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Musculoskeletal Causes of Chronic Pelvic Pain: A Systematic Review of Existing Therapies: Part II*

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Chronic pelvic pain is a common clinical problem with many causes. In addition to gynecologic causes, it is important to evaluate other potential etiologies, including the pelvic musculoskeletal system. There have been few published studies on musculoskeletal causes of pelvic pain and its treatment. The objective of this study was to evaluate treatment of pelvic musculoskeletal pain among women with chronic pelvic pain. We used a set of key words pertaining to pain and the pelvic musculoskeletal structures to initially review the PUBMED database. Additional articles were sought by discussion with a clinician specializing in this field and review of relevant textbook bibliographies. Study inclusion was restricted to English-language publications that reported a patient-related chronic pelvic pain outcome measure. Each report must have described at least four patients. For each selected article, two investigators separately summarized pertinent data on study characteristics, patient profiles, intervention characteristics, and treatment outcomes. Discrepancies were resolved by discussion. Twenty-nine treatment studies met entry criteria. The existing literature largely consists of retrospective, uncontrolled observational studies. The two studies that feature control groups lack sufficient size and scope to allow generalizability. Properly designed and executed randomized, controlled trials are urgently needed to determine the true effectiveness of treatments for pelvic musculoskeletal pain.

Target Audience: Obstetricians & Gynecologists, Family Physicians

Learning Objectives: After completion of this article, the reader should be able to summarize the current data on musculoskeletal causes of chronic pelvic pain, to outline the various techniques used to treat musculoskeletal causes of chronic pelvic pain, and to recall the lack of evidence based data on the subject and need for randomized controlled trials.

In contemporary gynecology, the initial approach to treatment of chronic pelvic pain is frequently

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hormonal or surgical. Some have suggested a need to consider nongynecologic causes of these chronic pain disorders, including neurologic, gastrointestinal, or musculoskeletal dysfunction (1,2). The musculoskeletal components of the pelvis may be primary or secondary generators of nociceptive signals to the central nervous system (3). Many different methods for treating persistent pelvic musculoskeletal disorders have been proposed, often involving referral to physical therapy. Although a systematic review of

chronic pelvic pain studies identified a small number of randomized, controlled trials that evaluate treatment, none relate to musculoskeletal problems (4). Because of the limited efficacy of existing surgical and hormonal treatments, defining the state of current research in pelvic musculoskeletal pain disorders may improve our management approaches for this challenging symptom complex.

MATERIALS AND METHODS

We conducted a systematic review of the English-language literature to determine the support for published treatments for pelvic musculoskeletal problems. Our primary search began with reviewing citations from PUBMED from January 1966 to June 2004 using the key words *musculoskeletal disease* or *musculoskeletal system* and *chronic pelvic pain*. For additional sensitivity, we also searched for the specific anatomic names of various pelvic muscles and *chronic pelvic pain*. The initial search yielded 411 articles. Criteria for included studies were jointly agreed on by all investigators and included a minimum of four patients, a specified intervention, data on outcomes, and a focus on musculoskeletal disease and chronic pelvic pain. This excluded 365 articles. We then excluded 22 articles not written in English. Twenty-eight other articles pertained to diagnosis, which we review in a separate article on diagnostic tests. Of the remaining 18 articles, two studies only focused on men and were also removed (5,6). This left 16 articles. One article on sacral neuromodulation described outcomes for data reported entirely in another study and was excluded (7). Handsearching of bibliographies and relevant textbooks of chronic pelvic pain yielded an additional 14 articles (8–10). We submitted our list of identified studies to a pain researcher at another university (Dr. Fred Howard); he found no omissions.

The first two authors separately summarized relevant data on participant characteristics (mean age, total number of patients studied, gender, disorder studied), intervention measures, and treatment outcomes. We prepared evidence tables (Table 1) summarizing these characteristics for each of four modalities: surgery, electrical stimulation, manual therapy, and medications.

RESULTS

We identified two randomized, controlled trials and 27 case series. All told, 1996 subjects within the 29 studies underwent some sort of therapy. Eight

studies primarily evaluated electrical stimulation, three studies examined the effect of surgery for a musculoskeletal condition, six studies examined medications, and 12 evaluated manual techniques for treatment. Several studies did not provide basic demographic information on their participants. Nine studies did not report the age distribution (11–19). Four studies did not report the gender distribution among the 17 studies that enrolled both men and women (12,13,15,16). Ten studies combined different approaches and reported outcomes jointly (11–14,20–25). Only six studies used a quantitative outcome measure such as a visual analog scale (VAS) (16,26–30). Specification of diagnostic criteria for the disorders varied; 13 studies provided insufficient information to allow reproducible diagnosis (11,17,18,20,22–24,26,29,31–34). Total time periods under study ranged from 18 months to 28 years (nine studies did not specify length) with mean/median follow-ups between 2 and 24 months. Fourteen studies did not specify length of follow-up (12,13,17–22,24,29,32–36).

Manual Techniques

Tenderness of pelvic muscles may be improved by decreasing muscle tension. Only one relevant study used any comparison group, which limits the use of the existing literature on this approach. In this randomized, controlled trial, Mens and associates randomized 44 women with peripartum pelvic pain to receive videotape instruction in diagonal trunk exercises, longitudinal trunk exercises, or no exercise for treatment of peripartum pelvic pain. The study failed to observe a difference resulting in mean VAS pain scores. Overall pain scores improved from before treatment for all groups, and roughly half of the subjects in each arm reported subjective global improvement of symptoms. Several limitations in the study exist: the definition of peripartum pelvic pain included durations as short as 3 weeks of pain and the method of randomization was not specified. Although the study's power analysis indicated ability to detect a 20% difference in global improvement, there is not enough information to determine if the early stopping of the trial truly allowed sufficient power to conclude no difference in treatments (28).

The remaining studies are all uncontrolled case series. Heah and associates performed biofeedback on patients with levator ani syndrome or chronic anal pain and reported median VAS scores posttreatment markedly decreased (27). Petros and Skilling noted pelvic pain improvement as a secondary outcome of

TABLE 1
Published English-language studies (PUBMED) of treatments for pelvic musculoskeletal pain (1966–2004)

Study (reference)	Condition	Intervention	Patients (no.)	Age (mean or range)	Outcomes and assessment instruments	Length of follow up	Results
Manual techniques							
Mens et al. (28)	Postpartum pelvic pain	Randomized to 1) diagonal trunk exercises, 2) longitudinal trunk exercises, or 3) no exercise (videotape instruction)	44 women	31.7	VAS* pain score (0–100); global assessment of improvement (1 = worse, 2 = unchanged, 3 = improved); Nottingham Health Profile (NHP) pain scale; blinded posterior pelvic pain provocation (PPPP) test	8 weeks	Between groups no difference in global improvement, VAS scores, NHP pain, or left-sided PPPP test; right-sided PPPP test better in 50% of diagonal trunk group vs. controls ($P < .05$); 28 of 44 (64%) of all patients had global improvement Pain scores decreased from 8 to 2 ($P < .02$)
Heah et al. (27)	Chronic anal pain/levator spasm	Biofeedback	7 women	50.5	Median VAS (0–10) 2 weeks after treatment	Mean 12.8 months	13 of 17 (76%) had improved pain
Skilling and Petros (20)	Pelvic pain	Pelvic floor strengthening exercises and vaginal electrotherapy	9 men 17 women (147 total in study)	52.5	Subjective "greater than 50% improvement"	—†	13 of 20 (65%) had improved pain
Petros and Skilling (11)	Pelvic pain	Pelvic floor strengthening exercises and vaginal electrotherapy	20 women (60 total in study)	—	Subjective "greater than 50% improvement"	3 months	Composite results of massage and indicated treatment of infection, 220 of 324 cured (68%), 72 of 324 improved (22%), 21 of 324 unimproved (6%), and 5 of 324 (2%) had questionable outcomes
Thiele (21)	Coccygodynia	Rectal massage primarily, with added surgical treatment of anal infection if massage failed	275 women 49 men	42.8	Subjective improvement	—	Results given in overlapping categories (many patients had more than one modality); complete or partial resolution achieved in 49 of 83 (59%) with Thiele's massage, 41 of 80 (51%) with relaxation exercises, and 34 of 66 (52%) with rectal diathermy
Sinaki et al. (22)	Pelvic floor tension myalgia	Thiele's massage with or without relaxation exercises and rectal diathermy	78 women 16 men	26–72	Subjective resolution of symptoms defined as "how long can you sit"	—	68% relief <4 treatments
Grant et al. (12)	Levator spasm	Manual massage, diathermy, sitz baths, and/or muscle relaxants in combination	316 participants	—	Subjective improvement: based on number of treatments needed to achieve relief	—	19% relief with > 3 treatments; 13% no relief
Cooper (13)	Coccygodynia	Rectal massage; or heat + postural instruction; or massage + surgical drainage of infection	100 participants	—	Subjective improvement	—	50 of 62 (80%) treated with massage had "complete" relief, 34 of 38 (90%) treated with either 1) heat + postural education or 2) surgery + massage had "complete" relief
Lilius and Vaitonen (23)	Levator ani syndrome	Perineal and perianal ultrasound (1–2.5 W/cm ²) with or without rectal massage/or relaxing exercises + tranquilizers	28 women 3 men	44	Subjective improvement	6 months	23 of 31 (74%) were symptomless or had only slight symptoms after treatment, 5 of 31 (16%) with some improvement, 3 of 31 (10%) unchanged
Lilius et al. (24)	Levator ani syndrome and interstitial cystitis	Perineal and perianal ultrasound (1–2.5 W/cm ²) with prednisolone bladder distention	23 women	—	Subjective improvement	—	6 of 23 (26%) were symptomless or had only slight symptoms after treatment, 2 of 23 (9%) with some improvement, 15 of 23 (65%) unchanged
Weiss (14)	Urgency/frequency syndrome (UF) or interstitial cystitis (IC)	Manual physical therapy of pelvic floor with or without trigger point injection	UF: 39 women, 3 men; IC: 6 women, 4 men	—	Percent improvement in overall symptom profile	Mean 20 months	UF group: 35 of 42 (83%) with >50% improvement; IC group: 7 of 10 (70%) had >50% improvement

TABLE 1
(Continued)

Study (reference)	Condition	Intervention	Patients (no.)	Age (mean or range)	Outcomes and assessment instruments	Length of follow up	Results
Markwell (15)	Descending perineum syndrome or levator syndrome	Abdominal and pelvic muscle-focused defecation retraining exercises	179 participants	—	Subjective improvement	Mean 16.5 months	157 of 179 (87%) with good to very good response
Pharmaceutical therapy Porta (16)	Piriformis, psoas, or scalenus anterior spasm	Botulinum toxin A (BOTOX) + bupivacaine vs. methyprednisone + bupivacaine	Piriformis: 13 BOTOX vs. 10 steroid regimen Psoas: 3 BOTOX vs. 4 steroid regimen; Scalenus: 4 BOTOX vs. 6 steroid regimen	—	VAS at 30, 60 days after treatment	2 months	Combining all muscle groups at 60 days, more improvement in mean VAS scores for BOTOX regimen (-5.5 ± 0.3) vs. steroid regimen (-2.5 ± 0.7), P = .001
Jarvis et al. (30)	Levator ani spasm	BOTOX injection	11 women	31.1	VAS pain scores for dyspareunia, dysmenorrhea, dyschezia, and nonmenstrual pelvic pain, quality of life (SF-12, EQ-5D)	12 weeks	Dyspareunia scores decreased from 80 to 28 (P = .01), dysmenorrhea scores decreased from 67 to 28 (P = .03), nonmenstrual pelvic pain, quality of life scores
Stocumb (38)	Abdominal, vaginal, or sacral trigger points in female chronic pelvic pain	Trigger point injection (bupivacaine)	122 women	29	0–4 rating scale (0 = no pain, 4 = worst pain)	≥3 months	64 of 122 (53%) reported no pain, 100 of 122 (83%) experienced relief enough to warrant no further therapy
Doggweiler-Wygul and Wygul (35)	Interstitial cystitis	Abdominal-pelvic trigger point injections (procaine)	4 women	45	Anecdotal	—	Descriptive pain improvement noted in 2 of 4 women
Mullin and de Rosayro (39)	Piriformis syndrome	Caudal injections of triamcinolone + bupivacaine; some had additional therapy	12 women	32	Subjective improvement	≥9 months	7 of 12 (58%) had complete relief after 1 injection, 5 of 12 (42%) had complete relief after 2 injections
McGivney and Cleveland (34)	Levator ani syndrome	Oral diazepam	48 women 16 men	48	Subjective improvement	—	51 of 64 (80%) had marked relief, 9 of 64 (14%) had minimal relief, 4 of 64 (6%) were unchanged
Surgery Miklos et al (40)	Chronic pelvic pain	Laparoscopic sciatic hernia repair	20 women	34.3	Subjective improvement	Median 13 months	14 of 20 (70%) complete relief, 6 of 20 (30%) with some improvement
Olenud and Walheim (33)	Symphyseal pain with or without sacroiliac joint pain	Surgical symphysiodesis	7 women, 1 man	33.4	Subjective improvement	Mean 24 months	7 of 8 (88%) complete or almost complete relief of pain
Robert et al (17)	Chronic perineal pain/pudendal neuralgia	Surgical decompression of the pudendal nerve	150 (two thirds were women)	—	Subjective improvement	—	45% cured, 22% improved, 33% no benefit
Electrical stimulation Aboseif et al (26)	Pelvic floor dysfunction	Sacral nerve stimulator	41 participants (total of 54 women, 10 men in study)	47	VAS (0–10) pain rating on average day	Mean 24 months	Mean pain score decreased from 5.8 to 3.7, (P > .05)
Everaert et al (25)	Chronic pelvic pain (superficial vs. deep pain on examination)	S3 sacral nerve stimulator following failure of TENS, intracavitary electrical stimulation, or physical therapy	71 women, 40 men	46	Subjective improvement (>50% relief)	Mean 36 months	9 of 11 (82%) with permanent implant satisfied; 3 of 23 (13%) with superficial pain responded to TENS unit; 15 of 27 (56%) with deep pain responded to intracavitary stimulation; 27 of 61 (44%) of those with voiding abnormality and deep pain treated with physical therapy + electrical stimulation responded

TABLE 1
(Continued)

Study (reference)	Condition	Intervention	Patients (no.)	Age (mean or range)	Outcomes and assessment instruments	Length of follow up	Results
Caraballo et al (31)	Bladder-related pelvic floor disorders	Sacral nerve stimulator	10 with pain (total of 15 women, 2 men in study)	60.6	Subjective improvement	Mean 13.4 months	2 of 10 (20%) cured; 5 of 10 (50%) "marked" improvement; 3 of 10 (30%) no improvement
Fitzwater et al (36)	Levator ani spasm	Intravaginal electrical stimulation	50 women	38.7	Subjective improvement—pain by patient report or vaginal examination	—	34 of 50 (68%) had "improvement"
Nicosia and Abcarian (32)	Levator ani syndrome	Intraanal electrogalvanic stimulation	32 women, 13 men	30–81	Subjective rating (excellent/good/fair/poor)	—	36 of 45 (80%) had excellent (total) relief of pain
Sohn et al (18)	Levator ani syndrome	Intra-rectal electrical stimulation	60 women, 20 men	—	Subjective improvement	—	50 of 72 (69%) had excellent results (complete relief), 15 of 72 (21%) had good results (recurred after initial relief), 7 of 72 (10%) failed therapy
Morris and Newton (29)	Levator ani syndrome	Intra-rectal electrical stimulation	23 women, 5 men	62.9	15-cm VAS (1) intensity (2) unpleasantness	—	25% had "relief" of pain or symptoms after 4 treatments, 50% had "relief" after 7.5 treatments
Oliver et al (19)	Levator ani syndrome	Intra-rectal electrogalvanic stimulation	74 women, 28 men	—	Subjective: good—relief with less than 4 treatments, moderate—some improvement, poor—no relief	—	44 of 102 (43%) good, 25 of 102 (25%) moderate, 33 of 102 (32%) poor outcomes

Randomized, controlled trials in bold (n = 2).

*Visual analog scale.

†(-) indicates information not reported.

‡Transcutaneous electrical nerve stimulator.

¶¶The author has disclosed that neither botulinum toxin nor local anesthetics have been approved by the U.S. Food and Drug Administration for use in the treatment of pelvic musculoskeletal pain conditions. Please consult product labeling for the approved usage of this drug or device.

§12-item quality-of-life scale.

§§European five-dimension quality-of-life scale.

an incontinence treatment trial using Kegel exercises, electrical muscle stimulation, and squatting exercises; however, the characteristics of the pelvic pain in the 37 women studied were not identified (11,20). Thiele, who is often credited for first describing rectal massage for coccygodynia or levator ani tenderness, has presented his experience with this technique; he found almost 70% of his 324 patients were cured with rectal massage plus treatment of anal infection when needed (21). Another study using Thiele's technique, in combination with relaxation exercises and rectal diathermy, found 59% of subjects had marked or complete resolution of pelvic floor tension myalgia (22).

Grant and colleagues have summarized their outcomes with rectal massage, diathermy, sitz baths, and muscle relaxants for levator spasm and stated that 68% of patients had good results (defined as relief of symptoms with less than four treatments). An additional 19% of the patients responded after more than four treatments. They also reported success treating four patients who did not respond to massage with lidocaine/methylprednisolone injections into the puborectalis; another four patients who did not improve with conservative treatment found improvement with rectal divulsion (dilation of the rectal canal) (12). Cooper's retrospective review also focused on rectal massage for levator ani spasm; 80% of patients treated only with massage had relief of pain, whereas 90% of a smaller subset treated either with massage plus surgical drainage of pelvic infection or postural instruction plus heat application improved. He did not state the timeframe for outcome assessment (13). Markwell's series of patients with heterogeneous pelvic pain complaints were largely comprised of patients with loss of perineal support or levator ani tenderness. A muscle strengthening and retraining regimen produced subjectively "good to very good" responses in 87% of the 179 patients over a 5-year period (15).

Interstitial cystitis, although thought to be a primary neuroinflammatory disorder of the bladder, has been targeted by some clinicians for musculoskeletal evaluation and treatment as a result of concomitant levator ani spasm. Lilius and Valtonen have described the use of perineal and perianal ultrasound to treat levator ani spasm; most patients became symptom-free or almost symptom-free with 2 to 4 weeks of treatment. A minority of patients also had either massage or relaxing exercises plus tranquilizers (23). However, in their separate study of women with both interstitial cystitis and levator ani spasm, only a small fraction of

women treated with ultrasound combined with prednisolone bladder distention had improvement. Notably, two women in the study who had previously had total cystectomies for their interstitial cystitis did improve with ultrasound treatment alone (24). Weiss used a similar approach with either rectal or vaginal massage (gender-appropriate) in patients with interstitial cystitis or urgency–frequency syndrome and found 81% had more than 50% improvement over global pretreatment symptom scores, which reflected composite urinary and pelvic pain discomfort. An unspecified number of these patients also had pelvic floor trigger points injected as part of their therapy. Whether the impact of treatment primarily favored pain symptoms as opposed to urinary function symptoms was not clear (14).

Injection Therapy

Botulinum toxin has been used in the treatment of spasticity based on its muscle-relaxing properties, secondary to inhibition of acetylcholine (37). Porta compared botulinum toxin A plus bupivacaine with methylprednisolone plus bupivacaine for treatment of chronic muscle spasm of the piriformis, psoas, and scalenus anterior muscles and found larger improvement in self-reported VAS scores for the botulinum group compared with the methylprednisolone group at 60 days posttreatment. He did not report the randomization method, and the results pooled pelvic and neck muscle outcomes together (16). Jarvis and colleagues also injected botulinum toxin into the pelvic floor of 11 women identified with levator ani spasm and chronic pelvic pain. At 3 months follow-up, mean dyspareunia and dysmenorrhea VAS scores significantly decreased from baseline (30). In this small series, nonstatistically significant improvements were also seen in dyschezia and nonmenstrual pelvic pain VAS, and quality of life as measured by the SF-12 and EQ-5D.

Three series have addressed other peripheral targets of injectable treatments for muscle spasm and chronic pelvic pain. Chronic muscle spasm may either directly impair normal functions, like with anal or urethral sphincter overactivity, leading to urinary or fecal retention, or possibly create a local environment of hypoxia leading to inflammation and pain. These local areas of muscle spasm may be palpable on physical examination and are labeled trigger points by some investigators. Slocumb found local anesthetic injections into trigger points identified in the abdomen, vagina, and sacrum of women with

chronic pelvic pain relieved symptoms in over 50% of subjects (38). Doggweiler-Wiygul and Wiygul used either a dry needling technique or local anesthetic to treat abdominal–pelvic trigger points in four women with chronic pelvic pain; they noted some improvement in overall function in three of the four, but the results are reported in a narrative without quantitative data (35).

One other study evaluated the effect of spinal injections on pain secondary to piriformis dysfunction. Although many studies of the piriformis focus on sciatica-predominant symptoms, Mullin and de Rosayro identified patients with pelvic pain and reproducible piriformis tenderness. Their retrospective review found complete relief of symptoms after one or two caudal steroid injections. However, some participants had additional indicated therapy that was not specified (39).

Although muscle relaxants have been suggested in the treatment of muscle spasm, only one study has evaluated the use of diazepam for levator syndrome. McGivney and Cleveland found that oral administration of this benzodiazepine (on average for 11 weeks) produced “marked relief” of symptoms in most of their patients. These patients also may have had rectal massage or other intrarectal medications (ortho-ido-benzoic acid and triethanolamine) (34).

Surgery

Three case series have targeted other pelvic musculoskeletal structures for surgical correction for pelvic pain; the rationale for these procedures is the restoration of normal pelvic support or decompression of impinged nerves. Miklos and colleagues reviewed their series of laparoscopic herniorrhaphy for sciatic hernias. In this retrospective review, 14 of 20 patients had complete relief at 3 months, whereas the other six had some improvement. Notably, other potential causes for pelvic pain such as adhesions or endometriosis were treated at time of surgery as well (40). Olerud and Walheim identified patients with pelvic instability and found symphodesis (surgical reunion of the dislocated symphysis pubis) provided complete or almost complete relief of pain in seven of eight patients who had presented with symphysis or sacroiliac joint pain (33). Finally, for patients with chronic perineal pain who demonstrated delay in pudendal nerve conduction velocity, surgical decompression has been proposed. Resection through a transgluteal approach of the sacrotuberous and

sacrospinous ligaments resulted in roughly half of their series of patients being cured of symptoms, with another one fourth showing some improvement. The length of follow-up in this descriptive series is not clearly specified, however (17).

Electrical Stimulation

Sacral neuromodulation has been suggested as a treatment for the dysfunction and symptoms of chronic urinary retention, possibly by somatic afferent inhibition of sensory processing in the spinal cord (41). Existing techniques involve percutaneous insertion of a permanent electrode into the sacral epidural space; electrical impulses are generated using an implanted generator (42). Our review did not identify any controlled trials for this technique. Abo-seif and colleagues assessed pain as a secondary outcome in a series of patients undergoing sacral nerve stimulator implantation for voiding dysfunction. They reported a decrease in self-reported mean daily pain scores after implantation, but the difference was not statistically significant (26). Everaert and others reported their experience with sacral nerve stimulation in 11 patients and noted that most subjects were satisfied with the result at follow-ups exceeding 1 year. Before using sacral stimulation, they initially used intrarectal or intravaginal stimulation for deep pelvic pain (location recorded in patient files as deep pelvic, urethral, or prostatic) with pelvic floor physical therapy; roughly half of patients had more than 50% improvement. A separate group of patients with superficial pain (location recorded in patient files as penile, perineal, inguinal, scrotal, or related to the pudendal nerve) were treated with transcutaneous electrical nerve stimulation (TENS) units, but only 13% had improvement (25). Caraballo has reported similar subjective improvement among 10 patients treated with sacral nerve stimulation for the diagnosis of interstitial cystitis (31).

Direct electrical stimulation may improve muscle spasm by fatigue of muscle after sustained contraction. In Fitzwater and colleagues’ retrospective series of women treated with transvaginal electrical stimulation for levator ani spasm, 68% had improvement of symptoms at final evaluation (occurring between 7 days and 63 weeks); most subjects underwent three or less sessions (36). Intra-anal approaches, to allow treatment of both women and men, have also been evaluated. Nicosia and Abcarian used intra-anal stimulation and found total relief of levator ani syndrome in 36 of 45 patients treated (32). Sohn’s ex-

perience was similar with 69% of subjects having complete relief (18). Morris and Newton reported only 25% of their subjects had complete relief after four treatments and an additional 50% after an average of 7.5 treatments (29). Likewise, Oliver and colleagues found this less effective, with only 43% of their subjects having relief after three intra-anal stimulations (19).

Discussion

Multiple etiologies may account for the spectrum of symptoms commonly referred to as chronic pelvic pain. This is a serious disorder with direct costs estimated at \$881 million in the United States in 1994 (43). The present review identifies significant limitations in the existing literature on treatment of pelvic musculoskeletal pain and consequently, little definitive evidence to guide clinicians. The deficiencies are principally flaws in study design, but the lack of consensus definitions for these syndromes also is problematic. In particular, the vast majority of studies failed to use a control group, which relegates the scientific use of these studies to hypothesis generation for future studies. The results of uncontrolled studies may overestimate effectiveness in comparison to historical controls, may overlook the effect of patient noncompliance, and may ignore harms resulting from the intervention (44). Two randomized, controlled trials were identified, but both have an extremely limited focus (pregnancy-related pelvic pain and botulinum toxin for myofascial pain), small sample sizes (only 44 participants in the pregnancy-related pain study and 30 participants in the botulinum toxin study), and design limitations (failure to perform a power analysis and inclusion of patients with pain outside of the pelvis in the botulinum toxin study). One further problem is that 19 of the studies combined men and women together in analysis; not only are there gender-specific causes for pelvic pain, but also stratifying results across gender might account for known hormonal roles in pain perception (45).

The absence of consensus criteria defining these musculoskeletal disorders also hinders assessment of the true clinical use of these proposed treatments. Only 16 studies specified readily reproducible diagnostic criteria with little consistency among them. As a result, reporting summary estimates for treatment efficacy is not possible. Furthermore, many have used subjective outcomes such as the ability to return to sitting, which may not represent meaningful outcomes in different populations (22). Most failed to

use quantitative outcome measures such as visual analog pain scores or quality-of-life questionnaires. Instead, subjective, nonreproducible end points such as “cured” or “improved” were often the only reported outcome. The need for careful assessment of outcomes in pain treatments has been emphasized in current guidelines for trial development (46). Indeed, arbitrary use of outcomes measures has been shown to overestimate efficacy of interventions in reviews of previous studies (47).

Clearly, increased scientific rigor is needed to guide management of musculoskeletal pelvic pain. With the prevalence of chronic pelvic pain approaching that of asthma, identifying effective treatments for these women should be an important priority for our healthcare system (48). Although consideration of a musculoskeletal etiology for pelvic pain typically follows conventional treatment failure (often surgical or hormonal), one Dutch study has suggested that initial attention to the musculoskeletal system along with other non-surgical therapy may be more effective than the conventional approach of initial laparoscopy to evaluate the pelvis (49). However, only properly formulated randomized, controlled trials can provide adequate evidence that these techniques are truly beneficial. In addition to the previously mentioned benefits of using controls, randomization of treatment assignment provides three benefits: avoidance of selection and confounding bias, and the ability to use probability theory to report how likely the observed effect is outside of chance occurrence (50). A first step in achieving these goals should be for all trials in this field to follow the guidelines promulgated by the Consolidated Standards of Reporting Trials (CONSORT), which explicitly describe how to report the design of such treatment trials (51).

We recognize that clinicians may feel obligated to attempt any means necessary to aid these women when unrelenting symptoms persist despite aggressive therapy. However, we are confident that gynecologists can improve on the present practice of using unvalidated, uncontrolled methods to treat these unfortunate women. Even as we improve our basic science understanding of common central neurologic mechanisms underlying persistent pain, our current research strategy into pelvic pain management must include musculoskeletal dysfunction. Only then will we be able to begin selected targeting of somatic triggers of central pain.

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