



REVIEW

Chronic pelvic pain: Pelvic floor problems, sacroiliac dysfunction and the trigger point connection

Leon Chaitow, N.D., D.O.*

Marylebone Health Centre, Marylebone Rd, London NW1 5LT, UK

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Stress incontinence;
Prostatitis

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 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. This paper attempts to 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.

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Introduction

Chronic pelvic pain (CPP) is a widespread and distressing condition that accounts for between 10% and 15% of all gynaecological referrals, 25–35%

of laparoscopies and 10–15% of hysterectomies (Reiter, 1998). 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.

*Corresponding author at: 144 Harley Street, London W1G7LE, UK.

E-mail address: leonchaitow1@mac.com

- 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 and 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).

Bo and Borgen (2001) found that 41% of elite female athletes experience SUI, a common feature of CPP. Nygaard et al. (1994) noted that in a study of 144 nulliparous female athletes, ages 18–21 years, 28% suffered from SUI.

Savidge and Slade (1997) observe that CPP “is a poorly understood condition”.

This view is echoed by major researchers into CPP in general, and 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.”

As discussed later in this paper, a strong association has been identified between chronic low back pain (LBP) 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 dysfunction, and a variety of pelvic floor/organ problems.

A subgroup of individuals with CPP/IC/SUI, etc., who appear to respond well to manual methods of treatment, are the main focus of this paper. Common features, and manual treatment approaches, are described below.

Trigger points, pelvic pain and associated symptoms

Recent studies, a number of which are summarized below, 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.

Additional finding in some of these studies (see below) 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, 2000; Oyama et al., 2004; Riot et al., 2005; McKay et al., 2001; Ling and Slocumb, 1993). Bernstein et al. (1992) 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 IC 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 TrPts, while also reducing the pelvic floor hypertonicity by means of stretching and strengthening exercises.

Weiss’s (2001) study (described below), via publication in a major peer-review journal, 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 (Figs. 1–3, Box 1).

Box 1

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 1930s 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.

weeks. Results were determined by patient-completed symptom score sheets. These indicated the rate of improvement according to outcome parameters, with 25–50% improvement rated as *mild*, 51–75% rated as *moderate*, 76–99% 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 IC reported moderate to marked improvement. The mean duration of symptoms before treatment, in those with IC 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. In 10 patients who underwent electromyography mean resting pelvic floor tension showed a 65% improvement, decreasing from 9.73 to 3.61 mV.

Noting that it is well established that dysfunctional pelvic floor muscles contribute significantly to the symptoms of IC, and what has been called the urethral syndrome (urgency-frequency with or

Examples of clinical studies

1. Using trigger point deactivation methods, described below, Weiss (2001) has reported the successful amelioration of symptoms in (mainly female) patients with IC, using myofascial release techniques. Forty-five women and 7 men, including 10 with IC and 42 with the urgency-frequency syndrome, underwent manual physical therapy to the pelvic floor once or twice weekly for 8–12

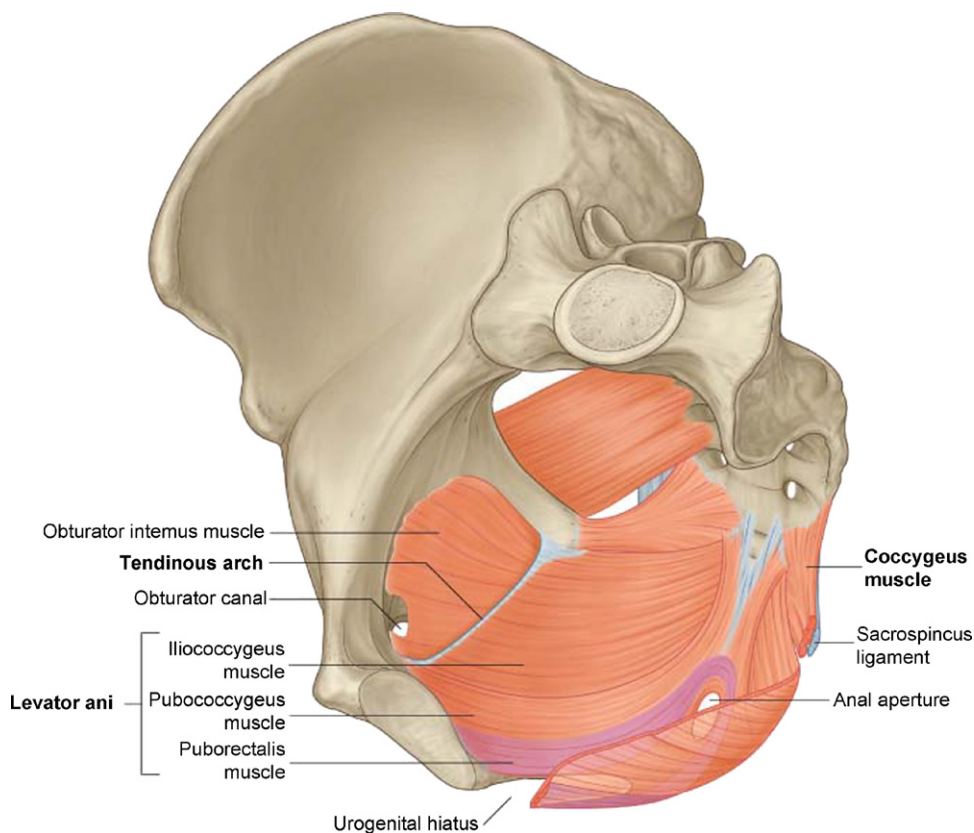


Figure 1 The pelvic diaphragm (from Gray's Anatomy for Students p. 393, Fig. 5.34).

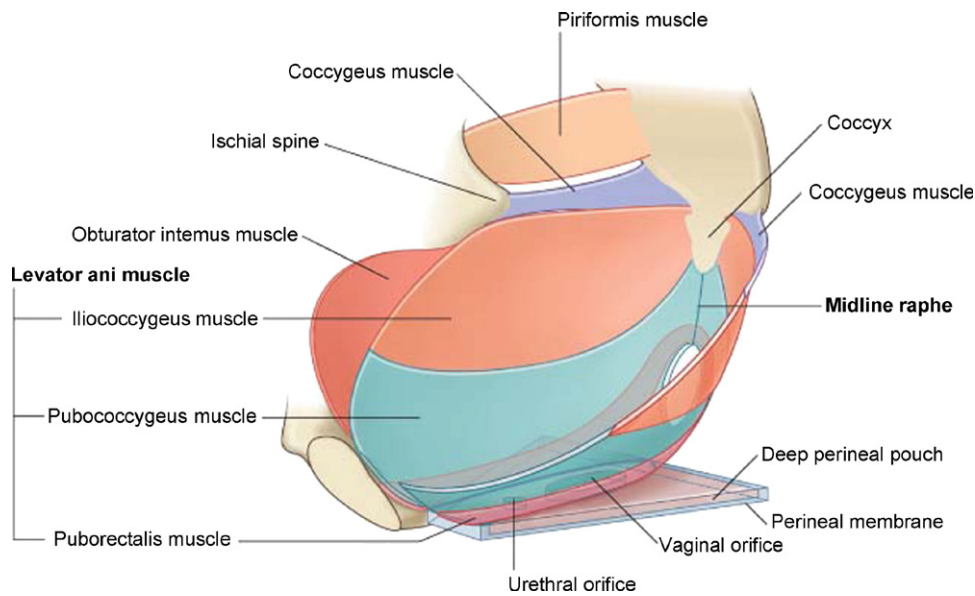


Figure 2 The pelvic floor muscles (from Gray's Anatomy for Students, p. 369, Fig. 5.7).

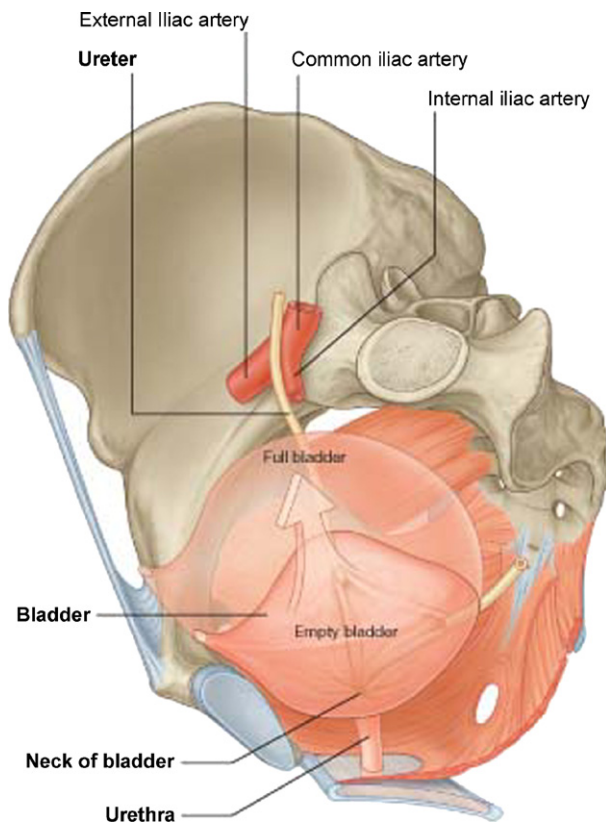


Figure 3 Pelvic part of the urinary system (from Gray's Anatomy for Students, p. 399, Fig. 5.39).

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 urothelial permeability, characteristic of IC.

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 TrPs, associated with abnormal muscular tension in key pelvic muscles, are commonly responsible for the symptoms. This 1-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 levator endopelvic 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 lying prone or lateral. 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 held for approximately 60s [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, has described palpation and treatment protocols for locating myofascial TrPt 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 TrPt 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 Thiele massage (see Note below) has been demonstrated on high-tone pelvic floor musculature in 90% of patients with interstitial (i.e. ‘unexplained’) cysti-

tis by [Holzberg et al. \(2001\)](#). Describing the technique the researchers observe: “Subjects underwent a total of 6 intravaginal massage sessions using the Thiele ‘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 8–12 s 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](#)) (Fig. 4).

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. Sixteen patients with 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 programme. The outcome was that there was a 94%

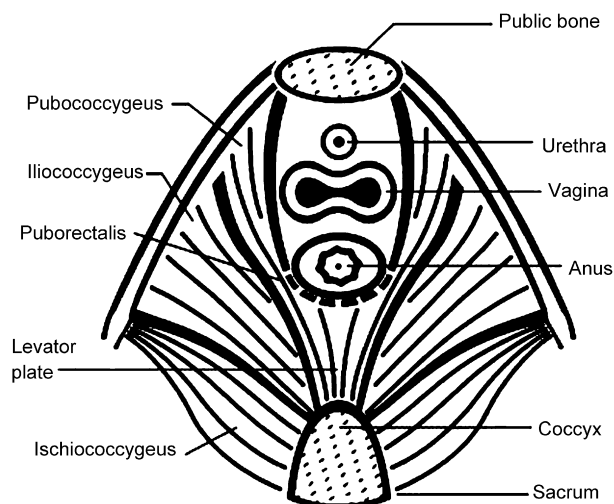


Figure 4 Diagrammatic view of the levator ani and ischio-coccygeus, viewed from the pelvic surface (from [Sapsford et al., 2001](#), with permission).

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 IC 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 IC 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. One hundred and one patients (76 female, 25 male, mean age: 54 years) with a diagnosis of Levator ani syndrome (LVAS) were studied prospectively over 1 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. Sixty-nine per cent 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 aetiology, and to screen for LVAS in all IBS patients.

Observation

These studies (amongst many others) point to trigger point activity being a probable aetiological feature of a number of different conditions involving the pelvic organs, most notably urinary incontinence (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 and 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 cited researchers such as Lukban et al. (2001), Riot et al. (2005) as well as Anderson (2006), have all identified sacroiliac dysfunction as a frequently associated factor. Possible mechanisms for this connection deserve some consideration.

It has been suggested that what are termed *Idiopathic Pain Disorders* (IPD)—which include pelvic disorders such as—IC and vulvar vestibulitis (VVS) (as well as non-pelvic related conditions such as temporomandibular joint disorders (TMJD), fibromyalgia syndrome (FMS), IBS, chronic headaches, chronic pelvic pain, chronic tinnitus and whiplash-associated disorders), are mediated by an individuals 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 aetiologically linked to CPP is not universally accepted. For example Henderson (2000) states, in relation to 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 show to cause IC."

Nevertheless, the fact that this paper focuses largely on the structural features of pelvic pain conditions is not meant to ignore the possibility that, in some instances, profound psychosocial elements may have been part of the aetiology of the condition, or that 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 TrPt) might be hypertonic, while others are hypotonic.

The treatment studies described earlier, and throughout this paper, relate in the main 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 (Nygaard et al., 1996), and others relatively low (~50%) success rates (Chaiken et al., 1993), it is clear that categorization of patients with IC and/or UI, into high-tone (where toning exercise may be less appropriate) or low-tone (where toning may be more appropriate) groups, 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 programme 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 LBP and pelvic symptoms, such as those discussed earlier, particularly 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

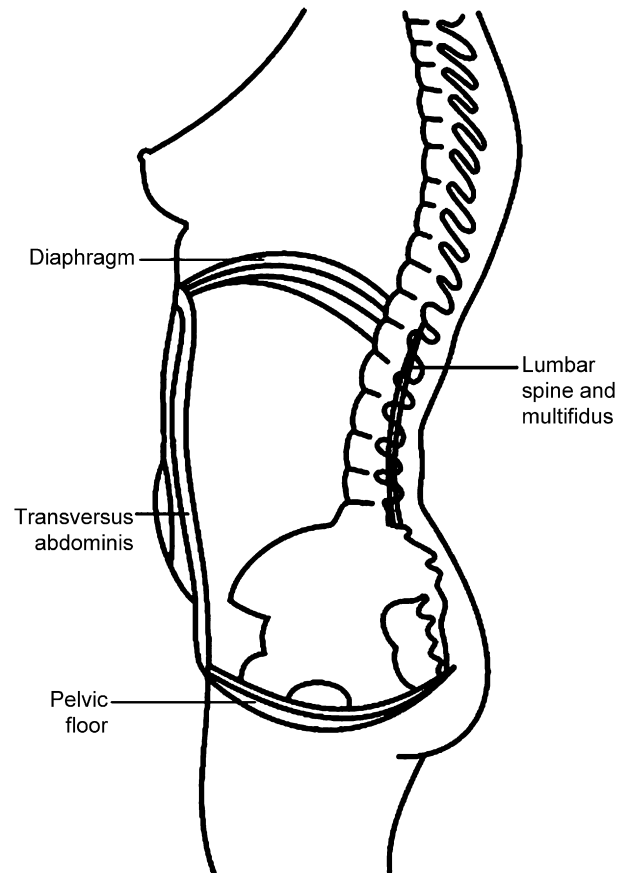


Figure 5 Diagrammatic representation of the abdomino-pelvic cavity surrounded by muscles, which contribute to spinal stability, intra-abdominal pressure and continence (from Sapsford et al., 2001, with permission).

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 unlike obesity and physical activity, 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 (Fig. 5).

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 obliquus externus activity that alters

pelvic floor muscle activity, possibly leading to UI. [Smith et al. \(2007\)](#) has confirmed this relationship between spinal support, pelvic and abdominal musculature, with implications for dysfunction involving UI.

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, 2007](#)).

Earlier still [Hodges et al. \(2001\)](#) had demonstrated that after approximately 60s of overbreathing (hyperventilation), the postural (tonic) and phasic functions of both the diaphragm and transversus abdominis are reduced or absent, with major implications for spinal stability.

Recently [O'Sullivan and Beales \(2007\)](#) 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 UI, 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 aetiological evolution of myofascial TrPt, as suggested by

[Simons et al. \(1999\)](#) with major implications for the development and exacerbation of myofascial pain conditions. Simons et al. have clearly demonstrated that an ischaemic environment is a natural breeding ground for TrPt. This has recently been confirmed by remarkable techniques involving microanalytical assays of the milieu of living muscle in the region of active TrPt ([Shah et al., 2005](#)). In addition ischaemia is a natural result of both excessively long-held muscular tone, and overbreathing ([Jammes et al., 1997](#); [Chaitow et al., 2002](#)).

It has been hypothesized 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 and DeLany, 2002](#)). Trigger point evolution in associated muscles appears to be a common accompanying feature of relatively lax ligaments ([Kerr and Grahame, 2003](#)). The author hypothesizes that these energy efficient (if painful) entities (TrPts), may offer a means of achieving relative stability.

The implications of this are that, if myofascial TrPts are serving functional roles, such as in stabilization of hypermobile joints, or in the context of our present discussion, 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 and Horacek \(2004\)](#) report that active TrPt 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 and Horacek have also identified a trigger point in the coccygeus muscle that if deactivated, also deactivates the erector spinae TrPt. Subsequent maintenance of the resulting improvement is then best achieved, these authors assert, by the individual learning to relax the muscles of the pelvic floor. [Skoglund \(1956\)](#) 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 TrPts may also affect 'LBP, coccygeal pain, pseudovisceral pain'.

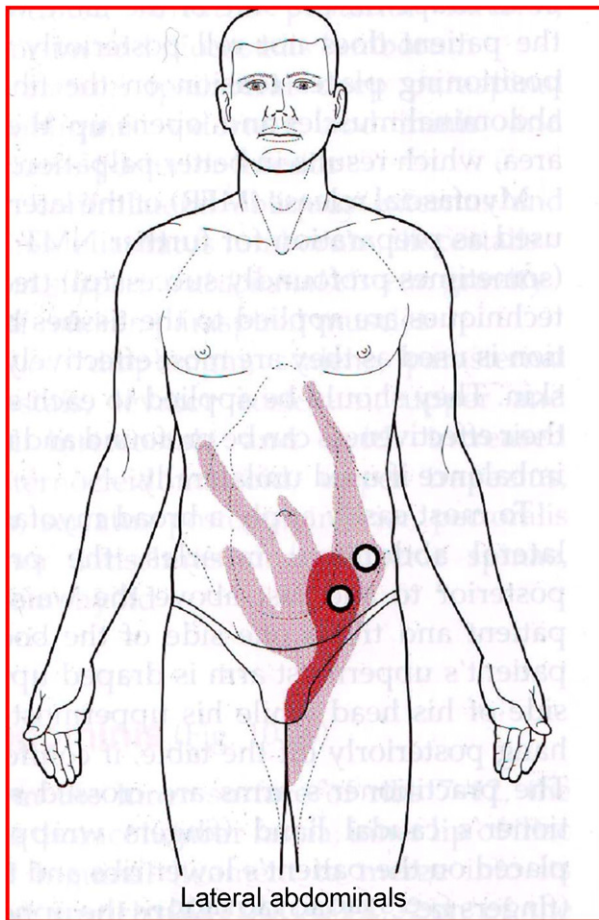


Figure 6 Trigger point location and referral pattern lateral abdominal muscles (from Chaitow and DeLany, 2002 adapted with permission from Travell and Simons, 1992).

Undoubtedly such scenarios (hypermobility, reflex influences) can be clinically confusing, and 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, TrPt.

Fortunately most TrPt affecting pelvic structures (both internal and external) are well documented and mapped (Simons et al., 1999; Chaitow and DeLany, 2002) (Figs. 6–8).

Urethral and sacro-iliac stability and instability

It is abundantly clear that symptom-related TrPt 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

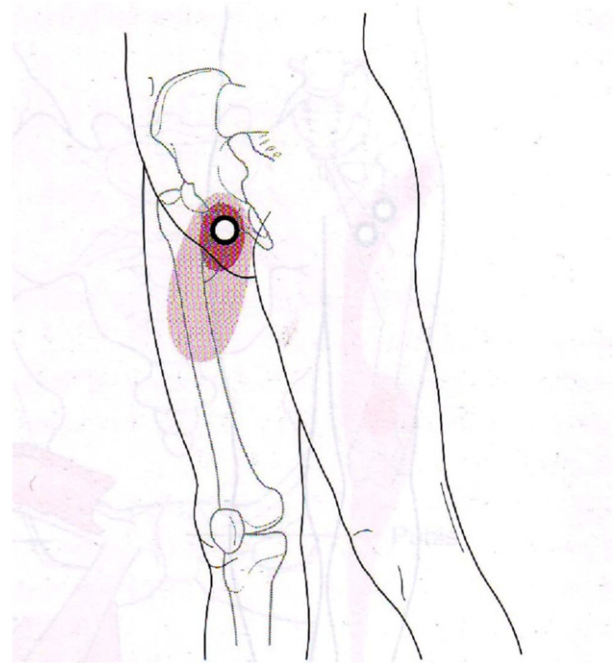


Figure 7 Trigger point location and referral pattern pectinius muscles (adapted with permission from Travell and Simons, 1992).

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 (1983) 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

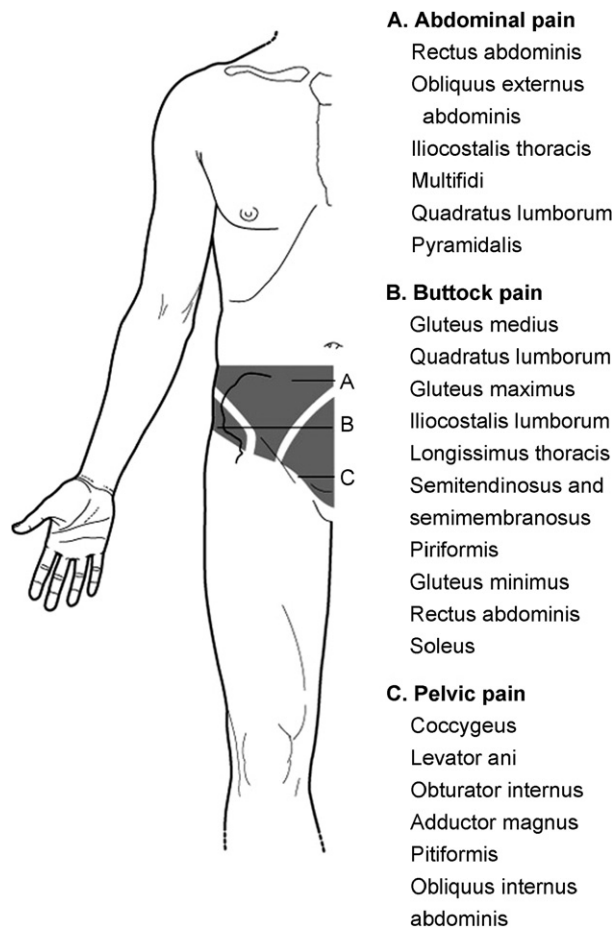


Figure 8 Designated areas in the anterior abdominal and pelvic region to which pain may be referred by myofascial trigger points (reproduced with permission from Chaitow and DeLany, 2005, after Travell and Simons, 1992).

closure feature that is a requirement for optimal sacro-iliac stability (Lee and 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 et al., 2001).

Lee and 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 and Lee, 2004).
- Inefficient load transfer involving excessive increases in intra-abdominal pressure, resulting in bladder and other pelvic organs being repetitively compressed inferiorly. Sapsford et al. (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 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 SUI, 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 hypothesize (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 IC, 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 and motor control of urethra is very similar to that of the SI joint. (Lee and 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 TrPt 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 and Slade, 1997).

In order to develop a manual treatment plan where biomechanical features appear to be con-

tributing 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: multifidi, 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 and Kotarinos, 2003).
- Hypermobility tendencies.
- Firing sequences of major muscle groups (e.g. Janda's (1983) hip extension and hip abduction tests).
- Presence of active TrPt (i.e. TrPt 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. Recognizing that pelvic floor status may be important to both the pathogenesis and maintenance of pelvic neurovisceral pain syndromes, a study was conducted of female pelvic floor pressure pain thresholds, involving ten healthy female volunteers, using a novel vaginal pressure algometer (Tua et al., 2006). The mean pressure pain threshold of the female levator ani and obturator complex was 1.59 kg/cm² (SD = 0.55), while thresholds of non-muscle vaginal sites (anterior and posterior raphe) were 1.68 kg/cm² (SD = 0.68).
- Breathing function (particularly evaluating for a paradoxical patterns).
- 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 TrPt and excessive tone) might include digital deactivation

of TrPt, 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 TrPt 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 TrPt contributing to symptoms, as well as normalizing joint and soft tissue imbalances, together with concomitant postural and breathing pattern disorders, 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.

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