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CLINICAL ARTICLE

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Pain and functionality improved when underlying neuromuscular dysfunction addressed in chronic pelvic pain patients

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Abstract

Aim: Examine the effects of treating underlying neuromuscular dysfunction in chronic pelvic pain (CPP) patients.

Methods: A retrospective longitudinal study of 200 female and male patients with CPP was performed upon an Institutional Review Board (IRB) approval (IRB# 17-0761). The outpatient protocol consisted of ultrasound-guided trigger point injections to the pelvic floor musculature with peripheral nerve blocks once a week for 6 weeks in an outpatient setting. Pelvic pain and functionality were measured before and after treatment using the Visual Analogue Scale and the Functional Pelvic Pain Scale. Functionality categories assessed were intercourse, bladder, bowel, working, walking, running, lifting, and sleeping.

Results: Pretreatment, mean VAS score was 6.44 (standard deviation [*SD*] = 2.50; $p < 0.05$, 95% confidence interval [CI] = 6.09–6.79). Posttreatment mean VAS score was 4.25 (*SD* = 2.63; $p < 0.05$, 95% CI = 3.88–4.61). The mean FPPS score before treatment was 10.77 (*SD* = 6.39; $p < 0.05$, 95% CI = 9.88–11.65). Posttreatment mean FPPS score was 7.42 (*SD* = 5.87; $p < 0.05$, 95% CI = 6.61–8.23). Analysis of subcategories within FPPS indicated statistically significant improvement in the categories of intercourse, working, and sleeping.

Conclusion: Findings show the treatment was efficient at decreasing pain in CPP patients. Results show promise for improving overall pelvic functionality, particularly within the categories of intercourse, sleeping, and working.

KEYWORDS

chronic pelvic pain, chronic prostatitis, endometriosis, pelvic floor dysfunction, pelvic floor myalgia, pelvic pain

1 | INTRODUCTION

Chronic Pelvic Pain (CPP) is characterized by noncyclical pain in the pelvis or abdomen present for 3–6 months, interfering with daily function.[1] CPP is also known as Urological Chronic Pelvic Pain (UCPPS) and Chronic Pelvic Pain Syndrome (CPPS),[2] for the purposes of this study, CPP will be the consistent nomenclature. Rather than being perceived as a single disorder, CPP should be viewed as a pattern of symptoms caused by overlapping

conditions including, Interstitial Cystitis (IC)/Bladder Pain Syndrome (BPS), Endometriosis, Irritable Bowel Syndrome (IBS), and Pelvic Myofascial Pain.[3] This prevalence between CPP and disorders of the urological organs, reproductive tract, gastrointestinal system, and musculoskeletal system explains the uncertainty in CPP's etiology.[4]

The best treatment option for this minimally understood pain complex is uncertain.[2] Current pharmacological treatments in CPP include antibiotics that ameliorate infection and voiding complications. Anti-inflammatories and alpha-blockers can also be utilized. Neurologic treatments include the use of neuropathic pain drugs for instance pregabalin, gabapentin, and amitriptyline. Acupuncture, lifestyle changes, physical therapy, shockwave therapy, prostatic massage, and trigger point release are nonpharmacological treatments.[2] Pelvic floor physical therapy comprises of biofeedback, nerve gliding, internal myofascial release, manual therapy, muscle control exercises, muscle energy, acupressure, and mobilization techniques.

Consequently, treatment of CPP may consist of two approaches: to treat chronic pain as a diagnosis and to treat the disorders that might be a cause/contributor to CPP. These approaches are not mutually exclusive and effective therapy is achieved by using both methods.[3]

We aim to treat the underlying myofascial pain syndrome and neurogenic pain seen in CPP patients with our outpatient neuromuscular protocol. The effectiveness of our protocol has been studied for men and women with CPP.[5,6] The current study was performed to provide additional data for the efficacy of our protocol with a much greater sample size.

2 | METHODS

2.1 | Participants

Participants were 200 patients (158 female and 42 male) between the ages of 17–86 years old diagnosed with CPP and presented to an outpatient pelvic rehabilitation practice between the dates April 2019 and January 2021. This is a multi-center retrospective study with offices in New York City, New Jersey, Houston, Dallas, Miami, Washington DC, Michigan, Chicago, and Atlanta participating. Patient demographics for the 200 participants are shown in Table 1. All participants undertook standard pretreatment evaluations with a detailed history and physical examination, including an internal pelvic floor examination performed by one of eleven physiatrists.

Internal examinations consisted of palpation of the levator ani sling to assess muscle strength and tone, and the presence of trigger points. Trigger points are tender, palpable stiff bands inside a muscle which sometimes have referred pain patterns and a twitch response. The pudendal nerve was also examined with palpation over Alcock's Canal and the ischial spines to observe tenderness/tingling sensation known as Tinel's sign. Also, allodynia was observed at the posterior femoral cutaneous nerve between the quadratus femoris and obturator internus 4 cm distal to the ischial tuberosity.

TABLE 1 Demographics table

Participants (*N*)	200
Females (*N*)	158
Males (*N*)	42
Average age (years)	40.61
Min Age (years)	17
Max age (years)	86
Average of duration of pain (years)	5.63

Inclusion Criteria:

1. History of CPP for greater than 6 months.
2. Completion of at least 6 weeks of pelvic floor physical therapy.
3. Full urologic consultation with necessary workup for all male patients. These tests were performed by a urologist before patient consultation with a physiatrist.
4. Full gynecological consultation with necessary workup for all female patients. These tests were performed by a gynecologist before patient consultation with a physiatrist.
5. Completion of full treatment protocol.

Exclusion Criteria:

1. Chronic opioid use
2. Active infection
3. Malignancy
4. Pudendal Nerve Entrapment with scar tissue on MR Neurography
5. Not concomitantly participating in pelvic floor physical therapy

The medications tried, relevant diagnoses, and past medical history, as well as the prior surgeries of patients, are displayed in Figure 1.

2.2 | Procedures

A retrospective chart review was done upon an Institutional Review Board (IRB) approval (IRB# 17-0761). This protocol was developed for patients with CPP who failed to progress after 6 weeks of pelvic floor physical therapy. One of

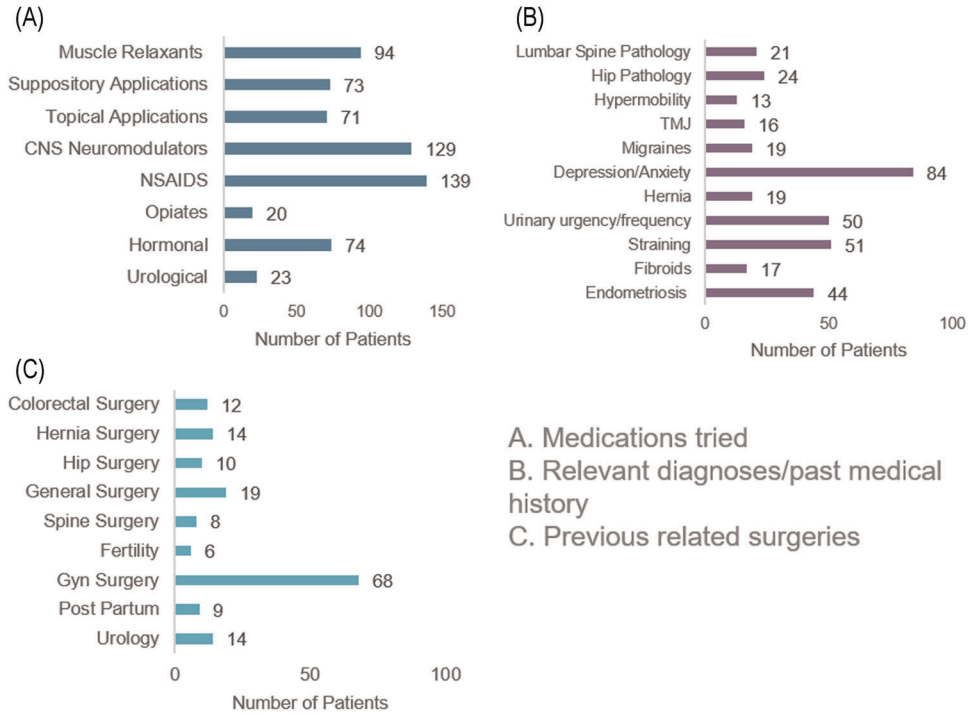

FIGURE 1 (A) Medications used, (B) relevant diagnoses and medical history, and (C) previous surgeries of patients

11 physiatrists performed the protocol and related interpretations. The protocol consists of external ultrasound-guided trigger point injections using 1cc of Lidocaine 1% to the pelvic floor muscular structure. Once a week for 6 weeks throughout the protocol, a global injection was administered into the iliococcygeus, pubococcygeus, or the puborectalis one side at a time.[7] This way, each muscle of the levator ani sling was treated one time throughout the 6 weeks. With the patient lying in prone, a flexible, 6-in., 27-gauge needle was used to inject the targeted muscle from the subgluteal posterior approach, using an aseptic technique under ultrasound guidance. On ultrasound, myofascial trigger points appear as focal, hypoechoic regions with reduced vibration amplitude on vibration sonoelastography, indicating a localized, stiff nodule.[8] Patients simultaneously underwent ultrasound-guided, peripheral nerve blocks of the pudendal nerve at Alcock's canal while in the prone position.[9] The patient was then flipped to the supine position and underwent ultrasound-guided peripheral nerve blocks of the posterior femoral cutaneous nerve 4 cm inferior to the ischial tuberosity[10] at each visit, alternating right and left sides throughout the protocol.

For the first treatment on each side, 2 ml of dexamethasone with 7 ml of 1% Lidocaine was placed around each nerve. At the following visits, the dexamethasone was replaced with normal saline for the peripheral nerve blocks. Patients continued to attend pelvic floor physical therapy at a facility of their choice throughout the protocol. The pelvic floor physical therapy included the internal release of the pelvic floor hypertonic musculature, visceral mobilization, scar tissue mobilization, skin rolling along the lower abdomen and buttocks, nerve gliding along the pudendal and posterior femoral cutaneous nerves, and diaphragmatic breathing.

All patients tolerated the protocol as it utilizes a 27-gauge needle with topical anesthetic spray before treatment and patients were premedicated with diclofenac 75 mg P.O. Patients resumed activities and returned to work the same day after sitting on ice for 10 min.

2.3 | Outcome measures

Effectiveness of treatment was assessed before treatment and 3 months posttreatment, with the 0–10 Visual Analogue Scale (VAS) to calculate pelvic pain and the Functional Pelvic Pain Scale (FPPS) to gauge pelvic functionality. For VAS scores, patients rated their mean pain intensity for the previous 24 h. Pelvic functionality on the FPPS encompasses the following categories: intercourse, bladder, bowel, working, walking, running, lifting, and sleeping. Patients ranked all categories from 0 to 4, where 0 represented regular function and serious debilitation was represented by 4. Hence, all patients were represented by an overall pelvic function score ranging from 0 and 32. Experimenter bias was minimized by keeping follow-up questions identical for all patients.

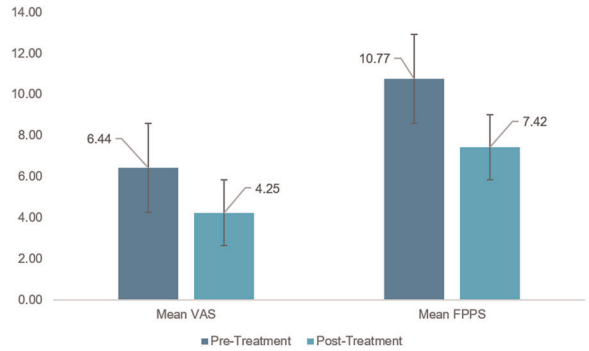

FIGURE 2 Mean VAS/FPPS. FPPS, Functional Pelvic Pain Scale; VAS, Visual Analogue Scale

The statistical significance between VAS and FPPS scores before and after our protocol was determined using the paired two-sample *t*-test with a *p* value of less than 0.05 correlating with a statistical difference. Descriptive Statistics was used to determine the lower and higher values of the confidence interval (CI). The sensitivity of our correlations is depicted via error bars in Figures 2 and 3.

3 | RESULTS

Patients underwent ultrasound-guided, pelvic floor trigger point injections, and peripheral nerve blocks. No adverse events were noted, and patients could return to work the same day as their treatment without any down time. 40.61 years (standard deviation [*SD*] = 13.70) was the average age of the 200 patients analyzed and 5.63 years (*SD* = 6.00) was the average period of pelvic pain. Table 2 summarizes the results, observing statistically significant progress in intercourse, working, and sleeping.

Before treatment, the mean VAS score was 6.44 (*SD* = 2.50; $p < 0.05$, 95% CI = 6.09–6.79). After treatment, the mean VAS score was 4.25 (*SD* = 2.63; $p < 0.05$, 95% CI = 3.88–4.61). The mean FPPS score before treatment was 10.77 (*SD* = 6.39; $p < 0.05$, 95% CI = 9.88–11.65). After treatment, the mean FPPS score was 7.42 (*SD* = 5.87; $p < 0.05$, 95% CI = 6.61–8.23). Analysis of subcategories within FPPS indicated statistically significant improvement in the categories of intercourse, working, and sleeping.

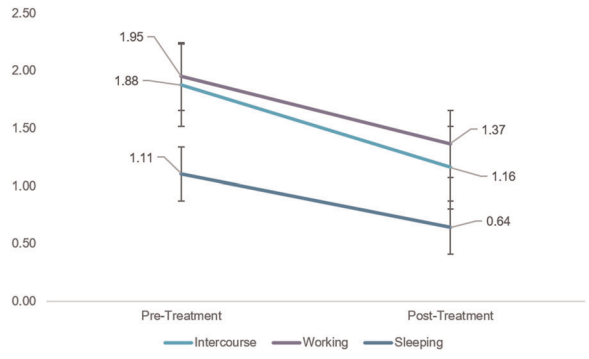

FIGURE 3 FPPS statistical significance figure. FPPS, Functional Pelvic Pain Scale

For the subcategory of intercourse, the average change in score after treatment was 0.72. Before treatment, the average was 1.88 ($p < 0.05$, 95% CI = 1.66–2.09). Posttreatment, the mean was 1.16 ($p < 0.05$, 95% CI = 0.97–1.35). In the subcategory of working, the average score change after treatment was 0.59. Before treatment, the average was 1.95 ($p < 0.05$, 95% CI = 1.76–2.14). After treatment, the average was 1.37 ($p < 0.05$, 95% CI = 1.21–1.52). For the sleeping subcategory, the average change in score posttreatment was 0.47. Before treatment, the average was 1.12 ($p < 0.05$, 95% CI = 0.94–1.27). After treatment, the average was 0.64 ($p < 0.05$, 95% CI = 0.51–0.77).

4 | DISCUSSION

This retrospective study examined 200 patients (158 female and 42 male) with a diagnosis of CPP that were treated with a comprehensive outpatient multimodal protocol that included pelvic floor physical therapy, ultrasound-guided trigger point injections, and peripheral nerve blocks of the pudendal nerve and posterior femoral cutaneous nerves. The average VAS and FPPS measures reduced substantially by 2.20 and 3.35, respectively as depicted in Figure 2 indicating our protocol's effectiveness. In this study, statistically significant improvements appeared across all categories except for the bowel. The subcategories of intercourse, working, and sleeping were particularly promising as visualized in Figure 3. The focus of our comprehensive outpatient protocol is to treat the underlying neuropathic pain and myofascial pain seen in CPP.[4,11] The neuropathic component of CPP includes peripheral sensitization, central sensitization, and cross-sensitization.[12]

The goal of reversing peripheral sensitization is through decreasing the neurogenic inflammation involved in promoting the aberrant firing of the peripheral nociceptors.[13] Treatment for neurogenic inflammation through our protocol comprises of first reversing the neural ischemia,[14] then using anti-inflammatory dexamethasone once each side[6] to deplete Substance P,[15] and finally exposing peripheral pelvic nerves to Lidocaine repetitively to decrease the mast cell release of histamine.[16]

The central sensitization process in CPP involves increased membrane excitability and synaptic efficacy in response to normally benign (allodynia) or nociceptive (hyperalgesia) stimuli. This results from neural plasticity within the central nervous system after exposure of the

TABLE 2 Results table

	Pretreatment	Posttreatment	p^*
VAS	6.44	4.245	2.77E−20
FPPS – TOTAL	10.765	7.42	2.32E−14
FPPS – INTERCOURSE	1.875	1.16	9.43E−11
FPPS – WORKING	1.95	1.365	1.34E−09
FPPS – SLEEPING	1.105	0.64	3.04E−07
FPPS – WALKING	1.115	0.735	4.92E−07
FPPS – RUNNING	1.265	0.805	9.33E−06
FPPS – LIFTING	1.075	0.77	0.000139
FPPS – BLADDER	1.24	0.92	0.000152
FPPS – BOWEL	1.14	1.025	0.079894

*$p < 0.05$.

sensory pathway to prolonged neurogenic inflammation or another neural insult.[17] With central sensitization, there is altered pain processing and the pain experienced can be magnified. Therefore, we use serial peripheral nerve blocks along the two major sensory peripheral nerves of the pelvis to break the excessive input from the peripheral nervous system to the central nervous system by (1) decreasing neurogenic inflammation and (2) desensitizing peripheral nociceptors. This decrease in excessive hyperexcitable peripheral nerve input ultimately helps to reverse the central sensitization process.[13]

Cross sensitization in the pelvis is when a sensitized structure can upregulate a "normal" structure.[18] The pudendal and posterior femoral cutaneous nerves are particularly vulnerable to cross-sensitization given their proximity and significant innervation overlap. Due to the presence of substantial overlap in pain patterns and innervation with the pudendal and posterior femoral cutaneous nerve,[19] it is important to address this example of cross-sensitization and treat both peripheral nerves simultaneously.[12]

Moreover, patients with CPP also have concomitant underlying pelvic floor hypertonia[20] and pelvic floor myofascial pain and dysfunction. It is increasingly identified as a major contributor to the symptoms of CPP. Treating the underlying hypertonic pelvic floor will help create space for the nerves to flow with less impingement[14] and will aid in releasing the hyperirritable taut bands of muscle that contribute to promoting the chronic pain cycle. Active myofascial trigger points serve as a source of ongoing nociception contributing to the aberrant firing of peripheral nociceptors and ultimately central sensitization. Thus, the ultrasound-guided trigger point injections to each muscle in the levator ani sling aim to reset the short, spastic, and weak pelvic floor musculature.[11]

Pain before, during, or after intercourse can cause significant biopsychosocial distress and have a strong negative impact on the quality of life for both female and male CPP patients. For female patients, this is called dyspareunia. Dyspareunia is a complex disorder that can be further classified as superficial or deep, and primary or secondary.[21] For male patient's pain before, during, or after intercourse falls under the umbrella of Chronic Prostatitis/Chronic Pelvic Pain Syndrome.[2] One study of psychosocial difficulties in 424 patients with CPP revealed a greater impairment in confidence and self-esteem in sexual relationships in CPP patients compared to the healthy control group.[22] The statistically significant improvement in the category of intercourse proves our protocol's efficacy in returning CPP patients to pain-free intercourse.

The improvement seen in the sleep category is most likely connected to a decrease in nocturia from the significant improvement noted in bladder symptoms. The bladder neck no longer sits on a spastic pelvic floor preventing dysfunctional voiding caused by a hypertonic pelvic floor keeping urinary urgency and frequency under control, allowing our patients' uninterrupted sleep. In addition, the significant decrease in the overall pain score demonstrated would promote a comfortable and restful sleep.

Absenteeism is a major liability on this patient population as proven by a report led by the Chronic Prostatitis Collaborative Research Network (CPCRN) which examined the explicit and implicit costs correlated with chronic prostatitis including absenteeism and work productivity. 26% of the affected men claimed their prostatitis caused an absence from work at a mean cost of $551 over the previous 3 months. 79% of men reported a decreased productivity at work and assigned half of this productivity loss to their prostatitis symptoms.[23] Another study analyzing women diagnosed with endometriosis showed a positive correlation between severity of symptoms experienced and hours of employment lost.[24] Our study shows that our comprehensive

outpatient protocol for treating CPP keeps our patients working.

One limitation to our study is its retrospective nature which prevents randomized control groups. The efficacy of our protocol in comparison to a placebo will not be possible as it would violate the ethics and trust of our patients who seek relief from their debilitating pain. Another major challenge is assessing the long-term efficacy of our protocol for the patients who have chronic underlying disease processes such as Endometriosis, Bladder Pain Syndrome/Interstitial Cystitis, and Connective Tissue disorders/Hypermobility because flare-ups can occur in these chronic conditions which require further treatment. Therefore, to maintain the progress that patients make in alleviating pelvic pain and functionality with the protocol, patients are given a neuromuscular re-education home program sometimes in combination with home internal dilator and/or wand work under the guidance of their physical therapist. Patients are educated on self-efficacy and techniques such as diaphragmatic breathing, stretching, taking a warm bath, and using a muscle relaxant suppository in case of flare-ups. Moreover, our follow-ups occur only 3 months after treatment which suggests our outcomes are short-term outcomes and may decrease over time. A future consideration includes the use of PROMIS-29[25] to assess our patients' physical and mental health to gauge the clinical impact of our results at a deeper level.

5 | CONCLUSION

Our investigation confirmed statistically significant advantageous results in both pain and function for women and men between ages 17–86 with the diagnosis of CPP who underwent our comprehensive, multimodal outpatient neuromuscular protocol. The progress noted in the functional categories of intercourse, working, and improved sleep quality was particularly promising.

CONFLICT OF INTERESTS

The authors declare that there are no conflict of interests.

AUTHOR CONTRIBUTIONS

Substantial contributions to conception and design: Janaki Natarajan, Tayyaba Ahmed, Soha Patil, Marjorie Mamsaang, Rucha Kapadia, Yogita Tailor, Allyson Shrikhande. *Drafting and revising the article critically for important intellectual content*: Allyson Shrikhande and Soha Patil. *Final approval of the version to be published*: Soha Patil.

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