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Management of common clinical syndromes of the Low Back and Pelvis

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Narrative: The interplay of bony, muscular, and ligamentous structures about the low back and pelvis can present a challenge to the Chiropractor to accurately diagnose and correct.

Here I present a selection of common clinical findings of this region and describe my diagnostic approach which uncovers the source of the issue to allow its effective treatment.

The technique of choice is the NeuroImpulse Protocol,™ a low force technique which is very specific in its application.

This paper is taken from Module 1 of the NeuroImpulse learning materials© and manual and provides the busy practitioner with a clean and tidy clinical approach to what are frequently difficult problems to resolve.

Indexing Terms: Chiropractic, Clinical management; Low Back; Pelvis; NeuroImpulse Protocol.

Introduction

... NIP chiropractic is uniquely placed to help restore neurological balance about the low back and pelvis using gentle and simple but precise techniques.

The following common clinical presentations are discussed through the lens of the *Neuroimpulse Protocol*™ (NIP) as developed by Dr Neil Davies.

The commentary is short and focussed and respects the reader's current knowledge and clinical skill set.

The emphasis is, of course, on safe and comfortable care that is effective in patients across the life-span.

The Lumbar Facet Syndrome

The cartilaginous layers covering the articulating facet surfaces enable frictionless motion between the adjacent vertebrae, while also bearing compressive, tensile, and shear loads. Such mechanical capabilities are due to the specific structure of the cartilage tissue and the mechanical properties of the matrix of the cartilaginous layer. The cartilage matrix consists of collagen fibres, glycosaminoglycans (GAGs), proteoglycans, and chondrocytes (Urban' 1994; Silver et al, 2001; Leddy & Guilak, 2008).

Located at the superior and inferior poles of the joint are the fibro-adipose meniscoids. These are continuous with the connective tissue rims located along the dorsal and ventral margins of the joint.

Fibro-adipose meniscoids, also covered by synovium, project from the joint capsule at the superior and inferior poles and enter between the articular surfaces. Adipose tissue pads and fibro-adipose meniscoids are probably derived from a common primitive mesenchymal meniscus which begins life as adipose and becomes increasingly fibroid with age due to mechanical pressure of weight-bearing (Engel & Bogduk, 1982).

With age and exaggerated weight-bearing, the intervertebral disc deteriorates morphologically, losing both imbibition capability due to decreased proteoglycan levels (Urban & McMullin, 1988) and vertical height (Frobin et al, 2001). This loss of morphological integrity and function brings pressure to bear on other spinal structures, more particularly the facet joints which are now bearing more weight than was intended (Adams et al, 1990).

In NIP™ practice the facet which is irritated from unintended weight-bearing almost exclusively presents as an obviously active lumbar subluxation pattern. However, at times, some patients will experience extreme pain from a so-called '*locked back syndrome*' which it seems is related to the fibro-adipose meniscoid sliding out of the intra-articular space on flexion (normal biomechanical physiology) and not reseating when the spine is brought back out of flexion. Pain is immediate, severe and gripping. This is what is termed as the acute trapped meniscoid syndrome (Kirkaldy-Willis, 1988; Petersen & Bergmann, 2002) and in NIP™ we have a specific methodology for correcting the problem in a clinically reasonable timeframe.

In a subset of patients with trapped meniscoid syndrome, their pain is much less severe and episodic depending on activity levels and motion characteristics. Diagnostically these cases are considered to be latent and it is difficult to demonstrate a trapped meniscus at all. However, with specific manoeuvres designed to irritate the meniscus in what should be its normal physiological state by sudden compressive force, the diagnosis becomes far easier to make.

Understanding the role of the multifidus muscle in facet syndrome

In the lumbar spine, the *multifidi* are spinal segment stabilisers (Macintosh et al, 1986). They arise from a broad base in the sacrum and ascend transversely to insert into the lumbar spinous processes. The superficial fibres ascend up to 4 segmental levels while the deeper fibres only 1-2. They are heavily involved in lumbar spine proprioception and have attachment into the facet joint capsule (Dickx et al, 2010). Under full load, when their nerve supply is compromised, this leads to inability to provide the necessary stabilisation of the lumbar spine in flexion and extension, thus contributing to the development of a pathophysiological milieu which will result in a trapped meniscoid.

The action of the *multifidi* is to cause contralateral rotation (in conjunction with the *rotatores*) and this fact is important when testing for latency.

Diagnostic Principles

When a patient has facet syndrome where the meniscoid is trapped, they will have a corresponding weakness in the hamstring group on the affected side. Once weakness has been demonstrated, the neurological pretest is simply to apply a force to the tip of the spinous process of the superior vertebra in the affected motion segment at a 45° cephalad direction while retesting the hamstring which will now be strong (Fig 1).

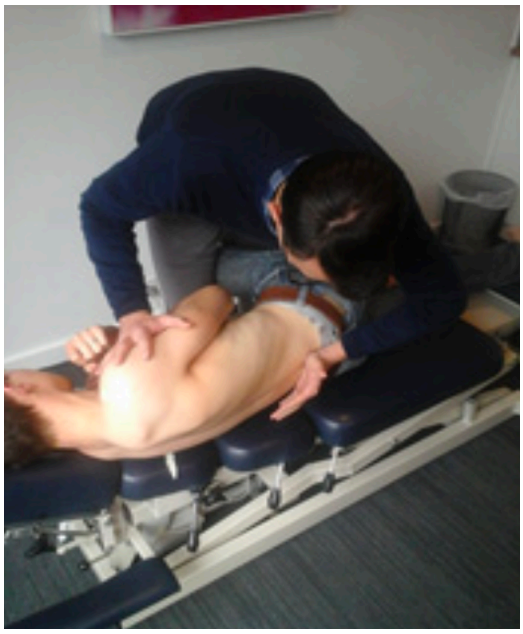
Figure 1: Neurological pretest for L5 facet syndrome on the right side.

Treating the Trapped Meniscoid Syndrome in NIP™

The principle of treatment is to open the facet at its ventral end to allow the meniscoid structure to reseat in its normal physiological relationship to the articular surfaces. Maximal gapping is the object of the exercise and this is best achieved

with the patient in the side posture position (Cramer et al, 2013) as shown in Fig 2.

Figure 2: Patient position for the application of the NIP™ trapped meniscoid adjustive procedure.



The chiropractor takes a pisiform contact with the inferior hand at the tip of the spinous process of the vertebra superior to the facet syndrome (ie L5 in a L5/S1 facet syndrome) as shown in Fig 3. After pushing the spine gently to tissue tension in extension a thrust at 45° cephalic direction using the drop mechanism set at minimum tension is applied. This direction of thrust has been shown in dry specimen experiments to cause the greatest gapping at the ventral pole of the facet. This is due to the fact that at the posterior pole, the superior facetal edge pivots on its inferior partner, allowing gapping at the ventral pole to occur. The gapping permits reseating of the meniscoid structure.

Figure 3: The chiropractor takes a contact on the inferior tip of the spinous process, pushes the lumbar spine into a position of tissue tension, and then thrusts using the drop mechanism.

The symptomatic response experienced by patients in this situation varies somewhat from almost maximal pain reduction within minutes to approximately 50% immediate pain reduction with further care needed the following day. The follow up care will almost invariably be a

standard NIP spinal basics procedure, the most common problems being a posterior pelvic floor or a sacral subluxation.

Pattern fragmentation

Like all subluxation complexes, adjusting using this technique may cause fragmentation. Because of the intimate relationship of the multifidus muscles with the joint capsule of the facet, the most likely fragmentation will involve this muscle group in either hypotonicity or, more likely hypertonicity. It is thought that this tendency to fragmentation is at least in part due to atrophy of the multifidus which may occur with acute low back pain syndromes (Goubert et al, 2016).

In order to test the neurological integrity, ask the standing patient to create a compressive force through the facet by rotating the trunk to the contralateral side while hopping on the leg on the affected side (Fig 4). They only need to do this 3-4 times and then the chiropractor tests the hamstring group, where weakness will once again be demonstrated. In some cases, this strategy is inadequate to expose the latency and the patient will need to run and the spot as well as hop. The chiropractor should also consider performing an anvil test (hitting under the heel with a closed fist).

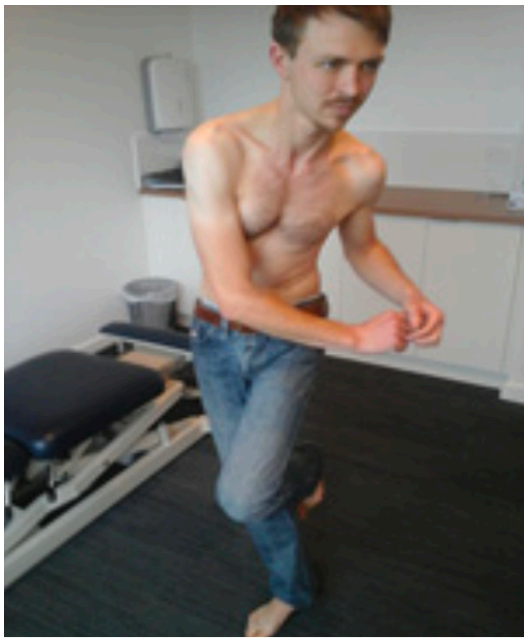


Figure 4: Testing for *multifidus* fragmentation. The patient turns the trunk to the contralateral side while hopping on the leg of the affected side.

The intrusion at the multifidus

To treat the multifidus, have the standing patient flex slightly forward and rotate the trunk to the contralateral side. Contact is taken over the multifidus in the paraspinal gutter as shown in Fig 5. The contact is held for 10-15 seconds and then a standard NIP™ thrust is made at 45° away from the spine. Retesting will demonstrate correction.

Figure 5: Making the intrusion at the *multifidus*.

Exposing the Latent Facet Syndrome

It is axiomatic that when a patient has facet syndrome where the meniscoid is no longer trapped but remains histologically irritated (and probably inflamed) they will have a corresponding weakness in the hamstring group on the affected side. When this problem is neurologically latent, one needs to ask the patient create a compressive force through the facet by rotating the trunk to the contralateral side while hopping on the leg on the affected side (Fig 4). They only need to do this 3-4 times then the chiropractor tests the hamstring group on the affected side.

Once weakness has been demonstrated, pretesting at the lumbar spinous process and the multifidus as described above is undertaken.

An important clinical point

It is important to note that when one is undertaking this testing protocol, the lumbar spine needs to be examined up to L3. It appears that the relationship to the multifidus can cause positive pretest up to that level, even though the actual mechanical problem is at L5/S1. If L5, L4 and L3 all pretest, then L3 is adjusted in the usual way. L4 and L5 should then be reassessed to see if they still pretest before proceeding with further intrusion.

The *Cluneal nerve* entrapment syndromes

Superior Cluneal Nerve

In relation to the *cluneal nerve* as if there is a single nerve trunk known by that name, the preponderance of information in the scientific literature applies to the *superior cluneal nerve*, which is in fact a series of cutaneous sensory nerve trunks arising from the dorsal ramus of the first through third *lumbar nerve* roots with terminal endings occurring in three distinct and predictable locations as shown in Figure 6.

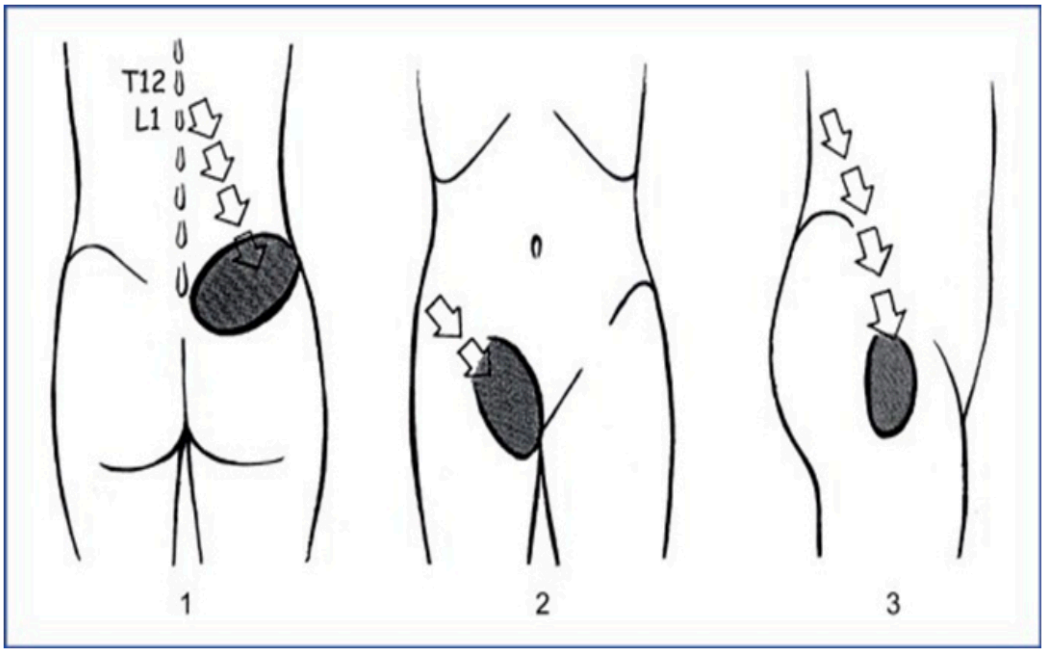


Figure 6: The three areas of cutaneous pain arising from cluneal nerve compression.

In orthopaedic medicine, pain in the distributions shown in Figure 6 is relieved by injection of local anaesthetic into the correct facet joint. It is essential for all diagnosticians confronted with

this syndrome to remember that the pattern of referred pain is not predictive of the spinal level involved.

Multiple studies confirm that there is considerable overlap in the distribution of pain stemming from the zygapophyseal joints, including anterior, lateral or posterior thigh, groin, lumbar spine region, and trochanter region. This overlap of innervation is poorly defined by the standard dermatome map. (Fukui, 1997; Maigne, 1980; Maigne. 2006; Marks, 1989; McCall et al, 1979)

Diagnosis

At history, the patient reports experiencing pain principally in area 1 (Fig 6). The astute clinician will recognise this as being possibly due to a *Maigne's syndrome*. The diagnosis is established by demonstration of the following criteria:

- Pain to palpation across the iliac crest
- Decreased sensation immediately below the iliac crest
- Demonstration of a spinal biomechanical derangement at T12, L1 or L2 where the open wedge is on the side on which the patient is reporting the symptoms
- Painful skin rolling test along the lumbar paraspinal muscles on the side on which the patient is reporting the symptoms (Fig 16.7)
- Decreased pain sensation after about 15 seconds following a contact being taken over the affected vertebra with impulse generated P-A and with the appropriate torque.

Figure 7: Skin rolling test used to confirm irritation of the *superior cluneal nerve*.

Figure 8: Intrusion at L1 PLI-m in a patient with a right sided cluneal nerve compression syndrome.

NIP™ management

Because of the YZ (sagittal) plane orientation of the lumbar facets, rotation is the least helpful direction in which to apply impulse, which should be applied P-A, I-S and appropriate torque added. The preferred method for NIP™ intrusion is shown in Figure 8.

Lateral Cluneal Nerves

The lateral cluneal nerves arise from the *iliohypogastric nerve* and distribute cutaneously over the lateral gluteals. The *iliohypogastric nerve* arises from the dorsal ramus of the L1 nerve close to the lateral margin of the *psoas m*. It descends inferiorly piercing the substance of the *quadratus lumborum*, *transversus abdominis*, and *obliquus internus*.

Diagnosis

At history, the patient reports experiencing pain principally in area 3 (Fig 6). The diagnosis is established by demonstration of the following criteria:

- Pain or hyperaesthesia to palpation in the cutaneous distribution
- Demonstration of a spinal biomechanical derangement at L1 where the open wedge is on the side on which the patient is reporting the symptoms
- Evidence of neuromuscular dysfunction syndrome at the *quadratus lumborum*, *transversus abdominis*, and *obliquus internus*
- Decreased pain sensation after about 15 seconds following a contact being taken over the affected vertebra with impulse generated P-A and with the appropriate torque.

NIP™ management

Management will involve making a NIP™ intrusion at the vertebral level as shown in Figure 8 or at one of the muscles identified above in the event the protocol leads you to a neuromuscular dysfunction syndrome.

Middle Cluneal Nerve

Middle cluneal nerve compression syndrome is far less common than the classic *Maigne's syndrome* (*superior cluneal nerve* compression), but symptomatically troublesome nonetheless. The *middle cluneal nerve* arises from the dorsal rami of the S2 and S3 nerves and traverses beneath the superficial fibres of the long sacroiliac ligament (Konno et al, 2017) to terminate cutaneously in the central gluteal area.

Compression is a recognised cause of low back and lateral leg pain (Aota, 2016).

Diagnosis

At history, the patient reports experiencing pain over the gluteus medius and into the lateral thigh, but never progressing below the knee. The diagnosis is established by demonstration of the following criteria:

- Pain or hyperesthesia to palpation in the cutaneous distribution
- Demonstration of a spinal biomechanical derangement at sacroiliac joint involving an AS, ASIn or ASEx ilium on the side on which the patient is reporting the symptoms
- Pain on palpation of the long sacroiliac ligament
- Decreased pain sensation after about 15 seconds following a contact being taken at either the contact for posterior sacrum intrusion or over the long sacroiliac ligament at the point of pain

NIP™ management

Management will involve the normalisation of ligamentous stretch in the long sacroiliac ligament. Stretch occurs with anterosuperior movement of the PSIS associated with the AS ilium and its compounds (ASIn/ASEx) and the posteriorly rotated sacrum (Fig 9)

Figure 9: Intrusion at the long sacroiliac ligament in a patient with a middle cluneal nerve compression syndrome.

Inferior Cluneal Nerve

This nerve arises from the *posterior femoral cutaneous nerve* (S1-3). Its distribution is in and around the genitalia of both men and women as shown in area 2 in Figure 6. It is closely associated with that of the pudendal nerve.

The diagnosis and NIP™ management is covered in the discussion of the anterior pelvic floor.

NIP™ Management of Pelvic Pain Syndromes

Introduction

Pelvic pain syndromes, at least in a neuromusculoskeletal sense, may arise from the following structures:

- L5/S1 junction
- L5 or sacral subluxation
- Sacroiliac joint
- Sacral or innominate subluxation
- Sacral Segments
- Sacroiliac ligament system
- Short SI ligament, long SI ligament, iliolumbar ligament or sacrotuberous ligament
- Pubic symphysis

Also consider

- Rectus abdominis neuromuscular dysfunction syndrome
- Pelvic floor neuromuscular dysfunction syndrome
- Quadratus lumborum neuromuscular dysfunction syndrome
- Posterior tibial subluxation

Important clinical point

Clinical pain syndromes arising for the somatic structures, while very common, are not the sole reason for pelvic pain. Pathology involving the bowel, bladder, kidneys, uterus, ovaries, testes, rectum and external genitalia along with bone disease, neurological disease and sexually transmitted disease can and most certainly do cause pelvic pain and must be duly considered by the conscientious Chiropractor.

Thorough, careful clinical history, physical examination and judiciously chosen diagnostic imaging are of paramount importance when confronted by a patient with pelvic pain

The Diagnostic algorithm

The NIP™ diagnostic algorithm follows the typical pattern of careful weighting of key questions from the clinical history (determination of precise pain pattern locality, timing, exacerbation and remission) to central and then to peripheral structures, biomechanical to neurological tests and finally diagnostic impression to conclusive pre-test.

Typical patterns of somatic pain

It is important to remember when evaluating a patient with low back and leg pain that with the exception of the S1 nerve, pain patterns do not follow dermatomal maps commonly in use (Murphy et al, 2009). The typical patterns of somatic pain that are commonly elicited at history are shown in Table 1 below

Table 1: Patterns of somatic pain and the structures from which they arise.

Structure	Pain Pattern
L5/S1	Low back, posterior acetabulum, posterolateral thigh. Pain below the knee all the way to the foot suggests a more severe disc injury (Murphy et al 2009)
Sacroiliac Joint	Low back, PSIS area, buttock, groin, posterior thigh Tingling/numbness: Posterolateral thigh and calf (Murakami et al 2017)
Sacral Segments 1, 2 & 3	Low back and sacroiliac
Sacral Segments 4 & 5	Sacrococcygeal region
Short SI Ligament	In the mid-joint when the ilium is externally rotated
Long SI Ligament	Low back, PSIS area, buttock, groin, posterior thigh Tingling/numbness: Posterolateral thigh and calf (Murakami et al 2017)
Iliolumbar Ligament	Low back over the ligament (Kiter et al 2010). Occassionaly lateral hip and thigh pain may occur.
Sacrotuberous Ligament	Sacroiliac, low back, groin, gluteal, posterior &/or posterolateral thigh and lateral knee pain
Pubic Symphysis	Pubis, groin, anterior hip, medial upper thigh, sacroiliac
Rectus Abdominus	Pubis, suprapubic, low back and sacroiliac
Pelvic Floor (posterior)	Low back, lower lumbar paraspinal, anogental (Univeristy of Chicago Medical Centre 2017)
Pelvic Floor (anterior)	Pubic, groin and genitalia. Symptoms may also include numbness, tingling and dysesthesia
Quadratus Lumborum	Low back, paraspinal, sacroiliac, buttocks and posterior acetabulum
Posterior Tibial Subluxation	Deep, aching sensation in ipsilateral sacroiliac joint
Broad ligament	Persistent pelvic and low back pain
Prostate	Low back pain

The preferred order of the Biomechanical Examination

The mechanics of the biomechanical examination are set out in exhaustive detail in a related paper. To maintain functional logic in the diagnostic algorithm, the order in which the individual structures should be examined are as follows:

- L5/S1 flexion/extension
- Sacroiliac joints flexion/extension
- Lumbar motion segments
- Sacral segments
- Sacroiliac joints internal/external rotation

Application of current treatment protocols

The L5 Subluxation

The biomechanical function of the lumbosacral junction is obscure, but its clinical significance is not, as it is the most common site of low back pain in mankind (Ezemagu UK, 2017). Pain from the L5/S1 junction is obviously associated with both the L5 subluxation and the sacral subluxation in all its permutations.

Typically, the L5 subluxation results in low back, posterior acetabulum and posterolateral thigh. Pain below the knee all the way to the foot suggests a more severe disc injury (Murphy et al, 2009) and requires careful orthopaedic and neurological examination.

The sacral subluxation may also produce a pain pattern similar to that but also includes the possibility of sacroiliac joint pain and groin pain, the latter particularly in the case of the posteriorly rotated sacrum where the innominate is anterior/superior.

The biomechanical and neurological assessment method for the subluxation at L5 has been adequately described elsewhere.

Assessment & adjustive intrusion

The method of assessment and adjustive intrusion for the subluxation at L5 swill be adequately described in a future, related paper

Common patterns of fragmentation

The most likely sites of fragmentation will be the iliolumbar ligament and the multifidus on the side of the open wedge.

Fragmentation involving the iliolumbar ligament will be seen as weakness in the *semimembranosus*, *semitendinosus*, or *biceps femoris* on the side of the open wedge, usually on full inspiration, but possibly on full expiration. This weakness will be eliminated when impulse is applied to the ligament in a direction toward the ilium.

Fragmentation involving the *multifidus* will be seen as a loss of humeral abduction on the side of the open wedge when the standing patient is asked to flex slightly forward and rotate the trunk to the contralateral side. To eliminate this fragment, contact is taken over the *multifidus* in the paraspinal gutter (Fig 5) and held for 10-15 seconds followed by a standard NIP™ thrust directed at 45° away from the spine. Retesting will demonstrate normal humeral abduction.

The problem of pattern recurrence

Recurrent L5 subluxation may be due to the following unrecognised problems:

- fragmentation following adjustive intrusion,
- weakness in the psoas on the side of the open wedge
- latent weakness in the psoas on the side of the open wedge

- cross reactive weakness of the psoas to the anterior neck flexor
- orthopaedic subluxation in the lower extremity on the side of the open wedge

Sacroiliac Joint

Despite spectacular advances in diagnostic imaging, the accurate diagnosis of low back pain that involves sacroiliac joint dysfunction remains somewhat elusive. In a study by Dreyfuss et al, (2017) which attempted to evaluate the usefulness of clinical history and physical examination in the diagnosis of sacroiliac joint pain, they concluded '*sacroiliac joint pain is resistant to identification by the historical and physical examination data from tests evaluated in this study*.'

This has led to treatment options that are no options at all. It has, for sake of argument, been a common procedure amongst orthopaedic surgeons to attempt to surgically fuse the suspect sacroiliac joint. This procedure is a failure and is now fortunately falling into disrepute (Bina & Hurlbert, 2017). You should actively discourage patients from submitting to this procedure.

In NIP™ the sacroiliac joint is first and foremost considered as part of a complex pelvic ring function, a diagnosis of sacroiliac joint dysfunction being arrived at largely by exclusion of the more compound, multiple joint problems such as the sacral subluxation.

It has long been a criticism of chiropractic that motion palpation of the sacroiliac joints is inaccurate, invalid and lacks for reliability between clinicians. The NIP™ model has utilised a composite of motion palpation and neurologically based provocation tests for close to a quarter of a century now and recent research by Arab et al (2009) has now drawn the following affirming conclusion 'I*t seems that composites of motion palpation and provocation tests together have reliability sufficiently high for use in clinical assessment of the SIJ*'.

In their study '*Innominate movement patterns, rotation trends and range of motion in individuals with low back pain of sacroiliac joint origin*' Adhia et al (2016)concluded that their findings demonstrate a clear association between SIJ pain and altered innominate kinematics, adding further affirmation to the NIP™ model of sacroiliac joint assessment.

Pain arising from the sacroiliac joint occurs in complex patterns due to the compound biomechanical problems that it is so commonly associated with. Areas of pain may include the sacroiliac joint itself, the groin, the testes and lateral shaft of the penis, the pubis and the hips.

Leg symptoms associated with SIJ pain originating from the posterior sacroiliac ligament include both pain and numbness, which do not usually correspond to the dermatome (Murakami et al, 2017) and seldom if ever extend below the knee.

The Sacral Subluxation

As stated earlier in this paper while biomechanical function of the lumbosacral junction is obscure, it is the most common site of low back pain in mankind (Ezemagu UK, 2017). Pain from the L5/S1 junction is obviously associated with both the L5 subluxation and the sacral subluxation in all its permutations.

Typically, the L5 subluxation results in low back, posterior acetabulum and posterolateral thigh. Pain below the knee all the way to the foot suggests a more severe disc injury (Murphy et al, 2009) and requires careful orthopaedic and neurological examination. The sacral subluxation may also produce a pain pattern similar to that but also includes the possibility of sacroiliac joint pain and groin pain, the latter particularly in the case of the posteriorly rotated sacrum where the innominate is anterior/superior.

The biomechanical and neurological assessment method for the subluxation at L5 will be described in a future associated paper. The method of assessment and adjustive intrusion for the sacral subluxation will be described in a future associated paper.

Common patterns of fragmentation

The most likely, and certainly the most common site of fragmentation is the cranial problem evidenced by retained elevated pressure in the ventricles. This will be demonstrated by a failed past pointing test, particularly when the head is taken into rotation to the side opposite that of the eye which initially demonstrated increased intra-ocular pressure.

Less likely is fragmentation involving the short and long sacroiliac ligaments. This will be seen as incomplete resolution of arm abduction and persisting weakness of the semimembranosus, *semitendinosus*, or *biceps femoris* on the side of the affected sacroiliac joint when the ligament is stretched. For the short ligament, stretching is accomplished by pushing the joint open (M-L force applied to the PSIS), while for the long ligament, taking the innominate into an AS position will effectively cause stretch.

Finally, fragmentation is occasionally seen involving organosensory neurodysfunction of the prostate or broad ligament of the uterus. When the prostate or the anterior fibres of the broad ligament are involved, the specific pain point (Chapman's reflex) will be the posterior margin of the *iliotibial band*, more particularly in its proximal one third. When the posterior fibres of the broad ligament are involved, the relevant pain point will be laterally on the sacral base. This may be seen as incomplete resolution of arm abduction and persisting weakness of the *semimembranosus*, *semitendinosus*, or *biceps femoris*. Creating impulse over the appropriate point will produce an immediate resolution of the arm abduction and the muscle weakness.

The problem of pattern recurrence

Recurrent sacral subluxation may be due to the following unrecognised problems:

- fragmentation following adjustive intrusion,
- weakness in the psoas on the ipsilateral side, or bilaterally with midline problems
- latent weakness in the psoas on the ipsilateral side, or bilaterally with midline problems
- cross reactive weakness of any muscle that acts upon the hip
- orthopaedic subluxation in the lower extremity on the ipsilateral side, or bilaterally with midline problems

The Innominate Subluxation

The innominate subluxation as a stand-alone entity is very uncommon. It can occur as a unilateral problem, a bilateral problem or even as a rotation/counter-rotation Y-axis problem (In-Ex pelvis).

The reality is, however, that it exists as an element of a more complex problem (ie sacral rotation, sacral base problem, iliolumbar ligament, pubic rotation, etc).

It is essential that during motion evaluation, the patient does not move backwards and forwards but slumps up and down literally along the Y-axis in order to produce rotation about the X-axis. Compliance can be seen as the patients' shoulders moving only vertically.

The typical pain patterns have been described earlier in this paper.

Assessment & adjustive intrusion

The method of assessment and adjustive intrusion for the innominate subluxation will be described in a future paper in this series.

Common patterns of fragmentation

The most likely structures to be involved in fragmentation are the sacroiliac ligaments (iliolumbar, short SI, long SI and sacrotuberous). Dural fragmentation patterns are unheard of

with innominate subluxation. While uncommon, it is possible to see fragmentation in the pubic symphysis, *rectus abdominis* and *linea alba*.

The problem of pattern recurrence

Recurrent innominate subluxation may be due to the following unrecognised problems:

- fragmentation following adjustive intrusion
- weakness in the psoas on the ipsilateral side, or bilaterally with midline problems
- latent weakness in the psoas on the ipsilateral side, or bilaterally with midline problems
- weakness of the hamstring group, quadriceps, sartorius, TFL, gluteus medius, gluteus maximus and piriformis
- cross reactive weakness of any muscle that acts upon the hip
- orthopaedic subluxation in the lower extremity on the ipsilateral side, or bilaterally with midline problems
- sacroiliac ligament syndromes
- posterior tibial subluxation
- unresolved scar subluxation
- the wearing of high heeled shoes
- sitting for long periods, especially in a slouched posture.

Sacral segment subluxation

It has been widely held that sacral segments are solidly fused by the onset of puberty or thereabouts. This notion is not borne out clinically and functional versus non-functional status can be demonstrated at all ages using the NIP™ composite method of assessment.

Generally speaking, the upper three sacral segments (S1, S2 & S3) tend to cause low back and sacroiliac joint pain, while the terminal two segments (S4 & S5) cause pain that is often indistinguishable from coccydynia.

In the adolescent and adult population, sacral segment subluxation is not particularly common below S2, the more common problem being S1. In the paediatric population, however, sacral segment subluxation occurs at all five levels with variable frequency according to a wide range of traumatic factors according to age. In babies, the most common trauma is the birthing process while in older children it is all manner of accidental events such as falls.

Unfortunately, a small number of children will present with such problems due to physical and sexual abuse.

Assessment & adjustive intrusion

The method of assessment and adjustive intrusion for the sacral segment subluxation will be described in a future paper in this series.

Common patterns of fragmentation

The most likely structures to be involved in fragmentation from the sacral segments are the ventricles, sacroiliac ligaments (iliolumbar, short SI, long SI and sacrotuberous) prostate or broad ligament.

The lower in the sacrum the initial subluxation, the more likely it is that the fragmentation will be seen in the ventricles and/or falx cerebri.

The problem of pattern recurrence

Recurrent sacral segment subluxation may be due to the following unrecognised problems:

- fragmentation following adjustive intrusion, seen more particularly in the ventricles and falx cerebri
- weakness of the hamstring group, quadriceps, adductors, sartorius, and piriformis
- orthopaedic subluxation in the lower extremity on the ipsilateral side, or bilaterally with midline problems
- sacroiliac ligament syndromes
- the wearing of high heeled shoes
- sitting for long periods, especially in a slouched posture
- Prostate and broad ligament

Important clinical correlations

Chordoma

This is a rare type of cancer that occurs in the sacrum as well as the bones of the skull base and spine. Chordoma is part of a group of malignant bone and soft tissue tumours called sarcomas.

Chordomas account for about 3 percent of all bone tumours and about 20% of primary spinal tumours. They are the most common tumour of the sacrum. Faced with recurrent sacral segment subluxation, chordoma should be considered (Romano et al, 2016) when the patient exhibits:

- Pain at the site of the tumour due to tumour growth
- Back pain, often radiating to other parts of the body
- Loss of sensation or muscle weakness, especially in the arms or legs
- Difficulty walking, sometimes leading to falls
- Decreased sensitivity to pain, heat and cold

Pilonidal Sinus

A chronically infected pilonidal sinus may present with nothing more than a painful small mass from which protrudes one or more hairs The tenderness may easily be mistaken for that associated with sacral segment subluxation. If you squeeze the mass between your fingers, you may see a discharge of pus. When active like this, the patient needs to see a surgeon to have the sinus closed.

Ligaments associated with the Sacroiliac Joint

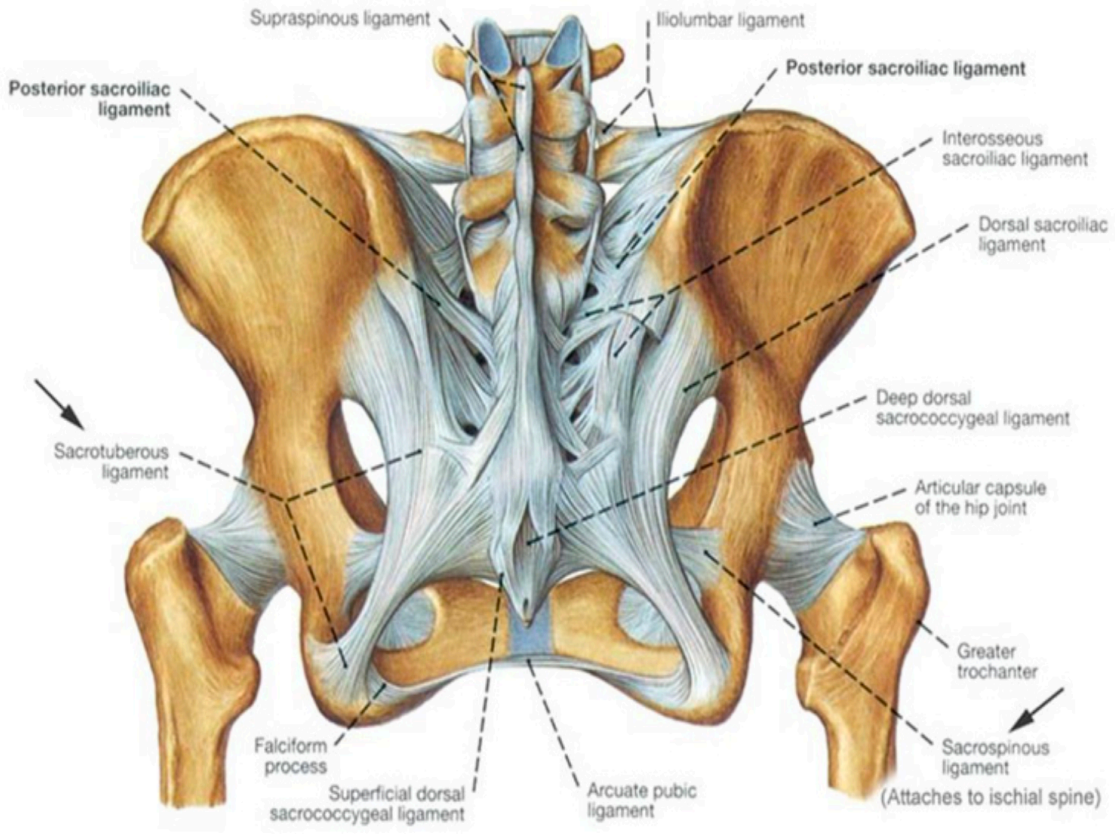
These include the following:

- Short Posterior SI ligament
- Long Posterior SI ligament
- Iliolumbar ligament
- Sacrotuberous ligament

All these connective tissue structures may be involved in pelvic pain syndromes and must always be considered and evaluated as fragmented patterns associated with sacral and innominate subluxation. Primary subluxation patterns in the ligament system is a very unlikely scenario and for all intents and purposes can be ignored. They are all readily accessible to direct palpation (Fig 10) and biomechanical stress testing procedures.

Connective Tissue anatomy of the posterior Pelvis

Figure 10: Ligamentous anatomy of the posterior pelvis



The Short (Posterior) SI Ligament

Tension increases in this ligament when the sacrum counter-nutates and the PSIS moves anteriorly and superiorly (AS innominate). Tension is also increased when the ilium moves away from the sacrum in external rotation (Ex innominate).

Associated clinical features

When fragmentation involving the short posterior SI ligament is in play, the following clinical features will be present:

- Pain to moderate palpation over the ligament
- Pain at the attachment to the sacrum
- Relief of pain when the sacrum is taken into nutation
- Hamstring weakness that strengthens when impulse is held over the pain point(s) in the ligament and its sacral attachments

The adjustive intrusion

This is effected with a single NIP™ hold and thrust from P-A as close to the medial margin of the PSIS as is practicable (Fig 11).

Figure 11: Application of the adjustive intrusion for the short posterior SIJ ligament.

The Long (Dorsal) SI Ligament

Tension increases in this ligament when the sacrum counter-nutates and the PSIS moves anteriorly and superiorly (AS innominate).

Associated clinical features

When fragmentation involving the long posterior SI ligament is in play, the following clinical features will be present:

- Pain to moderate palpation over the ligament immediately below the attachment
- to the inferior aspect of the PSIS
- Relief of pain when the sacrum is taken into nutation
- Hamstring weakness that strengthens when impulse is held over the pain point(s) in
- the ligament.

The adjustive intrusion

This is effected with a single NIP™ hold and thrust from P-A and I-S over the pain point(s) in the ligament (Fig 12).

Figure 12: Application of the adjustive intrusion for the long posterior SIJ ligament.

The Iliolumbar Ligament

The iliolumbar ligament is a critically important structure in low back and pelvic pain presentations.

The ligament arises from the transverse process of L5 and as it passes laterally breaks into two bands.

The more caudal of these bands attach to the base of the sacrum anteriorly and become fused with the fibres of the anterior short sacroiliac ligament. The more cephalad band attaches to the crest of the ilium at the same level as the L5 transverse process.

Tension increases in this ligament when the innominate moves posteriorly and inferiorly (PI) and when the body of the L5 vertebra rotates away from the affected side. This should be taken to mean, for instance, that L5 PRS will cause the ligament on the right to become taut.

The clinician should be diligent to note that the fibres of this ligament are in intimate relation to the *psoas major* anteriorly, the muscles occupying the paravertebral gutter posteriorly (pay particular attention to the *multifidus*) and the *quadratus lumborum* superiorly.

Associated clinical features

When fragmentation involving the iliolumbar ligament is in play, the following clinical features will be present:

- Pain to moderate palpation over the ligament between its vertebral and iliac crest attachments
- Relief of pain over the ligament when the innominate is manually taken into an AS position
- Relief of pain in the quadratus lumborum when the innominate is manually taken into an AS position
- Normalisation of arm abduction range of motion when impulse is applied to the ligament of the seated or standing patient
- Hamstring weakness that strengthens when impulse is held over the pain point(s) in the ligament

The adjustive intrusion

This is effected with a single NIP™ hold and thrust from P-A and M-L over the ligament (Fig 13)

Figure 13: Application of the adjustive intrusion for the iliolumbar ligament.

The Sacrotuberous Ligament

The sacrotuberous ligament is a critically important structure in low back and pelvic pain presentations. It has a broad, fan-like origin from the sacrum, coccyx, ilium and sacroiliac joint capsule. Its fibres converge to course caudally to insert into the medial ischial tuberosity and additional fibres (known as the falciform ligament) extend to the ischial ramus (Bierry et al, 2014; Mercer, 2005).

The sacrotuberous ligament syndrome is implicated in buttock pain and pain radiating down the thigh and calf in the posterior midline. It is also an integral part of anterior rotation subluxations of the sacrum and therefore associated with low back pain, groin pain and suboccipital headache.

Associated clinical features

When fragmentation involving the sacrotuberous ligament is in play, the following clinical features will be present:

- Pain to moderate palpation at the inferior margin of the ligament
- Biceps femoris weakness that strengthens when impulse is applied to the inferior margin of the ligament in a P-A, I-S & M-L direction

The adjustive intrusion

This is effected with a single NIP hold and thrust from P-A, I-S and M-L applied to the inferior margin of the ligament at the level of the tip of the coccyx (Fig 14).

Figure 14: Application of the adjustive intrusion for the sacrotuberous ligament.

The Pubic Symphysis

The pubic symphysis is a unique joint which consists of a fibrocartilaginous disc sandwiched between the articular surfaces of the pubic bones.

It resists tensile, shearing and compressive forces and is capable of a small amount of movement of up to 2mm under physiological conditions in most adults (Becker et al, 2010).

During pregnancy, circulating hormones such as relaxin induce resorption of the symphyseal margins and structural changes in the fibrocartilaginous disc, increasing symphyseal width and mobility.

Pain in the region of the pubic symphysis, referred to as symphyseal pain or symphyseal dysfunction, can affect a diverse group of individuals including athletes, patients with traumatic pelvic injuries, and pregnant women (Gibbon & Hession, 1997; Owens et al, 2002; Robinson et al, 2007; Ronchetti et al, 2007; Cheer & Pearce, 2009). While it is far more common in multiparous women, it can and does occur in nulliparous women and to a lesser extent in men.

While not invariable, trauma is usually a feature of the clinical history in men.

There are four ligaments that reinforce the pubic symphysis (Becker et al, 2010). These are:•

- The superior pubic ligament
- The inferior pubic ligament
- The anterior pubic ligament
- The posterior pelvic ligament

The superior pubic ligament bridges the superior margins of the joint and is attached to the pubic crest as far laterally as the pubic tubercles (Gamble et al, 1986). This ligament has connections with the interpubic disc, the *pectineal* ligament, the *linea alba* and the periosteum of the superior pubic ramus.

The inferior pubic ligament forms an arch spanning the inferior pubic rami which blends with the interpubic disc and posterior pubic ligament. The anterior pubic ligament connects the pubic bones anteriorly and merges with their periosteum laterally.

The more superficial fibres merge with the insertion of the r*ectus abdominis*, *transverse abdominis* and *pyramidalis*.

Finally, the posterior pubic ligament spans the posterior aspect of the pubic symphysis and apparently consists of only a few thin fibres. The posterior ligament is of little clinical interest to the Chiropractor.

The significance of the anatomy of the pubic symphysis is seen in the multidirectional movements (Becker et al, 2010; Meissner et al, 1996) and the points of attachment of the superior, anterior and inferior pubic ligaments into the periosteum of the pubic bone, locations which concur exactly with the pain findings established in the NeuroImpulse protocol™ for the various directions of kinesiopathological movement.

Assessment and adjustive intrusion

The method of assessment and adjustive intrusion for subluxation of the pubic symphysis will be described in a future paper. It should be borne in mind that because the ligaments figure as part of both the assessment and points of intrusion, it would seem impossible for there to be a fragmentation involving those structures. Indeed, collective clinical experience with adjusting the pubic symphysis gives powerful testimony to this hypothesis.

Common patterns of fragmentation

The most likely sites of fragmentation involving the pubic symphysis are muscular in nature and dependent upon which ligaments are the most compromised by the attendant kinesiopathology.

When the superior and/or anterior ligaments are involved, fragmentation will most likely occur in the *rectus abdominis*, t*ransverse abdominis*, or *linea alba*. When the inferior ligament is involved, the most likely site of fragmentation will be the *adductor* muscles.

The problem of pattern recurrence

Recurrent pubic symphysis subluxation is not particularly common. This situation is most likely to occur following significant trauma which has increased the joint width, with unrecognised fragmentation or in cases of prenatal or postnatal pelvic instability. It is also evident in patients who engage in repetitive activities, particularly football (one leg standing and pelvic torsion on kicking) but also in poor posture, such as the male who sits for hours in the evening on the sofa with one foot on the other knee in a 'Figure 4' position.

The *Rectus Abdominis*

The *rectus abdominis* has its origin at the crest of the pubis and inserts into the costal cartilages of ribs 5-7 as well as the xiphoid process of the sternum. Importantly from a clinical perspective its nerve supply is segmentally by thoraco-abdominal nerves (T7 to T11) and subcostal (T12).

While the thoraco-abdominal nerves supply the majority of the muscle , the lower reaches are supplied by the subcostal nerve in the same serial manner as that of the thoraco-abdominal nerves. It does, however, communicate with the iliohypogastric nerve to give a branch to the *pyramidalis* muscle which lies superficially over the origin of the *rectus abdominis* and continues on to supply the anterior *gluteal muscle*s and the *tensor fascia lata* (Goss, 1974).

The *rectus abdominis* is frequently involved in patients with low back pain, gluteal pain, hip pain and on occasion lateral leg pain. This wide spread effect is due to its involvement in spinal dynamic stabilisation and the reflexive action while the patient is in the upright posture with the *multifidus*, *lumbar erector spinae*, *thoracic erector spinae*, *transverse abdominis*, *abdominal internal obliques*, and *abdominal external obliques* (Lee et al, 2016). It would appear that this widespread effect is why it presents clinically as paradoxical kinesiopathology in the posterior elements of the pelvis.

Failure to consider the *rectus abdominis* as a primary pattern of dysafferentation may lead to a very frustrating clinical experience for both the clinician and the patient.

Assessment & adjustive intrusion

The method of assessment and adjustive intrusion for subluxation of the rectus abdominis will be described in an associated paper.

Common patterns of fragmentation

The most likely sites of fragmentation are the xiphoid, diaphragm (medial), pubic symphysis, pubic ligaments, *transverse abdominis*, *abdominal oblique* muscles, *quadratus lumborum*, pelvic floor, S-reflex latent pelvic floor, *gluteus minimus* and *tensor fascia lata*, the latter two due to the neurological connection via the lateral cutaneous branch of the subcostal (12th thoracic) nerve.

The problem of pattern recurrence

Recurrent rectus abdominis subluxation is unfortunately common enough. This is a result of lifestyle factors such as sport, an occupation requiring repetitive lifting from floor/ground level,

chronic coughing, age related weakness, scarring due to previous abdominal surgery and unrecognised fragmentation from a wide range of muscular and joint structures.

The Pelvic Floor (Posterior Portion)

The pelvic floor syndrome is an extremely painful, disabling problem that mimics acute lumbar subluxation and lumbar disc syndrome. Patients are often sent for unnecessary scans and in some cases, where there is a diffuse annular bulge even surgery. The involvement can be unilateral or bilateral and pain typically is located in a pattern consistent with an L5 disc lesion.

Typical symptoms associated with pelvic floor syndrome are:

- The feeling that you need to have several bowel movements during a short period of time.
- The feeling that you cannot complete a bowel movement.
- Constipation or straining pain with bowel movements.
- A frequent need to urinate. When you do go, you may stop and start many times.
- Painful urination.
- Pain in your lower back that cannot be explained by other causes.
- Ongoing pain in your pelvic region, genitals, or rectum.
- Pain for women during intercourse.

Contraction of the pelvic floor will always be associated with a base posterior sacrum. Once corrected, providing there are no fragmentation elements, on the second visit there is usually either a base anterior sacrum or a base posterior sacrum.

> The base anterior sacrum is a most welcome outcome as it implies no recurrence of the pelvic floor contraction, but a base posterior sacrum is just as unwelcome as it implies a multi-layered problem that may take many visits to correct.
>
> It is common to see multiple relapses of both the pelvic floor and the base posterior sacrum, sacral segment subluxation, pelvic ligament subluxation, quadratus lumborum syndrome and a variety of cranial issues, principally ventricular compression and falx cerebri problems.

Assessment & adjustive intrusion

The method of assessment and adjustive intrusion for subluxation of the pelvic floor will be described in an associated paper.

Common patterns of fragmentation

The pelvic floor is intimately associated with dural tension and CSF pressure and disturbed hydrodynamics. Fragmentation from adjusting the pelvic floor is therefore most likely to involve the ventricles.

Other less likely but probable sites include any of the pelvic ligaments, the pubic symphysis and its associated ligaments, the *rectus abdominis* and the *quadratus lumborum*.

The problem of pattern recurrence

Recurrent pelvic floor subluxation is a very particular clinical problem that seems to relate to two dominant factors:

1. Lifestyle factors such as sport, an occupation requiring repetitive lifting from floor/ ground level, chronic coughing, age related weakness, scarring due to previous abdominal surgery and unrecognised fragmentation from a wide range of muscular and joint structures
2. Undetected persistent latent pelvic floor from the S-reflex phenomenon.

The Pelvic Floor (Anterior Portion)

The anterior pelvic floor syndrome is essentially mechanical entrapment of the inferior branches of the cluneal nerve. Disturbing symptoms such as genital dysaesthesia, inability to reach orgasm in women, changed or loss of sensation on the shaft of the penis, pain on intercourse in women, groin pain, anterior thigh pain and urinary frequency, including needing to urinate frequently at night.

Assessment & adjustive intrusion

In terms of the subluxation assessment, the only difference between the posterior and anterior pelvic floor is the weakness of the *hip adductors*. The *adductors* are, of course weak with posterior pelvic floor problems. With the anterior pelvic floor, the *adductors* only become weak after the patient bears down and squeezes the thighs together hard. All the kinesiopathological and other neurological evidence is the same.

The intrusion is a difficult manoeuvre to perform. The patient is seated to begin with.

The clinician slides the contact hand under the pelvis until the ridge on the posterior surface of the pubic ramus is encountered (Figs 15, 16). Digital pressure is maintained over the muscle for 30-40 seconds.

Figure 15: Contact for the anterior pelvic floor.

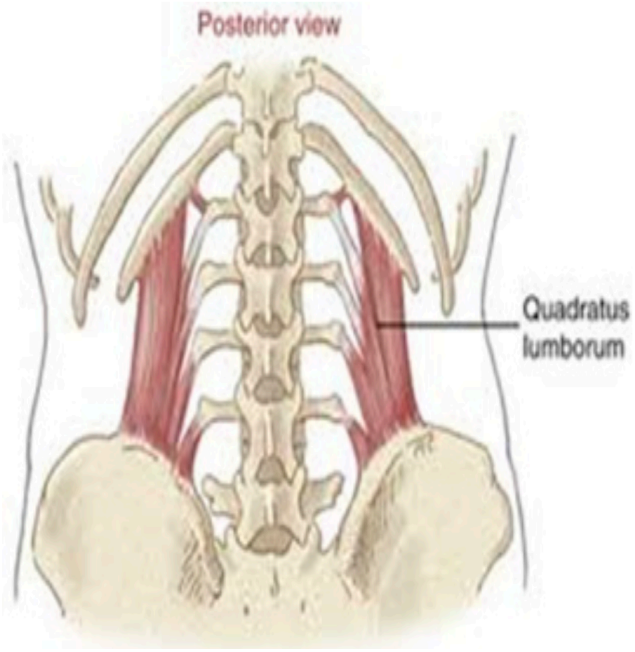
Figure 16: Application of the anterior pelvic floor contact on the seated patient.

Both the Common patterns of fragmentation and the problem of pattern recurrence are unknown at the time of writing.

The *Quadratus Lumborum*

The *quadratus lumborum* is located along the posterior abdominal wall. It is the deepest of the posterior abdominal wall muscles. Its origin is the iliac crest and iliolumbar ligament and its insertion is the 12th rib and the transverse processes of L1-L4 (Fig 17).

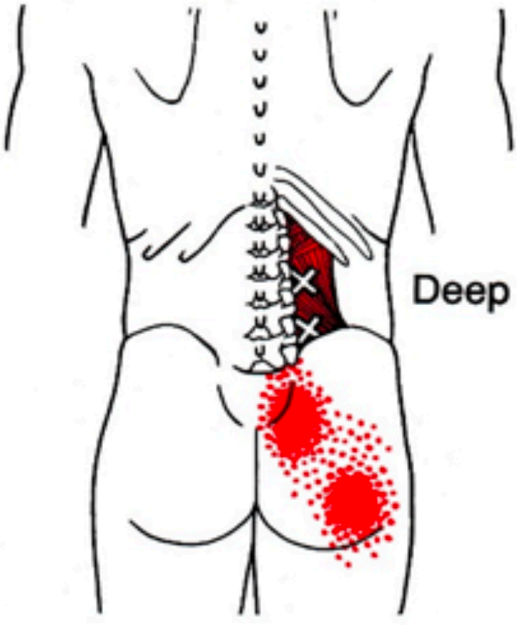
Figure 17: Anatomy of the quadratus lumborum



Typical symptoms associated with the quadratus lumborum are as follows (Fig 18):

- Deep aching pain in the lumbar paraspinal area
- Increased pain when transitioning from supine or sitting to standing
- Pain which radiates to the *gluteus medius*
- Pain which radiates to the *gluteus maximus*

Figure 18: Pain patterns from the quadratus lumborum



Assessment & adjustive intrusion

The method of assessment and adjustive intrusion for subluxation of the pelvic floor is given is a related paper.

Common patterns of fragmentation

Fragmentation from adjusting the *quadratus lumborum* very commonly involves the 12th rib (which will be inferior), the lateral *diaphragm* and the iliolumbar ligament.

The problem of pattern recurrence

Recurrent *quadratus lumborum* subluxation is an all too common clinical problem. First, it is particularly related to concurrent problems involving the 12th rib and second, the lateral *diaphragm*.

Third, it may also be related to the 4th cervical (phrenic) nerve and its peculiar relationship to the *anterior scalene muscle* and the *diaphragm*. Fourth, it may be a result of an active S-reflex (latent pelvic floor) and last, it is susceptible to cranial faults.

At a lifestyle level, the *quadratus lumborum* is particularly impacted by the effect of high heeled shoes, prolonged sitting and generally poor posture.

The posterior tibial syndrome

There is an unusual relationship that exists between the lower limb and deep, intractable aching in the sacroiliac joint. Patients suffering from this syndrome are usually unresponsive to conservative treatment. They present with chronic, aching quality pain which they identify as being deep in the sacroiliac joint.

On examination, we see the following:

- Hard locking quadriceps
- Weak hamstring muscles
- Weak gluteus maximus

The neurological pretest is instructional. Impulse is instigated in the popliteal fossa from P-A as the *hamstring* is tested (Fig 19). The previously weak muscle now will test strong. The intrusion is a simple drop piece assisted NIP™ thrust, preferable with the pisiform (Fig 20). It is not usually recurrent and there are no known fragmentation patterns.

Figure 19: Neurological pretest for the posterior tibial syndrome.

Figure 20: Intrusion for the posterior tibia.

The Broad Ligament Syndrome

The broad ligament is a sheet of peritoneum, associated with the uterus, fallopian tubes and ovaries (Fig 21). It is a possible cause of pelvic and low back pain in women. Anatomically, the broad ligament can be divided into three regions:

i. Mesometrium, surrounds the uterus and is the largest subsection of the broad ligament. It runs laterally to cover the external iliac vessels, forming a distinct fold over them. The mesometrium also encloses the proximal part of the round ligament of the uterus.

ii. Mesovarium, part of the broad ligament associated with the ovaries. It projects from the posterior surface of the broad ligament and attaches to the hilum of the ovary, enclosing its neurovascular supply. It does not, however, cover the surface of the ovary itself.

iii. Mesosalpinx, originates superiorly to the mesovarium, enclosing the fallopian tubes.

Trauma to the fascial layers in the ligament have been reported in the scientific as causing persistent pelvic pain, dyspareunia (pain during intercourse), menstrual disturbances and back pain (Allen & Masters, 1955).

While trauma of this nature is quite a rare cause of pelvic and back pain, a strain in the ligamentous fibres and associated fascia causing neurological compromise is far more frequently encountered.

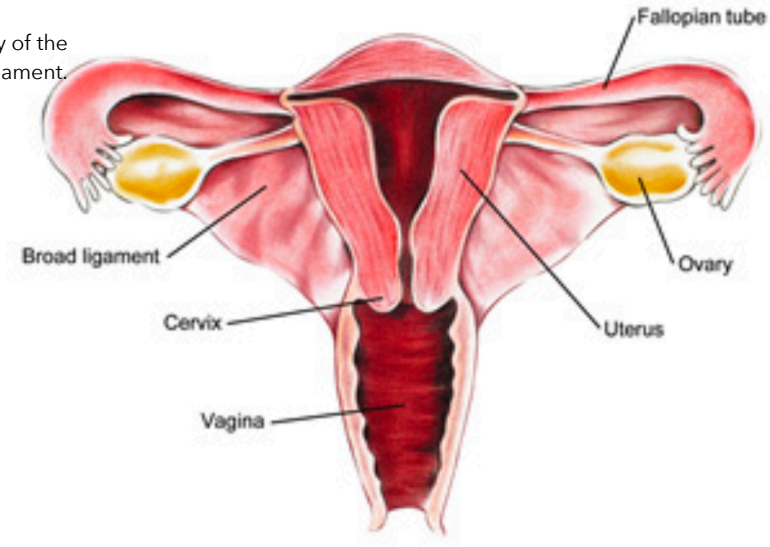


Figure 21: The anatomy of the broad ligament.

Assessment and adjustive intrusion

Organosensory neurodysfunction of the broad ligament of the uterus, either as a fragmentation from a sacral or innominate intrusion, or indeed as a stand-alone active pattern of subluxation is relatively common in women with pelvic or low back pain.

The neurological compromise may arise from either the anterior (mesometrium) or posterior (mesosalpinx & mesovarium) fibres of the ligament.

With both the anterior and posterior fibres, the key clinical findings are arm abduction loss and weakness of the *semimembranosus*, *semitendinosus*, or *biceps femoris*.

When the anterior fibres of the broad ligament are involved, the specific diagnostic pain point (Chapman's reflex) will be the posterior margin of the iliotibial band, more particularly in its

proximal one third. These points will pretest neurologically against the weak hamstring muscle (Fig 22) or the arm abduction loss.

Figure 22: Neurological pretest for the *anterior* fibres of the broad ligament.

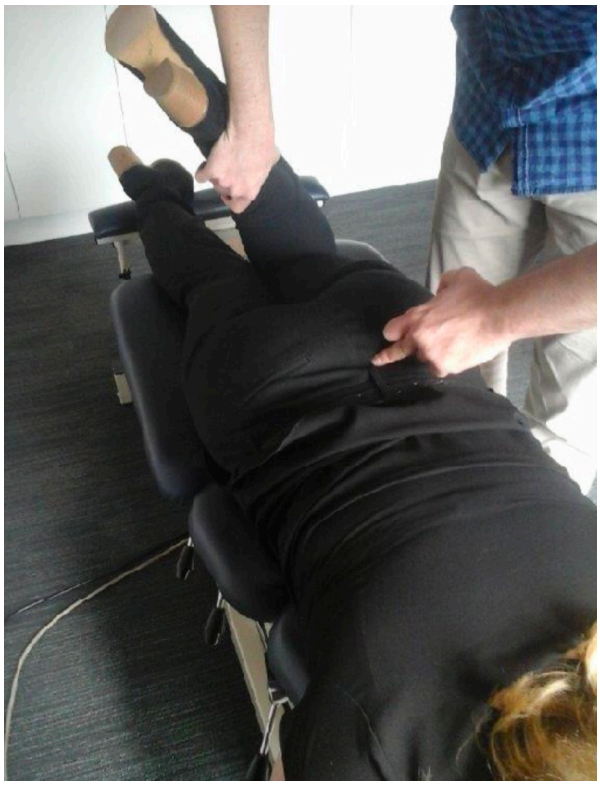


Figure 23: Neurological pretest for the *posterior* fibres of the broad ligament.

The Prostate Syndrome

Organosensory neurodysfunction of the prostate, either as a fragmentation from a sacral, innominate, pelvic floor or pubic symphysis intrusion, or indeed as a stand-alone active pattern of subluxation is relatively common in men.

The usual symptoms related to the prostate are frequent waking at night to urinate, a feeling of not having completely emptied the bladder, pain in the low back pain and in the perineal midline in the area between the testicles and anus, in the lower lower abdomen, upper medial thighs or suprapubic area.

When the prostate is involved, the specific pain point (Chapman's reflex) will be either the posterior margin of the *iliotibial band*, more particularly in its proximal one third or in the perineal midline in the area between the testicles and anus.

When the prostate is a fragment of another subluxation complex, this may be seen as incomplete resolution of arm abduction and persisting weakness of the *semimembranosus*, *semitendinosus*, or *biceps femoris*.

Creating impulse over the appropriate point will produce an immediate resolution of the arm abduction and the muscle weakness. The same key findings are seen when the prostate exists as a stand-alone, active subluxation pattern.

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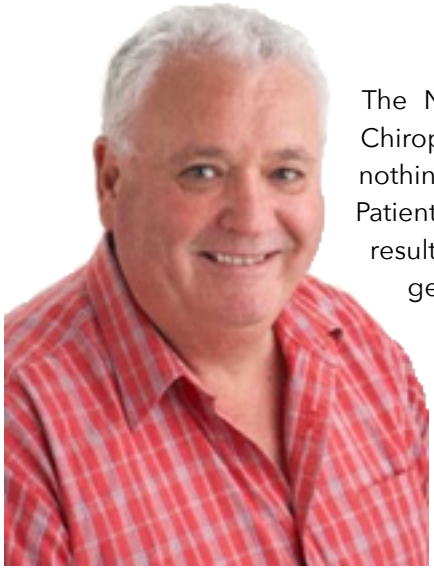
Also by Dr Neil Davies

Davies NJ. Dysponesis & the woman in transition: Diagnosis and NIP Management. Asia-Pac Chiropr J. 2024;4.3. apcj.net/papers-issue-4-3/#DaviesDysponesis

About the NeuroImpulse Protocol (NIP)

The NIP technique came about during the 1990's. It is the brainchild of Dr Neil J Davies, the author of the popular text "*Chiropractic Pediatrics A Clinical Handbook*" published by Churchill Livingstone. During this time Dr Davies was striving to evolve a technique approach to be used with babies that was absolutely precise neurologically, but extremely gentle in its application.



The NIP technique is used exclusively throughout Dr Davies' Chiropractic Clinics in Victoria, Australia and the result has been nothing short of astonishing in terms of new patient numbers. Patients drive long distances to receive NIP technique because the results they are getting are quick and sustainable and they don't get hurt by hard manipulative style techniques

Contact

https://neuroimpulse.net/

There is a NeurolmpulseProtocol Symposium(# 5) in picturesque Split, Croatia. This International Symposium will be held 21 - 27 April 2024 at Radisson Blu Resort, Split.

Note for readers

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