A Classical Physical Therapy Approach to the Overactive Pelvic Floor

16

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16.1 Introduction

Pelvic floor (PF) muscle dysfunction is a global term that incorporates malfunctioning of the musculoskeletal and neuromuscular systems. While the process for determining its underlying cause can be complex, the dysfunction is often a result of a structural malalignment of the skeletal system [1–3], of hyperactivity or hypoactivity of a muscle or muscle group, or of restrictions in the tissues and fascia [4–8]. One may suffer from both overactive and underactive pelvic floor dysfunction, and it is essential to address both for this complex presentation. For instance, a postpartum female may present with stress incontinence related to an underactive or weak pelvic floor condition, as well as dyspareunia, related to overactive pubococcygeus and transverse perineal muscles. In order to address the weakness without causing further muscle shortening, the pelvic floor muscles require lengthening to function at an optimal position, before they are strengthened with pelvic floor exercises. Such traumas as a slip and fall, childbirth, infections, and poor posture can contribute to these structural changes and muscle imbalances.

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Pelvic floor muscles assist with voluntary sphincter control of the bladder and bowel and with sexual performance and function. They provide support for pelvic organs and assist with lumbopelvic stability and mobility. It is estimated that 80 % of pelvic floor muscle fibers are Type I slow-twitch skeletal fibers; 20 % are Type II fast-twitch skeletal fibers. As a result, symptoms of bladder, bowel, and/or sexual dysfunction often accompany PF dysfunction. Pain in the pelvic and abdominal regions, in the back and lower extremities, and in the genital area as well as central sensitization are often correlating findings of PF dysfunction. These symptoms can start as early as childhood and present up until the elder years.

In recent years, there has been an increase in research, specifically regarding treatment techniques [9–19]. It has been described that pelvic floor physical therapy can be an integral and extremely effective treatment for the musculoskeletal causes of functional pelvic pain [20–24]. In this chapter we will review manual therapies, reeducation for both the bladder and bowel, neuromuscular reeducation, posture/body mechanics, therapeutic exercise, and modalities including biofeedback, low-level laser therapy (LLLT), ultrasound, electric stimulation, transcutaneous electrical nerve stimulation (TENS), and heat and cold therapy. This list by no means represents all the treatments available nor does it reflect the research in its entirety.

A. Padoa, T.Y. Rosenbaum (eds.), *The Overactive Pelvic Floor*, DOI 10.1007/978-3-319-22150-2_16

It should be noted that to successfully treat pelvic floor dysfunction, it is essential to treat the body as a whole and to address all the biopsychosocial conditions contributing to the patient's pelvic pain. A treatment plan must be constantly monitored by the therapist, and the patient's progress consistently re-evaluated in order to advance the treatment plan [25] and modify it as warranted.

16.2 Manual Therapy Techniques

Myofascial release
Myofascial trigger point release
Connective tissue manipulation
Scar mobilization
Neural mobilization
Visceral manipulation
Joint mobilization

16.2.1 Myofascial Release

It is estimated that a myofascial dysfunction afflicts as many as 23 % of women with chronic pelvic pain (CPP) [26]. Myofascial Release (MFR), a holistic therapeutic approach to manual therapy, was developed by John Barnes as part of a comprehensive approach to the evaluation and treatment of the myofascial system [27]. As the term implies, the main tissue to target for release in the myofascial system is the fascia, described by Barnes as "a tough connective tissue which spreads throughout the body in a three dimensional web from head to foot without interruption." The fascia surrounds all structures in the body including muscles, nerves, vessels, and bones. MFR is reported to be an excellent technique for releasing such restrictions as trigger points, muscle tightness, and dysfunctions in soft tissue that may cause pain and limit motion in all parts of the body [28].

In the MFR process, the therapist evaluates, identifies, and treats fascial restrictions. Such restrictions may be caused by trauma, musculoskeletal conditions, repetitive stress syndrome, or poor posture. The gentle, hands-on techniques the MFR therapist applies to the whole body can bring about positive structural changes, increasing range of motion (ROM), reducing pain, and augmenting fascial mobility [28].

Barnes' approach teaches the therapist to evaluate the fascial system through visual analysis of the human frame's three-dimensional space, by palpating the tissue texture and various fascial layers, and by observing the symmetry, rate, quality, and intensity of strength of craniosacral rhythm.

Craniosacral rhythm is the use of light touch to perform delicate mobilization of the cranial bones and sacrum. This subtle hands-on treatment facilitates the release of connective tissue tightness surrounding the brain and spinal cord, or the Central Nervous System (CNS). This light touch can help to create balance within the CNS, by inhibiting the Sympathetic Nervous System (flight or flight response), and activating the Parasympathetic Nervous System (rest and digest), it reduces stress within the body, decreases pain, and promotes normal function. In addition to assessing the craniosacral rhythm, it is important to have the treating therapist "observe the vasomotor response and their location after a particular fascial restriction has been released. This provides instantaneous and very accurate information enabling the therapist to proceed intelligently and logically from one treatment to the next" [27].

MFR at first releases the elastic component of the fascia; at some later point, the collagenous barrier will be engaged. This barrier cannot be forced. The therapist maintains gentle pressure for some 90 to 120-plus seconds, and as the collagenous barrier releases, the therapist follows the motion of the tissue until all the barriers are released [28].

16.2.2 Myofascial Trigger Point Release

Travell and Simons define a trigger point as a highly irritable spot in a palpable taut band in the muscle or the fascia [8]; according to Travell, a true trigger point is a restriction that has a clear and consistent referral pattern [7, 8]. When pressure is applied, pain or tenderness is often provoked along with the possibility of autonomic nervous system involvement. The autonomic

nervous system plays a role in the regulation of internal organs. Sweating, vasoconstrictions, vasodilation, and cutis anserine are possible responses to trigger points linked to the autonomic nervous system. McPartland and Simons reported the ANS may indirectly exacerbate myofascial trigger points formation via viscerosomatic reflexes [29].

Muscles containing trigger points are characteristically shortened and present with decreased ROM, hyperactivity, incoordination, and substitution patterns [4, 5, 30]. Muscles with trigger points present must expend greater effort than muscles without trigger points to produce the same effects; this may cause changes in surrounding muscles, and it may also disorder the proprioceptive, nociceptive, and autonomic functions of the affected region [31].

It is well documented that trigger points may produce pelvic pain; these trigger points can be found in the levator ani muscle group, obturator internus, coccygeus, abdominals, gluteals, adductors, iliotibial band, tensor fascia latae quadricep, piriformis, quadratus lumborum, paraspinals, and hamstrings [8].

Trigger points in the posterior pelvic region result in symptoms in the rectum, anus, coccyx, and sacrum. Trigger points in the anterior portion may result in more urogenital pain and symptoms. Dyspareunia and bladder and bowel dysfunction can be the result of pelvic floor trigger points and can present with sharp, dull, aching symptoms both deep and superficial [4, 5, 8, 30, 32–34].

Yet trigger points may often go unrecognized. For this reason, it is essential that a skilled practitioner actively palpate the tissue in order to find and treat the restriction. Once identified, the trigger point muscles may be eased and lengthened through stretching and/or with such proprioceptive neuromuscular facilitations, as contract relax, reciprocal inhibition, and active release techniques [5, 13].

Research has found that myofascial trigger point release can achieve up to an 83 % improvement in symptoms; it can lessen the overactivity of the pelvic floor musculature, which in turn can reduce neurogenic bladder inflammation and decrease CNS sensitization [33]. A research study by Fitzgerald et al. concluded that a group of women with interstitial cystitis/painful bladder symptoms responded with significantly higher improvement to myofascial physical therapy, achieving an overall improvement in symptoms, than to global therapeutic massage [18]. Success has also been achieved in the treatment of pelvic pain and bladder, bowel, and sexual dysfunction through the use of many of these manual therapy techniques [5, 7, 13, 18, 31, 32].

16.2.3 Connective Tissue Manipulation

Connective tissue manipulation is the movement of one layer of skin over the other—skin rolling—in order to release tension in the tissue, thereby augmenting the ROM of the joint and restoring neurodynamics [7]. The manipulation creates the sensation of a sharp scratch or of a nail digging at the skin. The more restricted the tissue, the sharper the sensation, and the patient may complain of feeling bruised [24]. Connective tissue manipulation improves circulation to areas with decreased blood flow and pelvic congestion. When tension is released, blood flow to the area increases, flushing toxins from that region. This also improves mobility in the surrounding structures [32]. The therapist will note any changes to the skin texture, color, temperature, and elasticity [24].

16.2.4 Scar Tissue Mobilization

Any restrictions throughout the trunk, pelvic floor, sacral, and lower extremity regions that could be causing restrictions and overactivity contributing to the patient's pain should be addressed through scar mobilization. For abdomino-pelvic floor disorders, it is essential to address both the superficial scars that are visible—i.e., from Caesarian sections, episiotomies, and any abdominal surgeries—and those not visible but formed internally either by a surgical procedure or by such conditions as endometriosis. Some studies suggest releasing the scar with each physical therapy treatment until normal flexibility returns and there is no more adherence to deeper tissues [4].

16.2.5 Neural Mobilization

The theory behind neural mobilization is that in improving axonal transportation, nerve conduction velocity is increased [28]. Manual neural mobilization restores altered neurodynamics by balancing the relative movement of neural tissue and surrounding mechanical interfaces, thus reducing intrinsic pressure and optimizing physiological functions [35]. Treatment is indicated if there are signs of pain due to increased resistance of the tissues and reproduction of symptoms [7]. The therapist will use various techniques to palpate and reduce restrictions in any tissue and musculature that could be restricting the nerve. In addition, neural glides can help free restrictions of the nerve.

16.2.6 Visceral Manipulation

Just as the skeletal system needs to be in proper alignment to maintain homeostasis, so do the viscera. Adhesions, abnormal tone, or displacement may result in a disharmonious movement between internal organs, and this disharmony may in turn lead to chronic irritation and pain. As Carriere and Feldt write, "The viscera of the pelvic floor needs to be very flexible to adapt to the daily filling of the bladder and rectum and to the monthly changes in the endometrium" [36].

Visceral manipulation uses gentle palpation and manual therapy to evaluate and correct the imbalances, returning the organs to their appropriate position and stimulating arterial and venous blood supply so that the organs return to optimal functioning [36]. Please refer to Chap. 21 for more information on visceral manipulation.

16.2.7 Joint Mobilizations

Joint mobilization is a manual therapy intervention, a type of passive movement of a skeletal joint. When applied to the spine, it is known as spinal mobilization. In a patient with pelvic pain, a structural deviation within the skeletal system can often be resolved with these techniques, which decrease muscle guarding, lengthen the tissue surrounding a joint, and affect neuromuscular influences on muscle activity and increased proprioceptive awareness [28].

16.3 Neuromuscular Reeducation

As per O'Sullivan and Schmitz, PNF, which is one of the many techniques of neuromuscular reeducation, focuses primarily on the facilitation of total patterns of movement and posture; this promotes learning—reeducation—in synergistic muscle groups. Pelvic floor muscle weakness, incoordination, adaptive shortening, joint immobility, and alterations in muscle tone may lead to impaired patterns of posture and movement. By applying PNF techniques to the pelvic floor and surrounding structures, those muscles and structures may be strengthened, lengthened, and coordinated [37].

These techniques include *contract-relax* to promote relaxation at a point of limited ROM [37] and *strain-counterstrain*, a form of passive positional release designed to release connective tissue restrictions. In this latter technique, the tissue is initially moved in the direction of ease that shortens the affective structure. According to Jones and Randall, "The purpose of movement toward shortening is to relax aberrant reflexes that produce the muscle spasm forcing immediate reduction of tone to normal levels. This allows the joints influenced by the now relaxed muscle to function optimally increasing its ROM and easing muscle pain. Strain and counterstrain is an effective but extremely gentle technique because its action for treatment moves the patient's body away from the painful, restricted directions of motion" [38].

16.4 Pelvic Floor Muscle Retraining

Pelvic floor muscle retraining requires developing or improving motor control for bladder, bowel, and sexual function and to ameliorate pelvic pain [39, 40]. Patients diagnosed with CPP, dyspareunia, or any urgency-frequency dysfunction often present with overactive pelvic floor

muscles [30]. Pelvic floor muscle overactivity may also be the result of holding patterns, which, over time, can result in shortened muscle fibers, restricted connective tissues, and/or contracted sarcomeres [4].

Behavioral therapy needs to be integrated into the treatment approach in order to break the cycle of dysfunction and pain. Education and training must focus on proper motor control—that is, on relaxing the pelvic floor muscles in voiding and intercourse rather than contracting or tensing the muscles out of fear of pain. Such training entails "learning" the difference between contracting, elongating, and relaxing the pelvic floor through verbal cueing and such other forms of cueing as biofeedback. The techniques for this retraining follow principles of the operant learning model and of cognitive behavioral therapy [41, 42]. In addition, it may be helpful to do any or several of the following behavioral modifications before or after any painful activity, including sexual activity: scheduled voiding, urge control, posture re-training, and pelvic floor muscle relaxation and massage. Such modifications have been shown to be extremely effective in pelvic floor rehabilitation [43, 44].

Various forms of "home remedies" have also been shown to be effective and can be applied by the patient. Stress management, relaxation breathing, pelvic floor muscle relaxation, relaxing time with a walk, hot bath, yoga, and meditation are all examples of behavioral or lifestyle modifications that can help with physiological quieting [43]. Two particularly effective techniques are the use of a dilator, or internal massage device, to help eliminate myofascial trigger points and to further elongate the shortened pelvic floor muscles [41, 44], and passive stretching of the tissues at the vaginal introitus [45].

16.5 Bladder and Bowel Reeducation

Pelvic floor muscles need to be relaxed during urination and defecation, which is why regulating bladder and bowel function is an essential component of the treatment of pelvic pain. For those diagnosed with chronic overactive pelvic floor muscles, getting those muscles to relax and lengthen is often a multi-step process that can be helped by both manual therapies and reeducation techniques. For example, proper positioning is key when voiding. Leaning forward and slightly extending the spine decreases the anorectal angle facilitating bowel movement. Depending on the height of the toilet, it may be necessary to place a stool under the patient's feet to allow for optimal positioning [9]. In addition, taking time on the toilet and allowing oneself time to relax can help avoid the straining that can put a lot of adverse tension on the pelvic floor muscles. Manual therapies, as well as such techniques as imagery, deep breathing, and biofeedback, may all assist in the reeducation of the muscles to address post-void dribble, bladder and bowel frequency, urgency, retention, and hesitancy [43, 46]. Here are some key techniques and tips for addressing these issues.

16.5.1 For Bladder Symptoms

- Eliminate dietary irritants
- Do not restrict water intake; rehydrate to progressively help expand bladder capacity
- Do not push out the urine (it should flow naturally)
- Timed voiding
- Delay the urge to urinate
- Double void
- Don't hover over the toilet
- Breathing with voiding

16.5.2 For Bowel Symptoms

- Increase intake of soluble and insoluble fiber to avoid constipation
- Increase water intake
- Urge delay if patient has bowel frequency
- Use a squatty potty/steps for proper positioning
- Breathing techniques to help relax the pelvic floor and abdominal muscles
- Avoid straining
- Colon massage and abdominal splinting

16.6 Posture/Body Mechanics

One common observation in patients with pelvic pain is that they tend to sit on one ischial tuberosity—often with minimal support on the chair—with legs flexed and crossed with no lumbar lordosis. Pelvic alignment was the biggest difference between women with complaints of pelvic pain and those without [47]. Patients with pelvic pain had a difficult time with single leg stance longer than 10 s [47].

Pelvic and abdominal dysfunction, including increased tone and/or weakness, can result in core instability and faulty postures [1, 2]. According to Howard et al., "Faulty postures are those positions that increase the stress to the joints and use excessive muscle activity. Viewed this way, posture is a mechanical state and when body mechanics are altered in a way that is less functional, the end result is dysfunction and pain." Typical pelvic pain patients present with faulty posture, which is a "contributing cause of weak, deconditioned muscles allowing for imbalances in the pelvis with formation of trigger points and overactivity, and as a result, pelvic pain" [48]. In order to correct these faulty postures and resulting dysfunctions, certain muscles and tissues may need lengthening while others will need strengthening. A healthcare provider with extensive training in the musculoskeletal system can determine what the needs are for each individual patient.

16.7 Therapeutic Exercise

Core strengthening and stretching exercises are also key components when addressing pelvic floor dysfunction.

16.7.1 The Core

Cough, sneeze, or laugh and the pelvic floor and abdominal muscles contract in concert with the action. This normal relationship among the pelvic floor, deep back muscles, diaphragm, and abdominal muscles can, in people with pelvic floor muscle dysfunctions, have adverse effects. The normal co-contraction when one coughs, sneezes, or laughs can be painful when there are active trigger points or irritation in the abdominal/pelvic musculature—including scarring, injury, or inflammation [4].

Certainly, a strong core is essential for mobility and stability of the spine, pelvis, shoulder, and hip girdle and to create a solid base of support for the body as a whole; it is the foundation for facilitating movement from the center of the body out to the extremities. Weakness in the core muscles or an imbalance in the musculoskeletal system can give rise to several different dysfunctions in the back, pelvis, sacroiliac joint, ligaments, discs, and hip joints and may eventually lead to other disorders such as osteoarthritis, degenerative disk disease, incontinence, and prolapsed pelvic organs. And while it is advisable to maintain strong core muscles—diaphragm, trunk, pelvis, and abdomen—through therapeutic exercise, such exercises should *not* be performed in muscles and tissues containing any trigger points, fascial restrictions, hypertonicity, skeletal malalignment, or an acute injury. Only when the dysfunction is resolved should patients return to building core strength through therapeutic exercises, and even then, care should be taken to not increase any pelvic, abdominal, or back pain.

Returning the patient to a neutral postural alignment is extremely important in order to allow for a proper length and tension relationship with the surrounding musculature. Stretching is key to maintaining the proper length and tension. According to Haugstad et al., the most significant restrictions to proper length and tension were found in the iliopsoas, straight abdominal muscles, and femoral adductors in women with CPP [47].

16.7.2 Stretching

The key to healing is letting go of the tension, and that is what stretching can help to achieve. Just as we stretch leg or arm muscles when they feel tight, we can address the tension in the pelvic floor with stretching. Foam rollers and/or a trigger point and MFR ball can help decrease the

tension within the pelvic floor and surrounding musculature. Stretching the muscles surrounding the pelvis—abdominals, hip flexors, extensors, abductors, adductors, and rotators—may also decrease the tension on the pelvic floor. According to a study by Viera and Costa, "The physiological effects of stretches may continue to reduce discomfort and pain" [20].

Vaginal dilators are useful to stretch the internal muscles of the pelvic floor. Vaginal dilators can play an important role in overcoming pelvic floor muscular response that remains and sometimes increases even after pain perception has decreased [41, 49, 50].

16.8 Treatment Modalities

A range of other modalities can complement or augment the primarily manual skills of pelvic floor physical therapy.

EMG Biofeedback provides instantaneous, performance-dependent, visual and/or auditory feedback that measures muscle activity and in so doing helps to increase self-awareness and teach proper muscle coordination. Electrode sensors positioned internally in the vagina or rectum or placed around the anal opening detect muscle activity; the activity is represented on a screen so that the patient can see the difference between what the muscles do during rest versus their appearance during activity. This visual feedback helps the patient learn how to downregulate overactive muscles or re-train pelvic muscle incoordination, and this in turn can help reduce the patient's pain [10, 12, 33, 51].

There are many occasions, however, when the biofeedback shows a low resting tone even though the patient's pain is extremely high. Typically, this occurs in patients with shortened pelvic floor muscles, which may not appear to be overactive on the EMG [4, 5]. For this reason, it is imperative to use manual techniques *with* the biofeedback for these patients. A comprehensive review of EMG biofeedback is provided in Chap. 28.

LLLT is a hand-held modality that assists in healing various pain conditions. LLLT emits photon light without heat, causing bio-stimulation at the cellular level and helping to accelerate the healing process. It uses power densities lower than those needed to heat tissue and low-intensity wave lengths in either scanning or spot form. LLLT may eliminate the trigger points common in pelvic pain by increasing local microcirculation, thus bringing more oxygen to the cells and helping reduce inflammation. It can also be used to temporarily relieve minor muscle and joint aches, reduce pain and stiffness, decrease muscle spasms, break up scar adhesions, and increase lymph flow; some of the research is contradictory, however, with conflicting results due to varying durations of symptoms and differing treatment techniques, parameters, and machine specifications [52–54].

Therapeutic ultrasound is the use of a transducer or applicator that transmits low-intensity and low-frequency sound waves, causing a warming and stimulation of the tissues that leads to vasodilation and thus delivers more blood and oxygen to the affected area. Maximum energy absorption in the soft tissue occurs from 2 to 5 cm beneath the skin's surface, with the intensity decreasing as the waves penetrate deeper. The transmission is absorbed primarily by connective tissue, ligaments, tendons, fascia, and scar tissue. The results are an increase in blood flow in the treated area and a decrease in pain from the reduction of swelling and edema [55].

Ultrasound has been used with success for perineal tears/episiotomies resulting in dyspareunia following vaginal delivery [56], and, in one study in which results were moderate, for interstitial cystitis [57].

Electrical stimulation can be used internally and externally. It works by interfering with the electrical currents of pain signals, inhibiting them from reaching the brain where they would normally induce a pain response. For pelvic pain and overactive pelvic floor muscles, electrical stimulation can help relax muscle spasms, increase local blood circulation, rehabilitate and reeducate muscles, maintain and increase ROM in the tissues, and manage chronic and intractable pain. A small amount of research supports the use of electric stimulation for pelvic and vulvar pain [58–62].

TENS is the application of mild electrical stimulation using skin electrodes placed near to or distant from an area of pain; it acts by interfering with the transmission of painful stimuli—the pain gate theory. Some studies have shown that high-frequency TENS is more effective for pain relief than placebo TENS, while low-frequency TENS is no more effective [63]. There have been many studies on the positive analgesic effects of TENS on chronic, non-pelvic pain conditions [64] and of TENS on dysmenorrhea, pelvic pain and overactive pelvic floor disorders [62, 65–67].

Hot and cold therapies are helpful modalities that have been shown to provide temporary reduction of pain [68, 69]. *Heat* helps to relax tight muscles and thus decrease pain caused by muscle tension or spasms; heat also vasodilates the blood vessels, which increases circulation to the area and helps promote healing. A small, controlled study of patients with anorectal pain showed positive therapeutic effects—compared to people without pain—of anal resting pressure while the patients were immersed in a warm bath [70]. *Cold therapy* causes vasoconstriction of the blood vessels in the area where the cold pack is applied. This helps to decrease the inflammation in the area, thus also decreasing pain. While this suggests that cryotherapy may help with pelvic pain, to date no studies have been done.

16.9 Conclusion

Manual therapy, neuromuscular reeducation, bladder and bowel training, biofeedback, therapeutic exercises, and modalities are all components of physical therapy that can be used as interventions for the effective treatment of pelvic floor muscle overactivity [2, 9–19]. A plan for such treatment properly begins with an evaluation performed by a pelvic floor specialist; this provides the information needed to individualize the plan of care for the patients' dysfunction.

Manual therapy, including MFR, myofascial trigger point release, connective tissue manipulation, scar mobilization, neural mobilization, visceral manipulation, and joint mobilization, as well as patient education, are important components of treatment. By informing the patient about proper posture, body mechanics, and body awareness, education becomes an essential support for successful treatment. Moreover, neuromuscular reeducation is the key to retraining the musculature for optimal positioning and therefore for maximal efficiency—especially in the pelvis where bladder and bowel re-training can reduce the pain and increase the efficiency of voiding and defecation.

Pelvic floor dysfunction can appear at any point throughout an individual's lifespan. As the research increasingly demonstrates, physical therapy can reduce, if not eliminate, the need for surgical interventions and in so doing can save both time and money.

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