Pelvic Floor Muscle Training In Males: Practical Applications

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Abstract: The pelvic floor muscles are vital to male genital-urinary health. Pelvic floor muscle training may prove helpful in a variety clinical circumstances: stress urinary incontinence that follows prostate surgery; overactive bladder; post-void dribbling; erectile dysfunction; orgasmic dysfunction; premature ejaculation; pelvic pain due to levator muscle spasm; and bowel urgency and incontinence.

Abbreviations:

BC bulbocavernosus muscle

BCR bulbocavernosus reflex

CPSI chronic prostatitis symptom index

ED erectile dysfunction

IC ischiocavernosus muscle

OAB overactive bladder

PE premature ejaculation

PFM pelvic floor muscle(s)

PFMT pelvic floor muscle training

PVD post-void dribbling

SUI stress urinary incontinence

TPM transverse perineal muscles

UTI urinary tract infection

Introduction: The pelvic floor muscles have long been recognized as important structural and functional components of the female pelvis. Dr. Arnold Kegel popularized exercises of the PFM in order to improve sexual[1] and urinary health after childbirth.[2,3] Kegel employed the principle of functional restoration of a segregated group of muscles—well established in the fields of orthopedics, neuromuscular and plastic surgery, and physical medicine and rehabilitation—applying it to the PFM.[4] Additionally, Kegel recognized that surgery to correct vaginal, urethral and rectal incompetence could be facilitated by preoperative and postoperative PFMT in order to improve the texture, tone and function of the perineal muscles.[4]

PFMT is defined as “any program of repeated voluntary pelvic floor muscle contractions taught by a health care professional."[5] PFMT in males is by no means a new concept, Hippocrates and Galen having described it in Ancient Greece and Rome, where it was performed in the baths and gymnasiums; strengthening these muscles was thought to promote general and sexual health, spirituality, and longevity.[6] Nonetheless, the male PFM have yet to receive the recognition that the female PFM have, although from a functional standpoint are of vital importance, certainly as critical to male genital-urinary health as they are to female genital-urinary health. Men have the very same pelvic floor muscles as women do and an equivalent capacity for exercising them, with a parallel benefit

and advantage to urinary and sexual health. Unfortunately, however, most men are unfamiliar with pelvic floor muscle exercises and it is the rare man who has performed them. Additionally, many urologists are not fully aware of the potential utility of PFMT for their patients, and if they are, certainly do not have the time necessary to devote to educating patients, with most of this responsibility falling to physiotherapists who have expertise in the pelvic floor.

The PFM, as with all skeletal muscles, are subject to the force of adaptation. They can become atrophic and poorly functional with aging, weight gain, a sedentary lifestyle, saddle sports (cycling, motorcycling, horseback riding) and other forms of injury and trauma. When exercise is applied to them, their structure and function can be enhanced, resulting in greater PFM strength, tone, durability and responsiveness, similar to the effect any strength-training regimen has on the muscle group targeted.

The deep PFM—the levator ani muscle—is comprised of the pubococcygeus, iliococcygeus and puborectalis muscles. These muscles, in conjunction with the urethral and anal sphincters, play an important role in maintaining urinary and bowel continence. The superficial PFM—the bulbocavernosus (BC), ischiocavernosus (IC) muscles and transverse perineal muscles (TPM)—function in maintaining erectile rigidity and the expulsion of the contents of the urethra. When contracted, the BC muscle engorges the glans and corpus spongiosum, expels residual urine from the bulbar urethra, and ejaculates semen from the urethra at the time of climax. The IC muscle stabilizes the erect penis

and inhibits venous return to help maintain rigid penile engorgement and intra-cavernosal blood pressures that far exceed systemic systolic blood pressures.

Strengthening the PFM will potentially benefit urinary and bowel incontinence, erectile dysfunction, and ejaculation issues. There are many potential specific utilities of PFM exercises in the male urology population in the following domains: stress urinary incontinence (SUI); overactive bladder (OAB); post-void dribbling (PVD); erectile dysfunction (ED); ejaculatory dysfunction; and pelvic floor tension myalgia.

It is critical to recognize that PFM exercises are advantageous not only for patients suffering from any of the aforementioned problems, but also as a means of helping to preempt these problems. For example, PFMT before undergoing prostatectomy may help prevent the occurrence of SUI.[7,8,9] This holds true for every single domain in which PFMT has utility.

Materials and Methods: A MEDLINE (via PubMed) search for “male pelvic floor exercises” garnered 218 articles, and non-relevant articles were excluded. Additional searches were made for the specific clinical situations potentially benefited by PFMT. Manual searches of reference lists were undertaken. The intent was to focus on the indications and efficacy of PFMT in males. Space limitations do not allow a discussion of the specifics and nuances of the PFMT regimens, which are quite variable, some involving exercises alone and others using biofeedback and electrical stimulation.

PFMT For SUI

SUI is provoked by activities including sneezing, coughing, bending, lifting, exercising, and positional change. It most commonly occurs as a consequence of radical prostatectomy performed to treat prostate cancer, although it can also occur after prostate surgery done for benign conditions.

The levator ani muscles help support and reinforce the external sphincter mechanism. The internal sphincter mechanism, from a continence leverage standpoint, is ideally situated at the bladder neck, whereas the external sphincter mechanism is downstream from the internal sphincter and does not have this mechanical advantage. In terms of their efficiency and utility, the internal sphincter mechanism can be considered to be the “standard” brakes of a car whereas the external sphincter mechanism can be considered the “emergency” brakes of a car.

When the internal sphincter mechanism is damaged, the bladder neck is often rendered in a partially scarred, fixed open position, similar to a damaged “washer” in a faucet that no longer has the elasticity and suppleness to provide closure. Under this circumstance, continence becomes dependent upon the auxiliary external sphincter mechanism. However, the external mechanism is not designed for sustained contraction, as is the internal sphincter mechanism. Even

though there is baseline tonicity to this muscle, only a relatively brief intense contraction of this muscle can be elicited upon demand.

The “guarding” reflex[10] is an increase in the magnitude of contraction of the external sphincter mechanism during urine storage, a means of helping to maintain continence as urine volume increases. The “cough” reflex[11] is a contraction of the external sphincter mechanism that occurs with coughing, a means of helping to maintain continence when there is a sudden increase in intra-abdominal pressure.

Since the external sphincter mechanism is a voluntary skeletal muscle that is contributed to by the levator ani, PFMT has the potential to increase its tone, strength, power, and endurance. When this muscle complex is trained, the guarding and cough reflexes will become more robust to better maintain continence. PFM conditioning will hone a patient’s ability to produce a voluntary, sustained and powerful contraction to offset SUI.

Numerous studies have shown the benefit of post-radical prostatectomy PFMT in facilitating an early return of urinary continence.[12,13,14] Ribiero et al[15] reported not only a hastening of the recovery of urinary continence, but also significant improvements in both the incontinence and lower urinary tract symptom severity as well as improved pelvic floor muscle strength.

Patients should be instructed to be attentive to the specific triggers that provoke the SUI. By intensely contracting the PFM immediately prior to the exposure to the trigger, the SUI can be mitigated. For example, if the transition from a sitting position to a standing position is what drives the SUI, a brisk and sustained PFM contraction during the process of standing up should help control the problem. This "knack" maneuver,[16] bracing the pelvic floor muscles immediately prior to an activity that might provoke the problem—can be a highly effective means of managing SUI. When this maneuver is practiced diligently, it will ultimately become an automatic behavior.

PFMT For Overactive Bladder (OAB)

OAB is the presence of urinary urgency, frequency and nocturia with or without urgency incontinence, in the absence of a UTI or other pathology. Although it often occurs without provocation, it can be triggered by positional changes such as arising from a sitting position; exposure to any source of running water—the kitchen sink, bathroom fixture, shower, hand-washing, cold or rainy weather; and getting closer and closer to a bathroom, particularly at the time of placing the key in the door to one's home (latchkey urgency).

Parents often instruct their young children to urinate on command by establishing a conditioned response. By sitting the child on the toilet with the bathroom faucet turned on, an association between running water and the act of urination is

created and reinforced. Later in life, this Pavlovian conditioned response can come back to haunt our patients when exposure to water triggers prompts an involuntary bladder contraction.

During storage, the detrusor muscle is relaxed and the sphincters (including the internal and external sphincter mechanisms) are engaged. During emptying, the detrusor muscle contracts and the sphincter muscles (including the contribution from the PFM) relax in a synchronous and coordinated fashion. Since the detrusor muscle and the PFM have an "antagonistic" relationship—when one muscle is "on" the other is "off," this relationship can be exploited to the advantage of our patients. It can be capitalized upon by having our patients recognize the involuntary bladder contraction and deploy their PFM, which when contracted, can serve to inhibit the involuntary bladder contraction.

Thus, PFM contractions play an important role in inhibiting urgency and urgency incontinence. PFMT helps stimulate inhibitory reflexes between the PFM and the detrusor muscle[17] and rhythmic pulsing of the PFM can prevent an involuntary contraction before it begins and inhibit an involuntary contraction once it starts. The "quick flick"[18] is a technique used for urge incontinence in which the PFM are rapidly pulsed 3-5 times at the time of the perception of the urge to void.

Increasing PFM tone, strength and facility is one of the most effective remedies for combating urgency and urgency incontinence, and one that works well in tandem with behavioral techniques and pharmacotherapy. The American Urological Association has published guidelines for overactive bladder[19] and guideline statement number six

recommends that clinicians should offer behavioral therapies including fluid management, bladder training, bladder control strategies and pelvic floor muscle training as first line therapy to all patients with overactive bladder.

Patients should be taught to recognize the specific *triggers* that induce the urgency or incontinence: hand washing, key in the door, rising from sitting, running water, entering the shower, cold or rainy weather, etc. Prior to exposure to a trigger, or at the time of the perceived urgency, quick rhythmic flicks or pulses of the PFM—"snapping" the PFM rapidly several times—can either preempt the involuntary bladder contraction before it occurs or diminish or abort the bladder contraction after it begins. Thus, by actively squeezing the PFM just before and during trigger activities, the urgency can be mitigated and the urgency incontinence can often be preempted.

PFMT For Post-Void Dribbling (PVD)

Post-void dribbling is the occurrence of urinary incontinence immediately or shortly after completing urination. Some urine remains pooled in the bulbar urethra and PVD occurs when this urine drips from the urethra aided by gravity and movement. This "after-dribble" is more annoying than serious and can be one of the earliest manifestations of BPH. Although it less commonly occurs before age forty, it can happen to men of any age.

Dorey et al [20,21] demonstrated the effectiveness of PFMT for PVD. She recognized an association between ED and PVD and concluded that these issues are linked and parallel problems, one sexual and the other

urinary—both manifestations of PFM weakness, and both amenable to improvement by PFMT.

PFM contractions are the body's natural mechanism to facilitate expelling the urethral contents. When contracted, the BC muscle—the body's urethral "stripper"—compresses the bulbar urethra, displacing the urine within distally. Improving the strength and tone of the PFM will increase the capacity to efficiently eject the contents of the proximal urethra. A powerful BC muscle will substantially help this process, in much the same way that it facilitates ejaculation.

Patients should be instructed to contract the PFM vigorously several times after completing urination in order to displace the contents of the bulbar urethra. If necessary, this can be supplemented with manually compressing and milking the urethra, but this should hardly be necessary since the PFM—particularly when conditioned—are eminently capable of emptying the urethral contents.

PFMT For Erectile Dysfunction (ED)

The penis is a marvel of engineering, uniquely capable of increasing its blood flow by a factor of 40-50 times or so over baseline, this vascular surge happening within a matter of seconds and accomplished by relaxation of smooth muscle within the media of the cavernosal arteries and within the erectile sinusoids of the corpora.[22]

The Massachusetts Male Aging Study[23] demonstrated that ED is present in about 40% of men by age 40 with an increase in prevalence by approximately 10% for each decade thereafter. Although there are many potential causes of ED, the common denominator is insufficient blood flow to fill the corpora, or alternatively, sufficient arterial blood flow, but poor venous trapping due to venous-occlusive disease, both issues often caused by a decline in the capacity for smooth muscle relaxation. This results in a spectrum of erectile difficulties including the following: increased refractory time; less rigid erections; adequate rigidity, but premature loss of erections; and the inability to achieve an erection.

ED is most often multifactorial, with biological, psychosocial and relational components, and the status of the PFM appears to be a meaningful contributing factor.[24] Colpi et al[25] studied PFM contractility in men with and without ED using anal electromyography, demonstrating that PFM voluntary activity is more efficient in men with normal erectile function as compared to a matched group of men with ED, supporting the concept that PFM efficiency is related to erectile capability.

The bulbocavernosus (BC) and the ischiocavernosus (IC) muscles are of particular importance during the erectile process. These PFM activate and engage during penile erections and their contractions help prevent the exodus of blood from the penis, enhancing penile rigidity and allowing for intra-corporeal pressure to far exceed systemic systolic pressure. The BC supports and maintains pressure within the turgid corpus spongiosum and glans. The IC

supports, stabilizes and compresses the corpora cavernosa, impeding the return of blood to maintain pressure and rigidity within the corpora cavernosa. Additionally, the IC functions as a strut to support the penile crura, the foundational support that, when robust, allows a more “skyward” angling erection. Kawanishi et al[26] determined that there are statistically significant differences between patients with intact erectile function and those with ED with respect to stroke length, duration of contraction, and maximal contractile force of the IC muscle, using a spring balance as a measuring tool.

Numerous studies have documented the potential benefits of PFMT in the management of ED. Dorey et al[21] demonstrated 40% normalization of erectile function, 35% improvement and 25% failure and concluded that PFMT should be considered a first-line approach for ED. PFMT seems to be most beneficial in the subset of men with venous-occlusive dysfunction.[27,28] The early application of PFMT after radical prostatectomy has been shown to have a beneficial impact on the recovery of erectile function in terms of duration and severity of ED.[29] By increasing the strength, tone and condition of the PFM, the ability to trap blood will be enhanced, increasing the potential for improved erectile rigidity and durability.

PFMT For Improving Ejaculation/Orgasm Intensity

Concomitant with the aging process, patients commonly experience changes in ejaculatory function. Ejaculation and orgasm often become less intense, with diminished ejaculatory force, trajectory, and seminal fluid volume.

The BC muscle functions as the "motor" of ejaculation, responsible for propelling semen after emission. A weakened BC muscle can result in semen dribbling or leaking with diminished force or trajectory. A strong BC muscle will generate powerful contractions in pulse-like waves that can forcibly ejaculate semen at the time of climax. The intensified ejaculation resulting from a fit BC muscle can enhance the magnitude of the orgasm that accompanies the physical act of ejaculation. The more robust the BC muscle, the better the capacity of the corpus spongiosum for maximal engorgement and urethral pressurization. By increasing the strength, tone and condition of the BC, it will function in an enhanced manner and thus PFMT can serve as a means of helping our patients to optimize ejaculatory volume, force, trajectory and intensity of sexual climax.

PFMT For Premature Ejaculation (PE)

PE is the most common male sexual disorder and is a very prevalent condition among patients seeking urological care.[30] Poor ejaculatory control and decreased intra-vaginal latency times cause significant distress to the patient and his partner. The basis of PE can be multifactorial including psychological and/or biological factors including the following: a hyper-excitable bulbocavernosus reflex (BCR); hypersensitivity of the penis; extreme arousal; infrequent sexual

activity; the use of alcohol or other substances; genetics; guilt; fear; and performance anxiety. There are numerous effective medical therapies including topical anesthetics and serotonin reuptake inhibitors; however, not all patients desire pharmacological management.

The “squeeze technique” is one of the classic treatments for PE, as popularized by Masters and Johnson.[31] This involves the patient recognizing impending ejaculation and withdrawing and squeezing the frenulum of the penis until the sensation subsides, thwarting the occurrence of PE and allowing resumption of intercourse. The purported mechanism is the education of the BC muscle to eliminate involuntary contractions. The problem with this technique is that, although it can be effective, it requires an interruption of intercourse and a cumbersome solution and requires a very cooperative partner.

The same endpoint can be achieved with a more subtle approach. The “squeeze technique” invokes the BCR, in which the BC and other PFM contract as a direct result of compression of the penile glans. The underlying basis for the inhibition of the imminent ejaculation via the squeeze technique may be related to the contraction of the PFM by inducing the BCR. However, the precise mechanism controlling the ejaculatory reflex remains to be elucidated, and it remains uncertain if ejaculatory inhibition occurs on the basis of contraction or relaxation of the BC and IC muscles or the contraction or relaxation of the external striated urethral sphincter mechanism.

Patients suffering from PE should be taught to slow the pace of intercourse, pause the pelvic thrusting and perform a sustained PFM contraction until the point that the ejaculatory urgency disappears. This is an internal “squeeze” without the external hand squeeze, yet can achieve the same goal, short-circuiting the premature ejaculation so that intercourse can be resumed. With sufficient practice and the achievement of pelvic floor fitness by PFMT on a regular basis, this process can become facilitated and PE improved.

La Pera et al[32] demonstrated the effectiveness of PFM rehabilitation in the management of PE, teaching patients to recognize the muscles involved in controlling the ejaculatory reflex and toning those muscles, resulting in 60% of patients being cured and 40% showing no improvement. Piedeferro et[33] al showed that physiotherapy of the PFM was successful in the management of PE associated with pelvic floor dysfunction. Pastore et al [34]compared pelvic floor muscle rehabilitation with on-demand treatment with the SSRI dapoxetine. After completion of the program, more than 50% of the patients treated with rehabilitation were able to control the ejaculation reflex. Although the dapoxetine achieved significantly greater increases in intra-vaginal latency time as compared to the patients treated with pelvic floor rehabilitation, the authors concluded that PFMT is a promising therapeutic option for PE.

PFMT For Pelvic Pain Due To Pelvic Floor Tension Myalgia

One of the factors that can contribute to *chronic prostatitis/ chronic pelvic pain syndrome* is tension myalgia of the levator ani. Under these circumstances, the muscle exists in a hyper-contractile and hypertonic state, causing pelvic, urogenital and rectal pain; tightness and spasticity; and adverse effects on sexual, urinary and bowel function. Essentially this is a neuromuscular dysregulation of the pelvic floor and/or perineum that can be triggered by stress and other circumstances.

In the management of tension myalgia, it is fundamental to foster relaxation of the spastic levator muscle. PFMT serves not only to increase the strength of the levator ani and other PFM, but also to instill awareness and the capacity to relax the involved muscles as one goes through the cycle of contraction and relaxation. The relaxing aspect of the PFMT is no less an important component of the exercise program than is the contracting phase and is the key to managing levator spasticity.

This often requires multiple approaches including antibiotics, anti-inflammatories, anti-spasmodics, alpha-blockers, stress management, heat application, physical therapy and massage. PFMT can be a useful component of this multimodal approach by fostering awareness and developing proficiency in contracting as well as relaxing the levator muscle. Patients need to be exercise care with regard to contracting muscles that are hypertonic, as the problem can potentially be aggravated—the crucial focus for this issue is the relaxation phase of PFMT.

Nadler[35] used PFMT in a population of men with chronic prostatitis / chronic pelvic pain syndrome and found that over 70% experienced an improvement in either pain scores or CPSI scores, indicating a role for pelvic floor and neuromuscular reeducation. The success of PFMT was predicated on the principle that maximal muscle contraction induces maximal muscle relaxation, a "meditative" state between muscle contractions.

Conclusion: PFMT can be beneficial in the management of a number of male urinary and sexual maladies and should be considered a first-line treatment. Furthermore, keeping the PFM toned may help prevent the typical functional declines that accompany the aging process. Diligently practiced PFMT is the very essence of "functional fitness," training muscles to help in practical life situations and activities. PFMT is a natural approach that is safe and cost-effective, particularly as compared to pharmacological treatments. The options of medical and surgical therapy remain available should a patient fail to derive a benefit from such conservative management.

There is a need for randomized controlled trials to compare PFMT with a control population in terms of long-term efficacy. Additionally, it remains to be determined what the ideal PFMT regimen is with respect to the variables of exercise position; contraction intensity; contraction time; rest time; number of repetitions; number of sets performed daily; number of training days per week; and duration of the regimen.

Despite evidence of efficacy, PFMT in males remains under-recognized, underutilized and marginalized. There is no reason that male PFMT should not achieve the same recognition, utilization, status and traction that it has in the female population. In current clinical urological practice, patients receive education regarding PFMT typically by means of verbal instructions and perhaps a written handout, or alternatively, referral to a physiotherapist with PFM expertise for biofeedback. There exists an unmet demand for an effective means by which a comprehensive PFMT program could be made easily accessible and available to urology patients.

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