

Session 5

Objectives

Following the study of this section, the reader should be able to:

Discuss

1. The types of accessory mobilisations.
2. How to select the appropriate technique.
3. How to select the appropriate grade
4. General mobility exercises & specific stabilising exercises.
5. The concept of chronic pain & the vagaries associated with it.
6. The types of Traction techniques available.

Explanation of Treatment Intervention 1 (Spinal)

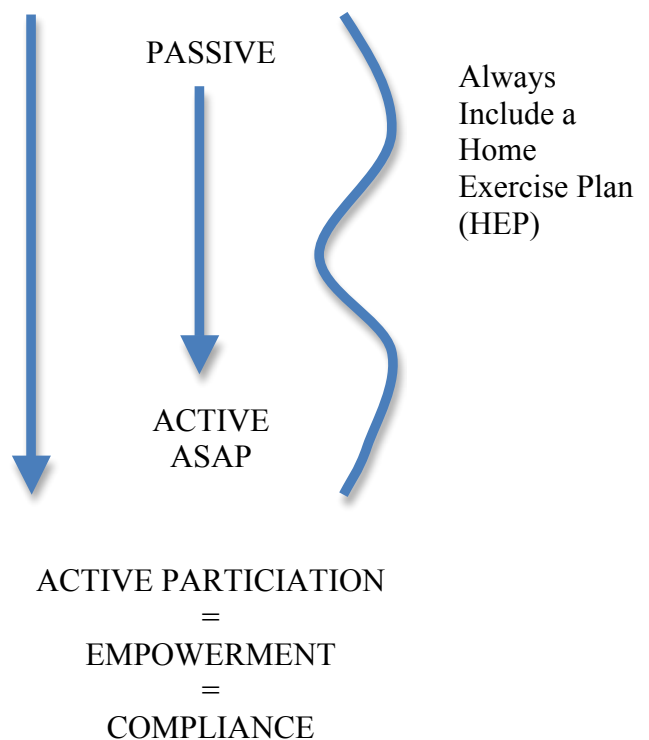
When deciding on appropriate treatment intervention at the spine it is useful to consider the three major systems which may be at fault.

These can be divided into:

- Arthrogenic (joint based)**
- Myogenic (muscle based)**
- Neurogenic (nerve based)**

However in reality most patients will have several systems involved to a greater or lesser extent.

I would suggest that the following diagram is a healthy way of thinking about intervention.



For example, most joint based problems such as ongoing disc pathology will have a secondary manifestation of muscular spasm, therefore both arthrogenic and myogenic systems are involved. Additionally it is worth noting that although the main system at fault might be arthrogenic, you may firstly have to settle the myogenic problem to be effective.

Any intervention needs to be based on the identification of specific problems gained during the assessment process.

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e.g.

No.	Problem	Date active	Date in-active
1	Neural tension of (Rt) sciatic nerve identified by positive straight leg raise at 60 ⁰		
2	Overactive right piriformis		
3	Limited lumbar extension at mid range due to nociceptor pain & resistance on ↓ PAIVM		

The problem list above demonstrates how 3 systems can be involved in a relatively simple presentation. It has been formulated from a patient with % (Rt) buttock pain, I/M (Rt) leg pain when driving and stiffness in the lower back when getting up from a chair.

If we consider the 'treatment toolbox' approach the following (not an exhaustive list) of interventions can be used for treatment intervention when dealing with the systems approach.

(A) Arthrogenic (joint based) Interventions at the Spine

1. Mobilisations (1a Passive & 1b Physiological)
2. Specific Directional Exercises
3. Manual and Mechanical Traction
4. Manual & Self Shift Correction
5. Home Exercise Plan (HEP)

(B) Myogenic (muscle based) Intervention at the Spine

1. Specific Stretching
2. Thermal & Cryotherapy
3. Massage – Specific Soft Tissue Mobilisations

4. Trigger Point Release Techniques
5. Acupuncture/Needling
6. Low Grade Joint Mobilisations
7. Muscle Endurance Training
8. Muscle Reprogramming

(C) Neurogenic (nerve based) Interventions at the Spine

1. Neurogenic Massage
2. Neurogenic Mobilisation
3. Neurogenic Exercises
4. Acupuncture/Needling

As well as specific interventions you can do in the systems approach it is essential that this is given in conjunction with the following.

(D) Education & Advice

This may include:

1. Education regarding the patient's condition, it will get better, healing tissue time, pathology behaviour explained, pain and reason for it.
2. General education on keeping active and doing general physical exercise such as aerobic (walking, housework, taking the stairs, swimming) as appropriate.
3. Drug medication – patients sometimes need to be encouraged to medicate as advised by their GP or pharmacist. Some patients resist using medication for various reasons. A fear of masking the pain, a fear of addiction or simply a dislike of having chemicals in their body. Conversely, you may need to advise a patient to seek a review of their medication if it is not working or if you are concerned about the amount they are taking.
4. lifestyle changes – consider if appropriate, weight, diet, smoking, alcohol consumption and exercise tolerance level.
5. General Exercise for Mobility - These are generalised exercises used to gain range of movement (ROM) and maintain ROM following mobilisation. They are also very useful to get a patient moving again following surgery, acute pathology or bed rest. Typical exercises include:
 - Patient supine rolling knees left to right and vice versa.
 - Individual knees to chest. Extensions in prone.
 - Side flexions in standing.
 - Marching on the spot.
 - Individual knees to chest.
 - Walking.
 - Walking with vigorous arm swinging.

- Hopping on one foot.
- Twisting torso on fixed legs.

The list is endless, what's important is you select what is appropriate and safe for the patient to achieve the outcome you are after.

(E) Centrally Maintained Pain & Illness Behaviour (Yellow Flags)

If after performing an examination you have identified a centrally maintained pain mechanism and the patient is displaying yellow flags (discussed in handout 2) treating using the systems approach may be counter productive as there is probably no prominent system (**arthrogenic, myogenic or neurogenic**) at fault (unless a peripheral driver exists – discussed later). In this presentation scenario it may be more beneficial to use a **'biopsychosocial approach'**.

In detail

Arthrogenic (joint based) Interventions

1. Mobilisations

1a) Passive Accessory Intervertebral Movements (PAIVM's)

These include movements available in a joint that are performed passively by the examiner. They take the form of gliding (sometimes referred to as translation or sliding) of the joint surfaces be it (medially, laterally, anteriorly or posteriorly). Additionally it may also include distraction and compression of the joint surfaces, and in some joints rotation where this movement cannot be performed actively. These movements are possible because all joints have a certain amount of joint play due to some slackness in the capsule and surrounding ligaments. You may here some clinicians refer to this joint play as a joints instantaneous axis of movement.

Accessory movements are important to examine and consequently restore with treatment because they occur during all physiological movements, and very often if there is a limitation of the accessory range of movement, there will be a limitation of the physiological movement available.

Movements which can be induced passively by the therapist include:

- Antero-posterior (*)
- Postero-anterior
- Unilaterals.
- Transverses (*)
- Rotations
- Compressions
- Longitudinal

(*) = NOT IN LUMBAR SPINE.

Purposed Effects of Passive Accessory Movements

- Maintain joint range of motion
- Promote nutrition of articular cartilage
- Maintain length of soft tissues e.g. ligaments and muscles, by preventing tissue adhesion and contracture
- Give sensory input to the central nervous system to promote memory of movement patterns
- Pain relief by stimulation of mechanoreceptors to close the pain gate in the spinal cord
- Give the therapist information on the tonal state of muscles during patient assessment

Contraindications to Passive Movements

- Fractures / dislocations
- Established osteoporosis (or prolonged high dosage of steroids)
- Unhealed wounds
- Deep vein thrombosis (avoid until anti-coagulated)
- Severe pain exacerbated by movement
- Tumour
- Acutely inflamed joints/
tissues

Housekeeping

- Remove jewellery and ensure your nails are short
- Ensure the patient is well supported and comfortable
- Prepare the environment for safe practice e.g. move bed away from the wall if passively elevating the patient's arm through flexion.
- Maintain the patient's dignity by exposing only that part to be moved
- Decide whether you are going to perform the joint movements in a proximal to distal sequence or from distal to proximal
- Ensure your foot position gives you an appropriate reach to complete the movement
- Ensure your grasp of the part to be moved is comfortable and supports the part adequately, and that changes to the grasp are smooth
- Apply slight traction as the movement is performed
- Consider where in the range you might add some compression if appropriate
- Keep the movements smooth and rhythmical at a steady tempo

Basic Reasoning for Selection of Technique (Efficacy)

The manner in which an accessory mobilisation is applied is somewhat subjective. Orders of efficacy exist and can be found in the manipulative text. However these orders can be somewhat unreliable. If trying to mobilise a segment centrally use a postero-anterio (PA) technique. If when examining the spine you note that pressure applied to the transverse processes reveals one side stiffer than the other you may wish to apply a unilateral technique. To increase general mobility at a segment a transverse or rotational technique could be employed. For the purpose of getting you started it is suggested you use the '***Technique Dosage Chart***'.

Basic Reasoning for Selection of Grade to be Applied (Pain Vs Stiffness)

It may be that your patient has a combination of symptoms usually pain and stiffness existing together. How you tackle them depends on the prominence of each symptom. For example if pain is the prominent symptom lower grades (I – II) are generally employed. Thereafter if stiffness is the prominent symptom then higher grades are employed (III – IV).

Definition of grades

Grade I is a small-amplitude movement at the beginning of the range.

Grade II is a large-amplitude movement which can be well into the range. It can be in any part of the range that is out of resistance or muscle spasm.


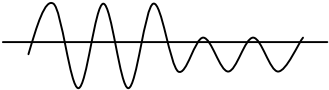
Grade III is a large-amplitude movement moving into or within resistance or muscle spasm.

Grade IV is a small-amplitude movement moving into or within resistance or muscle spasm.

Some Considerations When Applying Passive Techniques

When selecting a passive technique the following considerations need to be made:

- The patient's starting position.
- The Therapist's starting position & application of forces.
- Passive movement direction (range).
- Grade(s) amplitude and position in range.
- Rhythm.
- Speed.
- Duration.
- Advice/home program.

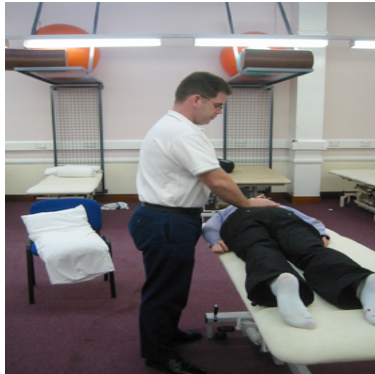
Technique Dosage Chart		
Consideration	Low Dosage (SIN Factor is high)	High Dosage (SIN Factor is low)
Patient starting position	Most comfortable. As Symptom free/discomfort free as possible.	Best position for access to apply forces in the appropriate direction.
Therapist starting position & application of forces	Light contact of hands/thumbs. Adapt to patient comfort whilst maintaining therapists body position in required direction & for accessibility of structure.	Firm but comfortable contact of hands/thumbs. Therapists body positioned in direction of technique with leverage giving optimal efficiency.
Passive movement direction (range)	Pain free or into slight/minimal pain or discomfort.	Into the restricted/painful direction at its limit (often in combined movements)
Grade (Maitland) amplitude & position in range	Reflex/neurophysiological effects I II	Mechanical effects III IV V
Rhythm	Smooth oscillatory 	Staccato 
Speed	Slow e.g. 1 cycle/2 seconds	Fast e.g. 2-3 cycles/second
Duration	Short 30 seconds – 2 minutes	Long 2 mins – 5 mins x (n)
Advice	<ul style="list-style-type: none"> • Comfortable rest position. • Relieving positions/movements. • Anti-inflammatory modalities if necessary. • Gentle pain free movement. 	<ul style="list-style-type: none"> • Automobilisations • Prophylaxis

(Adapted from pg 336, Kevin Banks in Pitt-Brooke et al 1998)

Notes on Positioning

- Excessive muscle tone or possibility of accidentally inducing greater tone, e.g. if doing spinal mobilisation and pain is occurring in extension, try using a pillow under the stomach.
- The effects of gravity or non-gravity related positions.
- Level of pain or discomfort, relate to the SIN factor.
- Accessibility to structures, where are they and can you actually get to the structure.
- The direction in which you require the movement to occur.
- The environment and if the patient is in a risk position, patient not about to fall off the bed.
- The direction of the technique.
- Body positioning, adopt a '**Step Standing**' position.
- In a position of advantage (mechanical advantage).
- Where possible use the 'third-order' lever principle, i.e. using the hand to mobilise the shoulder.
- The starting position should be where possible at the limit of movement, i.e. if examining a joint and a movement restriction is noted at say mid range extension, start the technique if possible in this position rather than from a neutral position.

Indicating good & bad positioning



Basic Bio-mechanical Reasoning

When selecting a technique consideration must be made in relation to what outcome you are trying to achieve. You need to think about what the problem is? Is it pain? Is it stiffness? Which are you trying to effect? Earlier in this handout you have seen how the dosage chart can be used to help you make that decision.

However it is important to think through what is happening bio-mechanically when you perform a passive mobilisation. In the spine consideration must be given to the joint mechanics, what plane does the axis of movement lie in and what shape are the articular surfaces such as the facet joints.

Showing Type of Mobilisation and Movement Gained

<u>Mobilisation</u>	<u>Movement</u>
Posteroanterior	Improves extension
Anteroposterio	Improves flexion
Unilateral	Gap or compress depending on side applied
Rotation	Gap or compress depending on side applied
Transverse	Improves side flexion or gaps opposite side
Longitudinal	Gaps reducing compressive forces

Any passive mobilisation can be performed if you have a clear understanding of the joint and its anatomy. Always think about what it is you are trying to achieve be it pain relief or reducing stiffness. Make sure the mobilisation you are performing is in the direction of joint alignment or your effect will be limited. Be aware of your position, passive mobilisation of a joint is best performed in a relatively relaxed operator position. Be aware of your

mobilising position, it is easy to damage the structural integrity of the thumbs. Always consider the dosage and finally always evaluate the effect and change as appropriate.

1b) Passive Physiological Intervertebral Vertebral Mobilisations (PPIVM's)

At the spine (cervical, thoracic and lumbar), these may include:

Flexion

Extension

Side flexion

In essence this technique is performed passively by the operator and within the normal cardinal planes of what movement would be available actively. These techniques can be employed to gain movement, assist movement patterns, establish the middle range or specific range so another technique can be performed. They are useful for the treatment of pain and to a lesser degree stiffness, they can also be used to help a patient retrain a motor pattern. They are often used in the early part of rehabilitation which will be discussed at the end of this handout.

2) Specific Directional Exercises

To maintain effects of PAIVM's or PPIVM's

Following a treatment where you have used PAIVM's or PPIVM's you may want to maximise this effect or gain. For example if you have been working on a stiff segment which is **hypo-mobile** you would want your patient to maintain this between treatment sessions (remember that a patient is probably only going to be with you for 30 minutes leaving 23 hours 30 minutes each day where they can be potentially working on their own problem), you might therefore prescribe specific directional exercises so this occurs. For example if you had been doing transverse glides to the cervical vertebra to improve side flexion, you would ask to patient to regularly perform active side flexions to maintain/improve the range where appropriate.

As a treatment regime to alleviate disc related pathology

A common progressive loading regime used in MSK for disc related pathology has been detailed under the 'McKenzie' approach. Essentially this involves progressively extending (predominantly) the lumbar spine to offload the effects of disc.

Typical progressions include:

Prone lying

Prone lying resting on elbows

Prone lying elbows fully extended

Variations of the above with overpressure

HOC – hips off centre with variations of above (depending on presentation)

Again this is something that we will pick up on during the practical sessions.

3) Manual & Mechanical Traction

Indications for Traction:

- Displace cervical intervertebral disc
- Slow onset lumbar disc lesion
- Capsulitis
- Loose body
- Degenerative spinal conditions
- Osteochondrosis
- Osteophytes
- Subluxations

Traction aims to:

- *Relieve pain (? Stimulation of mechanoreceptors therefore paingate)*
- *Create space*
- *Produce a negative pressure within a joint*
- *Tighten ligaments*
- Maintain joint range of motion
- Promote nutrition of articular cartilage
- Maintain length of soft tissues e.g. ligaments and muscles, by preventing tissue adhesion and contracture
- Give sensory input to the central nervous system to promote memory of movement patterns

Principles for Manual Application

- Use body weight.
- Straight arms.
- Allow traction to establish for a moment or two before proceeding with accompanying manoeuvres (if indicated).
- Consider the level of the spine you wish to affect / influence.

Contra-indications

- Fused lumbar spine (pathologically (AS) or surgical
- Unstable vertebral segment
- Rheumatoid Arthritis
- Unstable fractures
- Pathological bone conditions where the density is under scrutiny, e.g. osteoporosis, malignant disorders
- Pregnancy
- Hypertension

Guidelines for Mechanical Traction

Cervical – 80-120 n / 8-12 kg

Lumbar – 300-400 n / 30-40 kg

4) Manual & Self Shift Corrections

As discussed earlier in this module, it is possible that when a patient presents with a lumbar spine problem the spine will appear shifted to one side, this can be contralateral (on the other side) or ipsilateral (same side). In most case patients shift away from the pain, therefore contralateral. This occurs usually as a secondary manifestation to another problem. At the beginning of this handout I discussed that you may have a predominant arthrogenic problem with a myogenic element, this is usually the case when a shift is present.

To correct it the following can be used:

Holding patients waist and blocking the trunk with your shoulder manually draw the pelvis back to the mid line. Once the patient is able to tolerate this, teach self correction using a mirror or giving a goal such as keeping the torso straight and bringing the pelvis to the midline, this is a good home exercise for maintenance. To prevent re-occurrence teach your patient the above followed by add on's such as full glides to the opposite side.

5) Home Exercise Plan

Arguably the most important aspect of any treatment intervention given what I discussed in the mobilisation paragraph. This needs to be in context and specific to continuing on what you were trying to achieve in the treatment session.

In detail

Myogenic (muscle based) Interventions

1. Specific Stretching

As we go through this module we will demonstrate and practice specific stretches for muscles and muscle groups, write these down and practice them so they become second nature to you, you can then place them in your treatment toolbox.

So far we have covered:

Upper fibres of Trapezius
Levator Scapuli
Quadratus Lumborum
The Scaleni (anterior, middle, posterior)

2. Thermal & Cryotherapy Techniques

Please refer to your previous notes gained during bioclinical or clinical environment modules.

3. Massage - Specific Soft Tissue Massage

Again please refer to your previous notes gained during bioclinical or clinical environment modules. This will give you a background, however specific soft tissue massage involves dealing with tissue that is usually overactive and needs to be reduced to relieve pain and allow other systems to be worked on.

4. Trigger Point Release Techniques

Trigger points are essentially a local area of spasm within the muscle, normally present as a consequence of pain, most muscles contain trigger points and these are usually depicted on charts called 'trigger point charts'.

A trigger point has a distinctive feel when you palpate a muscle, it is often reported as a hard localised area the size of a 10p piece, on palpation it usually elicits nociceptor pain.

The treatment of a trigger point is relatively straight forward, either directly apply pressure over the trigger area and eventually you should feel the tissue release or soften, normally between 10 – 30 seconds. Alternatively massage across the trigger area using a stripping technique.

5) Acupuncture/Needling

This is a post graduate technique which is sometimes used to treat pain and reduce muscle spasm, the exact mechanism is unknown but essentially it involves placing sterilised needles into the local area of discomfort. Acupuncture can be used locally or indirectly.

6) Low Grade Joint Mobilisations

These typically arthrogenic techniques can be used at low grades (I and II) to settle muscle spasm, see previous notes on joint mobilisations.

7) Muscle Endurance Training

The important factor is to ensure that the active range is equal to the passive range. Typical areas targeted include gluteus medius and gluteus maximus.

8) Muscle Reprogramming

Spinal stability and lumbar stiffness regulation are reliant on the stability muscles of the region. These include the following:

- Pelvic Neutral
- Transverse Abdominus (TA's)
- Multifidus
- Gluteal Musculature
- Psoas
- Pelvic Floor (with all)

These muscles act as a corset tightening the region and maintaining stability. When they are working properly, i.e firing in time and at the correct intensity and frequency it is theorised they reduce the incidence of spinal pain. Of course many reasons exist for the presence of back pain but instability usually plays a key part regardless of the mechanism be it trauma, disc degeneration, fracture etcetera. The basic concept is to activate the corset by producing sufficient isometric tension and consequently tightening the abdominal area.

Patients who present with chronic low back pain at low load levels, are mainly deficient in endurance of contraction and order of recruitment, rather than strength of contraction. When dysfunction is present, the muscle often is unable to maintain a consistent contraction. Instead the contraction will be more phasic and jerky'.

Step 1 – Obtain Pelvic Neutral

Teach the patient to select pelvic neutral, this is best achieved by sitting the patient and physically facilitating the neutral position, get the patient to advance to full anterior tilt then full posterior tilt, pelvic neutral is the mid point, try repeating in standing where it is more difficult. You will note gender differences with men finding this concept more difficult to achieve.

Step 2 - Activating Transversus Abdominis (TA's)

Four point kneeling

A good position to start with because the weight of the abdominal viscera stretches the abdominal sling and this leads to facilitation of the deep abdominal muscles. Assume the position and ask the patient to allow the stomach to hang. Make sure the pelvis is in a neutral pelvic position and the rest of the spine is generally lined up. Then ask them to breathe in and out, then stop and then gently pull their tummy in below their belly button (abdominal hollowing) and continue breathing. During this contraction the lower abdomen should elevate before the upper abdomen, the oblique abdominal muscles should remain relaxed and there should be no inflare or outflare of the lower rib cage.

The ideal ability for muscle contraction is that the patient should be able to sustain a 10 second hold for the count of 10 repetitions.

Side lying

Once the patient is able to do the above progress to side lying. Repeat the breathing routine and exercise as above pulling the stomach in from below the umbilicus until a contraction is achieved. Again they need to be able to perform this for 10 repetitions, holding each for 10 seconds.

Sitting & Standing

Quickly progress the patient by switching to a functional position such as sitting. Use the activation of the pelvic floor to facilitate the TA's. In sitting repeat the above routine.

Step 3 – Activating Multifidus

Teach the patient how to find it, multifidus is the most medial spinal muscles closely associated with the stiffness maintenance of the spine. Following back pain this muscle is thought to de-condition, therefore it should be easy to pick out and will feel 'boggy' when palpated. Lay the patient in prone, thumbs in the boggy area and activate the TA's and pelvic floor. The patient may feel some activity over the boggy area. If not facilitate with the same process but add in elbow elevation on the opposite side to the boggy sensation, it should help activate the muscle, quickly move onto sitting and standing, use step standing and opposite arm raises to facilitate a swelling in this muscle, once able progress to functional movements such as brushing teeth or again the aggravating factor which causes the patients pain.

Step 4 – Activating Gluteal Musculature

“Butt squeezing’ or setting can be used as the gluteal muscles are acutely associated with the stability system. Get the patient to sit on a chair or bench and squeeze their gluts so the raise up slightly, repeat in standing and in conjunction with above exercises.

Step 5 – Activating Psoas

Sit the patient over the plinth and get them to suck the hip into its socket again holding for the statutory 10 x 10 reps/secs.

In detail

Neurogenic (nerve based) Interventions

Background

The principle functions of the nervous system are impulse transmission and movement; it is therefore a dynamic organ, not hard wired. It is a continuous structure from the brain to the terminal ends in the periphery.

The body acts as a container for the nervous system with the musculoskeletal system interspersing its route by 'mechanical interfaces' which we typically divide into bony or myofascial interfaces. These move independently to the nervous system, but impose forces upon it. For example the contraction of a muscle in some areas will cause compression on the nerve or the movement of a joint may cause a stretch of that nerve in some areas of the body.

The nervous system is able to withstand the forces imposed upon it by normal movement by undergoing distinct mechanical events that must occur in harmony with the movement. These events include elongation, sliding, cross-sectional area changes, angulation and compression. It is only when these dynamic protective mechanisms fail that symptoms occur.

In order to understand the basics of neural dynamics it is necessary to appreciate how a nerve functions normally, and how this can be interrupted by excessive forces. There are four main concepts to learn;

Axoplasmic Flow

All nerve cells (cell body and axon) contain axoplasm, which plays a vital role in the nutrition and health of the nerve. Sometimes nerve cells can be extremely long e.g from lumbar spine to toes, so a special transport system known as axoplasmic flow is needed to transport proteins, neurotransmitters and other substances up and down the nerve. A disruption in this system such as excessive lengthening or compression of the nervous tissue leads to an unhealthy nerve that is unable to get sufficient nutrients to perform normally or recover.

Biomechanical Properties

The connective tissue surrounding nerves contains elastin enabling them to be resistant to tensile forces, rather than the nerve fibres themselves being stretched, so it's the connective tissue which takes the strain of being lengthened rather than the nerve fibres). Excessive lengthening of a nerve would cause a reduction in cross sectional area (so actual diameter gets thinner), causing increased tension within the nerve, this also has the net result of compressing the nerve fibres causing a reduction in microcirculation.

In areas where nerves are susceptible to compression the connective tissue (epineurium) is much thicker, e.g. the sciatic nerve in the buttock, however too much sitting on your buttocks may still lead to symptoms especially in those people who have little overlying fat or muscle. Nerve roots (from end of spinal cord to exit at intervertebral foramen) incidentally have a lack of epineurium and perineurium (deeper layer) and are therefore less protected from a traction or compression injury (a bit of a design fault).

Blood Supply of Nerves

Peripheral nerves are heavily vascularised and have blood vessels running alongside the nerve branching into the epineurium and therefore feeding it. The blood vessels are coiled to allow a certain amount of lengthening to occur without interrupting blood flow. If a nerve is lengthened by 8% of its total route, you may start with pins & needles (remember telephone position) as the intraneural blood flow will be reduced, but if lengthening occurs by 15% (sleeping with hands behind head) the vessels will be completely occluded causing nerve ischaemia, this is usually accompanied by pins and needles and numbness. Additionally remember that this is usually different with babies, their container is smaller in comparison to their nervous system as the nervous system is the first aspect to grow.

Innervation of Peripheral Nerves

The connective tissue sheaths which surround peripheral nerves are all innervated from axons within these sheaths and the blood vessels that supply the nerve. Pain can be generated from the connective tissue as the nerve endings respond to high threshold mechanical, chemical and thermal stimuli (high being excessive). The connective tissue of a nerve can therefore be the direct source of pain due to mechanical deformation or chemicals released as a result of inflammation.

Anything that disrupts these systems can cause nerve injury. For example a lumbar disc prolapse may cause damage to the lumbar nerve roots through compression (reduced axoplasmic flow, reduced blood flow and mechanical stimulation of nerve endings) or through physiological responses such as stimulation of the nerve endings due to chemical irritation.

Background to Treatment

Treatment of the nervous system must look to restore the mechanisms discussed above. There are times of course when unless the cause of the injury/ongoing insult is dealt with e.g carpal tunnel syndrome requiring surgical decompression, that any physiotherapy treatment is pointless. However it must also be remembered that it takes time for a nerve to function normally again after such injury so physiotherapy can be useful in speeding this process along.

Treatment of the nervous system needs to follow these principles.

Determine if the problem is predominantly one of mechanical sensitivity, interruption to axoplasmic or blood flow or due to chemical irritation. All of these except chemical irritation should be responsive to physiotherapy treatment. If a nerve is highly sensitised by chemicals it will be painful regardless of positions, movement etc and needs treating through anti-inflammatory medication or injections.

After determining whether the nerve is treatable you need to identify the nerve at fault. Then you need to be able to recall the route that nerve takes through the body and what bony and myofascial interfaces it incorporates.

Treatment to Interfaces

By causing movement at the bony and myofascial interfaces you can have an effect on the surrounding nervous system. By causing them to move in a gentle way you desensitise the nerve to mechanical stresses.

Movement of the bony and myofascial interfaces also increases the blood flow to the nerve and improves axoplasmic flow. Techniques include;

- Joint mobilisations (for bony interfaces) usually accessory as less stress through nerve. These can be carried out in positions of nerve tension.
- Soft tissue massage (myofascial interfaces) to reduce tone in muscles through which nerve pass.
- Hold relax techniques (Myofascial interfaces) to reduce tone in muscles as above.

Treatment to increase axoplasmic flow

- Neurogenic massage, which is gentle massage along the course of a nerve where it is superficial.

Treatment to increase blood flow

- Movement, by keeping the nerve moving through specific exercises or generally through encouraging normal movement.
- Neurogenic massage.

Conclusion

Remember nerves are not able to treat, response can take time, beware of irritability and make sure you use subjective & objective management.

1. Neurogenic Massage

Essentially involves massaging along the line of the nerve, to increase blood flow as the majority of nerve pain is ischemic based.

2. Neurogenic Mobilisations

The below systematic approach to the management of neurodynamics using the interface (bony & myofascial) approach should help you. Remember this approach is reliant on you knowing your anatomy. In the lecture and practical session we discussed the various components of neurodynamics, the key is recognising a peripheral neurogenic pain mechanism in the subjective, identifying it in the objective with an appropriate neurodynamic test so you have an objective marker, then using your treatment toolbox approach to work on each interface. Remember, a neurodynamic test will only identify that there is a potential problem, it will not tell you where that problem is along the nerve root.

Below are 2 examples:

Ulnar Nerve

Interface	Bony	Interface	Myofascial
1	C&, C8 & T1		
2	Under & behind Clavicle		
		3	Medial side of Axilla
		4	Deep to Triceps
		5	Medial Intramuscular Septum
6	Medial Epicondyle		
		7	2 heads of FCU & UCL
		8	Pierces deep fascia
		9	Anterior to Retinaculum
10	Lateral to Pisiform		

Common Peroneal

Interface	Bony	Interface	Myofascial
1	Sciatic L4/5/S1/S2/S3		
2	Greater sciatic foramen		
		3	Piriformis (10% rule)
		4	Behind & deep to Biceps Femoris
NB. Be aware that 2/3 posterior thigh division of Tibial (medial) & Common Peroneal (lateral)			
		5	Popliteal fossa
6	Head of Fibula		
		7	Peroneus Longus
NB. There after splits to superficial & deep Peroneal			

3) Neurodynamic Exercises

It is essential that once you have settled the symptoms you incorporate neurodynamic exercises to ensure the nervous system is mobile, this might include any of the neurodynamic tests you would use to assess the glide or integrity of the nerves.

Examples might be:

Active slump
SLR with DF

4) Acupuncture/Needling

Again as discussed earlier, some practitioners use the above to settle neurogenic pain, the exact mechanism of how this occurs is unclear.

In detail

Centrally Maintained Pain & Illness behaviour (Yellow Flag) Interventions

The understanding of chronic pain covers many aspects and involves in depth post graduate training. Below are some issues you need to consider:

Typically physiotherapists are trained using the medical model, which attempts to link cause with effect using a framework of assessment leading to diagnosis and ultimately cure of the identified cause or lesion.

Explanation of Chronic Pain

Before you can begin to understand the mechanisms of chronic pain you must appreciate the difference between acute and chronic pain. With any type of pain it must be remembered that it is multidimensional not only affecting people physically but psychologically as well.

Acute Pain

This occurs in response to potential tissue damage or actual tissue damage. If you put your hand on a red hot surface, you experience acute pain which results in a reflex response of withdrawing your hand, this occurs so quickly that usually no tissue damage occurs and the pain settles in minutes. Acute pain is also experienced when actual tissue damage occurs, the resultant inflammation sensitises the nociceptive nerve endings within the tissues. The excessive nociceptive input to the brain causes enhanced sensitivity to mechanical forces, this encourages us not to move the injured area. Acute pain reduces and finally goes away as the injured tissue heals and function returns to normal, usually within 2-6 weeks.

Chronic Pain

This does not simply mean pain which has gone on for a long time, it is possible to experience pain for more than 6 weeks and not develop chronic pain in the sense that it is psychosocial in nature. Some tissues heal very slowly e.g. nerves, intervertebral discs and tendons, therefore pain can take longer to settle. However you must consider how the presence of pain for a long period of time would effects how a person may feel, whether a person can cope with this or if other factors are involved may determine whether this long-term pain develops into a chronic pain state.

Chronic pain usually refers to pain that is experienced long after any tissue damage has healed, or pain, which is out of proportion to the extent of the damage or stage of healing. The full mechanisms for why this occurs in some

people and not in others is not known, but there are thought to be several factors, which contribute to chronic pain states.

The physiology of this prolonged pain is also only based on theory. One possible explanation is that following injury the nociceptive inputs to the brain cause plastic changes resulting in alterations in the processing of afferent information. This results in movements or stressing of undamaged tissues providing inputs to the brain which are processed as pain.

A second problem which may occur in the central nervous system is that it spontaneously generates neural activity that results in pain being perceived without any input from the peripheral system.

A third problem is that the brain may respond to this perception of pain by stimulating the sympathetic system and causing other unpleasant feelings such as coldness or a creeping feeling.

It is also now known that negative thoughts or feelings of stress or depression can also give rise to pain due to the production of adrenaline produced when stressed or frustrated, this can stimulate certain ion channels on the surface of nerves. It is important to remember that people with chronic pain are feeling pain because their brain is perceiving something as pain, living with pain as part of everyday life will ultimately change a person's behaviour and sometimes their relatives behaviour too.

In Bullet form:

Pain which may or may not have an organic background.

Pain usually present in advance of 6 weeks.

Pain which is often difficult to define by the patient.

Pain which shows behavioural similarities to chronic fatigue syndrome & fibromyalgia.

Plastic changes to the CNS:

 In growths into lamina I & II

 Inhibition of descending tracts

Can be difficult to treat, often more responsive to a psychosocial approach but don't make the mistake of using only this approach, many chronic pain patients have peripheral drivers (i.e normal mechanical presentations).

Remember acute pain is purposeful and short lived, chronic pain serves no purpose and can last for years.

Identifying Chronic Pain

The presence of 'Yellow Flags' is thought to identify and quantify the risk of psychosocial factors in contributing to long term disability. There are many questions which can be asked to identify these yellow flags and some may be picked up throughout the assessment.

Gifford (2000) suggests six key questions can be asked to predict a patients beliefs and behaviours in response to chronic low back pain.

1. Have you had time off in the past with back pain?
2. What do you understand is the cause of your back pain?
3. What are you expecting will help you?
4. How is your employer (co-workers, family) responding to your back pain?
5. What do you currently do to cope with your back pain?
6. Do you think you will be able to return to work (your usual level of activities)? When?

Factors contributing to chronic pain can be remembered by the mnemonic ABCDEFW.

A= ATTITUDES AND BELIEFS

- A belief that pain means damage and is therefore harmful. Can lead to fear of activity in case it causes the pain
- Belief that all pain must be cured before returning to work or activity.
- Expectation that pain will be exacerbated by work or activity.
- Catastrophising, misinterpreting things they are told or symptoms that they feel, tend to think they have a very serious condition, always fear the worst.
- Belief that pain is uncontrollable.
- Passive attitude, wanting someone to cure them, not help themselves.

B= BEHAVIOURS

- Increased time resting, limited activity.
- Withdrawal from ADL's and social activities.
- Poor compliance with exercise programmes and often display a boom burst cycle.
- Reports of high intensities of pain, often scoring over the VAS scale.
- Excessive reliance on aids or appliances.
- Poor sleep pattern
- High intake of alcohol or cigarettes.

C= COMPENSATION ISSUES

- Lack of financial incentive to return to work
- Disputes over benefits
- History of claims due to other injuries

- History of previous sickness benefits
- Participation in an unsettled medico-legal claim.

D= DIAGNOSIS AND TREATMENT ISSUES

- Experience of conflicting diagnoses or explanations for their pain
- Unfamiliar medical terminology which can lead to catastrophising
- Dramatisation of back problem by health care professionals, leading to dependency on treatment.
- Continued receipt of passive treatments
- Advice from professionals to change or withdraw from job.

E= EMOTIONS

- Fear of increased pain
- Depression, loss of enjoyment
- More irritable than normal
- Anxiety about heightened body sensations
- Feelings of stress and loss of control
- Feeling useless and not needed
- Disinterest in social activities.

F= FAMILY

- Over-protective partner/spouse, reinforcing fear of harm.
- Family taking over tasks
- Family member who ignores or becomes frustrated with their pain
- Lack of person to talk about problems with
- Extent to which family support return to work or normal activities

W= WORK

- History of manual or repetitive, boring work
- Job dissatisfaction, frequent job changes, stress at work
- Belief that work is harmful & no interest from employer
- Low educational background, low socioeconomic status
- Minimal availability of lighter tasks to allow graded return to work

An understanding of the different factors involved in chronic pain can aid in its management. Sometimes the problem can seem so vast it is difficult to know where to start with treatment. Exploring these aspects of chronic pain will allow you to identify the main problem the patient has and explore ways in which this can be changed or managed. **Remember you are not aiming to cure their pain but teach them how to live life in the presence of their pain.**

Chronic Pain Management

It takes several years and specialist training to tackle this problem fully, but even if you can help to change one aspect of a patient's behaviour it is a success. It is easier to plan the

Management around the ABCDEFW model.

Attitudes and Beliefs is an area where you can make a huge difference just by talking to the patient and explaining basic concepts.

It is very important not to reinforce any negative beliefs, so do not talk in medical jargon this can lead to catastrophising. If someone has been given a diagnosis of degeneration and believes their spine is crumbling and they have extra bits of bone growing everywhere, it is no wonder they are feeling pain. Try to explain this in a manner that makes it sound less painful, like your spine is getting older so changes start to develop, the discs get narrower and the surrounding bone gets bigger to compensate for this.

Then an explanation of acute pain and chronic pain can help somebody understand that pain in their circumstances does not mean harm. Give them possible explanations for their feelings of increased pain such as, if you sit on the settee for long periods of time muscles become weak and tight, when you get up and walk around these muscles are stretched and have to start working, so they ache.

It is sometimes useful to use the analogy that if you yourself were to get up in the morning and run the London marathon you would have several aches and pains for several days afterwards. If you graded your running training you would find the marathon easier and there would be less pain and stiffness afterwards, therefore they need a graded return to activity.

Sometimes it is necessary to explain the healing process so that they can understand that it doesn't really matter what was injured initially it will have healed by now anyway.

Behaviour is another area where you can have a significant effect. Sometimes patients have no idea that the behaviours they have adopted is unnatural and often very unhealthy.

If they have prolonged resting time and have withdrawn from normal activities they not only become very physically deconditioned but depressed and frustrated. Sometimes patients will develop a boom burst cycle, this is where they rush around and get everything done in one go, usually when they are having a good day.

This is a level of activity their body is no longer accustomed to so they then feel very fatigued and their muscles ache, often then perceived as an increase in their pain. When they have an increase in pain they go to bed and rest for a prolonged period, consequently when they get up they have pain because their muscles have become stiff and tight.

The best way to discover a patient's behaviour is to get them to fill an activity diary where they record what they are doing every hour for a week and their pain levels. This can then be used to point out an increased down time (rest time) or boom burst cycle. **Identify if your patient is an under active or over active pacer?** It is essential to get chronic pain sufferers to pace their activities and only have short rest periods. It is advisable to try and increase their cardiovascular fitness also by setting them a pacing programme.

This involves picking a couple of activities which will increase their heart rate but that they will realistically be able to keep up with. Walking is usually a good activity, or even something as simple as sitting to standing. Start by measuring what they can do e.g. walking for 5 minutes.

Then decide how much they will be able to increase this each week. The patient then increases their walking time by a small amount each day to achieve the weekly increase. If they wake up and are having a terrible day they must at least carry out their baseline, in this case 5 minutes of walking.

Bibliography

Books

Gifford, L. (2000) *Topical Issues In Pain – Biopsychosocial Assessment & Management* Kestral CNS Press

Kesson, M. & Atkins, E. (1998) *Orthopaedic medicine A Practical Approach* Oxford Butterworth Heinmann

Kisner, C. & Colby, L. A. (1996) *Therapeutic Exercise – Foundations & Techniques* 3rd Ed. Philadelphia. F A Davis.

Pitt-Brooke J, Reid, H. Lockwood J. & Kerr, K. (1998) *Rehabilitation Of Movement-Theoretical Basis Of Clinical Practice*. London. W B Saunders

References

Sackett, D. L. (1997) *Evidence Based Medicine* Seminars In Perinatology 21, (1): 3-5

Saunders, H.D. (1998) *The controversy Over Traction For Neck & Low Back Pain* Physiotherapy 84, (6):285-288