991) described additional sacral foramen tender points which they identified as being related to sacral torsions. Cislo et al have provided clear guidelines as to the usefulness of these in treatment of low back pain associated with sacral torsion, using counterstrain methods.

The original identification of the 'new' medial sacral points occurred when a patient with chronic low back pain and pelvic hypermobility was being treated (Ramirez et al 1989). Use of counterstrain methods was found to be efficient using anterior and posterior lumbar tender points; however, despite relative comfort, the patient was left with 'tender points in the middle of the sacrum, associated with no problems'. These were originally ignored but when the patient's back pain recurred, the sacral points were re-evaluated and a number of release positions were attempted. Recognizing that the usual 'crowding' or 'folding' of tissue to induce ease in tender points was impossible in the mid-sacral area, the researchers then experimented with application of pressure to various areas of the sacrum.

Ramirez et al (1989) explained their progress from then on:

In the 3 weeks following this initial encounter with the unnamed sacral tender points, 14 patients with the presenting complaint of low back (sacral or lumbar, with or without radicular) pain demonstrated tenderness at one or more of the new sacral tender points. Ultimately we found six new tender points, all of which were relieved by positional release techniques to the sacrum.

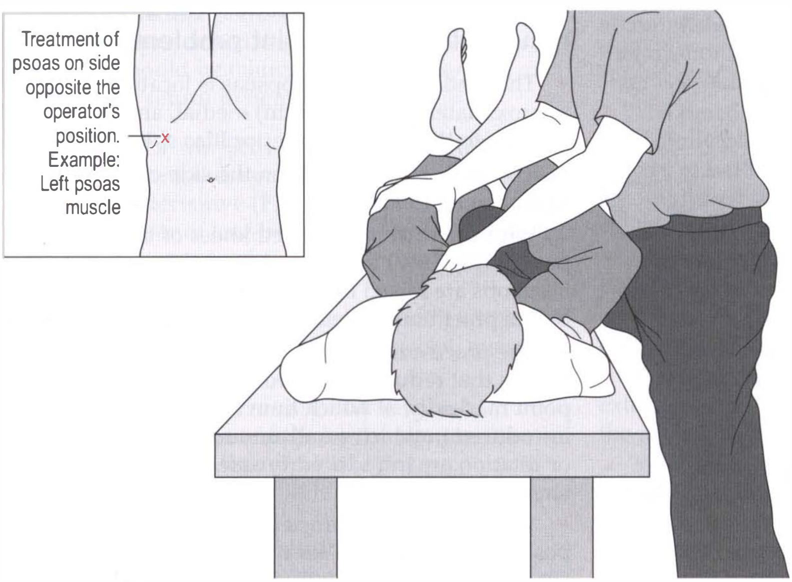

Figure 3.50 Positional release for psoas dysfunction.

Location of the new sacral medial tender points

Collectively known as the 'medial sacral tender points', these are located as follows:

- There are two possible cephalad tender points that lie just lateral to the midline, approximately 1.5cm medial to the inferior aspect of the posterior superior iliac spine (PSIS) bilaterally, and they are known as PS1 (for posterior sacrum). See Figure 3.51, where these two points (left and right) are identified by the letter A.
- The caudad two tender points are known as PS5 and may be located approximately 1 cm medial and 1 cm superior to the inferior lateral angles of the sacrum, bilaterally. See Figure 3.51, where these two points (left and right) are identified by the letter E.
- The remaining two tender points may be located on the midline: one (PS2) lies between the first and second spinous tubercles of the sacrum, identified as being involved in sacral extension, and the other (PS4) lies on the cephalad border of the sacral hiatus, which is identified as a sacral flexion point. See Figure 3.51, where these two points (superior and inferior) are identified by the letters B and D.
- Schwartz identified a seventh point lying between the second and third sacral tubercles (PS3), which relates to sacral extension. See Figure 3.51, where this point is identified by the letter C.

How to identify medial sacral tender points

Cislo et al (1991) note that when they first started trying to identify the precise locations of the sacral tender points they used drag palpation, as described earlier in this chapter and more fully in Chapter 2.

However, they state:

> *We have found that when these tender points occur in groups the associated sudomotor change is frequently confluent over the mid-sacrum. For this reason, we have begun to check all six points on all patients with low back pain, even in the absence of sudomotor changes.*

They report that this process of localization can be rapid if the bony landmarks are used during normal structural examination.

Treatment of medial sacral tender points (Fig. 3.52)

- With the patient prone, pressure on the sacrum is applied according to the location of the tender point being treated.
- Pressure is always straight downwards, in order to induce rotation around a perceived transverse or oblique axis of the sacrum.
- The PS1 tender points require pressure to be applied at the corner of the sacrum *opposite the quadrant in which the tender point lies*, i.e. left PS1 requires pressure at the right inferior lateral angle of the sacrum.
- The PS5 tender points require pressure to be applied *near the sacral base, on the contralateral side*, i.e. a right PS5 point requires downward – to the floor – pressure on the left sacral base just medial to the sacroiliac joint.
- The release of PS2 (sacral extension) tender point requires downwards pressure (to the floor) *at the apex of the sacrum in the midline.*
- The lower PS4 (sacral flexion) tender point requires pressure to *the midline of the sacral base.*
- Schwartz tender point PS3 (sacral extension) requires the same treatment as for PS2 described above.

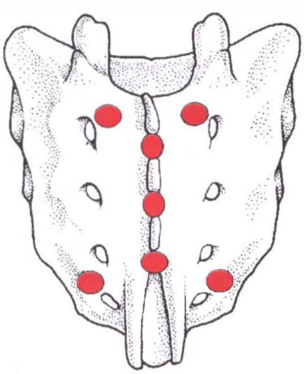

Figure 3.51 Positions of tender points relating to sacral and low back dysfunction.

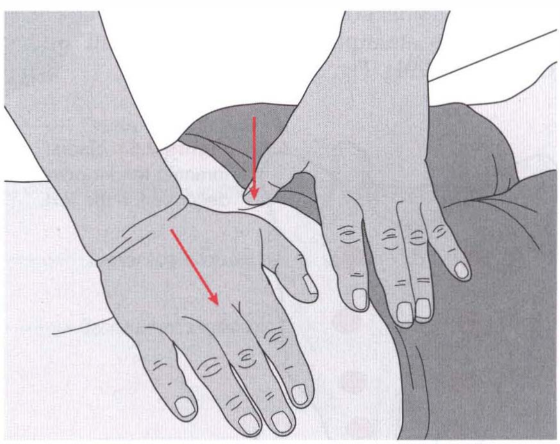

Figure 3.52 SCS treatment of medial sacral tender points relating to sacral and low back dysfunction.

- In all of these examples it is easy to see that the pressure is attempting to *exaggerate the existing presumed distortion* pattern relating to the point, which is in line with the concepts of SCS and positional release as explained earlier.

Jones is on record as describing his approach to the use of the sacral tender points identified by Ramirez et al (1989):

> *To keep this simple and practical, I search for the tender points. When one is found I press on the sacrum as far away from the tender point as possible. (Jones et al 1995, p. 84)*

What if medial sacral points are too sensitive?

From time to time, pressure on the sacrum itself was found to be too painful for particular patients, and a refinement of the techniques of SCS was therefore devised for the medial points (not the midline ones).

- The patient is placed on a table, prone, with head and legs elevated (an adaptable McManus-type table can achieve this, as can appropriately sited pillows and bolsters), inducing extension of the spine, which usually relieves the palpated pain by approximately 40%.
- Different degrees of extension (and sometimes flexion) are then attempted to find the position which reduces sensitivity in the point(s) most effectively.
- When this has been achieved, side-bending the upper body or the legs away from the trunk is carefully introduced, to assess the effects of this on the palpated pain.
- As in all SCS procedures, the final position is held for 90 seconds once pain has been reduced by at least 75% in the tender point(s).

Identification of sacral foramen tender points

Additional tender points were later identified as a result of problems attempting to treat a 'difficult' patient (Cislo et al 1991) (Fig. 3.53).

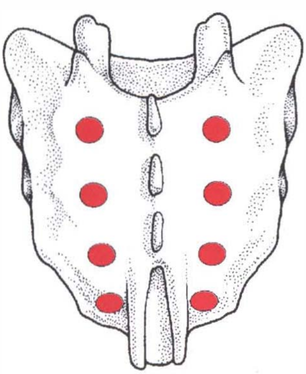

Figure 3.53 Sacral foramen tender points as described in the text.

A patient with low back pain, with a recurrent sacral torsion, was being treated using SCS methods with poor results. When muscle energy procedures were also found to be inadequate, a detailed survey was made of the region, and an area of sensitivity that had previously been ignored was identified in one of the sacral foramina.

Experimentation with various release positions for this tender point resulted in benefits and also in the examination of this region in other patients with low back pain and evidence of sacral torsion.

> *All the patients [who were examined] demonstrated tenderness at one of the sacral foramina, ipsilateral to the engaged oblique axis [of the sacrum]. (Cislo et al 1991)*

These foramen tender points have been named according to their anatomic position and are to be differentiated from sacral border tender points previously identified by Jones, and from the medial tender points as discussed above.

Clinically, these tender points are located by their positions relative to the posterior superior iliac spine.

- The most cephalad of the points (SF1 – sacral foramen tender point 1) is 1.5 cm (1 inch) directly medial to the apex of the PSIS.
- Each successively numbered sacral foramen tender point (SF2, SF3, SF4]) lies approximately 1 cm below the preceding tender point location.

Locating sacral foramen tender points

Evaluation of the sacral foramina should be a fairly rapid process.

- If a sacral torsion is identified, the foramina on the ipsilateral side should be examined by palpation and the most sensitive of these is treated as described below.
- A left torsion (forward or backward) involves the foramina on the left side.
- Alternatively, palpation of the foramina using the skin-drag method (see Chapter 2) may reveal dysfunction, even if the precise nature of that dysfunction is unclear.
- If there is obvious skin-drag over a foramen, and if compression of that foramen is unduly painful, some degree of sacral torsion is suggested – on the same side as the tender foramen.

Treatment protocol for sacral foramen points

For treatment of a tender point located over a left-side sacral foramen (Fig. 3.54):

- The patient lies prone with the practitioner/therapist on the side of the patient contralateral to the foramen tender point to be treated – right side in this example.

- The right leg (in this example) is abducted to about 30°.
- The practitioner/therapist, applies pressure to the sensitive foramen with his left hand (in this example) with the patient ascribing a value of '10' to the resulting discomfort.

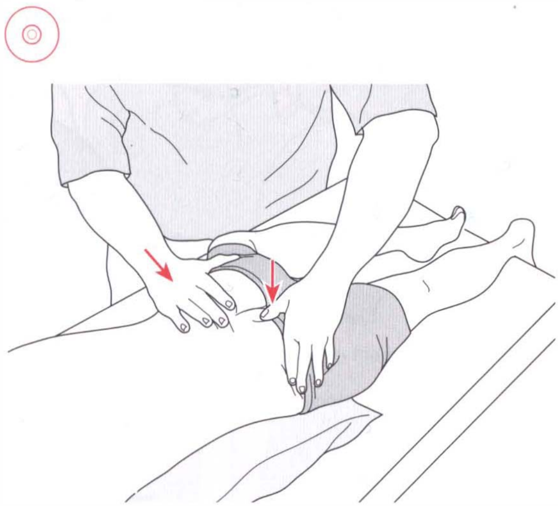

Figure 3.54A SCS treatment of sacral foramen tender points relating to sacral torsion dysfunction.

- The practitioner/therapist then applies pressure to the ilium a little lateral to the patient's right PSIS, directed anteromedially, using his right forearm or hand (in this example). This should reduce reported levels of sensitivity from the tender point.
- Variations in angle of pressure and slight variations in the position of the right leg are used for fine-tuning.
- The degree of reduction of sensitivity in the palpated sacral foramen tender point should achieve 70%.
- The position of ease is held for 90 seconds before a slow return to neutral (leg back to the table, contact released) is passively brought about.
- Whether the sacral torsion is on a forward or backward axis, it should respond to the same treatment protocol as described.

Tensegrity and the pelvis

Earlier in this chapter there was a description of tensegrity.

When envisaging the internal biomechanics of the effects of treating medial sacral points, or sacral foramen points, as described above, it may be helpful to keep the balance between compression and tension forces and other tensegrity concepts in mind (Figs 3.54B and C).

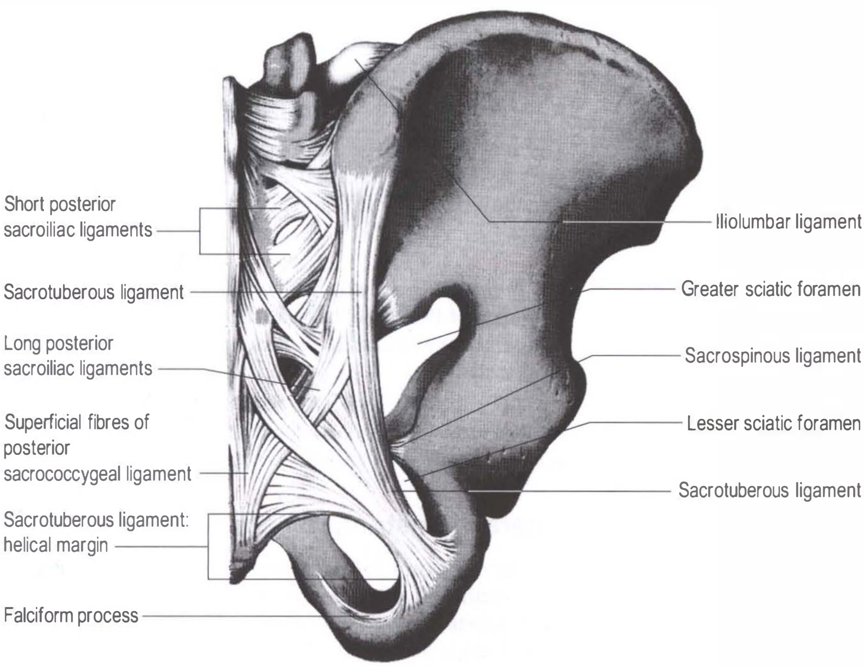

Figure 3.54B Joints and ligaments on the posterior aspect of the right half of the pelvis and fifth lumbar vertebra. (From *Gray's Anatomy*, 38th edn.)

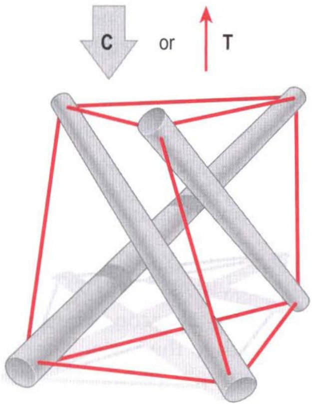

Figure 3.54C A simple model of a tensegrity structure in which internal tensions (T) and externally applied compression (C) forces are absorbed by the component solid and elastic structures by adaptation of form. (From Chaitow 1999.)

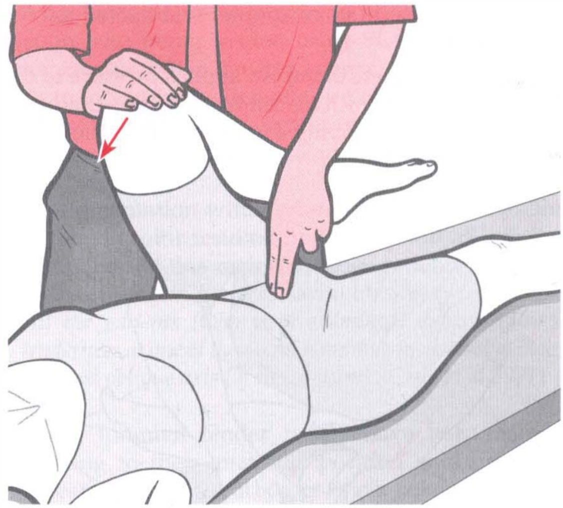

Figure 3.56 Treatment of pubococcygeus dysfunction.

Pubococcygeus dysfunction

The tender point for pubococcygeus dysfunction lies on the superior aspect of the lateral ramus of the pubis, approximately a thumb width from the symphysis (Fig. 3.55).

Method

- The patient lies supine as the ipsilateral leg is flexed (Fig. 3.56) until sensitivity in the palpated point drops by at least 70%.
- Long-axis compression through the femur towards the pelvis may be useful as part of fine-tuning.

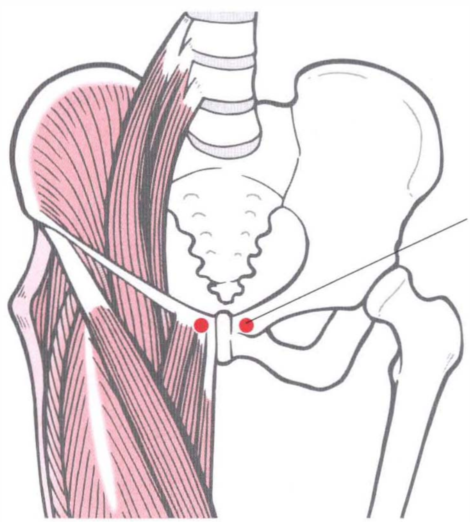

Figure 3.55 Pubococcygeus tender point.

Gluteus medius

The tender point for gluteus medius dysfunction lies laterally, on the posterior superior iliac spine (Fig. 3.57).

Method

- The prone patient's ipsilateral leg is extended at the hip and abducted (Fig. 3.58), until reported pain reduces by at least 70%.

Medial hamstring (semimembranosus)

The tender point for the medial hamstrings is located on the tibia's posteromedial surface on the tendinous attachment of semimembranosus (Fig. 3.59).

Method

- The patient lies supine, with the affected leg off the edge of the table, so that the thigh is extended and slightly abducted, and the knee is flexed (Fig. 3.60).
- Internal rotation of the tibia is applied for fine-tuning to reduce reported sensitivity in the tender point by at least 70%.

Lateral hamstring (biceps femoris)

The tender point for the lateral hamstring is found on the tendinous attachment of biceps femoris on the posterolateral surface of the head of the fibula (Fig. 3.61).

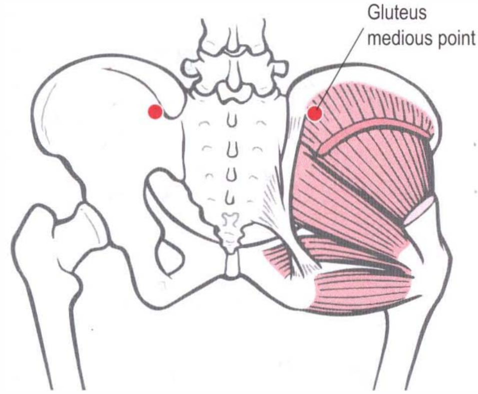

Figure 3.57 Gluteus medius tender point.

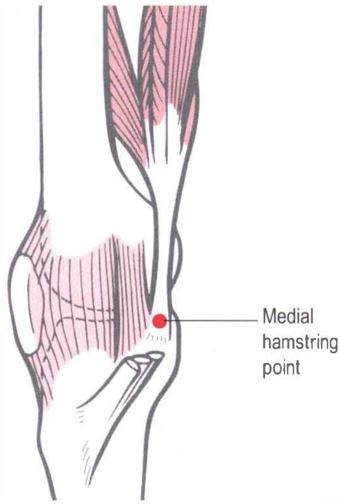

Figure 3.59 Medial hamstring tender point.

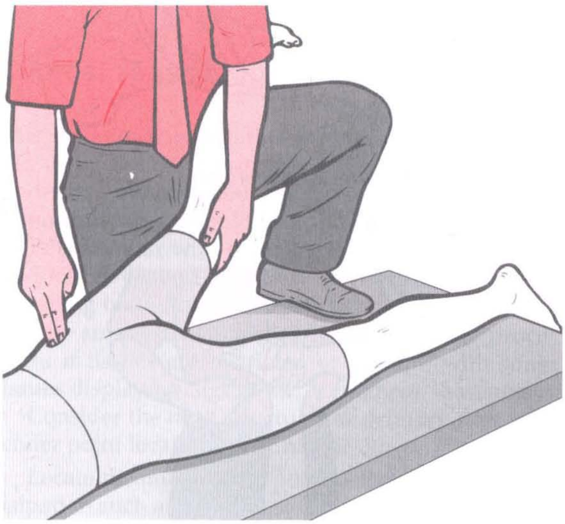

Figure 3.58 Treatment of gluteus medius dysfunction using the tender point as a monitor of discomfort.

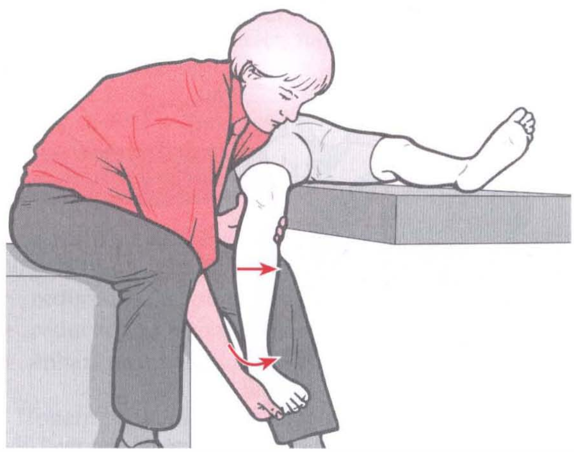

Figure 3.60 Treatment of medial hamstrings using the tender point as a monitor of discomfort.

Method

- The patient lies supine, with the affected leg off the edge of the table so that the thigh is extended and slightly abducted, and the knee is flexed (Fig. 3.62).
- Adduction or abduction, as well as external or internal rotation of the tibia, is introduced for fine-tuning, to reduce reported sensitivity in the tender point by at least 70%.

Tibialis anterior

The tender point for tibialis anterior is found in a depression on the talus, just medial to the tibialis anterior tendon, anterior to the medial malleolus (Fig. 3.63).

Method

- The prone patient's ipsilateral knee is flexed as the foot is inverted and the ankle internally rotated to fine-tune (Fig. 3.64), until reported sensitivity in the palpated tender point reduces by at least 70%.

Reactions following SCS

Despite the extreme gentleness of the methods involved in the application of all positional release in general, and SCS in particular, in about one-third of patients there is likely to be a reaction in which

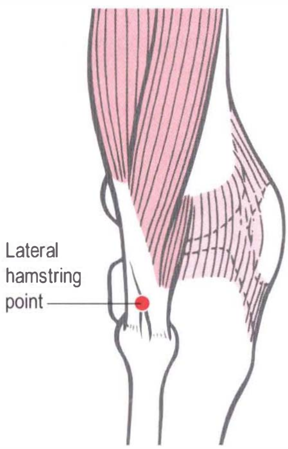

Figure 3.61 Lateral hamstring tender point.

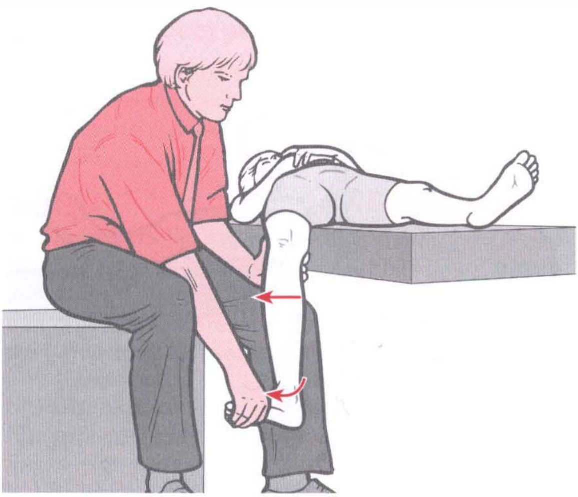

Figure 3.62 Treatment of the lateral hamstring using the tender point as a monitor of discomfort.

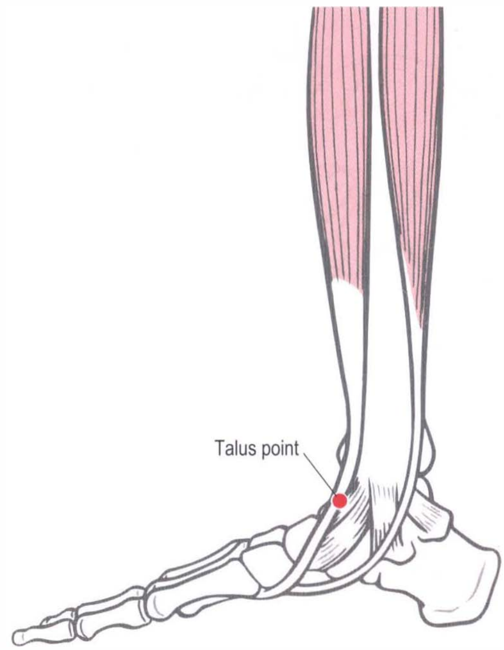

Figure 3.63 Tibialis anterior tender point.

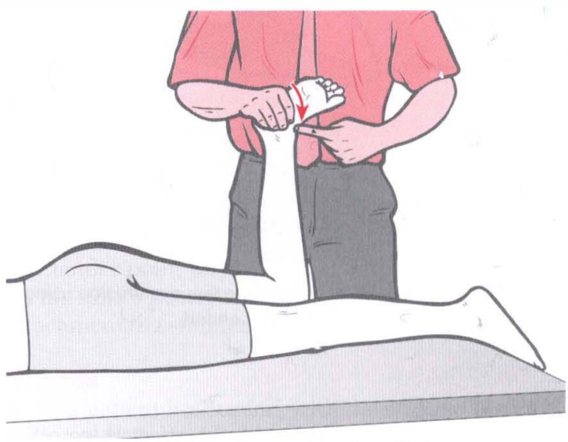

Figure 3.64 Treatment of tibialis anterior using the tender point as a monitor of discomfort.

soreness, or fatigue may be experienced, just as in more strenuous therapeutic measures.

This reaction is considered to be the result of homeostatic adaptation processes in response to the treatment, and is a feature of many apparently very light forms of treatment. Since the philosophical basis for much bodywork involves the concept of the treatment itself acting as a catalyst, with the normalization or healing process being the prerogative of the body itself, the reaction described above is an anticipated part of the process.

It is logical and practical to request that the patient refrains from excessive activity for some hours following SCS treatment to avoid disturbing any 'resetting' of tone that may have occurred.

Other body areas

The summary of SCS tender point locations and suggested positions of ease provided in this chapter is not comprehensive.

The author strongly believes that once the basic concepts of the methodology and underlying mechanisms of SCS are understood, a competent practitioner/therapist with good basic palpation and manual skills should be able to apply the method to almost any condition, in most clinical situations, acute and chronic, mild and severe.

A thorough reading of Jones's (1981) text is recommended, along with attendance at postgraduate lectures, seminars and workshops that teach the essence and detail of the method.

In the next chapter some further applications and refinements of SCS are described – in particular the guidelines offered by Goodheart (1985) that markedly simplify SCS, as well as Goodheart's remarkable 'coccygeal lift' method and Morrison's useful pelvic treatment approach ('inguinal lift') – that complement the treatments outlined in this chapter.

In Chapter 5 PRT (including SCS) for use in treatment of myofascial trigger points is described.

Clinical reasoning

With the information in this and subsequent chapters, and using the basic principle of identifying areas of tenderness in shortened structures, and easing these by positioning, it should be possible for the reader to become familiar with the clinical possibilities offered by PRT in general and SCS in particular, without becoming bound by rigid formulaic procedures.

At its simplest, SCS suggests the following procedures if tissues are restricted or painful, with some tissues displaying 'tightness', and others 'looseness':

- Consider the tight structures as primary sites for tender point location (see Chapter 2).
- Locate the most tender point using simple palpation such as 'drag' (see Chapter 3).
- Monitor this point while positioning and fine-tuning the tissues to reduce the perceived pain by not less than 70%.
- Hold the position of comfort/ease for not less than 90 seconds.
- Slowly return to neutral, and reassess.
- Anticipate an instant functional improvement (greater range of motion, for example) and some reduction in pain/discomfort that should commonly continue and increase over the coming hours and days.

Goodheart's guidelines as explained in Chapter 4 are particularly helpful in clinical decision-making when confronted with complex or acute conditions, building as they do on the basic formulation of 'exaggerating distortion' and 'reproducing positions of strain' – as explained in Chapter 1.

The reader is urged to revisit the various boxes in this chapter that cover different aspects of clinical decision-making. The boxes most relevant to clinical reasoning are:

- Box 3.2: Ideal settings for the application of SCS/PRT
- Box 3.3: SCS application guidelines
- Box 3.4: Positioning guidelines
- Box 3.5: Timing and SCS
- Box 3.6: Which points to treat first?
- Box 3.7: Some of the effects of sustained compression
- Box 3.8: SCS: contraindications and cautions
- Box 3.9: Indications for SCS (alone or in combination with other modalities)
- Box 3.11: SCS in treating the bed-bound patient.

SCS and other positional release methods are most appropriate in acute and subacute settings. They can also offer major benefits in chronic conditions, but by their noninvasive, indirect, nature are not capable of modifying structural changes (fibrosis, etc.).

The end-result of such positioning, if painless, slowly performed and held for an appropriate length of time (Box 3.5), is:

- a reduction in hyperreactivity of the neural structures
- a resetting of these to painlessly allow a more normal resting length of muscle to be achieved
- reduced nociceptor activity (see Chapter 1)
- reduction in fascial (di)stress
- enhanced circulation.

Hopefully, the detailed explanations in this chapter will have produced sufficient awareness to allow experimentation with the principles involved, in clinical settings, of both the areas presented and others.

As long as the guiding principles of producing no additional pain while also relieving pain from the palpated tender point during the positioning and fine-tuning are adhered to, no damage can possibly be done, and a profound degree of pain relief and functional improvement is possible.

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Advanced SCS and functional approaches

4

CHAPTER CONTENTS

This chapter contains details, discussions and outlines of the potential for use of SCS (and other positional release methods) in a variety of different settings and contexts:

- SCS and functional techniques (see Chapter 6) have been shown to offer major benefits for hospital (notably post-surgical) patients (see also details of use of SCS in bed-bound patients in Chapter 3).
- Specific positional release protocols are outlined in relation to post-surgical situations, respiratory dysfunction, temporomandibular joint problems, pregnancy and where there is a need for enhanced lymphatic drainage.
- Some novel approaches, developed by Jones himself, as well as positional release methods deriving from George Goodheart and John Upledger, in relation to cranial treatment, are detailed.
- Goodheart has also described a number of strategies that he believes allow for identification of those muscles that will respond best to positional release methodology, and these are described in this chapter, as is his remarkable 'coccygeal lift' method.
- A specific pelvic approach (inguinal lift), developed by Marsh Morrison is also detailed (see induration technique, also developed by Morrison, in Chapter 1).

Side-effects

(McPartland 1996)

Before describing these advanced SCS approaches it is important to discuss 'side-effects' of manual therapy in general, and positional release in particular, and a particular issue relating to the feedback that some ('stoic') patients offer.

McPartland (1996) notes that between one-quarter and one-third of patients treated by SCS have some reaction, despite the gentleness of these approaches.

Very occasionally there are extensive 'muscle release' reactions. These are usually transitory and seldom last more than a few hours. However, patients should be forewarned of the possibility, to allay anxiety. No treatment is needed for the reaction if it occurs, as it is itself merely evidence of an adaptation process and passes rapidly.

In relation to positional release methods applied to the cranium (see later in this chapter) it is important to highlight a report on iatrogenic effects from inappropriately applied cranial treatment (most of which involves positional release methodology) (McPartland 1996). This report presented nine illustrative cases, of which two involved intra-oral treatment. All cases seemed to involve excessive force being used, and this highlights the need for care and gentleness in all cranially applied treatment, particularly when working inside the mouth.

'Stoic' patients

Since the process of finding a position of ease requires fairly rapid feedback from the patient ('what's the pain score in the tender point now?'), it is unlikely to be useful in patients who say that there is little or no pain (despite evidence to the contrary) and who would therefore have difficulty in reporting any change as positioning and fine-tuning are carried out.

Such patients can be better treated using functional approaches, as described in Chapter 6, in which the practitioner relies on palpated tissue release or a sense of 'ease', rather than on subjective information reported by the patient.

This is also true of patients who are taking pain medication, whose judgement as to the degree of discomfort being experienced is likely to be dulled

The hospitalized patient

SCS has been widely used in hospital settings as an adjunctive treatment for patients with congestive heart failure, respiratory failure, pneumonia, bronchitis and asthma (Dicky 1989, Schwartz 1986, Stiles 1976). A few examples of osteopathic treatment (incorporating SCS and functional approaches) of hospitalized patients are summarized in Box 4.1.

Conditions that call for SCS in hospital settings include acquired positional pain, especially after spinal anesthesia, or after the return to a normal position following a lithotomy position, after perineal surgery.

Schwartz (1986) also suggests that SCS can be used in differential diagnosis in acute pain situations. He gives the example of an acute abdominal pain below

Box 4.1 Three examples of the efficacy of osteopathic methods (including SCS) used in hospital settings

1. Reduced duration of postoperative hospital stay

Osteopathic manipulative treatment (including SCS and functional techniques) is seen to be easily implemented and cost-effective because of the shorter hospital stays resulting from effective relief of acute pain. Patients who receive morphine preoperatively and osteopathic attention postoperatively tend to have less postoperative pain and require less intravenously administered morphine. In addition, those receiving osteopathic attention demonstrate early ambulation and body movement as well as decreased postoperative morbidity and mortality and increased patient satisfaction (Noll et al 2000).

2. Shorter hospital stay for patients with pancreatitis

In an outcomes research study, Radjieski et al (1998) randomly assigned eight patients with pancreatitis to receive standard care plus daily osteopathic manipulative treatment (comprising myofascial release, soft tissue, and SCS techniques) for the duration of their hospitalization, and eight patients to receive only standard care. Osteopathic treatment involved 10 to 20 minutes daily of a standardized protocol, with attending physicians blinded as to group assignment. Results indicated that patients who received osteopathic attention averaged significantly fewer days in the hospital before discharge (mean reduction, 3.5 days) than control subjects, although there were no significant differences in time to food intake or in use of pain medications.

3. Shorter hospitalization and duration of intravenous antibiotics for elderly pneumonia patients

Elderly patients hospitalized with acute pneumonia were recruited and randomly placed into two groups: 28 in the treatment group and 30 in the control group. The treatment group received a standardized osteopathic attention protocol (including SCS and functional methods), while the control group received a light touch protocol. There was no statistical difference between groups for age, sex, or simplified acute physiology scores. The treatment group had a significantly shorter duration of intravenous antibiotic treatment and a shorter hospital stay (Noll et al 2000).

and to the right of the umbilicus. This happens to be close to where pain would be palpated were there a flexion strain of a lower thoracic or upper lumbar vertebrae (see Fig. 3.10A), as well as if there were acute appendicitis. If pain returns rapidly after an SCS application to the point, appendicitis is strongly indicated.

A second example is given of the diagnostic potential of SCS in the case of a differential assessment between myocardial infarction and acute costochondritis. The latter is often rapidly amenable to SCS treatment using a tender point in one of the left costal interspaces, while the myocardial infarction would not respond to such treatment.

Schwartz (1986) suggests that:

Literally thousands of hospital days could be saved by judicious osteopathic examination for interspace dysfunction and appropriate counterstrain treatment.

SCS treatment is noninvasive and is anything but traumatic and can be applied to a patient in almost any degree of ill-health and distress.

Schwartz concludes:

It may be used on patients with fractures, as well as on post-surgical patients who have pain at the site of incision. It may also be used on patients who have osseous metastatic disease. If the part of the body that is to be treated can be moved by the patient it can safely be treated with SCS.

Results are claimed to be lasting and repetitive treatment is needed (in hospital settings) only if there is ongoing neurosensory reflex activity, or if the condition that produced the dysfunction in the first place is repeated or ongoing.

Schwartz's description of the tender point

Schwartz's description of tender points is based directly on Jones's work. The points are used as monitors in SCS application, and are described as being, 'pea-sized bundles or swellings of fascia, muscle tendrils, connective tissue and nerve fibers as well as some vascular elements'.

Interestingly, unlike many other clinicians, Schwartz notes that: 'Generally, but not always, pressure on the tender point will cause pain at a site distant to the point itself'.' That description defines such a point as a trigger point, as well as a tender point (trigger points are discussed in Chapter 5). He acknowledges that 'tender points' resemble both Chapman's neurolymphatic reflexes and Travell's myofascial trigger points (Owens 1982, Travell 1949).

Schwartz highlights the difference between SCS and other methods which use such points in treatment by saying: 'Other methods invade the point itself, for example by needle in acupuncture, injection of lidocaine into the point, or the use of pressure or ultrasound to destroy the tender point.'

When using SCS, if a position of ease is achieved and tenderness vanishes from the palpated point, one of a number of sensations may become apparent to the practitioner, a 'sudden release', or a 'wobble', or a 'give', or a 'melting away', all of which indicate a change in the tissues in response to the positional change that has been brought about by the practitioner.

The two phases of the positioning process are emphasized: 'gross' movement, which takes the area or the patient to the approximate position of ease, and 'fine-tuning', which takes the remainder of the pain from the tender point.

Problems of manual treatment delivery in hospital

Acutely ill patients have very special problems and needs when being considered for manual treatment. These relate to their inability to be moved more than a little, their difficulty in cooperating in a manual treatment because of 'multiple intravenous and subclavian taps, monitors or various types of catheters', as well as their current particular state of vulnerability, either due to illness or to their being pre- or post-surgical (Schwartz 1986).

Edward Stiles, then director of osteopathic medicine at Waterville Osteopathic Hospital in Maine, evaluated the usefulness of osteopathic attention to patients in hospital settings (Stiles 1976). He found that general osteopathic attention is of value in treating pre- and postoperative patients, especially with regard to excursion of the rib cage in order to establish a maximum ventilating ability:

This is particularly important for patients undergoing upper gastrointestinal or thoracic surgery, since a decrease in excursion of the rib cage can increase the patient's susceptibility to splinting of the thoracic cage and impede ventilating ability.

He found that few methods achieved this end more effectively than the application of variants of positional release methods, which are particularly relevant in the context of pain, restriction and limitation of the ability to manipulate the patient's position, as described in Chapter 3 (see notes on bed-bound patients).

Postoperative uses of positional release

Jerry Dickey (1989) has focused attention on the particular needs of the many thousands of people undergoing surgery each year via median sternotomy, in which the rib cage is opened anteriorly to allow access to the heart and other thoracic structures. More than 250000 patients undergo coronary bypass graft surgery annually (in the USA alone). This surgery is accomplished via a median sternotomy incision, an approach that has been gaining widespread acceptance.

- In this form of surgery an incision is made from the suprasternal notch to below the xiphoid process.
- The soft tissues below the skin are treated with diathermy to stem bleeding and the sternum is divided by an electric bone saw, the exposed edges being covered with bone wax.
- The sternum is then retracted with the upper level being placed at the level of the second rib.
- Following whatever surgical intervention is involved, the sternal margins are brought together and held by stainless steel sutures.
- There are often drainage tubes exiting from below the xiphoid following surgery.

The degree of stress and injury endured by all the tissues of the region is clearly major, especially considering that the open-chest situation may have been maintained for many hours. The sequels to this trauma are many and varied, as Dickey (1989) explains, and include:

> *Dehiscence, substernal and pericardial infection, nonunion of the sternum, pericardial constriction, phrenic nerve injuries, rib fractures and brachial plexus injuries.*

Fully 23.5% of patients undergoing these procedures develop brachial plexus injuries.

Dickey reports on this surgical procedure being carried out experimentally on ten cadavers, of which seven sustained first rib fractures with the fractured ends often impaling the lower trunks of the brachial plexus. While such negative effects are usually noted immediately postoperatively, many problems do not emerge until later, and these might include structural and functional changes in chest mechanics that do not become evident for weeks or months, particularly restrictions affecting thoracic vertebrae and the rib cage, as well as fascial and diaphragmatic changes.

Dickey (1989) has outlined a number of appropriate manual methods for helping in recovery, including positional release methods. He stresses the importance of structural evaluation and treatment, both before and after surgery, with the manual therapeutic methods being of various types. However, it is specifically the positional release approaches that he advocates that are discussed in the context of this book.

Because of the wide retraction involved, the upper ribs (because of their firmer attachments) sustain the greatest degree of strain. Interosseous contraction, fascial strain and diaphragmatic dysfunction may all be palpable and to an extent remediable.

It is as well to be reminded that patients undergoing this form of surgery are likely to be past middle age, commonly with a range of existing musculoskeletal restrictions and dysfunctions, and therefore with a limited prospect of normal function being completely restored (Nicholas & Oleski 2002).

Testing and treating fascial patterns

Commencing around 4 weeks post-surgery, the first step suggested in aiding recovery from this trauma involves a fascial release method.

This is a part of functional technique methodology (see Chapter 6) in which rather than using a 'tender point' monitor, the tissues being treated are evaluated for their directions of freedom of movement (ease), and are held in those directions until a spontaneous change takes place.

- The patient should be supine.
- The practitioner places one hand between the scapulae with the other hand resting on the surface of the midline of the sternum (Fig. 4.1).
- Each hand, independently, tests tissue preference in both a clockwise and then an anticlockwise direction, allowing assessment of the 'tissue preference pattern' relating to the skin and superficial fascia.
- In other words, the hands on the tissues are asking, 'in which direction do these tissues move most easily?', as the anterior and posterior assessments are made.
- Once assessed and identified, the tissues (anterior and posterior simultaneously), are taken in their respective directions of motion, towards the directions of preferred movement that they currently exhibit.
- Whichever direction of rotation is most 'easy' should be held – simultaneously front and back (90 seconds minimum), each in their preferred direction – until tension eases.
- This will commonly release recently acquired stress patterns in the fascia, possibly revealing older patterns which can then be addressed.
- This approach should be applied at least weekly until distorted fascial patterns are resolved or cease to alter, possibly indicating an intractably fixed state.

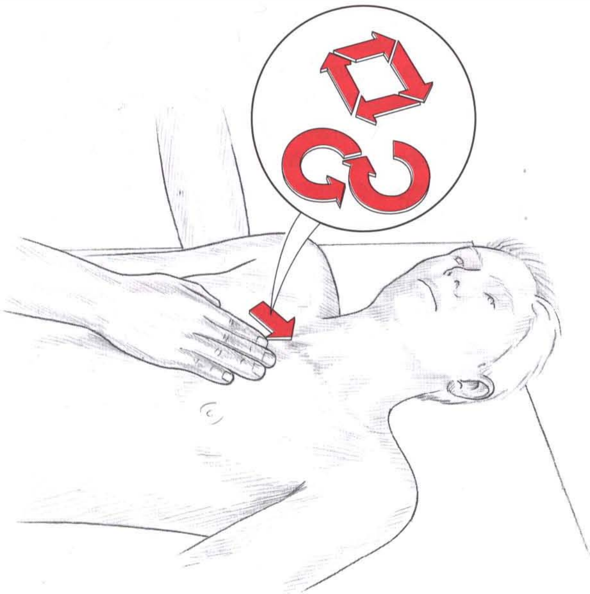

Figure 4.1 Release of traumatized fascial structures. In this figure, the practitioner's left hand lies between the patient's scapulae while the right hand lies on the sternum. The hands independently assess the 'tissue preference patterns' (Dickey 1989). These positions of ease are held in order to allow distorted fascial patterns to modify or normalize. **Note** This procedure is also illustrated in the accompanying CD-ROM with the patient seated, a position that allows greater freedom for the hand on the patient's back.

Normal, unstressed, tissues should exhibit an equal excursion in both directions of rotation, although this is seldom found in adults, even if surgical trauma has not been a factor (Lewit 1999, Zink & Lawson 1979).

SCS for respiratory distress

Schwartz (1986) also notes that SCS, which is the primary manipulative method routinely used in the hospital, is of particular value in mobilization of the mechanical aspects of respiration, including, 'clavicle, ribs, sternum and anterior and posterior vertebral segments, as well as the diaphragm' (see Chapter 3).

Patients due for surgery are routinely treated in order to normalize respiratory function, as well as being treated for postoperative ileus.

Release of the diaphragm can frequently be achieved using a simple functional approach:

Releasing the diaphragm (lower thoracic cage) using PRT

- The patient is supine and the practitioner stands at waist level facing cephalad, and places his hands over the middle and lower thoracic structures, fingers along the rib shafts (Fig. 4.2).
- Treating the structure being palpated as a cylinder, the hands test the preference this cylinder has to rotate around its central axis, one way and then the other: does the lower thorax rotate with more ease to the right or to the left?
- Once the direction of greatest rotational ease has been established, and with the lower thorax rotated into this 'preferred' direction, side-bending one way and then the other is evaluated: when rotation has been made toward ease, does the lower thorax side-flex with more ease to the right or to the left?
- Once these two pieces of information have been established, the combined positions of ease, are 'stacked' onto each other, i.e. the lower thorax is rotated towards its easiest direction, and then side-flexion is introduced, also towards the easiest direction.
- These positions are held for 90 seconds and a slow release is then allowed.
- At this time the diaphragm should be found to function more normally, accompanied by a relaxation of associated soft tissues and a more symmetrical rotation and side-flexion potential of the previously restricted tissues.

Indirect rib treatment

See also SCS rib treatment in Chapter 3.

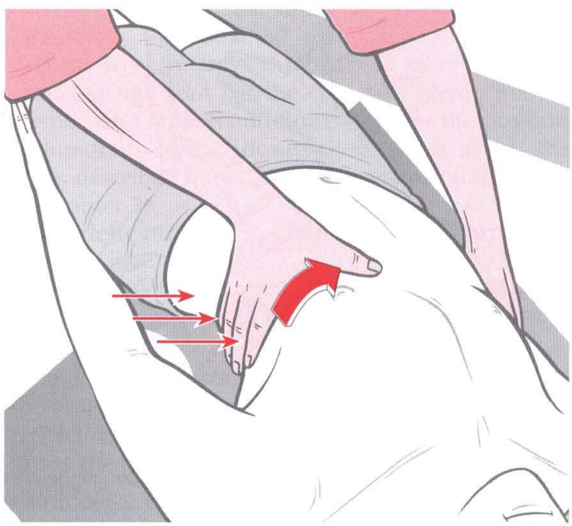

Figure 4.2 General MET for release of lower thorax and diaphragm. (From Chaitow 2001.)

Dickey suggests that following the nonspecific fascial release method described above (see Fig. 4.1), standard rib function tests should be performed in order to identify ribs that are not symmetrical in their range of movement during the respiratory cycle, so that treatment can be introduced in order to assist in normalizing what has become restricted.

In the early postoperative phase, a classical osteopathic positional release approach is suggested (Kimberly 1980).

Method

- The patient sits on one side of a treatment table and the practitioner sits facing the opposite way, on the other side.
- In this way, by half-turning towards the patient, there is easy access to the lateral chest wall.
- Having previously identified ribs that are restricted in their range of motion, using standard assessment procedures (as described in Chapter 3), the practitioner places his hands so that the index and middle fingers of one hand contact the restricted rib to be treated, facing forwards along the anterior aspect of the rib, while the other index and middle finger contact the same rib, facing backwards along the posterior aspect (Figs 4.3A and B).
- The thumbs rest touching each other, tip-to-tip, at the mid-axillary line.
- The patient is asked to sit erect and to lean gently towards the practitioner, so that the ribs and the fingers make good contact.
- In this way no force is exerted by the practitioner towards the ribs, and the patient controls the degree of pressure being applied, which should be just enough to maintain firm contact.
- At this point, the patient is asked to *slightly* and *slowly* rotate the trunk away from the side being treated, which effectively eases the rib away from its demifacets.
- When the practitioner senses that this has been achieved, the patient is instructed to partially inhale and to then exhale in order for an evaluation to be made as to which phase of the cycle induces the greatest sense of *palpable ease*, freedom from tension.

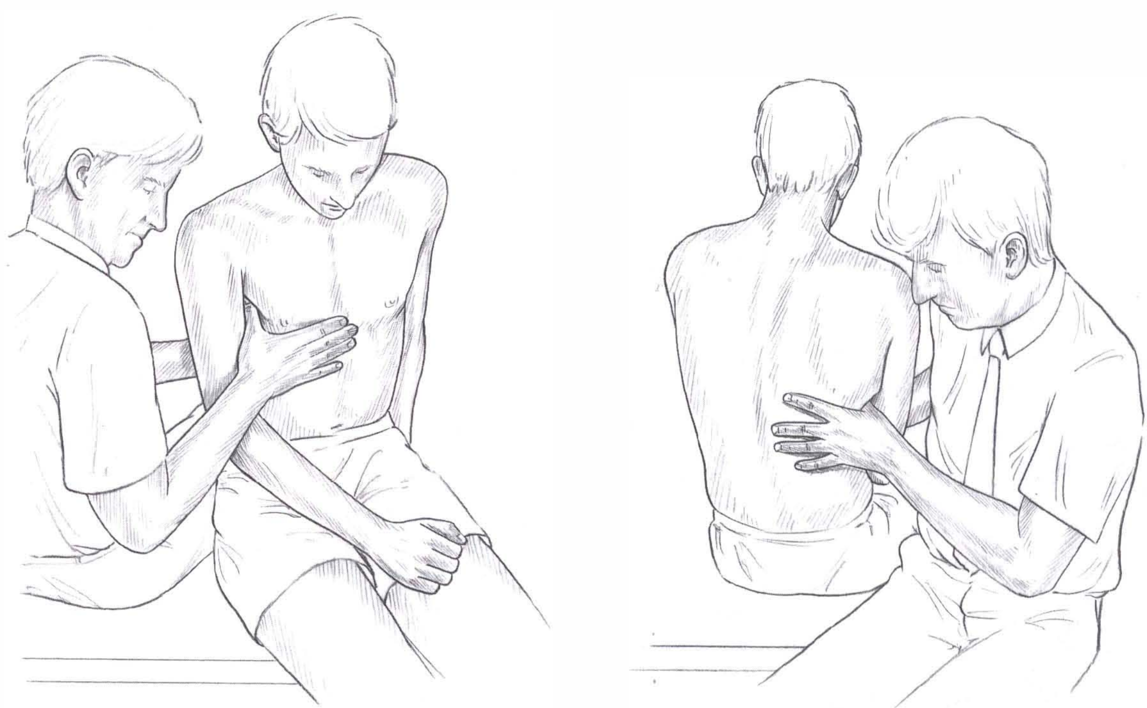

Figure 4.3A and B The practitioner achieves firm but gentle contact of a previously identified dysfunctional rib (elevated, depressed, restricted). The patient controls the degree of hand pressure by leaning towards the practitioner and then slightly turning towards the side opposite that being treated, which releases the demifacets. The patient then inhales and exhales as the practitioner assesses the phase at which the rib is most at ease. The patient holds this phase for as long as is comfortable, one or more times, until improved function is noted (Dickey 1989, Kimberly 1980).

- This evaluation is communicated to the patient, who is asked to hold the breath in the phase that induces maximum ease, for as long as is comfortable.
- The practitioner should be maintaining contact on the rib in order to achieve the maximal degree of ease.
- Any sense that tension, 'bind', is returning calls for a slight modification (fine-tuning) in the direction in which the rib is being held.

The patient may need to repeat the breathing phase several times in order to achieve freedom of motion for a restricted rib at any treatment session, which should be repeated not less than weekly until the ribs have all been released to the degree that is possible.

SCS techniques for rib dysfunction correction outlined in Chapter 3 can also be employed in order to support this method.

Improving lymphatic drainage

In patients who have undergone surgery, there may well be lymphatic stasis, as evidenced by swelling/edema in the region of the posterior axillary fold.

Dickey (1989) suggests that the practitioner should: 'Assess the tissue preference patterns of the upper arm and the forearm, independently'. Once established, both sites should be taken towards the direction of the tissue preference, 'with slight compression through the elbow and the shoulder until he or she perceives the tension relaxing'. This approach is repeated at each visit until tissue drainage is normal.

It is not difficult to see the similarities between the postoperative methods suggested by Dickey and the concepts of SCS and functional technique as described elsewhere in the book (see in particular the various aspects of the Spencer sequence as described in Chapter 3, and also Hoover's clavicle and thoracic exercises in Chapter 6).

The commonality is the sensing of directions of ease in tissues, along with a supportive, noninvasive holding of the tissues in that state until resolution occurs, whether the structures being treated are osseous (ribs, shoulder joint, clavicle) or soft (fascia, muscle).

Unlike SCS, these methods do not involve the use of pain-monitoring points, with the position of maximal ease being achieved entirely by means of palpation assessment.

Positional release in pregnancy

Stiles (1976) has discussed the value of positional release methods in treating a wide range of problems arising in hospitalized patients, including those who are pregnant. Pregnant patients commonly complain of pain in the back and/or legs. This usually can be relieved by osteopathic care, particularly functional techniques (see Chapter 6 for details of treatment of somatic dysfunction in the lumbar area, sacrum, pelvis, and lower extremities). Functional techniques also allow for continued manipulative care right up to the time of delivery.

SCS methods in bed-bound hospital patients

The potential value and importance of methods that are noninvasive and easily adapted to bedridden patients, or those in considerable pain or distress, speaks for itself.

The methods themselves are outlined by osteopathic physician Harold Schwartz, who for many years applied SCS methods to a severely ill, bed-bound population in hospital settings. This involved patients in medical and surgical, obstetric and pediatric wards, including pre- and post-surgical patients, some of whom had undergone cystotomy, gastrotomy and other major surgery.

Schwartz (1986) confirms Jones's assertion that all counterstrain positions are capable of being modified and successfully applied to bed-bound patients, saying that, 'without exception, this observation has been found to be valid'. (See Chapter 3 for suggested positions for bed-bound patients.)

Goodheart's positional release innovations

George Goodheart, the main developer of applied kinesiology, has adapted many aspects of Jones's original work in ways that make it more accessible, reducing the need for the constant reference to, or memorizing of, lists and illustrations of the positions of hundreds of specifically sited tender points that Jones described in his years of research (and as used in Chapter 3).

As briefly outlined in Chapter 1, Goodheart (1984) suggests that:

- A suitable tender point should be sought in muscles antagonistic to those that are active when pain or restriction is observed or reported.
- In such circumstances, the antagonist muscles to those operating at the time pain is noted (or restriction observed or palpated) will be those that house the tender point(s), and these are identified by palpation.
- Another way of understanding this concept is to consider that tender points will usually be found in tissues that have shortened.

Examples:

- If turning the head to the right is either painful or restricted, the muscles that produce that action would be those on the right of the neck, as well as the left sternocleidomastoid muscle.
- Restriction in rotation to the right might well relate to shortening (or dysfunction) involving the muscles on the left.
- According to Goodheart's guidelines (*'seek tender points in antagonist muscle to those active when pain or restriction is noted'*), it is in these shortened structures that a tender point can be found, and used as a monitor during SCS positioning.
- Palpation for suitable tender points should be carried out in the muscles on the left side of the neck, as well as in right side sternomastoid (as this helps to turn the head to the left).
- It is very important to avoid confusion that can occur if a tender point is sought in the tissues *opposite the site of pain on movement*.
- The appropriate tender point will be located in the antagonists to the muscles *active in producing the painful or restricted movement*.
- Once located, the point would be used as a monitor as in all SCS procedures.

Is the muscle weak or strong?

Goodheart suggested a simple test to identify a tender point's usefulness.

- If the muscle containing the tender point tests as weak following a maximal 3-second isometric contraction, after first testing strong, it will benefit from positional release (Walther 1988).
- When a positional release treatment is successful, this same protocol suggests that the muscle will no longer weaken after a short, strong, isometric contraction.

Different focus

Whereas Jones's use of SCS is largely focused towards treatment of painful conditions, Goodheart has focused on improving the neuromuscular function of muscles, using SCS, even if no pain is present.

Goodheart's associate, David Walther, notes that:

> *Neuromuscular dysfunction that responds to strain/counterstrain technique may be from recent trauma, or be buried in the patient's history.*

Goodheart and Walther agree with the interpretation of the role of neurological imbalance, which Jones and Korr (Korr 1975) have described as a key factor leading to many forms of soft-tissue and joint dysfunction (see Chapter 3), in which antagonistic muscles fail to return to neurological equilibrium following acute or chronic strain.

When this happens, an abnormal neuromuscular pattern is established that benefits from being held in 'ease' during a positional release treatment. The muscles that have shortened in the process of strain, and not those stretched (where pain is commonly noted), are the tissues that are used in the process of rebalancing.

'Understanding that the cause of the continued pain one suffers in a SCS condition is usually not at the location of pain but in an antagonistic muscle is the most important step in solving the problem', says Walther (1988).

The tender point might lie in muscle, tendon or ligament but the perpetuating factor is the imbalance in the spindle cell mechanisms. Since the patient can usually easily describe which movements increase the pain (or which are restricted) the search sites for tender areas are easily decided.

Self-help advice

Goodheart's approach can usually be taught to patients for self-help or first-aid use. If taught appropriately, simple stiffness and discomfort can be self-treated.

The patient may have an explanation offered, such as:

- If you wake with a stiff neck, test to see which direction of movement is stiffest, or hurts most.
- From that position, take your head back to its comfortable resting position, and as you do so feel to see which muscles are working to get you there.
- In these muscles, opposite those working when the painful or restricted movement is made, feel around for a very tender point.
- Once you have found this, gently position your head to take the pain away from the point you are lightly pressing – without creating any new pain.
- Once you have done this stay in that 'ease' position for several minutes then slowly return to normal, and see if the stiffness or pain has reduced. It will usually be much better.

More examples of self-help SCS methods are given in Chapter 5.

Reducing the time the position of ease is held

Goodheart has found that it is possible to reduce the length of time during which the position of ease is held, without losing the therapeutic benefits derived from the neurological and/or circulatory effects (as described in Chapter 3) offered by that position being maintained for 90 seconds.

There are two elements to Goodheart's innovation:

1. When the position of ease has been located, a 'respiration assist' is added. The nature of the respiratory strategy used depends upon the location of the tender point: if it lies on the anterior surface of the body, inhalation is used, and if on the posterior aspect, exhalation is used. This phase of breathing is held for as long as is comfortable, during which time the practitioner adds the second element.
2. A stretching of the tissues being palpated (the tender point) is introduced by means of the practitioner's fingers being spread over the tissues (Fig. 4.4).

Walther explains this approach as follows:

The patient takes a deep breath [the inhalation or exhalation phase being held, depending on anterior or posterior location of point] and holds it while the physician spreads his fingers over the previously tender point. The patient is maintained in the 'fine-tuned' position with the physician's fingers spreading the point and respiration assist for 30 seconds, as opposed to 90 seconds required without the assisting factors. On completion the patient is slowly and passively returned to a neutral position.

Is Goodheart's 'respiration assist' instruction too simplistic?

It is necessary to look a little beyond the fact that clinical experience often supports Goodheart's breathing guidelines in application of SCS, in order to gain an understanding of what might be happening physiologically.

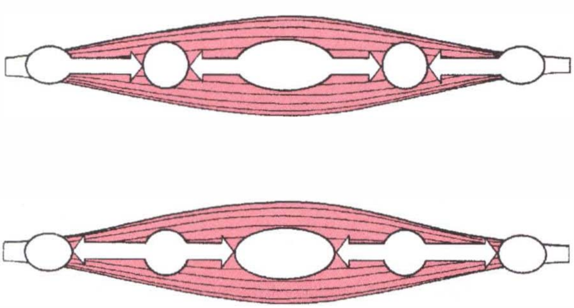

Figure 4.4 Proprioceptive manipulation of muscles. Pressure directed away from the belly of a muscle (B) towards the Golgi tendon organs (A) produces relaxation of the muscle, while pressure towards the belly of a muscle (B) from the region of the Golgi tendon organs (A) tones/'strengthens' it. Pressure near the belly of the muscle (B) towards the muscle spindle (C) weakens it, while pressure away from the spindle (C), near the belly (B), tones/'strengthens' it.

Cummings & Howell (1990) have demonstrated the effects of respiration on myofascial tension, showing that there is a mechanical effect of respiration on resting myofascial tissue (using the elbow flexors as the tissue being evaluated). They quote the work of Kisselkova (1976), who reported that resting EMG activity of the biceps brachii, quadriceps femoris and gastrocnemius muscles, for example, 'cycled with respiration following bicycle ergonometer exercise, thus demonstrating that non-respiratory muscles receive input from the respiratory centres'.

The conclusion was that, 'these studies document both a mechanically and a neurologically mediated influence on the tension produced by myofascial tissues, which gives objective verification of the clinically observed influence of respiration on the musculoskeletal system and validation of its potential role in manipulative therapy'.

But what is that role?

Lewit (1999) has helped to create subdivisions in the simplistic picture of 'breathing in enhances effort' and 'breathing out enhances movement'.

Among the relationships Lewit has identified are that:

- movement into flexion of the lumbar and cervical spines is assisted by exhalation, and
- movement into extension of the lumbar and cervical spine is assisted by inhalation, whereas
- movement into extension of the thoracic spine is assisted by exhalation, while
- thoracic flexion is enhanced by inhalation.

The influences of breathing on the tone of extensor and flexor muscles would therefore seem to be somewhat more complex than Goodheart's suggestions indicate, with an increase in tone being evident in the extensors of the thoracic spine during exhalation, while, at the same time, the flexors of the cervical and lumbar spine are also toned.

Similarly, inhalation increases tone in the flexors of the thoracic spine and the extensors of the cervical and lumbar regions.

Goodheart's proposed pattern of breathing during application of SCS would therefore increase tone in some of the tissues being treated, while inhibiting their antagonists.

Since the 'finger spread', which he also advocates during SCS, increases strength/tone in the tissues being treated, the use of a held breath would seem to require more discrimination than the simple injunction to hold the breath during inhalation when treating flexor muscles, and during exhalation when treating extensors.

What does the finger spread do?

SCS methods act upon the muscle spindles that lie throughout the muscle, with greatest concentration in the center, around the belly (Gowitzke & Milner 1980).

There are many more spindles found in muscles with an active (phasic) function than are found in those with a stabilizing, postural (tonic) function.

The role of spindles (based on the complex interplay between intra- and extrafusal fibers) is as a length comparator, as well as a means for supplying the central nervous system with information as to the rate of change (Figs 4.4 and 4.5). Spindles also exert an effect on the strength displayed by the muscle, a phenomenon used in applied kinesiology (AK) and which Goodheart has incorporated into his version of SCS methodology.

Spindle density is not uniform; for example, muscles in the cervical region contain a high density of muscle spindles, especially the deep suboccipital muscles.

Peck et al (1984) report that:

- rectus capitis posterior minor muscles are rich in proprioceptors, containing an average of 36 spindles/g muscle
- rectus capitis posterior major muscles average 30.5 spindles/g muscle
- in contrast, the splenius capitis contains 7.6 spindles/g muscle
- gluteus maximus contains only 0.8 spindles/g muscle.

'Manipulating' the spindles

If the practitioner's thumbs are placed about 5cm apart over the belly of the muscle, where spindles are

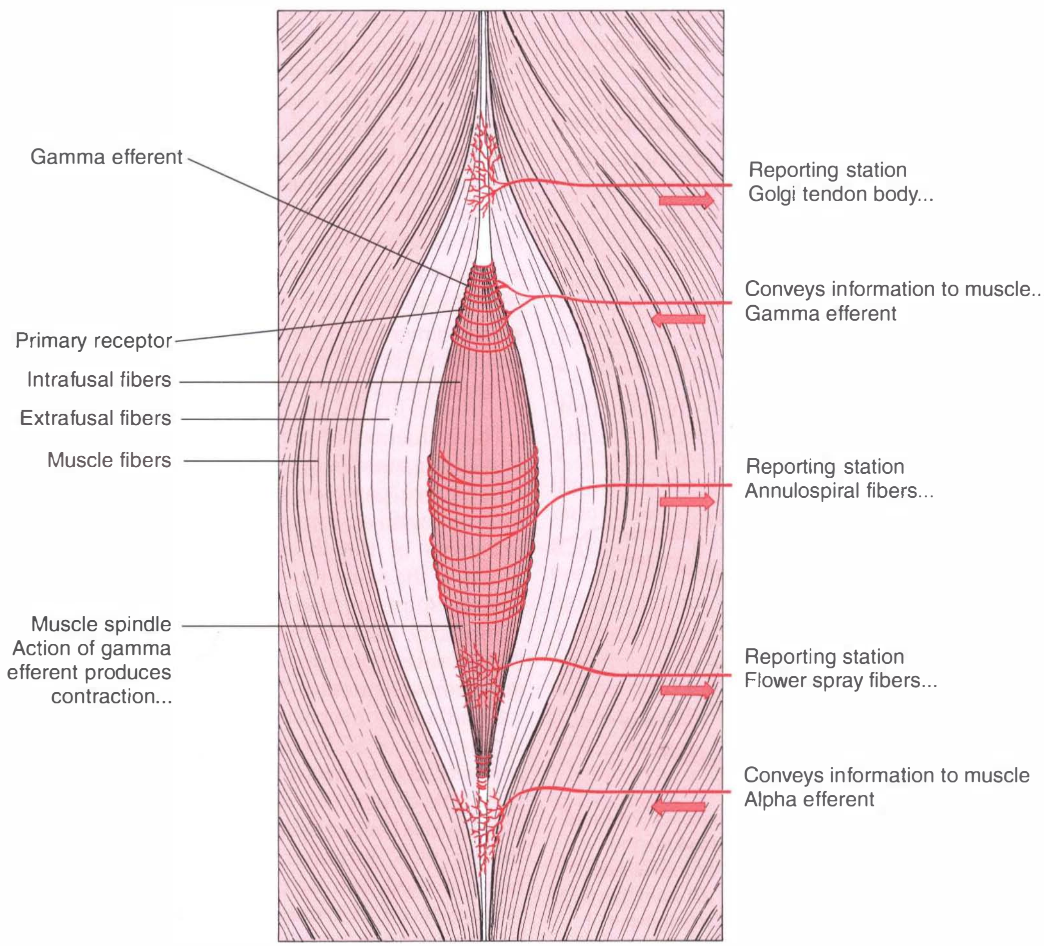

Figure 4.5 Illustration of muscle spindles, showing Golgi tendon organs and neural pathways to and from these reporting stations.

most densely sited, and heavy pressure is exerted by the thumbs pushing towards each other – parallel with the fibers of the muscle in question – a weakening effect will be noted if the muscle has been previously tested and is now tested again (see Fig. 4.4).

The explanation lies in the neurology, as Walther (1988) explains:

The digital maneuver appears to take pressure off the intrafusal muscle fibers, causing a decrease in the afferent nerve impulse and, in turn, causing temporary [minutes at most] inhibition of the extrafusal fibers.

If this experiment fails at first it may be because the precise location of spindles has not been influenced and repetition is called for (and this is especially likely in muscles with sparse spindle presence, such as gluteus maximus; see above regarding spindle density).

This effect of 'weakening' a muscle can be reversed by means of the precisely opposite manipulation of the spindles, in which the thumbs pressing into the tissues are 'pulled' apart. This will only 'strengthen' a hypotonic or inhibited, weak muscle and will not enhance the strength of an already strong one.

Recall that Goodheart suggests applying SCS techniques to muscles only when they initially test as being of 'normal' strength, and then test as weak following a short – 3-second – isometric contraction. This is thought to indicate a neuromuscular imbalance, possibly involving neuromuscular spindle cell function.

The introduction of a spread of the fingers over the spindle cells, during the time in which the tissues in which the spindles lie are being held in a position of ease, strengthens the muscle and inhibits the antagonist to that muscle; a combination of influences that apparently enhances the process of balancing neuromuscular function and reduces the time required for the spindle to 'reset'.

Testing the muscle by means of a short strong isometric contraction after an SCS treatment should subsequently fail to result in its weakening, according to Goodheart's approach.

Psoas treatment using Goodheart's protocol

The supine patient is asked to contract the hip flexors maximally against the practitioner's resistance, by means of hip flexion, adduction and external rotation, for 3 seconds (Fig. 4.6A).

- If the muscle tests as being weaker than previously, it is considered suitable for Goodheart's SCS approach.
- The tender point for psoas usually lies in the belly of the muscle where it crosses the pubic bone.
- This is palpated by a finger and thumb, or two fingers, while the hip is taken into flexion in order to shorten psoas.
- Fine-tuning is introduced to remove sensitivity from the palpated point (Fig. 4.6B).

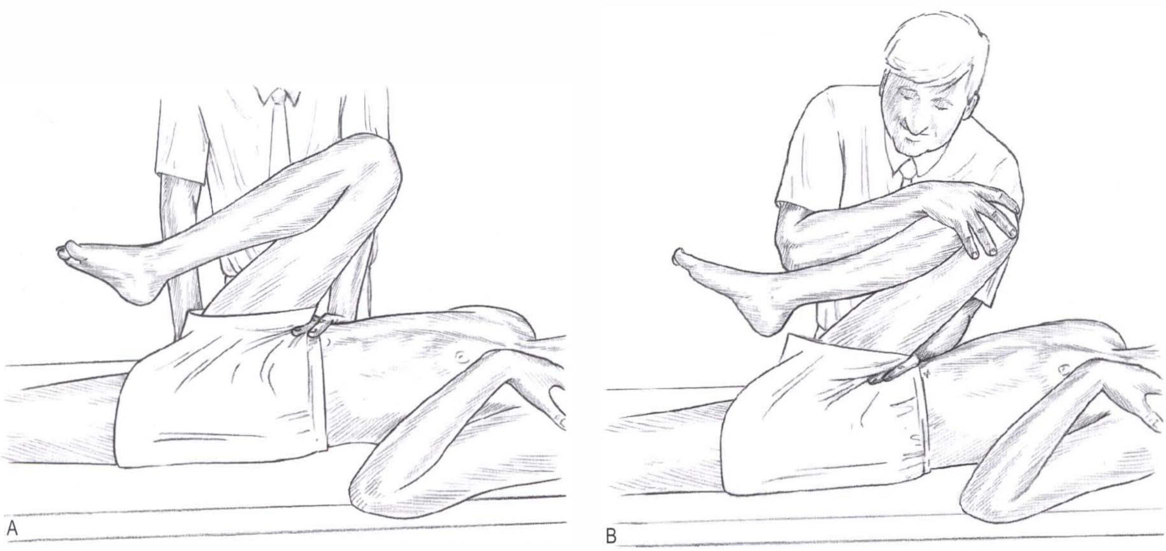

Figure 4.6 Treatment of psoas dysfunction using Goodheart's protocol to achieve ease. (A) hand position, (B) final position of ease.

- Goodheart's refinements are now added, as the patient is asked to inhale deeply and to hold the breath, while at the same time the practitioner strongly spreads the fingers that are in contact with the tender point.
- This is held for 30 seconds, with the patient being told to let the breath go when he feels any sign of strain in holding it.
- After 30 seconds, the patient's leg is very slowly and passively returned to a neutral position.
- A retest of the effects of a short strong isometric contraction should no longer produce a weakening effect, and symptoms of psoas imbalance should be reduced or normalized.

Goodheart's and Morrison's techniques

Different uses of what appear to be SCS mechanisms have been evolved by clinicians such as George Goodheart and Marsh Morrison (see induration technique described in Chapter 1, and the inguinal lift method, later in this chapter).

Coccygeal ('filum terminale cephalad') lift

Goodheart described a method that relies on the crowding, or slackening, of spinal dural tissues, with the coccyx being used as the means of achieving this.

Startling results in terms of improved function and release of hypertonicity in areas some distance from the point of application are claimed (Goodheart 1985). Goodheart's term for this is a 'filum terminale cephalad lift': it is proposed that this be shortened to 'coccygeal lift', at least in this text.

This method focuses on normalizing flexion/extension dysfunction between the spinal column and the spinal cord, despite the spiral nature of the manner in which the spine copes with forced flexion (Illi 1951).

Goodheart and Walther report that there is frequently a dramatic lengthening of the spinal column after application of this procedure, with Goodheart mentioning specifically that, in good health, there should be no difference greater than about half an inch in the measured length of the spinal column sitting, standing and lying, using a tapeless measure which is rolled along the length of the spine.

Goodheart quotes from the work of Upledger and of Breig in order to substantiate physiological and pathological observations which he makes relating to the dura, its normal freedom of movement, and some of its potential for problem-causing when restricted (Breig 1978, Upledger 1984).

Breig states that, using radiography, microscopic examination and mechano-elastic models, it has been shown that there are deforming forces, which relate to normal movements of the spine, impinging on the spinal cord and meninges, from the brainstem to the conus medullaris and the spinal nerves.

Upledger, in discussion of the physiological motion of the central nervous system, recalls that, when assisting in neurosurgery in 1971, in which extradural calcification was being removed from the posterior aspect of the dural tube in the midcervical region, his task was to hold the dura with two pairs of forceps during the procedure. However, he states:

> *The membrane would not hold still, the fully anaesthetized patient was in a sitting position ... and it became apparent that the movement of the dural membrane was rhythmical, independent of the patient's cardiac or respiratory rhythms.*

Goodheart states:

> *Tension can be exerted where the foramen magnum is attached to the dura, and also at the 1st, 2nd and 3rd cervicals, which if they are in a state of fixation can limit motion. The dural tube is completely free of any dural attachment all the way down to the 2nd anterior sacral segment where finally the filum terminale attaches to the posterior portion of the 1st coccygeal segment. The release which comes from the coccygeal lift cannot be just a linear longitudinal tension problem. The body is intricately simple and simply intricate and once we understand the closed kinematic chain and the concept of the finite length of the dura, we can see how spinal adjustments can sometimes allow compensations to take place.*

What is happening during this 'lift'?

The anatomy of what is happening and the process of using this procedure is briefly explained as follows (Sutherland 1939, Williams & Warwick 1980):

- The dura mater attaches firmly to the foramen magnum, axis and third cervical vertebrae, and possibly to the atlas, with a direct effect on the meninges.
- Its caudad attachments are to the dorsum of the first coccygeal segment by means of a long filament, the filum terminale.
- Flexion of the spine alters the length of the intervertebral canal, while the cord and the dura have a finite length (the dura being approximately 2.5 inches longer than the cord, allowing some degree of slack when the individual sits), which Goodheart reasons requires some form of 'arrangement' between the caudal and the cephalad attachments of the dura, a 'take-up' mechanism to allow for maintenance of proper tension on the cord.

- Measurement of the distance between the external occipital protuberance to the tip of the coccyx shows very little variation from the standing to the sitting and lying positions.
- However, if all the contours between these points are measured in the different positions, a wide variation is found: the greater the degree of difference the more likely there is to be spinal dysfunction and, Goodheart postulates, dural restriction and possible meningeal tension.
- Tender areas of the neck flexors or extensors are used as the means of monitoring the lift of the coccyx which is to follow: as the palpated pain and/or hypertonicity eases, so is the ideal degree of lift being approached.

Method

- With the patient prone, the practitioner stands at waist level.
- After palpation and identification of the area of greatest discomfort and/or hypertonicity in the cervical spinal musculature with the practitioner's cephalad hand, the index finger of the caudad hand is placed so that the tip of the index or middle finger is on the very tip of the coccyx, while the hand and fingers follow precisely the contours of the coccyx and sacrum (Figs 4.7A and B).
- This contact slowly and gently takes out the available slack as it lifts the coccyx, along its entire length including the tip, directly towards the painful contact on the neck, using anything up to 15lb (7kg) of force.
- If the painful monitoring point does not ease dramatically, the direction of lift is altered (by a few degrees only) slightly towards one shoulder or the other.
- Once the pain has been removed from the neck point, and without inducing additional pain in the coccyx, this position is maintained for up to one minute.
- Additional ease to the restricted or torsioned dural sleeve can be achieved by using the hand palpating the cervical structures to impart a gentle caudal traction by holding the occipital area in such a way as to lightly compress it, while easing it towards the sacrum (so moving the upper three cervical segments inferiorly) as the patient exhales.
- This hold is maintained for four or five cycles of breathing.

Goodheart and others report dramatic changes in function following use of this procedure, including lengthening of the spine so that it measures equally in all positions, reduction in cervical dysfunction, removal of chronic headaches and release of tension in psoas and piriformis.

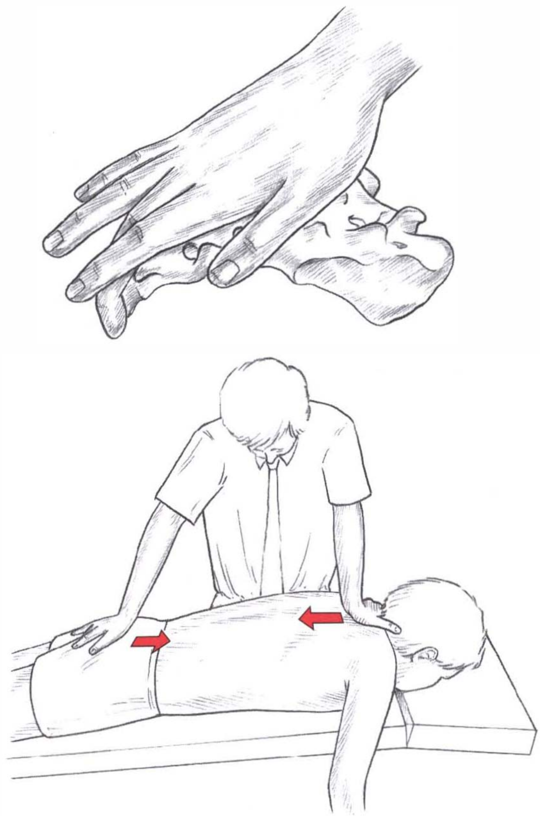

Figure 4.7A and B Goodheart's coccygeal lift technique for release of dural restrictions (see text). Practitioner's left hand is monitoring sensitivity ('tender point') in the cervical region as the coccyx is eased towards the head.

Variations

The author has commonly found that the following variations make application of the coccygeal lift less difficult to achieve:

- Once identified, the patient can be requested to apply the compressive force to the cervical tender point being used as a monitor until ease is achieved.
- This frees the practitioner so that positioning and application of the coccygeal lift is less stressful.
- The position described above, as advised by Goodheart and Walther, can be awkward if the practitioner is slight and the patient tall.
- A side-lying position of the patient allows for a less uncomfortable (for the practitioner) application of the procedure.

- In this instance, the patient monitors the pain in the cervical area once the practitioner has identified it.
- The practitioner stands at upper thigh level, behind the side-lying patient, and, using the fifth finger aspect of the cephalad hand, makes contact along the whole length of the coccyx (the tip of which is cushioned in the hyperthenar eminence), with the elbow braced against his own hip/abdomen area.
- The force required to achieve the lift is applied by means of the practitioner leaning into the hand contact, while the caudad hand stabilizes the anterior pelvis of the patient.
- As in Jones's SCS methods, the patient reports on the changes in palpated pain levels until a 70% reduction is achieved.

Morrison's 'inguinal lift'

American chiropractor Marsh Morrison was responsible for popularizing a number of methods that bear a close resemblance to SCS, and which certainly fall into the context of positional release methods.

His 'induration' technique was described in Chapter 1, and in this chapter a method that has a passing similarity to Goodheart's coccygeal lift method, is described.

Morrison maintained that most women who periodically wear high heels present with a degree of what he termed 'pelvic slippage' that is associated with undue pelvic and low back stress (Morrison 1969).

The use of the inguinal lift is meant to enable low back manipulation and mobilization methods to be more effective, by balancing ligamentous and muscular tension patterns. Morrison recommended its application when low back problems failed to respond to more usual methods, since he maintained that the pelvic imbalance could act to prevent the normalization of spinal dysfunction.

Method

- The patient lies supine with legs apart.
- The superior margin of the pubis should be palpated, close to the inguinal area.
- Pain will be found on the side of 'slippage'.
- This painful site is palpated by the patient and the same reporting of a numerical value for the pain as was described in detail in Chapter 3 should be used, with the objective of reducing pain during the procedure, from a starting level of 10, by at least 70%.
- The patient (if male) should be asked to hold the genitals towards the non-treated side.
- Whether the patient is male or female, a second person should be in the room, since the practitioner is in a vulnerable position when engaging the inguinal area.
- The practitioner stands to the side of the patient, just below waist level on the side to be treated, and places the flat table-side hand on the inner thigh so that the web between finger and thumb comes into contact with the tendon of gracilis, at the ischiopubic junction.
- It is important to have the contact hand on the gracilis tendon relaxed, not rigid, with the 'lift' effort being introduced via a whole-body effort, rather than by means of pushing with that hand, in order to minimize the potential sensitivity of the region.
- Light pressure, superiorly directed, is then made to assess for discomfort.
- If the pressure is tolerable, the hemipelvis on the affected side is 'lifted' towards the shoulder on that side until pain reduces adequately in the palpated tender point, and this position is held for 30 seconds.
- The author has found that introduction of a degree of lift towards the ceiling via the contact hand (sometimes involving support from the other hand) often allows for a greater degree of pain reduction in the palpated point.

Morrison described 'multiple releases' of tension in supporting soft tissues, as well as a more balanced pelvic mechanism.

The author confirms that this is an extremely valuable method that can be applied to lower abdominal 'tension' as well as to pelvic imbalances.

By removing the tension from highly stressed ligamentous and other soft tissues in the pelvis, some degree of rebalancing normalization occurs. Whether this involves the same mechanisms as are thought to occur when SCS is applied, or whether it relates directly to Goodheart's coccygeal lift method, remains for further evaluation. It is an example of positional release, involving a palpated pain point being used as a monitor, and so fits well with SCS methodology.

Positional release and cranial treatment

There is little if any debate regarding the pliability and plasticity of infant skulls. However, in order for cranial manipulation of adults, as currently taught and practiced, to be taken seriously, it is necessary to establish whether or not there is evidence of verifiable motion between the cranial bones during and throughout adult life.

Sutherland (1939) observed mobile articulation between the cranial bones almost 100 years ago and researched the relevance of this for the rest of his life. He also described the influence of the intracranial ligaments and fascia on cranial motion, which he suggested acted (at least in part for they certainly have other functions) to balance motion within the skull.

Sutherland further suggested that there existed what he termed a 'primary respiratory mechanism' which was the motive force for cranial motion. This mechanism, he believed, was the result of the influence of a rhythmic action of the brain, which led to repetitive dilatation and contraction of cerebral ventricles and which was thereby instrumental in the pumping of cerebrospinal fluid (CSF).

The reciprocal tension membranes (mainly the tentorium cerebelli and the falx cerebri), which are themselves extensions of the meninges, along with other contiguous and continuous dural structures, received detailed attention from Sutherland. He described these soft tissues as taking part in a movement sequence which, because of their direct link (via the dura and the cord) between the occiput and the sacrum, produced a total craniosacral movement sequence in which, as cranial motion took place, force was transmitted via the dura to the sacrum, producing in it an involuntary motion.

Five key elements of the cranial hypothesis that Sutherland (1939) proposed were:

- an inherent motility of the brain and spinal cord
- fluctuating CSF
- motility of intracranial and spinal membranes
- mobility of the bones of the skull
- involuntary sacral motion between the ilia.

How do these propositions stand up to examination?

The evidence is that inherent motility of the brain has been proven (Frymann 1971); however, the impact of this function on cranial bone mobility is possibly less than Sutherland imagined. Cranial motion probably contributes towards the composite of forces/pulses which it has been suggested go towards producing what is known as the cranial rhythmic impulse – CRI (Greenman 1989, Magoun 1976, McPartland & Mein 1997).

The CSF fluctuates, but its role remains unclear in terms of cranial motion. Whether it helps drive the observed motion of the brain, or whether its motion is a by-product of cranial (and brain) motion remains uncertain.

The intracranial membranous structures (falx, etc.) are clearly important, since they attach strongly to the internal skull and give shape to the venous sinuses.

Dysfunction involving the cranial bones must therefore influence the status of these soft-tissue structures, which strongly attach to them, and vice versa. To what degree they influence sacral motion is, however, questionable.

The bones of the skull can undoubtedly move at their sutures, albeit to a minute degree (Zanakis 1996). Whether this capacity is simply plasticity that allows accommodation to intra- and extracranial forces, or whether the constant rhythmical motion, the CRI, drives a distinct cranial motion, is debatable.

The clinical implications of restrictions of the cranial articulations seem to be proven, although dispute exists as to precise implications.

There seems to be involuntary motion of the sacrum between the ilia, but the means whereby this occurs remains unclear (or at least unproven), as does the significance of this motion in terms of cranial mechanics.

In adults, most cranial treatments that attempt to normalize perceived restrictions, or to influence function, involve indirect, positional release-type techniques.

Treatment of cranial structures

John Upledger, the internationally acknowledged craniosacral expert, suggests that in order for cranial structures to be satisfactorily and safely treated, 'indirect' approaches are best (Upledger & Vredevoogd 1983).

By following any restricted structure to its easy unforced limit, in the direction towards which it moves most easily ('the direction towards which it exhibits the greatest range of inherent motion'), a sense may be noted in which the tissues seem to 'push back' from that extreme position, at which time the practitioner is advised to become 'immovable', not forcing the tissues against the resistance barrier, or trying to urge it towards greater 'ease', but simply refusing to allow movement.

Upledger et al (1979) explain that, 'it is the inherent motion of the structure as it attempts to return to neutral, that pushes against you'.

It is not within the scope of this text to fully explore these concepts, some of which have been validated by animal and human research. However, a brief summary is needed in order for positional release applications to the cranial structures to be understood in the context of their clinical use (Chaitow 1999, Marmarou et al 1975, Moskalenko et al 1961, Upledger & Vredevoogd 1983).

Greenman (1989) summarizes cranial flexibility as follows:

> *Craniosacral motion involves a combination of articular mobility and change in the tensions within the (intracranial) membranes. It is through the membranes' attachment that the synchronous movement of the cranium and the sacrum occurs.*

During cranial motion, he explains:

The sutures appear to be organized to permit and guide certain types of movement between the cranial bones. These are intimately attached to the dura, and the sutures contain vascular and nervous system elements. The fibers within the sutures appear to be present in directions, which permit and yield to certain motions.

In one model of cranial theory the movement of the cranial elements is said to be driven, at least in part, by a coiling and uncoiling process in which the cerebral hemispheres appear to swing upwards during what is known as cranial flexion, and then to descend again during the extension mode of the cranial cycle.

As the flexion phase occurs, the paired and unpaired bones of the head are thought to respond in symmetrical fashion, which is both palpable and capable of being assessed for restriction.

A variety of other theories exist to explain cranial motion (Heisey & Adams 1993), ranging from biomechanical explanations, in which respiration and muscular activity are the prime movers, to circulatory models, in which venomotion and CSF fluctuations are responsible, and even compound 'entrainment' theories in which the body's multiple oscillations and pulsations combine to form harmonic influences (McPartland & Mein 1997). The truth is that while an undoubted, if minute (Lewandowski et al 1996), degree of motility (self-actuated movement) and mobility (movement induced by external features) can be demonstrated at the cranial sutures, many explanations for the mechanisms involved are as yet based on conjecture.

Motions noted at the sphenobasilar junction

During cranial flexion it is suggested by Upledger & Vredevoogd (1983) and others that the following movements take place simultaneously (it is important to realize that cranial motion is a plastic one rather than one involving gross movement):

- a reduction in the vertical diameter of the skull
- a reduction in the anteroposterior diameter
- an increase in the cranial transverse diameter.

These 'movements' are extremely small, in the region of 0.25mm (250 microns) at the sagittal suture (Zanakis 1996).

Put simply, this means the skull gets 'flatter', narrower from front to back, and wider from side to side. This is all said to happen as the occiput is described as easing forwards at its base, causing the sphenoid to rise at its synchondrosis (Figs 4.8A and B).

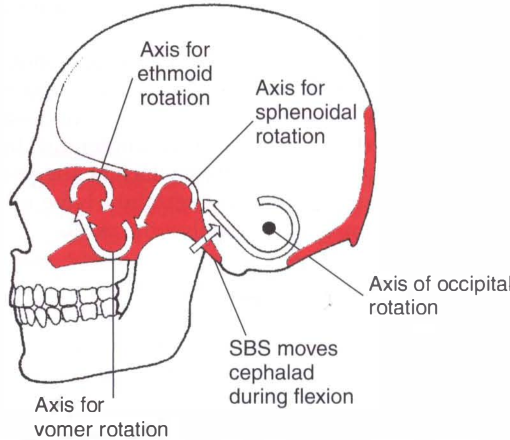

Figure 4.8A Schematic representation of cranial motion. During flexion, the occiput is thought to move anterosuperior, which causes the sphenoid to rise at its synchondrosis. Simultaneous movement occurs in the frontal, facial and nasal bones as indicated. The extension phase of this motion involves a return to a neutral position. SBS, sphenobasilar synchondrosis.

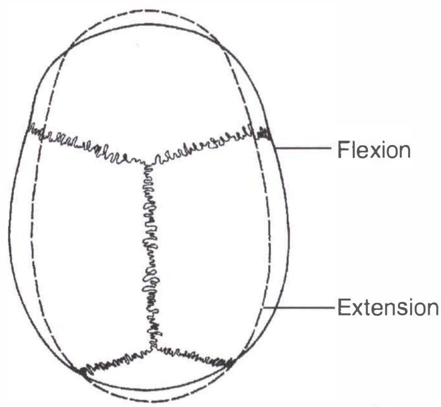

Figure 4.8B The flexion phase of cranial motion ('inhalation phase') causes the skull as a whole to widen and flatten.

Because of its unique structure, this then causes the great wings of the sphenoid to rotate anteriorly, followed by the frontal and facial bones. The temporals and other cranial bones are then said to accommodate this motion by externally rotating.

Two cranial exercises

Two exercises are described below that should allow the reader to get a sense of the subtlety of cranial methodology, and of the influence of positioning in order to effect a change.

Caution

D'Ambrogio & Roth (1997) caution that:

> *With any cranial treatment it is recommended that certain precautions be taken. Symptoms and signs of space-occupying lesions and acute head trauma are clear contraindications. A history of seizures or previous cerebrovascular accident should be approached with caution.*

1. Exercise in sphenobasilar assessment and treatment

- A useful exercise can be performed in which the model/patient is supine and the practitioner sits to the right or left near the head of the table.
- The caudad hand rests on the table holding the occipital area so that the occipital squama closest to the practitioner rests on the hyperthenar eminence while the tips of the fingers support the opposite occipital angle (Fig. 4.9).
- The cephalad hand rests over the frontal bone so that the thumb lies on one great wing and the tips of the fingers on the other great wing, with as little contact as possible on the frontal bone.
- If the hand is small, the contacts can be made on the lateral angles of the frontal bone.
- It is necessary to sit quietly in this position for some minutes in an attempt to palpate cranial motion.
- As sphenobasilar flexion commences (as a sense of 'fullness' is noted in the palpating hand), apparent occipital movement may be noted in a caudad and anterior direction; simultaneously the great wings of the sphenoid may seem to rotate anteriorly and caudally around their transverse axis.

Figure 4.9 Sphenobasilar assessment: hand positions.

- Encouragement of these motions can be introduced in order to assess any existing restriction.
- This is achieved by using very light (grams rather than ounces) pressure in the appropriate directions to impede the movement described.
- During sphenobasilar extension (as the sense of fullness in the palpating hand recedes), a return to neutral may be noted, as the hands appear to return to the starting position.
- Whichever of these motions (flexion, extension) is assessed as being *least* restricted should then be encouraged.
- As this is done, a very slight 'yielding' motion may be noted at the end of the range.
- The tissues should be held in this direction of greatest ease until a sense occurs of the tissues 'pushing back' towards the neutral position.
- A great deal of sensitivity is needed in order to achieve this successfully.

Note It is worth emphasizing the author's belief that while the cranial movements described may be palpated and perceived by the sensitive individual, precisely what is moving, and what moves it, remains unproven. The description of cranial motion given above expresses Upledger's (1984) belief as to what is happening (which is widely held to be 'true' in craniosacral circles) but remains unproven (Chaitow 2005).

2. Temporal freedom of movement exercise (Figs 4.10A and B)

- Sit at the head of the supine model/patient.
- Interlock your fingers (or have the hands cupped, with one in the other) so that the head is cradled, your thumbs are on, and are parallel with, the anterior surfaces of the mastoid processes, while the thenar eminences support the mastoid portion of the bone.
- Your index fingers should cross each other and be in direct contact.
- Assess the freedom of flexion of one side and then the other.
- This is achieved by focusing on the thumb contact on one side at a time.
- As the temporal bones move into the flexion phase the mastoid appears to ease very slightly posteriorly and medially (see Fig. 4.9B)
- This is more a sense of 'give' or plasticity, than actual movement.
- Assess one side and then the other several times, using a very small amount of contact pressure – no more than would be comfortable were this applied to your open eye.

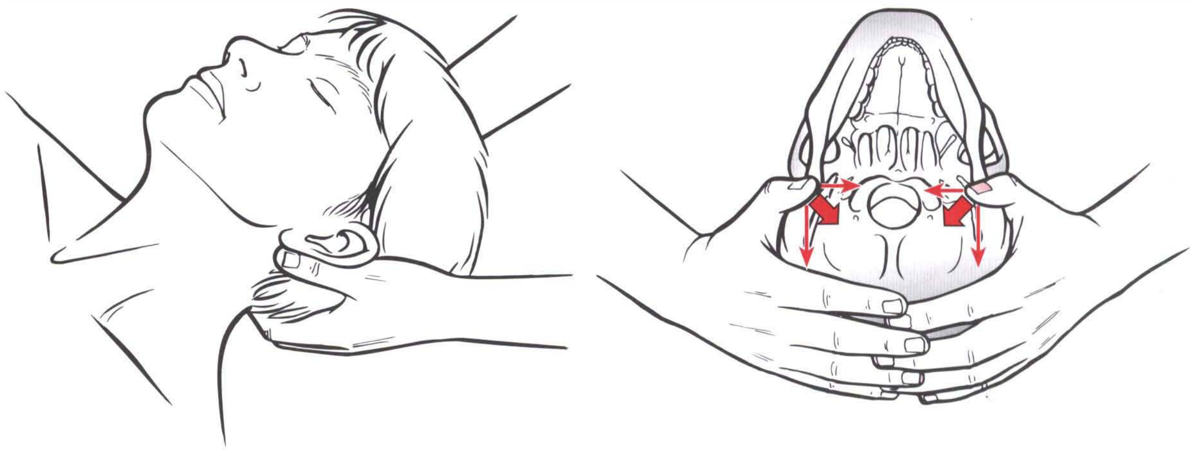

Figure 4.10 (A) Hand and thumb positions for temporal freedom exercise. (B) Directions of motion of the mastoid to encourage temporal flexion. (From Chaitow 1999.)

- By pivoting the middle joints of your index fingers against each other in rhythm with cranial flexion and extension (a very slight sense of fullness in the palms of the hands equates with the flexion phase), this can be achieved without use of actual hand or thumb strength.
- The amount of pressure introduced at the mastoid should be in grams only, and should only be attempting to evaluate whether there is symmetry of easy motion on each side.
- Test slight variations in the directions of applied pressure (grams only) as shown on Figure 4.10B.
- If one side appears to 'move' more freely into flexion, to be more resilient, more plastic, have more give, this is the side of relative freedom of movement.
- To evaluate whether this can be modified towards better balance (equal degree of freedom of movement bilaterally) ease the 'free' side towards its direction of free movement (posteromedially) and hold it there, while at the same time placing the thumb on the other side posterior to the mastoid in order to ease it anterolaterally.
- Hold this for four or five cycles of inhalation/exhalation, or until a sense of pressure against your palpating thumbs is noted.
- At that time release the pressure (grams only!) and reassess to see whether the exercise has created a more balanced sense of motion or plasticity.

Jones's SCS cranial approach

The developer of SCS, Laurence Jones, has also focused attention on cranial dysfunction (Jones 1981) and suggests specific corrective methods for pain ('tender points') or restrictions (Figs 4.11A, B and C).

It may be useful to superimpose these cranial points onto the image shown in Figure 4.11D, showing the superficial muscles of the neck and head.

Consider also the compression/crowding measures suggested (below) to treat these tender points, and how this would modify, shorten, crowd particular structures, particularly if the concept of tensegrity is considered (see Box 3.1).

Locating cranial tender points

Locating the tender points listed below and illustrated in Figure 4.11 (based on Jones's extensive research and clinical experience) is a matter of gentle fingertip palpation.

Despite there being only a very shallow layer of muscle in most of the locations described, trigger points are commonly located on the cranium, and care is needed as to how much pressure is applied.

The suggestion is that the palpating digit should produce just enough discomfort for the patient to register the sensitivity and be able to report on the easing of intensity as positional release is attempted.

How much force?

The author believes that the amount of effort required to produce 'ease' when working on the cranium should be minimal, and should not exceed ounces.

The opinions expressed by others are listed below.

- Jones (1981) speaks of 10lb (5kg) of pressure and more.
- D'Ambrogio & Roth (1997) suggest no more than 1lb (0.5kg) of pressure (this is the degree of force advocated by this text as a maximum, less if possible).
- Upledger (1984), however, believes 5g of pressure to be adequate.

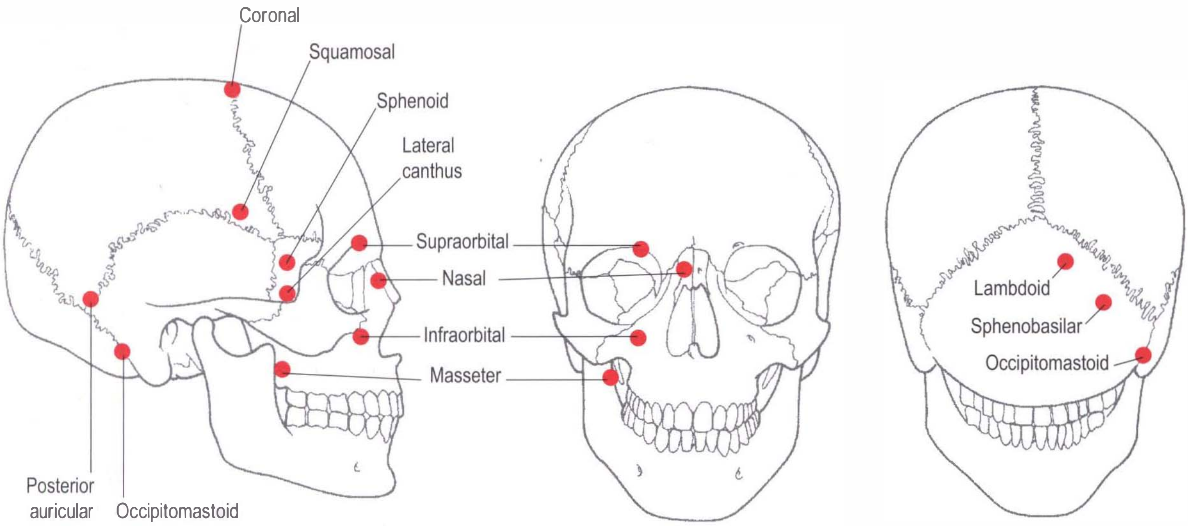

Figure 4.11A, B and C Jones's cranial tender point locations.

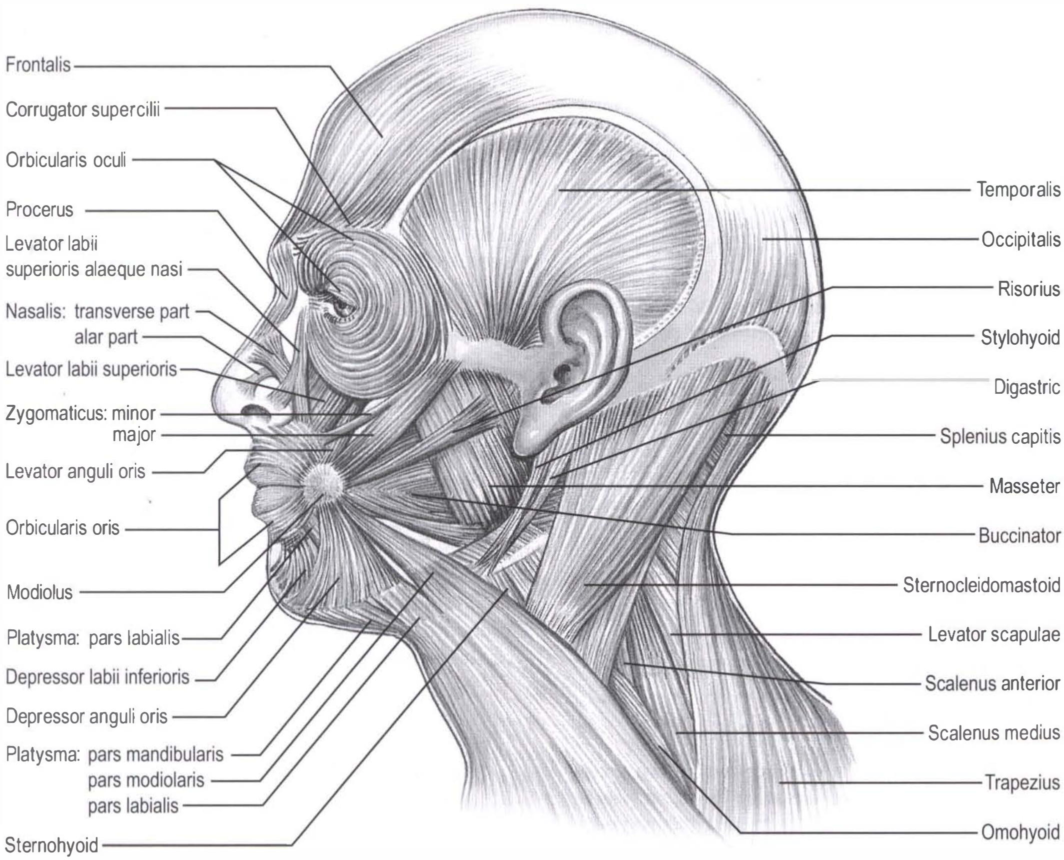

Figure 4.11D Muscles of the head and neck (superficial lateral view) including circumorbital, buccolabial, nasal, epicranial, masticatory and cervical groups. The articular muscles are omitted. Risorius, a variable muscle, here has two fasciculi, of which the lower one is unlabelled. The laminae of the direct labial tractors to both upper and lower lips have been transected to reveal orbicularis oris underneath. (From *Gray's Anatomy*, 38th edn.)

- Pick (1999) has described a practical method for evaluating the ideal 'working' level in different tissues, those that are close to bone and those that have many layers of soft tissue between the surface and bone (Fig. 4.12).

When positioning tissues into ease, varying but light forces should be used in order to ease the palpated pain/sensitivity. Once this has been achieved, the instructions in the text to 'hold the position for up to 90 seconds' will be seen.

It is worth keeping the words of Upledger in mind, regarding 'sensing' the tissues 'pushing back', at which time it is suggested that the structure be held towards the position of ease.

This approach is valid, although there is a difference between the underlying approaches of Jones and Upledger. While Upledger relates his guidelines to craniosacral therapy, Jones is clear that he does not:

> *By the time I had begun to adapt my method to treat cranial disorders, I had acquired an abiding faith in the reliability of the tender points to report the efficacy of treatment. I claim no mechanical understanding of the skull, but I am able to relieve most cranial problems simply by relying on feedback from the tender points. The method probably is not comparable to the cranial studies developed by Dr WG Sutherland (cranial osteopath) but it is much easier to learn and it does an excellent job. On these terms I am willing to forgo mechanical understanding.*

As indicated, the amount of pressure suggested by Jones displays his lack of awareness of (or belief in)

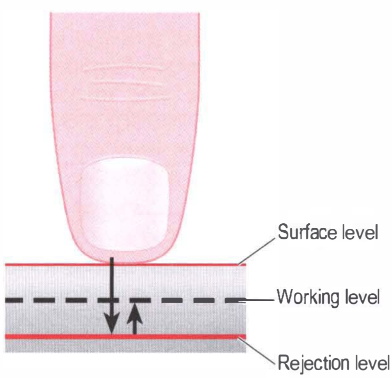

Figure 4.12 The concept of a 'working level'. Surface level involves touch without any pressure at all. Rejection level is where pressure meets a sense of the tissues 'pushing back', defensively. By reducing pressure slightly from the rejection level, the contact arrives at the working level, where perception of tissue change should be keenest, as well as there being an ability to distinguish normal from abnormal tissue (hypertonic, fibrotic, edematous etc.). (From Chaitow 1999.)

the delicacy of the cranial structure, and so the recommended degree of pressure described in the methods outlined below is a scaled down version of Jones's recommendations, and is in line with craniosacral levels of force – ounces (grams) or less, rather than pounds (kilos).

Treatment of cranial dysfunction using Jones's tender points

Jones reports that suitable treatment of dysfunction using the tender points numbered and described below, by positional release, can positively influence a variety of local problems and sensitivities (pain or sensitivity in the tender points, for example), as well as assisting in the resolution of a number of common complaints (Box 4.2).

1. Coronal and sagittal tender points

- The coronal tender point lies on the parietal bone, 1 cm from the anterior medial corner where the coronal and sagittal sutures meet.
- Tender points may also be found on either side of the sagittal suture anywhere between the bregma and the lambda.
- With the patient supine and the practitioner seated at the head, the tender point is monitored while light pressure is applied caudally to the identical site on the non-affected parietal until sensitivity vanishes from the tender point (Fig. 4.13).
- This is held for up to 90 seconds.

2. Infraorbital (or maxillary) tender point

- The infraorbital (or maxillary) tender point is located close to the emergence of the infraorbital nerve (Fig. 4.14).
- Sensitivity here is commonly associated with sinus headache symptoms.
- The patient is supine with the practitioner seated at the head of the table.
- The interlocked hands of the practitioner are placed over the face so that the middles of the palms of the hands rest over the cheekbones.
- Pressure (very light) is applied obliquely, medially and posteriorly, with both hands – as though the heels of the hands are being brought together.
- Mild discomfort is often noted even with light pressure (ounces only, not the 8 lb suggested by Jones!).
- This compressive effort needs to be sustained until a marked feeling of decongestion is reported, along with relief of any sense of pressure previously felt behind the nose.

Box 4.2 Common complaints assisted by treatment of cranial tender points

Infraorbital tender point:
- Periorbital headaches
- Maxillary sinus problems

Lateral canthus tender point:
- Upper dental neuritis

Masseter tender point:
- Earache
- Lower dental neuritis

Nasal tender point:
- Periorbital headaches
- Nasal congestion

Occipitomastoid tender point:
- Frontal and periorbital headaches
- Earache
- Vertigo
- Dysphagia

Posterior auricular tender point:
- Tinnitus

Sphenoid tender point:
- Upper dental neuritis

Squamosal tender point:
- Periorbital headaches
- Upper dental neuritis

Zygomatic tender point:
- Tinnitus
- Earache

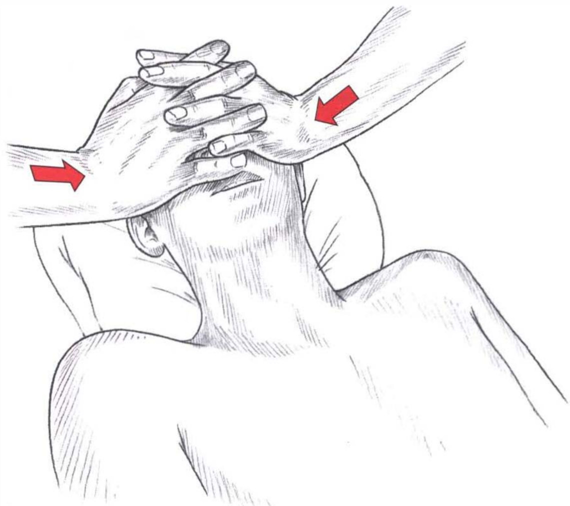

Figure 4.14 Infraorbital tender points, palpation and treatment contacts (only ounces of pressure at most).

3. Lambdoidal dysfunction

- The lambdoidal dysfunction tender point lies on the occipital bone, just medial to the lambdoidal suture approximately 2.5cm below the level of the lambda, obliquely above and slightly lateral to the inion.
- Positional release treatment is applied via light compression of precisely the same site on the contralateral side of the occipital bone (Fig. 4.15), until discomfort vanishes from the palpated tender point.
- The direction in which pressure is applied can vary from an anterior direction to a medial one, whichever produces ease in the tenderness, involving a light pressure of the treatment area towards the tender point site.

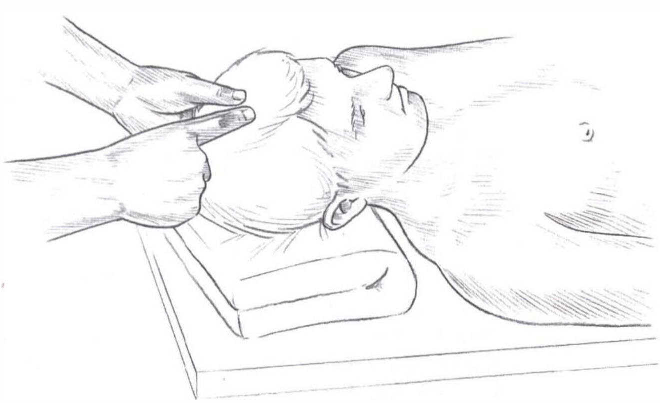

Figure 4.13 Coronal tender point, palpation and treatment contacts and hand positions.

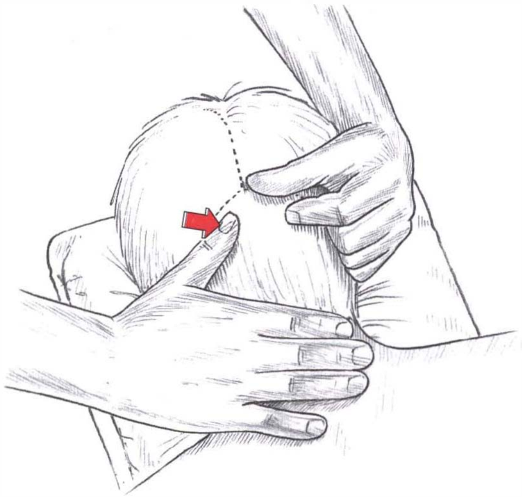

Figure 4.15 Lambdoidal dysfunction palpation and treatment contacts and hand positions.

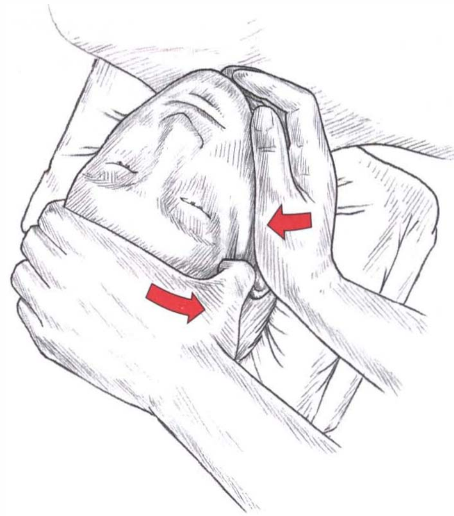

Figure 4.16 Lateral canthus (right side) dysfunction/tender point palpation and treatment contacts and hand positions.

- The patient should be seated or prone for easy access to the points (tender point and treatment point).

4. Lateral canthus

- The lateral canthus tender point lies in the temporal fossa, approximately 2 cm lateral to the end of the lateral canthus.
- The practitioner is on the ipsilateral side and treatment to the supine patient involves the practitioner's cephalad hand spanning the frontal bone so that the thumb can rest on the tender point as a monitor (Fig. 4.16).
- The other hand, using the thenar eminence as a contact, applies superiorly directed pressure towards the palpating thumb, via a contact on the zygomatic bone and the zygomatic process of the maxilla.
- The palpating cephalad hand exerts light pressure on the frontal bone towards the zygoma, so crowding the tissues and articulations in the area.
- Varying directions of application of these forces should be attempted until sensitivity in the palpated point eases markedly.
- The position of ease is maintained for up to 90 seconds.

5. Masseter

- The masseter tender point lies on the anterior border of the ascending ramus of the mandible, and may be involved in temporomandibular (TMJ) dysfunction as well as mandibular neuritis.
- The patient should be supine, with the jaw slack and the mouth open approximately 1 cm (Fig. 4.17).
- The practitioner is seated or stands on the non-affected side, the heel of the caudad hand resting on the point of the chin, applying very light pressure towards the affected side as the index finger of that hand monitors the tender point.
- The other hand, which lies on the dysfunctional side of the patient's head (on the parietal/temporal area), offers counterforce to the palpating hand's pressure via the heel of the hand which is stabilizing the head, while the fingers (which are just above the zygoma) lightly press towards the tender point.

6. Nasal dysfunction

- The nasal dysfunction tender point is located on the side of the bridge of the nose and, as this is palpated, tenderness is relieved by application of light pressure towards it from the same point on the contralateral side of the nose (Fig. 4.18).

7. Occipitomastoid

- The occipitomastoid tender point lies in a vertical depression just medial to the mastoid process approximately 3 cm superior to its tip.
- The patient lies supine and the practitioner holds the head in both hands (Fig. 4.19), with one finger on the tender point.
- The heels of the hands contact the parietal bones, the practitioner making absolutely certain that they are superior to the suture line between it and the temporal bones.

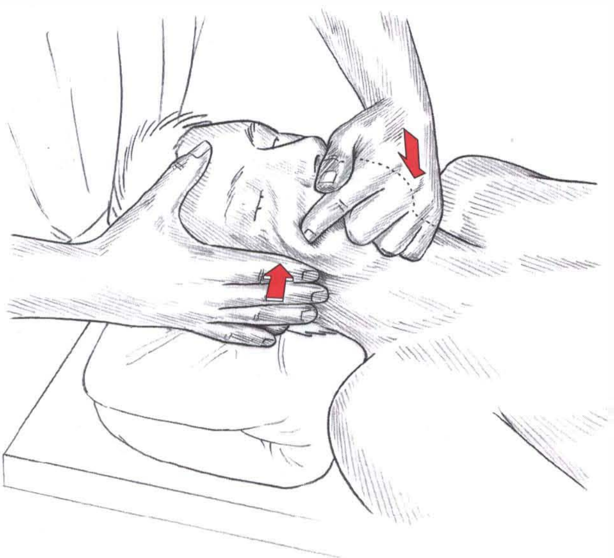

Figure 4.17 Masseter (right side) dysfunction/tender point palpation and treatment contacts and hand positions.

- A very slight (ounces at most) effort is introduced by each hand – one 'screwing' its contact clockwise and the other anticlockwise – until sensitivity vanishes from the tender point.
- The counter-rotation produced in this way attempts to cause the temporal bones to rotate in opposite directions around a transverse axis.
- The particular mechanics involved in the dysfunction will determine which side of the head, the ipsilateral or contralateral, requires a clockwise or an anticlockwise rotational effort.
- Once the tender point palpates as much less sensitive than previous to the introduction of counter-rotation, this is held for 90 seconds.

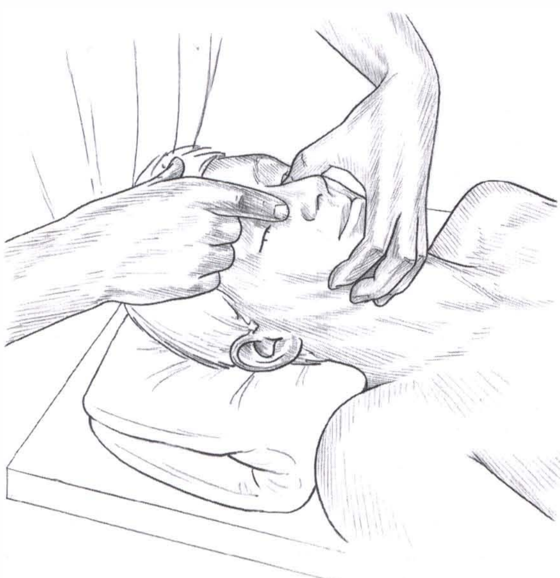

Figure 4.18 Nasal dysfunction/tender (right side) point palpation and treatment contacts and hand positions.

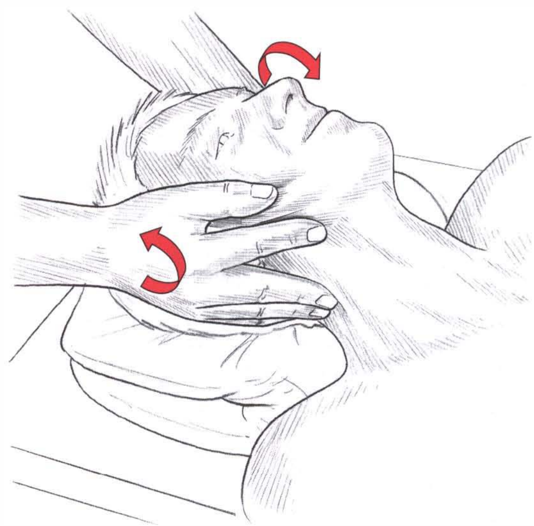

Figure 4.19 Occipitomastoid dysfunction/tender point palpation and treatment contacts and hand positions.

8. Posterior auricular

- The posterior auricular tender point lies in a slight depression approximately 4cm behind the pinna of the ear, just below its upper border (Fig. 4.20).
- Treatment requires the patient to be side-lying, with the affected side uppermost, resting on a small cushion which supports both the ear and zygoma of the contralateral side.
- Light pressure is applied to the parietal bone to 'bend' the skull 'sideward and over an anteroposterior axis' (Jones's words).
- Counterpressure can usefully be offered by the other hand.
- This should remove the pain from the tender point and should be held for up to 90 seconds.
- Jones reports that tinnitus and dizziness often respond well to easing of tenderness in this point.

9. Sphenobasilar

- The sphenobasilar tender point lies 2cm medial to the lambdoidal suture, above the level of the inion.
- Treatment (Fig. 4.21) involves the practitioner cupping the occipital bone (patient supine, practitioner seated at head of table) in one hand and the frontal bone in the other; tenderness in the point can be monitored by one of the fingers of the inferior hand cupping the occiput.
- Gentle counter-rotation to the frontal and occipital bones is then introduced, producing torsion through an anteroposterior axis.

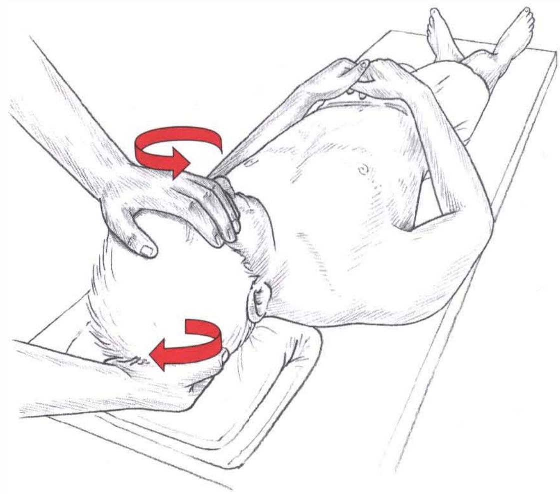

Figure 4.21 Sphenobasilar dysfunction/tender point palpation and treatment contacts and hand positions (use ounces of pressure at most).

- Counter-rotation (one hand going clockwise, the other counterclockwise) will be found to relieve the tender point sensitivity more effectively in one pair of directions than the other, and this should be maintained for 90 seconds.
- The amount of force introduced in these contacts should be minimal, involving ounces only.

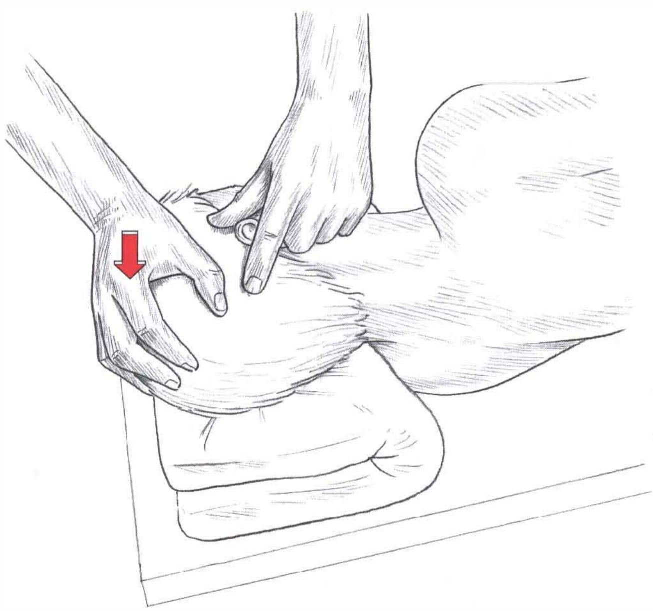

Figure 4.20 Posterior auricular (right side) dysfunction/tender point palpation and treatment contacts and hand positions.

10. Sphenoid

- The sphenoid (or lateral sphenobasilar) tender point lies on the great wing of the sphenoid, in a depression close to the lateral ridge of the orbit.
- Jones notes that the temple on the affected side will normally palpate as more prominent than its pair and that the tenderness may relate to tension in the temporalis muscle, as well as to the eccentric stress on the sphenoid.
- Positional release treatment is achieved by the application of pressure (light, ounces only) with the heel of one hand from the contralateral great wing towards the monitoring index finger contact on the affected side, which offers counterpressure (Fig. 4.22).

11. Squamosal suture

- The tender point on the squamosal suture lies on the superior border of the temporal bone and is best palpated from above (Fig. 4.23).
- The patient should be side-lying with a pillow under the head and the affected side uppermost.
- Positional release is achieved by placement of three fingers above and parallel to the temporoparietal articulation, distracting the parietal bone away from the temporal bone.
- Light pressure only is required (grams or ounces at most).

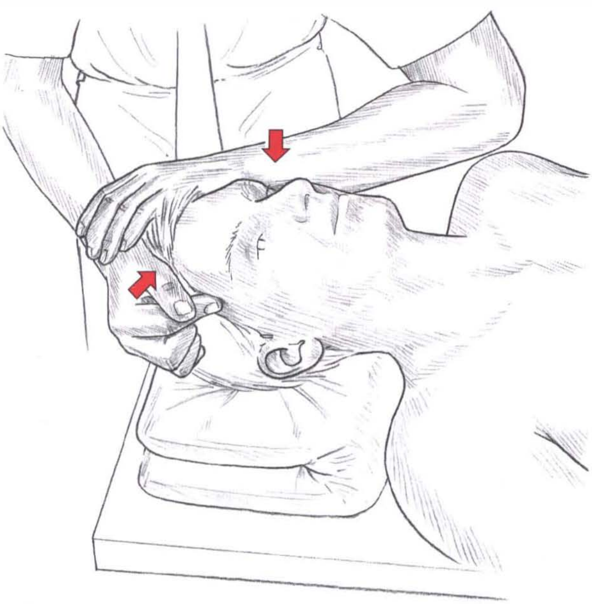

Figure 4.22 Sphenoid (right side) dysfunction/tender point palpation and treatment contacts and hand positions (use very light pressure only).

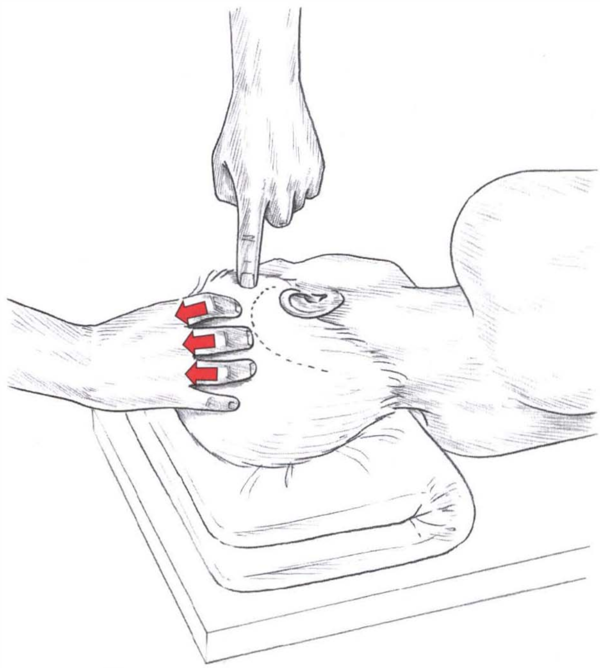

Figure 4.23 Squamosal (right side) dysfunction/tender point palpation and treatment contacts and hand positions.

- The angle of 'pull' should be varied until the pain noted from pressure on the tender point is reduced markedly or vanishes completely.
- This is held for 90 seconds or until a 'softening' warmth is noted.

Figure 4.24 Masseter muscle (right side) dysfunction/tender point palpation and treatment contacts and hand positions.

- If the tender point is more anterior, closer to the squamosal border, then the contact fingers would be placed on the frontal bone, and it is this that would be distracted obliquely away from the temporal bone in an anterosuperior direction, until pain is reduced or vanishes.

Jones reports that treating this point often relieves upper dental neuritis.

12. Zygomatic

The zygomatic tender point lies just above the zygomatic arch of the temporal bone, about 3cm anterior to the external auditory meatus.

Treatment is identical to that applied to the lateral canthus point (Fig. 4.16), except that the 'crowding' forces are applied approximately 4cm (1.5 inches) more posteriorly.

Positional release methods for TMJ problems

Method 1

DiGiovanna (Scariati 1991) describes a counterstrain method for treating tenderness in the masseter muscle (Fig. 4.24).

- The patient is supine and the practitioner sits at the head of the table.
- One finger monitors the tender point in the masseter muscle, below the zygomatic process.
- The patient is asked to relax the jaw and, with the free hand, the practitioner eases the jaw towards the affected side until the tender point is no longer painful.
- This is held for 90 seconds before a return is allowed to neutral and the point repalpated.

See also Figure 4.17.

Method 2 (TMJ compression and decompression)

Upledger uses a positional release via 'decompression' on the TMJ, as a preliminary to application of a gentle traction on the joint in order to disengage overapproximation.

The TMJ can be treated by a simple approach involving 'crowding' or compression followed by traction or decompression (Upledger & Vredevoogd 1983).

- The contact (no squeezing just a non-sliding contact) is on the skin.
- The palms and fingertips are placed on the skin of the cheeks of the supine patient as the practitioner sits at the head.
- Light traction on the skin pulls on connective tissue, which is attached to bone.

Figure 4.25A TMJ treatment crowding/compression stage of treatment (Upledger & Vredevoogd 1983).

Figure 4.25B Distraction/release phase of TMJ treatment.

- The skin is taken to a point of resistance as the hands are drawn cephalad (taking out the slack).
- This is held until any sense of the structures moving, or repositioning themselves, ceases – which could take a minute or more (Fig. 4.25A).
- At this time, skin traction is introduced in a caudad direction, and held at its easy resistance barrier in traction until all restriction has released – which can take some minutes (Fig. 4.25B).
- According to Upledger, this approach can produce multiple profound releases throughout the cranial mechanism, including the reciprocal tension membranes and sutures.

Method 3

Goodheart (Walther 1988) describes an in-the-mouth approach using SCS principles to treat the internal (most likely to be involved in problems associated with jaw closing) or external (most likely to be involved in jaw opening) pterygoid muscles.

- The patient is supine and the practitioner stands to one side.
- The patient is asked to open the mouth and the practitioner inserts a gloved index finger (caudad hand) which palpates beyond the last molar on the side on which she is standing (Fig. 4.26).
- The practitioner monitors the pain in the pterygoid muscle area with the index finger.
- The primary spinal motion for obtaining reduced tenderness in the pterygoid muscle is head and neck hyperflexion, with some lateral flexion and rotation.
- The position is changed until the maximum amount of pain is reduced in the pterygoid muscle.
- The patient remains passive while the head and neck are maneuvered to obtain the relief.
- When the optimal position is reached the patient takes a deep inspiration and holds it as long as possible.
- The practitioner holds the position for 30 or more seconds and then slowly and passively maneuvers the patient back to neutral.
- Re-evaluation is then performed, using digital pressure on the muscle.

These examples indicate the versatility and some of the variations of the application of osteopathic manipulative treatment, which in all instances incorporate positional release methods being used in a variety of ways, based on the needs of the particular condition and patient.

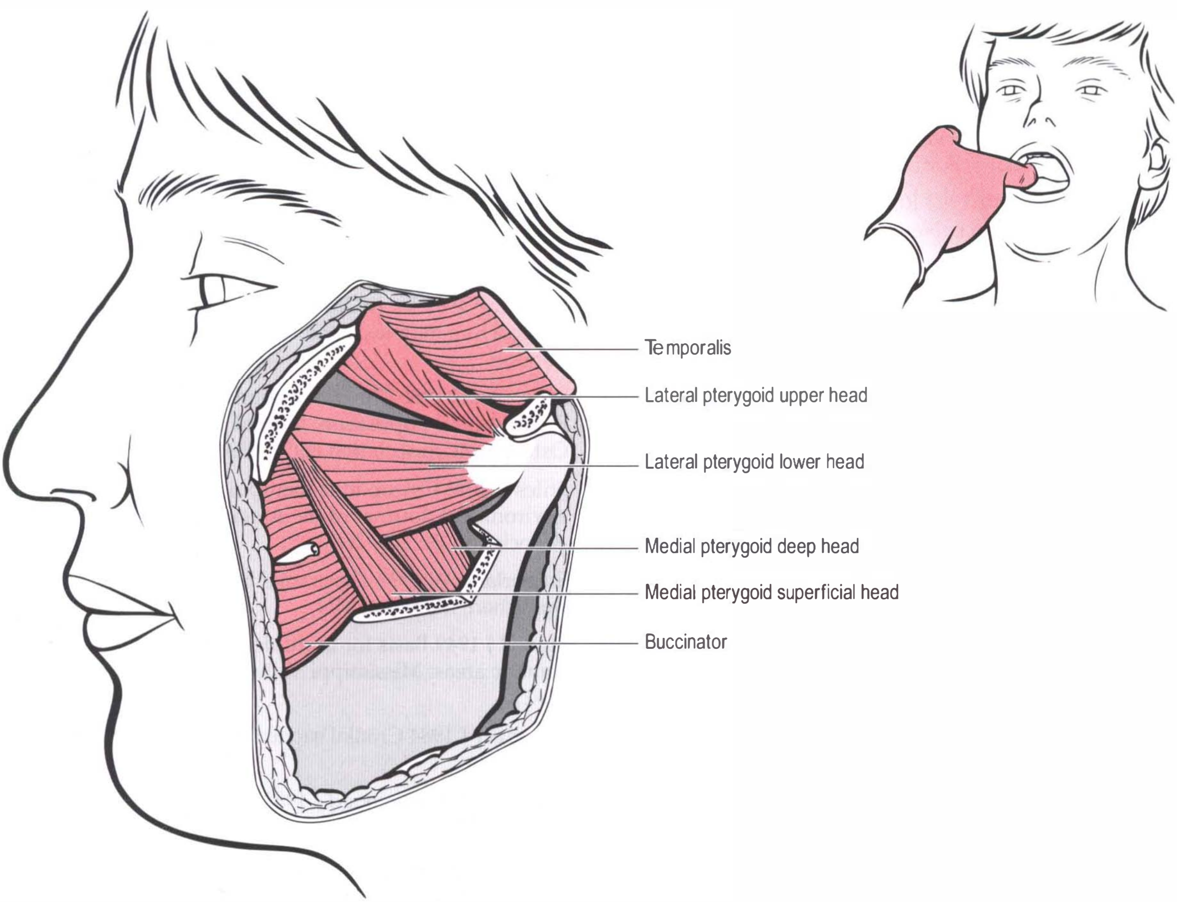

Figure 4.26 The pterygoid muscles, and hand position for palpating these on the right side. (From Chaitow 1999.)

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Muscular pain: trigger points, fibromyalgia and positional release

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CHAPTER CONTENTS

Muscle pain

Pain is the most frequent presenting symptom in medical practice in the industrialized world, and muscular pain forms a major element of that category of symptoms.

According to the leading researchers into the topic, Wall & Melzack (1989), myofascial trigger points are a key element in all chronic pain, and are often the main factor maintaining it.

It is clearly of major importance that practitioners and therapists have available safe and effective methods for handling myofascial and other pain syndromes, such as the current apparent epidemic involving muscular pain associated with chronic fatigue, now defined as fibromyalgia, or 'fibromyalgia syndrome' (FMS) (Wolfe et al 1990).

Simons et al (1999) have demonstrated the distinct connection between myofascial trigger point activity and a wide range of pain problems and sympathetic nervous system aberrations.

Trigger (and other nonreferring pain) points commonly lie in muscles that have been stressed in a variety of ways, often as a result of:

- postural imbalances (Barlow 1959, Goldthwaite 1949, Lewit 1999)
- congenital factors – warping of fascia via cranial distortions (Upledger 1983), short leg problems or small hemipelvis (Simons et al 1999)
- occupational or leisure overuse patterns (Rolf 1977)
- emotional states reflecting into the soft tissues (Latey 1986)
- referred/reflex involvement of the viscera producing facilitated (neurologically hyperreactive) segments paraspinally (Beal 1983, Korr 1976)
- hypermobility (Muller et al 2003)
- trauma (see Chapter 2 for discussion of the evolution of dysfunction).

What causes the trigger point to develop?

Simons and Travell are the two physicians who, above all others, have helped our understanding of trigger points. Simons et al (1999) have described the evolution of trigger points as follows:

> *In the core of the trigger lies a muscle spindle which is in trouble for some reason. Visualize a spindle like a strand of yarn in a knitted sweater ... a metabolic crisis takes place which increases the temperature locally in the trigger point, shortens a minute part of the muscle (sarcomere) – like a snag in a sweater – and reduces the supply of oxygen and nutrients into the trigger point. During this disturbed episode an influx of calcium occurs and the muscle spindle does not have enough energy to pump the calcium outside the cell where it belongs. Thus a vicious cycle is maintained and the muscle spindle can't seem to loosen up and the affected muscle can't relax.*

Simons has tested his concept and found that at the core of a trigger point there is an oxygen deficiency compared with the muscle tissue which surrounds it.

Travell (Travell & Simons 1992) confirmed that the following factors can all help to maintain and enhance trigger point activity:

- nutritional deficiency, especially vitamin C, B-complex and iron
- hormonal imbalances (low thyroid, menopausal or premenstrual situations, for example)
- infections (bacteria, viruses or yeast)
- allergies (wheat and dairy in particular)
- low oxygenation of tissues (aggravated by tension, stress, inactivity, poor respiration).

The repercussions of trigger point activity go beyond simple musculoskeletal pain – take, for example, their involvement in hyperventilation, chronic fatigue and apparent pelvic inflammatory disease as discussed below.

Muscle pain and breathing dysfunction

Trigger point activity is particularly prevalent in the muscles of the neck/shoulder region which also act as accessory breathing muscles, particularly the scalenes (Gerwin 1991, Sachse 1995).

In situations of increased anxiety and chronic fatigue, the incidence of borderline or frank hyperventilation is frequent, and may be associated with a wide range of secondary symptoms including headaches, neck, shoulder and arm pain, dizziness, palpitations, fainting, spinal and abdominal discomfort, digestive symptoms relating to diaphragmatic weakness and stress, as well as the anxiety-related phenomena of panic attacks and phobic behavior (Bass & Gardner 1985, Njoo et al 1995, Perri & Halford 2004).

Clinically, where upper chest breathing is a feature, the upper fixators of the shoulders and the intercostal, pectoral and paraspinal muscles of the thoracic region are likely to palpate as tense, often fibrotic, with active trigger points being common (Roll & Theorell 1987). Successful breathing retraining and normalization of energy levels seems in such cases to be accelerated and enhanced following initial normalization of the functional integrity of the muscles involved in respiration, directly or indirectly (latissimus dorsi, psoas, quadratus lumborum) (Lum 1984).

Pelvic pain and myofascial trigger points

Slocumb (1984) and Weiss (2001) have both shown that in a large proportion of chronic pelvic pain problems in women, often destined for surgical intervention, the prime cause of the symptoms involves trigger point activity in muscles of the lower abdomen, perineum, inner thigh, and even on the walls of the vagina. They have also demonstrated that appropriate deactivation of these trigger points can remove or relieve symptoms of both interstitial cystitis and chronic pelvic pain.

The evolution of muscle dysfunction

Progressive adaptation

See also discussion of progressive changes in Chapter 2.

Selye has described the progression of changes in tissues that are being locally stressed (local adaptation syndrome). Stress in this context is seen as anything at all that requires the muscle to adapt to it. In soft-tissue settings this often involves trauma or microtrauma, allowing what Liebenson (1996) called 'post-trauma adhesion formation' to occur.

Selye (1984) described an initial alarm (acute inflammatory) stage followed by a stage of adaptation or resistance, when stress factors are continuous or repetitive, at which time muscular tissue may become progressively fibrotic.

If such changes are taking place in muscle that has a postural rather than a phasic function, the entire muscle structure will shorten, rather than just the fibers being influenced, and parts of the muscle may become fibrotic (Janda 1985).

Clearly such fibrotic tissue, lying in altered (shortened) muscle, cannot simply 'release' in order to allow the muscle to achieve its normal resting length (a prerequisite for the normalization of trigger point activity) – to achieve that some degree of stretching is a requirement.

Pressure

Along with various forms of stretching (passive, active, muscle energy techniques, proprioceptive neuromuscular facilitation, etc.), it was observed in Chapter 2 that inhibitory pressure is commonly used in treatment of trigger points.

Such pressure technique methods (analogous to acupressure or shiatsu methodology) are often successful in achieving at least short-term reduction in trigger point activity, and are a part of what has become known as 'neuromuscular technique' (NMT) (Chaitow 1991).

Application of inhibitory pressure may involve elbow, thumb, finger or mechanical pressure (a wooden, rubber-tipped T-bar is commonly employed by therapists to save thumb wear-and-tear) or cross-fiber friction.

In addition, various positional release methods, including SCS, have been used to successfully release hypertonicity, improve function and reduce perceived pain. A combination of inhibitory pressure, accompanied by SCS, followed by stretching, can be employed in a sequential manner – known as integrated neuromuscular inhibition technique, or INIT (as described later in this chapter) – in order to deliver the benefits of all these methods in a single coordinated manner.

Gutstein's model

Gutstein (1955) called localized functional sensory and/or motor abnormalities of musculoskeletal tissue (comprising muscle, fascia, tendon, bone and joint) 'myodysneuria' (now known as fibromyalgia, formerly 'fibrositis' and 'muscular rheumatism').

The proposed causes of such changes are thought to include:

- acute and chronic infections, which may stimulate sympathetic nerve activity via the resulting toxic debris
- excessive heat or cold, changes in atmospheric pressure and draughts (Petersen 1934)
- mechanical injuries, both major and repeated minor microtraumas
- postural strain and unaccustomed exercises that may predispose towards soft-tissue changes via the processes of sensitization or facilitation (Korr 1978)
- allergic and endocrine factors that can disturb the autonomic nervous system (Lowe & Honeyman-Lowe 1998)
- inherited factors that make adaptation and adjustment to environmental factors inefficient (Knowlton 1990)
- arthritic changes: since muscles are the active components of the musculoskeletal system, it is logical to assume that their overall structural and functional state influences joints
- chronic spasm, contraction and shortening of muscles that may contribute towards osteoarthritic changes, which themselves produce further neuromuscular modification and new symptoms (Mense & Simons 2001)
- visceral diseases, which intensify and precipitate somatic symptoms in the distribution of their spinal and adjacent segments; paraspinal muscles become hypertonic as a result of organ dysfunction, which 'feeds back' into the tissues alongside the segment that innervates them (Beal 1985).

Diagnosis of myodysneuria was made according to some of the following criteria, according to Gutstein (1955):

- A varying degree of muscular tension and contraction was found to be present, although sometimes adjacent, non-indurated tissues were more painful than the contracted soft tissues.
- Sensitivity to pressure or palpation of affected muscles and their adjuncts was the main method of assessment.
- When contraction was marked, the application of deep pressure to demonstrate tenderness was needed.

An epidemic of muscle pain problems seems currently to affect most industrialized societies.

A detailed evaluation of aspects of this topic is appropriate in the context of descriptions of positional release techniques in general and SCS in particular, since they have shown themselves to be extremely useful in treating both myofascial pain problems (trigger points), as well as the far less responsive problems associated with fibromyalgia syndrome (FMS) – described below.

Pathophysiology of fibromyalgia/fibrositis/myodysneuria

The changes that occur in tissue involved in the onset of myodysneuria/fibromyalgia seem to involve localized sympathetic predominance, associated with changes in the hydrogen ion concentration and calcium and sodium balance in the tissue fluids.

It has been known for generations that such changes are usually associated with vasoconstriction and hypoxia/ischemia (Baldry 2001, Nixon & Andrews 1996). Pain results, it is thought, as these alterations affect the pain sensors and proprioceptors (Mense & Simons 2001).

Muscle spasm and hard, nodular, localized tetanic contractions of muscle bundles, together with vasomotor and musculomotor stimulation, intensify each other, creating a vicious cycle of self-perpetuating impulses (Janda 1991).

The discussions and examples in earlier chapters suggest that when descriptors are used such as 'spasm, hard, tetanic contracture', there is a possibility that these bunched tissues might benefit from being 'held' in ease, involving supporting them in the directions of shortness and tightness (see Chapter 1, 'exaggerate the distortion').

There are varied and complex patterns of referred symptoms that may result from such 'trigger' areas, as well as local pain and minor disturbances. Such sensations as aching, soreness, tenderness, heaviness and tiredness may all be manifest, as may modification of muscular activity due to contraction resulting in tightness, stiffness, swelling, etc. (Lewit 1999).

If muscles display 'modification of muscular activity' and 'contraction, tightness etc.', these tissues might benefit from Goodheart's positional release approaches, as described in Chapters 1, 3 and 4.

Self-care application is also to be encouraged using SCS. Some examples are given at the end of this chapter.

A great deal of research has been carried out relating to chronic muscular pain and fibromyalgia, resulting in the production of strict guidelines for a diagnosis of fibromyalgia by the American College of Rheumatology (Wolfe et al 1990). Although not universally accepted, these guidelines are the most widely used, and are listed in Box 5.1.

Associated conditions that predispose towards, and accompany, fibromyalgia are to be found in Box 5.2.

Box 5.1 American College of Rheumatology criteria for the diagnosis of fibromyalgia

1. History of widespread pain

Pain is considered widespread when all of the following are present:

- pain in the left side of the body
- pain in the right side of the body
- pain above the waist
- pain below the waist.

In addition, the patient should complain of pain in the spine or the neck or front of the chest, or thoracic spine or low back

2. Pain in 11 of 18 palpated sites

There should be pain on pressure (around 4 kg of pressure maximum) in not less than 11 of the following sites:

- either side of the base of the skull where the suboccipital muscles insert
- either side of the side of the neck between the fifth and seventh cervical vertebrae (technically described as between the 'anterior aspects of intertransverse spaces')
- either side of the body on the midpoint of the muscle which runs from the neck to the shoulder (upper trapezius)
- either side of the body on the origin of the supraspinatus muscle which runs along the upper border of the shoulder blade
- either side, on the upper surface of the rib, where the second rib meets the breast bone, in the pectoral muscle
- on the outer aspect of either elbow just below the prominence (epicondyle)
- in the large buttock muscles, either side, on the upper outer aspect in the fold in front of the muscle (gluteus medius)
- just behind the large prominence of either hip joint in the muscular insertion of piriformis muscle
- on either knee in the fatty pad just above the inner aspect of the joint.

Do trigger points cause fibromyalgia?

Myofascial pain syndrome (MPS) is a disorder in which pain of a persistent aching type is referred to a target area (usually localized rather than general such as occurs in FMS) by trigger points lying some distance away from the site of reported pain (Fig. 5.1). This phenomenon has long been recognized as a cause of severe and chronic pain in many people.

Since some experts insist that the 'tender' points palpated when diagnosing fibromyalgia need to refer pain elsewhere if they are to be taken seriously in the diagnosis (thus making them trigger points by definition), the question needs to be asked whether MPS is not the self-same condition as FMS. Or, more probably, whether at least some, and perhaps much, of the pain experienced by people with FMS is not in fact myofascial (trigger point) pain.

Scandinavian researchers showed in 1986 that around 65% of people with fibromyalgia had identifiable trigger points, and it is clear therefore that there is an overlap between FMS and MPS (Henriksson 1993).

Baldry (1993), a leading British physician/acupuncturist, has summarized the similarities and differences between these two conditions and these are given in Box 5.3.

Box 5.2 Main associated conditions which predispose towards and accompany fibromyalgia

These include the following (Block 1993, Duna & Wilke 1993, Fishbain 1989, Goldenberg 1993a, Jacobsen 1992, Kalik 1989, Rothschild 1991):

- 100% of people with FMS have muscular pain, aching and/or stiffness (especially in the morning)
- almost all suffer fatigue and badly disturbed sleep with consequent reduction in production of growth hormone
- symptoms are almost always worse in cold or humid weather
- the majority of people with FMS have a history of injury – sometimes serious but often only minor – within the year before the symptoms started
- 70–100% (different studies show variable numbers) are found to have depression (though this is more likely to be a result of the muscular pain rather than part of the cause)
- 34% to 73% have irritable bowel syndrome
- 44% to 56% have severe headaches
- 30% to 50% have Raynaud's phenomenon
- 24% suffer from anxiety
- 18% have dry eyes and/or mouth (sicca syndrome)
- 12% have osteoarthritis
- 7% have rheumatoid arthritis
- an as yet unidentified number of people with FMS have had silicone breast implants and a newly identified silicone breast implant syndrome (SBIS) is now being defined
- between 3% and 6% are found to have substance (drugs/alcohol) abuse problems.

What is happening in the FMS patient's muscles?

(Goldenberg 1989, 1994, Henriksson 1994, Moldofsky 1993)

Many of the adaptations and changes described above are likely to be taking place in the muscles of anyone with fibromyalgia – plus a number of additional factors:

- A biochemical imbalance seems to be present which may be the direct result of the negative effect of disturbed sleep – this leads to inadequate growth hormone production and therefore poor repair of minor muscle damage.
- There are also commonly lower than normal levels of serotonin in the blood and tissues, resulting

Box 5.3 Similarities and differences between FMS and MPS

FMS and MPS are *similar* (or identical) in that both:

- are affected by cold weather
- may involve increased sympathetic nerve activity and may involve conditions such as Raynaud's phenomenon
- have tension headaches and paresthesia as a major associated symptom
- are unaffected by anti-inflammatory, painkilling medication whether of the cortisone type or standard formulations.

FMS and MPS are *different* in that:

- MPS affects males and females equally, whereas FMS affects mainly females
- MPS is usually local to an area such as the neck and shoulders, or low back and legs, although it can affect a number of parts of the body at the same time, while FMS is a generalized problem, often involving all four 'corners' of the body at the same time
- muscles which contain areas that feel 'like a tight rubber band' are found in the muscles of around 30% of people with MPS and more than 60% of people with FMS
- people with FMS have poorer muscular endurance than do people with MPS
- MPS can sometimes be severe enough to cause disturbed sleep; in FMS the sleep disturbance has a more causative role, and is a pronounced feature of the condition
- patients with MPS usually do not suffer from morning stiffness, whereas those with FMS do
- fatigue is not usually associated with MPS but is common in FMS
- MPS can sometimes lead to depression (reactive) and anxiety whereas in a small percentage of FMS cases (some leading researchers believe) these conditions can be causative
- conditions such as irritable bowel syndrome, dysmenorrhea and a subjective feeling of 'swollen joints' are noted in FMS, but seldom in MPS
- low-dosage tricyclic antidepressant drugs are helpful in dealing with the sleep problems associated with FMS, and many of the symptoms – but not those of MPS
- exercise programs (cardiovascular fitness) can help some FMS patients; according to experts, but this is not a useful approach in MPS.

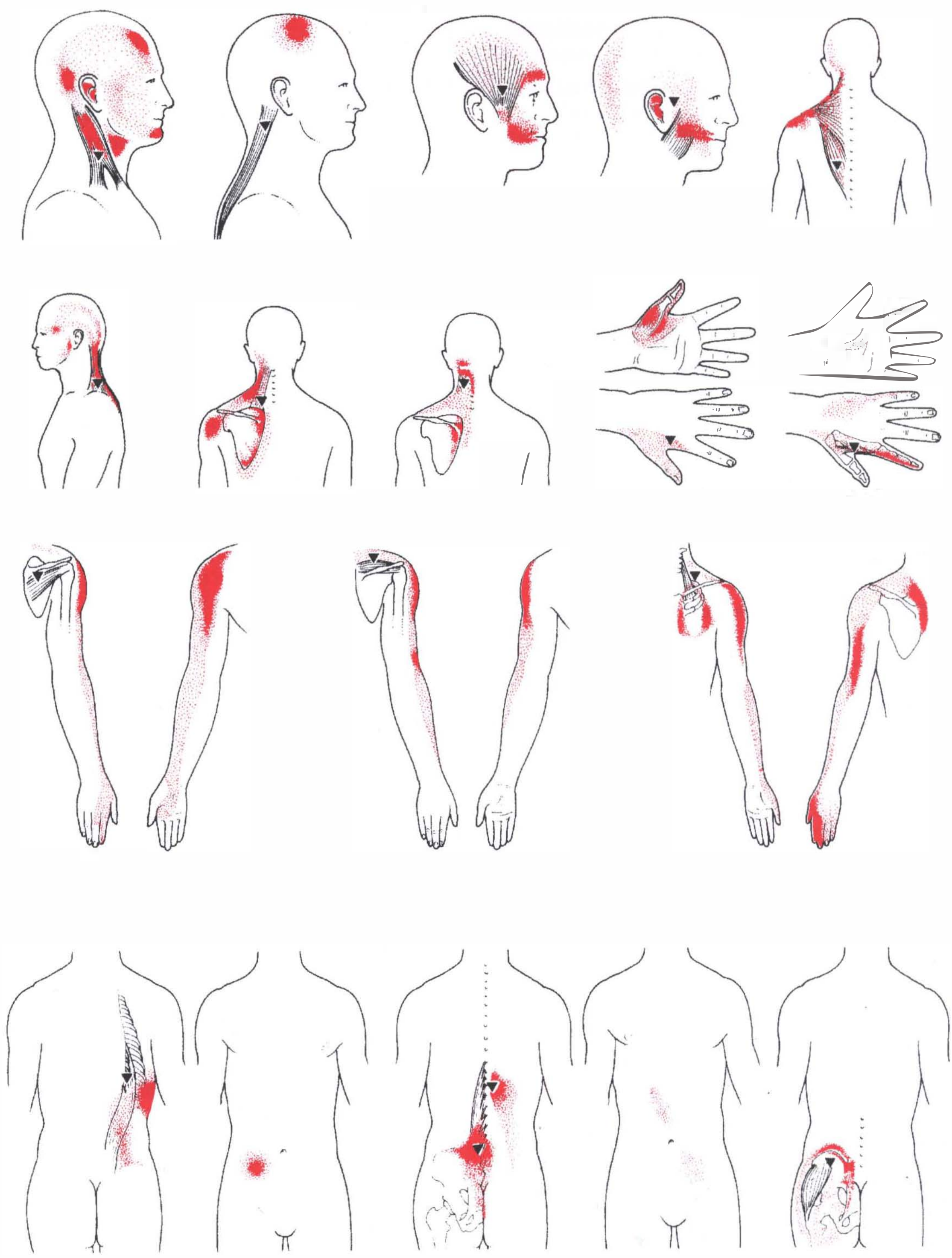

Figure 5.1 A selection of the most commonly found examples of representations of trigger sites and their reference (or target) areas. Trigger points found in the same sites in different people will usually refer to the same target areas.

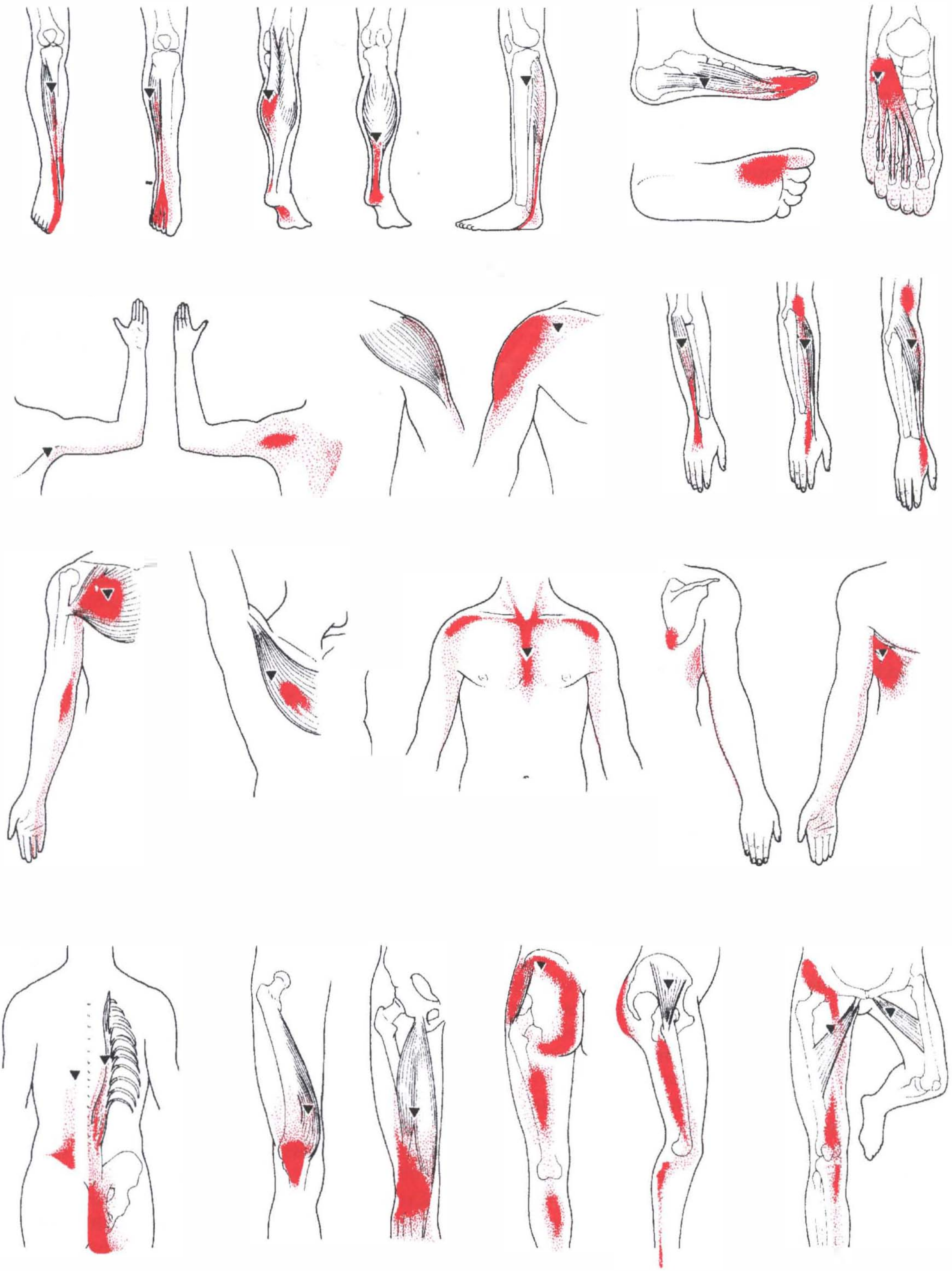

Figure 5.1 Continued

in lowered pain thresholds, because of the reduced effectiveness of the painkilling influence of endorphins and also due to the increased presence of substance P.

- The sympathetic nervous system – controlling as it does the degree of muscle tone – can become disturbed leading to muscle ischemia, resulting in additional presence of substance P and increased pain sensitivity.
- Some researchers (Duna & Wilke 1993) propose that all these elements combine in fibromyalgia including:
  - disordered sleep, which leads to reduced growth hormone production
  - low levels of serotonin, leading to reduced natural painkilling effects of endorphins
  - disturbed sympathetic nervous system, which has resulted in muscle ischemia and increased pain sensitivity.
- These disturbances involve substance P being released, leading to low pain thresholds and activation of latent trigger points, with fibromyalgia as the end result.

Other researchers propose that a great deal of 'microtrauma' of muscles occurs in FMS patients (for reasons not yet clear, but genetic predisposition is a possibility) leading to calcium leakage in the tissues, which increases muscle contraction, further reducing oxygen supply.

Microtrauma seems also to be associated with a reduction in the muscle's ability to produce energy, so causing it to fatigue more easily and to be unable to pump the excess calcium out of the cells. A similar mechanism is said by Travell and Simons to be involved in myofascial trigger point activity (Simons 1986).

Tests involving people with FMS (Bennett 1990) show that their muscles produce excessive lactic acid, which adds to their discomfort. Some patients show a dramatic rise in blood pressure during exercise; about one-third have erratic breathing when exercising, and many also have low carbon dioxide levels when resting – an indication of a hyperventilation tendency (see Chapter 2 for the implications of this).

There are clearly numerous interacting causative elements operating in both FMS and MPS, and many treatment methods have shown benefit. All of the following have been shown to be useful in encouraging recovery in some patients with FMS:

- manual therapy (Jiminez et al 1993, Rubin et al 1990, Stoltz 1993)
- nutritional and herbal treatment (Abraham & Flechas 1992, Kacera 1993, Kleijnen & Knipschild 1992, Warot et al 1991)
- breathing and postural re-education (Goldstein 1996)
- electro-acupuncture (DeLuze et al 1992, McCain et al 1988)
- microcurrent (McMakin 2003)
- magnets (Colbert et al 1999)
- hypnotherapy (Haanen et al 1991)
- hydrotherapy (Buskila et al 2001)
- homeopathy (Fisher et al 1989, Gemmell et al 1991)
- exercise, cardiovascular training (Richards & Scott 2002, Sandford Kiser et al 1983)
- biofeedback (Ferraccioli et al 1989)
- cognitive-behavioral modification (Deale 2001, Deale & Wessley 1994, Goldenberg et al 1991)
- sleep enhancement (Affleck 1996).

There is certainly evidence that progressive cardiovascular training (graduated training through exercise) improves muscle function and reduces pain in FMS, but this is not always thought desirable (and is often quite impossible anyway because of the degree of fatigue) for patients with chronic fatigue syndrome (ME) (Goldenberg 1993b).

Outlook for FMS and MPS

The outlook for people with myofascial pain syndrome (MPS) is excellent, since trigger points usually respond quickly to appropriate techniques.

However, the outlook for people with FMS is less positive, with a lengthy treatment and recovery phase being the norm. Research indicates that a number of approaches can minimize the suffering, including application of SCS and other osteopathic manipulative techniques (see later in this chapter for details).

Trigger points are certainly part – in some cases the major part – of the pain suffered by people with FMS (and they certainly are if pressure on the 'tender point' produces pain in a target area where pain is usually experienced by the patient).

Trigger points can be deactivated in various ways, one of which involves an integrated use of different soft-tissue approaches, INIT, a method that is discussed later in this chapter.

Self-care methods for treating muscular pain are described at the end of this chapter.

Terminology

Dr Craig Liebenson, a Los Angeles chiropractor and researcher, explains some of the difficulties we experience when describing soft-tissue changes (Chaitow 2001). He explains that muscles are often said to be 'short', 'tight', 'tense', or 'in spasm'; however, these terms are often used very loosely (Liebenson 2001):

In order to provide proper indications for the use of appropriate soft tissue techniques we should define our treatment objectives. Muscles suffer either neuromuscular, viscoelastic, or connective tissue alterations. A tight muscle could have either increased neuromuscular tension or connective tissue fibrosis.

Liebenson (2001) continues:

Muscle spasm is a neuromuscular phenomenon relating either to upper motor neuron disease or an acute reaction to pain or tissue injury. Electromyographic (EMG) activity is increased in these cases. Examples include spinal cord injury, reflex spasm such as appendicitis or acute lumbar antalgia with loss of flexion relaxation response (Triano & Schultz 1987). Long lasting noxious stimulation has been shown to activate the flexion withdrawal reflex (Dahl et al 1992).

Tension without EMG elevation

Increased muscle tension can also occur without a consistently elevated EMG. An example is in trigger points, in which case a muscle fails to relax properly.

Muscles housing trigger points have been shown to have dramatically different levels of EMG activity within the same functional muscle unit. Hubbard & Berkoff (1993) showed EMG hyper-excitability in the nidus of the trigger point in a taut band which had a characteristic pattern of reproducible referred pain.

Increased stretch sensitivity

Other influences are described by Liebenson (2001):

Increased sensitivity to stretch can also lead to increased muscle tension. This has been shown to occur under conditions of local ischaemia (Mense 1993). According to Janda neuromuscular tension can also be increased by central influences due to limbic dysfunction (Janda 1991).

He continues his discussion of these muscle states:

Muscle stiffness is a viscoelastic phenomenon described by Walsh (1992). This has to do with fluid mechanics and viscosity of tissue. It is not a neuromuscular phenomenon. Fibrosis occurs in muscle or fascia gradually and is typically related to post-trauma adhesion formation. Lehto found that fibroblasts proliferate in injured tissue during the inflammatory phase (Lehto et al 1986). If the inflammatory phase is prolonged then a connective tissue scar will form as the fibrosis is not absorbed.

Trigger point influence

Some of the influences of trigger points are also touched on by Liebenson (2001):

Various studies have demonstrated that trigger points in one muscle are related to inhibition of another functionally related muscle (Headley 1993, Simons 1993). In particular, it was shown by Simons (1993) that the deltoid muscle can be inhibited when there are infraspinatus trigger points present. Headley (1993) has shown that lower trapezius inhibition is related to trigger points in the upper trapezius.

Facilitation/sensitization

Facilitation, which was discussed in Chapter 2, describes how local areas become increasingly sensitized due to stress of any sort. This helps to explain some of the benefits achieved via 'spontaneous release by positioning', first described by Jones in 1964 after he had noted that a patient with a severe dysfunction, which was interfering with normal movement, gained considerable release when he was positioned in such a way that the discomfort was stopped.

It can be assumed that the factor of increased sensitization, or facilitation, reduces during the period that tissues are held in a relatively pain-free 'ease' position, during positional release.

A corollary to the decrease in sensitization influences would be that for a time following the treatment, the patient would be liable to recurrence of the problem as a result of residual sensitization and the long-lasting effects of conditioning. This tendency should be gradually reversed as calmer and more balanced neural inputs and responses become the norm.

Korr (1976) has proposed a mechanism involving the gamma motor system and muscle proprioceptors as one of the common causes of sustained muscle contraction associated with somatic dysfunction and the process of facilitation/sensitization. He proposed that manipulative procedures involving high-velocity, short-amplitude forces, as well as muscle energy techniques, can act to force the central nervous system to correct abnormally high excitation of the muscle spindles, and to so allow the muscle to return to its normal length and the joint to its normal motion.

Similar reasoning, with regard to decreasing muscle spindle activity, can be ascribed to functional positional release techniques, which, instead of forcing a contracted muscle towards its restriction barrier, allow it to continue to shorten until it relaxes normally.

In both direct (forcing through a barrier of restriction) and indirect (moving away from the barrier) procedures, afferent input to the cord may be reduced for a sufficient time, and to a sufficient degree, to allow the sensitization to decrease below a critical level. That is, afferent input would be reduced either directly, or via central brain influences, to a level below that required to sustain sensitization and therefore dysfunctional patterns of behavior, in this instance sustained inappropriate degrees of contraction and hypertonicity.

Local facilitation

According to Korr (1976), a trigger point is a localized area of somatic dysfunction which behaves in a facilitated manner, i.e. it will amplify and be affected by any form of stress imposed on the individual whether this is of a physical, chemical or emotional nature.

A trigger point is palpable as an indurated, localized, painful entity with a reference (target) area, to which pain or other symptoms are referred (Chaitow 1991).

Muscles housing trigger points can frequently be identified as being unable to achieve their normal resting length using standard muscle evaluation procedures (Janda 1983). The trigger point itself is commonly surrounded by fibrotic tissue, which has evolved as the result of exposure of the tissues to diverse forms of stress, and always lies in contracted bands of myofascial tissue.

Trigger point characteristics summarized

- The leading researchers into trigger points, Simons, Travell & Simons (1999), define trigger points as: 'hyperirritable foci, lying within taut bands of muscle, which are painful on compression and which refer pain or other symptoms at a distant site [target area]'.
- Embryonic trigger points tend to develop as 'satellites' of existing triggers in the target area, and in time these produce their own satellites.
- According to Wall & Melzack (1989), nearly 80% of trigger points are in exactly the same positions as known acupuncture points used in traditional Chinese medicine.
- Painful points ('tender points') that do not refer symptoms to a distant site are often latent trigger points that need only to experience additional degrees of stress in order to create greater facilitation, and so be transformed into active triggers.
- The taut band in which triggers lie will twitch if a finger is run across it, and is tight but not usually fibrosed, since it will commonly soften and relax if the appropriate treatment is applied – something fibrotic tissue cannot do.
- Muscles that contain trigger points will often hurt when they are contracted (i.e. when they are working) and they will almost always be painful if stretched.
- Trigger points are areas of lowered oxygen supply due to inadequate local circulation. Such muscles will therefore fatigue rapidly.
- The fact that muscles in which trigger points lie cannot reach a normal resting length – being held almost constantly in a shortened position – makes them an ideal target for the methods of positional release, since such muscles will happily be shortened further but will resist being lengthened.
- Simons et al (1999) have established that until a muscle housing a trigger point can reach its normal resting length, without pain or effort, attempts to deactivate a trigger point will only achieve temporary relief, as it will reactivate after treatment.
- Stretching of the muscles housing a trigger point, using either active or passive methods, is a useful way of treating the shortness as well as the trigger point, since this can reduce the contraction (taut band) as well as increasing circulation to the area – something that positional release methods such as SCS can also achieve.
- There are many variably successful ways of treating trigger points including acupuncture, procaine injections, direct manual pressure (with the thumb, etc.), stretching the muscle, ice therapy, etc. Whatever is done, though, unless the muscle can be induced to reach its normal resting length, any such treatment will be of limited value.
- Some of these methods (pressure, acupuncture) cause the release in the body and the brain of natural painkilling substances – endorphins – which explains one of the ways in which pain is reduced.
- Pain is also relieved when one sensation (finger pressure, needle) is substituted for another (the original pain). In this way pain messages are partially or totally blocked, or partially prevented from reaching or being registered by the brain.
- Methods that improve the circulatory imbalance will affect trigger points, which contain areas of ischemic tissue, and in this way appear to deactivate them.
- The target area to which a trigger refers pain will be the same in everyone if the trigger point is in the same position – but this pattern of pain distribution does not seem to relate to known nerve pathways.
- Trigger points involve a self-perpetuating cycle (pain leading to increased tone leading to more pain) and will almost never deactivate unless adequately treated.
- The way in which a trigger point relays pain to a distant site may involve neurological mechanisms; however, just how trigger points produce their symptoms remains unclear.
- Remarkable research by Langevin & Yandow (2002) has shed much new light on the possibility that fascial structures are the means whereby sensation is transmitted.
- Trigger points lie in parts of muscles most prone to mechanical stress, often close to origins and insertions as discussed earlier in this chapter

(see central and attachment point discussion below) and also, very commonly, they are situated on fascial cleavage planes.

See Box 5.4 for more details of important research that indicates the commonest sites for acupuncture points (which are equally commonly also trigger points (Melzack 1981, Wall & Melzack 1989)). Before looking at Box 5.4 it may be useful to revisit the notes in Chapter 3 regarding the interconnectedness of fascia throughout the body.

Different types of trigger points

(Simons et al 1999)

Central triggers

- Central trigger points form in the center of the muscle's fibers, close to the motor endplate (neuromuscular junction).
- Excess acetylcholine (ACh) is released at the synapse, usually associated with overuse or strain, leading to release of calcium.
- Resulting ischemia creates an oxygen deficit and energy crisis (ATP deficiency).
- Without available ATP, calcium ions, which are keeping the gates open for ACh to keep flowing, cannot be removed.
- Therefore a chemically sustained contracture, without motor potentials, exists, and this is different from a contraction (voluntary with motor potentials) or a spasm (involuntary with motor potentials).
- Actin–myosin filaments shorten in the area of the motor endplate.
- A contracture 'knot' forms the characteristic trigger point nodule.
- The remainder of the sarcomeres of that fiber are stretched, creating the palpable taut band.
- Massage, stretch applications and other modalities such as positional release techniques disturb the sarcomeres, alter the chemistry, and/or possibly damage the endplate, disrupting the cycle so that the tissues relax, often in seconds, often permanently.

Attachment triggers

- Attachment trigger points form at junctures of myofascial and tendinous or periosteal tissues.
- Awareness of a muscle's fiber arrangement (fusiform, pennate, bipennate, multipennate, etc.) and attachment sites, helps to locate trigger points rapidly, since their sites are predictable.
- Tension from taut bands on periosteal or connective tissues can lead to enthesopathy or enthesitis, as recurring concentrations of muscular stress provoke inflammation, with a strong tendency towards fibrosis and calcific deposition.
- Periosteal pain points may be palpated at the attachments.

Choices of trigger point treatment

(Simons et al 1999)

- Central trigger points should be addressed with their contracted central sarcomeres and local ischemia in mind.
- Since the end of the taut band housing the trigger point is likely to create enthesopathy, stretching the muscle before releasing its central trigger point might further irritate or inflame the attachments.
- Techniques should first be applied to relax the taut fibers before manual elongations are attempted (e.g. positional release, gliding strokes and/or myofascial release).
- Stretches, particularly active range of motion, should be applied gently until reaction is noted, to avoid tissue insult.
- Attachment trigger points seem to respond more beneficially to ice applications rather than to heat.
- Gliding techniques should be applied from the center of the fibers out towards the attachments, unless contraindicated (as in some extremity tissues).
- By elongating the tissue towards the attachment, sarcomeres that are shortened at the center of the fiber will be lengthened, and those that are over-stretched near the attachment sites will have their tension released.
- When passive stretching is applied, care should be taken to assess for tendinous or periosteal inflammation, in order to avoid placing more tension on already distressed connective tissue attachments (e.g. better to use methods to reduce hypertonicity rather than initiating stretching, and positional release achieves this effectively).
- As will be explained later in this chapter, a sequential combination of methods, including positional release, can effectively achieve trigger point deactivation and enhanced function.

Clinical choices

Unless soft tissue and other changes, as described above (and their causes), are accurately identified, no therapeutic method will do more than produce short-term relief.

In order for restrictions, imbalances and malcoordination in the musculoskeletal system to be satisfactorily

Box 5.4 Acupuncture ah shi points, trigger points and fascial cleavage planes

Ah shi points

Melzack (1981) has reported a high degree (71%) of correspondence between myofascial trigger points and acupuncture points, and suggests that: 'it is very likely that all MTrPs are Ah-shi acupuncture points'.

Hong (2000) has reported that: 'All active and latent MTrPs, but not all acupuncture points, are tender. Tender, and clinically relevant acupuncture points are called Ah-Shi points. In Chinese, Ah-Shi means "Oh Yes! (that's the right spot)". So, when the point is pressed, the patient feels pain and says "Oh Yes! That's it"'.

With high-pressure stimulation, referred pain can be elicited in most active and some latent trigger points.

Clinically it has been shown that the referred pain patterns of some trigger points are very similar to the traditional meridian connections of acupuncture points (Hong 2000).

The consistent pattern of referred pain in a specific trigger point suggests that there are fixed connections between certain sensory neurons in the spinal cord. These are probably the same as the connections between acupuncture points along a meridian.

Thus, Hong believes, the mechanism of MTrP injection may be similar to that of acupuncture in terms of pain relief – i.e. neurological.

Fascial signaling?

One of the important features of acupuncture theory is that the needling of appropriately selected acupuncture points has predictable effects remote from the site of needle insertion, and that these effects are mediated by means of the acupuncture meridian system. Langevin & Yandow (2002) note that: 'To date, physiological models attempting to explain these remote effects have invoked systemic mechanisms involving the nervous system (Pomeranz 2001).'

Langevin & Yandow go on to report on the results of their research, which shows that signal transduction appears to occur through connective tissue, probably involving sensory mechanoreceptors.

They hypothesize that the network of acupuncture points and meridians can be viewed as a representation of the network formed by interstitial connective tissue. This hypothesis is supported by ultrasound images showing connective tissue cleavage planes at acupuncture points in humans (Fig. 5.2).

They found that fully 80% of acupuncture points lie close to intermuscular or intramuscular connective tissue planes.

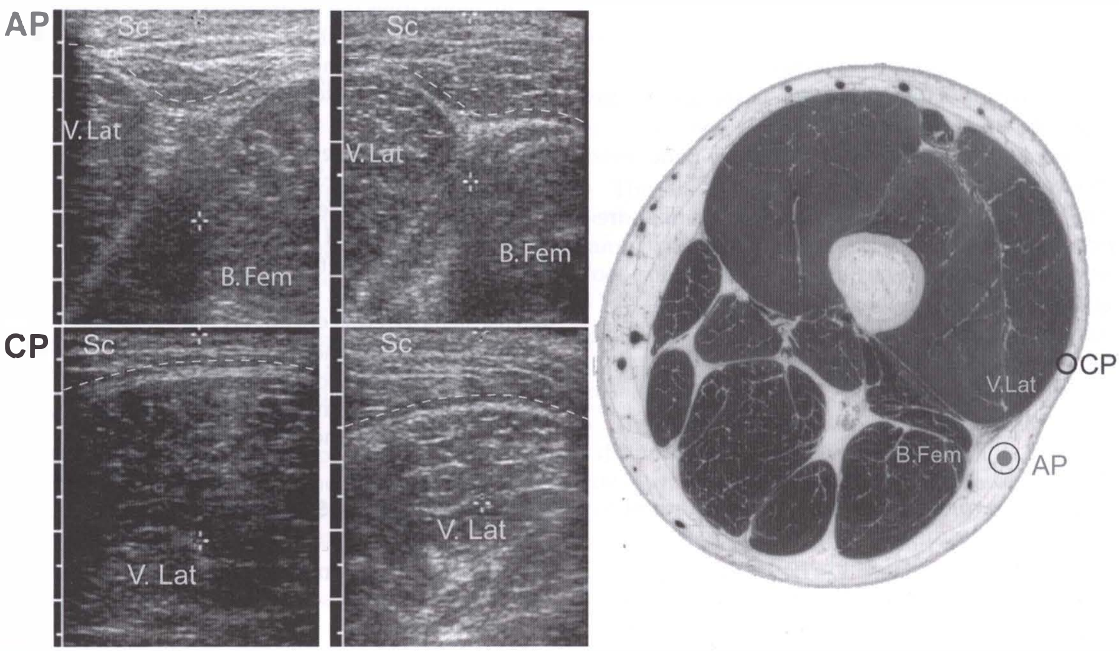

Figure 5.2 Ultrasound images showing connective tissue cleavage planes at acupuncture points in humans. (From Langevin & Yandow 2002, with permission.)

Box 5.4 Continued

They see acupuncture points as representing a convergence of connective tissue planes and being involved in the 'sum of all body energetic phenomena (e.g. metabolism, movement, signaling, information exchange)'.

Implications?

The implications of this evidence in relation to positional release methods seems clear – that normalization, or improved function, of connective tissue dysfunction can potentially modify this 'signaling' mechanism, and may well explain how and why positional release effects its results.

If pain created in sensitive and distressed tissues (SCS) by applied manual pressure can be relieved by positioning, this strongly suggests that the 'ease' position is one in which disturbed signaling may be able to normalize.

See the discussion on fascial structures in Chapter 3 (Box 3.1).

addressed, and where possible reversed, the individual needs to be appropriately treated as well as taught improved patterns of use.

In order for appropriate treatment to be offered, assessment methods are needed which lead to identification of:

- patterns of misuse, overuse, etc.
- postural imbalances
- shortened postural muscles
- weakened muscles
- patterns of functional malcoordination and imbalance
- local changes within muscles (such as trigger points) and other soft tissues
- joint restrictions
- functional imbalances in gait, respiration, etc.

Of equal importance is the availability of a repertoire of therapeutic modalities and methods, which can be tailored to the particular needs of the individual, and the tissues being addressed.

For example, functional or positional release methods such as SCS, or acute-phase muscle energy technique (MET) methods, can produce a neurological release of hypertonicity or spasm, and are therefore most appropriate in circumstances of acute dysfunction, or where hypertonicity is a key feature of a problem.

While it is not possible to modify fibrotic changes by means of positional release, the enhanced circulation which results from such methods (see Chapter 1) offers benefits to tissues that have been relatively oxygen-starved.

Similarly, it would be perfectly appropriate to attempt to use stronger MET methods (described below) in treatment of chronic fibrotic tissues, in which circumstances gentler (SCS, for example) methods might only be useful in reducing hypertonicity and enhancing circulation prior to more vigorous approaches being used, or as a means of calming tissues after they have been treated with MET.

Neuromuscular techniques could be usefully applied in both settings (indirect positional release or direct MET methodology) and in both acute or chronic settings (Chaitow 1991).

General treatment methods

A wide variety of treatment methods has been advocated in treating trigger points, including:

- inhibitory (ischemic compression) pressure methods (Chaitow 1982, 1989, Nimmo 1966)
- acupuncture, dry needling and/or ultrasound (Gerwin & Dommerholt 2002, Kleyhans & Aarons 1974)
- chilling and stretching of the muscle in which the trigger lies (Travell & Simons 1992)
- procaine or lidocaine (Xylocaine) injections (Slocumb 1984)
- active or passive stretching (Lewit 1999, Simons et al 1999)
- and even surgical excision (Dittrich 1954).

Clinical experience, confirmed by the diligent research of Simons et al (1999), has shown that while all or any of these methods – and others – can successfully inhibit trigger point activity in the short term, in order to completely eliminate the noxious activity of such a disruptive structure, more needs to be done, therapeutically speaking, to the local tissues, in order to stretch the muscle to a more normal length.

Whatever initial treatment is offered to inhibit the neurological hyperreactivity of the trigger point, the muscle in which it lies has to be made capable of reaching its normal resting length following such treatment, or else the trigger point will rapidly reactivate.

In treating trigger points, the method of chilling the offending muscle (housing the trigger), while holding it at stretch in order to achieve this end, was advocated by Mennell (1974) as well as by Travell & Simons (1992).

Lewit (1999) advocated the muscle energy method of a physiologically induced postisometric relaxation (or reciprocal inhibition) response, prior to passive stretching. Simons et al (1999) appear to have moved towards Lewit's viewpoint, using postisometric relaxation (MET) as a starting point before stretching offending muscles.

Both methods are commonly successful, although a sufficient degree of failure occurs (the trigger rapidly reactivates or fails to completely 'switch off') to require investigation of more successful approaches.

One reason for failure of muscle-stretching methods may relate to the possibility that the tissues being stretched were not the precise ones housing the trigger point. This thought was a factor which initiated the evolution of INIT, as described below.

Re-education and elimination of causes

Common sense, as well as clinical experience, also dictates that the next stage of correction of such problems should involve re-education (postural, breathing, relaxation, etc.), as well as the elimination of factors that contributed to the problem's evolution. This might well involve ergonomic evaluation of home and workplace, as well as the introduction and dedicated application of postural and/or breathing pattern re-education methods.

Muscle energy technique

A popular method for achieving tonus release in a muscle prior to stretching involves introduction of an isometric contraction to the affected muscle (producing postisometric relaxation through the influence of the Golgi tendon organs) or to its antagonist (producing reciprocal inhibition) (Lewit 1999) or by inducing an increased tolerance to stretch (Ballantyne et al 2003)

The original use of isometric contractions prior to stretching involved proprioceptive neuromuscular facilitation (PNF) techniques, which emerged from physical medicine in the early part of the twentieth century. PNF advocated a full-strength contraction against operator-imposed resistance, whereas in most forms of muscle energy technique (MET) methodology, derived from osteopathic research and clinical experience, a partial (not full-strength) isometric contraction is performed prior to the stretch, in order to preclude tissue damage or stress to the patient and/or therapist, which PNF not infrequently produces (Greenman 1989, Hartman 1985, Lewit 1999).

SCS and muscle problems

As described in Chapter 3, Jones (1981) has shown that particular painful tender points – relating to joint or muscular strain, chronic or acute – can be used as monitors, pressure being applied to them as the body or body part is carefully positioned in such a way as to remove or reduce the pain felt in the palpated point.

When the position of ease is attained, in which pain vanishes or markedly eases from the palpated tender point, the stressed tissues are felt to be at their most relaxed – and clinical experience indicates that this is so, since they palpate as 'easy' rather than having a sense of being 'bound', or tense.

It is not difficult to teach patients the basics of these methods for self-management of muscular pain and dysfunction. Examples are given at the end of this chapter.

SCS and trigger points

Simons et al (1999) discuss SCS in relation to the treatment of trigger points, and suggest that most of the tender points listed in Jones's original book (Jones 1981), and many of those described in subsequent PRT texts (D'Ambrogio & Roth 1997), are close to attachment trigger point sites.

This is, however, not universally true:

> *Of the 65 tender points [in Jones's original book], nine were identified at the attachment region of a named muscle. Forty-four points were located either at the region of a muscular attachment where one might find an attachment trigger point, or, occasionally, at the belly of a muscle where a central trigger point might be located.*

See also the discussion earlier in this chapter relating to attachment and central trigger points.

If at least some, and possibly the majority, of Jones's tender points, are demonstrably the same entities as Simons and Travell's trigger points, logic suggests that a therapeutic approach that effectively deactivates one (the tender point) should beneficially influence the other (trigger point).

The author believes that clinical evidence supports this supposition, especially when the positional release method is combined with other approaches such as ischemic compression and MET, which both have a good track record in trigger point deactivation.

Is SCS of value in fibromyalgia?

Osteopathic physicians using SCS and MET, as well as other osteopathic methods, have conducted numerous studies involving patients with a firm diagnosis of FMS.

Among the studies in which SCS was a major form of treatment of FMS are the following:

1. Doctors at the Chicago College of Osteopathic Medicine measured the effects of osteopathic manipulative therapy (OMT – which included both SCS and MET) on the intensity of pain from tender points in 18 patients who met all the criteria for FMS. Each had six visits/treatments and it was found, over a 1-year period, that 12 of the patients responded well, in that their tender points became less sensitive (14% reduction against a 34% increase in the six patients who did not respond well). Most of the patients – the responders and the non-responders who had received SCS and MET – showed (using thermographic imaging) that their tender points were more symmetrically spread after the course than before. Activities of daily living were significantly improved and general pain symptoms decreased (Stoltz 1993).
2. Osteopathic physicians at Kirksville College of Osteopathic Medicine treated 19 patients classified as having FMS, using SCS and MET approaches, for 4 weeks, one treatment each week; 84.2% of the patients showed improved sleep patterns and 94.7% reported a significant reduction in pain after this short course of treatment (Lo et al 1992).
3. Doctors at Texas College of Osteopathic Medicine selected three groups of FMS patients, one of which received OMT, another had OMT plus self-teaching (study of the condition and self-help measures), and a third group received only moist-heat treatment. The group with the lowest level of reported pain after 6 months of care was that receiving OMT, although benefits were also noted in the self-teaching group (Jiminez et al 1993).
4. Another group of doctors from Texas, in a study involving 37 patients with FMS (Rubin et al 1990), tested the differences resulting from using: drugs only (ibuprofen, alprazolam), osteopathic treatment (including SCS) plus medication, osteopathic treatment plus a dummy medication (placebo), a placebo only. The results showed that:
    - drug therapy alone resulted in significantly less tenderness being reported than did drugs and osteopathy, or the use of placebo and osteopathic treatment, or placebo alone
    - patients receiving placebo plus osteopathic manipulation reported significantly less fatigue than the other groups
    - the group receiving medication and (mainly) osteopathic soft-tissue manipulation showed the greatest improvement in their quality of life.

Hypothesis

The author hypothesizes that partial contraction (using no more than 20–30% of patient strength, as is the norm in MET procedures) may sometimes fail to achieve recruitment and activation of the fibers housing the trigger point being treated, since light contractions of this sort fail to recruit more than a small percentage of the muscle's potential.

Subsequent stretching of the muscle may, therefore, only marginally involve the critical tissues surrounding and enveloping the myofascial trigger point. Failure to actively stretch the muscle fibers in which the trigger is housed might account for recurrence of trigger point activity in the same site, a short time following treatment.

Repetition of the same stress factors that produced it in the first place could undoubtedly also be a factor in such recurrence – which emphasizes the need for re-education in rehabilitation.

A method (integrated neuromuscular inhibition technique – INIT) that achieves precise targeting of the tissues surrounding the trigger point would therefore seem to offer advantages because of a more precise focus for the contraction and stretch. This approach, which employs SCS as part of its methodology, is described below.

But before treating a tender or trigger point, with whatever method, it is necessary to find it.

How accurate are palpation methods?

Palpation tests for tender and trigger points

In 1992 a study was conducted by two leading figures in the study of myofascial pain, in order to test the accuracy of palpation for tender points and trigger points in myofascial tissues when used by experts who would be making the all-important diagnosis of FMS or MPS (Wolfe et al 1992).

- Volunteers from three groups were tested – some with FMS, some with MPS and some with no pain or any other symptoms.
- The FMS patients were easily identified – 38% of the FMS patients were found to have trigger points.
- Of the MPS patients, only 23.4% were identified as having trigger points and of the normal volunteers less than 2% had any.
- Most of the MPS patients had tender points in sites usually tested in FMS and would have qualified for this diagnosis as well.

Recommended trigger point palpation method

There are a variety of palpation methods by means of which trigger (or tender) points can rapidly be identified, among which the simplest and possibly the most effective is use of what is termed 'drag' palpation, as discussed in Chapter 4 (Chaitow 1991).

- A light passage of a single digit, finger or thumb, across the skin ('feather-light touch') elicits a sense of hesitation, or 'drag', when the skin has an increased water content compared with surrounding skin.
- This increased hydrosis (sweat) seems to correlate with increased sympathetic activity, which accompanies local tissue dysfunction in general and trigger point activity in particular (Lewit 1999).

Lewit (1999) additionally suggests that the skin overlying a trigger point will exhibit reduced elasticity when lightly stretched apart, as compared with surrounding skin. He terms such areas as 'hyperalgesic skin zones' and identifies a further characteristic: a reduced degree of movement of the skin over the underlying fascia, palpable when attempting to slide or 'roll' the skin.

These three features of skin change:

- reduced movement of skin on fascia
- reduced local elasticity
- increased hydrosis

offer simple and effective clues as to underlying dysfunction.

Systematic approaches to the charting of trigger point locations (and their deactivation) are also offered by systems such as neuromuscular technique (NMT), in which a methodical sequence of palpatory searches is carried out, based on the trigger point 'maps' as described by Simons et al (1999)

When attempting to palpate for trigger points at depth, not simply using skin signs, a particularly useful phrase to keep in mind is that used by Stanley Lief DC, co-developer of NMT:

> *To discover local changes [such as trigger points] it is necessary to constantly vary palpation pressure, to 'meet and match' tissue tensions. (Chaitow 1996)*

D'Ambrogio & Roth (1997) put it differently:

> *Tissue must be entered gently, and only necessary pressure must be used to palpate through the layers of tissue.*

INIT hypothesis
(Chaitow 1994)

Clinical experience indicates that by combining the methods of direct inhibition (pressure mildly applied, continuously or in a make-and-break pattern) with the concept of SCS and MET, a specific targeting of dysfunctional soft tissues should be achieved.

INIT method

- It is reasonable to assume, and palpation confirms, that when a trigger point is being palpated by direct finger or thumb pressure, and when the very tissues in which the trigger point lies are positioned in such a way as to take away the pain (entirely or at least to a great extent), the most (dis)stressed fibers in which the trigger point is housed are in a position of relative ease (Fig. 5.3A).
- At this time the trigger point would be under direct inhibitory pressure (mild or perhaps intermittent) and would have been positioned so that the tissues housing it are relaxed (relatively or completely).
- Following a period of 20–30 seconds of this position of ease and inhibitory pressure, the patient is asked to introduce an isometric contraction into the tissues and to hold this for 7–10 seconds – involving the precise fibers which had been repositioned to obtain the SCS release.
- The effect of this isometric contraction would be to produce (following the contraction) a degree of reduction in tone in these tissues (as a result of postisometric relaxation).
- The hypertonic or fibrotic tissues could then be gently stretched for 30 seconds, as in any muscle energy procedure, with the strong likelihood that the specifically targeted fibers would be stretched.
- Following this, a whole muscle isometric contraction, followed by a whole muscle stretch (also for 30 seconds) is then carried out.

In this way the tissues surrounding the trigger point receive an integrated neuromuscular approach (INIT): compression

- local positional release
- local contraction
- local stretch

following which the whole muscle is then contracted and stretched.

This is the process of trigger point deactivation recommended by the author.

Self-treatment SCS methods for FMS patients

The following are self-treatment methods, useful for people with FMS symptoms, which utilize SCS in

Figure 5.3A First stage of INIT in which a tender/pain/trigger point in supraspinatus is located and ischaemically compressed, either intermittently or persistently.

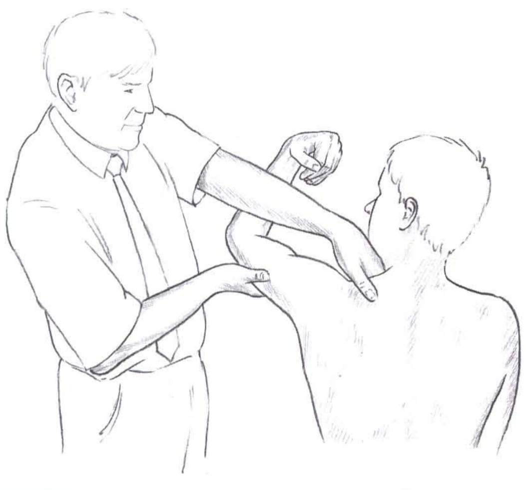

Figure 5.3B The pain is removed from the tender/pain/trigger point by finding a position of ease which is held for at least 20 seconds, following which an isometric contraction is achieved involving the tissues which house the point.

relieving pain and tension from key 'tender point' sites that are used in the diagnosis of the condition (Box 5.5).

What should emerge, if patients follow the guidelines as described below, is a sense of their being able to treat their own pain by this simple, noninvasive method.

Figure 5.3C Following the holding of the isometric contraction for an appropriate period, the muscle housing the point of local soft-tissue dysfunction is stretched. This completes the INIT sequence.

Using the tender points

As described earlier in this chapter (see Box 5.1), the official diagnosis of FMS depends on there being at least 11 tender points present out of 18 tested, using a set amount of pressure (not more than 4 kg).

The following points should be explained to the patient:

- As the person feels around to locate a tender point this should be performed with just enough pressure to produce a discomfort that can use to guide the patient to a position of ease, using an instruction/guideline such as: 'If '10' = the pain on pressure; find the position which equals '3' or less'.
- The patient should be told that any movements made should create no new pain, as the process is carried out, and should not make any existing pain worse.
- The person should remain in the 'position of ease', once found, for not less than 1 minute, and should then slowly return to a neutral position.
- It should be understood that a position of ease for a tender point on the front of the body probably involves bending forwards slightly, and vice versa, and that the guidelines given below for individual 'points' or muscles will be a guide only, not an absolute prescription, since other positions may be found that provide greater ease.

These are the instructions, given in lay terms, that can be spelled out and demonstrated to the patient for self-treatment of the most accessible of the tender points.

Patient's instructions for self-treatment

Guidelines for the basic rules to be followed during self-treatment are summarized in Box 5.5.

1. Suboccipital muscles

- To use SCS on these muscles you should be lying on your side with your head on a low pillow.
- These points lie at the base of your skull in a hollow just to the side of the center of the back of the neck.
- Palpate the tender point on the side which is lying on the pillow with the hand on that same side, and press just hard enough to register the pain and score this in your mind as a '10'.
- The muscles at the base of the skull, when tender, need the head to be taken backwards and usually leaned and perhaps turned towards the side of pain to ease the tenderness you are causing by your pressure (Fig. 5.4).
- First, just take your head slightly backwards very slowly as though you are looking upwards.
- If the palpated pain changes give it a score.
- If it is now below '10' you are moving in the right direction.
- Play around with slightly more backward bending of the neck, done very slowly, and then allow the head to turn and perhaps lean a little towards the pain side.

Box 5.5 Patient's self-treatment guidelines

Remember the basic rules:

- Find a pain point.
- These are usually in shortened muscles.
- If you find it painful to move in a particular direction, say turning your head to the left, then there may be shortness in the muscles that turn your head to the right – and this is where tenderness should be looked for by gentle palpation.
- Press on the point of tenderness just hard enough to score '10'.
- Move your body, or the part of the body, around slowly until the pain is reduced to a '3', causing no additional pain or new pain anywhere else.
- Stay in that position of 'ease' for 1 minute.
- Slowly return to neutral.

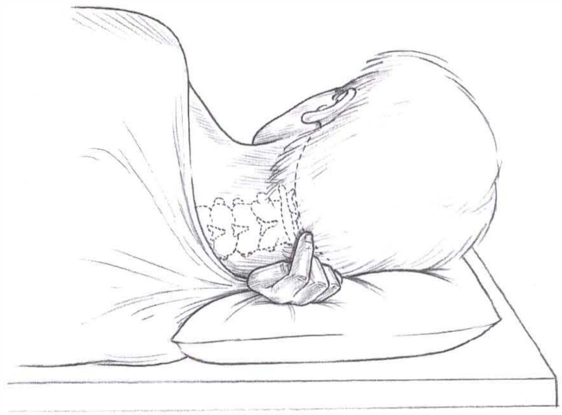

Figure 5.4 Strain/counterstrain self-treatment for suboccipital tender point.

- Keep 'fine-tuning' the position as you slowly reduce the pain score.
- You should eventually find a position in which it is reduced to 3 or less.
- If the directions described above do not achieve this score reduction, the particular dynamics of your muscular pain might need you to turn the head away from the side of pain, or to find some other slight variation of position to achieve ease.
- Once you have found the position of maximum ease, just relax in that position.
- You do not need to maintain pressure on the tender point all the time; just test it from time to time by pressing.
- Remember also that the position which eases the tenderness should not produce any other pain – you should be relatively at ease when resting with the pain point at ease. Stay like this for at least 1 minute and then *slowly* return to a neutral, starting position.
- Turn over, and treat the other side in the same way.

2. Lateral neck tender points

- These points lie near the side of the base of the neck between the transverse processes of the fifth and seventh cervical vertebrae.
- You can find the tenderness by running a finger very lightly – skin on skin, no pressure – down the side of your neck starting just below the ear lobe.
- As you run down you should be able to feel the slight 'bump' as you pass over the tips of the transverse processes – the part of the vertebrae that sticks out sideways.
- When you get to the level of your neck that is about level with your chin, start to press in lightly

after each 'bump'. Try to find an area of tenderness on one side (Fig. 5.5)

- Once you have found this, sit or lie and allow your head to bend forwards (use a cushion to support it if you are lying on your back).
- As with the first point treated, you will usually find that tenderness will be reduced as you take the head forwards.
- Find the most 'easy' position by experimenting with different amounts of forward-bending.
- The tenderness will be reduced even more as you fine-tune the position of your head and neck by slightly side-bending and turning the head either towards or away from the pain side – whichever gives the best results in terms of your 'pain score'.
- When you get the score down to a 3 or less stay in that position for at least 1 minute and then *slowly* return to neutral and seek out a tender point on the other side of the neck, and treat it also.

3. Midpoint of upper trapezius muscle

- The trapezius muscle runs from the neck to the shoulder and you can get an easy access to tender points in it by using a slight 'pinching' grip on the muscle using your thumb and index finger of (say) the right hand to gently squeeze the muscle fibers on the left until something very tender is found.
- If pressure is maintained on this tender point for 3 or 4 seconds it might well start to produce a radiating pain in a distant site, probably your head, in which case the tender point is also a trigger point.
- The same could be true of any of the tender points you are going to palpate but this one is one of the likeliest and commonest to refer pain elsewhere (Fig. 5.6).
- To treat the tenderness you should lie down on the side opposite that which you are treating (i.e. treated side is uppermost).
- Lightly pinch/squeeze the point to produce a score of 10 and try altering the position of the arm, perhaps taking it up and over your head to 'slacken' the muscle you are palpating, or altering the neck position by having it side-bent towards the painful side on a thick cushion.
- Fine-tune the arm and head positions until you reduce the score in your pain point (don't pinch it all the time, just intermittently to test whether a new position is allowing it to ease).
- Once you find your position of ease (score down to 3 or less) stay in that position for not less than 1 minute, then *slowly* return to a neutral position, sit up and seek out a tender point in much the same position on the other side.

4. Origin of the supraspinatus muscle above the shoulder blade

- Lie on your back, head flat on the floor/bed/surface, and resting your elbow on your chest, ease your hand over your opposite shoulder area to feel with the tips of your fingers for the upper surface (nearest your neck) of your other shoulder blade.
- Run your fingers along the upper surface of the shoulder blade, towards the spine, until you come to the end of the shoulder blade, and there press into the muscles a little, looking for an area of great tenderness (most people are tender here).

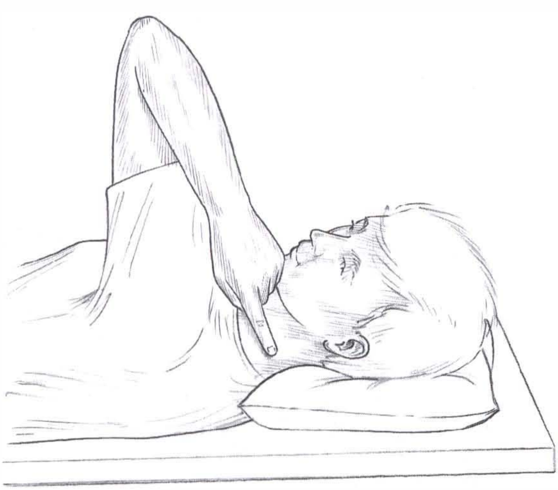

Figure 5.5 Strain/counterstrain self-treatment for lateral cervical tender point.

Figure 5.6 Strain/counterstrain self-treatment for tender point in middle fibers of upper trapezius muscle.

- You may need to press a little downwards, or back towards the shoulder, or in some other direction until your find what you are looking for and can score the sensitivity as a '10'.
- With your affected side (the side being treated) arm resting at your side and while your finger remains in contact with the tender point, bend the arm on the affected side so that your fingertips rest close to your shoulder.
- Now bring the elbow on the affected side towards the ceiling, *very slowly*, and let it fall slightly away from the shoulder about half way to the surface on which you are lying (Fig. 5.7). This should reduce the score.
- Now start to use 'fine-tuning' of the arm position in which you rotate the bent arm gently at the shoulder, twisting so that the elbow comes towards the chest and the hand moves away from the shoulder, very slightly, until the pain is down to a score of about 3.
- Hold this position for at least 1 minute, and then *slowly* return to neutral and do the same on the other arm.

5. Second rib tender points

- Sitting in a chair, rest one of your middle fingers on the upper border of your breast bone, and move it slowly sideways until you touch the end of your collar bone where it joins your breast bone.
- Now run the finger towards your shoulder for not more than an inch along the lower surface of your collar bone, and then down towards the chest half an inch (1 cm) or so.
- You should feel first a slight 'valley' before you come to the second rib (you can barely touch the first rib because it is hidden behind the collar bone).

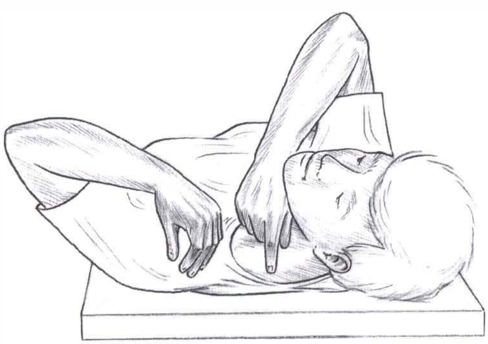

Figure 5.7 Strain/counterstrain self-treatment for supraspinatus tender point.

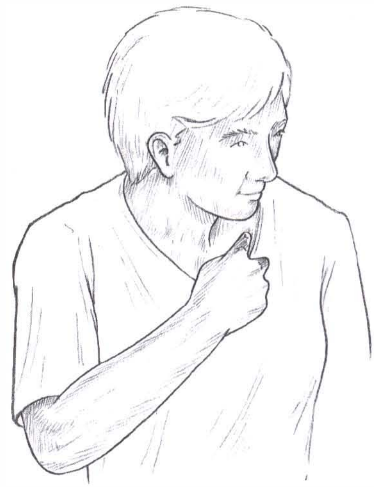

Figure 5.8 Strain/counterstrain self-treatment for second rib tender point.

- Press the upper surface of the second rib firmly and it should be tender, perhaps very tender (Fig. 5.8).
- Maintain the pressure and score '10' and then begin to take that score down by firstly bending your head and your upper back forwards, and also slightly (very slightly) towards the side of the pain point, until you feel the pain reduce.
- Find the most 'easy' position of forward and slightly side-bending, and then see whether slightly tilting your head one way or the other helps to reduce the score even more.
- Try also to take a full deep breath in, and then slowly let the breath go, and see which part of your breathing cycle eases the tenderness most.
- Once you have the score down to a 3 or less, add in that most 'easy' phase of the breath (hold the breath at that phase which eases the pain most) for 10–15 seconds.
- Then breathe normally, but retain the position of ease for at least 1 minute before *slowly* returning to neutral and seeking out the tender point on the other side for similar attention.

The patient should be taught these simple, safe, self-care approaches, and should be told: 'You can treat *any* tender point, anywhere on the body, using these same methods – possibly for only short-term relief of chronic pain, but without risk.'

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6

Functional technique

CHAPTER CONTENTS

Origins of functional technique

There is a long tradition in manipulative medicine in general, and osteopathy in particular, of positional release methods, often applied in an almost intuitive manner.

Hoover (1969a) quotes the words used by two osteopaths of his acquaintance who had been students of the founder of osteopathy, Andrew Taylor Still. They individually responded to a question as to what it was that they were doing while treating a patient, with the words, 'I am doing what the body tells me to do'.

All the words in the world cannot substitute for actually *feeling* of what happens when these methods are applied and, for this reason, exercises later in this chapter will be included in order to help bring to life the meaning and feeling of the explanations for what is in essence the most simple, and yet one of the most potent, of manipulative methods; one that creates a situation in which dynamic homeostatic balance of the affected tissues is created; one in which self-repair can most easily occur.

The term 'functional technique' grew out of a series of study sessions held in the New England Academy of Applied Osteopathy in the 1950s under the general heading of 'A functional approach to specific osteopathic manipulative problems' (Bowles 1955, 1956, 1957).

The methods being explored were derived from traditional methods that dated back to the origins of osteopathy in the nineteenth century, but which had never been formalized or scientifically evaluated.

It was only in the 1950s and 1960s that research, most notably by Irvin Korr (1947), coincided with a resurgence of interest in this approach, largely as a result of the clinical and teaching work of Hoover, with the result that, 'functional technique has become quite comfortable in today's scientific climate, as well as streamlined and highly effective in practice' (Bowles 1981).

When considering the methodology of functionally orientated techniques, one distinctive difference stands out as compared with most other positional release methods, and with strain/counterstrain (SCS) in particular.

In functional work, palpation for a 'position of ease' involves a subjective appreciation of tissue, as it is brought through positioning towards ease, to a state of 'dynamic neutral' (see Chapter 1), rather than relying on a report by the patient as to reduction in pain as positioning and fine-tuning is carried out.

Theoretically (and usually in practice) the palpated position of maximum ease (reduced tone) in the distressed tissues should approximate the position that would have been found if pain was being used as a guide as in Jones's or Goodheart's approaches, as described in Chapters 3 and 4.

Similarly, if the concept of 'exaggeration of distortion' or 'replication of position of strain' is being employed, the same end-position should be achieved whether functional or SCS is being used, a position of dynamic neutral (see Chapter 1, Box 1.2, for a summary of positional release variations).

Bowles (1956) gives an example:

A patient has an acute low back and walks with a list. A structural diagnosis is made and the fingertips palpate the most distressed tissues, within the area of most distress. The operator begins tentative positioning of the patient, preferably sitting. The fingertips pick up a slight change toward a dynamic neutral response, a little is gained, not much, but a little. A little, but enough so the original segment is no longer the most distressed area within the area of general distress. The fingers then move to what is now the most acute segment. As much feeling of dynamic neutral is obtained here as possible. Being temporarily satisfied with slight improvements here and there, this procedure continues until no more improvement is detectable. That is the time to stop. Using tissue response to guide the treatment the operator has step-by-step eased the lesioning and corrected the structural imbalance to the extent that the patient is on the way to recovery.

Compare this description with the example given in Box 10.14 of a mobilization with movement approach to a similarly acutely distressed young man (see also Figs 10.25A, B and C).

Functional objectives

Hoover (1957) has summarized the key elements of functional technique in diagnosis and treatment:

- Diagnosis of function involves passive evaluation as the part being palpated responds to physiological demands for activity made by the operator or the patient.
- Functional diagnosis determines the presence or absence of normal activity of a part which is required to respond as a part of the body's activities (say respiration, or the introduction of passive or active flexion or extension).
- If the participating part has free and 'easy' motion, it is normal. However, if it has restricted or 'binding' motion, it is dysfunctional.
- The degree of ease and/or bind present in a dysfunctional site when motion is demanded is a fair guide to the severity of the dysfunction.
- The most severe areas of observed or perceived dysfunction are the ones to treat initially.
- The directions of motion which induce ease in the dysfunctional sites indicate precisely the most desirable pathways of movement.
- Use of these guidelines automatically precludes undesirable manipulative methods, since an increase in resistance, tension or 'bind' would result from any movement towards directions of increased tissue stress.
- Treatment using these methods is seldom, if ever, painful and is well received by patients.
- The application requires focused concentration on the part of the operator and may be mentally fatiguing.
- Functional methods are suitable for application to the very ill, the extremely acute and the most chronic situations.

Functional exercises

The exercises described in this chapter are variously derived from the work of Johnston (1964), Stiles and colleagues (Johnston et al 1969, Johnston 1988), Greenman (1989), Hoover (1969b) and Bowles (1955, 1964, 1981).

Bowles is precise in his instructions to those attempting to learn to use their palpating contacts in ways which will allow the application of functional methods:

- The palpating contact ('listening hand') must not move.
- It must not initiate any movement.
- Its presence in contact with the area under assessment/treatment is simply to derive information from the tissue beneath the skin.
- It needs to be tuned into whatever action is taking place beneath the contact and must temporarily ignore all other sensations such as 'superficial tissue texture, skin temperature, skin tension, thickening or doughiness of deep tissues, muscle and fascial tensions, relative positions of bones and range of motion'.
- All these signs should be assessed and evaluated and recorded separately from the functional evaluation, which should be focused single-mindedly on tissue

response to motion: 'It is the deep segmental tissues, the ones that support and position the bones of a segment, and their reaction to normal motion demands, that are at the heart of functional technique specificity' (Bowles 1981).

Terminology

Bowles (1964) explains the shorthand use of these common descriptive words:

Normal somatic function is a well-organized complexity and is accompanied by an easy action under the functionally-orientated fingers. The message from within the palpated skin is dubbed a sense of 'ease' for convenience of description. Somatic dysfunction could then be viewed as an organized dysfunction and recognized under the quietly palpating fingers as an action under stress, an action with complaints, an action dubbed as having a sense of 'bind'.

In addition to the 'listening hand' and the sensations it is seeking, of ease and bind, Bowles suggests we develop a 'linguistic armament' which will allow us to pursue the subject of functional technique without 'linguistic embarrassment' and without the need to impose quotation marks around the terms each time they are used.

He therefore asks us to become familiar with the additional terms, 'motive hand', which indicates the contact hand that directs motion (or fingers, or thumb or even verbal commands for motion – active or assisted), and also 'normal motion demand', which indicates what it is that the motive hand is asking of the body part. The motion could be any normal movement such as flexion, extension, side-bending, rotation or combination of movements – the response to which will be somewhere in the spectrum of ease and bind, which will be picked up by the listening hand for evaluation.

At its simplest, functional technique sets up a 'demand–response' situation, which allows for the identification of dysfunction – as bind is noted – and which also allows for therapeutic intervention as the tissues are guided into ease.

Bowles's summary of functional methods

In summary, whatever region, joint or muscle is being evaluated by the listening hand, the following results might occur:

- The motive hand makes a series (any order) of motion demands (within normal range), which includes all possible variations. If the response noted in the tissues by the listening hand is ease in all directions, then the tissues are functioning normally.
- The motive hand makes a series of motion demands, which includes all possible variations.
- However, if/when some of the directions of movement produce bind when the demand is within normal physiological ranges, the tissues are responding dysfunctionally.
- For therapy to be introduced in response to an assessment of bind, relating to particular motion demands, the listening hand's feedback is required so that, as the motions which produced bind are reintroduced, movement is modified so that the maximum degree of ease possible is achieved:

Therapy is monitored by the listening hand and fine-tuned information as to what to do next is then fed back to the motive hand. Motion demands are selected that give an increasing response of ease and compliance under the quietly palpating fingers. (Bowles 1964)

The results can be startling, as Bowles (1964) explains:

Once the ease response is elicited it tends to be self-maintaining in response to all normal motion demands. In short, somatic dysfunctions are no longer dysfunctions. There has been a spontaneous release of the holding pattern.

1. Bowles's functional exercise

Bowles (1964)

- Stand up and place your fingers on your own neck muscles paraspinally, so that the fingers lie – very lightly, without pressing, but constantly 'in touch' with the tissues – approximately over the transverse processes.
- Start to walk for a few steps and try to ignore the skin and the bones under your fingers.
- Concentrate all your attention on the deep supporting and active tissues as you walk.
- After a few steps stand still and then take a few steps walking backwards, all the while evaluating the subtle yet definite changes under your fingertips.
- Repeat the process several times, once while breathing normally and once while holding the breath in, and again holding it out.
- Standing still, take one leg at a time backwards, extending the hip and then returning it to neutral before doing the same with the other leg.
- What do you feel in all these different situations?

This exercise should help to emphasize the 'listening' role of the palpating fingers and their selectivity as to what they wish to listen to.

The listening hand contact should be 'quiet, non-intrusive, non-perturbing' in order to register the compliance of the tissues and evaluate whether there is a greater or lesser degree of 'ease' or 'bind' on alternating steps and under different circumstances as you walk.

2. Johnston and Stiles's sensitivity exercise

(Johnston et al 1969)

Exercise 2(a) The time suggested for this exercise is 3 minutes.

- In a classroom setting, pair up with another person and have them sit, as you stand behind them resting your palms and fingers over their upper trapezius muscle, between the base of the neck and shoulder.
- The object is to evaluate what happens under your hands as your partner takes a deep inhalation.
- This is not a comparison of inhalation with exhalation, but is meant to help you assess how the areas being palpated respond to inhalation – do they stay easy, or do they bind?
- You should specifically *not* try to define the underlying structures or their status in terms of tone or fibrosity; simply assess the impact, if any, of inhalation on the tissues.
- Do the tissues resist, restrict, bind or do they stay relaxed?
- Compare what is happening under one hand with what is happening under the other during inhalation.
- Reverse the roles and have your partner assess you in the same manner to see which hand palpates the area of greatest bind on your inhalation.

Exercise 2(b) The time suggested for this exercise is 5–7 minutes.

- Go back to the starting position where you are palpating your original partner, who is seated with you standing behind.
- The objective this time is to map the various areas of 'restriction' or bind in the thorax, anterior and posterior, as your partner inhales.
- In this exercise try not only to identify areas of bind but to assign what you find into 'large' (several segments) and 'small' (single segment) categories.
- To commence, place a hand, mainly fingers, on (say) the upper left, upper thoracic area, over the scapula, and have your partner inhale deeply several times, firstly when seated comfortably, hands on lap, and then with the arms folded on the chest (exposing more the costovertebral articulation).
- After several breaths with your hand in one position resite the hand a little lower, or more medially or laterally as appropriate, until the entire back has been 'mapped' in this way.
- Remember that you are not comparing how the tissues feel on inhalation as compared with exhalation, but how different regions compare (in terms of ease and bind) with each other in response to inhalation.
- Map the entire back and/or front of the thorax in this way – for location of bind, and for 'size' of the restricted area(s).
- Go back to any 'large' areas of bind and see whether you can identify any 'small' areas within them, using the same simple contact and inhalation as the motion component.
- Individual spinal segments can also be mapped by sequentially assessing them one at a time as they respond to inhalations.
- Switch places, so that your partner now has the opportunity to assess you.
- As you sit having your thorax assessed, take the opportunity to ask yourself how you would normally handle the information you have uncovered in your 'patient':
  - Would you try in some way to mobilize what appears to be restricted?
  - If so, how?
  - Would your therapeutic focus be on the large areas of restriction or the small ones?
  - Would you work on areas distant from, or adjacent to, the restricted areas?
  - Would you try to achieve a release of the perceived restriction by trying to move it mechanically towards and through its resistance barrier, or would you rather be inclined to try to achieve release by some indirect approach, moving away from the restriction barrier?
  - Or, would you try a variety of approaches, mixing and matching until the region under attention was free or improved?

There are no correct or incorrect answers to these questions; however, the various exercises in this section (and elsewhere in the book) should open up possibilities for other ways being considered, ways which do not impose a solution but allow one to emerge.

Exercise 2(c) The time suggested for this exercise is 5–7 minutes.

- Go back to the original 'doctor/patient' setting, with your partner seated, arms folded on the chest, and you standing behind with your listening hand/fingertips placed on the upper left thorax, on or around the scapula area.
- Your motive hand is placed at the cervicodorsal junction, so that it can indicate to your partner your 'request' that she move forward of the midline (dividing the body longitudinally in the coronal plane), not into flexion but in a manner that carries the head and upper torso anteriorly.
- The movement will be found to be more easily accomplished if your partner has arms folded, as suggested above.

- The repetitive movement forwards, into the position described, and back to neutral, is initiated by your motive hand, while the listening hand evaluates the changes created by this.
- In effect you are comparing one palpated area with another, in response to this normal motion demand.
- As Johnston, Stiles and colleagues (1969) state: 'It is not anterior direction of motion compared with posterior direction, but rather a testing of motion into the anterior compartment only, comparing one area with the ones below and the ones above, and so on.'
- Your listening hand is asking the tissues whether they will respond easily or with resistance to the motion demanded of the trunk.
- In this way try to identify those areas, large and small, which bind as the movement forward is carried out.
- Compare these areas with those identified when the breathing assessment was used.

The patterns elicited in Exercise 2(c) involved movement initiated by yourself, whereas the information derived from 2(a) and 2(b) involved intrinsic motion, initiated by exaggerated respiration. Stiles and his colleagues have in these simple exercises taken us through the initial stages of palpatory literacy in relation to how tissues respond to motion that is self-initiated or externally induced.

Implications

Other ways of using the information gathered during Exercise 2(c) are further expanded:

> *In this particular testing what you have been doing is changing the positional relationship of the shoulders and the hips.*
>
> *Clues about this shoulder-to-hips relationship, elicited at the restricted area in this way, can become criteria for you in picking the technique you may want to use to effectively change the specific dysfunction being tested ... We feel that a better chance of 'correction' may be established if you use a technique which will take the dysfunctional area and deal not only with the flexion–extension component, the side-bending and the rotation, but also see that the shoulders are properly positioned in relation to the hips.* (Johnston et al 1969)

Hoover (1969b) poses a number of questions in the following exercises (he calls them 'experiments'), the answers to which should always be 'yes'.

If your answers are indeed positive at the completion of the exercise then you are probably sensitive enough in palpatory skills to be able to use functional technique effectively in clinical settings.

3. Hoover's clavicle exercise

(Hoover 1969a)

Exercise 3(a) Suggested time for this exercise is 5 minutes. The question posed in this part of the exercise is: 'Does the clavicle move in a definite and predictable manner?'

- Stand facing your seated partner and place the pads of the fingers of your right hand (listening hand) onto the skin above the right acromioclavicular joint.
- With your left hand, hold the right arm just below the elbow.
- Ensure that your partner is relaxed and that you have the full weight of the arm and that there is no attempt to assist or hinder in any way, as the exercise is carried out (Fig. 6.1).
- Ensure that you have this cooperation by raising and lowering the arm several times.
- Slowly and deliberately take the arm back from the midline, just far enough to sense a change in the tissues under your palpating hand, and then return it to neutral.
- Avoid quick movements so that the sensations being palpated are accurately noted.
- Repeat this movement several times so that this single movement's influence can be assessed.
- Recall the question posed by Hoover for consideration, as you make this passive movement of the arm.

Figure 6.1 Assessing for positions that induce ease or bind in the acromioclavicular joint. The fully supported arm is passively moved in various directions (Hoover 1969b).

- Now take the arm forward of the midline, until you sense a tissue change under your listening hand's fingertips.
- Repeat this single movement several times; forward and back to neutral, repeat and repeat, assessing all the while.
- Introduce abduction of the arm from its neutral position and then return it to neutral several times.
- Then introduce adduction – bringing the arm across the front of the trunk slightly – before returning it to neutral.
- Repeat this several times.
- In a similar manner, starting from and returning to neutral, assess the effect on ease and bind of a slowly introduced degree of internal and then external rotation, conducted individually.
- What was the response of individual physiological movements to the question: 'Does the clavicle move in a definite and predictable manner?'?

The answer to the question posed should be that the clavicle does indeed move in a definite and predictable manner when demands for motion are made upon it.

Exercise 3(b) Suggested time for this exercise is 5 minutes. The question posed in this exercise is: 'Are there differences in ease of motion and feeling of tissues of the clavicle when it is caused to move in different physiological motions?'

- Adopt the same starting position as in Exercise 3(a) and then move your partner's arm backwards into extension very slowly as you palpate tissue change at the lateral end of the clavicle.
- Compare the feelings of ease and bind as you then take the arm into flexion, bringing it forward of the body.
- Then compare the feelings of ease and bind as you abduct and adduct the arm sequentially, passing through neutral as you do so.
- Compare the ease and bind sensations as you internally and externally rotate the arm.
- In this exercise, instead of individual motion demands, assessed on their own, you have the chance to evaluate what happens in the tissues being palpated as opposite motions are introduced, sequentially, without a pause.
- The question posed asks that you decide whether there were directions of motion that produced altered feelings of ease in the tissues.
- The answer should be that, usually, there are indeed identifiable differences or aberrations of motion and tissue texture when the clavicle is caused to move in different physiological motions.

Exercise 3(c) Suggested time for this exercise is 5 minutes. The question posed in this exercise is: 'Can the differences of ease of motion and tissue texture be altered by moving the clavicle in certain ways?'

- Repeat the introductory steps and commence by *flexing* the arm, and bringing it forwards of the midline until you note the clavicle beginning to move and the texture under palpation changing to bind.
- Then move the flexed arm backwards into *extension* until the clavicle starts to move and the sensation of bind is noted.
- Between these two extremes lies a position of maximum ease, a position of physiological balance, in this plane of motion (forward and backward of the midline).
- It is this point of balance that you need to establish.
- Starting from this balanced point of ease, use the same guidelines for assessing the point at which the clavicle starts moving and bind is noted as you seek a point of balance between *abduction and adduction* of the arm.
- When you find the combined position of maximal ease, having explored flexion/extension and abduction/adduction, you will effectively have 'stacked' one position of ease onto another.
- Starting from that combined position of ease, you need to find the point of ease between the extremes where clavicle movement and bind are noted as you introduce internal and *external rotation*.
- Once this has been established you have achieved a reciprocal balance between the arm and the clavicle.
- If you were treating dysfunction in these tissues/structures you would maintain that combined ('stacked') position of ease for at least 90 seconds.

You should have effectively answered the question posed in Exercise 3(c), since it should now become clear that aberrations of motion and tissue texture can be changed by motion of the clavicle.

The experiment continues

Starting from this position of reciprocal balance, reassess, as you did in the first part of the whole exercise, all the individual directions of motion of the arm (flexion, abduction, etc.).

Unlike the first part of the exercise, however, you will not be starting from the position in which the arm hangs at the side, but rather from a point of dynamic balance in which the tissues are at their most relaxed.

What you are seeking now are single motions of the arm/clavicle which are free, which produce the least sense of bind and the greatest sense of ease, starting from this balanced position.

When such a motion is identified:

This one motion is continued slowly and gently as long as the sensory hand reports improving conditions, if a state is reached in which movement in that one direction increases bind and does not make movement more easy and tissue texture more normal, the sequence of physiological motions are again checked. (Hoover 1969a)

What Hoover (1969a) is taking us towards in this exercise is the point at which we no longer impose action on the body, but follow it – where we allow the tissues to guide us towards their most desired directions of motion and positional ease.

In effect, what he has done, if we can follow his instructions up to this point, is to bring us to the start of using functional technique clinically.

The process described above, of finding physiological, dynamic balance and then seeking the pathways of greatest ease for the tissues, is functional technique in action.

The further evolution of the process described (using the clavicle exercise), in which the tissues guide the operator, requires a great deal of practice.

Hoover (1969a) explains:

The operator relaxes and becomes entirely passive as his sensory or listening hand detects any change in the clavicle and its surrounding tissues. A change in the clavicle and its surrounding tissues, if felt by the sensory hand, sends information to the reflex centers which relay an order to the motor hand to move the arm in a manner so as to maintain the reciprocal balance, or neutral. If this is the proper move there will be a feeling of increasing ease of motion and improved tissue texture. This process continues through one or more motions until the state of maximum ease or quiet is attained.

4. Hoover's thoracic exercise

Hoover (1969b)

Exercise 4(a) Suggested time for this part of the exercise is 4 minutes.

- Stand behind your seated partner, whose arms are folded across the chest.
- You should have previously assessed by palpation, observation and examination the thoracic or lumbar spine of your partner, and should now lightly place your listening hand on an area that appeared to be restricted, or in which the tissues are particularly hypertonic.
- Wait and do nothing as your hand 'tunes' in to the tissues.
- Make no assessments as to structural status.
- Wait for at least 15 seconds. Hoover says: 'The longer you wait the less structure you feel. The longer you keep the receiving fingers still, the more ready you are to pick up the first signals of segment response when you proceed to induce a movement demand.'
- With your other hand, and by voice, guide your partner/model into flexion and then extension.
- The motive hand should apply very light touch, just a suggestion as to which direction you want movement to take place towards.
- The listening hand does nothing but waits to feel the functional response of the tissues – ease and bind – as the spinal segments and tissues move into flexion and then extension.
- A wave-like movement should be noted as the segment/area being palpated is involved in the gross motion demanded of the spine.
- Changes in the tissue tension under palpation should be noted as the various phases of the movement are carried out.
- Practice the assessment at various segmental levels, and areas of the back, and try to feel the different status of the palpated tissues during the phases of the process, as bind starts, becomes more intense, eases somewhat and then becomes very easy, before a hint of bind reappears and then becomes intense again.
- Decide where the *maximum bind* is felt and where *maximum ease* occurs. These are the key pieces of information required for functional technique as you assiduously avoid bind and home in on ease.
- Try also to distinguish between the bind that is a normal physiological response to an area coming towards the end of its normal range of movement, and the bind that is a response to dysfunctional restriction.
- Switch places and allow your partner to evaluate you in the same way.

Exercise 4(b) Suggested time for this part of the exercise is 3 minutes.

- Return to the starting position as in 4(a) and, while palpating an area of restriction or hypertonicity, induce straight side-bending to one side and then the other while assessing for ease and bind in exactly the same way as in 4(a) (where flexion and extension were the directions used).
- Change places and allow your partner to do this to you.

Exercise 4(c) Suggested time for this part of the exercise is 3 minutes.

- Return to the starting position as in 4(a) and 4(b) and, while palpating an area of restriction or hypertonicity, induce rotation to one side and then the other while assessing for ease and bind in exactly the same way as in 4(a) and 4(b).

- Change over to allow your partner to do this to you.

Different responses

Hoover describes variations in what might be felt as the response of the tissues being palpated during these various positional demands.

1. Dynamic neutral This response to motion is an indication of normal physiological activity. There is minimal signaling during a wide range of motions in all directions. Hoover states it in the following way:

> *This is the pure and unadulterated unlesioned (i.e. not dysfunctional) segment, exhibiting a wide range of easy motion demand–response transactions.*

2. Borderline response This is an area or segment which gives some signals of some bind fairly early in a few of the normal motion demands. The degree of bind will be minimal and much of the time ease, or dynamic neutral, will be noted. Hoover states that 'most segments act a bit like this'; they are neither fully 'well' nor 'sick'.

3. The lesion response This is where bind is noted almost at the outset of almost all motion demands, with little indication of dynamic neutral.

Note Terminology has changed and what was called a 'lesion' in Hoover's day is now known as somatic dysfunction.

Hoover suggests that you should:

> *Try all directions of motion carefully. Try as hard as you can to find a motion demand that doesn't increase bind, but on the contrary, actually decreases bind and introduces a little ease. This is possible. This is an important characteristic of the lesion [dysfunction].*

Indeed, he states that the more severe the restriction the easier it will be to find one or more slight motion demands that produce a sense of ease or dynamic neutral, because the contrast between ease and bind will be so marked.

Hoover's summary

Practice is suggested with dysfunctional joints and segments in order to become proficient.

Three major ingredients are required for doing this successfully, according to Hoover (1969b):

1. A focused attention to the process of motion demand and motion response, while whatever is being noted is categorized, as 'normal', 'slightly dysfunctional', 'frankly or severely dysfunctional', and so on.
2. A constant evaluation of the changes in the palpated response to motion in terms of *ease* and *bind*, with awareness that these represent increased and decreased levels of signaling and tissue response.
3. An awareness that in order to thoroughly evaluate tissue responses, all possible variations in motion demand are required, which calls for a structured sequence of movement demands.

Hoover suggests that these be verbalized (silently):

> *Mentally, set up a goal of finding ease, induce tentative motion demands until the response of ease and increasing ease is felt, verbalize the motion-demand which gives the response of ease in terms of flexion, extension, side-bending and rotation. Practice this experiment until real skills are developed. You are learning to find the particular ease-response to which the dysfunction is limited.*

In addition, depending upon the region being evaluated, the directions of abduction, adduction, translation forwards, translation backwards, translation laterally and medially, translation superiorly and inferiorly, etc., may need to be factored into this approach.

Greenman's functional exercise, below, introduces some of these elements.

Bowles describes the goal

Bowles (1964) summarizes succinctly what is being sought during such processes of assessment:

> *The activity used to test the segment (or joint) is largely endogenous, the observing instrument is highly non-perturbational, and the information gathered is about how well or how poorly our segment of structure is solving its problems. Should we find a sense of easy and non-distorted following of the structures, we diagnose the segment as normal. If we find a sense of binding, tenseness, tissue distortion, a feeling of lagging and complaining in any direction of the action, then we know the segment is having difficulty properly solving its problems.*

The diagnosis would be of dysfunction.

5. Greenman's (1989) spinal 'stacking' exercise

The recommended time for this exercise is 10 minutes.

In previous exercises individual directions and some simple combinations of movement have been used to assess the response of the palpated tissues in terms of ease and bind.

In this exercise pairs of motion demands are made (e.g. flexion and extension). However, each of these assessments, after the first one, commences from the point of ease discovered in relation to the previous motion demand assessed.

In this way, the ultimate position of maximal ease, of dynamic neutral, is equal to the sum of all the previously achieved positions of ease so that one position of ease is literally 'stacked' onto another.

- Stand behind your seated partner, whose arms are crossed on their chest, hands on shoulders.
- Place your listening hand on an upper thoracic segment and take your other arm across and in front of your partner's folded arms to embrace their opposite shoulder or lateral chest wall.
- Motion demands are made by verbal instruction as well as by slight encouragement from the motive hand.

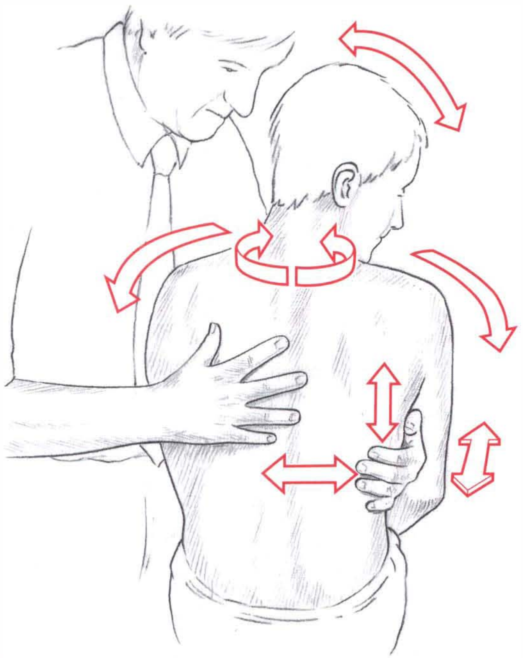


Figure 6.2 Functional palpation (or treatment) of a spinal region/segment during which all possible directions of motion are assessed for their influence on the sense of 'ease and bind' in the palpated tissues. After the first position of ease is identified (sequence is irrelevant) each subsequent assessment commences from the position of ease (or combined positions of ease) identified by the previous assessment(s) in a process known as 'stacking'.

- A series of assessments is made for ease (Fig. 6.2) in each of the following pairs of direction:
  - flexion and extension
  - side-bending in both directions
  - rotation in both directions
  - translation anteriorly and posteriorly
  - lateral translation in both directions
  - translation cephalad and caudad (traction and compression)
  - full inhalation and full exhalation.
- The last investigation should be of the influence on ease of the different phases of breathing, full inhalation and full exhalation. However, apart from this, the sequence in which the other movements are performed is irrelevant, as long as they are all introduced so that each subsequent motion demand commences from the position of ease previously discovered.
- The final respiratory demand indicates in which phase of breathing the most ease in the tissues is noted, and once this has been established that phase is 'stacked' onto the combined position of ease previously developed, and is held for anything from 90 seconds, after which the position of neutral is slowly readopted before the entire stacking sequence is performed again.

6. Exercise in cervical palpation

Note This is a modification of Greenman's (1989) exercise in which he suggested use of muscle energy technique to treat whatever restrictions are located when testing translation restrictions. In this variation, positional release (functional) techniques are suggested instead; however, the basic design of the exercise is as described by Greenman.

To easily palpate for side-flexion and rotation, a side-to-side *translation* ('shunt') movement is used, with the neck in one of three positions – neutral, moderate flexion and extension.

As a segment is translated to one side it automatically creates a side-flexion effect and, because of the anatomical and physiological rules governing it, *rotation to the same side occurs* (Mimura et al 1989).

This spinal coupling feature appears to be a predictable universal event in the cervical spine (i.e. side-flexion and rotation to the same side); however, coupling in the remainder of the spine, while universal, is less predictable (Gibbons & Tehan 1998).

In order to evaluate cervical function using this knowledge, Greenman suggests that the practitioner places the fingers as follows, on each side of the spine (Fig. 6.3A, B):

- The supine patient's occiput rests on the practitioner's thenar eminences.

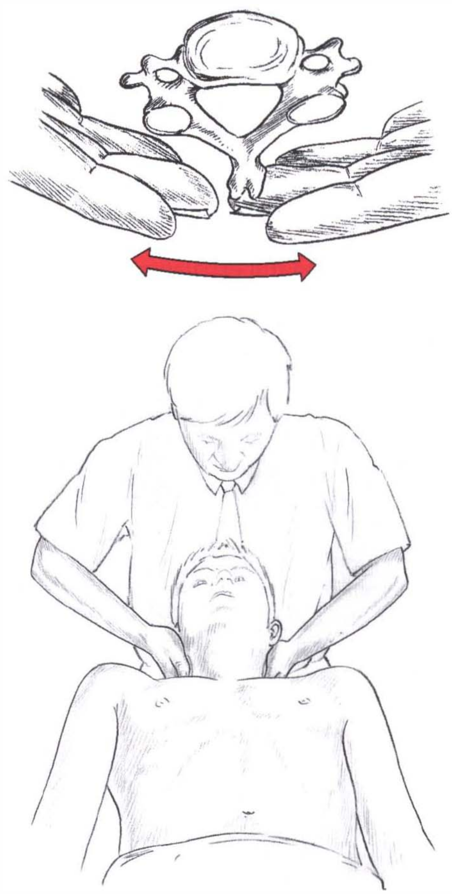


Figure 6.3A and B Functional assessment and/or treatment of the cervical area involving translation/rotation restrictions. (From Chaitow 2001.)

- The index finger pads rest on the articular pillars of C6, just above the transverse processes of C7, which can be palpated just anterior to the upper trapezius.
- The middle finger pads will be on C6, and the ring fingers on C5, with the little finger pads on C3.

Then:

- With these contacts it is possible to examine for sensitivity, fibrosis, and hypertonicity, as well as to apply lateral translation to cervical segments with the head in neutral, flexion or extension.
- In order to do this effectively, it is helpful to stabilize the superior segment to the one being examined.
- The heel of the hand helps to control movement of the head.
- With the head/neck in relative neutral (no flexion and no extension), translation to the right and then left is introduced (any segment) to assess freedom of movement (and by implication, side-flexion and rotation) in each direction.
- Say C5 is being stabilized with the finger pads, as translation to the left is introduced, the ability of C5 to freely side-flex and rotate on C6 is being evaluated when the neck is in neutral.
- If the joint (and/or associated soft tissues) is normal, this translation will cause a gapping of the left facet and a 'closing' of the right facet as left translation is performed, and vice versa.
- There will be a soft end-feel to the movement, without harsh or sudden braking.
- If, however, translation of the segment towards the right from the left produces a sense of resistance/bind, then the segment is restricted in its ability to side-flex left and (by implication) to rotate left.
- If translation right is restricted, then (comparatively) translation left will be more 'free'.
- If such a restriction is noted, the translation should be repeated, but this time with the head in extension instead of neutral.
- This is achieved by lifting the contact fingers on C5 (in this example) slightly towards the ceiling before reassessing the side-to-side translation.
- The head and neck can also be taken into slight flexion, and left-to-right translation again assessed.
- The objective is to ascertain which position (neutral, flexion, extension) creates the greatest degrees of *ease* and *bind* as any particular translation occurs.
- By implication if translation left (whether in neutral, extension of flexion) is the most free, then translation in the opposite direction would be more restricted.
- Because of spinal coupling rules, this indicates that rotation is also more restricted in the direction opposite that in which translation was most free (i.e. greater freedom of translation left suggests greater restriction of rotation right).
- The question the assessment is asking is whether (at the segment being assessed) there is more freedom of translation movement in one direction or the other, in neutral, extension or flexion.
- If this freedom of movement is greater with the head extended, or neutral, or flexed, then that is the position to be used in treating any dysfunction or imbalance (as indicated by greater restriction in translation in the opposite direction) at that segment.

- Hold the translation position for 90 seconds and then reevaluate the symmetry of translation movement.
- It should be more balanced.

Functional treatment of the knee – a case study

Johnston (1964) describes the way in which an acute knee restriction might be handled using a functional approach.

He stresses that the description given is unique to the particular pattern of dysfunction existing in the patient under consideration, and that quite different patterns of dysfunction and therapeutic input would be noted in each and every acute knee problem treated. We need to consider, in each case, 'this particular patient with this particular problem'.

A young male patient is described who had a painful left knee, of 3 months duration, which could not fully straighten following a period of extensive kneeling.

On examination, the left leg remained slightly flexed at the knee, with tissues in the region somewhat warmer and more congested than in the normal right knee. Extension of the knee was painful and produced a rigid resistance as well as subjective pain.

- Standing on the left of the patient the operator placed his right hand so that the palm was in contact with the patella, the thumb encircled the knee to contact the lateral aspect of the joint interspace while the second finger was in contact with the medial joint interspace.
- This *listening hand* maintained a contact light enough to appreciate subtle changes in tissue status (the sense of tension and rigidity in the tissues – described as bind) while also being able to assist in subsequent motion introduced by the other hand.
- The left hand firmly held the patient's left ankle (Fig. 6.4A).
- Initially the extreme sense of bind was assessed by slightly yet forcibly taking the joint into extension – straightening the leg a little.
- As the knee was then returned to its position of slight flexion the sense of ease was noted.
- Various directions of motion were then explored and evaluated for the response of ease and bind.
- This has the purpose of 'mapping out an enlarging pattern for the response of decreasing bind'.
- The knee was then moved into greater degrees of flexion, both elevated from the table and with the upper leg handing below the edge of the table (Figs 6.4B and C).

Figure 6.4A Johnston's (1964) exercise for 'mapping out an enlarging pattern for the response of decreasing bind' in a knee joint.

Figure 6.4B Commonly a position of ease for the knee will be found in which introduction of hip and knee flexion is followed by the lower leg being internally rotated and abducted, while tissue status is monitored in the knee area.

Figure 6.4C An alternative position of ease for the strained knee may be found in which the hip is slightly extended and abducted while the lower limb is taken into flexion, abduction and/or internal rotation.

- Various motions were assessed, including abduction and adduction of the lower limb, internal and external rotation of the lower leg.
- The greatest degree of ease was noted by the listening hand when the hip was flexed, the knee was markedly flexed and the lower leg was internally rotated and abducted.

Painless approach

Johnston highlights the value of such an approach in a painful condition:

> *Even when this testing involved the potentially painful ranges of motion, the increasing binding response at the fingertips is so immediate and is so dramatic a signal to the operator that the ranges need barely be entered.*

- Treatment was carried out, following this evaluation sequence, with the supine patient's leg supported as in the assessment process.
- The limb was raised to clear the table and taken into semi-flexion, as a torsion arc of internal rotation and abduction was introduced by the operator's left hand (holding the ankle), while the right hand monitored the response of the tissues around the knee, as well as supporting the knee in its flexed position.
- Alternative ranges and motions were occasionally tested during the procedure in order to 're-clue' the operator's right hand to the sense of immediately increasing bind.
- With the knee markedly flexed, the thigh slightly abducted, and the lower leg held in its 'ease' position of internal rotation and abduction, a 'sudden change' in tissue tension was noted, which allowed a sense of freedom as the leg was returned to its resting position.
- It remained slightly flexed but with objectively less rigidity, an assessed improvement of around 15% in terms of its degree of acuteness.

Repetition of the whole process

Precisely the same sequence of assessment and treatment was then repeated once more. This repetition is not a precise repositioning of the knee in the previous position of ease, but rather a further evaluation during which a new ideal position of 'balanced neutral' is determined by the process of palpation and motion.

Having gone through this process once, the second sequence will usually reveal a slightly different pathway to a state of ease.

In this instance, Johnston informs us that the subsequent evaluation of the position of maximal ease for the dysfunctional knee differed slightly from the previous one, as did the therapeutic holding position.

After these two functional treatments, the degree of dysfunction in terms of restriction and pain was reduced by approximately 40%.

At subsequent visits the process was carried further towards normalization so that: 'After five office visits during four weeks of continued improvement in use, the leg was able to be rested comfortably straight and the binding was no longer discernible at the knee' (Johnston 1964).

It is the experience of those using functional technique that a less chronic, less 'organized' degree of dysfunction would respond more rapidly than one, such as the case described, in which soft tissue changes in response to the strained tissues had become established for several months.

This functional diagnostic and treatment process takes longer to describe than to accomplish, for, once the listening hand learns to evaluate ease and bind, and the operator learns to assess the variable positions open to motion, in any given setting, the whole process can take a matter of a very few minutes.

Functional treatment of the atlanto-occipital joint

This final 'exercise' is offered as a means of introducing functional technique methodology into clinical practice. It is almost universally applicable, has no contraindications, and builds on the basic exercises in functional methodology described in this chapter.

The only situations in which it would be difficult or impossible to apply this method would be if the patient were unable to relax and allow the procedure to be completed, over a period of several minutes.

- The patient is supine.
- The practitioner sits at the head of the table, slightly to one side facing the corner of the table.
- One hand (caudal hand) cradles the occiput with opposed index finger and thumb palpating the soft tissues adjacent to the atlas.
- The other hand is placed on patient's forehead or crown of head.
- The caudal hand searches for feelings of 'ease' or 'comfort' or 'release' in the tissues surrounding the atlas, as the hand on the head directs it into a compound series of motions, one at a time.
- As each motion is 'tested' a position is identified where the tissues being palpated feel at their most relaxed or easy.
- This position of the head is used as the starting point for the next element in the sequence of assessment.
- In no particular order (apart from the first movements into flexion and extension), the following directions of motion are tested, seeking always the position of the head and neck which elicits the greatest degree of ease in the tissues around the atlas, to 'stack' onto the previously identified positions of ease (Figs. 6.5A–G):
  - flexion/extension (suggested as the first directions of the sequence: Figs. 6.5A and B)

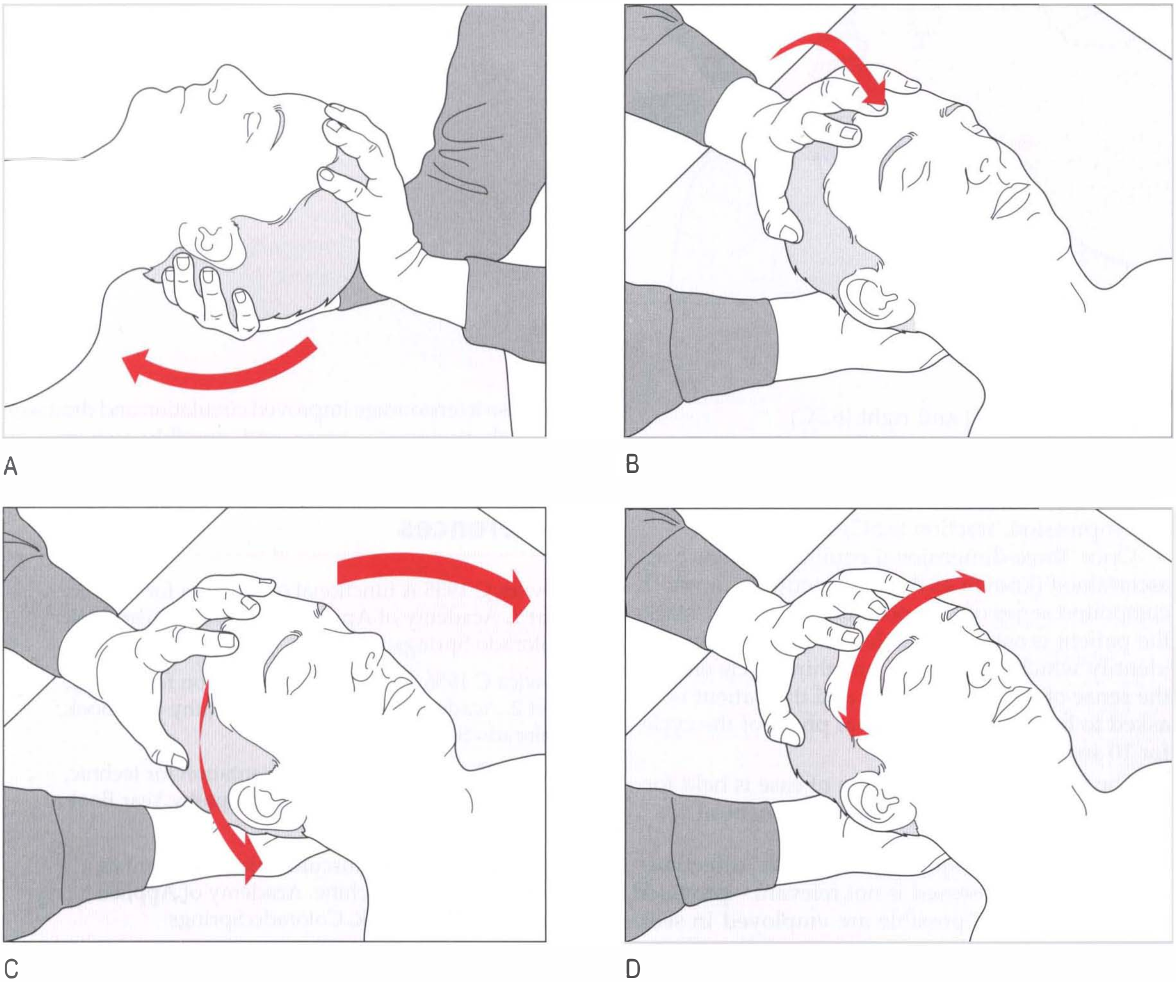
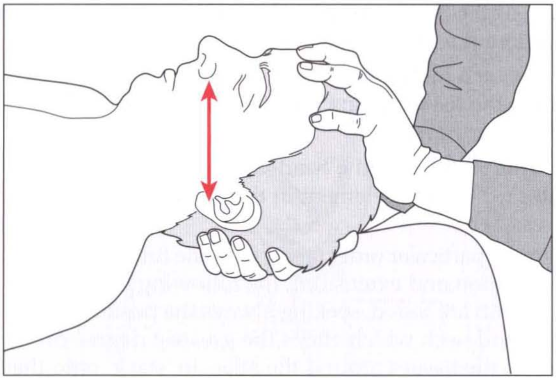


Figure 6.5A–G Functional atlanto-occipital joint release.



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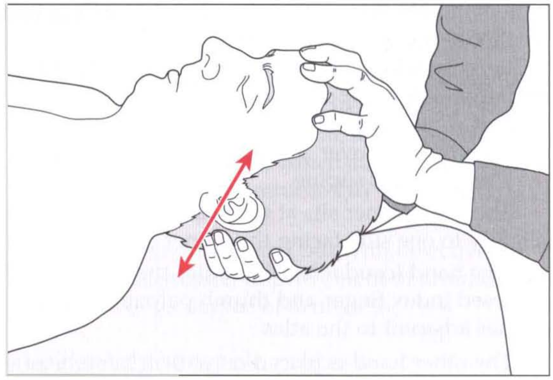

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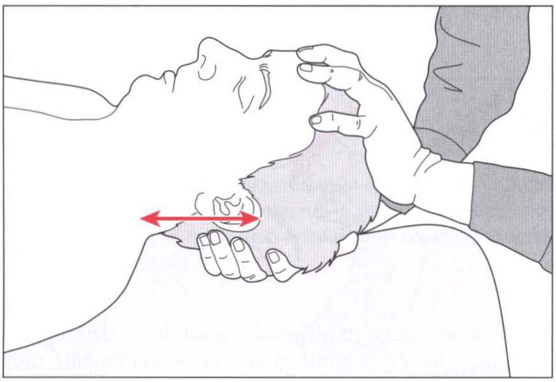

G

Figure 6.5A–G *continued*

- side-bending left and right (6.5C)
- rotation left and right (6.5D)
- anteroposterior translation (shunt, shift) (6.5E)
- side-to-side translation (6.5F)
- compression/traction (6.5G)

- Once 'three-dimensional equilibrium' has been ascertained (known as dynamic neutral), in which a compound series of ease positions have been 'stacked', the patient is asked to inhale and exhale fully – to identify which stage of the breathing cycle enhances the sense of palpated 'ease' – and the patient is asked to hold the breath in that phase of the cycle for 10 seconds or so.
- The final combined position of ease is held for 90 seconds before *slowly* returning to neutral.

Note that the sequence in which directions of movements are assessed is not relevant – provided as many variables as possible are employed in seeking the combined position of ease.

The effect of this held position of ease is to allow neural resetting to occur, reducing muscular tension, and also to encourage improved circulation and drainage through previously tense and possibly ischemic or congested tissues.

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7

Facilitated positional release (FPR)

CHAPTER CONTENTS

The nature of FPR

(Schiowitz 1990, 1991)

Stanley Schiowitz has described the method known as facilitated positional release (FPR), which incorporates elements of both SCS and functional technique, and appears to produce an accelerated resolution of hypertonicity and dysfunction.

He explains that FPR is in line with other indirect methods which adopt positional placement towards a direction of freedom of motion, and away from restriction barriers.

What is 'special' to this approach is that FPR adds to this absolute requirement (movement away from the barrier of restriction), the need for a prior modification of the sagittal posture – so that in a spinal area, for example, a balance would first be achieved between flexion and extension.

FPR then adds to this the 'facilitating' elements, which might involve either compression or torsion, or a combination of both, inducing an initial soft-tissue release, relating to hypertonicity or restriction of motion.

In spinal terms, the placing of regions into a neutral state, somewhere between extension and flexion, has the effect of releasing facet engagement.

The neurophysiology that Schiowitz describes in order to explain what happens during the application of FPR is based on the work of Korr (1975, 1976) and Bailey (1976) and correlates with facilitation and sensitization mechanisms suggested in earlier chapters (see Chapter 2 in particular) of this book in relation to the onset of somatic dysfunction. FPR appears to modify increased gamma motor neuron activity that may be affecting muscle spindle behavior. 'This (reduction in gamma motor neuron activity) allows the extrafusal muscle fibers to lengthen to their normal relaxed state' (Carew 1985).

The placement of involved tissues or joints into a position of ease involves the practitioner fine-tuning the neurological feedback process, ensuring that the relaxation response is specific to the muscle fibers involved in the problem.

Do muscles cause joint problems or vice versa?

Janda (1988) stated that it is not known whether dysfunction of muscles causes joint dysfunction or vice versa. However, he pointed to the undoubted fact that they massively influence each other, and that it is possible that a major element in the benefits noted following joint manipulation derives from the effects that such methods (high-velocity thrust, mobilization, etc.) have on associated soft tissues.

Steiner (1994) has specifically discussed the role of muscles in disc and facet syndromes and describes a possible sequence of events as follows:

- A strain involving body torsion, rapid stretch, loss of balance, etc., produces a myotatic stretch reflex response in, for example, a part of the erector spinae.
- The muscles contract to protect excessive joint movement, and spasm may result if there is an exaggerated response and the tissues fail to assume normal tone following the strain.
- This limits free movement of the attached vertebrae, approximates them and causes compression and, possibly, bulging of the intervertebral discs and/or a forcing together of the articular facets.
- Bulging discs might encroach on a nerve root, producing disc-syndrome symptoms.
- Articular facets, when forced together, produce pressure on the intra-articular fluid, pushing it against the confining facet capsule, which becomes stretched and irritated.
- The sinuvertebral capsular nerves may therefore become irritated, provoking muscular guarding, initiating a self-perpetuating process of pain–spasm–pain.

He continues:

> *From a physiological standpoint, correction or cure of the disc or facet syndromes should be the reversal of the process that produced them, eliminating muscle spasm and restoring normal motion.*

He argues that before discectomy or facet rhizotomy is attempted, with the all-too-frequent 'failed disc-syndrome surgery' outcome, attention to the soft tissues and articular separation to reduce the spasm should be tried, to allow the bulging disc to recede and/or the facets to resume normal relationships. (See Chapter 9 on the McKenzie approach for another alternative to surgery in many cases.)

Clearly, osseous manipulation often has a place in achieving this objective. However, the evidence of clinical experience indicates that a soft-tissue approach may also be employed in order to allow restoration of functional integrity.

If, for example, joint restriction were the result of muscle hypertonicity, then complete or total release of this heightened tone would ensure a greater freedom of movement for the joint.

If, however, other intra-articular factors were causing the joint restriction then, although improvement of soft-tissue status, produced by a reduction in hypertonicity, would ease the situation somewhat, the basic restriction would remain unresolved.

Focus on soft-tissue or joint restriction using FPR

Schiowitz suggests that FPR can either be directed towards local, palpable soft-tissue changes, or be used as a means of modifying the deeper muscles that might be involved in joint restriction:

> *It is sometimes difficult … to make a clear diagnostic distinction as to which is the primary somatic dysfunction, changes in tissue texture or motion restriction. If in doubt, it is recommended that the palpable tissue changes be treated first. If motion restriction persists, then a technique designed to normalize deep muscles involved in the specific joint motion restriction should be applied.*

In order to appreciate the way in which FPR is used, examples of its application will be explained.

Treatment of soft-tissue changes in the spinal region

Schiowitz follows Jones's guidelines, which state that soft-tissue changes on the posterior aspect of the body should be treated in part by taking them into a backward-bending direction, while those on the anterior aspect of the body require a degree of flexion to assist in their normalization using FPR.

However, he also reminds us that some muscles have a contralateral side-bending function or a rotary component or both. These muscles must be placed in their individual shortened positions. Schiowitz suggests that careful localization of the component motions of compression, forward- or backward-bending, and side-bending/rotation to the area of tissue texture change allows a faster and more accurate result.

FPR for soft-tissue changes affecting spinal joints

- After placing the patient into a relaxed position, the first requirement is that the sagittal posture should be modified to create a flattening of the anteroposterior spinal curve in whichever spinal region needs treating; 'thus a mild reduction of the normal cervical and lumbar lordosis or the thoracic kyphosis is established', inducing a softening and shortening of the affected muscle(s).

- Following this, additional elements of fine-tuning might involve compression and/or torsion (Fig. 7.1), in order to place dysfunctional tissue (or the articulation) in such a manner that 'it moves freely or is pain-free, or both'.
- The position of ease achieved by this fine-tuning is then held for 3–4 seconds, before being released so that the area can be re-evaluated.
- The component elements that comprise the various facilitating forces, i.e. crowding or torsion, can be performed in any order.

Intervertebral application of FPR

When dealing with restrictions and dysfunctional states of the intervertebral (soft tissue) structures, Schiowitz suggests that the associated vertebrae be placed into 'planes of freedom' of motion.

For this to be successful, the directions of 'ease' and 'bind' of a given segment need first to be evaluated.

If, for example, there is a restriction of a cervical vertebra in which it is found that, in relation to the vertebrae below, it cannot easily extend, side-bend right and rotate right, it would be logical, in order to establish a position of ease, to take it into flexion, side-bending left and rotation left, in relation to the vertebrae below, as a first stage of application of FPR.

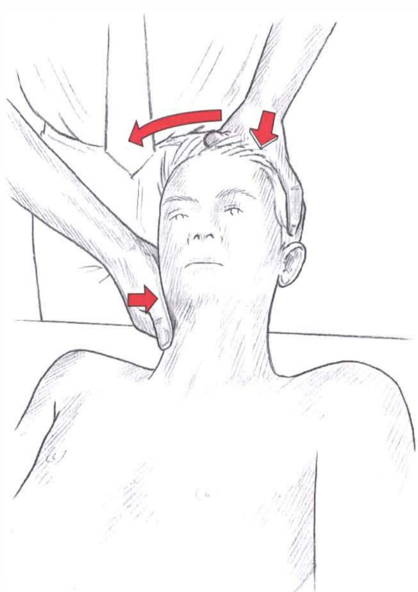

Figure 7.1 FPR treatment of anterior cervical dysfunction involves introduction of a reduced cervical curve followed by compression, side-bending and some slight torsion to achieve a sense of ease in palpated tissues.

Cervical restriction – FPR treatment method

If, in such an example, there were obvious discomfort/pain or tissue changes palpable posterior to the articular facet of the third cervical vertebra, the following procedure (which needs to involve backward-bending because the tissues are on the posterior aspect of the body) might be suggested.

- The patient would be supine on the table, the practitioner either standing, or seated at the head of the table with a cushion on his lap.
- The patient would have previously moved to a position in which the head was clear of the end of the table.
- Contact would be made with the area of tissue texture alteration (right articular facet, third cervical vertebra in this case) by the practitioner's left index-finger pad, while at the same time the head (occipital region) was being well supported by the right hand of the practitioner (Fig. 7.2A).
- It is via the activity of this right hand that further positioning would mainly be achieved.
- As noted previously, the first priority in FPR is to reduce the sagittal curve and this would be achieved by means of a slight flexion movement, introduced by the left hand.
- The second component, compression, would then be introduced by application of light pressure through the long axis of the spine towards the feet (Fig. 7.2A).
- The changes in tissue tone thus induced should be easily palpable by the contact finger ('listening finger') as a reduction in the sense of 'bind'.
- No more than 0.5 kg (1 lb) of force should be involved in this compressive effort
- The next component of FPR – in this instance – would be the introduction of rotation/torsion, and this could be achieved by slight extension and side-bending to the right over the practitioner's contact resting on the dysfunctional tissue, the right index finger.
- Cervical spinal mechanics dictate that side-bending is impossible without some degree of rotation taking place towards the same side.
- Therefore, rotation to the right would automatically occur as the neck was being side-flexed over the finger, so further easing and softening the tissues being treated (Fig. 7.2B).

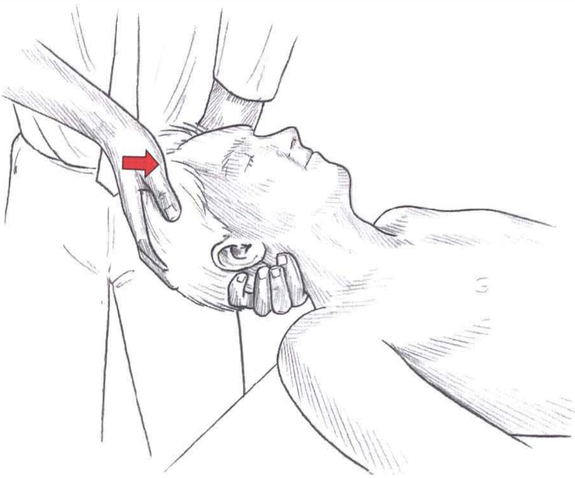

Figure 7.2A FPR treatment of posterior cervical dysfunction involves introduction of a reduced cervical curve followed by compression, as palpating hand monitors tissues for a sense of ease.

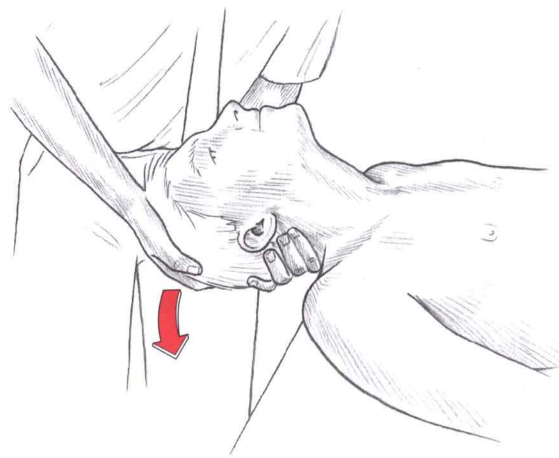

Figure 7.2B Additional fine-tuning involves introduction of extension side-bending and some slight rotation until a sense of ease in palpated tissues is noted, and held for 4–5 seconds.

- This final position would be held for 3–4 seconds, before slowly returning the neck and head to neutral for reassessment of the degree of tissue change/ release achieved by the procedure.

Spinal joint – FPR treatment

The only difference between treating a soft-tissue change that is affecting a spinal joint and treating the spinal joint itself using FPR is the degree of precision required in the positioning process.

Where the individual mechanics of restriction have been identified, the joint needs to be placed in 'all three planes of freedom of motion', into the directions of 'ease', using 'careful localization of the component motions'; in other words, in flexion, side-bending and rotation, having taken care to start from a position in which the normal sagittal curves have been somewhat reduced or neutralized.

Slight movement only for top cervical articulation

It is important to recall that in regard to the atlanto-occipital joint, flexion should require a slight degree of movement only, and that atlanto-occipital mechanics involves contralateral directions of motion; i.e. side-flexion and rotation of the atlas are in opposite directions, unlike the rest of the cervical spine where side-flexion and rotation are towards the same side.

FPR treatment of thoracic region dysfunction

- The patient should be seated for treatment of thoracic soft-tissue dysfunction.
- The example described here relates to tissue tension in the area of the sixth thoracic vertebral transverse process, on the right.
- The practitioner stands behind and to the right, having placed a contact, palpating or 'listening', (left index) finger on the area to be treated (Fig. 7.3).
- The practitioner places the right hand across the front of the patient's shoulders so that the practitioner's right hand rests on the patient's left shoulder and the practitioner's right axilla stabilizes the patient's right shoulder.
- In order to reduce the anteroposterior curves, the patient is then asked to sit up straight.
- In a controlled manner the patient is then told to 'lift the sternum towards the ceiling', so introducing a slight extension motion that is monitored by the contact (left index) finger in order to assess changes in tension/bind.
- This extension movement is slightly assisted, but not forced, by the practitioner's right hand/arm.
- When some ease is noted, the practitioner uses compressive effort through the right shoulder (via his own right axilla). The suggestion given by Schiowitz is that, 'this compressive motion should be applied as close to the patient's neck as possible,

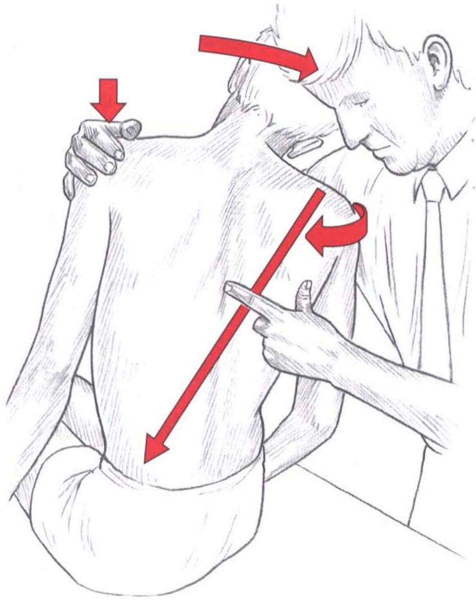

Figure 7.3 FPR treatment of thoracic region dysfunction (in this example 'tissue tension' to the right of the sixth thoracic vertebrae). One hand monitors tissue status as the patient is asked to 'sit straight' and to then slightly extend the spine. The practitioner then introduces compression from the right shoulder towards the left hip, which automatically produces right side-flexion at T6, and probably rotation to the left. Whatever the precise positional changes are, if ease is noted in the palpated tissues, the position is held for 4–5 seconds.

and directed downwards towards the patient's left hip'.

- Once again there is a monitoring, at the site of soft-tissue tension, of the effects of this compressive effort.
- In spinal structures other than the cervical spine (excluding C1), side-flexion is commonly (but not always) accompanied by contralateral rotation.
- In this case compressive force applied through the right shoulder, towards the left hip, would introduce both right side-flexion and left rotation at the area being palpated.
- If this produces a significant palpable softening, or 'ease', of the previously tense tissues, the position would be held for 3–4 seconds before returning to a neutral position for reassessment.

Thoracic flexion restriction and FPR

Schiowitz gives the example of a sixth thoracic vertebra which is free in its motions on the seventh vertebra when it moves easily into extension, side-bending right and rotation to the right.

The directions of restriction, therefore, which would engage the barrier would be into flexion, side-bending left and rotation left, and it is these directions of movement that would be utilized were a direct method (such as high-velocity thrust) being used to overcome that barrier, possibly involving the right articular facet joint.

However, since FPR is an indirect method, it is towards the directions of ease that we need to travel in order to achieve release.

- The starting positions (patient, practitioner, palpating digit at the right sixth articular facet, shoulder contacts) should be precisely as described in the previous example (above) for tissue release.
- This time, however, the compressive force would be applied straight downwards (inferiorly) from the shoulder towards the monitoring finger.
- No increase in movement into extension is suggested, as this would reduce the chances of facet release.
- When some ease was noted at this contact point from the compressive effort, a torsional side-bending and rotation movement to the right would be introduced until the freedom of motion was noted in the facet contact.
- This would be held for 3–4 seconds, then released.
- After repositioning into neutral, the range of motion which was previously restricted should be reassessed.

Prone treatment for thoracic flexion dysfunction

- For the same restriction (difficulty in moving into flexion and side-bending rotation to the left) the patient could be lying prone with the practitioner standing beside the table on the side opposite the dysfunctional vertebral restriction (Fig. 7.4).
- The prone position would tend to introduce a mild degree of extension which can be enhanced by placement of a thin cushion under the patient's head/neck area.
- In this example, standing on the left of the patient, the practitioner's left (monitoring) index finger would be placed on the right articular joint between the sixth and seventh thoracic vertebrae.
- The practitioner's right hand would cup the area over the acromion process, easing this towards the patient's feet, parallel to the table, until a desirable 'softening' of the tissues was noted by the palpating digit.
- This effort should be maintained as the practitioner leans backwards, in order to initiate a slight backward movement (towards the ceiling) of the patient's right shoulder, so adding a further degree of extension, together with side-flexion and rotation of the thoracic

Figure 7.4 FPR treatment of thoracic flexion dysfunction.

- The patient lies prone with a pillow under the abdominal area, the purpose of which is to reduce the anterior lumbar curve.
- The practitioner stands to the right of the table, having marked the area of tissue tension with the right index finger.
- The practitioner's right knee is placed on the table at the level of the right hip joint, in order to offer a fulcrum over which the patient can be side-bent to the right (Fig. 7.5).
- The practitioner's left hand draws the patient's legs towards the right side of the table, which effectively side-flexes the patient to the right.
- This motion is continued slowly until tissue change (softening) is monitored by the index finger.
- At this time, the practitioner changes the position of the left hand so that it grasps the anterior of the thigh, in order to be able to raise it into extension, at the same time introducing external rotation, until greater 'ease' is noted at the palpated monitoring point.

spine, up to the palpating finger, all the while maintaining the compression effort (light but firm).

- A sense of increased ease should be noted in the palpated region, at which time the various positions and directions of pull and pressure may be fine-tuned in order to enhance ease to an optimal degree.
- After holding the final position for 3–4 seconds, a return to neutral is allowed before reassessment of the dysfunctional area.

Thoracic extension restriction treatment

In the previous example there was difficulty moving into flexion, and therefore part of the treatment protocol involved increasing extension.

If we change this to an example of someone with difficulty moving into extension (but with freedom moving into flexion) the same sequence would be used:

- reduction of anteroposterior curves
- slight increase of flexion, into 'ease'
- followed by the other components of side-flexion and rotation to induce and increase ease in the palpated tissue
- all other elements remain the same.

FPR treatment for lumbar restrictions and tissue change

This example is of an area of exaggerated tissue tension located on the right transverse process of the fourth lumbar vertebra.

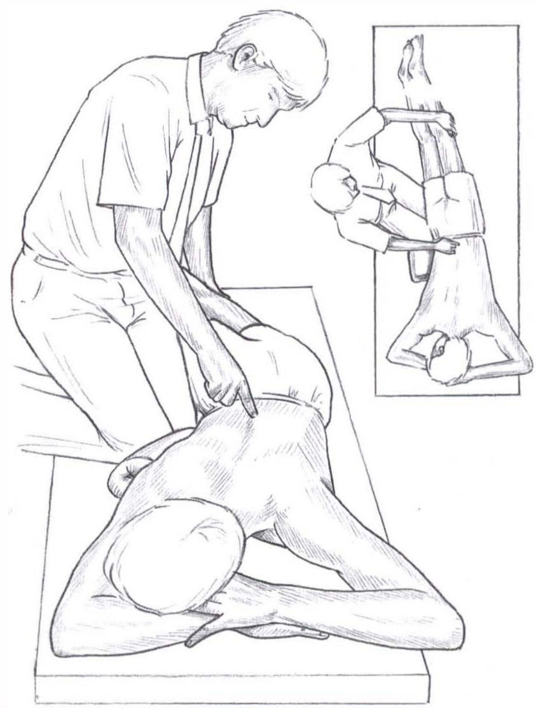

Figure 7.5 FPR treatment for lumbar restriction and tissue changes. Note that a pillow is used to reduce the anteroposterior curve of the lumbar spine while the practitioner introduces fine-tuning by positioning the legs to produce extension, side-flexion and rotation, until the palpating hand indicates that ease has been achieved. This is held for 3–4 seconds.

- This is held for 3 to 4 seconds before a return to neutral is allowed, followed by reassessment.

Variations

Depending upon the nature of specific spinal restrictions, the same general rules would be applied.

The basic requirements involve:

- a reduction in the anteroposterior curve
- a degree of crowding (or sometimes distraction)
- plus the spinal (or other) joint being taken to a combined position of freedoms of motion, away from the direction(s) of bind and into ease.

The examples given for thoracic and cervical normalization using FPR should make the general principles clear.

Muscular corrections using FPR

Schiowitz has described FPR application in treatment of piriformis and gluteal dysfunctions.

- The distinctive FPR feature is introduced first – the patient is prone with a cushion under the abdomen to neutralize the lumbar curve.
- The practitioner is positioned (possibly seated) on the side of dysfunction (right side in this example) facing cephalad.
- The practitioner's left hand monitors a key area of tissue dysfunction (Fig. 7.6A).
- The patient's flexed right knee and thigh are taken over the edge of the table and allowed to hang down, supported at the knee by the practitioner's right hand.
- Flexion is introduced at the hip and knee by the practitioner, until an ease is sensed in the palpated tissues.
- The patient's thigh is then either abducted or adducted towards the table until further ease is noted in the palpated tissues.
- The patient's knee is used as a lever to introduce either internal or external rotation at the hip, whichever produces the greatest reduction in tension under the palpating hand/finger (Fig. 7.6A).
- Once a maximal degree of ease has been achieved, light compression is introduced through the long axis of the thigh towards the monitoring hand, where a marked reduction in tissue tension may be noted.
- This is held for 3–4 seconds before release, a return to neutral and reassessment (Fig. 7.6B).

Figure 7.6A and B FPR for piriformis and gluteal dysfunction involves the patient lying prone with a cushion under the abdomen. For right-sided dysfunction the right leg is flexed at both hip and knee, and abducted over the edge of the table while internal or external rotation of the thigh (whichever produces greater 'ease' in the palpated tissues) is used to fine-tune a position of ease. Light compression through the long axis of the femur is the applied to facilitate ease.

Similarities and differences between FPR and SCS

The similarities and differences that exist when FPR and SCS are compared, should by now be clear (see the summary in Table 7.1).

One major advantage of FPR seems to lie in its reduced (hence 'facilitated') time for holding the position of ease.

Another is of course the fact that no pain is induced in tender points, merely a palpation of ease (as in functional technique).

Note There is of course no good reason to avoid using facilitating compression in application of SCS, and indeed the author strongly recommends that this be done, as long as (when using SCS) pain in the tender point reduces and no additional pain is caused.

Table 7.1 Similarities and differences between SCS and FPR

	SCS	FPR
Indirect approach	Yes	Yes
Monitoring contact	Pain point	Tissue tension
Find position of ease	Yes	Yes
Holding time	30–90 seconds	3–4 seconds
Uses facilitating crowding	No	Yes

Contraindications

There are no contraindications to FPR, except that its value lies most profoundly in acute and subacute problems, with its ability to modify chronic tissue changes being limited to the same degree as other positional release methods.

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Sacro-occipital technique use of padded wedges for diagnosis and treatment

8

Robert Cooperstein

CHAPTER CONTENTS

Introduction

This chapter discusses the use of 'padded wedges' (Fig. 8.1) in both diagnosing and treating low back conditions. Since the use of this equipment was pioneered by DeJarnette, the developer of sacro-occipital technique (SOT) (Cooperstein 1996), padded wedges are often referred to as 'SOT blocks'. In this chapter, we use the terms padded wedges and pelvic blocks interchangeably. Blocks can be used in therapeutic situations as well as to generate diagnostic information. Before turning to their use, the historical context in which padded wedges were developed and their place in modern manual medicine will be addressed.

Historical context of padded wedges

Major Bertrand DeJarnette, DC and DO, although universally known as 'The Major', bore no military commission. While working as an engineer, he sustained severe injuries in an explosion, which led to both a consultation with an osteopath and eventually attending osteopathic college (Heese 1991, Unger 1995). There he met and became very friendly with osteopath Garner Sutherland, developer (perhaps co-developer with chiropractic's Nephi Cottam) of cranial manipulation. After receiving an osteopathic degree in 1922, DeJarnette obtained a chiropractic degree in 1924, motivated in part by a chance encounter with a senior chiropractic student. He was arrested for practicing medicine without a license in 1929. Collaboration with Randolph Stone (of 'bloodless surgery' fame) eventually led to the development of chiropractic manipulative reflex technique (CMRT) (Heese 1991). DeJarnette's 1983 claim that SOT was then in its 58th year would assign its invention to the year 1925 (DeJarnette 1983). The use of pelvic blocks was introduced in 1962 (Heese 1991).

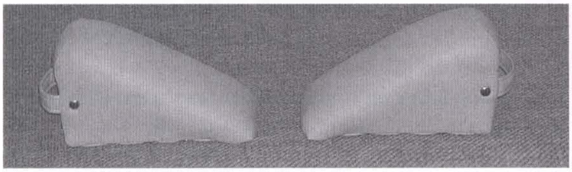


Figure 8.1 Padded wedges (pelvic blocks).

Padded wedges and SOT

In a narrow sense, SOT practitioners use blocks to effect a low-force correction of pelvic torsion, a complex rotation of the innominate bones in opposite directions (Cooperstein & Lisi 2000). However, in a broader sense, the blocks are part of a strategy to correct full-body structural distortions that include pelvic torsion, but are much more than that, and may include visceral as well as somatic conditions. In SOT, the ascription of patients to one of three possible 'categories' is central, and is briefly discussed below. Readers untrained in SOT may not make much sense of the next paragraph, but it is included in order to offer a sense of the jargon, its look and feel.

Example of SOT descriptive jargon Category I, 'the first level of subluxation to develop' according to Saxon (1985), involves failed coordination between the sacroiliac and cranial-sacral respiratory mechanisms, normally connected by the dural membranes and the flow of cerebral spinal fluid. Category II, following on the heels of an unresolved Category I subluxation, is essentially a post-traumatic clinical entity. It is said to involve the 'weight-bearing' function of the sacroiliac joint and 'affect the connective tissue of the cranial sutures and spine, the iliofemoral ligaments, the extremities, and the psoas muscle' (Getzoff 1993). An unresolved Category II may progress to a Category III, which Unger characterizes as an insult to the lumbosacral cartilaginous system (Unger 1991). Saxon (1985) adds that it is accompanied by nerve root compression or stretch syndrome, and Getzoff (1993) that there is injury to 'disc tissue, the surrounding muscles, the sciatic nerve and the pyriformis [sic] muscles'.

SOT is a prime example of a reflex technique. These are techniques or procedures that purport to examine or treat the patient by means of physiological pathways that tend to lie outside of what has been established by normal science. Such techniques often posit poorly understood connections between body parts and functions, such as an occipital area that would relate to cardiac function (DeJarnette 1966). Use of reflex techniques in SOT should not be confused with other, more conventional usages of the word 'reflex', as in 'deep tendon reflex' or 'pathological reflex'. Reflex techniques tend to be less forceful than other techniques, although nothing prevents a reflex practitioner from using a highly accelerated thrusting technique.

Once a theory, model or hypothesis underlying a reflex technique is validated, however ironic this may seem, it leaves the world of reflex technique and simply becomes a mainstream clinical reality. Although the use of padded wedges arose from a reflex technique, it does not follow that their use must be defined as a reflex procedure. Thus, readers not familiar with, or inclined to take up, reflex techniques, as we have defined them, need not eschew the use of padded wedges for that reason. One of the goals in this chapter is to rationalize the use of padded wedges, to help define their place in both the worlds of reflex and more orthodox manual medicine. These comments are not meant to discourage in any way the use of padded wedges as applied in reflex technique, even though that is not the author's practice inclination; and he would urge more research on such use. Rather, descriptions are offered as to how they can be used in a more orthopedic manner, by clinicians of literally any background.

Padded wedges and manual medicine

During the last several years a most welcome convergence and even integration of formerly competing technique systems and procedures has evolved, as many practitioners of manual medicine have become more familiar with, and supportive of, other techniques within and between professions. It is in this spirit that the use of padded wedges to diagnose and treat musculoskeletal disorders is presented. No attempt has been made to rigorously describe their use by SOT practitioners, either past or present. This chapter describes how padded wedges may be integrated into both other chiropractic techniques and healthcare disciplines. It is interesting to speculate what DeJarnette himself would have said about efforts to adapt the blocks to a contemporary practice setting, to wonder whether he would have resisted change or been pleased with the changes made – but such speculation will be avoided.

Provocation testing, directional preference and related procedures

Although SOT blocks were originally developed for treatment purposes, the author of this chapter has found them to be also very useful for diagnostic purposes. There is surprisingly little evidence that any chiropractic examination method, or indeed any examination method used by any of the manual medicine professions, provides information that demonstrably improves the outcome of care (French et al 2000, Hestbaek & Leboeuf-Yde 2000, Leboeuf-Yde & Kyvik 2000, Lisi et al 2004). For example, Haas et al (2003) found that treatment of the cervical spine according to the findings of motion palpation did not result in a better outcome than random findings generated by a computer program, although a variety of interpretations of that study are possible. Lacking substantial evidence that most of the commonly performed examination procedures in manual medicine are clinically useful, it is proposed that provocation testing generally, and orthopedic blocking more specifically, may offer a fresh starting point, at least for assessment of lumbopelvic and more generally postural conditions.

Orthopedic testing aims generally at increasing or decreasing the biomechanical stress in particular joints or soft tissue, the more specifically the better. Blocks may be used in this regard to apply specific light forces, gravitational in nature, in order to identify the location of structural problems and the directions that impact upon the symptoms. As always, the aggravation of symptoms, when joints are stressed into a certain position, not only indicates which joints are the worst offenders, but provides a rationale for treatment.

- If blocks are positioned under the patient in a way that increases symptoms, this is a priori evidence that the patient should not be treated in accordance with this pattern.
- If blocks are placed under the patient so that symptoms are decreased, this generally suggests an appropriate pattern for treatment.
- From this point of view, the condition itself is not being diagnosed, indeed it may be argued that the exact mechanical diagnosis may not be as important as identification of a treatment approach likely to improve the condition.

Those who feel that in manual medicine the best treatment flows from the most exact diagnosis have not been convincing, in the view of the author. Manual medicine is not like surgical medicine, where a good surgical outcome depends on the right surgeon, doing the right surgery, on the right patient, at the right time, and for the right reason. Indeed, in manual medicine there is no reason to think a good outcome entirely depends on getting the right 'listing' (a term used by chiropractors to characterize a subluxation, akin to the osteopathic somatic dysfunction) or level with 'somatic dysfunction'. The surgery metaphor is much abused when applied to a manual, conservative care setting. The consequences of a surgeon removing the wrong kidney in a case of kidney cancer are not really comparable to a manual therapist treating the wrong spinal segment, or the right segment using the wrong line of thrust, especially since as a general rule it has not been possible to agree upon or localize the optimal spinal level to address (Cooperstein & Haas 2001).

Although surgery is distinctly non-iterative, experienced clinicians know that manual therapy by comparison is. They do not determine the right 'listing' or structural diagnosis so much as converge upon it as the case develops over time. There is a lot of trial and error, clinical hunches and sometimes 'mistakes' – call them suboptimal interventions – since most will work in the long run. Provocation testing skips the exact structural diagnosis, and leads intuitively to a functionally identified intervention likely to obtain a good clinical result.

Directional preference in the physical therapy profession

In the physical therapy field, a component of the McKenzie mechanical examination method has been shown to provide information that can favorably influence the treatment of the low back and neck (see Chapter 9). Donelson et al (1991, 1997) have demonstrated that patients may exhibit a directional preference upon mechanical examination of the spine. This is described as a direction of motion that produces a beneficial change in symptoms, such as increased range of motion, decreased local pain, or decreased pain radiation. In patients with back and leg symptoms, the preferred treatment vectors are those that centralize symptoms (i.e. make them more proximal), whereas treatment directors that peripheralize symptoms (i.e. make them more distal) are to be avoided.

The incorrect, opposite treatment vector, although the majority of patients do not seem to be made worse by it, certainly results in much less improvement and a much greater withdrawal rate in a study setting (Long et al 2004). Several authors have shown that using directional preference to guide the treatment of certain low back pain patients results in positive clinical outcomes (Donelson et al 1997, Long 1995, Sufka et al 1998). Long et al (2004) convincingly argue that patient subtyping into groups more or less likely to respond favorably to various types of care has been very much neglected in manual medicine. It has been a great error to regard all patients suffering from mechanical pain as essentially representative of the same clinical entity, and to not attempt to find a way to customize treatment according to patient subgroups; in this case, based on directional preference. Although the McKenzie work has progressed to the point that the examination protocol can be shown to provide results congruent with advanced imaging (Donelson et al 1997), the clinical utility of the work does not really depend on its ability to provide an accurate morphological diagnosis.

Provocation testing in chiropractic

In chiropractic, elements of mechanical examination and directional preference have been developed as *provocation testing*, a relatively novel chiropractic examination method. As described by Triano et al (1997), provocation testing assesses changes in patient symptoms during the administration of a manually applied test load. In a manipulation setting, this usually means preparing a patient as if to administer a manipulative thrust, without actually doing so. Essentially, it involves the application of pre-manipulative tension, either singularly or repetitively. The patient's response to provocation testing either supports or refutes the appropriateness of the given procedure, its location and vector. Several authors have suggested that using provocation testing to guide the point application and direction of chiropractic manipulation has resulted in positive clinical outcomes (Cassidy et al 1993, Cooperstein 2000b, Hubka et al 1991, Lisi 2001, Triano et al 1997).

Test thrusting

Cooperstein & Morschhauser (2005) described a 'simulated adjustive procedure' (i.e. mock thrust or test thrust) as a light thrust, not intended to cavitate a joint, but otherwise resembling a high-velocity, low-amplitude (HVLA) thrusting procedure, especially as used in a learning or testing environment.

An anonymous survey of 14 North American chiropractic colleges found that 11 of 14 used such test thrusting in their technique classes (Cooperstein & Morschhauser 2005). The author suspects (but is not certain) that practitioners of manual therapy often use procedures akin to test thrusting in order to establish the appropriateness of an intended mechanical intervention. At the very least, it is reasonable to think that clinicians routinely detect apprehensive patient responses while preparing to deliver a manipulative thrust, and that they may modify or even retract their intention to deliver the planned manipulative thrust accordingly.

Using padded wedges for examination purposes

Although a priori testing of manipulation procedures has been quite feasible, there is no reason to limit provocation testing to *manipulation* pre-testing. In fact, the testing of mechanical vectors to determine the preferred direction of force application need not be technique-specific. Once directional preference is established, the clinician may choose among a variety of interventions – for example: high or low force, manual or instrument-assisted – as long as the direction, and to a lesser extent the magnitude, are guided by the results of provocation testing. Ultimately, this may lead to more reliable and valid examination methods for the selection of appropriate mechanical interventions.

Cooperstein (2000b) described his initial experience using padded wedges for provocation testing. The procedure involved identifying a tender or painful monitoring point in the low back, placing the patient on the blocks in various positions to assess changes in patient pain or tenderness, so deriving appropriate treatment vectors. (A more recently developed and simplified approach, not requiring the identification and assessment of changes in a tender point, is described below.)

The method is as follows:

- *Identification of the monitoring point*. The tender point may be primarily bony or articular: on either posterior superior iliac spine (PSIS), just medial to either PSIS in the sacroiliac joint, on either the lumbosacral, or any of the low lumbar facetal joints, or on a spinous process. Or, the monitoring point may be more myofascial or lodged in some other soft tissue: at the iliolumbar ligament area, the sacrotuberous ligament, or within any of the musculature. (There is no need to over-interpret the exact location of the tender point, since it will be used less to identify the specific pathology and more to monitor the appropriateness of alternative treatment vectors.)
- *Application of padded wedges*. The wedges are placed under the prone or supine patient to serve as fulcrums that allow gravitational forces to affect the position or movement of the sacroiliac and lumbar joints. Care is taken to insert the wedges to the same degree under the patient, usually bilaterally and perpendicular to the patient. (This does not emulate SOT block insertion, which is often done with the blocks angled in various and different ways.)

Provocation testing with blocks may as well be considered as an orthopedic test, since the purpose of virtually any such test is to put the joints under investigation in stressed or potentially de-stressed positions, noting the symptomatological changes and drawing the appropriate clinical conclusions.

SOT practitioners, who pioneered the use of padded wedges, also look for changes in pain or tenderness severity and location while the patient is on the blocks, but almost exclusively in remote locations, such as within the shoulder girdle, rather than locally, in the sacroiliac and lumbar areas. The author prefers determining the *local* effects of blocking procedures.

Although provocation testing favors vectors that ameliorate, and eschews those that aggravate symptoms, there are at least two possible exceptions to this analysis:

1. During blocking procedures, centralization of leg symptoms sometimes occurs at the expense of a mild and temporary (i.e. during the office visit) increase in low back pain. According to Mackenzie protocols (McKenzie 1981), this is an acceptable tradeoff.
2. Lying on padded wedges very occasionally evokes mild, temporary pain in shortened tissues, even while pain or tenderness in joints is reduced, if the blocking position stretches these tissues (Peterson & Bergmann 2002, p. 72). Patients have no problem identifying this stretch-related pain as appropriate, as 'a good pain'. A typical scenario would be the production of mild low back myofascial pain in a hyperlordotic patient, even as the facetal joints become less tender, if the blocks are applied so as to flex the low back.

In principle, changes in symptoms could result from changes in bone and joint positions, from amelioration of joint restrictions (Gillet & Liekens 1973, 1981), a combination of the two, or something else entirely. It is tempting to conclude that the test results confirm a particular distortion pattern, or movement restriction. For example, the patient shown in Figure 8.2, whose pain happens to be ameliorated by the blocking position, *may* have a right posterior, left anterior pelvic torsion pattern; or, this patient *may* be restricted in left posterior innominate rotation and/or right anterior innominate rotation; or both.

On the other hand, as plausible as these inferences may seem, it is not necessary to insist upon them. Nor is it necessary to go beyond the clinical finding that symptom amelioration speaks in favor of the blocking pattern shown as a treatment vector. In fact, when blocks can be used for diagnostic purposes, this suggests that a mechanical (somatic) clinical condition has been identified that can probably be made better through the application of certain vectors and avoidance of others. The condition diagnosed is a very good example of what Haldeman et al (1993) call a 'manipulable lesion', his particular subluxation-equivalent term (Cooperstein & Gleberzon 2001, Haldeman et al 1993). The treatment options include, but are not limited to, leaving that patient on the blocks in the ameliorating position for some period of time. (The second part of this chapter focuses in greater detail on treatment protocols using padded wedges.)

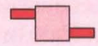
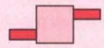
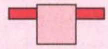
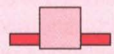
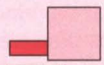
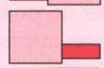
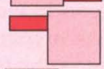
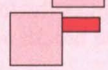
Figure 8.2 Prone diagonal blocking.

In the end, there is precious little information available as to whether, and to what degree, specific misalignments predict specific directions of restriction. We are not aware of any evidence confirming what pelvic misalignments, if any, are associated with particular pelvic movement restrictions. That stated, Table 8.1 identifies *consistent* positional and movement restriction diagnoses.

In SOT, the blocks are almost always used in pairs, usually diagonally, as in rows 1 and 2 in the table. In the author's practice the blocks are customarily inserted under the patient in at least four patterns, adding what may be described as sagittal to more typical diagonal placement, as in rows 3 and 4 of Table 8.1. Less frequently, single blocks are inserted under the patient, as in rows 5–8. The rationale for blocking positions beyond those typically used in SOT has been previously described (Cooperstein & Lisi 2004). It is recognized by the author that it is very time-consuming and cumbersome to test all eight blocking positions in the table, and in clinical practice this is rarely done. Usually testing the first four patterns provides enough clinical information to proceed.

As stated previously, if it is felt to be necessary to interpret the results of provocation testing, diagonally placed blocks are thought to exacerbate or ameliorate pelvic torsional states, or perhaps innominate restrictions in posterior and anterior rotation around an axis through the symphysis pubis (Cooperstein & Lisi

Table 8.1 Provocative orthopedic testing using padded wedges

Blocking pattern that ameliorates and/or does not aggravate	Consistent positional inference	Consistent restriction inference	Illustration
1. Left crest, right trochanter	Left AS/right PI (pelvic torsion)	Restriction in left posterior, right anterior innominate rotation	
2. Right crest, left trochanter	Right AS/left PI (pelvic torsion)	Restriction in right posterior, left anterior innominate rotation	
3. Bilateral iliac crests	Lumbopelvic hyperextension (sagittal plane fault)	Restriction in posterior pelvic tilting	
4. Bilateral trochanters	Lumbopelvic hypolordosis (sagittal plane fault)	Restriction in anterior pelvic tilting	
5. Left trochanter	Left PI (unilateral misalignment)	Restriction in left anterior innominate rotation	
6. Right trochanter	Right PI (unilateral misalignment)	Restriction in right anterior innominate rotation	
7. Left iliac crest	Left AS (unilateral misalignment)	Restriction in left posterior innominate rotation	
8. Right iliac crest	Right AS (unilateral misalignment)	Restriction in right posterior innominate rotation	

PI: posterior, inferior; AS: anterior, superior.

2000). Sagittally placed blocks putatively exacerbate or ameliorate symptoms related to lumbopelvic hypolordosis or hyperlordosis, and/or flexion/extension lumbopelvic restrictions.

Quantifying blocking as provocation testing

After years of clinical experience using padded wedges qualitatively for provocation testing, Cooperstein & Lisi (2004) set out to quantify the frequency and magnitude of possible subject responses using a soft-tissue algometer, in a minimally symptomatic (pain less than or equal to 2 on a numerical rating scale) population of 20 chiropractic students (Lisi et al 2004). In one experimental run, the baseline pain-pressure threshold (PPT) was measured at each PSIS and at each lumbosacral facetal joint. Next, repeat measurements were taken after placing the blocks under the research participants as depicted in the first four rows of Table 8.1, and in that exact order (to maximize procedural consistency).

In another experimental run, the subject was asked to identify the most tender point during the application of 8 kg of pressure, as measured and applied by the algometer through the examiner's thumb, rating the tenderness from 0 to 10 on a numerical rating scale. Then, as before, repeat measurements were taken with blocks in place, in the same four previously described blocking positions, and in the same order.

Although a variety of responses were obtained, most could be classified as falling into one of the following three categories:

1. non-responders: none of the blocking positions changed the PPT
2. coherent responders: at least one of the blocking positions reduced or increased pain or tenderness, while the opposite blocking position either had no effect or had an opposite effect
3. paradoxical responders: both a given blocking position and the opposite blocking position increased or decreased pain or tenderness.

Coherent responders, were defined as either being a *strong responder* in those whose pain or tenderness was increased in one blocking position and decreased in the opposite position, or as a *weak responder* in those whose pain or tenderness was either increased or decreased in one blocking position, and unaffected by the opposite blocking pattern.

Although this was not anticipated, many of the study participants in the first experiment, in which each of four different monitoring points were checked before and after four patterns of block placement, experienced an across-the-board lowering of their PPTs. This apparently resulted from the excessive number of measurements taken. Thus irrespective of their other responses to blocking, this protocol was judged to be too invasive and thus unacceptable, and the data are not discussed in this description of the study.

Only one subject of 20 in the second protocol, in which only one monitoring point was assessed, showed a decreased PPT. Thus, this second method is preferred. Eleven of the subjects (55%) demonstrated a coherent response (three strong responders, eight weak responders), seven (35%) demonstrated a paradoxical pattern of response, and two (10%) were non-responders. In comparing baseline to post-blocking measurements, five subjects showed a decrease in tenderness, one showed an increase in tenderness, and 14 were unchanged.

In the case of strong responders, it was concluded that there are very clear indications as to how to proceed clinically, with blocking, or other directionally consistent procedures. In the case of weak responders, although there is less certainty in the suggested clinical approach, it seems unlikely that the patient will be made worse by proceeding in accordance with its results, and is more likely to be improved than worsened. The strong and weak responders make up collectively more than half the patients, at least in the sample of minimally symptomatic research participants. It might be expected that this percentage would increase in a more symptomatic population.

Simplified approach to provocation testing: the quick scan

Having found quantitative support for the use of padded wedges for provocation testing, using both diagonal and sagittally applied vectors, it was thought expedient to return to a more qualitative and simpler approach, one more conducive to clinical practice. Instead of monitoring changes in a tender or painful monitoring point, the patient is now asked to report which of two blocking positions is preferred to the other, first for diagonal blocking (rows 1–2, Table 8.1) and then for sagittal plane blocking (rows 3–4, Table 8.1) (Fig. 8.3).

For the sake of consistency, the blocking process always begins with a high left block and low right block; the blocks are then reversed (rows 1–2, Table 8.1). The patient is then asked which blocking position of these two is preferred. Very few patients have any problem understanding the question; most respond rapidly and unequivocally. After the diagonal blocking information is logged, the blocks are then tested double-high versus double low (row 3 vs. row 4, Table 8.1), and the patient's preference for these two blocking positions logged. Treatment is ultimately rendered that is consistent with the test results, as described below in the treatment section of this chapter. The finding in each of the two comparisons may be separately addressed by two interventions, using blocks or otherwise; or a single intervention may be devised that satisfies both diagonal and sagittal plane patient preferences.

Overall, the procedure is not unlike what happens at an optician's office when eyeglasses are being prescribed. To a point, there are various measures that may be taken using a variety of equipment. However, there always comes a point where the optician switches back and forth between two suggested lenses, asking 'if this is number one, and this is number two, which is better, one or two?'

There are several advantages to using this quick scan approach, as compared with the original more detailed method involving evoked changes in pre-established tender or painful spots:

1. There may be more than one obvious tender point. If a blocking position were to exacerbate one point while ameliorating another, the information as to how to treat would be confounded.
2. In the comprehensive scan, the patient must compare the pain or tenderness levels associated with four different blocking positions: diagonal 1 vs. diagonal 2 vs. sagittal 3 vs. sagittal 4. Although a patient can readily compare one blocking position with the previous blocking position, it is far more difficult to compare a blocking position with a position tested previous to the former one. That is, it is not easy to compare the third position with the first, nor the fourth with the first or second. By comparison, in the quick scan, the patient compares diagonal 1 vs. diagonal 2, then sagittal 1 vs. sagittal 2.
3. Since during the quick scan it takes less time to insert the blocks, and less time to obtain the information, there is less opportunity for the patient's condition to become altered by the provocation procedure.
4. Since repetitive blocking and unblocking during assessment might itself produce therapeutic or exacerbating changes in the patient, the quick

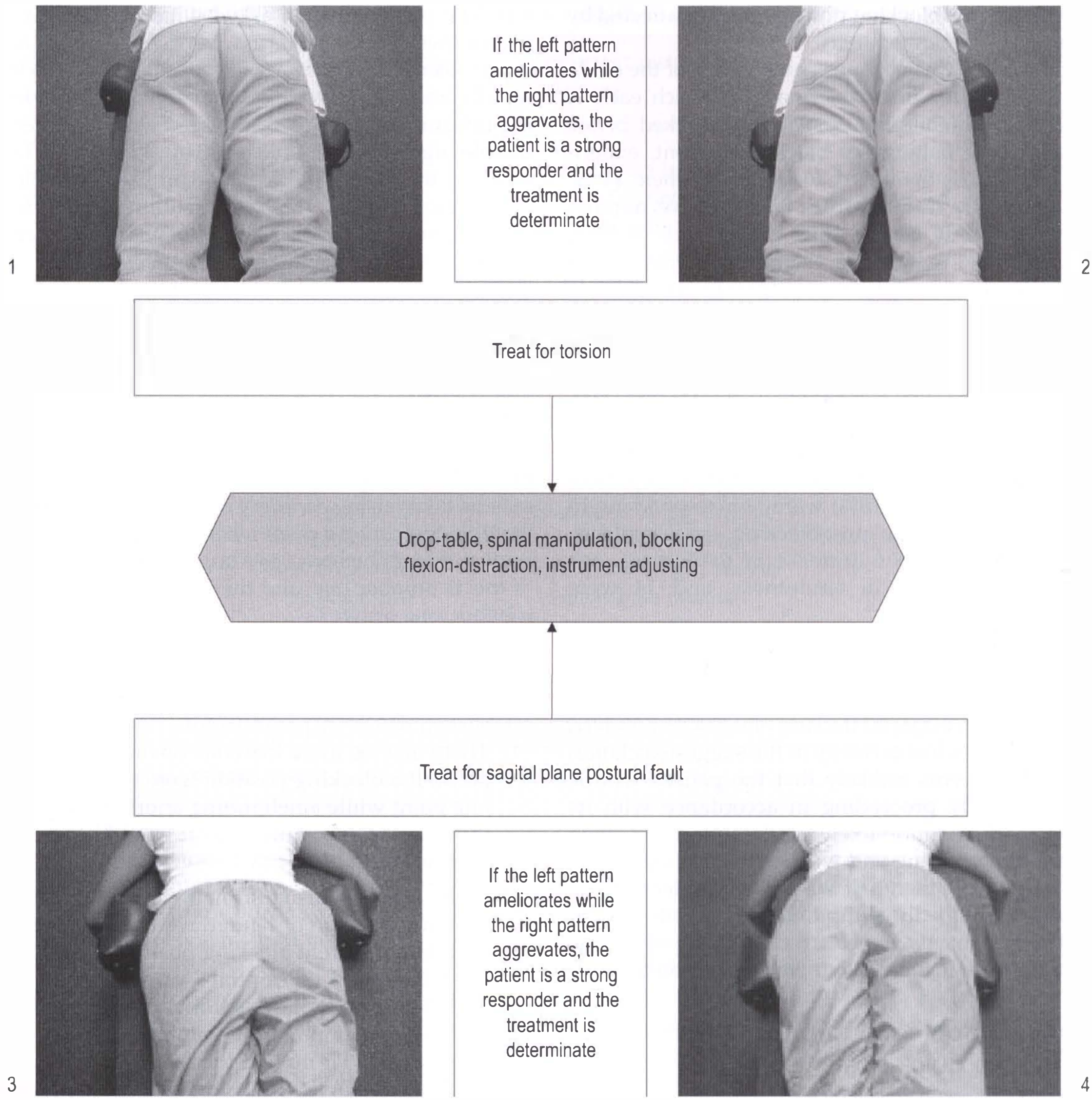


Figure 8.3 Diagnostic blocking protocol, quick scan.

scan, in that it uses fewer test positions than the original more detailed protocol, is less likely to alter the clinical condition being assessed.

Provocative lumbar blocking

Cooperstein serendipitously accidentally discovered that placing the blocks under the lumbar spine of a supine patient, so as to extend the low back, could effect a reduction in low back and especially back-related leg pain (Cooperstein & Lisi 2000). (This is further discussed in the treatment section of this chapter.) On occasion a dramatic increase in straight leg raising has been observed during block placement, and this is regarded as a favorable prognostic sign. It would seem that supine lumbar blocking (Fig. 8.4) emulates the Mackenzie directional preference protocol (see Chapter 9), and that the implications are parallel.

Conclusions on provocation testing using padded wedges

Summarizing: Padded wedges (blocks), apart from their value in treating patients, may be used to generate diagnostic information as well, offering a procedure

Figure 8.4 Lumbar blocking.

that amounts to *mechanically-assisted orthopedic testing*. Following that, the clinician decides whether to proceed by simply leaving the patient on the blocks for a period of time; to apply a consistent manipulative thrust, with or without using a drop-table; to treat using a handheld percussive instrument; or to devise a rehabilitative approach; or apply some other consistent mechanical means.

The aggravation and/or amelioration of symptoms when joints are stressed into a certain position not only identifies which joints are the worst offenders, but suggests appropriate vectors for treatment. If padded wedges are positioned under the patient so as to increase local symptoms, this is a priori evidence that the patient should not be adjusted (manipulated) in this pattern. If padded wedges ameliorate symptoms, an appropriate treatment approach is instantly identified.

This may be considered a 'black box' approach to treating the patient. Provocation testing simply identifies vectors that are likely to be clinically useful, regarding the lumbopelvis as a black box: the padded wedges provide input to the box, and patient responses represent outputs from the box. It is not based on obtaining a specific mechanical *listing*. It is more based on the clinical intuition that a pre-adjustive body placement pattern that ameliorates mechanical pain is more likely to inform a good clinical outcome and prevent symptom aggravation than the opposite pattern.

As all clinicians know, the final examination maneuver – following static and motion palpation, X-ray analysis, leg checks, etc. – is *setting up on (preparing) the patient*, prior to introducing a treatment force. This 'orthopedic test' amounts to a mechanical override switch that prevents us from not seeing the forest for the trees. If the patient winces, tenses up, becomes apprehensive, or even complains as the practitioner begins to assert pre-adjustive tension, there is good reason to expect a bad outcome. True, a forceful adjuster may be able to overcome the patient's resistance, but at what price? The best adjustments do not result from the application of irresistible force, but from the practitioner finding a way to minimize patient resistance. Diagnostic blocking should be seen as an orthopedic test designed to illuminate the way.

Test blocking may suggest a listing or structural diagnosis

It has already been observed that provocation testing with padded wedges need not produce 'listings', as they are called in chiropractic, or mechanical 'diagnoses' as they are called in osteopathy or physical therapy. That stated, a simple study was mounted to see if patient blocking preferences were associated with pelvic torsion (Cooperstein et al 2004a). Initially patients were identified who were thought to exhibit pelvic torsion, by palpating their PSISs in the sitting position, using a method based on a description by Levangie (Cooperstein 2004, Levangie 1999). An examiner blinded as to the torsion findings then performed diagonal blocking provocation testing. The data in Table 8.2 show a very robust tendency (kappa = 0.79, $P < 0.001$) for patients judged to have a right posterior, left anterior pattern of torsion to prefer being blocked so as to correct just that pattern, and vice versa. (The data in the table include more subjects than the more preliminary published report (Cooperstein et al 2004a).)

Thus, although provocation need not lead to an anatomical diagnosis in order to suggest treatment vectors, initial results from this study suggest that there may indeed be such a diagnosis obtainable. Although what was being studied was a diagnostic procedure, rather than a treatment procedure, the

Table 8.2 Blocking preferences and pelvic torsion findings

PSIS palpation/blocking preference	Right PI	Left PI
Right PI blocking preferred	14	1
Left PI blocking preferred	1	6

results do suggest there would be an enhanced treatment outcome based on the mechanical diagnosis, in this case, of pelvic torsion of a specific direction. Given the dearth of information linking mechanical diagnosis and treatment outcomes in chiropractic, unlike the plethora in physical therapy, thanks to McKenzie et al, this might be quite significant.

Padded wedges as treatment method

Before addressing the historical basis and contemporary setting in which padded wedges are used for treatment purposes, some typical clinical scenarios in which they, as well as other light force treatment methods, appear preferred to more invasive treatment methods deserve comment.

Treating with padded wedges may be classified as a type of mobilization, in that light forces are used. It differs from more traditional mobilization in that the treatment is block-assisted. Although the relative merits, in particular clinical situations, of manipulation and other treatments vs. block-assisted mobilization are not the subject of this chapter, the evidence suggests that in similar clinical circumstances both are likely safe and effective. Thus, it would be rational, from an evidence-based care point of view, to use one or the other, depending on the particulars of the case.

With one or both blocks in position under the prone position, the practitioner may simply allow the patient to rest on the blocks and allow 'gravity to do the work'. Or, the practitioner may attempt to speed things up or introduce more joint movement by 'pumping' on the sacroiliac (SI) joints, through the application of mild and repetitive oscillatory thrusts on the PSIS and the ischium, but not at the block itself. Although this chapter emphasizes a typical low force manner of using blocks, they may also be used as fulcrums to assist HVLA thrusting. As another manipulative possibility, the practitioner may use a drop-table thrusting procedure, with one or two blocks in place.

Table 8.3 Indications for lumbopelvic blocking

Large or heavy patient
Osteoporosis
Previous poor outcome with HVLA
Previous good outcome with blocking
Patient fears cavitation
Sacroiliac instability
Uncertain diagnosis

Where evidence is lacking, the judicious use of a best-practices approach allows the clinician to choose treatment methods at least partially on the basis of individual, doctor and patient, preferences. Although in many cases we, as chiropractors, are quite comfortable using manipulation, which has been afforded respect in a number of settings (Haldeman et al 1993, Shekelle et al 1991a, 1991b, 1992a, 1992b), there are certain clinical situations that render manipulation less preferred. These are indicated in Table 8.3.

Padded wedges in SOT

In pelvic blocking, the mechanical intervention is accomplished by means of gravity being applied across asymmetrically placed fulcrums, and so must be considered a low force treatment method, a type of mobilization. Applying the blocks to the patient for an extended period of time allows elongation of shortened tissues, muscle relaxation, and possibly correction of aberrant neurological function. According to Magnusson et al (1996), reflex electromyographic activity does not limit the range of movement during slow stretches, and training-related increases in range of motion result from the subject's increased stretch tolerance; they do not result from a change in the mechanical or viscoelastic properties of the muscle.

Before describing the author's own used of padded wedges for treatment purposes, it is worth reiterating that DeJarnette, who pioneered their use, and SOT practitioners, who remain their principal proponents, do not champion using blocks for treating stand-alone lumbopelvic conditions. DeJarnette did believe that if the innominate bones could be balanced using blocks, then the sacrum, lodged in-between where it forms an integral part of the pelvic kinematic chain, would also achieve a balanced position, associated as well with head-on-spine balance (DeCamp 1990, 1994, Heese 1988). As a barometer of how important the blocks were to DeJarnette himself, he once stated '80% of all correction is accomplished by use of the DeJarnette mechanical wedges' (DeJarnette 1977).

However, DeJarnette also believed that pelvic dysfunction was intimately related to cranial dysfunction. The very term 'sacro-occipital' confirms the kernel idea of SOT: if the sacrum and occiput are both balanced, then the spine in-between can function normally, hopefully eliminating the perceived need for the practitioner to 'adjust the vertebrae of the spine traumatically' (DeJarnette 1982).

The pelvic complex is stated to accomplish three tasks:

1. The posterior ligamentous aspect of the SI joint is weight-bearing.
2. The anterior fibrous aspect of the SI joint functions in the craniosacral respiratory mechanism.

3. The pelvic complex must allow normal lumbosacral function (DeCamp 1992).

Pelvic torsional dysfunction is thought to interfere with these functions, predisposing to and aggravated by associated cranial dysfunction. It should be noted that SOT practitioners ascribe much importance to the controversial view that the cranial sutures are mobile, and can attain dysfunctional states that are related to and corrected simultaneously with sacroiliac dysfunctional states. A hypermobile anterior sacrum would be associated with an ipsilateral compensatory hypomobile and contralateral hypermobile occiput (DeCamp 1990).

SOT practitioners strongly prefer a block-assisted shifting of the pelvis to manual HVLA thrusting on the sacroiliac joints, which they believe introduces more of the microtrauma that supposedly led to the problem in the first place. Although the author does not share that view, it is an opinion that has also been expressed by Knutson (2004), who speculates: 'In cases where sacroiliac joint sprain is suspected, based on probable neuromuscular reactions, low-load manipulation via pelvic blocking is advised', although to his credit he adds: 'Testing of this hypothesis is recommended'.

SOT practitioners also believe that side-posture manipulative thrusting on the innominate 'tries to move a bone without supporting its opposing side … The blocks are so constructed that they correct by respiratory motion' (DeJarnette 1983). Although this chapter is not the place to critically examine what is meant by 'respiratory motion', suffice to say that this putatively involves coordination between the sacroiliac and cranial-sacral respiratory mechanisms, considered (by SOT) to normally be connected by the dural membranes and the flow of cerebral spinal fluid. According to Getzoff (1990), the cranial-sacral respiratory mechanism (CSRM) is: 'A combination of integrated functions that support, nourish and enhance the performance of the nervous system as it controls bodily functions'. The CSRM is also said to involve: cranial motion, sacral weight-bearing motion, dural tension, cerebrospinal fluid pulsation and flow, ventricular respiration, and several other functions that relate to cranial development (Getzoff 1990).

Identification of pelvic torsion and treatment in SOT

In SOT, patients are ascribed to one of three categories, a detailed description of which is beyond the scope of this chapter. Suffice to say that Category I and III patients are treated in the prone position, whereas Category II patients are blocked in the supine position. Blocking is not only thought to effect a more relaxed and easy correction from the patient's point of view, but to constitute a tremendous ergonomic innovation for the doctor, whose 'effort is primarily lifting [the] wedges to position them' (DeJarnette 1983).

The blocks are used as fulcrums to correct intrapelvic torsion in either the prone or supine position. Although there are some different views among practitioners, the evidence thought to identify pelvic torsion and characterize its direction is obtained by means of a visual, prone leg check. Although a detailed description cannot be provided as to how leg-length checking is conducted in chiropractic, osteopathy and physical therapy settings, it is safe to say that it is commonly believed that a functional short leg identifies a posteriorly rotated innominate, whereas a functional long leg identifies an anteriorly rotated innominate (Cooperstein & Lisi 2000).

It is usually stated (Cooperstein 1993, Cooperstein & Lisi 2000) that a posterior swing of the innominate bone, around an axis through the sacroiliac joint, swings up the hip as well, and thus creates a functional short leg, as would be seen in a prone or supine leg check. However, such a model, were it accurate, would luxate the symphysis pubis, since it as well would have to offer accommodation by approximately twice as much as the hip (Fig. 8.5).

Cooperstein, in a geometric analysis of this problem (Cooperstein 1993), elaborates a different (muscular) model linking a functional short leg to a posterior innominate rotation. This model invokes hypertonic lumbosacral musculature on the side of a standing low innominate bone, creating a functional short leg in the prone or supine position. Figure 8.6 shows a standing low iliac crest on the right, presumed hypertonus in the right-sided sacrospinalis and quadratus lumborum muscles, resulting in a hiking up of the right lower extremity in the prone position, and thus the creation of a right functional short leg.

Schneider (1993) provides a similar explanation. Studies performed using a novel apparatus called the friction-reduced table (Cooperstein & Jansen 1996a, Jansen & Cooperstein 1998) confirmed the functional short leg as a temporally stable entity (Cooperstein & Jansen 1996b). Cooperstein further discusses situations in which anatomic leg length inequality would confound the interpretation of this effect (Cooperstein 2000a), and has described a procedure called compressive leg checking thought to distinguish functional from anatomical short leg (Cooperstein et al 2003, 2004b).

Whatever the exact explanation of the putative short leg on the posterior innominate side, and thus a functional long leg on the side of the anterior innominate, it follows that identifying functional leg length

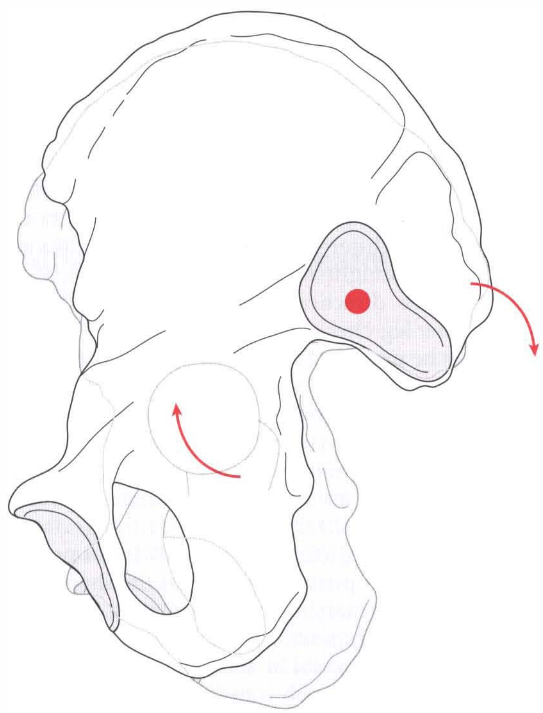


Figure 8.5 Common subluxation model luxates symphysis.

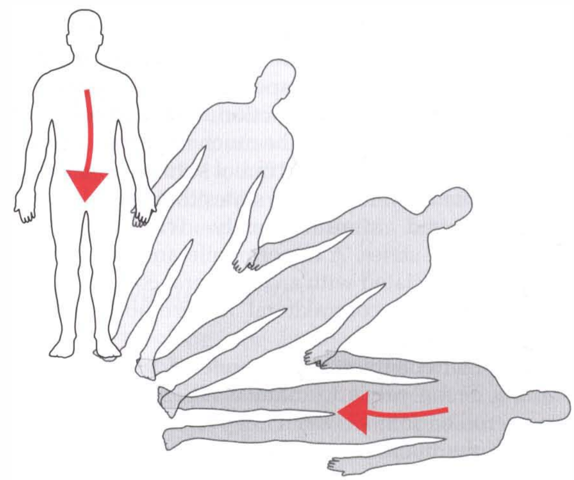


Figure 8.6 Muscular model of the functional short leg on side of inferior innominate.

inequality would seem to suggest how one might have the patient lie on the blocks, in either the prone or supine position. Unfortunately, the presence of anatomic leg length inequality, which some investigators have found to be very common, is a troubling complication. Friberg (1987), in an authoritative study, found that about 50% of an asymptomatic population, and about 75% of the low back pain patients, had leg length inequality of 5mm or more. Either anatomic leg length inequality would need to be ruled out so that blocks could be used according to the side of the (functional) short leg, or the blocks could be inserted under the patient according to the results of provocation testing. How the blocks are used to rotate the innominate bones in opposite directions is described in the next section of this chapter, in the mechanics of prone and supine diagonal blocking.

The mechanics of prone and supine diagonal blocking

It is widely believed by chiropractors, including SOT practitioners, that pelvic torsion occurs around a horizontal axis through the acetabuli. A similar view is found in the work of a physical therapist (Manheimer & Lampe 1984) and possibly in osteopathy. From this point of view, the correction of pelvic torsion could plausibly involve having the patient lie prone or supine, the blocks positioned so as to turn the innominate bones in opposite directions, around this hypothetical acetabular axis (Fig. 8.7).

Following this logic, Figure 8.8 shows a prone patient with a high right block (under the iliac crest and ASIS), so as to effect posterior rotation of the right innominate, and a low left block (under the trochanteric area), to effect anterior rotation of the left innominate.

Figure 8.9 shows a supine patient with a high right block (under the iliac crest and PSIS) so as to effect anterior rotation of the right innominate, and a low left block (under the trochanteric and ischial area), to effect posterior rotation of the left innominate. Thus, the same diagonal listing can be corrected using either a prone or supine setup, although there are some differences in the overall mechanics, as discussed below.

Unfortunately, these pelvic mechanics are unlikely to occur as described and shown in Figure 8.7, since the pubic symphysis would be luxated. Despite the popularity of this acetabular axis view of pelvic torsion, investigators since at least 1936 (Pitkin & Pheasant 1936) have posited the symphysis pubis as a more likely location for pelvic torsion (Fig. 8.10). Although he came to the same conclusion by different means, Hildebrandt (1985) argued the same point in chiropractic, as did Bourdillon in osteopathy (Bourdillon & Day 1987). In prone blocking, although the high padded wedge under the crest and ASIS area

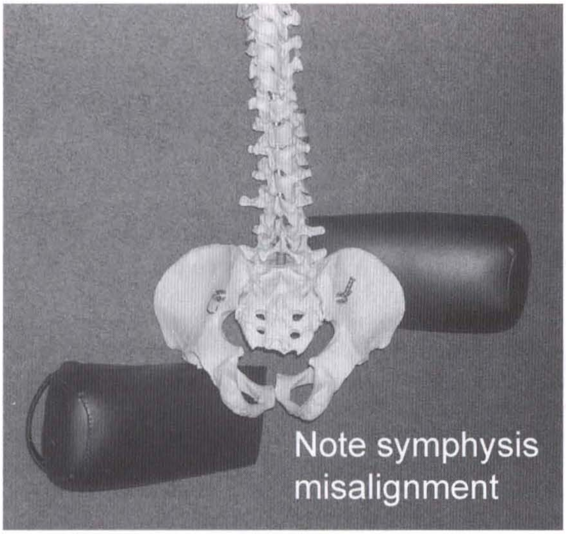


Figure 8.7 Pelvic torsion assuming acetabular axis of rotation.

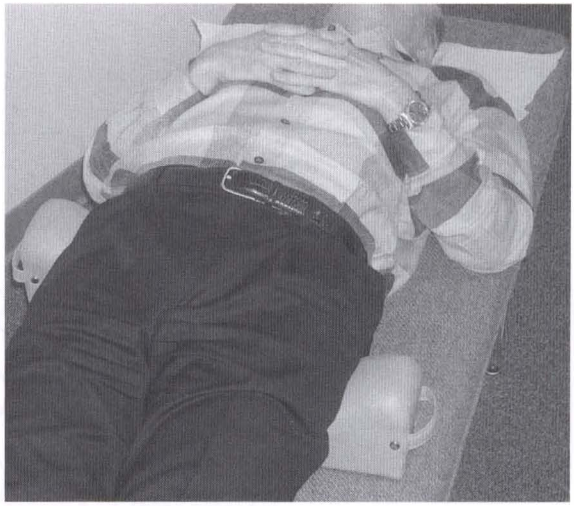


Figure 8.9 Supine diagonal blocking, with high right block and low left block.

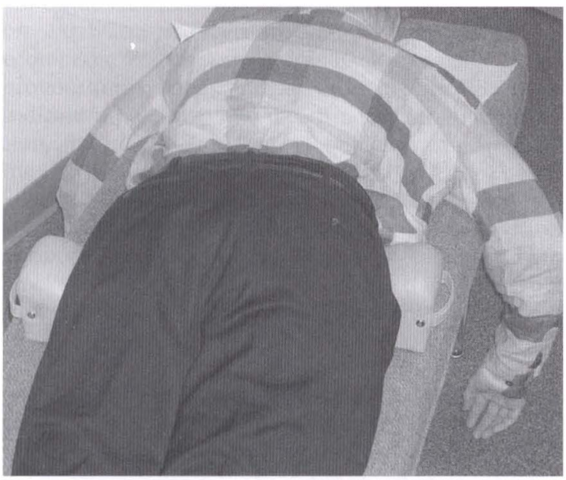


Figure 8.8 Prone diagonal blocking, with high right block and low left block.

would indeed be expected to rock the innominate posterior-ward, around the symphysis axis, the low block under the trochanteric area would not be expected to create the desired anterior rotation, since the block is near the symphysis pivot point. (Similar considerations apply to supine blocking: the high block would be expected to effect anterior innominate rotation, but the low block would not be expected to produce posterior innominate rotation.)

None of this implies that diagonal blocking is ineffective, but rather suggests that the mechanical impact of such blocking needs to be further investigated, in full view of contemporary understanding of the mechanics of pelvic torsion. This analysis also suggests that if the primary therapeutic goal is to create anterior rotation of an innominate bone, say, because the ipsilateral sacroiliac joint seems fixated, then supine blocking is preferred; whereas, if the primary goal is to create posterior rotation of an innominate bone, then prone blocking is likely more optimal. Discussion below offers yet another consideration affecting the choice between prone and supine blocking, having to do with sacroiliac joint mobility.

Although the acetabular axis view of pelvic torsion is considered by the author to be inaccurate, the different effects of prone and supine blocking need to be considered, the analysis of which seems mostly axis-independent (Figs 8.11A and B). Although both prone and supine pelvic blocking would both be expected to reduce pelvic torsion, the mechanics would be quite different.

- Prone blocking, by raising the innominate bones relative to the sacrum, simultaneously distracts the sacroiliac joints (Cooperstein 1996).
- Supine blocking, by elevating the innominate bones relative to the sacrum, simultaneously approximates the sacroiliac joints (Cooperstein 1996, Getzoff 1999).

Practitioners will have to decide whether, in addition to reducing the pelvic torsion (or at least blocking according to the results of provocation testing), there is a further therapeutic goal of mobilizing (increasing motion) in the sacroiliac joints using prone blocking;

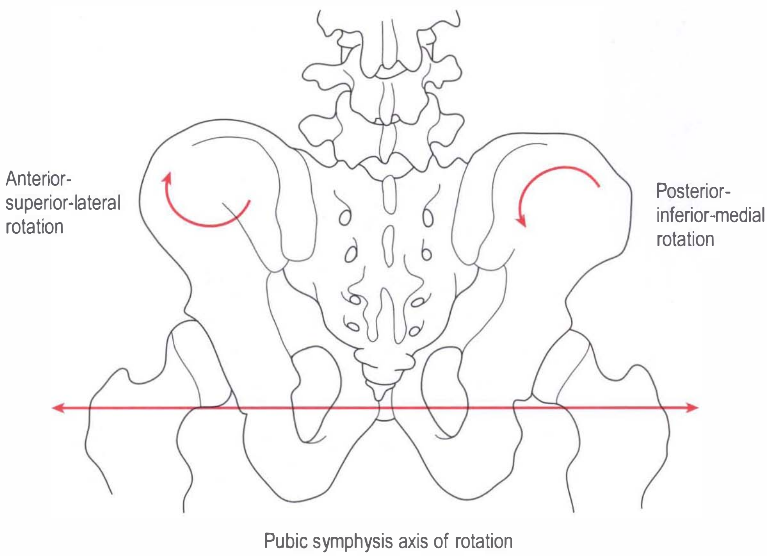


Figure 8.10 Pelvic torsion about the pubic symphysis.

or stabilizing the sacroiliac joints, using supine blocking. From this point of view, the quintessential candidate for supine blocking would be a young, pregnant or postpartum, female. Other candidates would be hypermobile patients of either sex, including congenital cases, such as in Ehlers–Danlos syndrome.

According to SOT practitioners, the patient is kept on the wedges for 2 minutes or less if supine, and usually for longer periods of time if prone. Asked 'why 2 minutes?' a chiropractor who teaches SOT once stated in a personal communication that: 'there have been several reports of spontaneous patient combustion when left supine on the blocks for longer than 2 minutes'. Although we certainly doubt that, we do recognize that the approximation of the sacroiliac joints during supine blocking is likely to prove uncomfortable in many patients in a relatively short space of time. The only important limit on the time frame for prone blocking is how much time the practitioner has to spare, although 1 to 5 minutes makes sense from what we know of the stretching properties of soft tissues. It takes some time for stretching to begin, and little further stretch is likely after a few minutes. Besides the results of provocation testing, other criteria for blocking in this manner would include tests that determine the presence and direction of pelvic torsion (Cooperstein 2004) or motion restriction (Cooperstein & Lisi 2000).

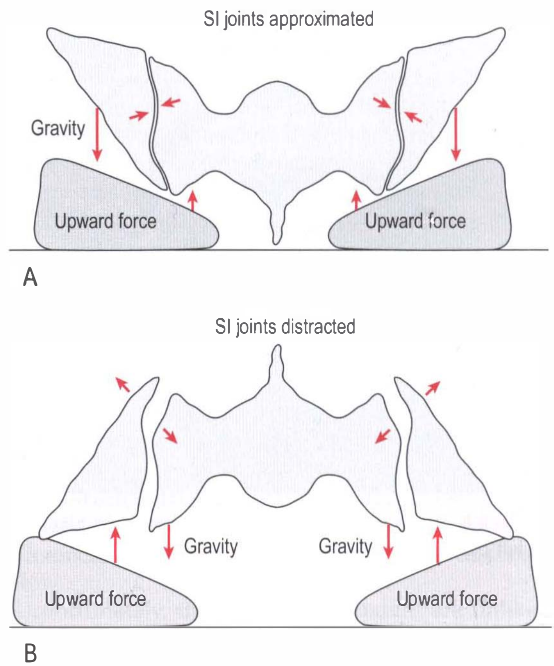


Figure 8.11 (A) Mechanics of supine blocking. (B) Mechanics of prone blocking.

Sagittal plane blocking

Sagittal plane prone blocking addresses the postural listings commonly known in chiropractic as the 'double PI' (PI = posterior, inferior) ilium and 'double AS' (AS = anterior, superior) ilium. These listings, at first glance, would appear to refer to sacroiliac dysfunction, since in traditional chiropractic terminology, unilateral PI and AS listings refer to innominate rotations involving the sacroiliac joints. However, the double PI and double AS listings actually denote lumbopelvic postural distortion: the so-called double PI amounts to lumbopelvic hypolordosis, and the double AS to lumbopelvic hyperlordosis (Clemen 1983).

Although the link between bad posture and low back pain does not appear to be as strong as widely believed (Scannell & McGill 2003, Tuzun et al 1999, Widhe 2001), some investigators continue to support the concept that lumbopelvic hypolordosis and hyperlordosis are often contributing factors to low back and other pain syndromes (Evcik & Yucel 2003, Harrison et al 2002). Paradoxically, even when studies fail to find an important relationship between posture and pain, it is often the case that improving posture reduces pain (Fann 2002, Kuchera 1997).

When provocation testing indicates a patient preference for lumbopelvic flexion, the blocks are inserted bilaterally underneath the ASIS area in the prone position (Fig. 8.12). Besides the results of provocation testing, other criteria for blocking in flexion would be restriction in forward flexion, and/or pain on extension as seen in Kemp's test or similar orthopedic tests that create low back extension. When provocation testing, and/or other orthopedic tests, indicate a patient preference for lumbopelvic extension, the blocks are inserted bilaterally underneath the ischia in the prone position (Fig. 8.13).

Sagittal plane blocking can also be done in the supine position, using bilateral low blocks to effect lumbopelvic flexion (Fig. 8.14), or bilateral high blocks to effect lumbopelvic extension (Fig. 8.15). That stated, prone blocking is preferred by the author, because in that position there is access to the paraspinal musculature and other soft tissues while the patient is afforded treatment with the blocks. This allows concurrent ancillary treatment to be rendered: ischemic compression of trigger points, massage, passive stretching, and application of physical therapy modalities to the low back area.

Figure 8.12 Prone pelvic blocking flexion for lumbopelvic hyperlordosis.

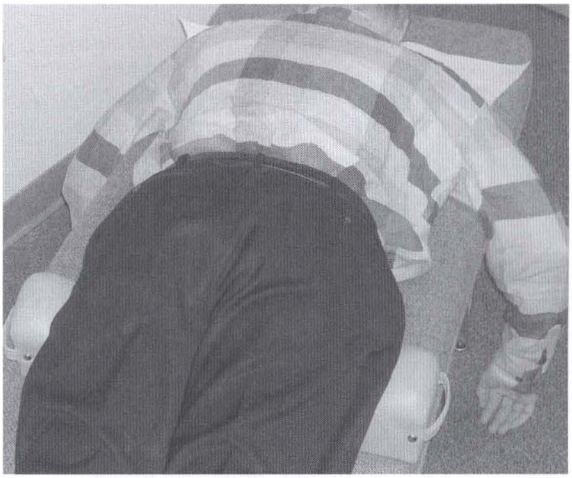


Figure 8.13 Prone pelvic blocking in extension for lumbopelvic hypolordosis.

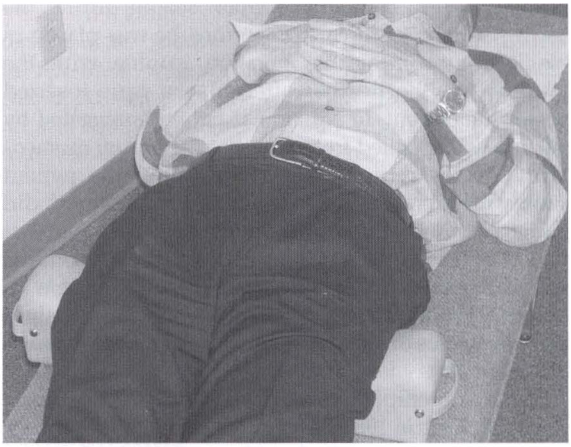


Figure 8.14 Supine pelvic blocking flexion for lumbopelvic hyperlordosis.

Lumbar blocking

Quite accidentally, Cooperstein discovered the value of lumbar blocking (Fig. 8.4). One day, many years ago, a patient was brought to his office by friends, flat on his back in a pickup truck. This patient, who

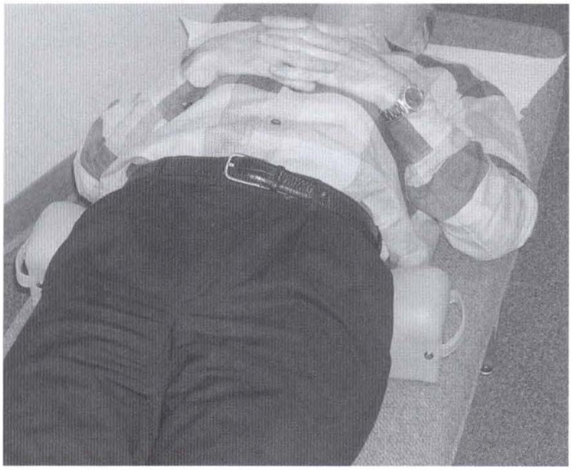


Figure 8.15 Supine pelvic blocking in extension for lumbopelvic hypolordosis.

exhibited the classic behavior of a patient with lumbar herniated disc, could not remain seated during the taking of the case history. Therefore, he was placed in his least uncomfortable position, supine with the knees bent. Shortly thereafter, blocks were inserted under the patient, in a diagonal pattern suggested by SOT analysis. Called from the treatment room momentarily, on his return Cooperstein found the patient visibly more comfortable: 'I don't know what you did to me, but this is the best I have felt in two days ... but you put these things underneath me crooked, so I had to rearrange them.' The patient was lying supine with both blocks underneath the mid-lumbar spine. Straight leg raising was dramatically improved with the lumbar blocks in place.

Physical therapist Robin McKenzie tells a similar story (McKenzie 1981), except his patient, asked to lie down on a hospital bed with a raised back piece, inexplicably lay down in the prone position, thus extending his low back. This eventually led to the McKenzie method of treating spinal conditions, especially of the low back, which has had a dramatic impact on the physical therapy profession especially.

Jones (1981), the developer of strain/counterstrain, tells a very similar story of accidentally 'discovering' positional release benefits in someone with an acute low back pain.

Lumbar blocking seems to produce relaxation of the low back musculature, primarily quadratus lumborum and sacrospinalis, by approximating their origins and insertions. The frequent improvement in straight leg raising, at least while the blocks are in place, may result from diminished stretch reflexes in the low back muscles that would otherwise reduce straight leg raising. Lumbar blocking amounts to a supine version of McKenzie-style pain provocative orthopedic testing (McKenzie 1981). It is not known whether this method obtains the same, lesser, or greater clinical benefit as compared with McKenzie's prone method, which has been shown to be safe and effective for patients exhibiting directional preference (Donelson et al 1991, 1997, Donelson & McKenzie 1992).

Diagonal, sagittal plane, and lumbar blocking not mutually exclusive

Diagonal, sagittal plane, and lumbar provocative blocking each provide indications for treatment, and the vectors suggested are not mutually exclusive. Thus, a patient who receives diagonal blocking might also receive lumbar blocking and/or sagittal plane blocking during the same office visit. A practitioner need never decide, for example, whether the patient has a left posterior ilium or a hyperlordotic lumbopelvis or a lumbar spine that would benefit from more extension. Each indication can be separately addressed by its own specific intervention, including but not limited to blocking procedures.

Outcome studies on padded wedges

The author is not aware of outcome studies, rigorous or otherwise, comparing the use of padded wedges with any other form of treatment, including no treatment. There are a few case reports describing patients treated with blocking procedures, but in all cases other types of treatment (often cranial) were also rendered, leaving no way of ascertaining any specific treatment benefit accruing from the use of blocks alone. That stated, a number of studies deserve to be cited.

Study 1 Cook & Rasmussen (1992), in a rather esoteric article, report on the treatment of uterine fibroids in two chronic cases using a manual method known as the 'total mesenteric apron' in conjunction with SOT chiropractic adjustments. Although the authors acknowledge that it was difficult to determine which of the utilized procedures had the largest impact, they felt there was no doubt that visceral manipulation did in fact have a beneficial impact in this case.

Study 2 Richards et al (1989, 1990) reported on two patients with documented disc herniations and sciatic neuropathy who were treated with a variety of methods, including activator adjusting instrument (AAI) adjustment, pelvic blocking, high voltage galvanic current, and exercise. Follow-up CT scans showed complete resolution of the bulge in one case, and reduction in the other. The patients experienced marked reduction in pain and an increase in their functional activities. The research design did not permit attribution of clinical utility to any of the individual components of the regimen, but the authors concluded that the 'favorable patient outcomes are somewhat encouraging'.

Study 3 Hospers (1992) reports on a case study involving a chiropractic student suffering from chronic headaches, who was studied with computerized electroencephalography (CEEG) before and after treatment of a Category II subluxation. Colorized brain maps recorded 10 and 60 minutes after treatment showed normalization of pre-adjustment frequency spectras in the brain. In an apparently overstated summary remark concerning this $n = 1$, non-controlled study, the investigator concludes that 'subluxation in a remote member of the craniosacral pump mechanism, specifically unilaterally in the sacroiliac joint, can induce abnormal frequency spectra in cerebral cortical activity, which can return to normative values when this subluxation is removed'.

Study 4 Gregory (1993) presents an interesting case of a woman with temporomandibular disorder whose symptoms reduced with pelvic blocking (without treatment directly aimed at the jaw), and whose low back complaints were made worse by the replacement of a crown. He goes on to present a model for the biomechanical interdependence of the temporomandibular joint and sacroiliac sprain (dental malocclusion and Category II sacroiliac dysfunction).

Study 5 Froehle (1996) reported retrospectively on 46 children with complaints related to the ear, paying 'particular attention to the cervical vertebrae and occiput'. Regarding technique, he states he used 'Sacral occipital technique-style pelvic blocking and the doctor's own modified applied kinesiology.' (Applied kinesiology is a chiropractic technique system, described by Cooperstein in Cooperstein & Gleberzon (2004), and also by Perle (1995).) Somewhat unconvincingly, the author concludes 'this study's data indicate that limitation of medical intervention and the addition of chiropractic care may decrease the symptoms of ear infection in young children'.

Study 6 Blum et al (2003) presented a case series of three cases of lumbar herniated disc, each treated by prone blocking with padded wedges. In each of the cases, pre- and post-magnetic resonance images (MRIs) were available, although the imaging protocols varied from case to case. The investigators concluded that there were both symptomatic and structural improvements, as determined by the advanced images, in each of the three patients. Blum et al (2004) also reported on three patients with what were thought to be signs and symptoms of discogenic nerve root irritation, treated using both traditional SOT procedures (blocking included) and a novel patient coughing method. This method was speculated to effect a reduction in 'intrathecal impingement'. Finally, Blum provides another report (Blum 2004) related to disc herniation, of a 37-year-old patient with multilevel lumbar disc herniation, who responded favorably to blocking and other SOT procedures, and was found on repeat MRI to have a significantly reduced degree of disc herniation.

Study 7 Blum & Klingensmith (2003) took X-rays with subjects lying on a pair of padded wedges in four different patterns, two types of diagonal blocking and two types of sagittal blocking. The research goal was to determine if the insertion of the blocks would affect apparent leg length, and whether it would affect radiometric measurements of the pelvis while the blocks were in place. There were too many methodological problems with the research to comment on the results.

Study 8 Unger (1998), while providing what he described as 'routine' chiropractic care, treated until he felt there were amelioration of Category II indicators. At that point, he ascertained through manual muscle testing that strength had improved in 15 of 16 muscles, among eight muscle groups bilaterally tested.

Study 9 Rosen (2003) reports on a patient who, although she had been able to conceive through in vitro fertilization, had not previously been successful at becoming pregnant naturally. While under SOT care, including blocking procedures, she not only experienced resolution of a variety of somatic complaints, but became pregnant and delivered a child.

Conclusions

By definition, this chapter is about the use of padded wedges for diagnostic and treatment purposes, as a type of mobilization procedure. However, in practice, they can be favorably combined with other interventions, including those that originally developed in other fields of manual medicine. The ascendancy of the interdisciplinary care model and more particularly of integrative care, which differs from interdisciplinary care only in making more use of complementary and alternative methods (CAM), marks something of a turnaround in technique wars and interprofessional rivalry, as it becomes clear that patients are best served by the accumulated knowledge and diverse procedures of all the allied professions that specialize in the conservative treatment of somatic and, to an uncertain degree, somatovisceral conditions.

Now, practitioners need not so much choose one or several techniques, let alone professional approaches, over the others, so much as 'integrate' them into a more generic diagnosis and treatment package. We hope the reader will be motivated by this chapter to consider becoming familiar with and possibly integrate padded wedges into his or her daily practice of manual medicine.

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9

Overview of the McKenzie method

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CHAPTER CONTENTS

Clinicians using manual means to manage musculoskeletal conditions face the stark realization that many of our diagnostic and therapeutic methods are not supported by significant external evidence. Much of what is used in the field is an extension of one's clinical training, where the methods of one's mentors become the basis for ongoing practice. This is likely expanded by personal experience and collegial interaction. These manners of knowledge derivation are *integration* processes. Such processes require the parallel track of *synthesis* processes – systematic collection of data through clinical science and outcomes research (controlled clinical trials, systematic reviews, etc.). Indeed, the combination of both types of processes in the approach to clinical practice – termed syntegration – has been described as a more complete knowledge-based approach to patient care than either one alone (Errico 2005).

Although there are no shortage of manual practice approaches based on integration processes (such as mentoring and personal experience), there are few methods that are supported by data from synthesis processes. One notable exception is mechanical diagnosis and therapy of the spine, also known as the McKenzie method (1981). The McKenzie approach allows the clinician the rare opportunity to take methods supported by reasonable published data and integrate them with clinical experience, to improve patient care.

The McKenzie method is often incorrectly equated with spinal extension exercises alone. While these and other exercises are important components of the technique, McKenzie is more correctly understood as a system of diagnosis and treatment based upon predictable responses to mechanical examination. The diagnostic element of McKenzie is often overlooked by those who are not very familiar with the system.

Perhaps the most defining element of the McKenzie diagnostic approach is the central role it gives to patient response. As a patient is put through a series of positions and repetitive movements, reactions are assessed. Does the range of motion increase or decrease? Does pain intensity rise or fall? Does the location of the pain change? These findings are considered more important than any palpatory assessment. Actually, in many cases, a successful McKenzie examination can be performed without the provider ever touching the patient.

At first this approach may seem incongruous to the manual practitioner; and, indeed, those manual providers who would say, 'Palpation is all' may never reconcile with those McKenzie practitioners who would say 'Palpation is anathema'. However, clinicians who are comfortable navigating the vast waters between these extreme positions can find a blend of approaches that works best for the particular patient's benefit.

This chapter will provide an overview of the McKenzie method. It is aimed at introducing clinicians unfamiliar with this system to the principles and approaches used therein. After reading this chapter, providers should be able to incorporate elements of mechanical diagnosis and therapy into their clinical approach. For further education, the reader is directed to McKenzie's texts and to the McKenzie Institute (www.mckenziemdt.org).

Examination

The heart of the McKenzie assessment procedure is the mechanical examination (McKenzie 1981, Taylor 1996). While the full assessment also includes patient history and postural analysis, this chapter will focus exclusively on the mechanical examination. Furthermore, the lumbar spine will be used as the illustrative example in text and illustrations. Although McKenzie has applied his methods to the cervical spine and extremities, the vast majority of published work on the McKenzie methods relates to the lumbar spine.

The mechanical examination is an assessment of the patient's response to end-range loading (the application of forces). The load can be applied singularly and sustained, or repetitively. This method is different from many other forms of musculoskeletal examination because it is patient-driven. That is, the patient performs much of the examination (via active range of motion) and the patient's responses to the examination maneuvers are considered more important than what the provider may sense via palpation. During the course of the examination, the patient learns which positions and movements are beneficial, and which are harmful; thus the entire process interweaves patient education and active care. McKenzie advocates making the patient as independent as possible – to minimize the chances of becoming reliant on the provider – and this process begins during the examination.

The process of the mechanical examination is outlined in Table 9.1 and Figures 9.1–9.13. At first the patient is instructed to assume a series of static sustained postures at end-range. The significance of the patient's response to these positions will be discussed below; however, at this point it is noteworthy to consider that each position attempts to elicit a change in patient symptomatology by varying the spinal configuration through a range of flexion to extension. This includes sitting slouched (Fig. 9.1), sitting erect (Fig. 9.2), standing slouched (Fig. 9.3) and standing erect (Fig. 9.4). Note that the slouched positions put the lumbar spine in a position of relative

Table 9.1 The mechanical examination

Static (sustained posture at end-range)
Sitting slouched, sitting erect
Standing slouched, standing erect
Lying prone in extension, lying supine in flexion
Dynamic (repetitive end-range movements)
Active
Flexion standing, extension standing
Flexion supine (knee to chest); extension prone (prone press-up)
Side-gliding, right or left, standing or prone
Passive
Mobilization (grades 3–4) in flexion, extension, right or left rotation

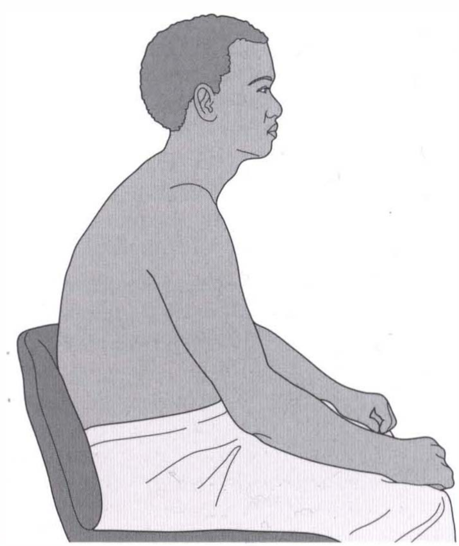


Figure 9.1 Sitting slouching.

Figure 9.2 Sitting erect.

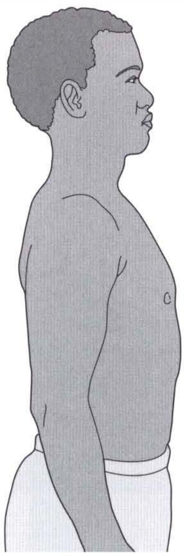


Figure 9.4 Standing erect.

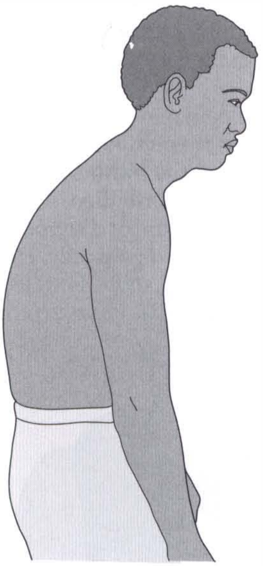


Figure 9.3 Standing slouched.

flexion, while the erect postures introduce relative extension to the spine. Next the patient will lie supine and then prone, so introducing relative flexion and extension, respectively. To increase the amount of flexion the patient may bring the knees to the chest (Fig. 9.6); to increase extension the patient may lie propped up on the forearms (Fig. 9.5). If a patient response is demonstrated at any point during the examination it is not necessary to further increase the given amount of flexion or extension. For instance, if symptoms change during supine lying, knees to chest would not be added.

The dynamic portion of the examination is the assessment of the effects of repetitive end-range movements. This includes both active and passive motions. The active movements are standing flexion (Fig. 9.7), standing extension (Fig. 9.8), supine flexion (knees to chest) and prone extension (prone press-ups). The patient is instructed to perform each of these movements up to ten times in sequence, with the response assessed after each series of repetitions.

Note that up to this point, the entire mechanical examination can be performed without touching the patient, or with only minimal contact to guide the patient through the positions and movements. If the appropriate patient response has occurred (as explained below), the examination is complete. However, if a patient does not exhibit the desired clinical change, further assessment is needed, and the examiner moves on to passive dynamic movements, which are essentially grade 3–4 mobilizations. These are performed supine in flexion (Fig. 9.10), prone in extension (Fig. 9.11), and side-lying in rotation to the right and left (Fig. 9.13).

One variable not discussed previously is side-gliding (Fig. 9.9), or horizontal (x-axis) trunk translation. In the McKenzie system, a patient who initially presents with an antalgic list is also assessed for the response to side-gliding, both standing and prone, active and passive (Fig. 9.12). This assessment is typically reserved only for those patients with an initial list, with the transition movement performed in the direction that would neutralize the list.

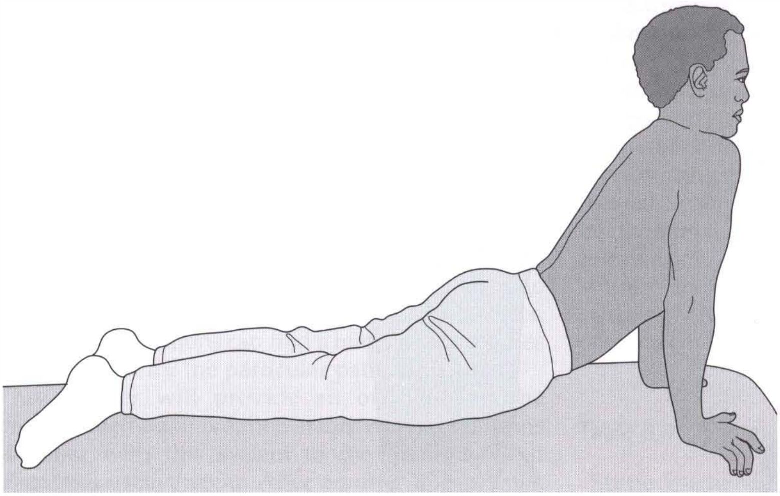


Figure 9.5 Lying prone in extension (press-ups).

Examination findings

While proceeding through the above mechanical examination, the clinician assesses the patient's response in terms of two main variables: range of motion and pain. First, has the range of motion in any given direction increased, decreased or remained stable? In this context an improvement in antalgia is considered an increase in range of motion, such that the patient with an initial left list (shoulders left relative to the pelvis) who stands straighter after a maneuver is said to have gained right lateral flexion. On the other hand, a patient who initially could flex the trunk forward 45° and after several repetitions of flexion can subsequently only flex 25° clearly has a decrease in range of motion. As might be expected, an increase in range of motion that was initially restricted is considered a desirable finding; a decrease in range undesirable.

Next, has the patient's pain complaint changed? Pain is monitored in terms of intensity and location. The intensity of pain, simply, can increase, decrease or remain unchanged.

The location or distribution of pain may change independent of pain intensity. Thus, the pain may spread away from the lumbar region into the buttock, thigh and leg, becoming more distal in its distribution. Alternately, lower extremity pain may decrease or disappear, leaving a smaller distribution of lumbar pain only. The former example, where pain moves distally, is called peripheralization; the latter, where pain shrinks to a

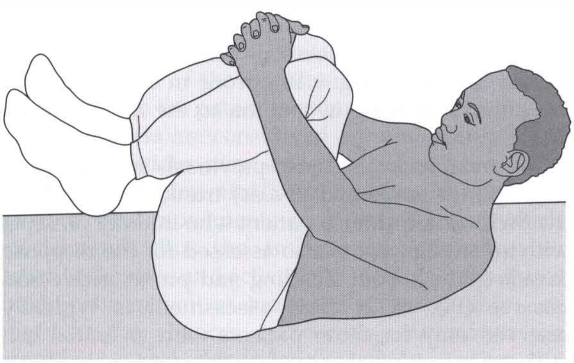


Figure 9.6 Lying supine in flexion (knees to chest).

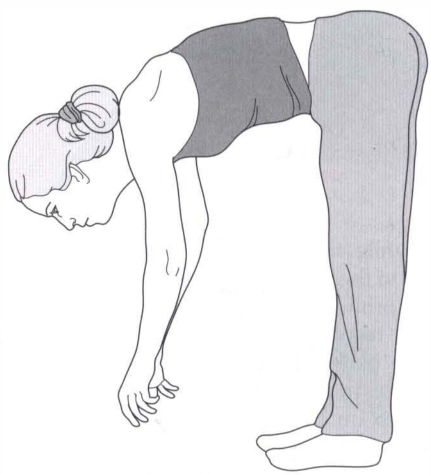


Figure 9.7 Standing in flexion.

Figure 9.8 Standing in extension.

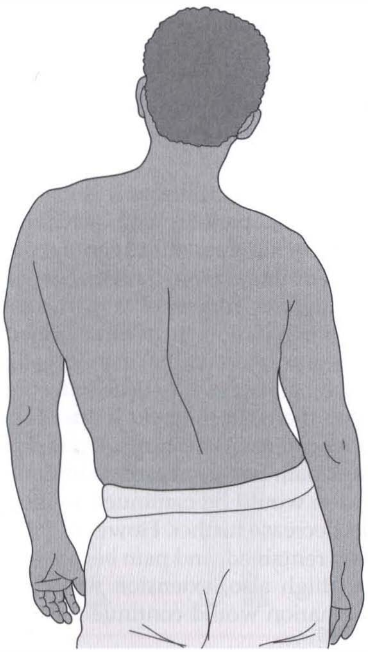


Figure 9.9 Side-gliding.

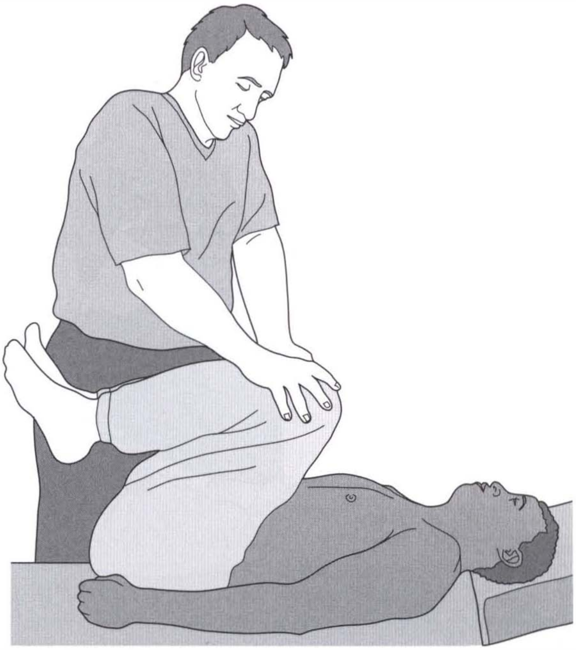


Figure 9.10 Supine flexion.

more proximal location, is called centralization (Fig. 9.14). These terms are of great importance in the McKenzie system and will be discussed in more detail.

Since McKenzie's original description, other authors have applied somewhat varied definitions to centralization, with the key concept remaining the abolition of distal pain in response to positions or repeated movements (Aina et al 2004). Some studies have defined centralization as occurring as long as distal pain is eliminated during the course of treatment over days or weeks; whereas others require distal symptoms to be abolished during the examination. There has been some disagreement as to whether the distal pain must be abolished entirely, or simply decreased. Apart from pain, reduction of distal paresthesia has also been called centralization. These prior differences notwithstanding, it is important to clarify the following defining points. After the patient has assumed a particular position or performed a given repeated movement, centralization is said to have occurred in the following circumstances:

- The most distal symptoms (pain or paresthesia) are eliminated or substantially decreased.
- If the patient presents with local low back pain only, that pain is eliminated.
- The change in distal pain is the defining element, and is often independent of proximal pain. That is, if a patient with low back pain and leg pain

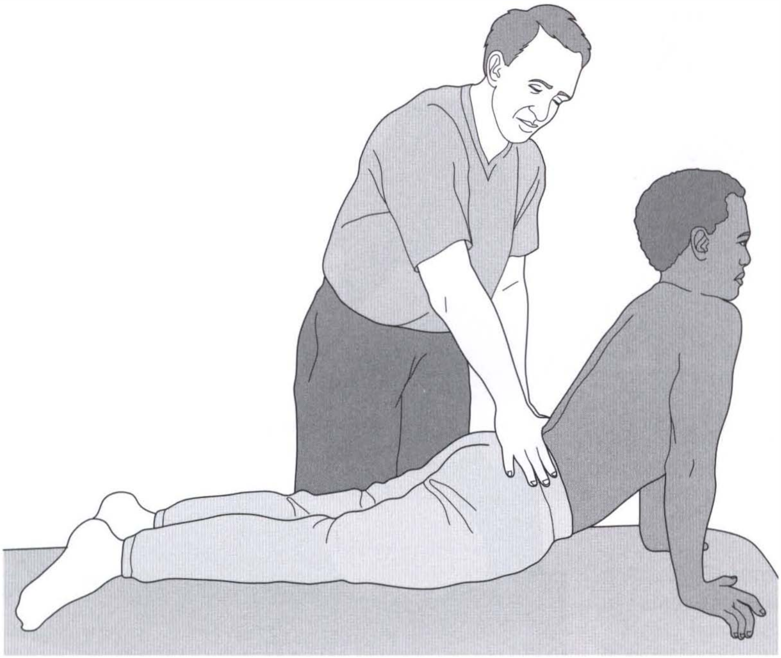


Figure 9.11 Prone extension.

experiences relief of leg pain yet an increase of low back pain, that patient is still said to have centralized. The converse of this is also true: the patient with relief of low back pain and an increase in leg pain has peripheralized.

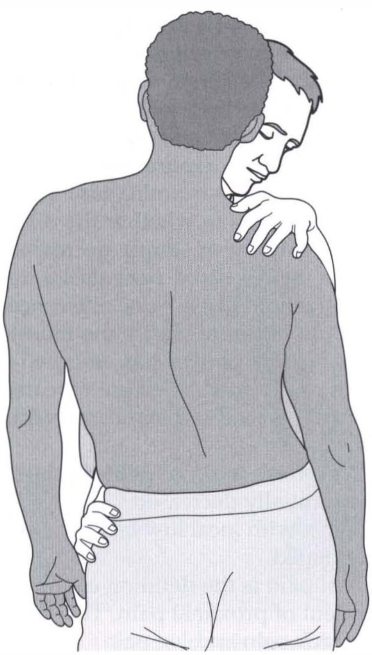


Figure 9.12 Side-gliding, with overpressure.

- The reduction in symptoms is of some duration – seconds to minutes, perhaps hours in excellent responders. There must be some plasticity to the change. (This also applies to peripheralization. In contrast, say, to the palpation of a latent myofascial trigger point, which may cause distal pain while pressure is applied, but results in elimination of distal pain essentially instantly when pressure is removed. If a patient has peripheralized, the distal pain will linger for some time after the posture or repeated movements have ceased.)

As will be seen, achieving centralization is considered advantageous to the patient, and achieving peripheralization is considered disadvantageous (Donelson et al 1991). For this reason, if centralization begins to occur during the course of a particular movement examination, that movement is continued. If peripheralization begins to occur, that movement is ceased. As an example, consider a patient with low back pain radiating to the right buttock. If after four repetitions of standing extension the buttock pain has resolved and the back pain has decreased, additional repetitions of extension would be continued to see if the back pain would decrease further. However, if the back and buttock pain remained, and pain began to be felt in the posterior thigh also, extension would be halted and the examination would continue through the other motions.

Figure 9.13 Supine rotation.

The syndromes

McKenzie has classified mechanical low back pain into three syndromes: postural, dysfunction, and derangement. Each syndrome is defined by a theoretical model of the underlying pathology, plus patient history, postural assessment and mechanical examination findings (Table 9.2). The validity of the theoretical models remains largely undemonstrated, but as McKenzie has stated, the observed clinical phenomena in response to mechanical assessment are important, regardless of the proposed mechanisms, for these phenomena provide guidance for conservative management that has been shown to improve clinical outcome. In order to achieve that outcome, the McKenzie approach outlines treatment implications or strategies for each syndrome. These include strategies for educating patients on proper posture/ergonomics, patient self-care exercises, and manual therapy.

Postural syndrome

The postural syndrome includes patients who are experiencing pain simply due to poor posture. The presumed pathology here is that there is no pathology: this is normal tissue being brought to pain by prolonged loading for which it is not suited. Consider an index finger supporting a load while in a position of flexion. Normal joints, ligaments, capsules and muscles are able to resist this load without discomfort. Now consider that same load being applied with the finger in a position of hyperextension. That same

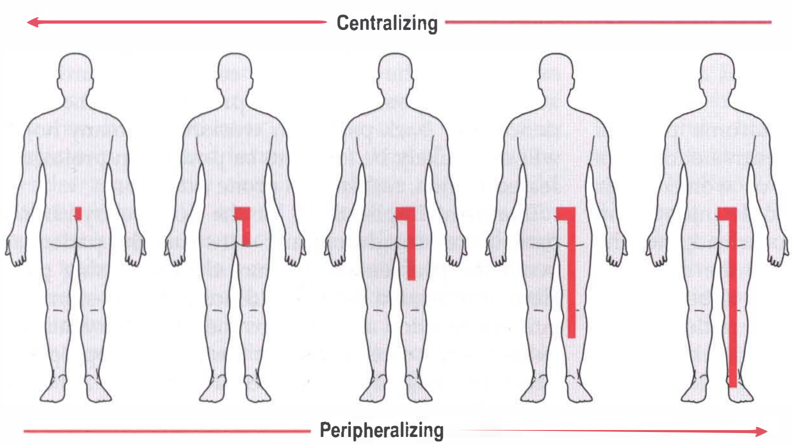


Figure 9.14 Diagrammatic representation of centralization and peripheralization. Moving from left to right depicts peripheralization; from right to left centralization.

Table 9.2 A brief summary of the McKenzie syndromes

Syndrome	Mechanical examination findings	Pathology model	Treatment strategies
Postural	AROM is full and pain-free Repetitive motions are pain-free Sustained posture at normal end-range causes pain	Normal tissue being strained by prolonged inappropriate posture	Avoid painful positions; maintain correct posture
Dysfunction	AROM is restricted in one or more directions with local pain at end-range Repetitive motions are painful at end-range, but may increase range of motion	Chronic soft tissue contracture or fibrosis (facet capsular fibrosis, nerve root adhesions)	Repetitive motions that increase pain are indicated to break adhesions and increase elasticity This applies to: • patient exercises • patient posture/ergonomics • manual treatment
Derangement	AROM is restricted in one or more directions; painful at end-range Repetitive motion reveals centralization (± peripheralization)	Discogenic pain with competent annulus (contained annular tear, internal disc disruption, or herniated disc)	Motions that centralize are indicated Motions that peripheralize are contraindicated This applies to: • patient exercises • patient posture/ergonomics • manual treatment
	AROM is restricted in one or more directions; painful at end-range Repetitive motion reveals peripheralization only (*no* centralization)	Discogenic pain with incompetent annulus (non-contained annular tear, internal disc disruption, or herniated disc)	Avoid peripheralization Often poor prognosis; often poor response to conservative treatment

AROM: active range of motion.

normal anatomy will now be subjected to loading that is biomechanically disadvantageous, and discomfort will result.

During examination, postural syndrome patients will have full range of motion. Repetitive end-range motions do not typically bring on or worsen their pain. This pain is intermittent and only initiated by prolonged (inappropriate) postural overload; thus the patient may be asymptomatic during the examination. The examination procedure likely to be positive is the sustained static posture. Some patients may experience the onset of pain when in a given position for under a minute, while others may take several minutes or more. The practicality of such a prolonged examination varies from one clinical setting to another; however, history findings will guide the examiner to the most likely culpable postures. For instance, the young computer programmer who experiences low back pain after working for many hours will most likely be found to be positive in prolonged seated flexion, rather than prone extension.

Treatment implications for the postural syndrome patient are straightforward – instruct the patient to avoid the problematic posture that is causing pain. Here, it is argued that this advice is the most important intervention and perhaps the only intervention a patient really needs. Giving the patient appropriate education on body mechanics and exercise aimed at strengthening supporting muscles empowers the individual to care for himself.

If the patient truly has full and painless range of motion, it is argued that manual treatment aimed at joints and or myofascial structures is unnecessary and may inappropriately contribute to patient dependence on the provider. To be sure, the patient without any articular or myofascial restriction may be very rare in given clinical populations. Nevertheless, if such a patient is encountered, it is likely that appropriate education and activation will be of greatest value.

Dysfunction syndrome

The dysfunction syndrome patient is characterized by chronic soft-tissue contracture or fibrosis. This may be facet joint capsular fibrosis, nerve root adhesions and the like. Such situation may arise in response to a major trauma or to cumulative microtrauma.

Upon examination these patients will demonstrate a restriction in range of motion in one or more directions. Pain will be elicited at the inappropriately premature end-range. However, this pain will diminish essentially instantly when the patient returns to neutral. During the course of a repetitive motion examination there may be a gradual increase in the restricted range of motion, as the shortened soft tissue is repeatedly brought to tension. This can be thought of as the spinal analog to the clinical presentation of chronic hamstring tightness. An initial simple stretch of hip flexion is painful. Removing the stretch relieves the pain. Repeating the stretch is painful, yet again; however, doing so may start to increase the hip flexion range of motion.

In contrast to the postural syndrome, the therapeutic approach to the dysfunction syndrome patient is to strive for repeated motions that *increase* pain. It is postulated that these motions are required in order to break inappropriate adhesions and increase overall elasticity. These motions are indicated for patient home exercise as well as clinician manual therapy.

One point of clarification is that McKenzie stresses patient self-reliance as the primary goal of treatment. Thus, it would be preferred to have the patient perform the exercises alone if he can achieve the proper response. If the patient is unable to reach any lasting decrease in pain and increase in range of motion by exercise alone, only then would the clinician add manual therapeutic means (in accordance with pain reproduction). Furthermore, the clinician would keep these interventions to a minimum, with the intention of simply assisting the patient to become independent as quickly as possible.

Most contemporaries in spine care would certainly agree on the importance of patient independence and active care; however, the suggestion that *any* amount of passive care leads to patient dependence on the provider has not been demonstrated. Thus the McKenzie stipulation that *all* passive care be omitted in patients who demonstrate success with self-care can be viewed as a guiding suggestion, rather than an admonition. Consequently, the clinician can find rich opportunity to blend manual therapies with repeated motion exercises that both attempt to stretch inappropriately shortened tissue, and educate the patient on the importance of self-sufficiency in the process.

Derangement syndrome

The portion of the McKenzie methods supported by the most significant evidence is its approach to the derangement syndrome patient. In short, derangement refers to lumbar intervertebral disc pathology. McKenzie originally described seven subcategories of derangement. However, in the 2003 revision of his text (McKenzie & May 2003) these have been collapsed into three subcategories. For the purposes of this chapter we will consider derangement to be divided into two subcategories only, corresponding with the relevant supporting evidence.

Lumbar intervertebral disc pathology includes both pathoanatomy (morphometric changes) and pathophysiology (changes in function, namely nociception). The pathoanatomy includes a wide spectrum of structural changes visible on advanced imaging: internal disc disruption, disc bulges and focal herniated discs, with or without nerve root compromise. In each of these cases, a distinction can be made between situations in which the outer annulus is fully intact, and those in which it is breached in one or multiple places. The former is called 'contained' pathology, where the outer annulus contains any distortion present; the latter is 'non-contained' pathology, where the hydrostatic mechanism of the disc is compromised (Fardon & Milette 2001).

As has been shown numerous times, the mere presence of disc pathology as seen on imaging does not correlate with symptoms (Boden et al 1990, Boos et al 1995). However, a very interesting relationship has been shown to exist regarding symptomatic – i.e. painful – lumbar discs. It has been demonstrated that low back pain patients who exhibit centralization upon McKenzie examination are very likely to display a painful lumbar disc(s) with contained pathology as evidenced by provocative discography (Donelson et al 1997, Laslett et al 2005). Conversely, those patients who exhibit peripheralization without centralization are very likely to display a painful lumbar disc(s) with noncontained pathology as evidenced by provocative discography. In other words, the presence of centralization and/or peripheralization upon mechanical examination is highly correlated with painful lumbar discs upon discography. Moreover, patients who centralize (whether or not they peripheralize also) are likely to demonstrate contained pathology, whereas those who peripheralize only (and do not centralize) are likely to demonstrate noncontained pathology.

During mechanical examination, derangement syndrome patients will display restriction in active range of motion in one or more directions. Pain will be produced at the premature end-range and perhaps during the range of motion prior to that point (this is in contrast to the pain of the dysfunction syndrome, which is only elicited at the restricted end-range). Repetitive motion examination will reveal centralization and/or peripheralization. When centralization occurs, it is typically in response to one given direction of motion only; the opposing direction very commonly, but not always, will cause peripheralization. The motion that results in centralization is called that patient's *directional preference*. In the lumbar spine, extension has been shown to be the most common directional preference (Donelson et al 1991).

A number of studies have examined the frequency with which centralization occurs in patient populations. In one retrospective study it was seen that 76 of 87 patients (87%) experienced centralization of symptoms in response to repeated end-range movements in a single direction (Donelson et al 1990). In each case, movement in the opposite direction always exacerbated distal symptoms.

A prospective study examining only sagittal motions in 145 patients with low back pain, with or without lower extremity pain, demonstrated a frequency of 47% (Donelson et al 1991). In a prospective descriptive analysis of the centralization phenomenon in 289 patients with low back pain or neck pain, with or without extremity symptoms, 30.8% of subjects were classified as centralizers, 23.2% as non-centralizers, and 46% as partial reduction (Werneke et al 1999).

Good reliability (kappa = 0.823. percentage agreement of 89.7%) has been shown among 40 physical therapists in deciding whether centralization, peripheralization, or neither had occurred (Fritz et al 2000).

Another study also demonstrated good reliability between two physical therapists for classifying patients into McKenzie syndromes (kappa = 0.70, percentage agreement of 93%) (Razmjou et al 2000). In this work, when centralization or peripheralization occurred, the reliability increased to excellent (kappa = 0.96, percentage agreement of 97%).

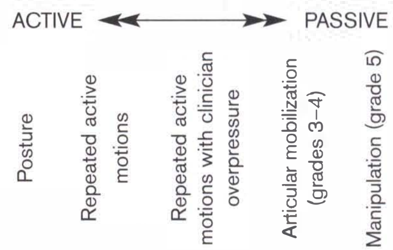
Other work has shown that patients who centralize achieve superior clinical outcomes compared with those who do not. Long (1995) investigated 223 subjects with chronic low back pain with or without lower extremity pain and found that the centralizer

Box 9.1 General note on manual therapy

The McKenzie method emphasizes the primary importance of patient education and self-care. The technique includes a focused role for manual therapy in the context of achieving desired mechanical outcomes.

As has been described in the text, centralization of symptoms and/or increase in restricted range of motion are advantageous for a patient. The goal of the McKenzie approach is to identify positions/movements that produce the advantageous results (diagnosis), and then apply these positions/movements to reach positive outcome (treatment). Manual therapy is included in both diagnosis and treatment. However, in each case it is employed only as a second tier option for situations where active methods did not achieve the desired result.

In the McKenzie system the mechanical methods can be thought of as existing on a continuum from active to passive means as shown below.



The guiding principle is to utilize active methods first, moving sequentially further to the right on the spectrum only when the preceding method has failed. In some patients, successful diagnosis and outcome can be obtained with active methods from the start. Other cases will initially require the use of mobilization or manipulation in order to achieve centralization and/or increased range of motion. Yet during the course of care the intent is to use less of the passive and more of the active methods as quickly as possible, while still maintaining positive outcome.

The manual therapies described within the McKenzie method are joint mobilization and manipulation, with the latter considered more aggressive than the former. However, the eclectic clinician may blend other forms of soft-tissue therapies into this approach. Since the principles of centralization and peripheralization in particular are supported by significant evidence, for those patients who demonstrate either, it would behoove the clinician to strive for centralization and avoid peripheralization during the application of any myofascial release technique.

group had a significantly greater decrease in maximum pain intensity scores on the NRS-101 Pain Scale and a significantly higher return-to-work status. Improved return-to-work rates were also seen among centralizers in a study of 126 consecutive low back pain patients, with or without leg pain (Karas et al 1997). The centralizers among 289 patients with low back or neck pain experienced a greater reduction in pain intensity on an 11-point pain scale, and increase in function as measured by the Oswestry Questionnaire or Neck Disability Index (Werneke et al 1999).

For those patients who can be made to centralize, treatment is always aimed at achieving centralization and avoiding peripheralization. Thus, exercises, ergonomics and manual therapies are employed following the patient's directional preference. For instance, a patient who centralized upon repeated extension will be given extension exercise, advised to maintain lordotic postures, and receive manual treatment favoring extension. As in the dysfunction syndrome, the McKenzie approach advocates refraining from passive treatment in cases where patients can achieve positive changes – in this instance centralization – by performing active exercises (Box 9.1).

Those patients who peripheralize only, and do not centralize upon any movement, present the clinician with a more challenging situation. In the absence of a clear directional preference, there is not one particular motion for which to strive. Avoiding peripheralization does remain a guiding principle for exercise, body mechanics and in-office care; however, this alone is not as valuable as having a particular direction/posture that results in positive change. In fact, it has been shown that these patients often have a poor response to conservative treatment, and may be more likely to require surgical intervention (Donelson et al 1997).

In summary, remembering the following key points may be particularly helpful to the clinician. Centralization occurs with a frequency of 30.8% to 87%, and good to excellent inter-examiner reliability regarding assessment of centralization has been demonstrated.

A single preferred direction of motion typically results in centralization. When present, centralization and/or peripheralization indicate painful intervertebral disc pathology.

Pain that centralizes probably arises from a disc with a competent annulus; pain that peripheralizes but does not centralize probably arises from a disc with an incompetent annulus. For patients with intervertebral disc pathology, those whose symptoms can be made to centralize have a better prognosis for response to conservative care than those whose symptoms cannot.

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The Mulligan concept: NAGs, SNAGs, MWMs

10

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CHAPTER CONTENTS

It is axiomatic that there are a finite number of manual therapy methods. Mobilization/manipulation of articular or soft-tissue structures forms the bedrock, but the techniques may be performed anywhere along a continuum from light touch to high-velocity thrusts. They may also range from pain-free to pain-provocative in their intended effects.

The actual concepts underpinning the application of techniques are equally varied and depend to a large degree upon the therapist's training and their subsequent clinical experience. However, they all inhabit the same basic paradigm.

Of the multiple varied approaches possible in manual therapy, Mulligan's concept and methods have many similarities to positional release techniques (PRT), hence the inclusion of this chapter. Both see lightness of touch and an asymptomatic tissue response as fundamental to clinical success. Elimination of symptoms – usually pain or stiffness – before or during functional movement is at their core. Perhaps positional release attaches a greater degree of importance to the physiological consequences of treatment than does Mulligan, who tends towards a more mechanical philosophy. However, others working in the Mulligan tradition have supplemented his work by examining the impact on neural patterning processes of the central nervous system (CNS) wrought by his mechanically conceptualized techniques (Wilson 1994, 1997).

The above is discussed more fully later in the chapter, but the similarities between, for example, Mulligan's spinal mobilization with arm movement and PRT's induration technique are immediately apparent (Box 10.1). Both require a sustained, relatively light pressure to perform an intervertebral translation. For Mulligan, however, this is done while the patient carries out active arm movements, i.e. it is not done in preparation for movement, unlike many PRTs. These latter techniques typically restore normal function by the elimination of, for example, trigger points, by holding the offending structure in the 'ease' position, achieved by passive repositioning of articular structures. Functional movement is performed afterwards.

Box 10.1 Basic similarities between Mulligan's concept and PRT

- Repositioning of abnormal tissues (by technique) leads to
- Normal output to CNS, which leads to
- Defacilitation of CNS, hence
- Normal output to tissues and
- Normal positioning maintained by neuromuscular control.

Mulligan's (1999) relatively simple but effective treatment techniques involve the repositioning of joint components as (usually) the patient simultaneously carries out their previously symptomatic movement. In some respects they are similar to Kaltenborn's (1980) work and are based on some of his biomechanical principles, but by adding concurrent active movement to passive joint mobilization, Mulligan has adopted a more functional approach. This chapter serves only as an extended introduction to Mulligan's methods. It is by no means exhaustive: a more comprehensive review can be found in his book (Mulligan 1999).

The basic techniques described below are:

1. NAGs – natural apophyseal glides
2. SNAGs – sustained natural apophyseal glides
3. MWMs – mobilization with movement
4. SMWLMs – spinal mobilization with limb movement.

The concept

The essential components of Mulligan's concept are as follows.

Pain-free

This is absolutely crucial. The techniques must not reproduce the patient's symptoms. Mild pressure or palpation discomfort may be experienced upon application of the technique, but the symptoms for which the patient has consulted the therapist must not be reproduced by the palpation or the movement.

Positional faults/tracking problems

Mulligan contends that many symptoms (pain, stiffness, weakness) result from joints with subtly malaligned biomechanics, and that these symptoms can be eliminated in many cases by equally subtle repositioning techniques, i.e. they assist in the restoration of biomechanical normality. The key word here is assist: 'force' has no place in Mulligan's vocabulary.

That a normal joint will follow a normal 'track' or 'path' through any particular normal movement is axiomatic (Kapanji 1987). This articular track – incorporating spin, slide, glide, rotation, etc. – is a genetic inheritance and is dependent upon the shape of joint surfaces and articular cartilage, and upon the orientation and attachments of capsule, ligaments, muscles and tendons. To facilitate controlled, free movement while minimizing compressive forces is the overall aim of such a design. Any anomalies in the recruitment or coordination of the sequential elements of the movement pattern will be signaled to the CNS, which may well seek to inhibit that inappropriate movement by pain, stiffness or weakness. Thus the therapist is guided as to what is normal movement by its symptom-free status.

Repetition

With the patient and the therapist having been reassured that the biomechanical anomaly has been overcome by the application of a technique and consequent symptom-free movement, it makes sense to bombard the agitated CNS with the normal signals – from the joint and attendant structures – that it has always been patterned to receive. Thus the purpose of symptom-free repetition of movement and mobilization is ultimately to sedate the CNS, to re-establish dynamic neutral (Hoover 1969). The overlap with positional release concepts can readily be seen here.

Treatment planes

The techniques, of course, must allow for variation in articular structure and types of movement.

Hinge joints

Here the bones lie end-to-end and articulate in the sagittal plane, somewhat like a hinge (Fig. 10.1). Examples would be the elbow and the knee, although the wrist too can be considered to be basically a complex, compound hinge.

With such joint types the accessory force of the mobilization is applied at right angles to the movement taking place. In the example of the elbow, a glide laterally of the forearm on a fixed humerus would be applied through the limited range of flexion or extension (see case example in Box 10.7).

Parallel joints

Here the bones lie side-by-side and their articulation is characterized by alterations in that parallel relation-

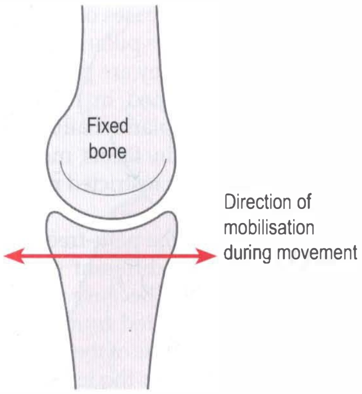

Figure 10.1 Hinge joint.

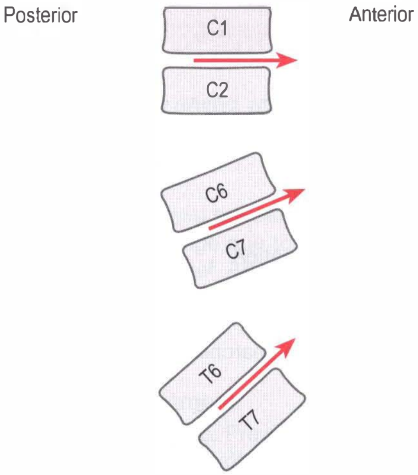

Figure 10.3 Spinal facet planes.

ship – the radius and ulna or the metacarpals, for example. In treatment situations, one of the pair would be stabilized and the other would be repositioned upward or downward as the patient performed active movement (Fig. 10.2).

Spinal facet planes

The angles of spinal facet planes varies from region to region and therefore the angle of the accessory mobilization must correspond with them. The orientation of C1 and C2 differs from that of C5 and C6, which in turn differs from T6 and T7 (Fig. 10.3).

Indications for use

Because they involve simultaneous joint accessory mobilization with active movement SNAGs, MWMs and SMWLMs are used exclusively to treat movement-generated symptoms. That is, they are not used where the patient complains of resting aches and pains, except perhaps where these are truly of minor significance to the patient, but are exacerbated by active movement. Significant resting symptoms are usually associated with a degree of underlying pathology far beyond that of relatively minor biomechanical abnormalities.

The therapist may be advised to treat the underlying pathology before concerning themselves with limitation of movement, especially as mechanical techniques run the risk of exacerbating the problem, especially if combined with movement. As far as the Mulligan concept is concerned, such a patient would be inappropriate for these techniques because it is highly unlikely that a pain-free status can be achieved, so the approach would be abandoned forthwith.

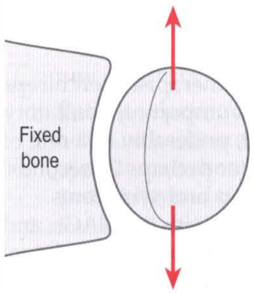

Figure 10.2 Parallel joints.

NAGs and headache techniques, meanwhile, are performed on passive patients and, to a limited extent, stand outside the above strictures, but even they have a mechanical rationale and would be inappropriate for use on a patient whose symptoms were of systemic origin (headache techniques are not used for classical migraine presentations, for example).

However, mild resting aches may simply be indicative of disturbed articular proprioception and inappropriate CNS modulation and are therefore worth considering from a mechanical viewpoint, including adding movement to mobilization. Overall, the therapist should be guided in the use of Mulligan's techniques by careful consideration of what Maitland (1986) has labeled SIN, i.e. severity, irritability and nature of the presenting symptoms. Inappropriate treatments are performed by even the most expert clinicians sometimes, but at least if the pain-free framework is adhered to then the consequences of such an action should be minimal.

In order to identify which vertebral segment requires treatment by NAGs or SNAGs, the rules common to all manual therapy approaches apply, i.e. an interplay between interrogation, observation, palpation and ongoing analysis (Box 10.2).

The patient will describe the location of the primary symptoms and their history, if questioned well. This may support or undermine the therapist's embryonic hypothesis formed as a general observation of gait/

Box 10.2 Summary of the pre-treatment assessment process

- Patient enters
  - Observation begins
- Patient speaks
  - Symptom description
- Patient exposes area
  - Observation and palpation
- Patient moves
  - Observation and palpation
- Therapist palpates more searchingly
  - Tissue response
  - Symptom responses
- Treatment of patient

posture as the patient entered the room and sat down. Observation of muscle tone, body biomechanics during undressing and the formal, undressed observation phase will further build the hypothesis.

Active and passive spinal movements are then observed and analyzed. What is the quality of movement? What is the range? What happens to the symptoms? How do the muscles feel when palpated during the movement?

During this process the therapist is considering the pathologies, physiology and anatomy which make sense of the data thus far. For example, cervical/shoulder symptoms in the early stages of cervical rotation would implicate an upper cervical spine problem, because not until much later do the lower vertebrae become involved in cervical spine movement.

Thus, the original hypothesis is built upon layer-by-layer, or modified according to findings. Palpation of the vertebrae and surrounding soft tissues for stiffness, deformity and pain response will hopefully confirm the tentative hypothesis and treatment can commence. For NAGs and SNAGs, if the right facet joint between C6 and C7 is implicated, the treatment of choice would be a unilateral NAG or SNAG (depending upon the irritability of the problem) at the right articular pillar of C6.

Methods

NAGs

As previously stated, NAGs are accessory spinal facet mobilizations applied to a passive patient, i.e. the patient does not simultaneously move the affected joint. They can be applied to a spinous process in cases of central or bilateral symptoms, or to articular pillars where unilateral symptoms are dominant. They are posterior to anterior oscillatory glides performed in mid- to end-range, respecting the treatment plane. Failure to respect the facet planes will result in facets merely being compressed and their movement restricted rather than facilitated.

The technique is safe and simple if the pain-free rule is observed, and may be applied to different spinal levels in the same treatment session. Because of the starting position they can only be applied from C2 to approximately T2, depending upon the size of the patient and the span of the therapist's hand, or the length of their arm.

Technique: a central NAG in neutral

The patient, who is seated, preferably on a chair without arms, is approached from their right and the (right-handed) therapist's right arm enfolds the patient's head. The patient's forehead should rest comfortably against the therapist's biceps, and their zygomatic arch along the forearm. All serve to stabilize the head. The thumb and fingers of the (right) hand are spread around the patient's occiput and cervical spine, where appropriate, with the exception of the little finger, whose middle phalanx is placed on, and slightly under, the spinous process to be mobilized. For example, if analysis of symptoms allied to palpation has revealed an affected C5/C6 articulation, then the little finger would be applied to either the spinous process or articular pillar of C5.

The patient's head is then further stabilized by having it held against the pectoral region of the therapist (female therapists may wish to place a pillow or similar object between themselves and the patient). The patient's body is stabilized by being sandwiched between the chair back and the therapist's hip region (Fig. 10.4).

The thenar eminence of the therapist's left hand is then applied to the middle phalanx of the right, and it is through this phalanx that the mobilization force is applied (see Fig. 10.5). Note that the right hand does not draw the vertebra forwards; the left hand is the active one. The middle phalanx primarily serves to spread the pressure from the left hand, which is more comfortable than direct thumb pressure on a vertebra, for example.

Rhythmical contraction of the therapist's left biceps brachii and brachialis will now impart an oscillatory force to the vertebra contacted, preferably at a rate of about 2–3 per second. Then after perhaps 20 seconds, reassess the patient's movements and symptoms.

How long the therapist persists with the NAGs, and in what range, depends upon the patient's original SIN presentation – and their response to treatment of

Figure 10.4 Hand positions for cervical NAG.

course. If it seems to be effective very quickly, then leave well alone. In the words of the old adage: don't try to fix what is not broken!

Typical patient

A typical patient is one who presents with pain or stiffness on cervical movement, getting progressively worse as the patient moves further into the affected range (Box 10.3). This accruing of symptoms often indicates multiple levels of involvement, which can be confirmed by palpation. The patient may have some slight resting ache and a degree of irritability of their symptoms. Often they have been made worse by other, more vigorous, manual therapy techniques, and yet their symptoms would seem to demand a mechanical solution.

Common errors

1. Patient selection. Patients with significant resting aches or pains are unsuitable, as are those whose symptoms, when generated by movement, persist beyond a minute or so.
2. Failure to stabilize the head in the position intended for treatment. Cervical rotation and side-flexion are frequently inadvertently achieved

Box 10.3 Case example of NAGs

Patient

A 72-year-old retired woman, an avid gardener and golfer.

Complaint

Inability to extend the cervical spine beyond 30% of its normal range due to central cervical pain at around C5/6 level. Attempting to move beyond that restriction spreads sharp pain into both scapulae. The symptoms were of 3 days' duration following gardening.

Previous treatment

Nil for this episode. Previous episodes had responded to manual therapy after 10–14 days usually.

Presentation

Asymptomatic at rest. Increased thoracic kyphosis and attendant increased cervical lordosis. This was her natural posture and was not antalgic for these symptoms, apparently. Movement restrictions as described above, plus 'tightness' at all other end-ranges. Sore on palpation C4–C6 spinous processes and facet joints. Very stiff C7–T3.

Treatment

Because of the widespread soreness central NAGs were the treatment of choice. However, due to increased cervical lordosis it was very difficult to locate the spinous processes in neutral sitting. To overcome this, the patient's cervical spine was slightly flexed to bring the spinous processes into prominence.

Central NAG C5 mid-range was performed for 20 seconds, after which the patient's symptoms were not manifest until approximately 60% of range. A further 20 seconds of similar NAGs enabled the patient to achieve full range without scapular pain, but still with some central cervical discomfort.

The application of NAGs was then switched to C7 and T1 for 20 seconds each. This eliminated all symptoms.

Follow-up

The patient remained symptom-free at 2-week telephone follow-up.

Note

The final part of the treatment was switched to C7 and T1 because it was felt that their immobility contributed to symptom generation at the higher levels. This is often the case with kyphotic patients.

as the therapist positions his right arm around the patient's head.

3. Mobilization of soft tissue only, i.e. failure to appreciate what is or is not bony contact. The middle phalanx of the finger is, after all, an unusual palpatory tool and must, therefore, be educated by practice and experience.
4. Failure to execute the treatment pressure along the facet or treatment plane.
5. Failure to explain to the patient the overwhelming importance of accurate feedback during the application of the technique to ensure a symptom-free process.
6. Failure to explain the treatment as a whole to the patient. Explaining that their symptoms are essentially benign and are simply due to joint mal-tracking will put them at their ease and encourage normal movement. The assurance from the explanation of their symptoms, and that treatment will cease if symptoms persist, might also recruit the downward inhibitory modulation which can also assist in the alleviation of symptoms (Jones 1992).

NAGs: a summary

1. Oscillatory glides.
2. Along treatment planes.
3. In mid- to end-range.
4. In a weight-bearing, functional position.
5. To treat multilevel stiffness.
6. Do not reproduce the symptoms complained of by the patient.
7. Are applied from C2 to T2, approximately.
8. As central or unilateral mobilizations, usually in neutral head position, but they can be progressed into other positions by experienced practitioners.

SNAGs

Method: cervical SNAGs

SNAGs ally active patient movement with the therapist's accessory force and aim at restoring the natural glide of one facet on another during that movement. To this end, the direction of force is always along the treatment (or facet) plane. However, because SNAGs involve active spinal movement too, the therapist must be prepared to 'follow' the chosen plane throughout the movement (see Fig. 10.3).

To mimic this facet behavior it is instructive to place the palm of one hand on the dorsum of the other to represent the planes, then replicate spinal movement with the wrists, observing the alterations in hand orientation as one does so.

Technique: central cervical SNAG in neutral

Like NAGs, the force is applied to the upper of the two vertebrae implicated in the movement dysfunction. With a central SNAG it would be applied to the spinous process, whereas for a unilateral SNAG it would be to the appropriate articular pillar. As a rough rule of thumb, for the cervical spine for flexion, extension and side-flexion the direction of force is towards a point between the eyes whereas a unilateral would be directed toward the ipsilateral eye, no matter where in the cervical spine the technique is applied. However, it should be borne in mind that in rotation, the upper cervical facets move much further than the lower cervical facets, and therefore the degree of 'following' the facet is considerably less, and at the end of rotation the lower cervical facets will not lie in line with the eyes. The amount of movement at individual vertebrae can, of course, be palpated beforehand to ascertain the appropriate force direction at any given stage of a movement.

To carry out the technique the patient is again seated and the (right-handed) therapist stands behind. The medial border of the distal phalanx of the right thumb is placed on the spinous process or articular pillar indicated. Like NAGs, the contact digit does not apply the pressure, for in the case of SNAGs the pad of the other thumb is placed over the 'base thumb' and it is the former which applies the pressure (Fig. 10.5).

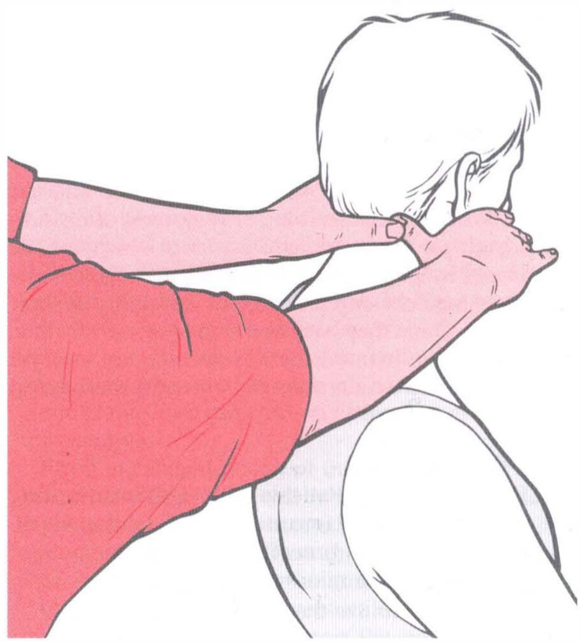

Figure 10.5 Unilateral right C1 SNAG.

How the patient is stabilized depends upon the level of the cervical spine being treated. If it is the upper cervical, then the therapist stabilizes the head by laying the lateral border of each index finger along the patient's zygomatic arch. However, if a lower cervical or upper thoracic vertebra is to be mobilized, then most therapists' hands do not have sufficient span to stabilize at the zygomatic level. Instead, the index finger can be laid along the jaw line while the other four fingers drop onto the clavicle to restrain the patient's trunk as the treatment pressure is applied to the spine.

With each SNAG the technique is applied through the previously-painful movement range and back again, often up to and including end-range and slight overpressure. An accessory mobilization plus an active movement to end of range obviously entails some risk of exacerbating the symptoms in a notoriously volatile area. In order to minimize this, Mulligan suggests the following protocol.

1. Ensure that the patient understands the importance of the pain-free nature of the treatment, and complies with it.
2. Explain what is being done and why, e.g. joint mal-tracking.
3. Before applying any treatment pressure negotiate with the patient the precise direction and their speed of movement, in order that both can be anticipated accurately as treatment begins.
4. Use the minimum amount of pressure necessary to achieve a pain-free movement. Often the amount needed is barely perceptible to the patient, yet is successful nevertheless.
5. Once the correct amount of pressure and its direction are established and symptom-free movement is achieved, do only three repetitions of that movement with the glide in place. Over-treatment of the cervical spine has more repercussions usually than under-treatment. Subsequent treatment sessions may involve up to 10 repetitions, once the patient has confirmed that no latent symptoms were manifest after session one. Improving but recalcitrant symptoms may benefit from the increased repetitions.

Note The decision regarding whether to use NAGs or SNAGs on the cervical spine is not entirely clear-cut. The decision made is based upon the patient's symptom presentation (the SIN characteristics) and the findings at assessment. As a guide, use NAGs for irritable conditions and where multiple intervertebral joint dysfunction is apparent, and generalized ache and stiffness present. SNAGs are more appropriate for the 'catch' of pain in a particular part of the movement range (implicating just one joint problem), or for symptoms at the end of range, which NAGs will not really address satisfactorily.

Thoracic spine – snags

Despite the overwhelming incidence of back pain, the thoracic spine remains largely unrepresented in the literature. Research is sparse in all areas including normal biomechanics and pathomechanical processes.

An article published by Edmondston & Singer (1997) stated that: 'the sustained natural apophyseal glide (SNAG) described by Mulligan is of particular importance in the context of painful movement associated with degenerative change. In contrast to most other mobilization techniques, SNAGS are performed with the spine under normal conditions of physiological load-bearing. Further they combine elements of active and passive physiological movements with accessory glides along the zygapophyseal joint plane. These techniques facilitate pain-free movement throughout the available range and, since movement is under control of the patients, reduce the potential problems associated with end-range passive movements in degenerative motion segments.'

Horton (2002) published a case report of a student with acute left side back pain adjacent to the level of T8/T9 intervertebral joint. A central SNAG was applied in a cephalad direction to the spinous process of T8. He concluded that the thoracic spine is ideally suited to SNAGs and therefore may be the treatment of choice in acute presentations of thoracic pain when the zygapophyseal joint is implicated. This case report is illustrated and discussed further in Box 10.14. See also Box 10.4.

Method

The method is usually applied from T3 to T12, and the principles are the same as for the cervical spine. However, the execution is somewhat different. Thumb pressure is uncomfortable here, and is difficult to maintain, so the ulnar border of the fifth metacarpal is used in contact with the vertebrae. Patient stabilization is achieved either by the therapist's other arm or by the use of a seat-belt around the patient's iliac crest. Be sure to avoid the abdomen, as this is uncomfortable for the patient and also distorts movement patterns by acting as a fulcrum around which flexion particularly can take place.

Note that the patient is, where appropriate, seated on the end of a plinth with the legs somewhat abducted. This has the important effect of stabilizing the pelvis so that the therapist is certain that the majority of rotation is taking place in the trunk. If the patient cannot straddle the plinth, then an acceptable if less effective alternative is to have the patient seated on the edge of the plinth.

Box 10.4 Case example of thoracic SNAGs

Patient

A 23-year-old male student.

Complaint

Sharp stabbing pain at T4/T5 during right rotation.

The symptoms had started 7 months previously and worsened after manipulation by a chiropractor 4 months previously.

Previous treatment

He had been treated with myofascial release techniques and postural global re-education.

Presentation

Active movements of thoracic spine were restricted (right rotation more than left rotation) and provoked a strong pain at T5 with radiation to the posterior aspect of the ribs. Extension was limited and painful. Flexion was slightly restricted, side-bending to the right was painful. There was a strong muscle spasm in the right paravertebral muscles.

Treatment

SNAGs – rotation to the right with slight axial traction, three times, and to the left three times, retested (Mulligan suggests that when dealing with the thoracic spine both sides should be addressed).

Result

Mobility increased by about 50% and less pain during rotation. No changes in pain during left side-bending. The patient was sent home with guidelines on self-traction.

Second day

SNAGs applied to ribs at level of T4/T5, bilaterally.

Results

After three treatments the patient was pain-free for thoracic movement, except for slight pain during overpressure at the end of range.

The patient received another treatment and was sent to a spinal stabilization program. One week after discharge the patient was pain-free.

Lumbar spine

Because mechanisms and origins of acute low back pain are a controversial issue, manual therapy is the most commonly used approach independent of which kind of technique is chosen. Mulligan describes three groups of techniques depending on the level of pain:

1. SNAGS are advised to patients who present with back pain.
2. When back pain is referred to above the knee he advises other techniques like gate technique, bent leg raise and straight leg raise (SLR) with traction.
3. In case of pain referred below the knee, Mulligan suggests SLR with traction and SMWLM.

Konstantinou et al (2002) published a study investigating the current use of MWM for low back pain management in Britain. This is reported on in Box 10.14. Central SNAGs for flexion were the most often used. The most commonly reported changes, seen immediately after MWM, were increases in range of movement (ROM) (54.4%) and pain relief (27.5%).

Lumbar SNAGs – method

Again, the principles common to all SNAGS apply, but the application differs a little (Box 10.5).

Like the thoracic spine, the lumbar spine is mobilized in movement with the ulnar border of the fifth metacarpal, with the exception of L5 (L5/S1 unilaterally), which is inaccessible to such a technique. Instead, at this level the therapist must revert to thumb pressure.

One further aspect of protocol should be mentioned for the lumbar spine. Mulligan suggests that if patients' symptoms can be reproduced by carrying out the movement in sitting then they should be treated in sitting to minimize the influence of the hamstrings. Care should be taken to ensure that the patient's feet are supported to avoid loss of balance when treated, which would induce lumbar co-contractions, and that the hips are at more than 90°, otherwise the lumbar spine is encouraged into flexion.

Common errors using SNAGs

1. Failure of communication, specifically regarding explanation of treatment, its pain-free nature, and the need to establish speed and direction of movement before commencing treatment.
2. Being unaware of differing facet joint angles at different levels of the spine.
3. Over treatment.
4. Lack of familiarity with seat-belt use, leading to inability to control the patient comfortably. However, where appropriate the therapist's left arm can fulfil this function (Fig. 10.6). Practicing using the seat-belt on asymptomatic models is invaluable.
5. Failure to recognize that joint dysfunction is often minimal even where symptoms are significant. The two do not always correlate and minimal treatment pressure is frequently sufficient to eliminate maximal symptoms.

Box 10.5 Case example of lumbar SNAGs

Patient

A 42-year-old male laborer.

Complaint

Sharp stabbing pain to the right groin with lumbar flexion at mid-range, and with lumbar right lateral flexion just before mid-range. Before and beyond these points the movements were asymptomatic. All other lumbar movements merely felt 'stiff' but were of good range.

The symptoms had persisted for 4 months and there was no known or remembered cause.

Presentation

Movements as above. Some evidence of increased tone in right lumbar musculature. Tender to deep palpation of left L1/L2 facet joint. All other orthopedic tests relevant to the spine were within normal limits and provoked no symptoms. However, groin symptoms in hip adduction with medial rotation at 90° flexion were made worse by hip joint compression.
The symptoms were not reproduced by lumbar flexion in sitting.

Treatment

SNAG L1 unilateral (right) from just before to just beyond mid-range flexion in standing eliminated the symptoms. This was repeated three times and the patient retested.

Result

Asymptomatic on lumbar flexion and lateral flexion. Lumbar musculature tone normal. Hip test asymptomatic.

Follow-up

The patient was reassessed 2 days later. All the symptoms were as the initial presentation except they were much diminished, a mild ache only being produced on testing. The SNAGs were repeated three times, which eradicated the symptoms. Telephone follow-up 1 week later revealed that the patient had remained symptom-free.

Note

It is not unusual for right-sided symptoms to be generated by a left-sided lumbar lesion. The increased muscle tone on the right side of this patient was presumably protective of the left-sided L1/L2 facet. Also, due to shared innervation characteristics it is not unusual for hip tests to be positive even when no hip pathology exists (Bogduk 1987).

Figure 10.6 Lumbar SNAG using arm for stabilization.

SNAGs: a summary

1. Are weight-bearing and hence functional.
2. Incorporate active patient movement, unlike NAGs.
3. They are a sustained, not an oscillatory pressure.
4. Used to treat one level of spinal dysfunction per treatment session.
5. Do not reproduce patient's symptoms.
6. Can be central or unilateral. In the case of L5/S1 can be bilateral.
7. Can be used diagnostically to confirm level of lesion.

Headache

Method

The headache technique stands somewhat outside the usual Mulligan protocols for two reasons:

- The patient must be complaining of a current headache in order that the treatment can be proved efficacious. Usually we are not interested in pain or ache at rest.
- The technique employs a sustained glide in neutral on a passive patient and hence falls somewhere between a NAG and a SNAG. Oscillatory glides have no part to play here.

Technique

The patient is counseled as to the technique and its hoped-for effect, and cautioned to report immediately any change of symptoms for good or ill. They are seated, and the therapist approaches the patient exactly as for a NAG (see Fig. 10.4). However, the glide is directed at C2 usually, or C3 occasionally. It begins with the lightest pressure imaginable on the C2 spinous process and the patient reports the effect (Box 10.6). If none is forthcoming then the pressure is very gradually increased until change is reported. Assuming it is beneficial change, the same precise pressure is maintained until either the headache has gone, or until it ceases improvement. If it ceases improvement then further pressure is added until it changes again, and so on until the headache is successfully eliminated. The pressure is then released and the patient reassessed. If the headache has gone, no further treatment is indicated. If it returns then the procedure is repeated perhaps two or three times until the headache finally goes.

Box 10.6 Case example of headache

Patient

A 17-year-old schoolgirl.

Complaint

Constant, severe headache consistent with the cutaneous nerve supply of the greater occipital nerve (C2, C3 dorsal rami). The onset was 2 years before, after being struck on the back of the head by a hockey ball. X-rays were normal.

Previous treatment

Various types of manual therapy practiced by different disciplines. All had served to exacerbate her problem, usually a few hours after treatment. They were reported as being quite vigorous in their application.

Presentation

Mechanically normal cervical spine, with only slight 'pulling' at the end of each passive and active test. Thoracic spine, shoulder girdle and glenohumeral tests all normal. Palpation revealed minor stiffness and soreness centrally and bilaterally at C2, and soreness bilaterally along the nuchal line.

Treatment

Mulligan's headache technique, with clear instructions to the patient to relate immediately even the most subtle changes in her symptoms; she was seated in her normal, relaxed posture then very gently sustained manual traction was applied to her head to distract the upper cervical facets. This quickly proved to have no therapeutic value and was abandoned.

Next, a very gentle headache SNAG, barely perceptible to the patient, was applied to the spinous process of C2. This has the effect of moving the C2 vertebra anteriorly both below C1 and above C3.

The patient was immediately aware of a 50–60% reduction in her symptoms so the SNAG was maintained at precisely the same pressure. Within approximately 60 seconds her symptoms had disappeared completely and the SNAG was released. Unfortunately, within a few seconds her symptoms returned in their entirety.

The SNAG was therefore reapplied at the previous pressure and sustained until the symptoms again disappeared. However, instead of releasing the SNAG at this moment it was maintained in a pain-free status for a further 60 seconds.

Upon release the patient declared herself symptom-free for the first time in 2 years. It was then agreed that she would be left in the treatment room to sit, read, walk around, drink coffee, etc., and be re-evaluated after half an hour. When this period had elapsed she was still symptom-free. She was then sent home and asked to report back immediately she experienced any headache symptoms.

Results

Eighteen days post-treatment the patient rang the clinic to report the onset of a constant generalized ache in the posterior cervical spine the previous day. There was as yet no recurrence of the headache. She reported that she had fallen off a settee at home and struck the left side of her head on the floor. The next day, the day of the telephone call, she had developed the cervical symptoms.

On re-examination that day her cervical movements were as before but flexion in particular increased her generalized ache a little. Palpation revealed stiffness and soreness at C2 and C3 centrally but not over the facet joints.

In the absence of headache symptoms the choice of treatment for an acute, previously irritable cervical spine was NAGs. These were performed centrally to C2 and C3 for one minute each. The cervical ache was no longer present when the patient was re-evaluated and flexion no longer provoked it.

The patient was again sent away and asked to report any recurrence of relevant symptoms. No contact was made, so prior to writing this case report she was contacted by the author when 4 months had elapsed. She remained symptom-free.

Box 10.6 Continued

Discussion

A brief perusal of any anatomy textbook, e.g. *Gray's Anatomy*, will demonstrate the relevance of C2 and C3 to headache symptoms. The interesting points raised by this particular case report are:

1. All previous manual therapy intervention had exacerbated her symptoms, yet normal cervical movements failed to do so.
2. The symptoms were eradicated by the most subtle, gentle anterior movement of C2, sustained for only 2 minutes or so. Indeed, it is arguable whether the amount of pressure exerted did in fact elicit any mechanical movement at all. Over the previous 2 years, normal cervical movements must have replicated what the headache SNAG did mechanically. The only difference here was the sustained nature of the therapeutic technique.
3. Other than a possible massive placebo effect, the technique arguably defacilitated the trigemino-cervical nuclei (Bogduk 1989), and it was the sustained barrage of A-beta nerve firing that achieved this. These fibers respond maximally to light touch and pressure, are non-noxious on central states, and are the most rapidly-transmitting nerve fibers present in the human body (Campbell et al 1989). In effect they not only operate the 'pain gate', but also effectively switch off the centrally excited cells after approximately 30 seconds of sustained barrage.

Hence, the normal movement would not replicate this effect, and the more vigorous manual therapy techniques merely provoked central excitability even further.

To conclude, this case report demonstrates the advisability of manual therapists keeping a pain-free, gentle and brief set of techniques in their repertoire.

However, if gliding C2 anteriorly below C1 and above C3 (which is what happens with the conventional headache technique) makes the headache worse, then a similar process can be followed on C3 which would have the reverse effect to the C2 glide, i.e. C3 is now moving anteriorly relative to C2, whereas before it was moving backwards relative to C2.

Dizziness

Method

The patient will be complaining of dizziness and/or nausea on movement of the cervical spine, most frequently extension or rotation.

Technique

Having first carefully screened the patient for vertebral artery insufficiency, etc., the therapist approaches the seated patient precisely as for an upper cervical SNAG (see Fig. 10.5). Palpation will have revealed the most likely vertebra for the application of the technique and the SNAG is applied accordingly. Feedback regarding symptom alteration is particularly crucial for this technique at this level and cannot be emphasized enough.

With the SNAG applied, the patient performs the previously symptomatic movement. If successful it is repeated a maximum of three times, and is not repeated in session one even if dramatic improvement is exhibited.

Note Empirical evidence suggests that with symptoms on extension a C2 central SNAG into extension is the most beneficial.

If rotation is the problem then a unilateral SNAG on the ipsilateral side is recommended. The SNAG pressure is applied to the transverse process of C1, which is located immediately below the mastoid process.

Special notes on headaches and dizziness

These techniques are performed to alter the relationships between C1, C2 and C3 for valid anatomical reasons. Significant areas of the head and face are innervated from these sources, the remainder from various cranial nerves (Fig. 10.7).

Thus, at surface level there is an intimate relationship between spinal and cranial nerves. Unsurprisingly, their axons terminate intimately too, in the trigemino-cervical nuclei in the upper portion of the cervical spinal cord (Fig. 10.8).

As will be noted, the vertibulo-cochlear nerve is a part of this system. This nerve, an integral part of the system controlling balance, has obvious implications for dizziness. If the trigemino-cervical receptor cells are not in a state of dynamic neutral balance – are facilitated in fact, perhaps by inappropriate afferent discharges from an upper cervical facet joint – then the reception of efferent inputs from the trigeminal or vertibulo-cochlear nerves may be misinterpreted and the patient could experience headache or dizziness. These symptoms could then be

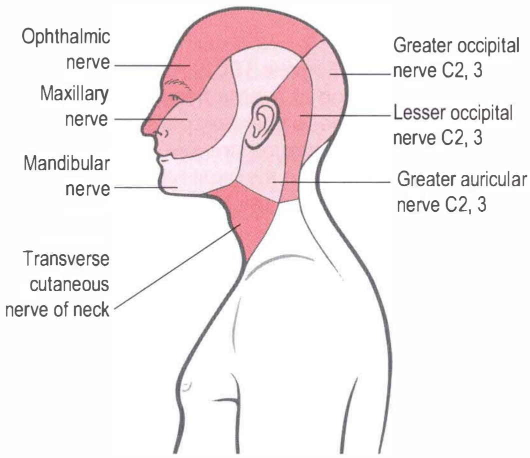

Figure 10.7 Cutaneous nerve supply to head and neck. Note the contribution of the cranial nerves.

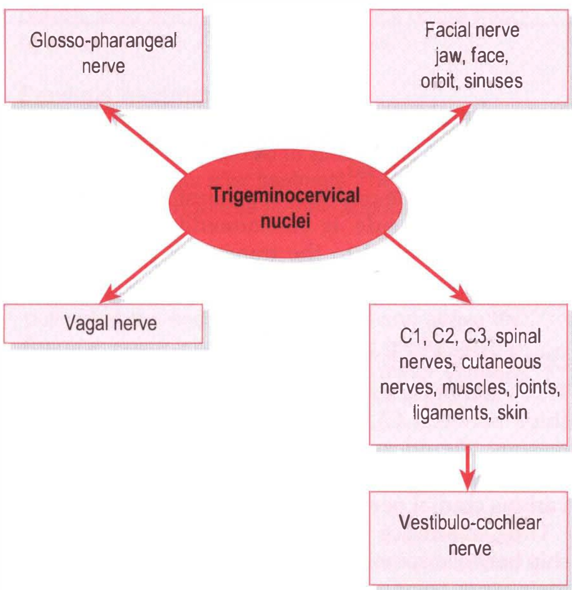

Figure 10.8 Potential links between cervical structures and structures influencing headache and vertigo.

relieved by appropriate techniques directed at the facet joint.

Peripheral mobilizations with movement

Method

As with NAGs and SNAGs, suitable patients for MWMs are those who complain of symptoms (pain, stiffness, weakness) on movement. It is also equally important to explain to the patient what is going to happen and why, and that the pain-free status should be maintained at all times. Spinal conditions are not alone in responding to downward central inhibitory modulation systems. Finally, remember to negotiate both a starting signal for the movement and its velocity.

Four important points regarding methodology should be noted here:

1. With hinge joints, it is the proximal partner that is stabilized and the distal one that is repositioned. This applies to all cases except for when the joint is weight-bearing. In these circumstances the distal partner is obviously fixed by the weight-bearing and it is often the proximal partner that is moved.
2. The therapist's hands must be positioned directly above and directly below the hinge joint in order to effect a simple glide. Failure to comply will convert the technique into a collateral ligament stress test (see Fig. 10.10).
3. The oblique nature of the joint lines must be respected, and the accessory treatment force directed along it.
4. Remember, 'less is more' often applies with these techniques. Always try very gentle pressure first. Some joint disturbances are very minor anatomically, even if they display major clinical signs and symptoms.

A methodological protocol for MWMs is shown in Figure 10.9.

Taping

Controversy surrounds the issue of taping joints, particularly weight-bearing ones (Box 10.7). The debate centers upon whether taping achieves the desired articular realignment or whether its effects are limited to surrounding soft tissues (the essence of this debate can be found in Herrington & McConnell (1996). However, it is possibly not necessary to refute or confirm either side if we can produce a dialectical argument that unites the opposing factions.

Chapter 11 describes taping methodology fully.

Taping is mechanical – whether on articular or soft-tissue structures – and mechanical techniques inevitably have physiological consequences: they invoke altered neural discharges from the target tissues. These neural discharges have the capacity to act upon the CNS in such a way that its output is affected. Changes in muscle tone may be a consequence, which may in turn subtly alter the biomechanics of the joint or joints upon which the muscle acts. So a soft-tissue treatment can have

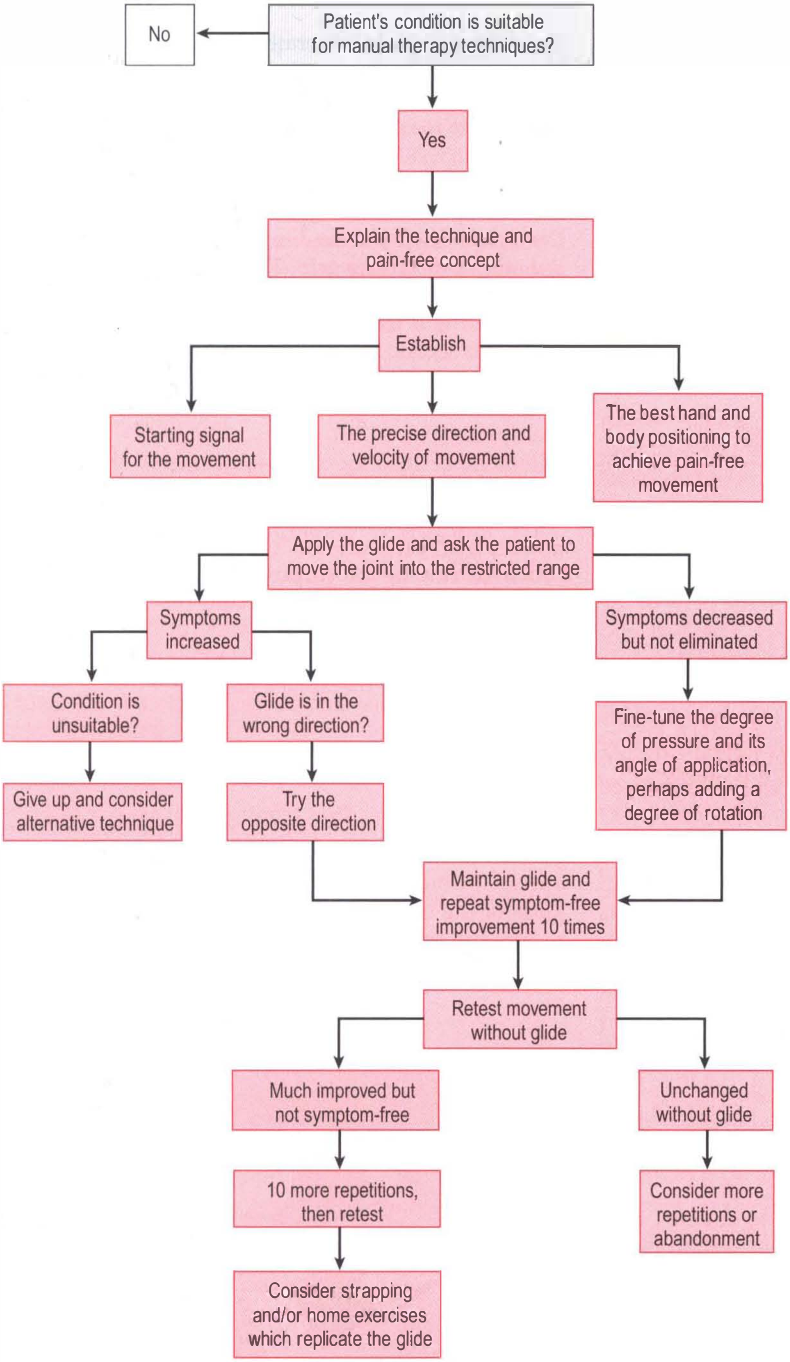

Figure 10.9 Methodological protocol for MWMs.

articular consequences, and vice versa. Perhaps taping should be seen simply as a means of achieving asymptomatic status of target tissues, be they articular or soft tissue.

Note Therapists and practitioners are advised to not be afraid to admit to a faulty analysis. Many factors may cause or mimic a tracking problem. Abandon MWMs and consider other methods if

Box 10.7 Joints commonly strapped for MWMs

- Interphalangeal
- Intermetacarpal/intermetatarsal
- Wrist
- Scapula
- Ankle

virtual symptom resolution is not forthcoming relatively quickly.

MWMs: regional techniques

Interphalangeal joint – finger

These are perhaps the best examples of pure hinge joints. The therapist stabilizes the proximal phalanx by gripping it lightly from above with the pads of the thumb and index finger of one hand. The pad and index finger of the other hand then execute the glide as the patient flexes or extends the affected joint. Many repetitions can be performed here because it is rare for these joints to be irritable. It is a simple matter to replicate this glide with strapping if required.

The carpal bones

Many patients with functional pain in the carpus can benefit from repositioning one bone in relation to its neighbor. The carpal bones form a parallel relationship, so the essence of the technique is to stabilize one bone, then elevate or depress its neighbor in relation to it. A simple index finger/thumb pinch grip is used for both the stabilization and the glide aspects of the technique. An example would be a patient who experiences pain over the dorsal aspect of the trapezium with gripping. Repositioning it ventrally in relation to the scaphoid could make the gripping pain-free.

The same principle can be applied to patients with pain over their scaphoid with wrist extension or for those who are unable to weight-bear on their extended wrist (like a press-up). Repositioning the scaphoid ventrally or dorsally on the lower end of the radius makes the movement pain-free (Mulligan, 2003).

It is useful to remember that if one end of a long bone is elevated then the other end is depressed. When recording the treatment be sure to record where on the glided bone the controlling fingers were placed.

Wrist: symptomatic flexion or extension

The carpus is glided laterally upon the fixed forearm. Therefore, if the carpus and hand are to be 'pushed' laterally then the forearm must be stabilized on its lateral side to counteract that 'push'.

Technique

The therapist enfolds the distal radius and ulna from the lateral side by using his web space primarily. This is a soft, comfortable grip. The web space of the other hand then slides directly on top of the first one but approaching it from the opposite side of the patient's limb. This second hand is the gliding hand and the web space should rest against the pisiform between the distal wrist creases, and should glide the carpus towards the thumb (Fig. 10.10).

Remember that the wrist-joint line is oblique and direct the glide accordingly.

Remember also that not all wrist flexion/extension takes place between the radius and ulna and the proximal row of the carpus. It may be necessary to experiment with angles and hand positions in order to succeed.

It is possible to strap the wrist to recapture the glide performed by the therapist's hand.

Wrist: resisted pronation and/or supination

The inferior radioulnar joint is one where the bones lie parallel to each other, and it is this relationship that is altered. More specifically, it is usually an anterior glide of the ulna on a fixed radius that is required to restore full movement.

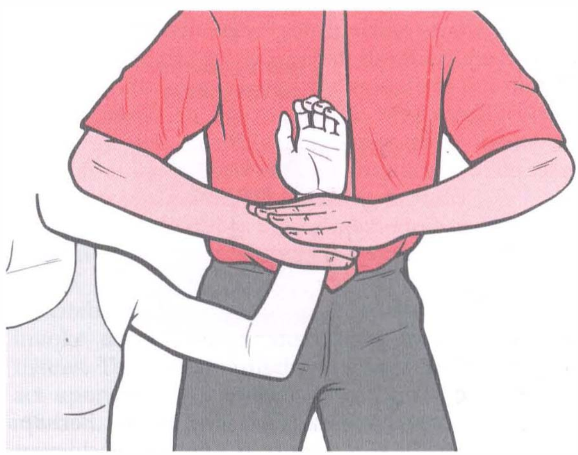

Figure 10.10 Hand positions for wrist joint lateral glide for loss of flexion and extension.

Technique

The most comfortable grip is to secure the patient's radial styloid between the therapist's thumb pad and proximal phalanx of the first metatarsal of one hand, and the patient's ulnar styloid similarly with the other hand. As the patient moves into pro/supination, the thumb over the ulnar styloid exerts an appropriate pressure to glide the ulna anteriorly.

If this technique fails or even makes the patient's symptoms worse then, using the same grip, try altering the radioulnar relationship in other ways; i.e. bring the ulna posteriorly or fix the ulna and move the radius instead.

Note The radial artery is vulnerable to pressure during this technique.

Elbow

There are two major conditions to consider at the elbow:

1. Loss of flexion and/or extension
2. Tennis elbow (lateral epicondylalgia).

Both can benefit from lateral glide techniques. However, the starting positions and mechanisms of treatment differ.

Loss of movement

If there is a small positional fault, the olecranon will not track correctly into the olecranon fossa. Like tapings to correct patellar tracking, obliquely applied tapings for the elbow can be attempted to rotate it or reposition the olecranon (Mulligan 2003).

Additionally a medial or lateral glide can be applied to the olecranon to ease elbow flexion and/or extension.

Techniques

For a loss of extension, the patient is seated, the lower end of the humerus is fixed by the therapist's hand while the other hand grips the upper forearm from beneath and rotates it internally or externally on the humerus. While sustaining the appropriate pain-free rotation, the patient is asked to move the elbow into the restricted direction. Overpressure may be usefully employed.

For a loss of flexion, it may be easier to have the patient supine while applying the same principles.

Note If the glides or rotations are not successful it can be due to a radial head positional fault, which may be palpable. When suspected, the therapist pushes the radial head anteriorly on the humerus and sustains this while the patient flexes or extends the elbow without pain. Other directions for the radial head should also be considered.

The humerus is fixed and the forearm is glided laterally toward the radial head (Box 10.8). Bear in mind the often quite acutely angled joint line, slanting cephalad from medial to lateral. The humerus is fixed by the therapist's hand lying along its lateral border, with the thenar eminence on the lateral condyle just above the joint line. The web space of the therapist's other hand is then applied to the upper end of the ulna, just below the joint line, and performs a cephalo-lateral glide as movement through the previously symptomatic range takes place (Fig. 10.11). Due to the obliquity of the joint line, subtle changes in the direction of the glide may be necessary if a considerable range of movement is traversed.

Note This technique can be performed using a seat-belt to effect the glide. However, this is a difficult technique to master without supervised training.

Tennis elbow

There is evidence supporting the claims that this treatment technique provides a substantial initial amelioration of pain and dysfunction (Vicenzino & Wright 1995). Improved grip strength in patients with lateral epicondylalgia has also been demonstrated (Abbott 2001, Abbott et al 2001).

This technique is indicated for patients with pain over the lateral elbow on gripping that is worse than tenderness to direct palpation over the lateral epidondyle (Vicenzino 2003).

Ideally, this technique is performed with the patient in supine lying. The affected arm is along the patient's trunk, in pronation. The humerus is fixed by the therapist holding it down with his web space positioned just above the elbow joint on the lateral humeral condyle.

The seat-belt is then passed under the forearm of the patient, then over the scapula and acromioclavicular joint of the therapist's shoulder nearest to the patient's head. The therapist is slightly stooped and the shoulder carrying the seat-belt is over the patient's elbow. With the belt taut it is then a simple matter for the therapist to move into a slightly more upright posture, which has the effect of tightening the belt and gliding the forearm on the fixed humerus (Fig. 10.12).

With this glide in position the patient is asked to carry out an action previously provocative of symptoms, e.g. gripping, wrist extension, etc.

To adjust the angle of the glide if the symptoms do not fully disappear initially, the therapist merely leans more forward or backward (minimally) to alter the line of pull of the belt.

Note

1. Tennis elbow is an irritable condition and this should be considered when establishing the number of attempts to be made to achieve the correct

Box 10.8 Case example of peripheral joint (elbow) treatment

Patient

A 26-year-old woman physiotherapist.

Complaint

Inability to extend her right elbow through the last 30° of extension. The patient reported that it felt 'blocked', although not painful unless forced into its end-range zone. This situation had persisted since a fracture of the radial head at the age of 9. There was no resting ache.

Previous recent treatments

1. Oscillatory mobilization of the elbow joint as a whole, and of the radial head/capitulum joint and the superior radioulnar joint.
2. Manipulation.

Both failed to alter her movement restriction.

Presentation

Active and passive elbow extension seemed to be met by a solid end-feel, although there was some evidence of hyperactivity in the elbow flexors of the upper arm and forearm when end-range was reached.

Treatment

At approximately 10° short of her end-range the humerus was stabilized by the therapist's left hand on the lateral condyle, immediately above the joint line. The therapist's right hand was then placed on the medial condyle of the ulna, immediately below the joint line. Via pressure through the therapist's right hand the forearm was induced to glide laterally in relation to the humerus. The direction of the glide specifically followed the obliquity of the elbow joint as a whole. The patient then attempted to fully extend her elbow.

Result

The patient was immediately able to regain full extension asymptomatically. With the glide maintained in the same precise direction with the same degree of pressure, 10 repetitions into full extension were performed. At the end of these repetitions the patient was able to fully extend her elbow without the assistance of the accessory glide. In other words, it was now tracking correctly through the previously restricted range.

Follow-up

The patient remains symptom-free, several months after that treatment.

Note

This case example undermines the widely held belief that adaptive shortening automatically accompanies prolonged movement restriction. It may do, of course, but it is not axiomatic.

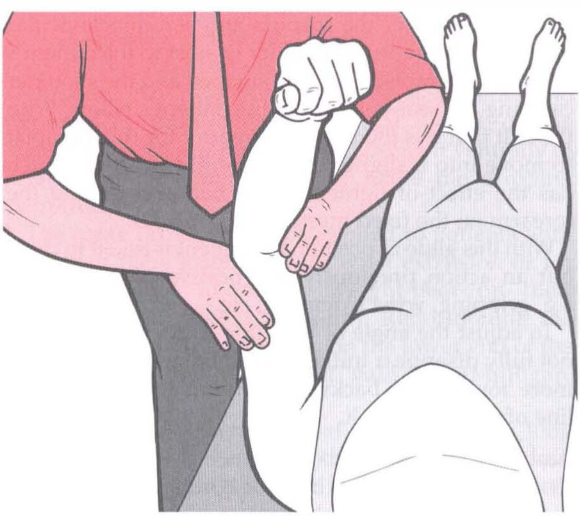

Figure 10.11 Hand positions for elbow MWM.

Figure 10.12 Tennis elbow: lateral glide with active gripping.

glide angle, and how many repetitions of a successful glide might sensibly be attempted.

2. Critics have complained that this technique does not involve movement, merely contraction. However, the common extensor group of muscles crosses the elbow joint and it is seemingly contraction of these muscles that elicits symptoms of terms elbow. Their contraction (acting as stabilizers of the wrist during gripping, of course) will exert a linear movement of the forearm on a fixed humerus and therefore increase intra-articular pressure between the radial head and the capitulum. This is particularly so in full elbow extension (close-pack position) when, coincidentally, tennis elbow symptoms seem to be most pronounced.
3. This technique is of value in tennis elbow conditions of 3 weeks or more standing.
4. If a lateral glide fails to resolve either restricted flexion/extension or a tennis elbow condition, yet clinically a tracking problem or positional fault seems to exist, it is worth applying an anterior or perhaps posterior glide on the radial head as the symptomatic action is performed.

Shoulder

Disorders of the shoulder complex are multifactorial with features in both clinical anatomy and biomechanics contributing to development of shoulder pain and dysfunction. Because the majority of shoulder pain seems to originate within the subacromial region and the glenohumeral joint, the acromioclavicular, sternoclavicular, and scapulothoracic articulations may be overlooked.

Movements in the glenohumeral joints are enormously complex, involving muscles that attach to the cervical and thoracic spines, the scapula, the pelvic ring, the occiput, the clavicle, the sternum and the upper eight ribs, as well as the humerus and the forearm. A minimum of 40 joints may affect the way the shoulder moves, but although all such joints are amenable to MWMs to enhance shoulder movement, classically three techniques have proved the most useful.

1. Posterior glide of the head of the humerus

Technique Performed in sitting or standing depending upon the relative heights of patient and therapist, this technique is particularly useful for symptomatic flexion and/or abduction, but it can be used for rotation problems too.

Standing on the opposite side to the patient's affected shoulder, one hand is placed on the patient's upper/mid thoracic region and scapula to counter any trunk rotation or extension. The thenar eminence of the other hand is placed on the greater tubercle of the head of the patient's humerus, with the fingers pointing directly upward. This hand then applies anteroposterior pressure (directed obliquely/lateral to conform with the orientation of the glenoid surface) as the patient moves the limb in the required direction (Fig. 10.13).

Note With end-range flexion or abduction it is very easy to roll the gliding hand so that it begins to exert a downward pressure on the humerus instead of a posterior one. Keeping the fingers of the gliding hand pointing upwards will negate this tendency.

2. This shoulder technique is not suitable for taping

Scapula Although not described in Mulligan's book this technique is certainly useful. As with the humeral glide, the therapist stands at the opposite shoulder of the patient, who may be seated or standing. Now, the trunk-restraining hand is placed anteriorly on the sternum or along the clavicle, depending upon the sex of the patient. The other hand, the one that will alter

Figure 10.13 Posterior glide of the head of the humerus.

scapular tracking, is placed over the scapula in such a way that it mimics the shape of the scapula (Fig. 10.14). The thumb lies along the spine of the scapula.

In this way, the scapula can be controlled advantageously during a patient's movement. It can be maintained more caudad where reversed scapulohumeral rhythm is apparent, or greater approximation of the scapulothoracic joint can be maintained where scapula 'winging' is evident. Similarly, scapula rotation can be assisted or resisted as appropriate (see example in Box 10.9).

3. Transverse vertebral glides

This technique falls into the category of spinal mobilization with arm movement (SMWAM), but it is appropriate to include it here. It can be performed for shoulder movement restriction in any plane where that movement restrictor has been shown to be of spinal origin (Box 10.10). The therapist stands behind the seated or standing patient and with thumb pad or finger against the side of the spinous process (chosen as a result of careful examination and palpation) pushes it transversely away from the side of the affected shoulder (Fig. 10.15) as the patient moves that shoulder.

Note

1. Almost any cervical or thoracic vertebra has the capacity to interfere with shoulder movement.
2. Minimal repetitions are indicated (3–4), as this combination of spinal mobilization plus arm movement can be voluntary.

Foot

As the foot is a replica of the hand the same techniques apply here. Therefore, only one technique and application will be described.

Patients who have inversion injuries of the ankle frequently complain of symptoms along the lateral border of the foot. This is not surprising since the fifth metatarsal, too, is vulnerable in such injuries. These symptoms may be apparent during gait or maybe on inversion of the ankle.

Technique

The history and presentation of the symptoms suggest malfunction between the fifth and fourth metatarsals. It is then a simple matter to fix the fourth metatarsal between finger and thumb and raise or lower the fifth in relation to it, as the patient performs the appropriate action.

However, if the problem is manifest only in weight-bearing, a better solution may be to strap the fifth metatarsal into the desired position and retest, reversing the strapping if that proves ineffective or exacerbates the situation. Alternatively, consider the relationship between the fifth metatarsal and the cuboid.

Figure 10.14 Hand position on the scapula prior to patient's arm movement.

Talocrural joint

Plantar flexion

In plantar flexion the talus moves anteriorly in relation to the tibial and fibular condyles. If it fails to do so correctly then plantar flexion will be compromised. However, it is not possible to gain purchase on the talus to assist its movement so an alternative must be found.

The patient sits on the bed with the knee on the affected side bent at 90°. The patient's posterior calcaneus is resting on the bed. The therapist stands at the end of the bed and uses one hand to glide the tibia and fibula posteriorly on a talus fixed by its close association with the calcaneus, now jammed against the bed. This effectively brings the talus anteriorly, relative to the tibia and fibula. The therapist's other hand now grips the calcaneus and glides it anteriorly, bringing the talus with it. At this point the patient performs plantar flexion with the above glides in position.

Box 10.9 Case example of scapula treatment

Patient

A 52-year-old woman cleaner.

Complaint

Sudden onset of severe left-sided shoulder pain on movement, 4 months before. Symptoms primarily over the acromioclavicular joint area, bicipital groove, and the deltoid insertion on the humerus. Originally diagnosed by her general practitioner as 'frozen shoulder', the diagnosis had been altered to scapulothoracic nerve palsy when pronounced winging of the scapula developed subsequently.

Presentation

Increased thoracic kyphosis and cervical lordosis. Poor left upper trapezius tone. Increased levator scapulae and pectoralis minor tone. Winging of scapula at rest, significantly worsened by the glenohumeral movements of flexion and abduction beyond approximately 40°. Pain accompanied these movements. These movements were described as heavy, painful and weak.

Previous treatment

Anti-inflammatory medication and pendular exercises prescribed by the general practitioner. No benefits had been reported.

Treatment

The scapula technique as described in the text was performed. The purpose was to use mechanical pressure to approximate the scapula to the chest wall and to guide it through a normal pattern during limb movements. It required several attempts to determine the precise amount of pressure required and to coordinate that pressure with guidance of the scapular rotation on movement, but eventually symptom-free flexion was achieved.

Asymptomatic flexion with MWM was repeated eight times and retested. There was an appreciable reduction in the winging both at rest and on movement, but it was still symptomatic beyond 90°. A further three sets of 10 MWMs were performed with a retest between sets, each one exhibiting further improvement.

At the end of treatment with MWMs the mild resting ache had disappeared and there was no winging of the scapula apparent at rest either. However, movement of the limb above 90° flexion was still demonstrating some winging and some symptoms, although markedly reduced in both cases.

The patient was then taught scapula 'setting' exercises to be performed in lying.

Follow-up

Three days later the improvement had been maintained but not improved upon. Three × 10 sets of the treatment described above were performed, which then resulted in asymptomatic unassisted movement into full range with no winging evident.

Result

Two further treatment sessions were required to maintain an asymptomatic status for the patient, the final session taking place 3 weeks after the initial one.

Dorsiflexion

This is the reverse of plantar flexion in that the talus moves posteriorly during movement.

The patient is sitting on the bed with the affected foot and ankle just clear of the end of the bed. A rolled towel or similar protects the achilles tendon. The therapist grasps the calcaneus (using a cupped hand as if holding a ball – do not grip with fingers and thumb; it is too painful and will inhibit movement) with one hand and draws it posteriorly, i.e. toward the floor. With the web space of the other hand a posterior glide is exerted on the anterior talus (Fig. 10.16). However, and this is important, when the patient actively dorsiflexes, the hand on the talus must be removed or it will compress the network of tendons over the anterior talus as they begin to exert their force on the foot.

Alternative in weight-bearing Having moved from an open-chain to a closed-chain action, this technique differs from that above. Instead the talus is glided posteriorly as before, but now the other hand (or towel, or seat-belt) draws the tibia and fibula forwards over the talus.

Ankle sprains

Ankle sprains are a common sports injury, with the most common acute form noted in multidirectional sports such as basketball and soccer. Most ankle sprain mechanisms involve plantar flexion and inversion forces. The literature alleges that the anterior talofibular ligament (ATFL) is the most commonly injured, followed by the calcaneofibular ligament. Mulligan's technique challenges this assumption on some occasions.

Box 10.10 Case report of SMWAM treatment

Patient

Middle-aged woman physiotherapist.

Complaint

Painful inability to elevate or abduct the left arm above 90°. The situation had persisted for some years since surgery to her left breast and lymphatics.

Previous treatment

Various combinations of massage, mobilization and stretching.

Presentation

Movement as above. Other arm movements stiff and limited to a minor degree. 'Tight' but not hard end-feel. Trigger points throughout the girdle musculature. Acutely tender T2 spinous process.

Treatment

Spinal mobilization T2 to right, concurrent with left arm elevation. This permitted almost full pain-free elevation and was repeated three times.

Result

Almost full pain-free range of flexion and abduction.

Follow-up

The patient was seen the next day and had maintained her movement. However, she now had a moderately severe constant resting ache along her inner, upper left arm, which had developed some hours after the treatment. A right transverse glide of T2 sustained for 10 seconds eliminated the ache.

Note

Adaptive shortening had not occurred despite quite extensive scarring. The post-treatment arm pain was presumably somatic referral rather than radicular, since it disappeared so swiftly.

Figure 10.15 Transverse pressure on C7 to the left while the patient swings up the right arm.

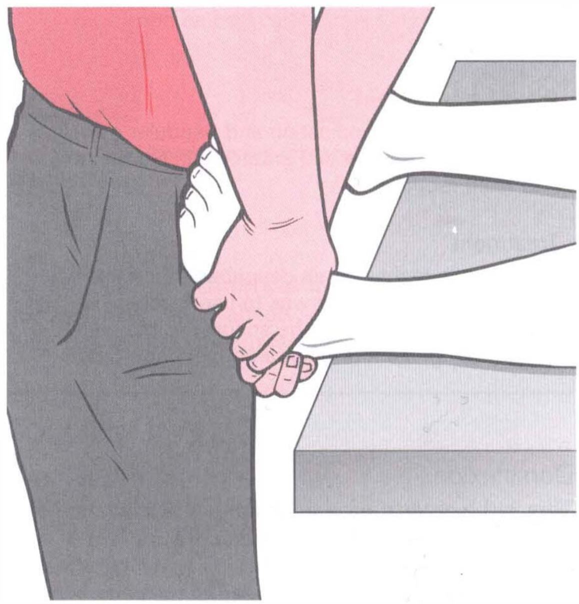

Figure 10.16 MWM for ankle dorsiflexion.

Several studies support the hypothesis that a positional fault occurs at the inferior tibiofibular joint in a number of patients who sprain their ankles. The correction of this positional fault can have a dramatic effect on the patients' symptoms (Hetherington 1996, Kavanagh 1999). O'Brien & Vicenzino (1998) in another single case study concluded that MWM in the sprained ankle produces immediate reduction in pain, increases ROM of inversion and improves clinical outcomes.

Another paper written by Collins et al (2004) in regard to ankle dysfunction is summarized in Box 10.14.

Inversion

This technique has generated some controversy. The reason will become apparent.

Pain on inversion of the talocrural joint is usually the indicator for the technique, and a 'sprained ankle' the usual cause initially.

Posterior glide of the lateral malleolus is the technique to employ. The patient is sitting on the bed with the affected leg outstretched. The therapist stands at the end of the bed. The calcaneus is supported in one cupped hand, and the thenar eminence of the other is used, first to take up soft-tissue slack, then to effect a posterio-cephalad glide of the lateral malleolus, approximately along the line of the anterior portion of the lateral ligament. The patient then carries out the active movement, with the glide in situ of course (Fig. 10.17).

Note

1. Ankle inversion loss following 'ankle sprain' usually invokes concepts of lateral ligament damage, and yet this technique effectively stresses the anterior portion of the lateral ligament, the portion most often implicated, apparently, in ankle sprains. Herein lies the controversy: stressing the seemingly damaged structure at either acute or chronic phases can dramatically reduce the symptoms during ankle inversion. Mulligan, with some justification, argues it this way: the lateral ligaments are so tough and inelastic that the forces acting upon the ankle during inversion injuries often cause avulsion fractures or malleollar fractures, rather than major ligament damage. If neither fracture occurs and the ligament stays relatively intact, then the forces applied will serve to sublux the malleollus anteriorly. Soreness and swelling would still occur due to disruption of the talocrural joint and the relationship between the tibia and fibula. This might mimic a ligament sprain and potentially confuse the unwary clinician.
2. This technique is readily replicated by strapping. The tape is anchored on the anterior part of the lateral malleolus, which is then glided into its corrected position by the therapist's hand. Their other hand reaches around behind the patient's ankle and pulls the tape into a spiral, avoiding the achilles tendon as far as possible.

The knee

The knee is a hinge joint with a slight obliquity of joint line, and the techniques are similar to those of the elbow. However, the leg is a much heavier and more unwieldy limb and therefore the seat-belt is used more frequently.

Technique

With the patient sitting or lying on the bed and the knee positioned just short of entering the restricted range, the therapist applies the heel of each hand to opposite sides of the leg, one just above, one just below the joint line. Which is above and which is below depends upon whether a medial or a lateral glide is required, of course. If it is to be a lateral glide then the upper hand will be above the joint line to stabilize the femur, and the lower hand will be below the joint line on the tibia to glide it laterally (Fig. 10.18).

Seat-belt technique

This has the advantage of enabling the therapist to keep one hand free to introduce an element of rotation into the glide if indicated, or to perform over-pressure at the end of range.

The patient is lying prone on the bed. For a lateral glide the therapist stands at the same side of the affected knee, level with it, with the seat-belt around

Figure 10.17 MWM for ankle inversion.

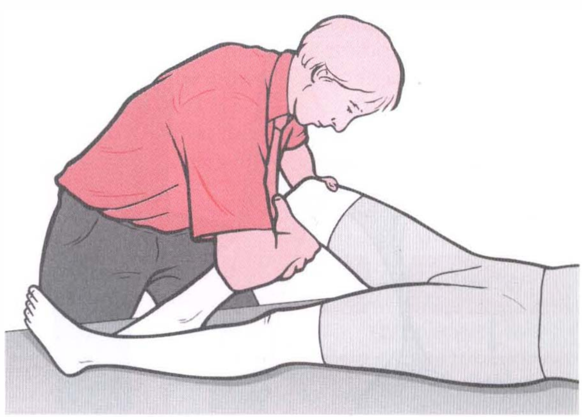

Figure 10.18 Lateral glide of the lower leg with femur fixed.

the patient's lower leg, just below the knee joint, and around the therapist's hips. The femur is fixed by one hand of the therapist, while the other hand holds the lower leg. By simply pushing against the belt with his hips the therapist will induce a lateral glide at the knee joint through the belt (Fig. 10.19). For a medial glide the therapist stands on the opposite side of the bed.

Note The joint cannot be taped, but a home exercise to replicate the glide is applicable either in weight-bearing or non-weight-bearing. It is in fact one of the simplest home exercises to master.

Hip joint

Hip pain is a common problem referred to physical therapists and osteopaths. The hip is a major weight-bearing joint, and even during an upper limb performance, load transference occurs in the hip joint.

Compared to most other joints the hip is huge, inaccessible and unwieldy. It is a ball and socket joint and really the only MWM available is that of distraction. To an extent this compromises the concept of MWM, because in all other cases joint surfaces have remained in contact, but with altered contact patterns. Nevertheless, the technique of hip distraction is useful and is included here.

Indications

When pain and capsular signs are present in the hip joint and X-rays show little or no degenerative changes, MWM usually has a place in treatment.

Technique

The patient is lying with the affected leg in 90° of flexion at the hip. A seat-belt is passed around the inner, upper thigh as close to the joint as propriety allows. Padding the belt is a necessary kindness here. The seat-belt then passes around the therapist's hips, who is standing at the same side as the hip being treated. One of the therapist's hands stabilizes the pelvis by pressure on the ileum, just above the acetabulum, while the other hand wraps around the patient's mid thigh to assist with distraction (Fig. 10.20).

Note This starting position and technique is used for flexion, medial rotation and lateral rotation loss.

Figure 10.19 Lateral glide of the tibia on the femur.

Common errors for MWM as a whole

1. Over-treatment. The zeal of the converted is a powerful force!

Figure 10.20 Technique for internal rotation with the belt. In this position (without internal rotation) flexion dysfunction can be treated.

2. Too aggressive. Always try light pressure/low amplitude glides first. They can both be steadily increased if light pressure is ineffective.
3. Hands too far from joint line.
4. Inadequate knowledge of functional anatomy. When the initial treatment fails, good anatomical knowledge will enable the therapist to innovate as necessary.
5. Tension. When trying a new, unpracticed technique the mental tension of concentration is frequently transmitted to the hands, making them hard and unresponsive.
6. Poor starting position. This prevents the therapist from adequately following joint movements.
7. Poor patient selection. Again, either the zeal of the converted wishing to use these techniques on everyone, or just basic lack of experience and knowledge.
8. Poor communication. It is vital that the patient understands and complies with the pain-free concept, and understands the treatment methods.
9. Poor strapping skills. The strapping rapidly becomes ineffective, especially on weight-bearing joints.
10. Lack of follow-up. Always review the patient within 2–3 days, especially if strapping or home exercises are used, to probe for unwanted consequences. Telephone contact will suffice in many cases.

Rationale of the Mulligan concept

At this time the reader will probably have two questions in mind:

1. How is it possible that the techniques can appear to be instantly successful?
2. Why do the treatment effects persist when the glide is no longer applied, especially in chronic conditions?

In order to explain it is necessary to introduce physiological concepts to complement the mechanical ones on display thus far.

The mechanism of action of manipulative therapy has been the focus of several reports in recent times, but still suffers from a lack of empirically validated treatment procedures. Nevertheless, a wide range of biological explanations can be applied (Hearn & Rivett 2002, McLean et al 2002). A review of current evidence indicates in part a neurophysiological basis (Abbot et al 2001, Hall et al 2000, Kavanagh et al 1999, Vicenzino et al 1996, 1998, 2000, 2001). New theories and evidence have emerged in the field of pain and movement science and possible explanations can be applied in the rationale of the Mulligan concept.

The techniques of the Mulligan concept can be conceived as acting upon a model of dysfunction based on the Nagi model of disablement (Jette 1994), as outlined in Figure 10.21.

Joint abnormalities, for whatever reason, and no matter how brief or long-standing, create abnormal afferent output which 'agitates', 'facilitates', 'sensitizes' the CNS, particularly the wide dynamic range (WDR) cells of the dorsal horn (Woolf 1991). This is in turn provokes abnormal efferent discharge to the muscles controlling the joint, creating further muscle imbalance around a joint that is already misbehaving, because of muscle tone problems originally. Thus a vicious circle is formed. Certain muscles respond to conditions such as pain, or altered joint proprioception with tightness and shortness, whereas other muscles respond with inhibition and weakness (Janda 1996).

The restoration of normal movement may have both mechanical and neurological components (Folk 2001). The correction of positional faults and consequently re-establishment of a normal articular track along a proposed treatment plane (Kaltenborn 1980) causes a decrease in the irritability of sensory receptors, altering inappropriate feedback, pain and motor control dysfunction.

If we break into this circle in such a way that the CNS receives normal afferents, and reacts accordingly, then what appear to be extraordinary mechanical events may be generated, including immediately enhanced muscle contractile power (Vicenzino & Wright 1995, Wilson 1997).

This assumes that there are no major intra- or extra-articular pathologies affecting the joint. For example,

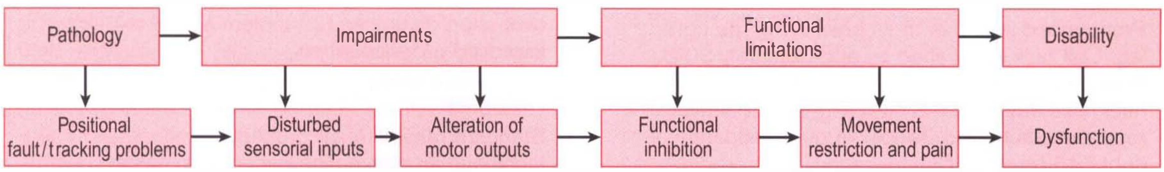

Figure 10.21 Mulligan concept can be conceived acting upon a model of dysfunction.

any leakage of inflammatory exudate would continue to sensitize chemosensitive nerve endings and an abnormal afferent discharge would persist. Similarly if there is, for example, significant joint surface deformity then the abnormal afferent barrage will persist via the mechanoreceptors, or the pressure sensors in the subchondral bone. Under such circumstances the techniques described will have only a temporary effect at best. However, under appropriate circumstances, realigning joint biomechanics is as good a place as any to break into the circle. If movement is then rendered pain-free, the excitatory barrage will be contained. If active muscle work is added normal bombardment from the mechanoreceptors will be recruited. This effect is reinforced by repetition.

Activation of proprioceptive mechanisms may contribute beneficially to joint position sense, to the sensation of force or effort of a required workload, or possibly to the perceived timing of muscle contraction (Slater et al 2005). The effects evoked allow the return of feedback and feed-forward mechanisms, and consequently the regaining of motor control and interruption of central sensitization processes (Carr & Shepherd 2000).

A full explanation to the patient of the problem and the technique, gentle handling and a caring manner recruits a downward inhibitory modulation that further sedates the CNS.

The so-called placebo effect also has profound physiological effects (Wall 1995). Gentler techniques may be very useful for pain modulation (Sims 1999), and their underlying mechanisms are a combination of mechanical and reflexogenic processes (Hearn & Rivett 2002). Gate control theory teaches us the importance of spinal and brain mechanisms in pain states and control.

Neuromatrix theory tell us about possible ways to influence these mechanisms directly, and manual therapy sensorial stimulus can 'sculpt' this matrix (Melzack 2005) and can explain how these techniques can influence and modulate pain generator sites, reducing the chances of central sensitization.

However, if we have chosen our patient badly we will exacerbate the problem by overloading highly reactive CNS cells. These simply will not cope and react by creating a shut-down scenario, i.e. increased pain, spasm or inhibition to prevent further noxious afferent discharge – prevent movement that is.

Manual therapy techniques such as Mulligan's provide an adequate input for endogenous descending inhibitory pain pathways that control and regulate the hypoalgesic effect. Treatment with spinal and peripheral techniques demonstrate an initial hypoalgesic effect and concurrent sympatho-excitation (Paungmali 2003, Paungmali et al 2003).

The resolution of headache and dizziness draws on the same concept of sedating an agitated CNS as was outlined earlier.

Integration with the ideas of other clinicians

It will have become apparent that a combination of Mulligan's technique and/or the concept of the facilitated CNS (Boxes 10.11 and 10.12) can be integrated with the work of other schools.

Box 10.11 Central facilitation for remote effects (Wilson 1997)

Patient

A 42-year-old businessman.

Complaint

Pronounced limp due to weak calf muscles following immobilization after a compound lateral dislocation of the right talocrural joint 8 weeks previously.

Presentation

Pronounced limp due to nil push off of the right leg. Calf bulk diminished by approximately 30%. Poor proprioception in right leg standing. Poor-quality heel raise in supported standing with only two repetitions achieved. Tender to deep palpation of right L4/L5 and L5/S1.

Treatment

Unilateral SNAG of right L5/S1 in supported standing with attempted heel raise. The patient successfully performed 12 good-quality heel raises before the onset of fatigue. This technique was then repeated for three × 10 repetitions (Fig. 10.22).

Result

Patient able to perform six good-quality heel raises unaided before fatigue. Markedly better gait over short distances (20 meters approximately). Improved proprioception.

Follow-up

Standard rehabilitation procedures plus the technique as above. The patient also carried out

Box 10.11 Continued

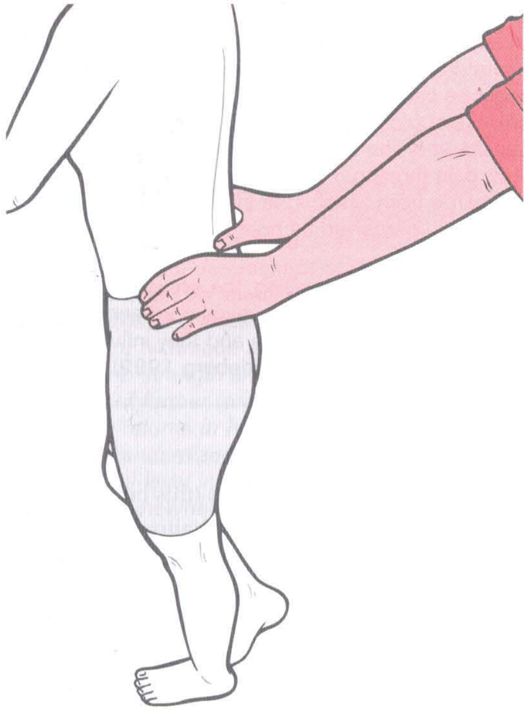

Figure 10.22 Unilateral SNAG with ipsilateral heel raise.

self-SNAG plus heel raise as a home exercise. Return to full activity progressed rapidly and uneventfully.

Note

The shared innervation characteristics of the ankle joint, the calf muscles and the L5/S1 facet joint made this treatment possible. The calf muscle was not particularly weak, merely inhibited, and this inhibition was accessed through the medium of its shared innervation (Bullock-Saxton 1994). Alternatively it could be argued that the bladder meridian was invoked.

(The author has applied this technique many times and found it particularly successful in restoring vastus medialis obliquus performance by stimulation of L1/L2 or L2/3L concurrent with attempted knee extension.)

Box 10.12 Peripheral joint mobilization and its effect on pathoneurodynamics

Patient

A 38-year-old male professional rally driver.

Complaint

Pain and swelling around the right ankle during weight-bearing after moderate exercise, e.g. golf, hill walking. The situation had persisted for 4 months following a severe ankle sprain. He also complained of right intermittent low back pain and haunch pain.

Previous treatment

Immediate rest, ice, compression, elevation for 2 days followed by ultrasound, joint mobilization, friction massage and active and passive exercises.

Presentation

Old pitting edema plus recent swelling around right malleolus. Tender on palpation of lateral malleolus, lateral ligament (anterior portion), achilles tendon, peroneal tendons, and finally right L5/S1, plus the upper quadrant of ankle inversion reproduced his pain at 50% of range. Straight leg raise (SLR) reproduced his ankle and buttock pain at 60°.

Treatment

In sitting, the MWM posterior glide lateral malleolus was performed with concurrent active ankle inversion. This rendered inversion pain-free and was repeated 10 times. On retest without the glide in place both movement and pain had improved markedly. The technique was repeated a further 10 times and retest showed further improvement. A last set of 10 repetitions was deemed enough for that session because of the possible spinal involvement.

After the three sets of 10 repetitions inversion was full and almost pain-free. The SLR was equal to that of the left and provoked no symptoms.

Follow-up

2 days later all the improvements had been maintained and the swelling had diminished considerably too. There was no tenderness on

Box 10.12 Continued

palpation of any of the previously sore structures, including the spine and buttock. SLR was normal. The follow-up treatment required only two sets of 10 repetitions of the previous MWM to render inversion pain-free.

Note

The ankle, the peronei, the achilles tendon, gluteus maximus and the L5/S1 facet joint are united in having L5 and S1 as their primary innervation. The connective tissue supporting the sciatic nerve also receives some innervation from that source (Hromada 1963). Therefore, if the original ankle trauma so sensitized the WDR cells of the L5 and S1 cord segments, then pressure on or movement of any similarly innervated structures would generate neural traffic into those same segments where they might be perceived as pain (Cohen 1995). Normalizing ankle joint biomechanics contributed to diminished sensitivity of the spinal receptor cells and raised their pain threshold. Suddenly, the normal afferent discharge from associated structures like the sciatic nerve was perceived as normal and became asymptomatic.
With regard to the swelling, the sympathetic trunk is, of course, linked to the spinal cord segments via the gray rami communicans and they influence each other's level of activity (Lundeberg 1999).

The summation of effects consequent upon changes in joint motion, afferent discharge alteration, efferent discharge alteration, muscle tone/contractile strength changes and, finally, pain behavior, can instigate profound mechanical and physiological benefits for the patient (Box 10.13).

One, many or all of the above play some part in the concepts of:

- positional release techniques (this book)
- muscle energy techniques (Chaitow 2006)
- the McConnell methods (1986)
- pathoneurodynamics (Butler 1994)

(see Box 10.12)

- trigger point and myofascial techniques (Chaitow 1988, Chaitow & DeLany 2000) to name but a few.

Box 10.13 Benefits to patient post-stroke (contributed by Joan Pollard MCSP SRP)

Patient

A 74-year-old woman.

Complaint

Pain in right hand and shoulder following a left cerebrovascular accident (CVA). The patient had high tone in the right forearm flexors, biceps, brachioradialis, and low tone in the wrist and elbow extensors.
The hand was held in a position of finger flexion and wrist flexion with radial deviation. The shoulder was held in internal rotation and adduction due to increased tone in pectoralis major and latissimus dorsi. Consequent on these facts there was inevitable movement reduction in the shoulder, elbow, wrist and fingers.

Previous treatment

Bobath (1979) approach to stroke rehabilitation, including active assisted and passive movements of the upper limb.

Treatment

The pain in the right hand was principally located around the lateral border. Realignment of the fifth metacarpal on the fourth by posterior glide, held in position by strapping.

Result

Reduction of pain in the hand. Reduction of tone through the upper limb. Increased availability of active wrist, finger and shoulder movement.
Improvement in gait, with reciprocal gait pattern and step-through.

Follow-up

Improvement maintained if hand-strapping in place. Only pain level and gait improvement remained if the strapping was removed.

Note

This case serves to illustrate the far-reaching effects of the vicious circle of altered tone to joint dysfunction, to pain to altered tone, etc., and the significant benefits that can accrue from apparently quite insignificant treatment ideas.

Box 10.14 Recent research

1. What is the practitioner's optimal force? (McClean et al 2002):

This pilot study evaluated the ideal level of applied force ('grip strength') when treating chronic lateral epicondylalgia, as this apparently influences the hypoalgesic effect.

This pilot study has demonstrated that the level of force applied manually during the application of the lateral glide treatment technique in chronic lateral epicondylalgia is a determinant of the technique's hypoalgesic effect. In addition, the data suggest that there may exist a critical level of force below which the treatment technique is ineffectual at reducing pain free grip strength and that beyond which the application of further force results in comparatively diminishing returns in hypoalgesic effect. In this study, the standardized force level that appeared to be the critical level in terms of the hypoalgesic effect was somewhere between 1.9 and 2.5 N/cm, that is, between approximately 50% and 66% of the therapist's maximum force.

Conclusion: Moderate force appears to offer better results than excessive force.

2. Use of MWM, by physiotherapists in the UK, in treatment of low back pain (Konstantinou et al 2002)

The aims of this study were to investigate the current use of mobilizations with movement (MWM) for low back pain (LBP) management in the UK, and to inform future clinical research exploring their effects.

A postal survey of a random sample of 3295 practicing physiotherapists in Britain was conducted.

A response rate of 72.1% ($n = 2357$) was obtained. Of these, 48.2% (1136) reported treating LBP, of whom 41.1% (467) reported using MWMs in LBP management.

Therefore, the sample applicable for analysis consisted of these 467 therapists currently treating LBP and using MWMs.

- Most respondents (51.4%) worked in a national health service setting.
- Over half of the respondents used MWMs on at least a weekly basis, with 61.9% using MWMs primarily for mechanical LBP.
- The most commonly reported changes seen immediately after the application of MWMs were increases in range of movement (ROM) (54.4%) and pain relief (27.5%).
- This was also reflected in the outcomes chosen to evaluate improvement. On average, two spinal levels were mobilized using 2–3 sets of 4–5 repetitions.
- The lower lumbar levels were treated most often using MWM.
- Most therapists indicated using a combination of other treatment approaches together with MWMs when treating LBP patients.

Conclusion: MWM is widely and regularly used in the UK by physiotherapists in treatment of low back problems, in combination with other methods, with functional improvement and pain reduction as the main outcomes.

3. MWM effect not due to endorphin release (Paungmali et al 2004)

Research has shown that Mulligan's mobilization with movement treatment technique for the elbow (MWM) produces a substantial and immediate pain relief in chronic lateral epicondylalgia (48% increase in pain-free grip strength). This hypoalgesic effect is far greater than that previously reported with spinal manual therapy treatments, prompting speculation that peripheral manual therapy treatments may differ in mechanism of action to spinal manual therapy techniques.

Conclusion: The initial hypoalgesic effect produced by the MWM for the elbow was not significantly antagonized by pre-treatment intravenous injection of naloxone, supporting the hypothesis that manual therapy-induced hypoalgesia most likely involves a nonopioid mechanism of action.

4. What aspects of subacute ankle sprain are helped by MWM? (Collins et al 2004)

This study investigated whether a Mulligan's mobilization with movement (MWM) technique

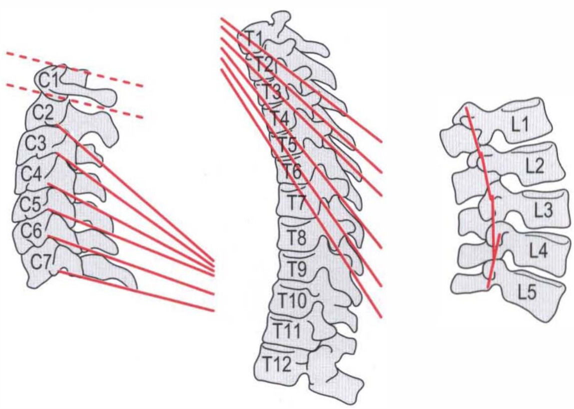

Figure 10.23 Orientation of zygapophyseal joints. (After Exelby 1995, with permission of Chartered Society of Physiotherapy.)

Box 10.14 Continued

improves talocrural dorsiflexion, a major impairment following ankle sprain, and relieves pain in subacute populations. Fourteen subjects with subacute grade II lateral ankle sprains served as their own control in a repeated measures, double-blind randomized controlled trial that measured the initial effects of the MWM treatment on weight-bearing dorsiflexion and pressure and thermal pain threshold. The subacute ankle sprain group studied displayed deficits in dorsiflexion and local pressure pain threshold in the symptomatic ankle. Significant improvements in dorsiflexion occurred initially post-MWM ($F(2, 26) = 7.82$, $P = 0.002$), but no significant changes in pressure or thermal pain threshold were observed.

Conclusion: MWM treatment for ankle dorsiflexion has a mechanical rather than hypoalgesic effect in subacute ankle sprains.

5. Single case study of thumb dysfunction using MWM (Hsieh et al 2002)

The success of MWM appears to rely greatly on the selection of the direction for the sustained corrective glide.

In clinical practice the process of determining the direction for MWM often involves a series of different directions being tested before settling on the most effective.

In this case report, the authors employed both X-ray (Fig. 10.24) and MRI scans to study the positions of the phalanx and metacarpal bones and the effects of MWM on these bony positions.

A small positional fault was found in the axial plane of the metacarpophalangeal joint (MPJ) of the thumb, which appeared consistent with the mode of injury described by the patient.

Figure 10.24 The lateral views of the thumbs in maximal flexion. The right thumb (A) showed less flexion than the left thumb (B) in the interphalangeal and metacarpophalangeal joints. No 'positional fault' is apparent. (From Hsieh et al 2002.)

Box 10.14 Continued

The MWM was chosen purely on a clinical reasoning basis (i.e. pain alleviation and improved range of motion), and this addressed the positional fault during its application.

It was not possible to establish if the immediate reduction of the patient's pain following MWM was the direct result of the correction of the positional fault. The authors point out that the finding that the direction of the effective MWM glide (i.e. MPJ supination) was opposite to the MRI determined positional fault (i.e. MPJ pronation) – and that the positional fault appeared consistent with the mechanism of injury tends to indicate that the selection process for determining the direction of the glide should also take account of the mechanism of injury.

That is, the glide should be in a direction opposite to that induced by the mechanism of injury. This appears to be in contradiction to the concepts of 'reproducing the position of strain' as discussed in Chapter 3, in relation to SCS.

In this case the follow-up MRI scans taken after the completion of the treatment program showed no change from the positional fault seen on the pre-treatment MRI scans, even though there was an immediate relief of pain and improvement in function.

This implies that 3 weeks of MWM may have produced its clinical effects through other mechanisms than a long-term correction of the positional fault.

There was, however, an immediate change in bony position during application of the MWM, as seen on repeat MRI scans. This initial effect, the authors hypothesize, may have been sufficient to stimulate the longer-term changes in nociceptive and motor system dysfunction that are reflected in pain relief and improved function, possibly through more complex mechanism(s) than implied by a simple and long-lasting correction of bony alignment.

Conclusion: In this fascinating case study it is possible to see similarities and differences when comparing MWM with SCS methodology.

6. Combining MWM (SNAG) and taping

A case is described of a young male patient with acute left-sided back pain adjacent to the level of the T8/T9 intervertebral joint, following a 'bear-hug' greeting the previous day (Horton 2002).

The patient was stooped in a position of flexion and right-side flexion such that he needed to support himself with his right hand on his right knee when standing. In sitting, the patient needed his right hand on the plinth to support his trunk (Fig. 10.25A).

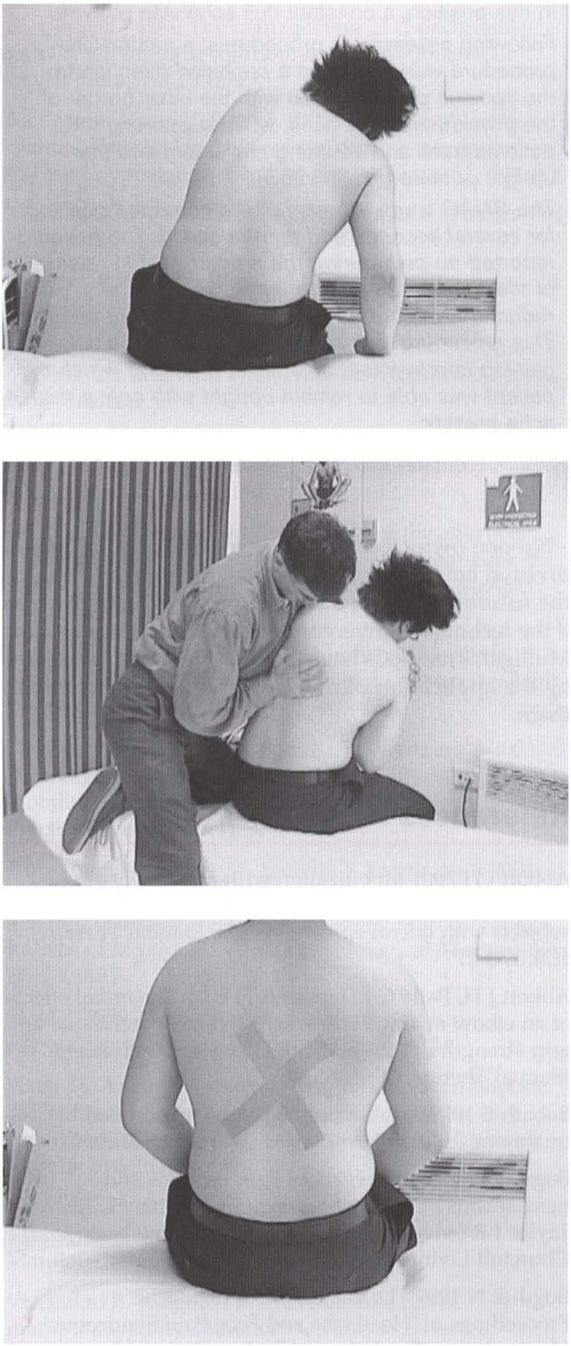

Figure 10.25 (A) Patient presentation with acute locking in flexion/right-side flexion. (B) Starting position and application of modified SNAG technique. (C) Taping applied across the thoracic spine for support. (From Horton 2002, with permission.)

Box 10.14 Continued

In this position, a constant dull ache was present.

Following assessment procedures, a central SNAG procedure was applied in a cephalad direction to the spinous process of T8 with the ulnar border of the physiotherapist's hand, while supporting the patients trunk and assisting movement into the upright posture (Fig. 10.25B).

The SNAG was sustained in the corrected position for several seconds and then released. The patient reported no pain during the procedure. On release of the SNAG, the pain returned, although at a reduced level, but he was unable to remain upright. This procedure was repeated another three times gaining improvement each time, following which the patient was able to remain upright with only a mild ache present.

Another attempt to overcorrect into further extension or left-side flexion was too painful, therefore the technique was not pursued.

Two strips of 2.5 cm zinc oxide strapping tape were applied diagonally across the T8/9 segment in an attempt to provide support as well as remind the patient not to flex into the position of deformity. (Fig. 10.25C)

On re-examination the next day there had been marked improvement (95%). Passive mobilization was carried out and the patient was discharged.

Conclusion: This case dramatically illustrates the value of this noninvasive positional release approach, and how use of supportive strapping/taping (see Chapter 11) can add to maintenance of improvement.

No-one owns techniques or concepts and sectarian division helps no-one, least of all the patient. Perhaps the future will bring a holistic unity of concept, even if the techniques diverge somewhat. In the meantime, Mulligan's methods have the concept of 'symptom-free by the application of minimum force' to recommend them.

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11

Unloading and proprioceptive taping

Dylan Morrissey

CHAPTER CONTENTS

Introduction

Unloading taping to reduce musculoskeletal pain, and proprioceptive taping to improve movement patterns, are useful empirical adjunctive treatment approaches. It is probable that they operate by similar mechanisms, the precise nature of which remain as yet unproven, despite an increasing evidence base. Particular attention has been paid to the effects of taping on muscle recruitment, pain scores during functional tasks and motor relearning. Relatively little progress has been made in understanding the mechanisms by which proprioceptive taping effects may be mediated. Hypotheses regarding mechanisms based on the available literature are presented in this chapter. These concepts are accompanied by clinical guidelines for the application of taping in a variety of situations with illustrative case histories.

Taping can be used in a number of ways to reduce movement-associated pain. Based on a thorough assessment of presenting movement patterns and pain mechanisms, taping can be used as a useful treatment approach in itself, or as a means of maintaining treatment effects. It can be used to provide a physical effect on the tissues that lasts for hours, or even days, supplementing the relatively brief therapist–patient contact. Taping can be used to affect pain directly by offloading irritable myofascial and/or neural tissues. Taping can also be indirectly used to alter the pain associated with identified faulty movement patterns (Table 11.1). These effects are both proprioceptively and mechanically mediated depending on the approach used. This is easily demonstrated in the shoulder girdle, with this area therefore being particularly used to demonstrate these approaches.

Other musculoskeletal dysfunctions and derangements have been the subject of increasing study since the second edition of this book. The management of patellofemoral pain by means of taping has been increasingly investigated in the literature and described elsewhere with evidence for both mechanical and motor control effects of

Table 11.1 Means of pain reduction by taping

Direct	Indirect (proprioceptively mediated)
Longitudinal offload	Inhibition of overactive movement synergists and antagonists
Transverse offload	Facilitation of underactive movement synergists
	Promotion of optimal interjoint coordination
	Direct optimization of joint alignment during static postures or movement

taping on patellofemoral movement and symptoms (Gilleard et al 1998, Hinman et al 2003a, 2003b, McConnell & Fulkerson 1996, Pfeiffer et al 2004, Salsich et al 2002, Whittingham et al 2004).

The pain symptoms of osteoarthritis of the knee have been shown to be ameliorated in the short and medium term with concomitant improvements in function (Hinman et al 2003a, 2003b). Studies aiming to quantify taping effects on foot and ankle pain and positioning have begun to reinforce clinical observations of efficacy, with positive effects of taping in reducing the pain of plantar fasciitis and adverse movement patterns of the rear foot being demonstrated (Landorf et al 2005, Wilkerson et al 2005). Conflicting evidence about the effects of tape on muscle latencies in the ankle in relation to perturbations mimicking those of inversion sprains continues to be a theme in the literature (Allison et al 1999, Hopper et al 1999, Shima et al 2005). There is still plenty of work to do in determining the optimal taping techniques to use in given circumstances, with even more work required to determine the pathophysiological mechanisms of action.

Direct methods

Longitudinal offload

Painful tissues that are held in tension either because of the unrelieved influence of gravity or because of chronically increased background muscle tone, e.g. due to habitual postures, can often be effectively helped by taping if the tissue can be passively supported in a shortened position. This is particularly useful when addressing symptoms associated with adverse neural dynamics (Fig. 11.1).

It is suggested that free nerve endings and C-fiber end-organs which intertwine with the tissues are irritated by the mechanical and chemical effects of the tissue under tension. This is reduced by holding the tissue in a shortened position therefore reducing pain fiber stimulation (Fig. 11.2).

Transverse offload

A transverse offload approach can be used particularly for myofascial tissues that may be mediated either by similar means to that described above or by a more mechanical effect. This type of technique has been shown to be effective in reducing elbow pain associated with lateral epicondylalgia (Vicenzino et al 2003) Transverse offloading of muscle structures effectively lengthens the muscle being used and may be inhibitory (Figs 11.3, 11.10) or may alter the free nerve endings' position in connective tissue (Fig. 11.2).

A number of suggested techniques mix the two approaches effectively (Fig. 11.4).

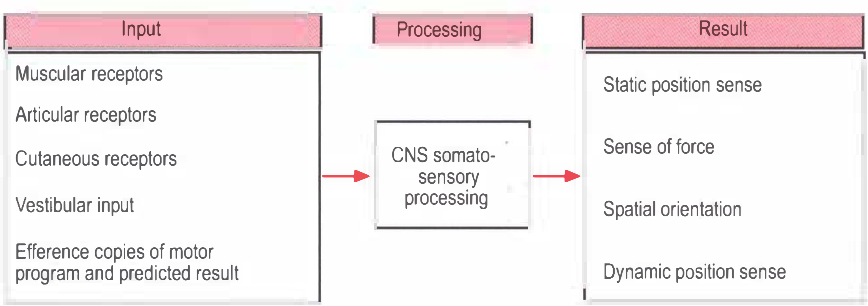

Figure 11.1 Proprioceptive summary. Input from a number of peripheral sources is integrated with expected movement patterns and the commands sent to the periphery with the result being a CNS representation of movement parameters.

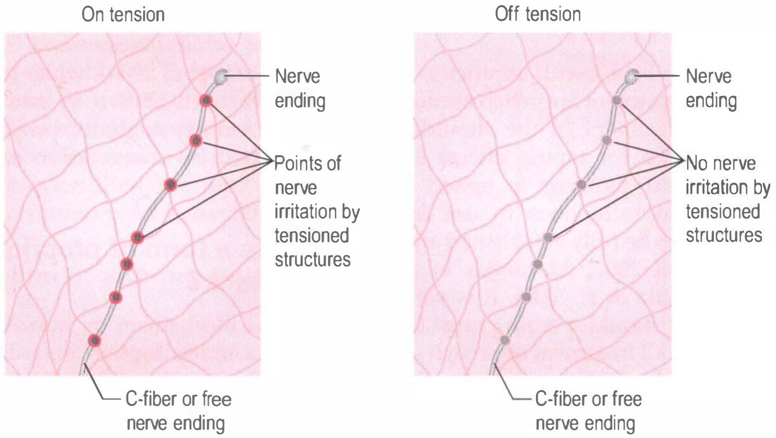

Figure 11.2 Free nerve endings piercing the multidirectional fascial planes may be irritated when there is sustained significant tension placed on the tissues. Taping that holds these tissues in a shortened position helps to reduce symptoms associated with movement.

Indirect methods: with reference to the shoulder girdle

Normal upper limb function is dependent on the ability to statically and dynamically position the shoulder girdle in an optimal coordinated fashion (Glousman et al 1988, Kibler 1998).

Movement faults, for example of the scapulothoracic 'joint', have been shown to be strongly associated with common pathologies (Hebert et al 2002, Ludewig & Cook 2000, Lukasiewicz et al 1999, Michener et al 2003).

Physiotherapy that aims to improve joint stability, optimal interjoint coordination and muscle function has been shown to be clinically effective in the management of a variety of shoulder presentations (Ginn et al 1977). Proprioception is a critical component of coordinated shoulder girdle movement, with significant deficits having been identified in pathological and fatigued shoulders (e.g. Carpenter et al 1998, Forwell & Carnahan 1996, Voight et al 1996, Warner et al 1996). It is an integral goal of rehabilitation programs to attempt to minimize or reverse these

Figure 11.3 Upper trapezius inhibition. From anterior aspect of upper trapezius just above the clavicle over the muscle belly to approximately the level of rib 7 in a vertical line. Once the tape is partially attached, a firm downward pull is applied and the tail of the tape attached.

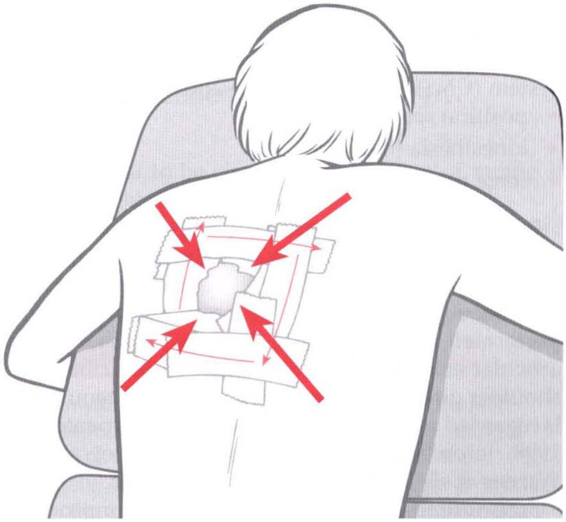

Figure 11.4 The skin over the thoracic spine is gathered centrally in the direction of the large arrows and the skin taped in the direction of the small arrows (see taping guidelines).

proprioceptive deficits (Lephart et al 1997, Magee & Reid 1996).

Taping is seen clinically to be a useful adjunct to a patient-specific integrated treatment approach aiming to restore full pain-free movement of the shoulder girdle, although the evidence for taping effects on scapular muscle recruitment patterns is mixed – suggesting that the optimal techniques to use for given presentations remain to be fully established and evaluated (Ackermann et al 2002, Alexander et al 2003, Cools et al 2002, Zanella et al 2001). It is very clear from the literature that shoulder taping must be fully integrated into the overall treatment approach so that its effects can be realized.

Initial study of the effects of taping on motor neuron pool excitability has shown physiological effects that conflict with clinical experience, but these are early days in the exploration of the pathophysiological effects of taping on musculoskeletal dysfunction, so little can be taken from this work (Alexander et al 2003).

Taping is particularly useful in addressing movement faults at the scapulothoracic, glenohumeral and acromioclavicular joints. The exact mechanisms by which shoulder taping is effective are not yet clear but the suggestion is that the effects are proprioceptive, mechanical and pain-relieving.

Possible physiological mechanisms

Proprioception is a complex process that is difficult to define (Jerosch & Prymka 1996). Essentially, information from mechanoreceptors in the skin, muscles, fascia, tendons and articular structures is integrated with visual and vestibular input at all central nervous system (CNS) levels in order to allow perception of:

- position sense (static)
- kinesthesia (dynamic)
- force detection.

Proprioception is particularly important for upper limb interjoint coordination (Sainburg et al 1993) due to the complexity of the kinetic chain, the relative lack of osseous stability and the precision of the tasks performed. The literature focuses on the role of articular and myofascial structures in contributing to shoulder girdle proprioception while cutaneous input is regarded as having a lesser role (e.g. Carpenter et al 1998, Jerosch & Prymka 1996, Lephart et al 1997, Warner et al 1996).

Proprioception has been shown to be compromised in upper limb pathologies such as sub-acromial impingement (Michner et al 2003) and glenohumeral instability (Barden et al 2004). Full return to sport is dependent on reversal of these deficits (Fremery et al 2005). These deficits can be normalized after long periods of rehabilitation and recovery following surgery (Potzl et al 2004), while immediate improvements have been shown in pathological shoulders when cutaneously mediated proprioceptive feedback is augmented by compressive bracing (Ulkar et al 2004).

Taping as a form of proprioceptive biofeedback?

A potential mechanism by means of which proprioceptive shoulder taping may be effective is via augmented cutaneous input (Figs 11.5–11.7).

Tape is applied in such a way that there is little or no tension while the body part is held or moved in the desired direction or plane. The tissues will therefore

Figure 11.5 Retraction of the shoulder. From the anterior aspect of the shoulder, 2 cm medial to the joint line, around the deltoid muscle just below acromial level to the T6 area without crossing the midline. Tape pull is into retraction.

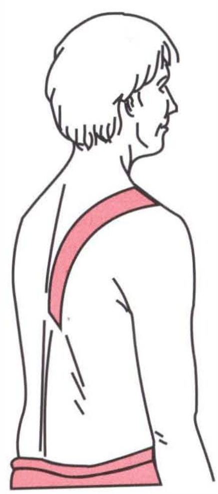

Figure 11.6 Retraction/upward rotation. From anterior shoulder just below the coracoid to low thoracic (T10) area. The initial pull on the tape is up and then back as the tape comes over the midline.

develop more tension when movement occurs outside these parameters. This tension will be sensed consciously, thus giving a stimulus to the patient to correct the movement pattern. Over time and with sufficient repetition and feedback, these patterns can become learned components of the motor engrams for given movements. This process therefore represents cutaneously mediated proprioceptive biofeedback.

Taping as a means of altering muscle function

Mechanically, if taping can be applied in such a fashion that a chronically inhibited (underactive) muscle is held in a shortened position (Fig. 11.8), there will be a shift of the length–tension curve to the left, and greater force development in the inner range through optimized actin–myosin overlap during the cross-bridge cycle (Fig 11.7).

Similarly, if taping can be applied in such a fashion that a relatively short, overactive, muscle is held in a lengthened position, there will be a shift of the length–tension curve to the right, and lesser force development through decreased actin–myosin overlap during the cross-bridge cycle at the point in joint range at which the muscle is required to work (Fig. 11.3).

The taping method used to inhibit upper trapezius activity (as in Fig. 11.3) has been investigated in a pilot study (O'Donovan 1997) and shown to have a significant inhibitory effect on the degree of upper trapezius activity in relation to lower trapezius during elevation (Morin et al 1997). Alexander et al (2003) have also shown inhibition of lower trapezius, by means of H-reflex latency and amplitude, with scapular taping albeit with a counter-intuitive procedure.

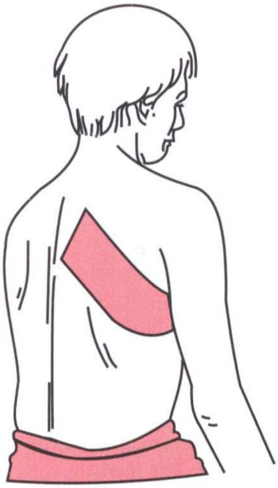

Figure 11.7 Serratus anterior facilitation and inferior angle abduction. From 2 cm medial to the scapula border, following the line of the ribs down to the mid-axillary line. Four one-third overlapping strips are applied with the origin and insertion pulled together and bunching the skin.

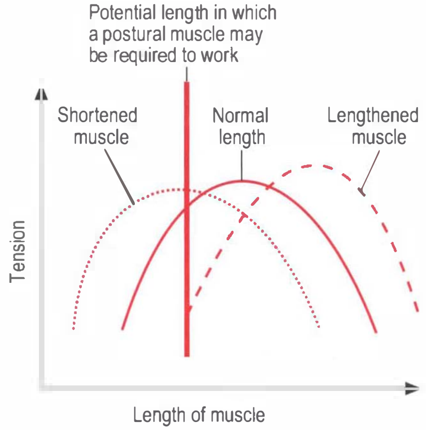

Figure 11.8 Length–tension curves. Although lengthened muscle has the capability to generate more force, postural muscles frequently need to be able to generate most force in inner range positions, in which case it is often desirable that they are relatively short.

Inhibition is demonstrated as soon as the tape is applied. Clinical effects of taping the shoulder girdle can be significant and immediate, especially in promoting altered movement patterns and allowing earlier progression of rehabilitation. Recent study has shown that the pull involved in applying the second of the two tapes is critical to the electromyographic and mechanical positional changes observed during successful taping application (Alexander et al 2003, Brown 1999). The mechanisms underlying the above study results, and the clinical effects seen during application, still merit further investigation.

Taping guidelines: shoulder as an example

It is essential to be clear about the aims of taping in order to ensure optimal results:

- In the case of the shoulder this would be assessed for its habitual resting position and for movement faults contributing to the symptom presentation.

Box 11.1 Downward rotation and tipping

Downward rotation occurs about an axis located one-third of the length of the spine of the scapula lateral to the proximal end of the spine of the scapula. Tipping is when the inferior angle protrudes from the chest wall and the coracoid is pulled down and medially as compared to winging where the entire medial border of the scapula lifts off the chest wall.

Box 11.2 Case history: direct longitudinal offload

A 34-year-old woman presented with acute discogenic low back and long leg sciatic pain, due to an exacerbation of existing low back pain caused by sleeping awkwardly on a long-haul airplane journey.

The presentation was both severe and irritable, to the extent that she had to be examined in side-lying, in order to avoid exacerbation.

A key comparable sign was a 20° straight leg raise (SLR) reproducing all her leg and back pain symptoms.

Application of longitudinal offload taping along the course of the sciatic nerve, and its common peroneal branches, reduced her symptoms on SLR and increased the pain-free range to 45° in conjunction with manual therapy techniques.

This allowed her to walk far more normally with markedly reduced pain.

The V-shaped tapes were placed at the base of the fibula, at the head of the fibula, two-thirds of the way down the posterior aspect of the thigh and at the top of the posterior aspect of the thigh. These were applied in the order stated. Interestingly, an initial attempt to apply the tape in a reverse order was not successful (Fig. 11.9).

This taping was used throughout the first 2 weeks of her management, by which time she was significantly better and able to discontinue that aspect of her treatment.

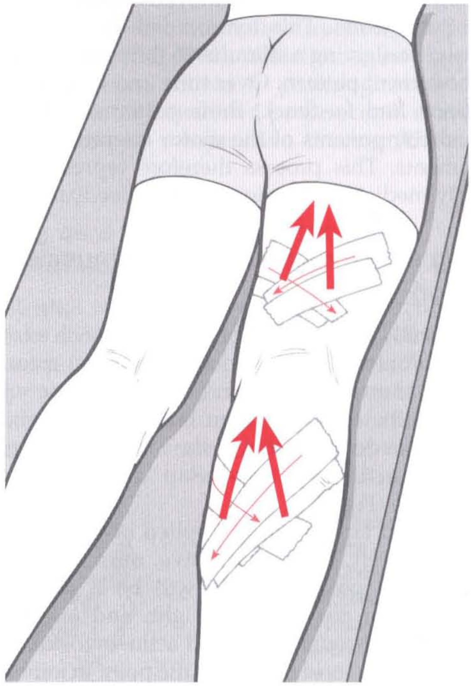

Figure 11.9 The tissues over the sciatic nerve are offloaded superiorly in the direction of the large arrows and the skin taped in the direction of the small arrows (see taping guidelines).

Box 11.3 Case history: direct transverse offload

A recreational racquet sports player presented with lateral elbow pain with clear local soft-tissue components as well as a positive radial nerve tension test and low cervical facet joint stiffness.

Static resisted contraction (SRC) of the common extensor origin muscles and extensor carpi radialis brevis in particular was comparable (Fig. 11.10).

As part of the management a transverse offload tape was applied to the common extensor origin with immediate reduction of symptoms from SRC and improved grip strength, through reduction of pain inhibition.

This remained part of her management until return to sport when it was replaced with an 'aircast' lateral epicondyle brace, which can be used to similar effect.

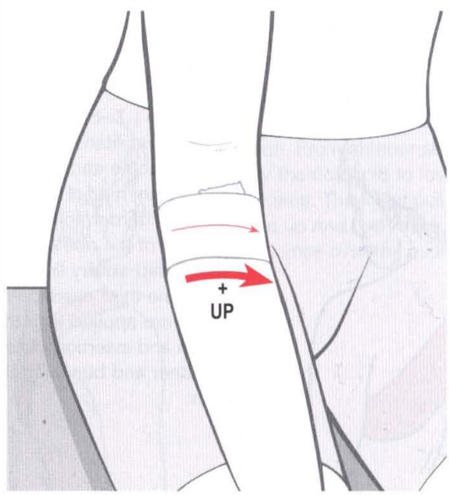

Figure 11.10 The skin and muscle tissue overlying the common extensor origin is lifted and pulled medially in the direction of the large arrows and the skin taped in the direction of the small arrows (see taping guidelines).

Box 11.4 Case history: shoulder pain

This case represents a particular example of inhibition of overactive movement synergists and antagonists and facilitation of underactive movement synergists.

A 33-year-old cricketer presented complaining of persistent and progressive shoulder pain of nonspecific onset but particularly related to bowling and throwing. He had experienced episodes of pain towards the end of the previous season, which had not interfered with participation nor persisted after the end of the season. He had experienced problems from the start of the current season which had progressed to the extent that he was no longer able to bowl or throw overarm, had pain persisting between games, while overhead activities of daily living were compromised.

Assessment showed clear impingement features including:

- localized pain to the front of the shoulder
- a painful arc on mid-range elevation that was associated with marked protraction and tipping (Norkin & Levangie 1992) of the scapula and accentuated on slow eccentric elevation
- generalized loss of thoracic extension and rotation focused at T5–T7
- a positive empty-can test (Magee & Reid 1996) (a static resisted contraction of abduction with the arm medially rotated and held at 90° of abduction in the scapular plane)
- general restriction of glenohumeral accessory joint glides
- restricted medial rotation with scapulothoracic relative flexibility on the kinetic medial rotation test (Comerford 1992, Morrissey 1998)
- painful, weak static resisted abduction and lateral rotation
- tight overactive pectoralis minor as demonstrated by the shoulder girdle not being able to lower to the supporting surface when the patient was supine and gentle pressure was applied anteroposteriorly through the coracoid process.

An initial treatment plan was formulated including: thoracic manipulation (HVLA thrust) to increase the available thoracic extension during elevation; pectoralis lengthening using trigger point treatment and specific soft-tissue mobilization to decrease the active scapula tipping; local soft-tissue deinflammation with ice; and scapula setting – initially in neutral but then incorporated into dynamic movement. It was decided to emphasize upward rotation and retraction as he demonstrated an excessively protracted, tipped scapula during elevation.

The scapula setting (Box 11.5) proved difficult for the patient to master so the shoulder was taped (Figs 11.5 and 11.6). This resulted in an immediate improvement in the patient's ability to set the scapula and an improved scapulohumeral rhythm associated with a marked decrease in the painful arc symptoms. The taping was reapplied for 3 weeks while his treatment and rehabilitation were progressed to the extent that he had achieved satisfactory control of scapula movement during functional activities and had begun to resume some of his sporting activities.

- The skin would then be prepared by removal of surface oils and body hair.
- The shoulder would be actively positioned in the desired position by the patient with the guidance of the therapist, or passively if the patient is unable to maintain the desired position.
- A hypoallergenic mesh tape would be applied without tension (e.g. Mefix, Molnlycke, Sweden).
- A robust zinc oxide tape (Strappal, Smith and Nephew, UK) would then be applied.
- Further tapes may then be applied as necessary.
- The taping is continued until the patient has learnt to actively control movement in the desired fashion, or the effects on symptoms are maintained when it is not worn.

Skin reactions

If the client develops a skin reaction this can either be due to an allergic reaction, a 'heat rash', or because the tape is concentrating too much tension in one area. Tension concentrations usually occur around the front of the shoulder.

Box 11.5 Scapula setting

Scapula setting has been defined as 'Dynamic orientation of the scapula in a position so as to optimize the position of the glenoid and so allow mobility and stability of the gleno-humeral joint' (Mottram 1997).

Box 11.6 Case history: shoulder injury

This case represents a particular example of promotion of optimal interjoint coordination as well as direct optimization of joint alignment during static postures or movement.

A 23-year-old rugby player presented 2 weeks after a shoulder pointer (fall onto the point of the shoulder causing an inferior blow to the acromion) and resultant acromioclavicular joint sprain.

Assessment showed a visible joint step with upper trapezius spasm accentuating this via its attachment to the lateral third of the clavicle (Johnson et al 1994). Range of movement was markedly reduced and the patient complained of constant pain aggravated by any movement. He was still using a sling. The scapula was noted to be in a downward rotated, depressed position thus accentuating the step and resultant acromioclavicular joint pain.

The initial treatment therefore aimed to decrease the resting joint pain using large amplitude joint mobilizations and interferential therapy, which was partially successful.

In order to further reduce the resting pain and affect the pain on movement it was necessary to improve the symmetry of the joint by decreasing upper trapezius activity and facilitating upward rotation and elevation of the scapula. This was done using tape (Figs 11.11 and 11.12) and reinforced with soft-tissue techniques (trigger point massage and specific soft-tissue mobilization) to the upper trapezius (see Figs 11.3, 11.5, 11.11 and 11.12).

An immediate improvement in symmetry was noted and a marked increase in pain-free range of motion. He was able to discard the sling. Taping remained an integral part of the treatment until he was able to actively set the scapula independently.

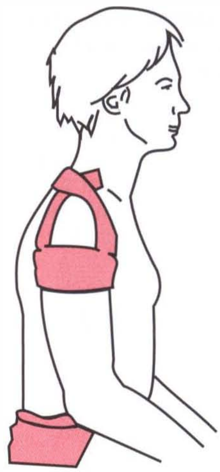

Figure 11.11 Elevation of the shoulder girdle. (1) Anchor strip applied at level of deltoid tuberosity, encircling two-thirds of the circumference of the arm; (2) elevatory strips applied from posterior arm/deltoid to the anterolateral aspect of the base of the neck; (3) elevatory strips applied from anterior arm/deltoid to the posterolateral aspect of the base of the neck; (4) locking strip over tape 1.

Figure 11.12 Acromioclavicular joint relocation; from coracoid process over the distal end of the clavicle with a downward pull applied just before the tail of the tape is attached to level of rib 6 in vertical line. Only ever applied after successful application of elevatory taping (Fig. 11.11).

Heat rashes tend to be localized to the area under the tape and settle quickly. Allergic reactions are more irritating and widespread, and must be treated with great caution as reapplication is likely to lead to a more severe reaction due to immune sensitization.

Scapulohumeral function

The scapulothoracic joint gains some stability in relation to medially directed forces from the clavicular strut via the acromioclavicular joint. This still allows a large range and amplitude of translatory and rotary movement that is primarily produced, controlled and limited by the axioscapular myofascial structures (Kibler 1998).

Compromised thoracoscapulohumeral rhythm results in the potential for impingement due to downward rotation of the glenoid associated with tipping or winging (Box 11.1) (Ludewig et al 2000, Lukasiewicz et al 1999). An anterior tilt of the glenoid, resulting from adverse scapula positioning, is regarded as being a significant occult instability risk (Kibler 1998).

The scapulohumeral joint relies heavily on the passive stability provided by the capsulo-ligamentous structures and the dynamic stability provided by the rotator cuff (Glousman et al 1988, Harryman et al

1990, 1992, Payne et al 1997, Terry et al 1991). This stability is crucially dependent on intact proprioception (Nyland 1998). Disruption by trauma or repetitive disadvantageous movement patterns is associated with impingement or instability (Barden et al 2005, Machner et al 2003).

An example of how taping can be used in the management of a patient with excessive tipping of the scapula is presented in the case history in Box 11.4. An example of how taping can be used to elevate a depressed scapula and stabilize a traumatically unstable acromioclavicular joint is presented in the case history in Box 11.6.

The case histories have been deliberately chosen to show a range of taping techniques that can be used either in conjunction with other modalities and methods, or in isolation.

Conclusion

Management of complex neuromusculoskeletal dysfunction and pathology and pain syndromes requires a multifactorial approach based on individual assessment. Strategies used to reduce pain, increase mobility, improve movement coordination and improve strength may be augmented by the use of taping to offload tissues or to improve movement patterns by proprioceptive and mechanical means.

Taping is a particularly useful treatment adjunct as it has the particular advantage of lasting well beyond the patient–therapist contact, thus extending the duration of therapeutic stimulus. Repetition and long duration experience of altered movement is essential in altering established motor engrams and overcoming the effects of established inhibition or pain presentations.

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Application of positional techniques in the treatment of animals

12

Julia Brooks and Anthony G. Pusey

CHAPTER CONTENTS

One of the myths of musculoskeletal medicine is that humans are uniquely susceptible to back pain because they have risen onto their hind legs by adapting a structure designed for four legs. A chat with any vet will dispel this impression, as they frequently encounter animals presenting with physical problems involving the spine and associated structures (Jeffcott 1979) (Fig. 12.1).

On further consideration, this is unsurprising. The forces of gravity and the potential effects of injury are common stressors for humans and animals alike. Animals have the added complication of interacting with people, and may be subjected to diet changes, unnatural exercise regimes and breeding programs.

The clinical challenge for those working with animals is to make a diagnosis without the benefit of direct verbal communication. Veterinary surgeons use their clinical expertise and special investigations such as imaging techniques and blood tests to identify pathology. However, difficulties arise for vets confronted with cases where there is obviously discomfort and dysfunction and yet no pathology can be identified. These cases are the product of an altered physiological state rather than pathological change (Williams 1997). Osteopathy adds another dimension to addressing these problems by using observation and palpatory skills to identify areas of disordered function and using a range of physical treatments to influence the disturbance in the integration of peripheral and central nervous systems.

History of animal treatment

The early years of animal osteopathy were distinguished by isolated pockets of activity with individuals experimenting with techniques. In the 1970s, Arthur Smith in Leicestershire pioneered an approach for treating horses under general anesthetic, encouraged by a vet whose back he had successfully treated. Elsewhere, racehorse trainers looking for optimum performance recruited osteopaths

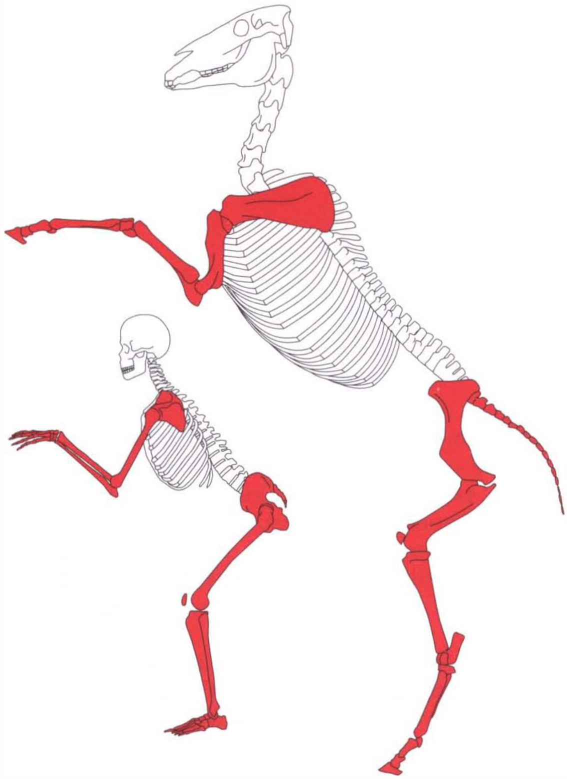

Figure 12.1 Animals and humans are similar in structure.

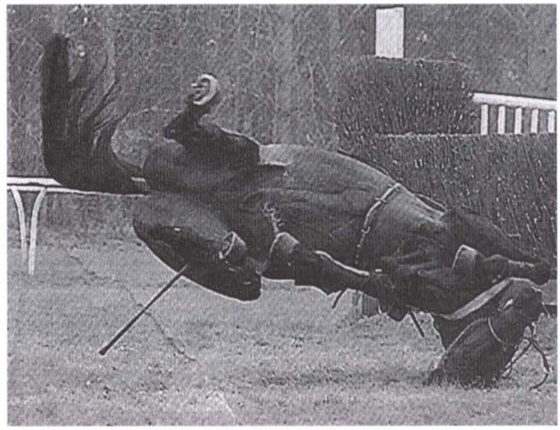

Figure 12.2 A horse may suffer compression rotation injuries that affect the whole spine (with permission from Ed Byrne).

such as Gregg Currie in Epsom and those working in rural areas were approached by local farmers. Latterly, postgraduate courses have provided a forum for disseminating information in this field. At the present time, osteopaths work alongside many forward-thinking veterinary surgeons wishing to offer another approach to musculoskeletal problems, and their services extend to organizations such as the Household Cavalry and even zoos.

Mechanisms of injury

Causes of injury are many and varied. A horse may fall at 30mph driving its half a ton of body weight into the ground (Fig. 12.2), or an elderly dog relives its boisterous youth by playing with a new puppy. A cat may try to cross the road at an inopportune moment, or a hunting owl is swiped by a car aerial as it makes a low night flight. All share an inability to communicate. However, there are other ways of identifying where musculoskeletal problems exist, based on the physiological effects of injury.

Neurophysiological effects of injury

These effects are widespread but may be divided for convenience into peripheral responses at the site of the injury (Bevan 1999), and central responses occurring within the central nervous system (Doubell et al 1999).

Peripheral responses

An injury will result in local tissue changes to give the classic signs of inflammation, pain, heat, erythema and swelling. This site is usually fairly easy to identify clinically by eliciting a pain response by pressure over the area and feeling for increases in temperature and areas of swelling. At this juncture, the animal may be treated successfully with anti-inflammatory drugs. However, the injury will also stimulate the small nerve fibers of the nociceptive system, which send warning signals to the dorsal horn of the spinal cord. Here the fibers arborize within the network of the spinal cord to form a multitude of interconnections.

It is in this central network that changes can occur which may not respond to first-line drug treatment but which are accessible to physical treatments such as osteopathy (Colles & Pusey 2003).

Central responses

On reaching the spinal cord, if the stimulus is of sufficient intensity it will be relayed to the brain to register pain. It will also interconnect with motor neurons of the ventral horn to increase muscle tone (He et al 1988) and, via the lateral horn, increase sympathetic nervous system activity to drive blood from the surface to the muscles (Sato & Schmidt 1973) (Figs 12.3 and 12.4).

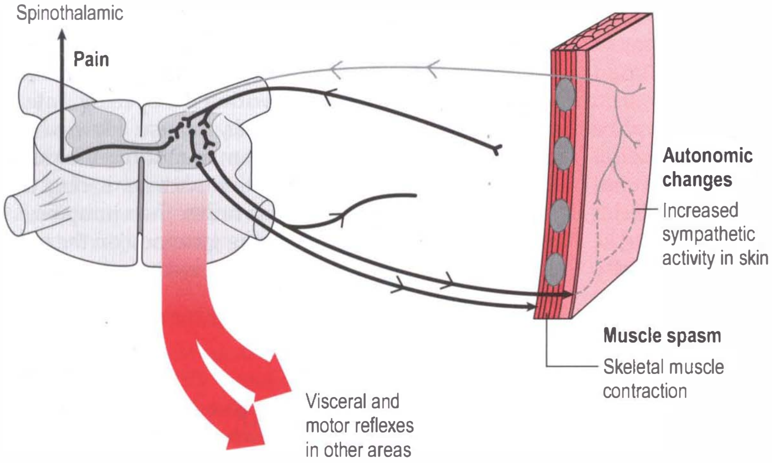

Figure 12.3 Neurophysiological responses to injury.

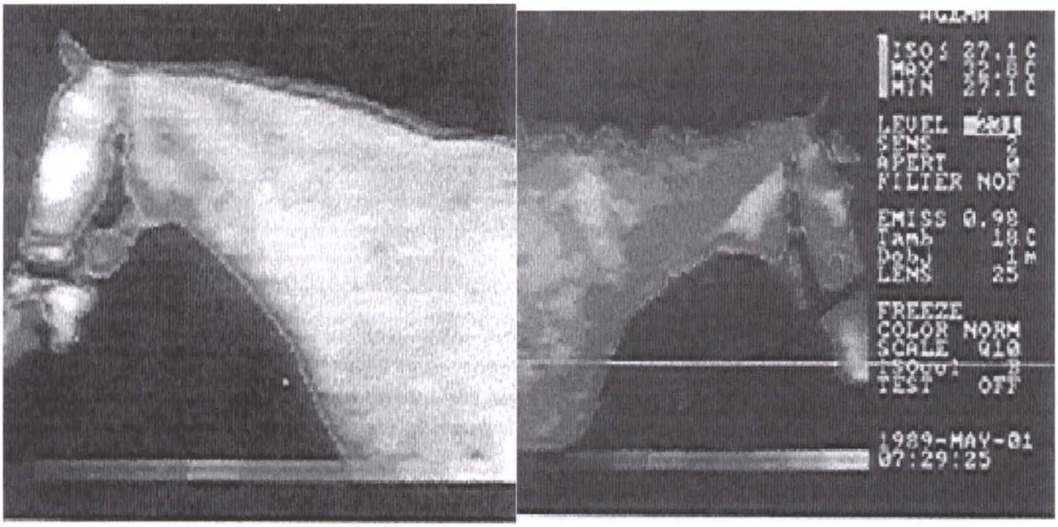

Figure 12.4 Infrared thermography showing reduced blood flow at surface in long-term response to injury 'Normal' neck (left) and upper cervical dysfunction (right). Note: temperature color scale runs from left (lower temperature) to right. Intervals approximately 0.6° (Colles et al 1994).

In the short term this has a protective function by preventing further damage to the injured area. However, the long-term effect may be to leave a neurological footprint of abnormal patterning where the pain circuits maintain their activity after the initial injury has resolved (Patterson & Wurster 1997).

Retaining this abnormal patterning has a number of undesirable effects. One effect is that the threshold at which the pain circuit fires is lowered and a relatively mild stimulus will fire an inappropriately large pain response. It will also alter the way an animal moves as a result of increased tone and asymmetry of tone in the muscles. This is particularly significant in animals as there are strong interconnections between spinal segments to support integrated movement between all four limbs. In fact, unlike the human system, these connections are so strong that in experiments on cats, it was found that crude gait patterns could be generated even when the connection between the spinal cord and brain had been severed (Pearson & Gordon 2000). This integration becomes compromised in the presence of altered patterns of muscular activity.

These changes may be quite subtle, but they leave the animal vulnerable to a recurrence of symptoms or cause other problems by virtue of the altered mechanics of movement.

This combination of neurophysiological responses to injury may be followed through in the natural history of a presenting problem and can be summarized in what may be described as the 'traffic light' effect (Fig. 12.5).

These cases are more difficult to identify clinically as it requires careful observation and palpation of the whole biomechanical structure to detect altered function as opposed to the more obvious changes of acute inflammation.

Diagnostic process

This is a multistage process structured very much along the lines of the human approach but with particular emphasis on the dynamic function of the animal observed in active movements.

Case history

The case history is the first part of this process. It will often require an open mind and critical thinking as this is obtained second hand through the medium of the owner. This will include demographics such as age, breed and work of the animal, which are important in building up a picture of the injuries that the animal may have sustained and the problems to which a particular breed may be susceptible.

With this background knowledge in mind, details of the presenting problem are elicited. This may give a picture of a sudden onset, acute problem as a result of a specific trauma such as a dog leaping awkwardly from a stile. More often, there is a history of increasing impairment of movement without a specific date of onset and no reported injury as a cause. However, in these cases, the owner will often mention minor alterations in activity and behavior such as a dog that prefers to be lifted from a car rather than jumping, or a horse that is sensitive to being groomed on the neck.

Armed with this information, examination is the next phase.

Examination

Examination of the animal at rest and in movement is used to identify alterations in whole movement patterns and specific levels of dysfunction.

Static examination

This looks at the animal's weight-bearing and muscle development, which gives a visual record as to how the body is being used. For example, wasted muscle in the hip region of a Labrador may suggest stiffness in this area with the result that the dog tends to favor other limbs in weight-bearing. A horse with apparently well-developed shoulders and neck but rather weedy hind quarters may be compensating for poor hind limb and lumber spine function by overuse of the front half.

Active examination

In order to establish how the animal is using its body, it is observed in active movement from a number of viewpoints and at different speeds. For most domestic animals a routine can be developed for observing from behind, in front and from the side at walk and trot.

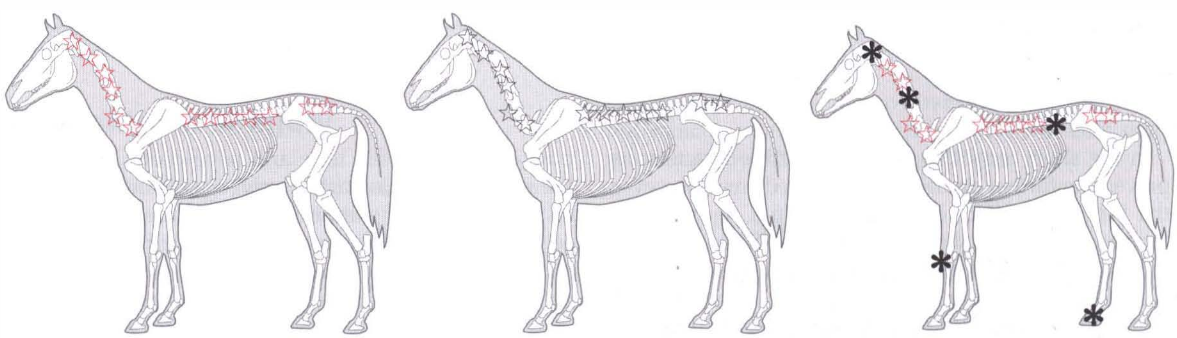

Figure 12.5 (A) In the normal horse appropriate screening of sensory input takes place at the level of the spinal cord. (B) Old injuries have left neurological footprints – regions of spinal cord which, despite being asymptomatic, have retained elements of abnormal patterning, with lowered threshold to external stimuli and altered muscular activity. (C) Minor stresses on the system, such as a slight injury or increasing the amount or level of work, may result in acute symptoms at levels of abnormal patterning.

The osteopath is looking for fluidity and symmetry of movement, whereby activity is transmitted from one part of the body to another in a smooth, easy way. Where dysfunction occurs there can be very obvious breaks in the transmission of movement, identified by observations such as a puckering of the skin in the cervical spine or short stubby action of the limbs.

Balance, coordination and flexibility can be assessed by observing more complex movements such as turning short in a tight circle.

Palpatory examination

Passive motion testing and palpation of the soft tissue are used to identify specific regions of dysfunction. Skin drag, where the fingers are pulled slowly along the paravertebral muscles, will pick up alterations in tissue texture, and regions of muscle spasm (Fig. 12.6). Joints at each level can be tested for the expected range of movement and asymmetries and reduced ranges may be identified.

Treatment

Once a full diagnostic routine has been completed and a biomechanical diagnosis proposed, treatment can begin.

General considerations

Treatment can take many forms. Some are adapted from human techniques, and others have been developed for a particular species of animal (Brooks et al 2001). As in the approach to children, for treatment to be effective a degree of cooperation is necessary,

By spending a little time with the owner and animal, a relationship built on trust can be achieved. Domestic pets, particularly dogs, are very accepting of treatment and, having assured themselves that you intend to do them no harm, will abandon themselves, often achieving a trance-like state. By contrast, herbivores such as horses are instinctively more suspicious and vigilant. Indeed, this characteristic in the wild may be the very key to their survival. In these cases, treatment may be facilitated by giving a light sedative, particularly where refined changes in joint complex movement are required and a position held for some time. An effective agent, which allows the horse to remain standing while giving a good level of sedation, is a mixture of opioid and an alpha-2-adrenoceptor agonist. The latter reduces the sympathetic drive so decreasing overlying muscle tone and making the deeper structures of the joint complex accessible to examination and treatment. The opioid works through the central pain-inhibiting pathways which in combination with inhibitory input from the peripheral large fiber system (Melzak & Wall 1965) resulting from osteopathic treatment gives a dual beneficial effect.

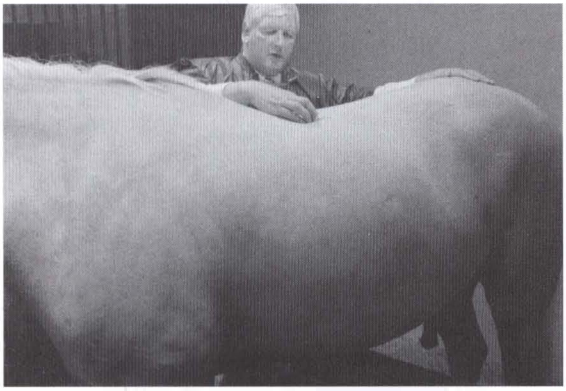

Figure 12.6 Skin drag test identifies areas of altered tissue texture and muscle tone.

Another consideration when choosing techniques is the complexity of the problem. Unless the problem is very short term and localized, treatment will have to address dysfunction of the animal as a whole rather than being directed merely to the area that appears to be symptomatic. Positional techniques are particularly useful in complex strain patterns where there is involvement at many levels.

Positional release techniques in animals employ the idea of 'ease' and 'bind'. A normal joint has a point, usually at the middle of its range of movement, where there is minimum tension on the capsular ligaments and the overlying muscles, i.e. the point of 'ease'. Movement away from this point will increase tension or 'bind'. This information is processed in the central nervous system to map joint position and to generate an appropriate pattern of motor activity. Where abnormal neural patterning follows an injury, the normal relationship between joint structures is disturbed, and this point of ease will be offset. Sensory information from that joint is subsequently changed at rest and for any given movement. Difficulties arise with imposing new reference points on well-established networks and the joint complex is less able to react appropriately or coordinate movement with other joints.

This new abnormal resting position may be isolated by testing each range of movement – flexion/extension, side-bending, rotation, translocation from side to side, traction/compression. These vectors are combined together at the point of ease. With the joint held in the position of minimum tension, there is minimum sensory input into the spinal cord. This appears to reduce conflicting information entering the network and allows the normal pattern to reassert itself. A change in neural activity is signaled by a relaxation of the muscles surrounding the joint complex accompanied often by a deep sigh and altered breathing pattern.

This technique of finding the point of ease can be used on whole body parts, such as a limb, or on specific joint complexes at strategic points of the skeleton.

Regional approaches

Certain regions are more susceptible to injury and have a greater impact on the function of the animal.

Cervical spine

The head and neck are especially vulnerable, particularly in horses. Huge forces are generated during a fall and occipito-atlantal-axial dysfunction is common.

One way of starting the technique is to lift the horse's head onto ones shoulder and move along the line of the jaw to find a point of balance. The jaw can then be used as a lever to take the cervical joints through their ranges of movement. Often, upper cervical joint complexes are dealt with together by introducing elements of flexion and extension, the main movement of the occipito-atlantal articulation, alongside rotation at the atlanto-axial level. In this way, the point of ease can be isolated. This can be refined further by placing the hands up on the subocciput in order to introduce secondary vectors of compression, traction and translocation (Fig. 12.7).

Temporomandibular joint

Intimately associated with the top of the neck not only mechanically but neurologically by virtue of trigeminal innervation, is the jaw. Dogs are particularly susceptible to strains in this region resulting perhaps from their predilection for carrying over-large sticks. Using fingers on the medial surface of the mandible, trigger point inhibition can be used while introducing traction or compression through the ramus into the jaw itself (Fig. 12.8).

The limbs

The limbs are also susceptible to alterations in normal relationships. Dogs move with rapid changes in directions, and strain patterns which reflect these forces may be followed up the leg, starting with the phalanges, and working up through the limb into the thorax.

Another important area is where the scapula and forelimb connect with the thorax. This is particularly important in horses as, unlike humans, there is no actual bony connection between forelimb and rib cage. The human clavicle is represented rather by a fibrotendinous band in the brachiocephalicus muscle. Instead the muscles of the thorax, notably the pectorals, form a muscular sling in which the thoracic cage can rotate, so allowing much of the lateral movement occurring in the horse. Fascial binding in this region clamps the scapula to the thorax and restricts limb movement and lateral flexibility. A combination of stretch and fascial unwinding through the foreleg is a backbreaking but rewarding way of improving movement (Fig. 12.9).

A similar procedure can be used for the hind limb. Problems here are often associated with lumbosacral and sacroiliac involvement.

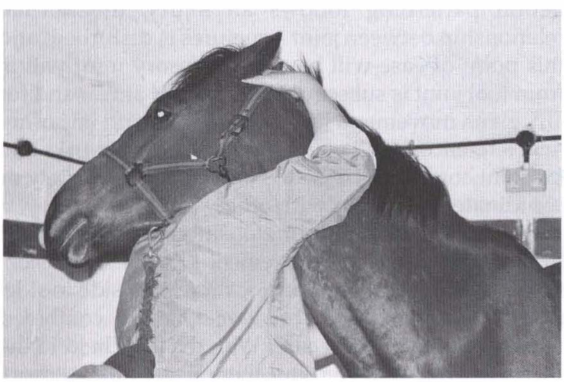

Figure 12.7 Using the mandible as a lever, the point of minimum tension in the upper cervical complex can be isolated.

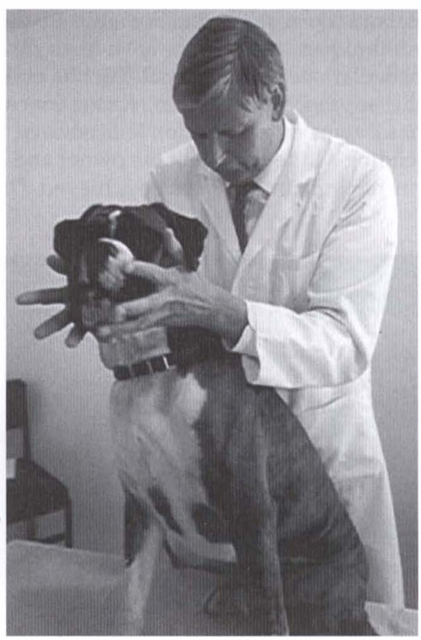

Figure 12.8 The temporomandibular joint is an important site of dysfunction.

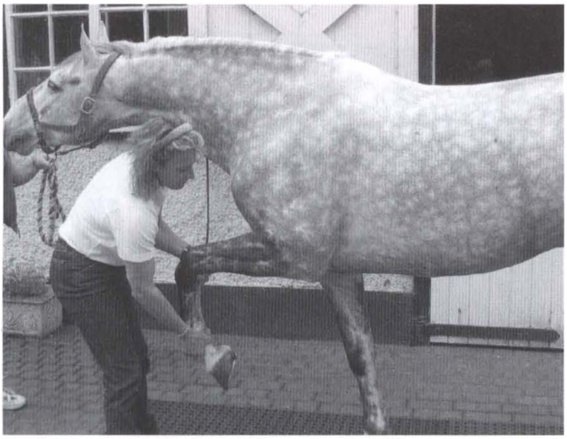

Figure 12.9 Fascial unwinding through the forelimb into the thorax. (Photo courtesy of Annabel Jenks DO.)

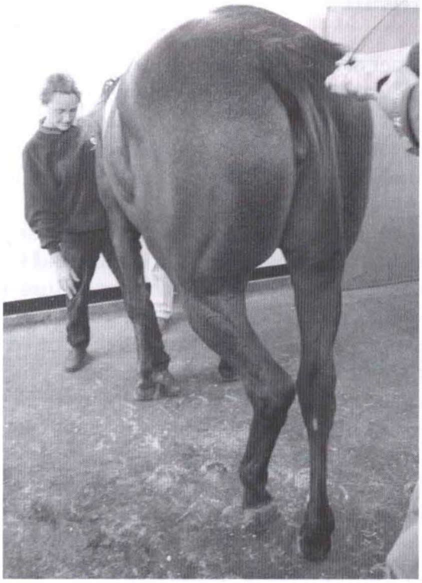

Figure 12.10 The horse shifts its pelvic balance in response to functional traction through the tail. (Photo courtesy of Jonathan Cohen BSc(Hons) Osteopathy.)

Lumbosacral and pelvic region

Another way of accessing the lumbosacral and pelvic complex that is not available in human osteopathy is via the tail. This is formed by approximately 18 caudal vertebrae which, after the first three, start to lose shape and articulations to form simple rods joined with cartilaginous discs. The muscles of the tail, particularly the sacrocaudalis dorsalis, link with the multifidus muscles of the lumbar spine and sacrum, which have an important role in the segmental stabilization of the spine (Geisler et al 1996). As these muscles have been implicated in recurrent back pain, the tail is a good 'handle' on these structures.

By gently taking up the tension in the root of the tail and taking it through all its possible ranges of movement, an idea of the fascial tension from the tail into the pelvis can be identified. In fact, this can be seen quite clearly, particularly in horses where the tail may be held to one side of the midline. When a point of ease has been established, traction can be increased, and this is often accompanied by quite dramatic maneuvering of the pelvic girdle by the animal itself as it shifts its weight from one hind limb to the other (Fig. 12.10).

The pelvic girdle may also be accessed via the pelvic diaphragm. By using a shoulder medial to the ischial tuberosity in the horse or fingers in the dog, trigger points can be identified. The animal will often lean into the pressure being applied, and this can be used to introduce ranges of movement in the sacroiliac articulation, using the ischial tuberosity as a lever (Fig. 12.11).

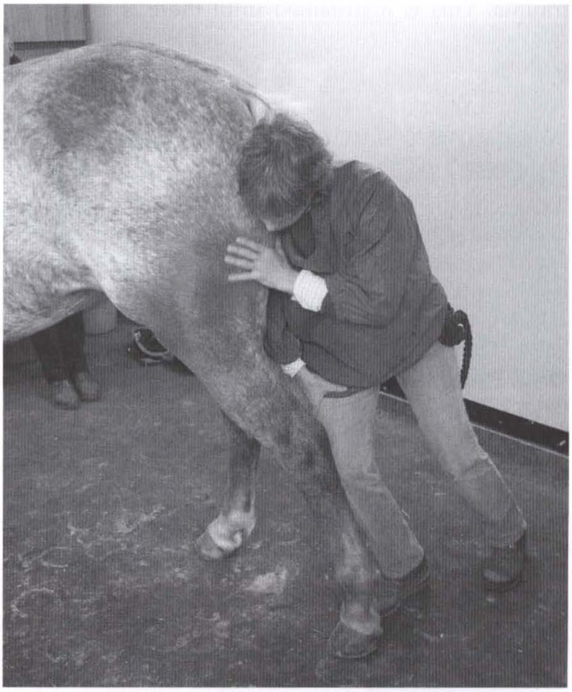

Figure 12.11 With the shoulder medial to the horse's ischial tuberosity, the fascia, muscles and joints of the sacrum and pelvis can be influenced. (Photo courtesy of Jonathan Cohen.)

Treatment under general anesthetic

In a number of cases, the complexity and long-standing nature of the problem may require treatment to be carried out under a general anesthetic. This is particularly relevant in horses where the speed and weight of the animal mean that huge forces are often involved in injury.

The horse is anesthetized, intubated and supported on its back. In this position, examination and treatment resembles even more closely the procedure used in human practice. It is interesting to note that under these conditions it is often possible to detect marked restrictions in joint function that were not apparent on examination of the conscious horse. This indicates the effectiveness of some of the compensatory mechanisms that develop over time.

Another point of interest is that some of these cases are unable to lie squarely on their back. The fascial and muscular patterns developed as a result of injury and subsequent compensation produce a functional scoliosis that is maintained even under full anesthetic.

These cases are ideal candidates for the 'whole body unwind' technique. With someone on each leg, the limbs are put through ranges of movement to reach a point of minimum tension (Fig. 12.12). This position often reflects the directional forces involved in the original trauma. This is maintained until there is a sense of relaxation often accompanied by a change in breathing pattern.

Figure 12.12 Fascial patterns may be 'unwound' by using all four limbs. (Photo courtesy of Jonathan Cohen.)

Is equine osteopathy (positional release) effective?

Osteopathic treatment appears to be successful according to anecdotal evidence. In order to obtain more information, a clinical audit was carried out in 1995. This established details concerning the case load referred to the clinic in terms of demographics and symptom presentation, as well as whether owners and veterinary surgeons felt that osteopathic intervention had been of long-term benefit to their animals.

A retrospective study of 127 cases showed that horses presented to the clinic principally with back pain, nonspecific and shifting lameness, and back stiffness, and were unable to perform work expected of them (Pusey et al 1995). These problems had been present for over 2 years in 30%, and over 6 months in 71% of cases (Table 12.1). A follow-up at least 12 months after the last osteopathic treatment showed that 95 (75%) had maintained improvement and were working at the expected level or above according to owners' and veterinary surgeons' reports (Fig. 12.13). Three cases were lost to follow-up.

The next step was to consider physiological markers to identify any changes that may result from osteopathic treatment.

One response to injury and pain is muscle hypertonia (He et al 1988) and this may be expressed as shortened stride length (Jeffcott 1979).

A pilot study showed that horses presenting to the clinic had a significantly reduced step length by a mean of 11.4cm ($P < 0.001$) in trot compared with controls (Woodleigh 2003). After osteopathic treatment, there was a significant increase of mean 12.5cm ($P < 0.05$) in step length in the clinical cases.

Table 12.1 Duration of symptoms where known in cases presenting to an osteopathic clinic (in some cases the duration of symptoms was unknown)

	Duration (months)						
	<6	6–11	12–17	18–23	24–29	30–35	≥36
Frequency	32	16	21	9	9	0	24
Percentage	29	14	19	8	8	0	22

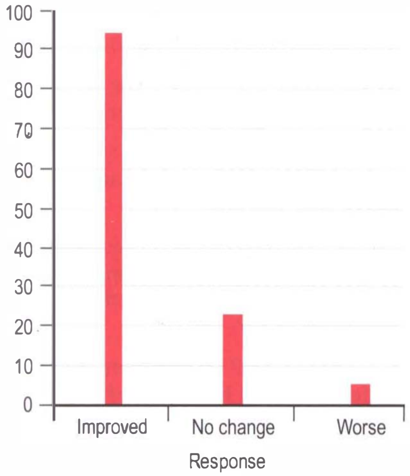

Figure 12.13 Outcome following osteopathic treatment at least 12 months after the last treatment.

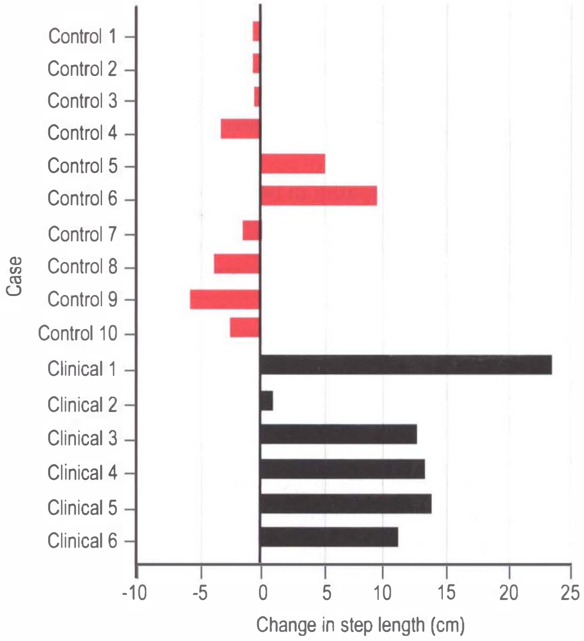

Figure 12.14 Change in step length from initial reading to follow-up for controls and clinical cases.

This study was useful in that it indicated that the intervention appeared to have changed stride length and the order of the change has provided information concerning the sample size required for further studies (Fig. 12.14).

Another physiological marker is the change in sympathetic nervous system activity in response to a painful stimulus (Sato & Schmidt 1973). This is manifested by alterations in surface temperature, which can be detected by infrared thermography. There is general agreement on normal patterns of cutaneous heat distribution (Turner et al 1986), with surface temperatures throughout the body remaining consistent to within 1°C. Although acute injuries are detected as 'hot spots' by virtue of local inflammatory changes, increased activity of the sympathetic network in response to a painful stimulus will act on the arteriovenous shunts to move blood away from the surface to the muscles and are shown as cooler regions (Fig. 12.4). Where this pattern of activity is retained in the network after the initial injury has resolved, areas of cooling almost along dermatomal distribution may be detected (Fig. 12.15) (Colles et al 1994).

A further study of 46 horses looked at thermal patterns in the gluteal regions. These were found to be significantly cooler ($P < 0.02$) than expected in cases presenting to the osteopathic clinic. These regions showed a significant increase in temperature following treatment (Brooks 2003).

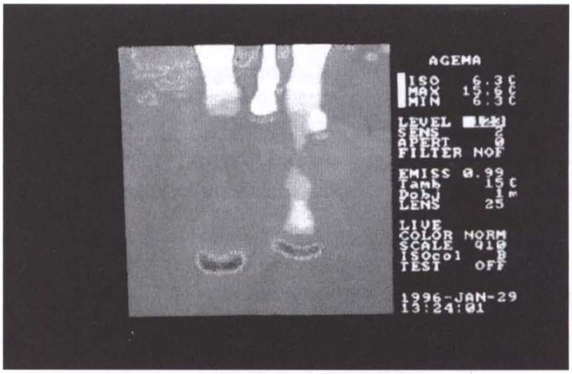

Figure 12.15 Cooling of distal forelimb: Abnormal patterns of sympathetic nervous system activity may cause cooling along almost dermatomal distribution.

Conclusion

Treatment of animals is a rewarding field for those wishing to extend the boundaries of practice. There are the challenges of working where verbal communication is not possible, and where techniques must be adapted to highly variable body sizes and shapes between species. There is considerable overlap in human and animal practice and both aspects have something to offer in the areas of clinical reasoning, palpatory skills and technique development – a case of the whole being greater than the sum of the parts.

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