

Chronic Pelvic Pain: Pelvic floor problems, Low Back Pain & Sacro-iliac dysfunction

What your health advisor needs to know

Leon Chaitow ND DO Consultant Naturopath/Osteopath
www.leonchaitow.com

Summary

The incidence of Chronic pelvic pain (CPP) is widespread, with multiple potential aetiological features. There is evidence that CPP is relatively poorly understood, even by some specialists in genitourinary dysfunction and disease, and certainly by the wider health-care community. Recent research has suggested connections between chronic sacro-iliac restrictions/instability and a wide range of pelvic floor related problems, as well as breathing pattern dysfunction. In addition myofascial trigger points are reported to be commonly actively involved in the pain aspects of problems associated with these structures. Studies have also indicated that in many instances CPP is amenable to manual therapeutic approaches.

It has been hypothesized that inadequate force closure may be a common aetiological feature, affecting both urethral and sacroiliac instability. These notes outline current research-based concepts linking these mechanisms and influences with pelvic pain and dysfunction, including variously : interstitial cystitis, stress incontinence, dyspareunia, vulvodynia, prostatitis , prostatodynia, penile pain, sacroiliac dysfunction, myofascial trigger point activity, and respiratory disorders such as hyperventilation.

Evidence based therapeutic approaches suitable for application by physiotherapists, osteopaths and other manual practitioners and therapists are discussed.

Introduction

Chronic pelvic pain (CPP) is a widespread and distressing condition that accounts for between 10 and 15% of all gynecological referrals, 25–35% of laparoscopies and 10–15% of hysterectomies (Reiter 1998, Heinberg et al 2004).

Zondervan et al (2001) report that the estimated lifetime occurrence of CPP is 33%, affecting primarily, but not exclusively, females.

Associated conditions (to CPP) may include:

- Stress urinary incontinence (SUI) - difficulty in controlling urination

- Interstitial cystitis (IC) - frequency, urgency, discomfort/pain on urination - non-bacterial. This is also described as Painful Bladder Syndrome (PBS)
- Vestibulitis - Essential Vulvodynia - with no obvious cause
- Vulvar Vestibulitis Syndrome - a subset of urinary & genital pain disorders or "painful bladder" syndromes.
- Dyspareunia - painful intercourse

A broad clinical definition of IC includes any patient who complains of urinary urgency, frequency, and/or pelvic/perineal pain, in the absence of any identifiable cause, such as bacterial infection or carcinoma. (Rovner et al 2000).

Savidge & Slade (1997) observe that CPP "is a poorly understood condition."

This view is echoed by major researchers into CPP in general, and Interstitial cystitis (IC) in particular. For example Rovner et al (2000) state: *"In the absence of a generally accepted and effective therapy, a "trial-and-error" approach has emerged for the treatment of IC. Subsequent therapy is predicated on prior failures, and the patient's and physician's willingness to proceed with increasingly time-consuming, invasive, and/or costly treatments."*

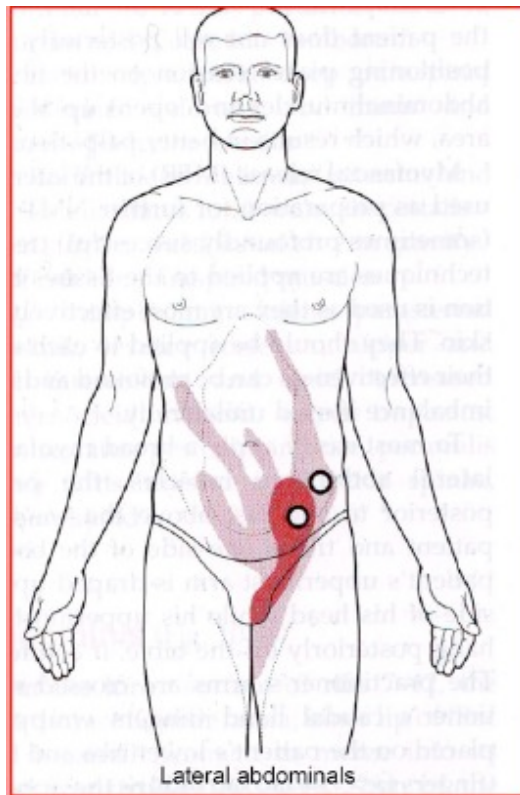
Bø & Borgen (2001) found that 41% of elite female athletes experience Stress Urinary Incontinence, a common feature of CPP. There is a strong association between chronic low back pain and many of the CPP symptoms listed above. (Eliasson 2006, Smith et al 2006). These and other studies suggest that there may frequently be identifiable relationships between lumbo-pelvic /low-back dysfunction, and a variety of pelvic floor/organ problems.

Trigger points, pelvic pain and associated symptoms

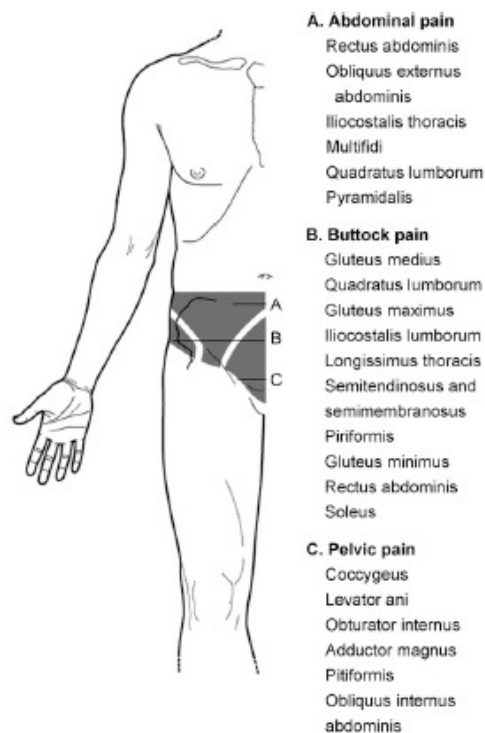
Recent studies suggest that a variety of chronic symptoms involving the pelvic organs, including the bladder, urethra, prostate and the lower bowel, can be caused, aggravated or maintained by the presence of active myofascial trigger points (TrPt) in the muscles of the region, both external and internal.

In many instances deactivation of these triggers has been shown to improve or eliminate functional symptoms, as well as associated pain.

A glance at the two images shows a/ how a specific trigger point can refer pain (red area) to distant tissues, and b/how local areas can be affected by trigger points in a range of muscles – as listed



Trigger points in the abdominal muscles can refer pain into the red and shaded areas. Trigger points can develop in any muscle – these are examples only



The dark areas show where pain is likely to be reported, if there are active trigger points in the listed muscles

Additional finding in some of these studies indicate that sacroiliac dysfunction may at times also be a part of the complex of overlapping influences. (Anderson et al 2005, Weiss 2001, Holzberg et al 2001, Lukban et al 2001, Glazer H 2000, Oyama et al 2004, Riot et al 2005, McKay et al 2001, Ling & Slocumb 1993)

In 1992 Bernstein et al observed that patients, with the urgency-frequency syndrome, commonly demonstrated a high tonic level in the pelvic floor muscles, associated with a poor ability to relax or tense these muscles, often leading to inadequate voluntary control of urinary flow.

Weiss (2001) echoes this observation, noting that in his experience the majority of patients with interstitial cystitis report an early history that resulted in pelvic floor muscle dysfunction, suggestive of increased pelvic floor tension. Weiss reports that he has found that an integral part of the treatment regimen, in such patients, involves normalization of these muscles via manual deactivation of Trigger Points (TrPts), while also reducing the pelvic floor hypertonicity by means of stretching and strengthening exercises.

Weiss's 2001 study (described below) was a landmark in drawing attention to the efficacy of these approaches. It has been followed by numerous good quality studies, all of which confirm the validity of the link between major, often debilitating, pelvic symptoms, and the presence of high-tone pelvic floor musculature containing active trigger points. These are usually capable of being manually deactivated with marked symptomatic improvement following.

Brief Glossary.

The following definitions/explanations should help with unfamiliar terms:

Diastasis recti: separation at the midline of rectus abdominis left and right, preventing normal pelvic floor function

Force closure: how musculo-ligamentous forces control translation between two joint or soft tissue surfaces, when under load

High Tone: excessively sustained tone or 'tension' in muscular or fascial structures

Thiele massage: a form of internal soft tissue manipulation of pelvic floor muscles developed in the 1930's by a German physician G.H.Thiele.

Paradoxical breathing: a paradox occurs when reality conflicts with expectation. In respiration the diaphragm should move caudally on inhalation, however in paradoxical respiration it moves cephalad instead.

Examples of clinical studies

1. Interstitial Cystitis

Using trigger point deactivation methods, described below, Weiss (2001) has reported the successful amelioration of symptoms in (mainly female) patients with interstitial cystitis, using myofascial release techniques. 45 women and 7 men, including 10 with interstitial cystitis and 42

with the urgency-frequency syndrome, underwent manual physical therapy to the pelvic floor once or twice weekly for 8 to 12 weeks. Results were determined by patient-completed symptom score sheets. These indicated the rate of improvement - with 25% to 50% improvement rated as *mild*, 51% to 75% rated as *moderate*, 76% to 99% rated as *marked*, and 100% rated as *complete resolution*. In 10 cases these subjective results were confirmed by measuring resting pelvic floor tension by electromyography, before and after the treatment course.

Of the 42 patients with the urgency-frequency syndrome, with or without pain, 35 (83%) had moderate to marked improvement, or complete resolution, while 7 of the 10 (70%) with interstitial cystitis reported moderate to marked improvement. The mean duration of symptoms before treatment, in those with interstitial cystitis and the urgency-frequency syndrome, was 14 years (median 12) and 6 years (median 2.5), respectively. In patients with no symptoms, or brief, low intensity flares, mean follow-up was 1.5 years

Noting that it is well established that dysfunctional pelvic floor muscles contribute significantly to the symptoms of interstitial cystitis, and what has been called the urethral syndrome (urgency-frequency with or without chronic pelvic pain), Weiss suggests that it is also possible that these muscles act not only as a source of symptoms, but also as contributing factor for the evolution of neurogenic inflammation of the bladder wall, which is itself a source of changes that are characteristic of interstitial cystitis.

2. Chronic prostatitis involving non-bacterial urinary difficulties, accompanied by chronic pelvic pain (involving the perineum, testicles and penis), has been shown in a 2005 study at Stanford University Medical School, by Anderson et al, to be capable of being effectively treated using trigger point deactivation, together with relaxation therapy. The researchers point out that 95% of chronic cases of prostatitis are unrelated to bacterial infection, and that myofascial trigger points (TrPs), associated with abnormal muscular tension in key pelvic muscles, are commonly responsible for the symptoms. This one-month study involved 138 men, and the results showed that there were marked improvements in 72% of the cases, with 69% showing significant pain reduction and 80% an improvement in urinary symptoms. Anderson et al (2005) note that the fascia, lateral to the prostate, is the most common location of trigger points in men with pelvic pain. The manual methods used involved the therapist applying treatment with the patient sidelying or prone. The therapist's right hand was used to examine and treat the left side of the pelvic floor

musculature, while the left hand was used for the right side. When myofascial TrPs were identified, digital pressure was applied for approximately 60 seconds [described as *myofascial trigger point release technique - MFRT*]. In addition it was found to be helpful if the patient was periodically requested to voluntarily contract the muscles being palpated/treated in a manner that induced "release/hold-relax/contract-relax/reciprocal inhibition" of the tissues. Additionally mobilization of the pelvic floor muscles included "stripping, strumming, skin rolling and effleurage". Treatment in this study was delivered weekly for 4 weeks, and biweekly for a further 8 weeks.

3. In a review of **prostatitis and chronic pelvic pain**, Anderson (2002), the lead author of the study outlined above, described palpation and treatment protocols for locating myofascial trigger points associated with prostatitis symptoms, and something of the rationale associated with this approach:

"The patient is examined in the dorsal lithotomy position to provide better examination of the lower abdomen, genitalia, and rectal and internal pelvic musculature. Inserting a finger in the rectum the examiner evaluates the sphincter ani circular muscles for tone and tenderness. Mapping of painful trigger points is performed with special attention focused on the insertion of muscles and ligaments into the following areas: rectus abdominus into pubic bone, inguinal canal obliques, subpubic adductor longus insertion, pubococcygeus insertion intersecting with prostatic endopelvic fascia, and obturator internus muscle with accompanying Alcock's canal (examined with and without external rotation of the knee)."

Anderson (2002) has also reflected on possible aetiological features:

"Predisposing factors for the formation of myofascial trigger points [in this region] include mechanical abnormalities in the hip and lower extremities; chronic holding patterns, such as those that occur in toilet training; sexual abuse; repetitive minor trauma in constipation; sports that create chronic pelvic stimulation; trauma; unusual sexual activity; recurrent infections; and surgery. Pelvic floor muscles are commonly tightened out of instinct under stress. Initiating factors that incite trigger points are often forgotten; they may not arise from a single event but are rather additive in nature. There seems to be a general association with the process of somatization"

Anderson notes that pelvic trigger points are painful on compression, commonly giving rise to characteristic referred pain, tenderness, and autonomic phenomena. When pressure is applied the patient may react with a spontaneous verbal expression or withdrawal movement

4. The effectiveness of transvaginal Theile massage has been demonstrated on high-tone pelvic floor musculature in 90% of patients with **interstitial (i.e. 'unexplained') cystitis** by Holzberg et al (2001). Describing the technique the researchers observe : *"Subjects underwent a total of 6 intravaginal massage sessions using the Theile 'stripping' technique."* This technique encompasses a deep vaginal massage via a "back and forth" motion over the levator ani, obturator internus, and piriformis muscles, as well as a myofascial release technique. Where a trigger point is identified, pressure is held for 8 to 12 seconds and then released. As to the mechanisms involved, they report: *"As a result of the close anatomic proximity of the bladder to its muscular support, it appears that internal vaginal massage can lead to subjective improvement in symptoms of IC."*

Note:** Thiele massage was developed in the 1930s (Thiele 1937) for treatment of coccygodynia. Thiel subsequently noted that in his experience pain in this region was only due to trauma in approximately 20% of cases and in the rest by pelvic muscles that were 'in spasm'. (Thiele 1963).

5. Lukban et al (2001) have noted a link between the sort of symptoms described in the previous examples, as well as painful intercourse (**dyspareunia**), together with **sacro-iliac (SI) joint dysfunction**. 16 patients with **interstitial cystitis (IC)** were evaluated a/ for increased pelvic tone and trigger point presence, and b/ for sacro-iliac dysfunction. The study reports that in all 16 cases SI joint dysfunction was identified. Treatment comprised direct myofascial release, joint mobilization, muscle energy techniques, strengthening, stretching [as appropriate to findings], neuromuscular reeducation, and instruction in an extensive home exercise program. The outcome was that there was a 94% improvement in problems associated with urination; 9 of the 16 patients were able to return to pain-free intercourse. The greatest improvement seen related to frequency symptoms and suprapubic pain. There was a lesser improvement in urinary urgency and nocturia. The researchers suggest that: *"Manual physical therapy may be a useful therapeutic modality for patients diagnosed with IC, high-tone pelvic floor dysfunction, and sacroiliac dysfunction. Intervention seems to be most useful in patients with primary complaints of urinary frequency, suprapubic pain, and dyspareunia."*

6. Oyama et al (2004) evaluated the effectiveness of transvaginal manual therapy of the pelvic floor musculature (Thiele massage) in 21 symptomatic female patients with **interstitial cystitis and high-tone dysfunction of the pelvic floor**. Thiele massage treatment (including trigger point deactivation) was given twice weekly for 5 weeks. At long-term follow-up symptoms of pain and

urgency remained '*significantly improved*'. They concluded that: "*Thiele massage appears to be very helpful in improving irritative bladder symptoms in patients with interstitial cystitis and high-tone pelvic floor dysfunction, in addition to decreasing pelvic floor muscle tone.*"

7. A French osteopathic study by Riot et al investigated a new approach to treatment of **irritable bowel syndrome (IBS)**, in which the treatment offered involved a combination of massage of the coccygeus muscle, together with physical treatment of frequently associated pelvic joint disorders. 101 patients (76 female, 25 male, mean age: 54 years) with a diagnosis of Levator ani syndrome (LVAS) were studied prospectively over one year following treatment. Internal massage, including trigger point deactivation) was given with the patient sidelying on the left. Physical treatment of the pelvic joints was applied at the end of each massage session. Forty-seven (46.5%) of the 101 patients, suffered both from LVAS and IBS. On average less than 2 sessions of treatment were necessary to alleviate symptoms. 69% of the patients remained free of LVAS symptoms 6 months later, while 10% still had symptoms, but were improved. At 12 months, 62% were still free of symptoms, with a further 10% improved. A similar improvement trend was observed in the IBS-patient group (53% IBS free initially following treatment, 78% at 6 months, 72% at 12 months). All IBS-free patients were LVAS-free at 6 months. The conclusion was that the LVAS symptoms may be cured or alleviated in 72% of the cases at 12 months, following one to two treatment sessions. The researchers suggest that since most of IBS patients benefited from this treatment, it is reasonable to suspect a mutual etiology, and to screen for LVAS in all IBS patients.

Observation

These studies (amongst many others) point to trigger point activity being a probable causative feature of a number of different conditions involving the pelvic organs, most notably urinary incontinence and interstitial cystitis (UI and IC).

A recurring feature in these studies was an excessive degree of tone in the pelvic floor muscles, particularly levator ani, as well, commonly, as piriformis. A variety of names have been ascribed to the condition including '*levator ani spasm syndrome*' (Lilius & Valtonen 1973), '*tension myalgia of the pelvic floor*' (Sinaki et al 1977), and most recently '*chronic pelvic floor myofascial trigger point pain syndrome*' (Baldry 2005).

In addition to pelvic floor involvement, previously mentioned researchers such as Lukban (2001), Riot (2005), as well as Anderson(2006), have all identified sacroiliac dysfunction as a frequently associated factor. Possible mechanisms for this connection deserve some consideration.

Genetic variability plus environmental events

It has been suggested that what are termed *Idiopathic Pain Disorders* (IPD) - which include pelvic disorders such as - interstitial cystitis and vulvar vestibulitis (VVS) (as well as non-pelvic related conditions such as temporomandibular joint disorders (TMJD), fibromyalgia syndrome (FMS), irritable bowel syndrome (IBS), chronic headaches, chronic pelvic pain, chronic tinnitus and whiplash-associated disorders), are mediated by an individual's genetic variability, as well as by exposure to environmental events. The primary pathways of vulnerability that underlie the development of such conditions are seen to involve pain amplification and psychological distress, modified by gender and ethnicity. (Diatchenko et al 2006).

The possibility that stress and emotion are causally linked to CPP is not universally accepted. For example Henderson (2000) states, in relation to interstitial cystitis (IC): *"Stress is often cited as the underlying cause of the disorder, and relaxation is the first treatment option—regardless of the fact that neither stress nor psychological factors has been shown to cause IC."*

In some instances however, profound psychosocial elements may have been part of the aetiology of these conditions, or they may be important features in maintenance of such problems. (Krir 2000)

High tone? low tone?

Despite some of the studies reported on above confirming the presence of excessive pelvic floor muscle tone, it is important to acknowledge that in many instances the cause of such symptoms may relate to *low-tone* pelvic floor conditions, and to prolapse. It is of course possible, and indeed likely, that in some instances some of the pelvic floor/lower abdominal/inner thigh muscles (some housing active trigger points) might be hypertonic, while others are hypotonic.

The treatment studies described earlier, and throughout these notes, relate mainly to high-tone conditions, and not to prolapse-related symptoms, where quite different strategies would be more appropriate than Thiele massage, as used in the high tone settings described above. (Sapsford 2004. Hagen 2004)

With some studies demonstrating relatively high (<70%) success rates when Kegel-type toning exercises are employed (Nysgaard 1996), and others relatively low (~50%) success rates (Chaiken et al 1993), it is clear that categorization of patients with IC and/or urinary incontinence, into high-tone (where toning exercise may be less appropriate, and stretching helpful) or low-tone (where toning may be more appropriate) groups – while desirable, this remains an inexact science.

In some studies, where high tone issues prevail, and where success was achieved via Thiele massage as the main therapeutic tool, Kegel exercises were nevertheless employed as part of home care. Weiss (2001) for example reports that *"In addition to office [i.e. Thiele massage] treatment, the patient is instructed in a home program consisting of biofeedback and Kegel instruction, external pelvic muscle stretches and strengthening, and stress reduction techniques."* Investigation of clinical methods for differentiating whether high-tone or low-tone pelvic floor dysfunction (or mixtures of these states) are operating, and therefore selecting appropriate treatment strategies in any given case, offer a potentially fruitful area for research.

Pelvic floor problems and back pain

A number of studies have pointed to an association between low back pain (LBP) and pelvic symptoms, such as those discussed earlier, particularly **urinary incontinence (UI)**.

For example Eliasson (2006) reports that UI was noted by 78% of 200 women with LBP. In comparison with a reference group, the prevalence of UI and "significant UI", as well as signs of dysfunctional pelvic floor musculature, were greatly increased in those with back pain. Analysis of the evidence shows that suffering from LBP, and inability to interrupt the urine flow, increases the risk for UI.

Smith et al (2006) evaluated these, and other symptoms, in a total of 38,050 women, from three age-cohorts. They found that disorders of continence and respiration were strongly related to frequent back pain. It was considered that this relationship might be explained by physiological limitations of co-ordination of postural, respiratory and continence functions of the trunk muscles.

The Breathing connection

Hodges (2007) has observed that there is a clear connection between respiratory function, pelvic floor function, and SIJ stability, particularly in women. He notes that if pelvic floor muscles are dysfunctional, spinal support may be compromised, increasing external oblique muscle activity that alters pelvic floor muscle activity, possibly leading to urinary incontinence. Smith (2007) has confirmed this relationship between spinal support, pelvic and abdominal musculature, with implications for dysfunction involving urinary incontinence.

Earlier Barbic et al (2003) revealed evidence that the pelvic floor muscles actively assist lumbopelvic stability, as well as urinary and fecal continence. A motor control deficit, operating in

incontinent individuals, affects levator ani and pubo-coccygeus muscles, and therefore lumbopelvic stability. In addition, motor control can be shown to be disturbed by the effects of breathing pattern disorders such as hyperventilation. (Chaitow 2004, Chaitow 2007).

Earlier still Hodges, Heijnjen & Gandevia (2001) had demonstrated that after approximately 60 seconds of over-breathing (hyperventilation), the postural (tonic) and phasic functions of both the diaphragm and transversus abdominis are found to be reduced or absent, with major negative implications for spinal stability.

Recently O'Sullivan et al (2007) have shown the benefits of rehabilitation of motor function to pelvic floor, diaphragm and sacroiliac function, when applied to individuals with SI joint pain.

The combined evidence that emerges suggests that there is a complex inter-relationship between spinal and sacro-iliac stability, and a variety of pelvic floor/organ problems, including urinary incontinence, as well as diaphragmatic (and therefore respiratory) function. Somewhere in this mix myofascial trigger point activity emerges as a significant symptom-causing, aggravating or maintaining, feature.

The evolution of trigger points and their influences

Anxiety and other emotions have been shown to encourage recruitment of a small number of motor units that display almost constant, or repeated, activity when influenced psychogenically. In one study, low amplitude myoelectric activity (measured using surface electromyography) was evident, even when muscles were not being employed, in situations of mental stress (Waersted et al 1993): *"A small pool of low-threshold motor units may be under considerable load for prolonged periods of time...motor units with Type 1 [postural] fibres are predominant among these. If the subject repeatedly recruits the same motor units, the overload may result in a metabolic crisis"*.

This sequence parallels the proposed evolution of myofascial trigger points, as suggested by Simons et al (1999), with major implications for the development and exacerbation of myofascial pain (including pelvic pain) conditions. Simons et al have clearly demonstrated that an ischemic environment is a natural breeding ground for trigger points. This has been confirmed by remarkable techniques involving microanalytical assays of the milieu of living muscle in the region of active trigger points (Shah et al 2005). In addition ischemia is a natural result of both excessively long-held muscular tone, and overbreathing (Jammes et al 1997, Chaitow, Bradley & Gilbert 2002).

It has been suggested that in situations of hypotonia and joint laxity, symptoms deriving from the presence of active trigger-points, may represent a stabilizing response to the resulting hypermobility (Chaitow & DeLany 2002). Trigger point evolution in associated muscles appears to be a common accompanying feature of relatively lax ligaments (Kerr & Grahame 2003). It may be that these energy efficient (if painful) entities (TrPts), may offer a means of achieving relative stability.

The implications of this are that, if myofascial trigger points are serving functional roles, such as in stabilization of hypermobile joints, or even enhancement of pelvic floor stability in stretched or lax tissues, their deactivation may ease pain, but at the cost of stability. Simons (2002) concurs '*In this case it is wise to correct the underlying cause of instability before releasing the MTrP tension.*'

It is also important to consider that, at times, apparent symptoms may represent a desirable physiological response to imbalance, or hypotonia (Thompson 2001).

Lewit & Horacek (2004) report that active trigger points (TrPs) in the erector spinae of the thoracic region are capable of inducing strong contractions of the lumbar erector spinae, extending the lumbar spine and pelvis. (Silverstolpe 1989). Lewit & Horacek have also identified a trigger point in the coccygeus muscle that if deactivated, also deactivates the erector spinae trigger points.

Subsequent maintenance of the resulting improvement is then best achieved by the individual learning to relax the muscles of the pelvic floor. Skoglund showed, using EMG evidence, that these triggers and reflexes are linked to what he termed '*mechanical pelvis dysfunction.*'

Noting that '*[the coccygeus muscle] shares a common attachment to the pelvic diaphragm via the pubococcygeus muscles*', Liebenson (2000) reports that symptoms associated with these same trigger points may also affect '*low back pain, coccygeal pain, pseudovisceral pain.*'

Undoubtedly such scenarios (hypermobility, reflex influences) are deserving of clinical research that may ultimately offer clear guidelines as to when to deactivate, and when to consider not deactivating, symptom-producing, active, trigger points.

Fortunately most trigger points affecting pelvic structures (both internal and external) are well documented and mapped – as shown in the illustrations above. (Simons, Travell & Simons 1999, Chaitow & Delany 2002)

Urethral and Sacro-iliac stability and instability

It is abundantly clear that symptom-related trigger points develop in pelvic floor and other muscles local to the lower pelvis, such as those muscles attaching to the pubic region. The local causes of their evolution might relate to excessive tone in these muscles, however some may relate to

psychogenic symptoms such as anxiety.

Chronically dysfunctional postural patterns may further add to instability in the pelvic region.

Janda (1982) identified crossed-syndrome patterns in which particular muscle groups were either inhibited or lengthened, while opposing muscle groups tightened and shortened, in response to patterns of overuse and misuse, often involving postural factors.

Key et al (2007) have observed and catalogued a number of variations within the patterns of compensation/adaptation associated with chronic postural realignment involved in crossed-syndromes. Such modified postural patterns are commonly associated with pelvic deviation and or rotation, with profound implications for both respiratory and pelvic floor function. For example Key et al report that, in relation to what they terms the posterior pelvic crossed syndrome, characterized by "*a posterior [pelvic] shift with increased anterior sagittal rotation or tilt*", together with an anterior shunt/translation of the thorax, among many other stressful modifications, there will inevitably be poor diaphragmatic control and altered pelvic floor muscle function.

Efficient control of the urethra is essential for normal bladder control. Force closure of the urethra involves a similar mechanism to the force closure feature that is a requirement for optimal sacroiliac stability (Lee & Lee 2004). An important part of the achievement of urethral control, and sacroiliac stability, relates to how these structures and functions respond to load transfer during movement of the body, and this is dependent on the efficiency of muscles that produce adequate force closure, including levator ani, pubococcygeus, the diaphragm and multifidi. There appears to be a direct functional connection between pelvic floor muscle activity and the major abdominal muscles such as transversus abdominis. (Sapsford 2001).

Lee & Lee (2004) remind us that achievement of continence relies on a combination of endopelvic support for the urethra, the active muscular involvement of levator ani that offers a constant degree of tone, and a muscular control system that is dependent on pudendal nerve innervation of levator ani, as well as reflex interactions between the detrusor muscle and pelvic floor muscles. These muscular relationships confirm that pelvic organ function, respiration and many of the major muscles involved in spinal support, are all intimately related.

A number of factors that appear to be capable of interfering with force closure of the urethra by these muscles include:

- Trauma (major or repetitive minor) that leads to loss of anatomical integrity or neurophysiological function of the pelvic floor. (Lee & Lee 2004)

- Inefficient load transfer involving excessive increases in intra-abdominal pressure, resulting in bladder and other pelvic organs being repetitively compressed inferiorly. Sapsford (2001) suggests that this may result in repetitive microtrauma to the fascial support of the urethra, or altered recruitment of the pelvic floor muscles.
- Female stress urinary incontinence (SUI) has been associated with bladder-neck hypermobility. (Balmforth et al 2006)
- An inherited element involving reduced collagen in the individual's connective tissue has been suggested as one aspect of hypotonic pelvic floor structures, with decreased collagen content in the tissues of women affected by prolapse. Biopsy specimens of women with striae also show a diminution of collagen far more frequently than is observed in non-prolapse women (Salter et al 2006).
- Straining during bowel movements has been found to be common in women with uterovaginal prolapses and stress urinary incontinence, often involving altered lumbopelvic posture (Spence-Jones et al 1995).
- Uterovaginal prolapse is often associated with reduced lumbar lordosis and back pain. (Nguyen et al 2000).
- Vaginal delivery may impair normal pelvic floor muscle strength. (Allen et al 1990)
- Ashton-Miller et al (2001) report that failure of the endopelvic fascial support for the urethra, preventing optimal closure, may sometimes be the result of damage to the nerve supply to the levator-ani muscle, caused during labor

In examples where tone is inadequate, or where tissues have been over-stretched, it is not unreasonable to hypothesise (as discussed above) that trigger point evolution might be seen as a physiological response that is attempting to restore tone in damaged, dysfunctional or denervated tissues.

Summary

- **Pelvic pain** may be associated with a variety of conditions involving genitourinary function including **interstitial cystitis, stress incontinence, vulvodynia, prostatitis , prostatodynia, penile pain and dyspareunia** (Ottem et al 2007)
- Pelvic problems involving low back and pelvic pain, as well as pelvic floor dysfunction, may involve failed load transfer through the musculoskeletal components of the pelvic girdle, and/or failed load transfer through the organs of the pelvic girdle. Load transfer, force closure & motor control of urethra is very similar to that of the SI joint. (Lee & Lee 2004)

- Treatment strategies should reflect assessment findings. There may be joint or bladder neck hypo- or hypermobility, High or low muscle tone, or combinations of these features (Lee 2007, O'Sullivan 2005) - with or without the presence of active trigger points that contribute to the pain being experienced.
- Pelvic-floor muscle training (PFMT) may be useful in rehabilitation of control of bladder function, particularly where evidence exists of hypermobility of the bladder neck. PFMT has been shown to increase the resting tone of the pelvic floor, improve bladder elevation during voluntary pelvic-floor contraction, and reduce bladder displacement during straining (Balmforth et al 2006).
- A cautionary note is raised by Key et al (2007) who suggest that there is currently an over-emphasis on core control/stability, which may result in 'core rigidity': *"Over- applied core stability training can become 'core rigidity training' - inducing central fixing behaviour around the body's centre of gravity and associated dysfunctional breathing patterns"....* and by implication, pelvic floor dysfunction.

Assessment and treatment

Before commencing manual/structural interventions, there should be consideration of **Red flag** symptoms that might suggest the need for referral to eliminate serious pathology. (Fall et al 2004)

Additionally, signs and symptoms should be considered that suggest that psychological issues should be evaluated, and possibly treated, by a suitably trained health care provider. (Savidge & Slade 1997)

In order to develop a manual treatment plan where biomechanical features appear to be contributing to the patient's symptoms, a comprehensive overview of patterns-of-use and function is necessary, in which there would be evaluation of :

- Posture - particularly crossed syndrome patterns
- Gait and other functional movement patterns
- Spinal and pelvic (e.g. SI, pubic) status: mobility, restriction and - if appropriate - form and force closure tests (Lee 2004).
- Possible shortness of key pelvic and related muscles: erector spinae, iliopsoas, thigh adductors, piriformis, QL, hamstrings, quadriceps, abdominals (internal oblique) as well as internal pelvic muscles

- Possible weakness of key pelvic and related muscles : as above and gluteals, abdominals (transversus)
- Possible presence of diastasis recti (Fitzgerald & Kotarinos 2003).
- Hypermobility tendencies
- Firing sequences of major muscle groups (e.g. Janda's (1983) hip extension and hip abduction tests)
- Presence of active trigger points (i.e. trigger points that when stimulated reproduce symptoms recognizable to the patient as relating to current symptoms) in key pelvic muscles, as well as in the abdominal wall, inner thigh, pelvic floor.
- Breathing function (particularly evaluating for a paradoxical patterns and overbreathing tendencies)
- Diaphragm and rib status

Conclusion:

Pelvic floor muscles may be hyper or hypotonic in relation to chronic pelvic pain and dysfunction. Such conditions are frequently related to lumbopelvic or sacroiliac dysfunction (restriction or instability), although the aetiological relationship is not always clear.

Manual treatment methods (broadly covered by the term Thiele massage for internal trigger points and excessive tone) might include digital deactivation of trigger points, and/or use of dry needling (Baldry 2005), and/or rehabilitation methods involving biofeedback, relaxation and/or toning of the dysfunctional pelvic floor muscles.

The manner in which force closure of the SI joint is achieved is closely mirrored by the way urethral control of urination is achieved, and dysfunction of one may be related to the other, as well as being influenced by respiratory function and dysfunction.

Myofascial trigger points situated in high-tone muscles of the pelvic floor, the lower abdomen and the abductors, adductors, internal and external rotators of the hips, are a common feature of chronic pelvic pain.

Therapeutic approaches that endeavour to deactivate trigger points contributing to symptoms, as well as normalising joint and soft tissue imbalances, together with concomitant postural and breathing pattern retraining, have all been shown to be capable of modifying, modulating or eliminating associated symptoms, including chronic pelvic pain.

Several areas of evaluation of patterns of pelvic floor dysfunction would benefit from research, particularly in relation to identification, in a clinical setting, of methods for establishing whether symptoms relate to high or low tone conditions, as well as whether or not trigger point deactivation is an appropriate treatment strategy.

References

- Allen R Hosker G Smith A et al 1990 Pelvic floor damage and childbirth: a neurophysiological study. *British Journal of Obstetrics and Gynaecology* 97:770
- Anderson R 2002 Management of chronic prostatitis—chronic pelvic pain syndrome *Urologic Clinics of North America* 29(1):235-239
- Anderson R Wise D Sawyer T et al 2005 Integration of myofascial trigger point release and paradoxical relaxation training treatment of chronic pelvic pain in men. *J Urol.* 174(1):155-160
- Anderson R 2006 personal communication to the author.
- Ashton-Miller J A, Howard D, DeLancey J O L 2001 The functional anatomy of the female pelvic floor and stress continence control system. *Scandinavian Journal of Urology and Nephrology Supplement* 207
- Baldry P 2005 Acupuncture, Trigger points and musculoskeletal pain. Elsevier/Churchill Livingstone Edinburgh pp353
- Balmforth JR *et al.* 2006 A prospective observational trial of pelvic floor muscle training for female stress urinary incontinence. *BJU Int* 98:811–817
- Barbic M et al 2003 Compliance of the bladder neck supporting structures. *Neurourology and Urodynamics* 22:269
- Bernstein A Philips H Linden W et al., A psychophysiological evaluation of female urethral syndrome: evidence for a muscular abnormality, *J Behav Med* 15 (1992), p. 299
- Bo K Borgen J 2001 Prevalence of stress and urge urinary incontinence in elite athletes and controls. *Med Sci Sports Exerc.* 33(11):1797-1802
- Chaiken D et al. 1993 Behavioral therapy for the treatment of refractory interstitial cystitis. *J Urol.* 149:1445–1448
- Chaitow L, DeLany J 2002 Clinical application of neuromuscular techniques, Volume 2, The lower body. Churchill Livingstone, Edinburgh, p. 27
- Chaitow L, Bradley D, Gilbert C 2002 Multidisciplinary approaches to breathing pattern disorders. Churchill Livingstone, Edinburgh
- Chaitow L 2004 Breathing pattern disorders, motor control and LBP. *Journal of Osteopathic Medicine* 7(1):34–41
- Chaitow L DeLany 2005 Clinical Applications of Neuromuscular Techniques: Practical Case Study Exercises. Churchill Livingstone, Edinburgh p53
- Chaitow L 2007 Breathing Pattern Disorders and back Pain IN: Vleeming A Mooney V Stoekart R (Eds) Movement stability & lumbopelvic pain. Churchill Livingstone/ Elsevier. Edinburgh pp563-572
- Diatchenko L et al 2006 Idiopathic Pain Disorders Pathways of vulnerability *Pain* 23:226-230
- Eliasson K 2006 Urinary incontinence in women with low back pain. *Manual Therapy* : In Press. Available online Science Direct 28 March 2007
- Fall M Baranowski A Fowler C et al EAU Guidelines for Chronic Pelvic Pain 2004 *European Urology* 46(6):681-689
- FitzGerald, M.P., Kotarinos, R. 2003 Rehabilitation of the short pelvic floor. II: Treatment of the patient with the short pelvic floor *International Urogynecology Journal and Pelvic Floor Dysfunction* 14 (4), pp. 269-275
- Glazer H 2000 Dysythetic vulvodynia. Long term follow-up after treatment with electromyography-assisted pelvic floor muscle rehabilitation. *J Reproductive Medicine.* 45:798-802

- Hagen S 2004 A United Kingdom-wide survey of physiotherapy practice in the treatment of pelvic organ prolapse *Physiotherapy* 90 (2004) 19–26
- Henderson L 2000 Diagnosis, Treatment, and Lifestyle Changes of Interstitial Cystitis *AORN* 71(3):525-538
- Hodges P 2007 Postural and respiratory functions of the pelvic floor muscles *Neurourology and Urodynamics* In Press: Published Online: 15 Feb 2007
- Hodges P W, Heijnjen I, Gandevia S C 2001 Postural activity of the diaphragm is reduced in humans when respiratory demand increases. *Journal of Physiology* 537(3):999
- Holzberg A Kellog-Spadt S Lukban J et al 2001 Evaluation of transvaginal theile massage as a therapeutic intervention for women with interstitial cystitis *Urology* 57(6) Sup 1, p120
- Jammes Y, Zattara-Hartmann M, Badier M 1997 Functional consequences of acute and chronic hypoxia on respiratory and skeletal muscles in mammals. *Comparative Biochemistry and Physiology Part A: Physiology* 118(1):15–22
- Janda V 1983 *Muscle function testing*. Butterworths, London.
- Kerr R, Grahame R 2003 *Hypermobility syndrome*. Butterworth Heinemann, Edinburgh pp15-32
- Key J et al 2007 A model of movement dysfunction provides a classification system guiding diagnosis and therapeutic care in spinal pain and related musculo-skeletal syndromes: a paradigm shift. *Journal of Bodywork & Movement Therapies*. IN PRESS
- Krir J 2000 The importance of psychosocial aspects in clinical assessment *British Journal of Chiropractic* 4(2-3):50-53
- Lee D 2004 *The Pelvic Girdle* (3rd edition) Churchill Livingstone, Edinburgh pp43-46
- Lee D 2007 An integrated approach for the management of low back and pelvic girdle pain IN: Vleeming A Mooney V Stoekart R (Eds) *Movement stability & lumbopelvic pain*. Churchill Livingstone/ Elsevier. Edinburgh pp593-620
- Lee D Lee L 2004 Stress Urinary Incontinence – A Consequence of Failed Load Transfer Through the Pelvis? Presented at the 5th World Interdisciplinary Congress on Low Back and Pelvic Pain Melbourne, November 2004
- Lewit K Horacek O 2004 A case of selective paresis of the deep stabilization system due to boreliosis *Manual Therapy* 9(3):173-175
- Liebenson C 2000 The pelvic Floor muscles and the Silverstolpe phenomena *Journal of Bodywork and Movement Therapies* 4(3):195
- Lilius H Valtonen E 1873 The levator ani spasm syndrome. *Annales Chirurgiae et Gynaecologiae*. 62:93-97
- Ling F Slocumb J 1993 Use of trigger point injections in chronic pelvic pain. *Obstet Gynecol Clin N. America* 20:809-815
- Lukban J Whitmore K Kellog-Spadt S et al 2001 The effect of manual physical therapy in patients diagnosed with interstitial cystitis, high-tone pelvic floor dysfunction, and sacroiliac dysfunction *Urology* 57(6) Sup.1; p121-122
- Nguyen J K, Lind L R, Choe J et al 2000 Lumbosacral spine and pelvic inlet changes associated with pelvic organ prolapse. *Obstet Gynecol* 95(3):332-336
- Nygaard N et al 1994 Urinary incontinence in elite nulliparous athletes', *Obstetrics and Gynecology* 84:183–187
- Nygaard I et al 1996 Efficacy of pelvic floor muscle exercises in women with stress, urge, and mixed urinary incontinence *Am J Obstet Gynecol* 174(1): 120-125
- O'Sullivan P. 2005. Diagnosis and classification of chronic low back pain disorders: Maladaptive movement and motor control impairments as an underlying mechanism. *Manual Therapy* 10: 242-255
- O'Sullivan P Beales D 2007 Changes in pelvic floor and diaphragm kinematics and respiratory patterns in subjects with sacroiliac joint pain following a motor learning intervention: A case series *Manual Therapy* In Press
- Ottom D Carr L Perks A 2007 Interstitial Cystitis and Female Sexual Dysfunction *Urology* 69(4)608-610
- Oyama I et al 2004 Modified Thiele massage as therapeutic intervention for female patients with interstitial cystitis and high-tone pelvic floor dysfunction. *Urology* 64(5):862-865

- McKay et al 2001 Treating vulvar vestibulitis with electromyographic biofeedback of pelvic floor musculature. *J Reproductive Medicine* 46:337-342
- Reiter R 1998. Evidence-based management of chronic pelvic pain. *Clin Obstet Gynecol* 41:422–435.
- Riot F-M Goudet P Moreaux J-P 2005 Levator ani syndrome, functional intestinal disorders and articular abnormalities of the pelvis, the place of osteopathic treatment *Presse Medicale* 33(13):852-857
- Rovner E Probert K Brensinger C et al 2000 Treatments used in women with interstitial cystitis: the Interstitial Cystitis Data Base (ICDB) study experience. *Urology* 56(6):940-945
- Salter S et al 2006 Striae and Pelvic Relaxation: Two Disorders of Connective Tissue with a Strong Association. *Journal of Investigative Dermatology*. 126:1745–1748
- Sapsford R et al 2001 Co-activation of the abdominal muscles and pelvic floor muscles during voluntary exercises. *Neurourology and Urodynamics* 20:31
- Sapsford R 2004 Rehabilitation of pelvic floor muscles utilizing trunk stabilization. *Manual Therapy* 9(1):3-12
- Savidge C Slade P 1997. Psychological aspects of chronic pelvic pain. *J Psychosom Res* 42:433–444.
- Shah JP. Phillips TM. Danoff JV. Gerber LH. 2005 An in vivo microanalytical technique for measuring the local biochemical milieu of human skeletal muscle. *Journal of Applied Physiology*. 99(5):1977-1984
- Silverstolpe I 1989 A pathological erector spine reflex—a new sign of mechanical pelvis dysfunction. *J Manual Med* 4:24
- Simons D Travell J Simons L 1999 Myofascial pain and dysfunction: the trigger point manual. Vol 1, upper half of body, 2nd edn. Williams and Wilkins, Baltimore
- Simons D 2002 Understanding effective treatments of myofascial trigger points. *Journal of Bodywork and Movement Therapies* 6(2):81-88
- Sinaki M et al 1977 Tension myalgia of the pelvic floor. *Mayo Clinic Proceedings* 52:717-722
- Skoglund C Neurophysiological aspects of the pathological erector spinae reflex in cases of mechanical pelvis dysfunction. *J Manual Med* 4:29
- Smith M Russell A Hodges P 2006 Disorders of breathing and continence have a stronger association with back pain than obesity and physical activity *Australian Journal of Physiotherapy* 52:11-16
- Smith M et al 2007 Postural response of the pelvic floor and abdominal muscles in women with and without incontinence. *Neurourology and Urodynamics* (in press)
- Spence-Jones C, Kamm M A, Henry M M, Hudson C N 1995 Bowel dysfunction: a pathogenic factor in uterovaginal prolapse and urinary stress incontinence. *Obstetrics and Gynecology* 85:220-4.
- Thiele G 1937 Coccygodynia and pain in the superior gluteal region *JAMA* 109: 1271-1275
- Thiele G 1963 Coccygodynia: cause and treatment. *Diseases of the Colon & Rectum* 6:422-436.
- Thompson B 2001 Sacroiliac joint dysfunction: Neuromuscular massage therapy perspective. *Journal of Bodywork and Movement Therapies* 5(4): 229-234
- Tua F Fitzgerald C Kuiken T et al 2006 Pelvic floor pressure-pain thresholds: A pilot study. *Journal of Pain* 7(4)Supplement 1:page S30
- Travell J Simons D 1992 Myofascial pain and dysfunction: the trigger point manual. Vol 2 Lower half of body 1st edn. Williams and Wilkins, Baltimore
- Waersted M, Eken T, Westgaard R 1993 Psychogenic motor unit activity – a possible muscle injury mechanism studied in a healthy subject. *Journal of Musculoskeletal Pain* 1(3 and 4):185
- Weiss, J. M 2001 Pelvic floor myofascial trigger points: manual therapy for interstitial cystitis and the urgency-frequency syndrome. *J Urol*, 166:2226
- Zondervan K Yudkin P Vessey M et al 2001 The community prevalence of chronic pelvic pain in women and associated illness behavior. *Br J Gen Pract* 51:541–547.