10

The Mulligan concept: NAGs, SNAGs, MWMs

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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-

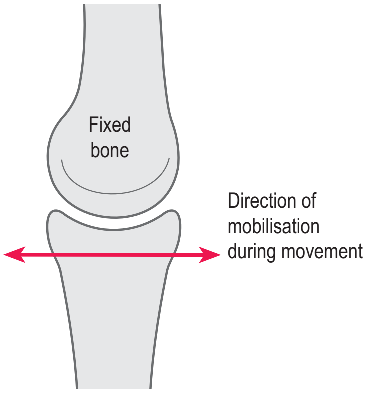

Figure 10.1 Hinge joint.

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

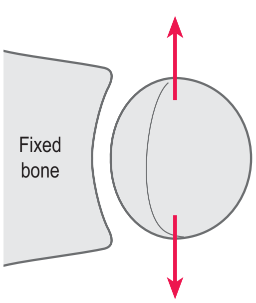

Figure 10.2 Parallel joints.

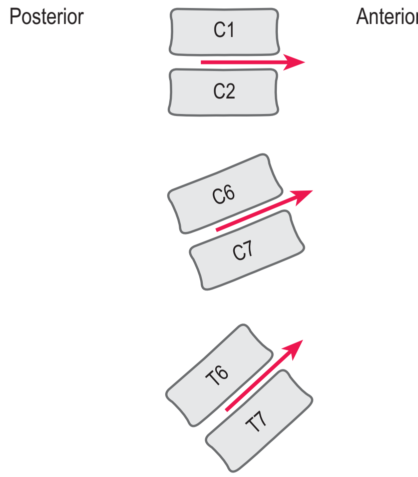

Figure 10.3 Spinal facet planes.

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.

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).

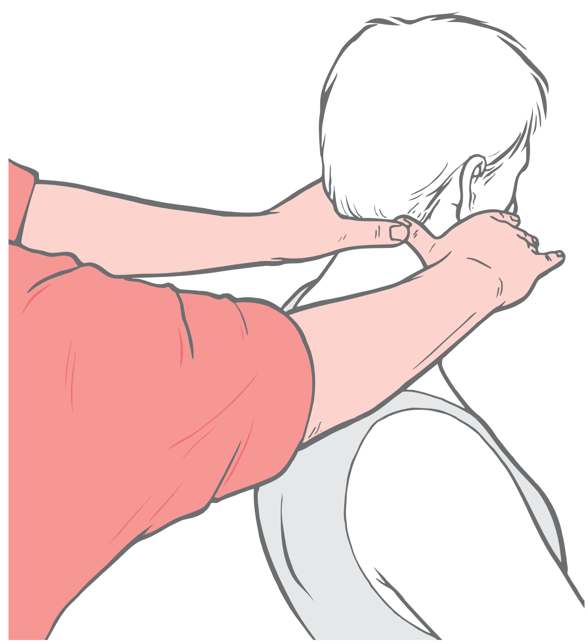

Figure 10.5 Unilateral right C1 SNAG.

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).

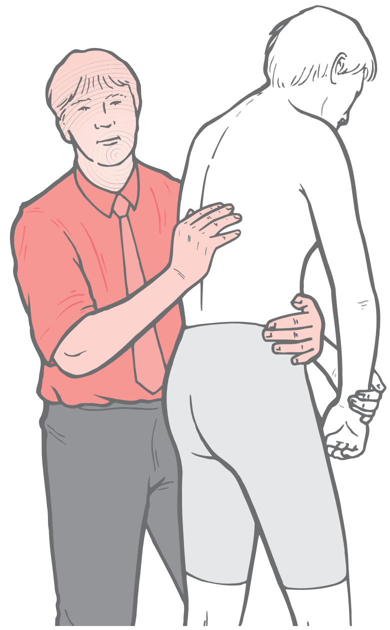

Figure 10.6 Lumbar SNAG using arm for stabilization.

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

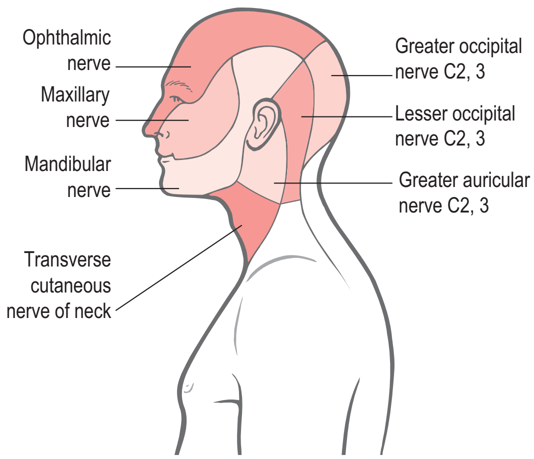

Figure 10.7 Cutaneous nerve supply to head and neck. Note the contribution of the cranial nerves.

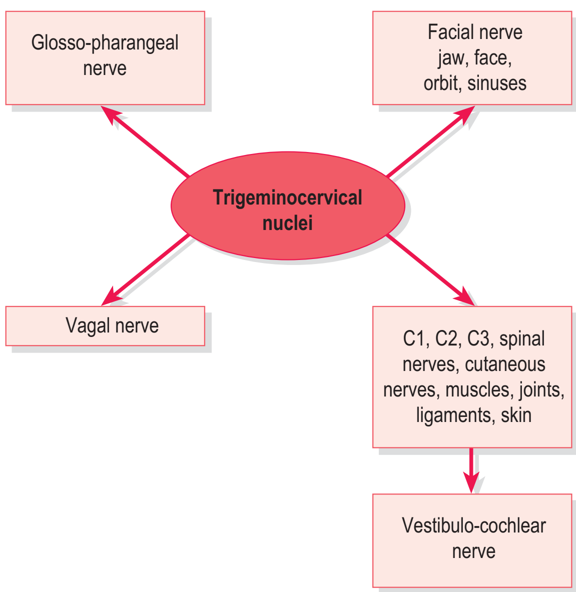

Figure 10.8 Potential links between cervical structures and structures influencing headache and vertigo.

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

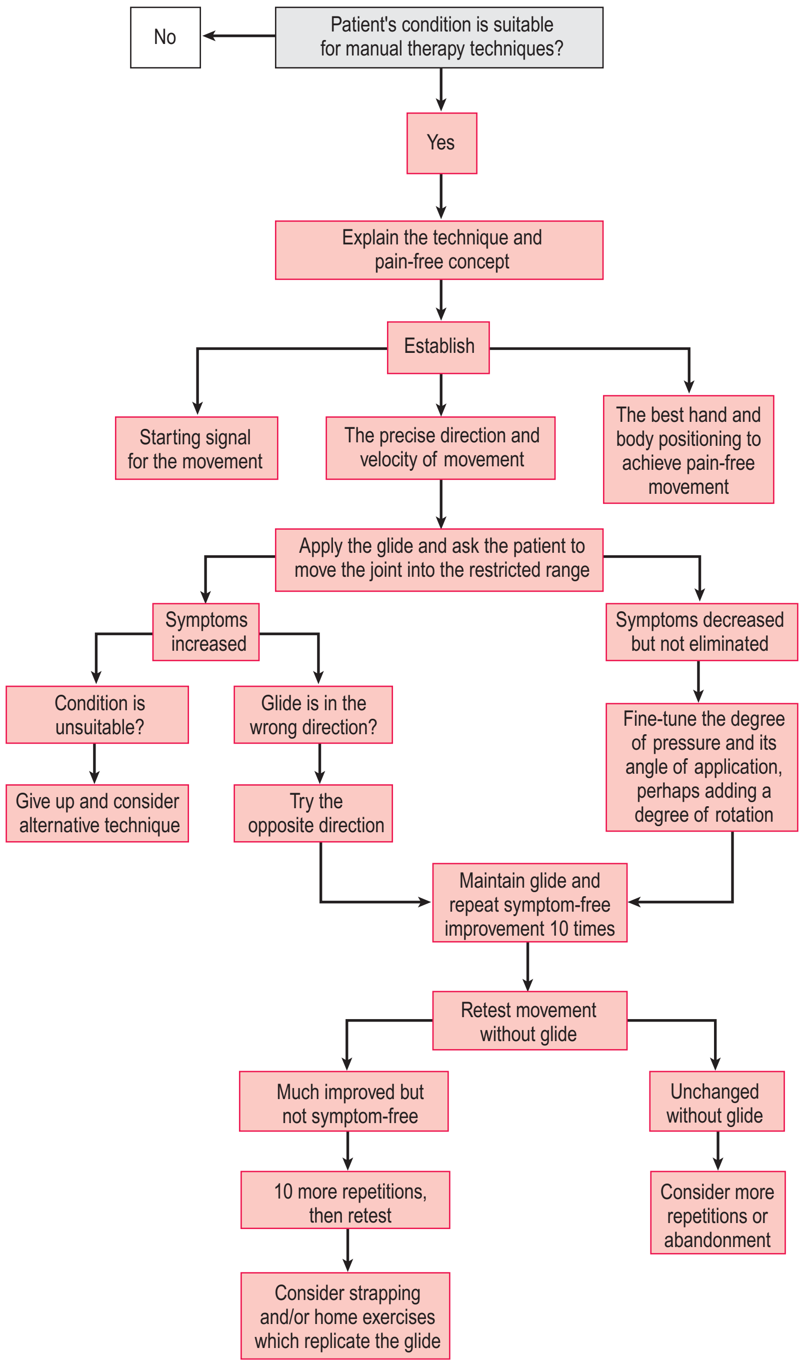

Figure 10.9 Methodological protocol for MWMs.

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.

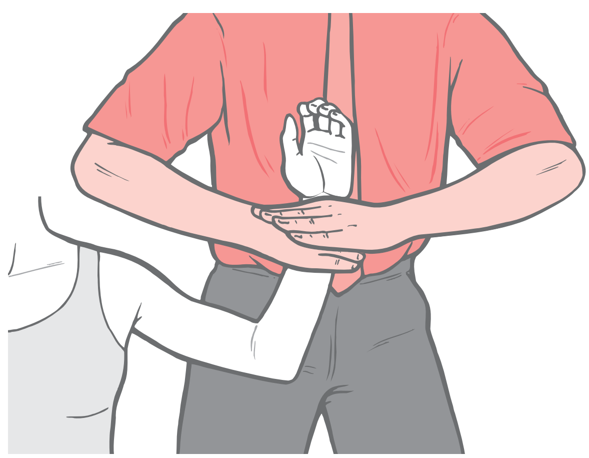

Figure 10.10 Hand positions for wrist joint lateral glide for loss of flexion and extension.

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.

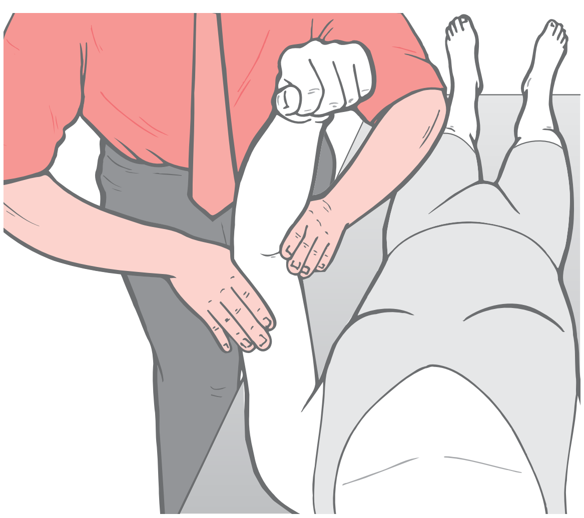

Figure 10.11 Hand positions for elbow MWM.

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.

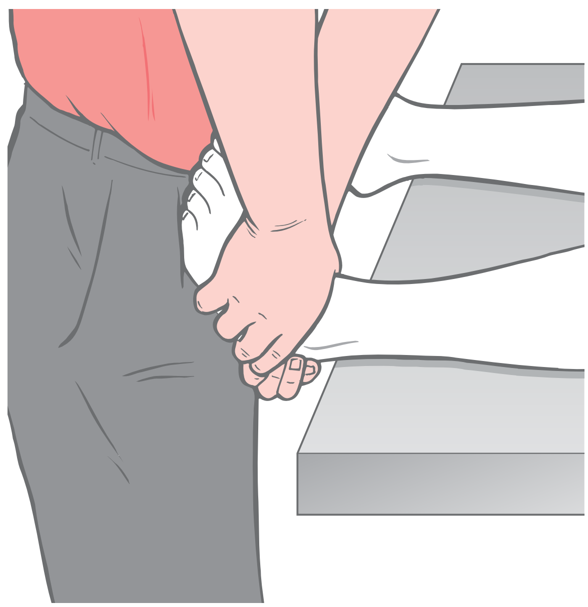

Figure 10.16 MWM for ankle dorsiflexion.

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.

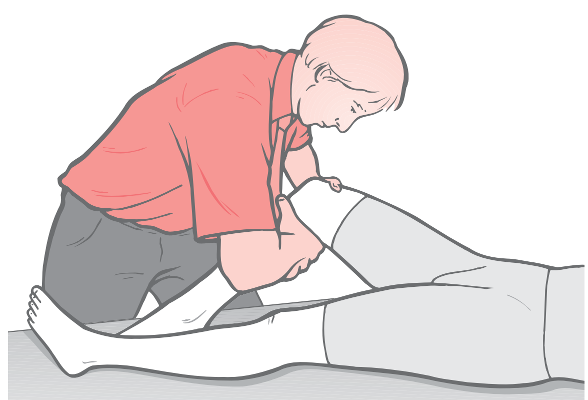

Figure 10.18 Lateral glide of the lower leg with femur fixed.

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.

Common errors for MWM as a whole

1. Over-treatment. The zeal of the converted is a powerful force!

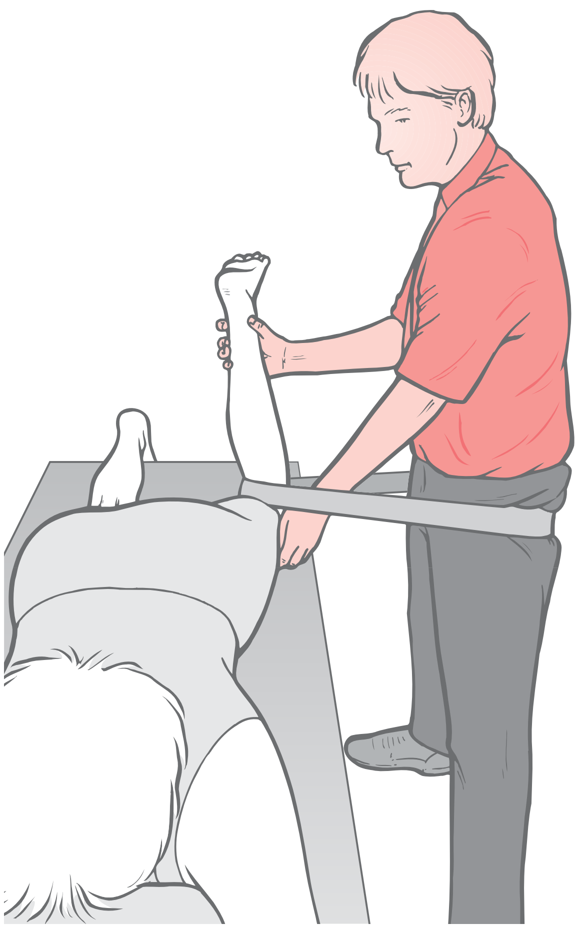

Figure 10.19 Lateral glide of the tibia on the femur.

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,

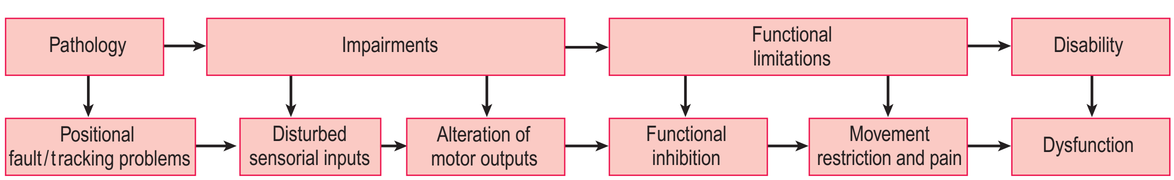

Figure 10.21 Mulligan concept can be conceived acting upon a model of dysfunction.

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

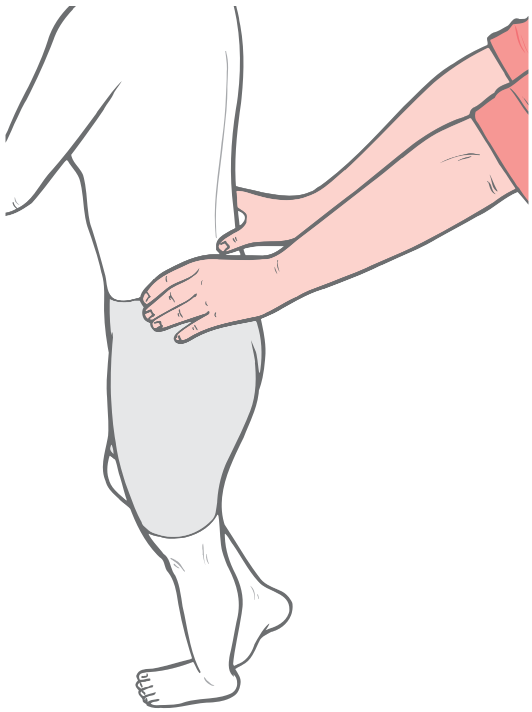

Figure 10.22 Unilateral SNAG with ipsilateral heel raise.

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

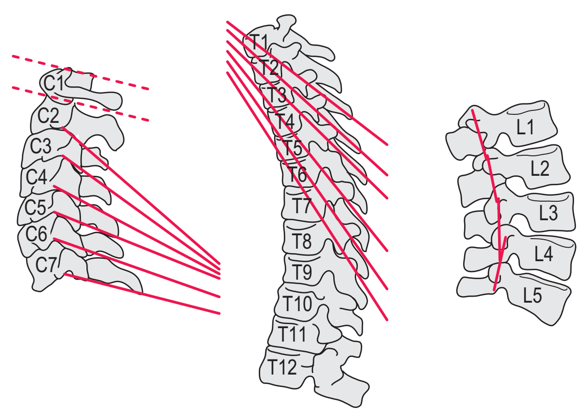

Figure 10.23 Orientation of zygapophyseal joints. (After Exelby 1995, with permission of Chartered Society of Physiotherapy.)

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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