

Conservative therapy for overactive pelvic floor muscle (PFM)
Beth Shelly, PT, DPT, WCS, BCB PMD
International Continence Society Meeting Glasgow Scotland August 29, 2011
Workshop #16 Pelvic pain in patients with lower urinary tract symptoms

Outline

	Overactive PFM	Pain management	Trigger point treatment
Manual therapy	X	X	X
Moist Heat	X	X	X
Cold	X	X	
Therapeutic Ultrasound	X	X	X
Dry needling of trigger points			X
Electrotherapeutics	X	X	X
EMG Biofeedback	X		
Vaginal or rectal dilators	X		
Aerobic exercise and Therapeutic exercise of other pelvic girdle muscles		X	
Functional training in self-care and home management	X	X	X

Systematic review of treatment for the overall category of chronic pelvic pain (CPP) (Tu 2005)

- 29 studies which met entrance criterion
- Most had design flaws and lacked standard definitions and criterion
- Only 2 studies with control groups and both had study design flaws and small sample size (neither study included overactive PFM)
- 16 appear to have focus on overactive PFM
- Most are observational case reports or series
- Studies were published from 1960 to 2004 with only 5 studies less than 15 years old
- Conclusion – not enough evidence to know which treatments work.

Comparison of behavioral and surgical treatments

- Patient population for these two studies was vestibulitis – not specific to overactive PFM
- Comparison of groups shows no significant difference in outcome (Weijmar Schultz 1996)
- Both groups had significant pain reduction and quality of life scores – patient who underwent surgery did have more pain relief (Bergeron 2001)
- Conservative management can be very effective and should be offered as a first line treatment for vestibulitis

Multi-disciplinary team approach to pelvic pain management

- “The optimal approach to treatment (of pelvic pain) requires integration of the mind and body of the patient, medical and surgical treatment and attention to other medical and health-related issues the patient may face.” (Steege 1998)
- “Access to multidisciplinary chronic pain management should be available for women with CPP” Consensus Guidelines for the Management of Chronic Pelvic Pain (Jarrell 2005)
- Case report highlighting importance of the interdisciplinary team (Neville 2008)
- Interdisciplinary team is more effective in managing neuropathic pain syndromes, preventing unnecessary emotional and physical impairment, and controlling medical costs (Harden 1998)
- Multi-disciplinary approach to provoked vestibulodynia resulted in pain reduction and return to intercourse in 80% of patients 3 to 7 years after treatment (Spoelstra 2011)
- “Management of pelvic pain is most effective when a multidisciplinary team of physician, physical therapist, and psychologist is concurrently involved in patient treatment from the outset.” RCT (Peters 1991)
- Organ generated pain can perpetuated muscle trigger points and muscle trigger points can perpetuate or mimic organ dysfunction (Doggweiler-Wiygul 2004)

Manual therapy

- Manual therapy refers to a group of hands on treatments including:
 - Myofascial release (MFR), scar massage, soft tissue massage, Theile’s massage, trigger point release
 - Used for overactive PFM, loosening of non-contractile tissues, and pain management
 - Can all be helpful inside the vagina and rectum as well as associated muscles such as the piriformis, gluteal, abdominals, and adductors.
 - Joint mobilization / manipulation of the spine (T11 to L5), pubic symphysis, hips, and sacroiliac joints
- Most studies combine manual therapy treatment with other conservative treatments making it difficult to evaluate the effectiveness of the manual therapy alone (Frawley 2007)
- Treatment usually starts with ischemic pressure holding mild to moderate pressure on tender areas until tissue softens 2 to 5 minutes. Repeat in all painful areas
- Progression of treatment would include sweeping across or along muscle fibers several times in several areas.
- Internal vaginal or rectal MFR – Interstitial cystitis (IC) (Weiss 2001)
 - 1 to 2 times per week for 8 to 12 weeks
 - Combined with EMG training for the PFM, relaxation training and external PFM MFR and injections when indicated
 - 65% improvement in resting PFM tone on EMG
 - 70% of had moderate to marked improvement of symptoms

- Deep tissue mobilization of rectal PFM males with CPP (Anderson 2005)
 - Weekly for 4 weeks and biweekly for 8 weeks
 - Combined with voluntary contraction and release/hold-relax/contract-relax/reciprocal inhibition; specific breathing technique to quiet anxiety and relaxation training of the body with simultaneous relaxation of PFM
 - 72% reported marked improvement after therapy
- Self-internal rectal / vaginal massage of patients with CPP(Anderson 2011)
 - Curved tool used to massage internal PFM trigger points
 - 95% of patient felt wand was at least moderately effective in decreasing pain
 - Three patient reported rectal bleeding following use of device
- Thiele rectal massage women with IC and overactive PFM (Oyama 2004)
 - 2 times per week for 5 weeks
 - A statistically significant improvement was seen in QOL and pain on palpation immediately after treatment and 4 to 5 months after treatment
- RCT of a feasibility study of manual physical therapy (MPT) or traditional global therapeutic massage (GTM) of patient with self-proclaimed CPP (Fitzgerald 2009)
 - Patients were randomized - 10 weekly, 1-hour treatments of either MPT or GTM
 - ‘Responders’ = ‘moderately’ or ‘markedly’ improved.
 - MPT group responders 13/23(57%), GMT group responders 5/24(21%) (p=0.03)
 - Manual physical therapy appears to have better outcome than general massage
- Older manual therapy research (Tu 2005)
 - Thiele 1963 – 68% cured
 - Sinaki 1977 – 59% complete or partial resolution
 - Grant 1975 – 68% relief
 - Cooper 1960 – 80% complete relief
- Joint mobilization for overactive PFM – to date there is no research focused on joint mobilization however there is evidence that pelvic joint dysfunction can perpetuate PFM trigger points. Therefore treatment of pelvic joint dysfunction is recommended for full resolution of overactive PFM – expert opinion (Doggweiler-Wiygul 2004, Lee 2011)
- Combination manual therapy – MFR and joint mobilization (possibly with other treatments)
 - Vaginismus (Holland 2003)
 - Vestibulitis (Bergeron 2002)
 - Interstitial cystitis (Lubkan 2001, Messelink 1999)
 - “Short pelvic floor” (FitzGerald 2003)
 - Coccyx pain (Maigne 2001, 2006)
 - Prostatitis (Potts 2000)

Physical, electro-therapeutic and mechanical agents

Moist Heat

- Local thermal stimulation (heat pad to the infragluteal region or warm bath) (Jiang 1999, Dodi 1986)
 - Multiple pain diagnosis including anorectal pain, hemorrhoid, and fissure
 - Relaxation of the hypertonic internal anal sphincter measured by anal manometry
 - Response beginning 3 minutes after heat application
- Lack of scientific data to support the use of sitz baths (hot or cold) in the treatment of anorectal disorders or perineal pain (Tejirian 2005)
- Heated rice sack on coccyx / rectal area 10 to 20 minutes daily to increase circulation and decrease pain

Cold Treatment

- Post-partum perineal pain and edema - No significant difference with the use of heat or cold (Hill 1989)
- Used most often with acute pain syndromes
- Some patients with “burning” sensations of the perineum may find cold soothing
- Long term use of cold should be discouraged as it has been shown to decrease muscle resting length (Travel 1999)

Therapeutic Ultrasound Treatment

- General usage
 - Scar pain or adhesions: surgery, episiotomy, trauma (Creates 1987, McClaren 1984)
 - Muscle spasm: vaginismus, anismus, pelvic girdle muscles (Lilius 1973a, 1973b)
 - Swelling, hemorrhoids, perineal bruising: (Grant 1989)
 - Muscle trigger point: 0.5 W/cm^2 (Travell 1999)
- Cochrane Review of ultrasound for perineal pain (Hay-Smith 2002)
 - “Insufficient evidence to make any definite conclusion about the benefits, or otherwise, of therapeutic ultrasound for the treatment of acute or persistent perineal pain and dyspareunia.”
 - Inconsistencies between studies (ie, differing treatment parameters, variable times to intervention post-delivery) make it difficult to draw clinically relevant conclusions
- Levator ani syndrome
 - 1.0 to 2.5 W/cm^2 around anus 5 to 10 minutes, 15 to 30 successive days
 - 74% cured or improved when combined with massage and exercise (Lilius 1973a)
 - 26% cured when combined with bladder distension (Lilius 1973b)
- Decreased perineal pain
 - Treatment 62.2%, sham 30% (Creates 1987)
 - Treatment group - greater improvement in pain than sham (McClaren 1984)
- Perineal bruising - treatment group had faster dispersal of bruising and less pain than the control group (Grant 1989)

Dry needling of trigger points

- Insertion of small filament needles directly into the trigger point
 - PFM near the coccyx / external anal sphincter
 - Superficial perineal muscles
 - Inside the vaginal canal
 - Other pelvic girdle muscles – abdominals, adductors, gluteals
- Results in decrease in electrical activity of the trigger point and elongation of muscle fibers (Dommerholt 2006)
- Consider licensing limitations of your area.
- No studies were found but the technique is described in several books and papers (Travel 1999, Long 1956, Waters 1937, Dommerholt 2006)
- Many locations to get education including <http://www.kinetacore.com/> Advanced Dry Needling Course for the Pelvic Floor
- Trigger point injection of the PFM vaginally has been successful in decreasing pelvic pain (Langford 2007)

Electrotherapeutic:

- Many wave forms and parameters, often not reported in the literature
- Very difficult to assess benefit for overactive PFM
- Sensory application - used primarily to activate sensory nerves for neuromodulation (re educating the nerve) and gating of pain
- Motor application – there is little evidence that it is possible to stimulate a muscle to fatigue although some practitioners subscribe to this theory

Electrical muscle stimulation (ES)

- Usually biphasic pulsed wave at high frequency (100 to 200 Hz, 250 to 400 usec) internal vaginal or rectal probe
- Prostate pain syndrome - statistically significant improvement in NIH-CPSI score; 60/62 reported significant relief or cure (Ye 2003)
- CPP and overactive PFM - retrospective study, 68% of patients reported decreased pain after intravaginal stimulation; no control group (Fitzwater 2003)
- Dyspareunia - 10 sessions of intravaginal ES at 8 MHz, 30 minutes, 2 to 3 times per week: less complaint of dyspareunia, alleviated pain up to 7 months after treatment (DeOliveria 2005)
- Pelvic pain in men - rectal electrical stimulation 20 Hz, 20 minutes, continuous, weekly 8 sessions, treatment appears to be helpful in 17 of 20 patients (Park 1999)
- Vaginismus – electrical stimulation with biofeedback and dilator training resulted in all 12 participant's return to intercourse (Seo 2005)
- Pelvic pain – vaginal electrical stimulation and PFM strengthening 76% had improved pain (Petros 2004)

Transcutaneous electrical nerve stimulation (TENS)

- Most research on CPP and pain management – unclear affect on overactive PFM
- External electrodes usually placed near the sacral nerve roots posteriorly
- General TENS has proved to be remarkably safe and provides significant analgesia in about half of patients experiencing moderately predictable pain (Rushton 2002)
- Primary dysmenorrhea - high frequency TENS (50-100 Hz) more effective than low frequency TENS, placebo, or acupuncture. (Proctor 2002)
- IC - pain and symptoms improved in 26% of patients without ulcers and 54% of patients with ulcerative disease (Weina 2002)

High-volt pulsed current (HVPC) / electrogalvanic twin peak dual pulse wave

- Levator ani syndrome, overactive PFM (Sohn 1982, Nicosia 1985, Morris 1997, Oliver 1985, Hull 1993, Billingham 1987, Ger 1993)
 - Parameters vary: 80 to 120 Hz, 15 to 60 minutes per treatment, 150 to 400 volts to patient tolerance, frequency and duration vary greatly (daily to 3 times per week, 5 to 10 treatments), negative pole at the rectum
 - 50% to 90% relief
- Chronic a-bacterial prostatitis - not specific to overactive PFM (John 2003)
 - 2 times per week, 30 minutes, 5 weeks, 450 to 500 Hz
 - Pain improved in 83%, but did not continue 3 months after treatment ended

Other electrotherapeutic modalities

- Low level laser therapy (cold laser, infrared laser, light therapy) (no studies)
 - PFM spasm, pain and dyspareunia
 - S2-4 nerve roots on the effected side for 30 seconds before other treatments
- Iontophoresis
 - Sacrococcygeal joint pain, labial pain (no studies)
 - Peyronie’s disease (Treffilette 1997)
 - Dexamethosone, placed over dysfunction, typical parameters
- Interferential wave is said to reach deeper into tissues, can be used for CPP (no studies)
- Shortwave and microwave diathermy - Deep heating modality that has been used for pelvic pain in the past
- Magnetic electrical stimulation - Two studies in patients with CPP, none specifically investigated overactive PFM (Frawley 2007)

Principles of PFM training in patients with overactive PFM

- Aggressive PFM strengthening usually increases pain in patients with overactive PFM
- Relaxation or down training initially helps to restore normal muscle tone, increase circulation in the muscle and decrease pain
- Restoring PFM elongation and length through manual therapy may be necessary before any strength or contraction training (Frawley 2007)
- “Tenderness of PFM may be improved by decreasing muscle tension” (Tu 2005)
- Pelvic pain (Skilling 2004) – ES and PFM strengthening, 76% improvement

EMG Biofeedback

- General relaxation training or specific PFM training
- Biofeedback to facilitate isolation of contraction/relaxation of PFM – with the focus on relaxation first can be helpful in decreasing overactive PFM and pain (Doggweiler-Wiygul 2004, Lubkan 2002, Bergeron 2001, Glazer 1995, McKay 2001, Cornel 2005, Bassotti 2004, Heah 1997)
- Often combined with cognitive behavioral training and education listed below
- General biofeedback principles
 - Early biofeedback research shows muscle tension may be present without patient awareness (Basmajian 1983)
 - As little as an increased resting tone of 10% of maximum voluntary contraction can decrease circulation significantly and contribute to trigger points (Cram 1998)
 - 2/3 of dysfunctional muscles will have normal resting baseline (Cram 1998)
 - Patients with pelvic pain may have normal resting baseline (Potach 2006)
 - Some patients with PFM pain may not benefit from EMG training
- Obstructed defecation (Nogueras 1992, Battaglia 2004, Enck 1993, Wexner 1992, Lewicky –Gaupp 2008)
 - 50% to 74% success with EMG down training and coordination training
 - Often combined with behavioral training
- Anorectal pain (systematic review) - EMG is “possibly efficacious” “insufficient data” for further recommendations (Palsson 2004)
- Vulvodynia (Bergeron 2001)
 - EMG biofeedback with contract/relax of the PFM
 - 8 weekly sessions and home trainer use 2x/ day
 - Significant pain reduction in 34.6% of participants
- Vulvodynia (Glazer 1995, McKay 2001)
 - Aggressive contract / relax EMG training
 - Stability of the muscle at rest (standard deviation of 0.5 to 1.0) was the only predictor of decreased pain
 - 52% to 69% reported pain-free intercourse
- Males with overactive PFM (Clemens 2000)
 - Significant improvement in quality of life and symptoms scores, decreased pain and increased voiding interval
 - Biweekly treatment and timed voiding
- Males with CPP (Cornel 2005)
 - Anal EMG: hold/relax, weekly for 6 to 8 weeks
 - Average PFM tone - initial 4.9 uV, final 1.7 uV
 - 97% of men had improvement in symptoms

Vaginal or rectal dilators

- For stretching of PFM and non-contractile tissue of the pelvis
- Insertion of gradual increasing dilators
- Can be used with EMG feedback to encourage relaxation during insertion
- Desensitization of the vaginal vault to penetration / practice intercourse (Husted 1975)
- Significant increase in spontaneous bowel movements and decreased laxative use in patient with puborectalis syndrome and constipation (Maria 1997)
- Improved ability to tolerate penetration in 77.8% to 98% of patients (Idama 2000, Fuchs 1980)

Aerobic and general exercise

- Aerobic exercise maintains homeostasis of the parasympathetic (increased) and sympathetic (decreased) systems, at rest and during exercise – applicable to chronic pain in general (Goldsmith 2000)
- Case reports and clinical evidence - general aerobic exercise helps to decrease pain and increases function in patients with IC (Karper 2004)
- Yoga and breathing exercises have been suggested for overall rehabilitation
- Clinically patients report daily walks decrease pain

Therapeutic exercise of other pelvic girdle muscles

- No RCT studies on the effect of exercise of other pelvic girdle muscles on overactive PFM
- Stretching into intercourse positions during PFM relaxation training may help patients maintain relaxation of the PFM during intercourse
- Abnormal pelvic girdle muscle length and strength increases strain on dysfunctional pelvic joints (Lee 2011)
- Exercises to restore length and strength of the pelvic girdle muscles may decrease overactive PFM and can decrease overall pain perception
- Some pelvic girdle muscle refer pain to the PFM and PFM trigger points can refer pain to coccyx and buttock area
 - Gluteals
 - Adductors
 - Hip rotators – obturator internus and piriformis
 - Iliopsoas
 - Abdominals
 - Quadratus lumborum

Functional training in self-care and home management

- Posture and body mechanics education
 - Decreasing strain on injured pelvic joints
 - Posture instruction (standing, lying, and sitting) - marked improvement or complete resolution in 19 of 35 patients with overactive PFM (Sinaki 1977)
 - Avoidance of slouched sitting appears to be important in decreasing irritation on overactive PFM
 - Body mechanics and ADLs – lifting, exercise, and intercourse positions
- Education
 - Location of perineal structures, visual and palpation
 - Skin disturbances → myofascial hyperirritability (Travell 1999) – teach patients to avoid irritants to vulvar skin
- General relaxation training and stress management
- Breathing
 - PFM moves caudally during diaphragmatic inhalation – relaxation and elongation of the PFM occurs during descent of the respiratory diaphragm (Talaszi 2011)
 - Diaphragmatic breathing with EMG to encourage PFM relaxation
 - Gentle bearing down or other variations in breathing may also decrease resting tone (Benetti 2011)
- Counseling
 - Support groups, individual or partner counseling
 - Development of desire and arousal as patient restores the ability to tolerate penetration
- Treatment of dysfunctional voiding and defecation
 - Bladder retraining - start when pain is decreased, proceed slowly, 50% improvement in bladder pattern in patients with minimal IC pain (Parsons 1991)
 - Avoid constipation and the need for straining
 - Normalize fluid and fiber intake

PT Treatment of vulvodynia (Hartmann 2007)

- 68% of women's health PTs in the US are in agreement on 9 treatment modalities:
 - Exercise
 - PFM exercises
 - Pelvic girdle exercise
 - Abdominal/lumbopelvic stabilization
 - MFR / soft tissue massage
 - Pelvic girdle muscles externally
 - Internal vaginal MFR of the PFM
 - Connective tissue of the pelvis
 - Bowel/bladder retraining
 - Eliminating vulvar skin irritants
 - Pelvic joint mobilization

Call for more quality research (Tu 2005, Palsson 2004, Frawley 2007, Hay-Smith 2002, Weijmar Schultz 2005)

References

- Anderson RU, Wise D, Sawyer T, Chan C. Integration of myofascial trigger point release and paradoxical relaxation training treatment of chronic pelvic pain in men. *J Urol*. 2005;174:155–160.
- Anderson R, Wise D, Sawyer T, Nathanson BH. Safety and effectiveness of an internal pelvic myofascial trigger point wand for urologic chronic pelvic pain syndrome. *Clin J Pain* 2001.
- Basmajian B. *Biofeedback: Principles and Practice for clinicians*, 2nd ed. Baltimore: Williams and Wilkins. 1983.
- Bassotti G, Chistolini F, Sietchiping-Nzepa F et al. Biofeedback for pelvic floor dysfunction in constipation 2004 *BMJ* 328(7436):393-396.
- Battaglia E, Serra AM, Buonafede G, et al. Long-term study on the effects of visual biofeedback and muscle training as a therapeutic modality in pelvic floor dyssynergia and slow transit constipation. *Dis Colon Rectum*. 2004;47:90-95.
- Benetti TH, Santos MF, Mergulhao MEA, Fagundes JJ, Ayrizono MJS, Coy CSR: Variation of the Anal Resting Pressure Induced by Postexpiratory Apnea Effort in Patients with Constipation. *Arq Gastroenterol* 2011; 48(1):30-5.
- Bergeron S, Binik YM, Khalife S. In favor of an integrated pain-relief treatment approach for vulvar vestibulitis syndrome. 2002 *J of Psychosomatic Ob and Gyn*, 23(1):5-6.
- Bergeron S, Binik YM, Khalife S, Pagidas K, Glazer HI, Meana M, Amsel R. A randomized comparison of group cognitive-behavioral therapy, surface electromyography, and vestibulectomy in the treatment of dyspareunia resulting from vulvar vestibulitis. *Pain*. 2001;91(3):297-306.
- Billingham RP, Isler JT, Friend WG. Treatment of levator syndrome using high-voltage electrogalvanic stimulation. 1987 *Dis Colon Rectum* 30(8):584-587.
- Clemens JQ, Nadler RB, Schaeffer AJ, Belani J, Albaugh J, Bushman W Biofeedback, pelvic floor re-education, and bladder training for male chronic pelvic pain syndrome. *Urology*. 2000 Dec 20;56(6):951-5.
- Cooper WL. Coccygodynia. An analysis of one hundred cases. *J Int Coll Surg* 1960;33:306–311.
- Creates V. A study of ultrasound treatment to the painful perineum after childbirth. *Physiotherapy*. 1987;73(4):162-165.
- Cornel EB, van Haarst EP, Browning-Groote WM, et al. The effect of biofeedback physical therapy in men with chronic pelvic pain syndrome type 2. *Eur Urol*. 2005;47:607-611.

Cram J, Kasman G. *Introduction to Surface Electromyography*. Gaithersburg, Md: Aspen Publishers; 1998

Dodi G, Bogoni F, Infantino A et al. Hot or cold in anal pain? A study of the changes in internal anal sphincter pressure profiles. 1986. *Dis Colon Rectum* 29(4):248-251.

Dommerhotl, J et al. Trigger point dry needling, *J Man Manip Ther*, 2006;14:E7-E87.

Doggweiler-Wiygul R. Urologic myofascial pain syndromes. *Current Pain and Headache Reports* 2004;8:445-451.

Enck P. Biofeedback training in disordered defecation. *Dig Dis Sci*. 1993;38:1953-1959.

FitzGerald MP, Kotarinos R. Rehabilitation of the short pelvic floor II: treatment of the patient with the short pelvic floor. 2003 *Int Urogyn J and pelvic floor dysf* 14(4):269-275.

FitzGerald MP, Anderson RU, Potts J, et al Randomized multicenter feasibility trial of myofascial physical therapy for the treatment of urological chronic pelvic pain syndromes. *J Urol*. 2009 Aug;182(2):570-80

Frawley H, Bower W. Treatment of PFM pain and/or overactivity In *Evidenced based physical therapy of the pelvic floor*. Eds Bo K, Berghmans B, Morkved S, Van Kampen M. Churchill Livingstone Elsevier. Edinburgh, 2007.

Fuchs K. Therapy of vaginismus by hypnotic desensitization. 1980 *Am J Obstet Gynecol* 1;137(1):1-7.

Ger GC, Wexner SD, Jorge JM, et al. Evaluation and treatment of chronic intractable rectal pain – a frustrating endeavor. 1993 *Dis Colon Rectum* 36(2):139-145.

Glazer H, et al. Treatment of vulvar vestibulitis syndrome with electromyography biofeedback of pelvic floor muscular. *J Reprod Med*. 1995;40:283.

Goldsmith R, Bloomfield D, Rosenwinkel E. Exercise and autonomic function. *Coron Artery Dis*. 2000;11(2):129–135.

Grant SR, Salvati EP, Rubin RJ. Levator syndrome: an analysis of 316 cases. *Dis Colon Rectum* 1975;18:161–163.

Grant A, Sleep J, McIntosh J, Amherst H. Ultrasound and pulsed electromagnetic energy treatment for perineal trauma: a randomized placebo-controlled trial. *Br J Obstet Gynecol*. 1989;4:434-439.

Harden RN, Cole PA. New developments in rehabilitation of neuropathic pain syndromes. *Neurol Clin*. 1998;16:937-950.

Hartmann E, Strauhal MJ, Nelson CA. Treatment of women in the United States with localized, provoked vulvodynia – practice survey of women’s health physical therapists. *J Reprod Med.* 2007;52:48-52.

Hay-Smith EJ. Therapeutic ultrasound for postpartum perineal pain and dyspareunia. *Cochrane Database Syst Rev.* 2000;2:CD000495.

Heah SM, Ho YH, Tan M, Leong AF. Biofeedback is effective treatment for levator ani syndrome. *Dis Colon Rectum* 1997;40:187–189.

Hill PD. Effects of heat and cold on the perineum after episiotomy/laceration. *J Obstet Gynecol Neonatal Nurs.* 1989;1:124-129.

Holland A. Physical therapy intervention for dyspareunia: a case report. *J of Sec on Women’s Health* 2003;27:18-20.

Hull TL, Milsom JW, Church J, et al. Electrogalvanic stimulation for levator-syndrome – how effective is it in the long-term. 1993 *Dis Colon Rectum* 36(8):731-733.

Husted JR. Desensitization procedures in dealing with female sexual dysfunction. *Counseling Psychologist.* 1975;5(1):30-37.

Idama TO, Pring DW. Vaginal dilator therapy – an outpatient gynaecological option in the management of dyspareunia. 2000 *J Obstet Gynecol* 20(3):303-305.

Jarrell JF, Vilos GB, et al. Consensus Guidelines for the Management of Chronic Pelvic Pain *J Obstet Gynaecol Can* 2005;27(8):781–801

Jiang JK, Chiu JH, Lin JK. Local thermal stimulation relaxes hypertonic anal sphincter: evidence of somatoanal reflex. *Dis Colon Rectum.* 1999;42:1152-1159

John H, Ruedi C, Kotting S, et al. A new high-frequency electrostimulation device to treat chronic prostatitis. *J Urol.* 2003;170:1275-1277.

Karper WB. Exercise effects on interstitial cystitis: two case reports. *Urol Nurs.* 2004;24:202–204.

Langford CF, Nagy SU, Ghoniem GM. Levator Ani Trigger Point Injections: An Underutilized Treatment for Chronic Pelvic Pain. *Neurourol and Urodynam* 2007;26:59-62.

Lee D, *The Pelvic Girdle An integration of clinical expertise and research.* Churchill Livingstone Elsevier Edinburgh. 2011.

Lewicky-Gaupp C, Morgan D, Chey WD, Muellerleile P, Fenner DE. Successful Physical Therapy for Constipation Related to Puborectalis Dyssynergia Improves Symptom Severity and Quality of Life. *Dis Colon Rectum* 2008 Jun 27 epub

- Lilius HG, Valtonen EJ. The levator ani spasm syndrome: a clinical analysis of 31 cases. *Ann Chir Gynaecol Fenn.* 1973a;62:93-97.
- Lilius HG, Oravisto KJ, Valtonen EJ. Origin of pain in interstitial cystitis. Effect of ultrasound treatment on the concomitant levator ani spasm syndrome. *Scand J Urol Nephrol.* 1973b;7(2):150-2.
- Long C. Myofascial pain syndromes: part III – some syndromes of the trunk and thigh. 1956 *Henry Ford Hosp Bull* 4:102-106.
- Lukban JC, Whitmore KE. Pelvic floor muscle re-education treatment of the overactive bladder and painful bladder syndrome. *Clin Obstet Gynecol.* 2002;45:273–285.
- Lukban JC, et al. The effect of manual physical therapy in patients diagnosed with interstitial cystitis, high-tone pelvic floor dysfunction, and sacral dysfunction. *Urology.* 2001;57(suppl 1):121–122.
- Maigne JY, Chatellier G. Comparison of three manual coccydynia treatments: a pilot study. *Spine.* 2001;26:E479-E483.
- Maigne JY, Chatellier G, Le Faou M, Archambeau M. The Treatment of Chronic Coccydynia With Intrarectal Manipulation. 2006 *Spine.* 31; 18, E621–E627
- Maria G, Anastasio G, Brisinda G, Civello IM. Treatment of puborectalis syndrome with progressive anal dilation. *Dis Colon Rectum.* 1997 Jan;40(1):89-92.
- McClaren J. Randomised controlled trial of ultrasound therapy for the damaged perineum. *Clin Physics Physiological Measure.* 1984;5:40.
- McKay E, et al. Treating vulvar vestibulitis with electromyographic biofeedback of pelvic floor musculature. *J Reprod Med.* 2001;46:337-342.
- Messelink EJ. The overactive bladder and the role of the pelvic floor muscles. *Br J Urol Int.* 1999;83(suppl 2):31–35.
- Morris L, Newton RA. Use of high voltage pulsed galvanic stimulation for patients with levator ani syndrome. *Phys Ther.* 1997;67:1522-1525.
- Neville CE. An Interdisciplinary Approach to Treatment of a Patient with Chronic Pelvic Pain following Gall Bladder Surgery: A Case Study. *Journal of Women's Health Physical Therapy.* 2008; Vol 32, No. 2: 24-34
- Nicosia JF, Abcarian J. Levator syndrome: a treatment that works. *Dis Colon Rectum.* 1985;28:406-408.

Nogueras J, Wexner S. Biofeedback for non-relaxing puborectalis syndrome. *Sem Colon Rectal Surg.* 1992;3(2):120-123.

Oliver GC, Rubin RJ, Salvati EP, Eisenstat JE. Electrogalvanic stimulation in the treatment of levator ani syndrome. *Dis Colon Rectum.* 1985;28:662-663.

Oyama IA, Rejba A, Lukban JC, et al. Modified Thiele massage as therapeutic intervention for female patients with interstitial cystitis and high-tone pelvic floor dysfunction. *Urology.* 2004;64:862-865.

Palsson OS, Heymen S, Whitehead WE. Biofeedback treatment for functional anorectal disorders: a comprehensive efficacy review. *2004 Appl Psychophysiol Biofeedback* 29(3):153-174.

Park DW, et al. Electrical stimulation therapy in prostatodynia. Abstract presented at: *American Urologic Association Annual Meeting*; 1999.

Parsons CL, Koprowski PF. Interstitial cystitis: successful management by increasing urinary voiding intervals. *Urology.* 1991;37:207-212.

Peters AA, et al. A randomized clinical trial to compare two different approaches in women with chronic pelvic pain. *Obstet Gynecol.* 1991;77:740-744.

Potach LM, et al. Evaluation of pelvic floor muscle function using intravaginal electromyography. *J of Women's Health PT.* 2006;30(2):30.

Potts JM, O'Dougherty E. Pelvic floor physical therapy for patients with prostatitis. *Curr Urol Rep.* 2000 Aug;1(2):155-8.

Rushton DN. Electrical stimulation in the treatment of pain. *Disabil Rehabil.* 2002;24:407-415.

Seo JT, Choe JH, Lee WS, Kim KH. Efficacy of functional electrical stimulation-biofeedback with sexual cognitive-behavioral therapy as treatment of vaginismus. *Urology.* 2005 Jul;66(1):77-81.

Sinaki M, Merritt JL, Stillwell GK. Tension myalgia of the pelvic floor. *Mayo Clin Proc* 1977;52:717-722.

Skilling PM, Petros P. Synergistic non-surgical management of pelvic floor dysfunction: second report. *Int Urogynecol J Pelvic Floor Dysfunct* 2004;15:106-110.

Sohn N, Weinstein MA, Robbins RD. The levator syndrome and its treatment with high volt electrogalvanic stimulation. *Am J Surg.* 1982;144:580-582.

Spolelstra SK, Dijkstra JR, van Driel MF, Weijmar Schultz WC. Long-term results of an individualized, multifaceted, and multidisciplinary therapeutic approach to provoked vestibulodynia 2011 *J Sex Med* 8(2):489-496.

Steege JF, Metzger DA, Levy DA. *Chronic Pelvic Pain: An Integrated Approach*. Philadelphia, PA: WB Saunders; 1998.

Talasz H, Kremser C, Kofler M, Kalchschmid E, Lechleitner M, Rudisch A. Phase-locked parallel movement of diaphragm and pelvic floor during breathing and coughing—a dynamic MRI investigation in healthy females. *Int Urogynecol J Pelvic Floor Dysfunct*. 2011 Jan;22(1):61-8. Epub 2010 Aug 31.

Tejirian T, Maher AA. Sitz bath: where is the evidence? Scientific basis of a common practice. *Dis Colon Rectum*. 2005;48:2336-2340.

Thiele GH. Coccygodynia: cause and treatment. *Dis Colon Rectum* 1963;11:422–436.

Travell JG, Simons DG. *Myofascial Pain and Dysfunction: The Trigger Point Manual*. vol 1 & 2. Baltimore, Md: Williams & Wilkins; 1999.

Treffiletti S, Annoscia S, Montefiore F, Boccafasci C. Iontophoresis in the conservative treatment of Peyronie's disease: preliminary experience. *Arch Ital Uro Androl* 1997;69(5):323-327.

Tu FF, As-Sanie S, Steege JF. Musculoskeletal Causes of Chronic Pelvic Pain: A Systematic Review of Existing Therapies: Part II. 2005, *Ob and Gyn Survey*, 60(7):474-483.

Waters EG. A consideration of the types and treatments of coccygodynia. 1937, *Am J Obstet Gynecol* 33:531-535.

Weijmar Schultz WC, Gianotten WL, et al. Behavioral approach with or without surgical intervention to the vulvar vestibulitis syndrome: a prospective randomized and non-randomized study 1996 *J Psychosom Obstet Gynecol* 17(3):143-148.

Weijmar Schultz W, Basson R, Binik Y, et al. Women's sexual pain and its management. 2005 *J Sexual Med* 2(3):301-316.

Weina AJ, Hanno PM. Targets for therapy of the painful bladder. *Urology*. 2002;59(suppl 1):68–73.

Weiss JM. Pelvic floor myofascial trigger points: manual therapy for interstitial cystitis and the urgency frequency syndrome. *J Urol*. 2001;166:2226–2231.

Wexner S, et al. Prospective assessment of biofeedback for the treatment of paradoxical puborectalis contraction. *Dis Colon Rectum*. 1992;35(2)145-149.