Evaluation of the Levator Ani And Pelvic Wall Muscles in Levator Ani Syndrome

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Chronic pelvic pain is a difficult problem to evaluate and treat. Knowledge of the pelvic floor and pelvic wall muscles may enable the provider to identify levator ani spasm syndrome, a possible cause of chronic pelvic pain.

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Key Words: Levator ani, pelvic wall muscles, chronic pelvic pain, levator ani spasm syndrome.

Objectives
1. Explain chronic pelvic pain.
2. Discuss the examination process for properly diagnosing chronic pelvic pain.
3. Identify treatment modalities for chronic pelvic pain.

Background
Today’s researchers and clinicians refer to this condition as levator ani spasm/syndrome (LAS) (Hoffman, 2008; Smith, 1959). It was first described by Simpson in 1859 and later by Thiele (1963), although these researchers called it, somewhat inaccurately, coccygodynia (Grant & Salvati, 1975). Thiele (1963) made significant contributions to further understanding the syndrome by noting that patients who had levator spasm often complained of low back and buttock pain, which are common complaints of people who have coccygodynia.

Even though similarities exist between LAS and coccygodynia,
important differences exist to separate them. For example, early researchers noticed that patients with levator ani spasm could not describe any traumatic or triggering event; unlike coccygodynia, the symptoms of levator spasm may worsen during periods of stress that led observers in the past to question a relationship between the syndrome and psychiatric disorders (Grant & Salvati, 1975). Furthermore, patients with spasm may experience rectal pain when the levator ani muscles are palpated, but the pain may not be reproducible when applying pressure or moving the coccyx, as is seen in those with coccygodynia (Smith, 1959; Wright, 1969).

As seen in early discussions, this debate over what constitutes LAS and coccygodynia is somewhat nebulous, with much controversy surrounding the definition. Much of the confusion continues to this day with disagreement over the evaluation and diagnosis of LAS. Therefore, the objectives of this discussion are to provide a detailed description of the levator ani muscles and to present a thorough system of examination of these muscles. Discussion will also include a description and examination of the pelvic wall muscles, which include the piriformis and obturator internus muscles. While these muscles do not comprise the levator ani complex, and therefore, are not included as part of the diagnosis of LAS, dysfunction of them may impact the levator ani muscles, which may greatly affect patients with chronic pelvic pain. Finally, some basic therapeutic measures will be described. While not meant to be a complete listing of techniques and treatments for LAS, this information will further aide the provider in understanding how some techniques may help relax the muscles and alleviate the patient’s pain.

Figure 1.

**Levator Ani and Pelvic Wall Muscles**

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**Anatomy**

One of the muscle layers in the pelvic floor is collectively known as the pelvic diaphragm. This diaphragm consists of the levator ani and coccygeus muscles along with their superior and inferior layers of fascia (see Figure 1).

The levator ani is a very important muscle complex in the pelvic floor and represents a critical component of pelvic organ support. The normal levators maintain a constant state of resting contraction, maintained by the action of Type I (slow twitch) fibers that predominate in this muscle. This baseline activity of the levators keeps the urogenital hiatus narrowed and draws the distal parts of the urethra, vagina, and rectum toward the pubic bones. Type II (fast twitch) muscle fibers allow for involuntary reflex muscle contraction elicited by sudden increases in abdominal pressure. The levators can also be voluntarily contracted, as with Kegel exercises and sudden increases in abdominal pressure. Relaxation of these muscles occurs only briefly and intermittently during the processes of evacuation (voiding, defecation, and during parturition) (Corton, 2008).

The most commonly recognized components of the levator ani muscles are the pubococcygeus, puborectalis, and iliococcygeus muscles. The pubococcygeus muscle arises from the pubic bone and inserts at the anococcygeal body forming a sling around the urethra, vagina, and rectum. According to Delancey and Ashton-Miller (2007), this muscle elevates the vagina, perineal body, and anus. Spasm from this muscle can create low abdominal pain, back pain, and insertional dyspareunia, as well as pain with repetitive pelvic movement and thrusting (see Table 1). The puborectalis also arises on either side from the pubic bone and forms a U-shaped sling behind the anorectal junction. The action of the puborectalis draws the anorectal junction toward the pubis contributing to the anorectal angle (Corton, 2008). Spasm of this muscle may result in chronic constipation as the anorectal canal remains angulated, prohibiting the relaxation needed for proper evacua-
Table 1. Symptoms of LAS and Pelvic Wall Muscle Spasm

| Pubococcygeus: | Dyspareunia, lower abdominal pain, low back pain |
| Iliococcygeus: | Dyspareunia, low back pain, low abdominal pain |
| Puborectalis: | Painful defecation, constipation |
| Coccygeus: | Dyspareunia, low back pain, low abdominal pain |
| Piriformis: | Hip and back pain, referred pain to lower abdomen, dyspareunia |
| Obturator Internus: | Urinary symptoms, dyspareunia, hip pain |

ation of stool (El-Minawi, 2000; Grant & Salvati, 1975). Finally, the iliococcygeus muscle, which is the most posterior part of the levators, arises laterally from the arcus tendineus levator ani and the ischial spines, and muscle fibers from one side join those from the opposite side at the iliococcygeal raphe and the coccyx (Corton, 2008). Spasm from this muscle may result in low abdominal pain, low back pain, and dyspareunia as well.

The coccygeus muscle lies posterior and adjacent to the iliococcygeus. It attaches to the ischial spine laterally, to the coccyx, and the lowest aspect of the sacrum medially (Corton, 2008; Simons & Travell, 1999). While spasm of the pubococcygeus and iliococcygeus portion of the levators may cause dyspareunia with penile insertion, spasm of the coccygeus muscle may result in dyspareunia with deep penetration. No data support this problem, and observation is supported by anecdotal experience alone.

While not part of the levator ani complex, the pelvic wall muscles can contribute to chronic pelvic pain. Discussion of these muscles will include the piriformis and the obturator internus. The piriformis muscle arises from the anterior and lateral surface of the sacrum and partially fills the posterolateral pelvic walls. It exits the pelvis through the greater sciatic foramen, attaches to the greater trochanter of the femur, and functions as an external or lateral hip rotator. Spasm of this muscle can cause pain that is referred to multiple regions of the pelvis and low back (Simons & Travell, 1999), and may contribute to dyspareunia and painful defecation (Brown, 2000).

The obturator internus muscle partially fills the sidewalls of the pelvis. This muscle arises from the pelvic surfaces of the ilium and ischium, and from the obturator membrane. It exits the pelvis through the lesser sciatic foramen, attaches to the greater trochanter of the femur, and as the piriformis muscle, it functions as an external hip rotator (Howard, 2003; Simons & Travell, 1983). Patients with spasm of this muscle may complain of severe urinary frequency, urgency, and dysuria, as well as dyspareunia (Oyama et al., 2004).

Examination

Conducting a comprehensive physical examination is an essential part of a proper diagnosis of chronic pelvic pain. The first step is observation of the patient’s gait and sitting habits. Patients may be observed walking slowly and stiffly, attempting to guard the abdominal area. When seated, the patient may lean somewhat lopsidedly, avoiding the side that causes greater discomfort, or may frequently shift positions while seated in an attempt to reduce the pain (Simons & Travell, 1999).

A systematic pelvic examination is necessary to thoroughly evaluate the cause of one’s pain. With the patient in the lithotomy position, a thorough inspection of the pelvic floor should be completed. This includes both observation and palpation of any scars, such as from an episiotomy. Furthermore, the examiner assesses skin integrity by looking for any atrophic or dermatologic changes that may contribute to the patient’s discomfort. While the patient may have LAS, if such lesions or conditions are present, further evaluation is necessary.

Next, the clinician should evaluate the patient’s perineal sensation and bulbocavernous and anal reflexes. When evaluating sensation, the clinician can use the soft and sharp sides of a cotton swab and apply light touch to firm touch to all parts of the perineum and inner thighs attempting to discern the patient’s ability to differentiate between the two types of stimulation. This evaluation is also useful to determine if the pain has a neuropathic cause (Hoffman, 2008). The perineum and lower extremities are innervated by S2 to S4, and an understanding of the nerve pathways can help the clinician determine the source of the patient’s pain (see Figure 2).

Looking for involuntary movement, reflex evaluation is completed by using the soft part of a cotton swab while gently striking the right and left labia majora and either side of the anal meatus, respectively. Frawley and Bower (2007) write that an absent reflex may be seen in a patient who has spasm in the muscles. An excursion test can be performed to evaluate coordination and relaxation of the levator ani muscles. While continuing to observe the perineum, the examiner asks the patient to contract her levator ani muscles, relax them, then valsalva and relax again (Castello, 1998). Performance of this test may prove useful to the clinician because the patient with spasm may not have the ability to thoroughly relax the pelvic floor, may recruit additional muscles in an attempt to contract the levator ani, and may not have the ability to properly valsalva (Frawley & Bower, 2007).
The focus of the internal examination is the evaluation of the levator ani and pelvic wall muscles for spasm. Therefore, the examiner evaluates for any taut muscle bands; any small, pea-sized nodules within the muscle that may or may not be painful; and any tenderness with palpation. Pressure applied to the levator ani during the examination should be firm but gentle, with the examiner paying close attention to the patient’s experience of pain. Internal examination can be achieved by picturing the vagina on the face of a clock. Introducing the gloved index finger approximately one inch, or to the first knuckle, into the distal vagina, the examiner will palpate the pubococcygeus muscle from 7 to 11 o’clock on the left and from 1 to 5 o’clock on the right. Palpation of the puborectalis can also be achieved vaginally and may be felt more laterally in the distal vagina.

Insertion of the examining finger further into the vagina allows for palpation of the iliococcygeus. This muscle can be felt from the 4 to 8 o’clock positions. With the examining finger still positioned in the vagina at approximately the second and third knuckles, evaluation of the obturator internus muscle can be performed by directing the index finger superiorly and laterally palpat ing it at the 10 and 2 o’clock positions (see Figure 3).

Inserting the finger very deeply into the vagina and directing it to the 5 and 7 o’clock positions enables the examiner to evaluate the coccygeus muscle.

With the vaginal muscle assessment completed, the examiner evaluates coccygeal mobility with a two-handed technique (Smith, 1959). Demonstration of this technique is performed with the examiner inserting the finger of the dominant hand into the rectum. While using this hand to palpate the coccyx internally, the examiner then uses the other hand to palpate the coccyx exter-

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**Figure 2.**
S2-S4 Dermatomes

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**Figure 3.**
Obturator Internus Evaluation

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nally. With the coccyx anchored between the two fingers, the examiner can assess its mobility by rocking the fingers in an anterior and posterior fashion. The coccyx should be freely mobile and non-tender when palpated with a 30-degree range of motion.

The examiner then completes the rectal examination by inserting the gloved index finger into the rectum to palpate the puborectalis muscle, which is beyond the external anal sphincter (Delancey & Ashton-Miller, 2007). Evaluation of the muscle is achieved by using a downward, U-shaped, or sweeping motion on the muscle from 1 to 11 o’clock.

While palpating the puborectalis muscle, the examiner should direct the patient to push the examining finger out of the anus. Similar to the excursion test, this procedure can be used to evaluate non-relaxation and incoordination of the puborectalis muscle. Does the patient contract around the examiner’s finger while attempting to valsala? Does she have the ability to relax the muscles when directed? These examination techniques can provide the clinician with further clues to determine the cause of the patient’s chronic pelvic pain.

Palpation of the medial portion of the piriformis may be achieved during the rectal examination as well (Simons & Travell, 1999). With the index finger fully inserted into the rectum, the piriformis muscle can be felt at the 4 or 5 o’clock and 7 or 8 o’clock positions. In addition to the internal examination, an external examination should be completed to fully evaluate the piriformis muscle for spasm. External palpation of the piriformis muscle is completed with the patient first lying in the right and then the left lateral Sim’s position, and with the dependent thigh flexed to 90 degrees and the independent leg fully extended. Examination is completed by locating the landmarks at the greater trochanter and sacrum, and performing light and deep palpation, evaluating for any tightness in the muscle while directing the fingers across the imaginary line created from the lateral border of the sacrum to the proximal end of the greater trochanter (Simons & Travell, 1999).

**Treatment**

Several therapeutic techniques have been described and may prove useful in relieving symptoms of LAS. The following are only some of the described treatments that may prove effective for the patient.

**Thiele’s Massage**

Performance of Thiele’s massage rectally or through a vaginal approach has been shown to relieve pain from muscle spasm (Oyama et al., 2004; Thiele, 1963). With the patient in the Sim’s position, the index finger is inserted into the rectum. Palpating the levator ani, the examiner then provides firm, steady pressure while performing a sweeping, U-shaped massage to the muscle. Massage should be performed 10 to 15 times using firm but gentle pressure. Ideally, massage is provided every other day and gradually spaced out as the patient’s pain resolves (Thiele, 1963). Modifying this technique through the vaginal approach still allows the examiner to reach the levator ani but also aides in the massage of the obturator internus muscle. This modified technique is performed most effectively while the patient is in the lithotomy position, a different method from the traditional side-lying rectal approach (Oyama et al., 2004).

**Ischemic Compression and Trigger Point Massage**

Ischemic compression may also provide relief for the patient. With this technique, the patient may experience some discomfort but should not feel severe pain. Performance is completed with the examiner using deep palpation to the affected muscle and maintaining a constant pressure for 90 seconds to 2 minutes until the muscle relaxes. Likewise, if the patient has palpable trigger points within the muscle, the provider may perform trigger point massage by applying constant, direct pressure to the specific point to reduce the pain. This technique is slightly different from ischemic compression, where the provider applies pressure to the spastic muscle. With trigger point massage, pressure is directed to the specific trigger point within the muscle. Trigger points, as defined by Simons and Travell (1999), are tender, hyper irritable nodules within the muscle. When palpated in the vagina, they can cause referred pain throughout the pelvis. Patients with LAS may or may not have palpable trigger points. Likewise, patients without LAS may still have trigger points within the muscle causing pain and requiring therapy. Identification of these nodules appears to be common. In 1984, Slocumb evaluated 177 patients and found 133 of them had identifiable trigger points that contributed to their chronic pelvic pain. During performance of this therapy, the patient may describe a decrease in pain as the trigger point dissipates, affirming that massage has been beneficial.

**Pharmacologic Therapy**

Several medications can be used to help relax the muscles. Analgesics (acetaminophen, anti-inflammatory medications, and aspirin) are considered first-line pharmacologic therapy choices when managing pain. However, the focus of this discussion will be on the use of other potentially therapeutic options, such as low doses of antidepressants, skeletal muscle relaxants, and anticonvulsants (see Table 2). Other analgesic agents, such as opioids,
may be used, but only when other pharmacologic treatments have failed. The use of these medicines for the management of chronic pain is very controversial (Howard, 2003).

There is some evidence to support the use of tricyclic antidepressants, such as amitriptyline (Elavil®) or imipramine (Tofranil®). These drugs work by suppressing histamine release and decreasing the reuptake of norepinephrine and serotonin. This chemical process can potentially decrease a patient’s pain levels and improve one’s overall tolerance to the pain (American College of Obstetricians and Gynecologists [ACOG] Committee on Practice Bulletins—Gynecology, 2004). While research has shown these medications to be effective in alleviating neuropathic causes of pain (Bryson, 1996), use of these medications for pain stemming from LAS is not as well understood, and it is important to note that use of them in the treatment of chronic pelvic pain is strictly an off-label practice.

Another option to consider for the treatment of LAS includes use of skeletal muscle relaxants, such as cyclobenzaprine (Flexeril®) or diazepam (Valium®). These drugs may help control pain through relaxation of the levator ani (McGivney & Cleveland, 1965). However, the patient may find these medications less tolerable because they can produce a sedative effect. Care must also be exercised, specifically with Valium, as it can be habit forming.

Finally, gabapentin (Neurontin®), an anticonvulsant, may prove beneficial by acting on hyper-stimulated nerve endings to decrease a patient’s perception of pain (ACOG Committee on Practice Bulletins—Gynecology, 2004). While often used to treat neuropathic pain, with some evidence showing its usefulness in the treatment of pain associated with interstitial cystitis (Gunter, 2003), it may also prove beneficial for the treatment of LAS.

All medications reviewed here have been used for the treatment of LAS with varying results. Extensive research is needed to further characterize and understand the beneficial effects of these drugs.

**Conclusion**

Dysfunction of the pelvic floor and pelvic wall muscles may lead to chronic pelvic pain. A thorough understanding of the pelvic wall and pelvic floor anatomy is essential to the systematic examination of patients suffering from chronic pelvic pain. Only a few therapeutic techniques have been briefly described in this article, and a thorough knowledge of these modalities is important to properly treat the patient. There is some evidence to support the positive benefits of these listed treatments; however, there is still a lack of randomized trials to support the improvements noted with them. With few objective procedures to measure the reduction of pain, the clinician must often rely on anecdotal experience to gauge whether or not the treatments are effective.

Other treatments not mentioned in this article may also prove helpful; they include electrical stimulation, biofeedback with electromyography, trigger point injections, and relaxation therapy. It is important for the clinician to be knowledgeable of all treatment modalities for levator ani spasm, since this may significantly benefit the patient by reducing her experience of pain. This article focuses on levator ani massage; however, it is important to note that massage can be made more effective when working with the patient on her posture, exercise, and joint alignment, as well as re-education with electromyogram and other types of feedback. While the clinician (nurse, nurse practitioner, physician assistant) may not be the primary provider of these treatments, a complete understanding of the potential benefits will help facilitate proper referrals to alleviate the patient’s pain caused by LAS. Therefore, treatment for LAS should involve a multidisciplinary approach of physicians, nurse practitioners, physician assistants, and physical therapists.

As a final note, one must not forget other health care professionals who may prove supportive in alleviating the many emotional and psychological issues that are often a part of one’s experience of LAS. These experts include sex therapists and psychologists; the inclusion of these providers can be tremendous when navigating the complicated issues that occur from the interruptions of patients’ interpersonal relationships. Therefore, when treating the patient with LAS, it is important to have a thorough referral system in place to properly assist the patient. An association of skilled multidisciplinary providers is essential in the evaluation and treatment of LAS, in an effort to significantly improve quality of life.

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