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CLINICAL ARTICLE

Neuromuscular treatment approach for women with chronic pelvic pain syndrome improving pelvic pain and functionality

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Abstract

Aims: Reporting the effects of treating underlying myofascial dysfunction and neuropathic pain in women with chronic pelvic pain syndrome (CPPS).

Methods: Retrospective longitudinal study of 186 women with CPPS treated with ultrasound-guided peripheral nerve blocks and trigger point injections to pelvic floor muscles alongside pelvic floor physical therapy once weekly for 6 weeks in an outpatient setting. Visual Analogue Scale (VAS) and Functional Pelvic Pain Scale (FPPS) questionnaires quantified pain and function in the pelvis. Working, intercourse, sleeping, walking, running, lifting, bladder, and bowel were the function categories. Statistical significance was established by p value less than .05 in paired two-sample t-test.

Results: VAS improved by 2.14 where average VAS before treatment was 6.61 (standard deviation [*SD*] 2.45; $p < .05$, 95% confidence interval [CI] = 6.26–6.96) and average VAS after treatment was 4.47 (*SD* 2.71; $p < .05$, 95% CI = 4.08–4.86). Total FPPS decreased by 3.38 from 11.26 (*SD* 6.51; $p < .05$, 95% CI = 10.32–12.19) before treatment to 7.88 (*SD* 6.22; $p < .05$, 95% CI = 6.99–8.78) after treatment. Working, intercourse, and sleeping accounted for the highest statistically significant improvement.

Conclusion: Findings support the success of the comprehensive treatment protocol. Patients who had persistent symptoms after a full course of pelvic floor physical therapy experienced improvements in pain levels and function once it was combined with ultrasound-guided nerve blocks and trigger point injections, interactively treating underlying neuromuscular dysfunction.

KEYWORDS

bladder pain syndrome, chronic pelvic pain, dyspareunia, endometriosis, interstitial cystitis, pelvic floor myalgia, pudendal neuralgia

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1 | INTRODUCTION

Chronic pelvic pain syndrome (CPPS), a multifactorial, debilitating condition combining the anatomic malfunction of pelvic floor musculature and malfunction of pain perception.[1] The noncyclical pain restricts function and is persistent for more than 6 months. Applying this rigorous definition of "noncyclical pain lasting at least 6 months," a 2014 review found prevalence ranged from 5.7% to 26.6%. Additionally, the presence of overlapping pain syndromes such as endometriosis and bladder pain syndrome were 70% and 61%, respectively.[2]

The specific etiology of CPPS has not been identified, however its symptoms present as an interplay between dysfunction in the gastrointestinal, gynecological, urological, musculoskeletal, and neurological systems.[1] Relevant underlying factors in CPPS include myofascial and neuropathic pain and dysfunction. The neuropathic factors in CPPS include the triad of peripheral sensitization, central sensitization, and cross-sensitization. Essentially, experiencing pain long term alters the brain's processing and perception of pain signals leading to an "exaggeration" phenomenon with amplification of pain.[3]

This minimally understood, complex disease process makes CPPS diagnosis and treatment unpredictable with ineffective patient outcomes.[4] Traditional treatment approaches include (1) identifying and treating overlapping pain syndromes including endometriosis, interstitial cystitis/bladder pain syndrome, and irritable bowel syndrome[2]; (2) identifying and treating potential underlying primary pain generators such as a multitude of gynecological disorders, femoral acetabular impingement/labral tear, hernias, pelvic congestion syndrome, and gastroenterology disorders[1]; (3) pharmacological treatment options such as anti-inflammatories, analgesics, central nervous system neuromodulators, muscle relaxers, and hormonal suppression[2]; (4) and nonpharmacological treatments such as pelvic floor physical therapy, physiatry, acupuncture, lifestyle modifications, nutrition, cognitive behavioral therapy, and yoga. Patient education on the benefits of a multimodal, comprehensive treatment plan to include a mixture of behavioral therapy, pelvic floor physical therapy, physiatry, nutrition, medications, and surgical options when applicable is important.[1,2]

Appropriate treatment options for CPPS in women regardless of the pain's severity and the underlying predisposing factors remains limited.[1] This study's objective is to establish the efficacy of an outpatient, comprehensive, neuromuscular treatment protocol aimed at treating the myofascial pain and dysfunction, peripheral sensitization, and central sensitization seen in CPPS patients. This treatment's effects have been studied for 200 male and female CPPS patients[5] and the current analysis was completed for only women with CPPS.

TABLE 1 Demographics and clinical characteristics of women with chronic pelvic pain syndrome

Demographics and clinical characteristics	
Participants (*n*)	186
Age (years) (mean ± *SD*)	40.45 ± 13.96
Average duration of pain (years) (mean ± *SD*)	6.37 ± 6.78
Participants with comorbidities (*n*)	
Endometriosis (pathology confirmed)	56
Depression/anxiety	80
Straining	49
Urinary urgency/frequency	46
Fibroids	22
Hernia	13
Migraines	26
Hypermobility	11
Temporomandibular joint disorder (TMJ)	19
Hip pathology	26
Lumbar spine pathology	13

2 | MATERIALS AND METHODS

2.1 | Participants

One hundred and eighty-six female patients aged 17–76 years old diagnosed with CPPS who presented to an outpatient pelvic rehabilitation practice between the dates April 2019 and February 2021 are the participants. This multicenter retrospective study reports data from offices in Atlanta, Chicago, Dallas, New Jersey, Houston, Miami, New York City, Michigan, and Washington DC. Patient demographics and clinical characteristics are summarized in Table 1.

2.1.1 | Inclusion criteria

1. Completion of full course of pelvic floor physical therapy (6 weeks).
2. Record of CPPS for more than 6 months.
3. Complete gynecological consultation with necessary workup. This was performed by a gynecologist before patient consultation with 1 of 11 physiatrists.
4. Standard pretreatment evaluations performed by one of eleven physiatrists with detailed history and

physical examination, including an internal pelvic floor examination of muscles and nerves consisting of: (1) examining the pudendal nerve and posterior femoral cutaneous nerves internally to observe allodynia/hyperalgesia; and (2) palpating levator ani sling to provoke tenderness indicative of trigger points.
5. Completion of full treatment protocol.
6. Trigger points and pelvic floor dysfunction found at internal examination. Trigger points often co-exist with pelvic floor dysfunction.[3,6] They are evident bands within a muscle which often have pain patterns and twitch responses[7] and are present in patients with sensitization.[8] This is because they serve as an ongoing source of nociception, sending afferent signals to the spinal cord that cause structural and functional changes leading to central sensitization.[8] Only patients who have tenderness upon palpation are included, suggesting that the trigger points are painful.

2.1.2 | Exclusion criteria

1. Active infection.
2. Malignancy.
3. Active pregnancy.
4. Pudendal nerve entrapment syndrome.
5. Not simultaneously partaking in pelvic floor physical therapy.
6. No evoked tenderness upon palpation of levator ani sling at internal examination.
7. Incomplete Visual Analogue Scale (VAS) or Functional Pelvic Pain Scale (FPPS) questionnaires.

Figures 1 and 2 show the previous medications tried and past surgeries of patients.

2.2 | Processes

Retrospective chart review for an institutional review board (IRB) approved (IRB# 17-0761) treatment protocol was performed. Informed consent was not required due to study design. This protocol was designed for CPPS patients who did not improve after participating in the traditionally recommended first-line treatment: pelvic floor physical therapy,[1] for a 6-week course.
The protocol consists of:

- External ultrasound-guided trigger point injections applying 1 cc of Lidocaine 1% to the pelvic musculature once weekly for 6 weeks. A global injection gets administered into the iliococcygeus, pubococcygeus, or the puborectalis one side at a time[9] treating every muscle of the levator ani sling one time through 6 weeks. A flexible, 6-inch, 27-guage needle injects the specific muscle from the subgluteal posterior approach, using an aseptic technique under ultrasound guidance with patient lying in prone position. On ultrasound, myofascial trigger points look like focal, hypoechoic zones with lowered vibration amplitude on

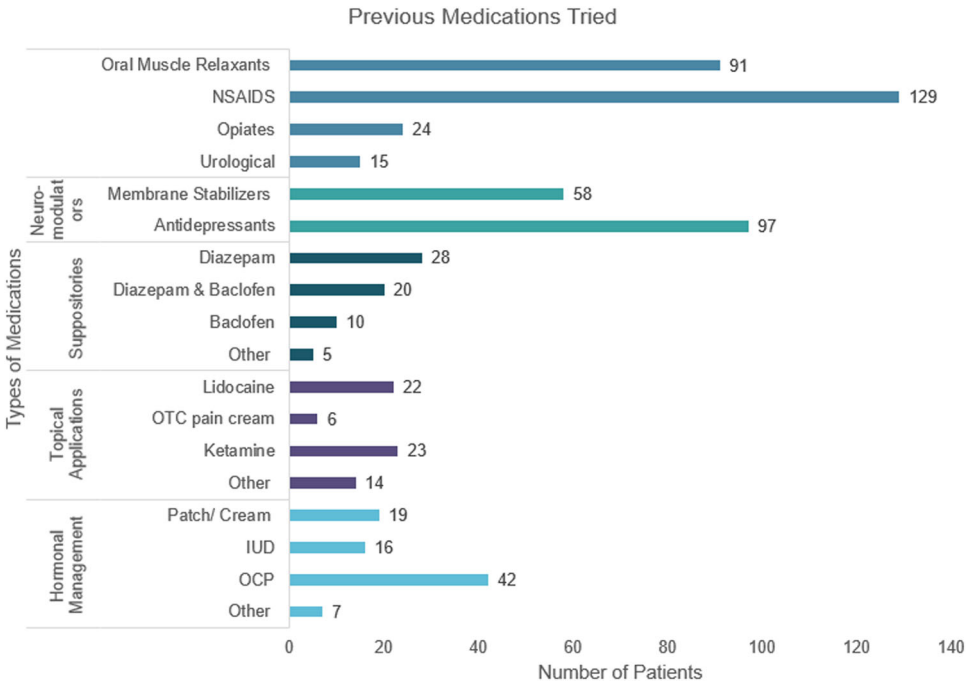

FIGURE 1 Previous medications tried

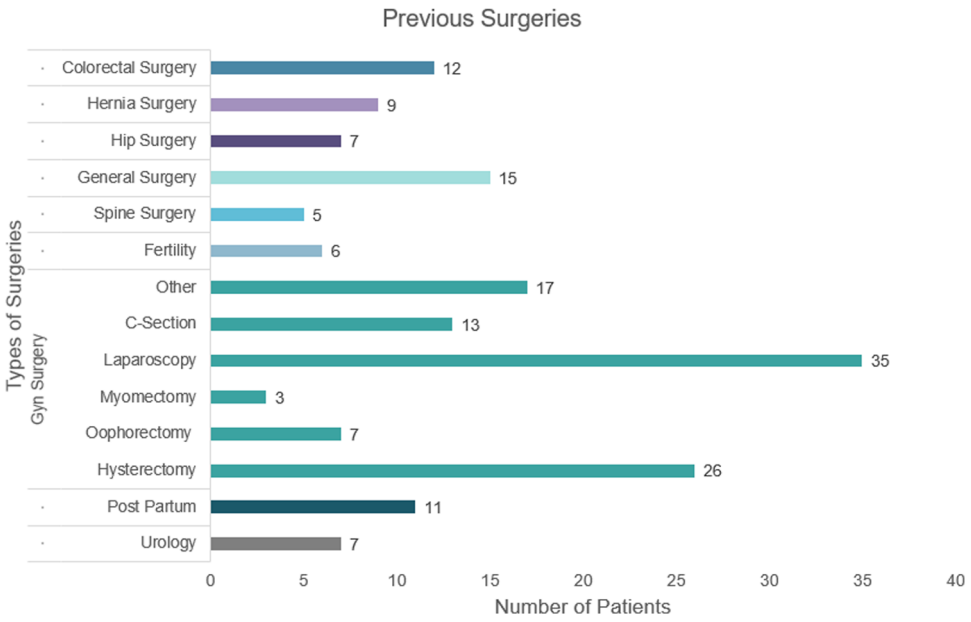

FIGURE 2 Previous related surgeries

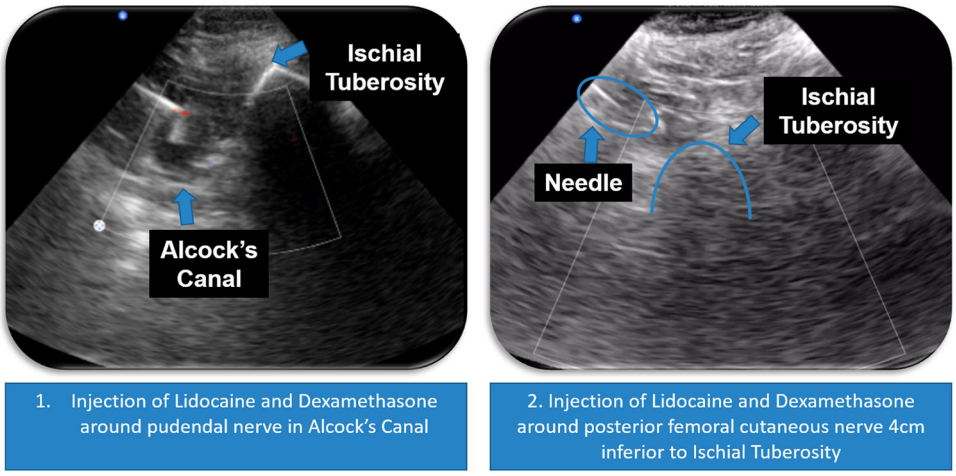

FIGURE 3 Ultrasound images of Alcock's Canal and Obturator Canal. Work by Pelvic Rehabilitation Medicine. Reprinted with permission from Pelvic Rehabilitation Medicine. www.pelvicrehabilitation.com

vibration sonoelastography, suggesting a local, rigid nodule[7] (Figure 3).

- Simultaneous ultrasound-guided, peripheral nerve blocks of the pudendal nerve at Alcock's canal are administered.[10] Then, in prone position, nerve blocks of the posterior femoral cutaneous nerve 4 cm inferior to the ischial tuberosity[11] are given at every appointment, exchanging right and left sides during treatment. For the initial treatment, 2 ml of dexamethasone with 7 ml of 1% Lidocaine was placed around each nerve on each side. In the next appointments, normal saline was used for the nerve blocks.
- Attending pelvic floor physical therapy at a facility of patient's choice during the course of the treatment. Patients attended pelvic floor physical therapy one-on-one with a physical therapist for 1 h, attending each session within 7 days after each injection. Pelvic floor physical therapy in concomitance to the injections is referred to "down training" to restore the peripheral nervous system and central nervous system to a relaxed state and release muscle spasms. The focus is on internal release of the hypertonic pelvic floor muscular structure, skin rolling along the lower abdomen and buttocks, scar tissue mobilization, visceral mobilization, nerve gliding along the pudendal and posterior femoral cutaneous nerves, and diaphragmatic breathing.[5] Home exercise program consists of restorative yoga poses involving stretches

for thighs, buttocks, abdomen, and the back which can be repeated 1–3 times a day as needed.

The treatment was completed and tolerated by all patients as a 27-gauge needle with topical anesthetic spray before treatment was used. Patients were premedicated with diclofenac 75 mg P.O and they resumed normal activities and went back to work the same day after sitting on ice for 10 min.

After undergoing the treatment protocol for 6 weeks and presenting at follow-up visits, the next steps for patients to maintain the progress made involve following a neuromuscular re-education home program guided by their physical therapist. Patients are also educated on self-efficacy, lifestyle modifications, and pain management techniques such stretching, diaphragmatic breathing, taking a warm bath, or using a muscle relaxant for any flare-ups.

2.3 | Outcome measurements

Patient response to treatment was measured at their new patient consult and 3-month visit, with the 0–10 VAS to calculate pelvic pain concentration and the FPPS to measure pelvic functionality. Patients scored their mean pain intensity for the previous 24 h for VAS. FPPS comprises of the following categories: working, intercourse, sleeping, walking, running, lifting, bladder, and bowel were the function categories. All categories were ranked from 0 to 4, where 0 embodied normal performance and major debilitation was characterized by 4. This way all patients were represented by a total pelvic function score ranging 0 and 32. Follow up questions were kept identical for all patients to reduce experimenter bias.

Paired two-sample *t*-test with a *p* value of less than .05 for a statistical difference was used to calculate significance of the difference in VAS and FPPS after treatment. The established problem statement assumed a null hypothesis that the two averages are equal and there is no improvement. A one-tailed *p* value of less than .05 represented statistical significance and rejected the null hypothesis in one direction. If the average decreased and the *p* value was less than .05, we concluded a statistical significance in that direction (i.e., reject the null hypothesis because there is an improvement in pain and function). Lower and higher values of the confidence interval (CI) were calculated with descriptive statistics.

3 | RESULTS

Figures 4 and 5 visually demonstrate the results. We observed statistically significant reductions in VAS and FPPS scores between patients' new patient consult ("initial") to their 3-month visit ("final"). Initial average VAS was 6.61 (*SD* 2.45; $p < .05$, 95% CI = 6.26–6.96) and final average VAS decreased to 4.47, (*SD* 2.71; $p < .05$, 95% CI = 4.08–4.86). Initial average FPPS score was 11.26, (*SD* 6.51; $p < .05$, 95% CI = 10.32–12.19) and final FPPS score reduced to 7.88, (*SD* 6.22; $p < .05$, 95% CI = 6.99–8.78). Statistically significant improvements appeared across all functionality categories as depicted in Table 2. Working, intercourse, and sleeping accounted for the highest improvements.

Working: Average change in score of 0.60. Initial average was 1.97 ($p < .05$, 95% CI = 1.76–2.18) and final average was 1.37 ($p < .05$, 95% CI = 1.19–1.54).

Intercourse: Average score change of 0.69. Initial average was 2.02 ($p < .05$, 95% CI = 1.79–2.25) and final average was 1.33 ($p < .05$, 95% CI = 1.12–1.54).

Sleeping: Average change in score was 0.46. Initial average was 1.16 ($p < .05$, 95% CI = 0.98–1.33) and final average was 0.70 ($p < .05$, 95% CI = 0.56–0.84).

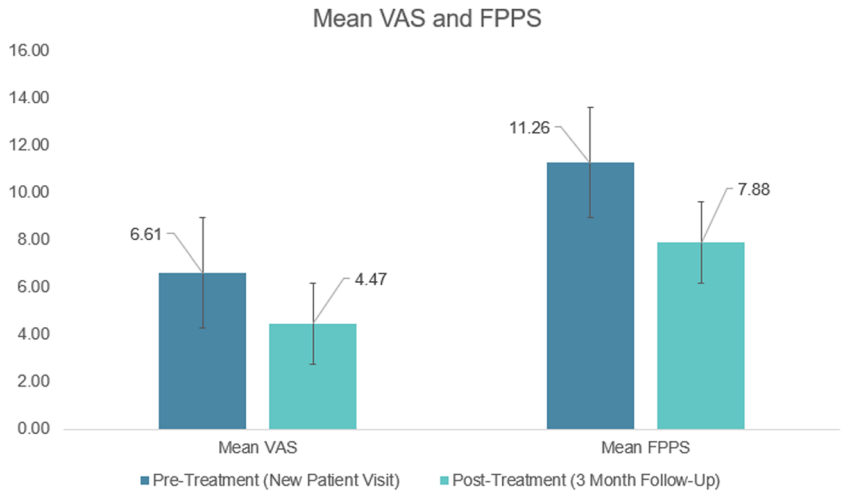

FIGURE 4 Visual Analog Scale (VAS) and Functional Pelvic Pain Scale (FPPS) pre- and posttreatment

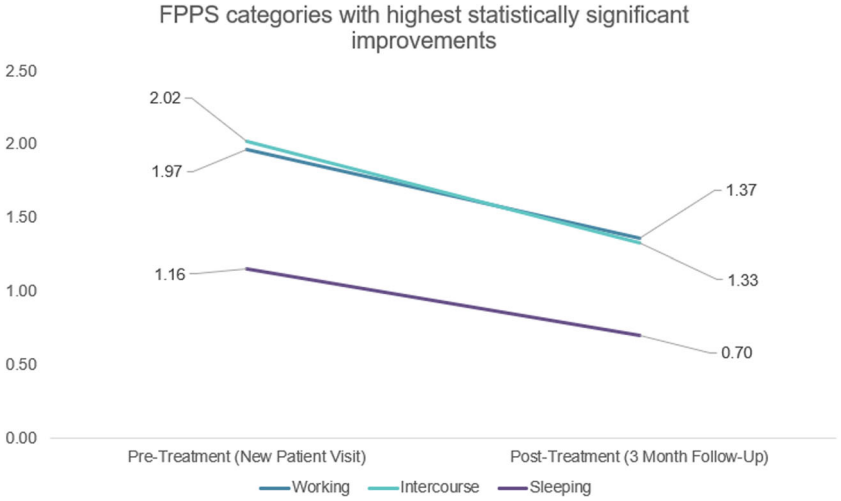

FIGURE 5 Functional Pelvic Pain Scale (FPPS) pre- and posttreatment for most improved categories: Working, Intercourse, Sleep

TABLE 2 Visual Analog Scale (VAS) and Functional Pelvic Pain Scale (FPPS) results table

	Pretreatment	Posttreatment	*p* value*
VAS	6.61	4.47	1.66×10^{-17}
FPPS – TOTAL	11.26	7.88	9.11×10^{-14}
FPPS – WORKING	1.97	1.37	2.41×10^{-09}
FPPS – INTERCOURSE	2.02	1.33	2.51×10^{-09}
FPPS – SLEEPING	1.16	0.70	1.08×10^{-06}
FPPS – WALKING	1.24	0.84	1.51×10^{-06}
FPPS – RUNNING	1.31	0.86	.000051
FPPS – LIFTING	1.10	0.78	.00013
FPPS – BLADDER	1.20	0.91	.00071
FPPS – BOWEL	1.27	1.09	.020

*$p < .05$.

4 | DISCUSSION

Our study evaluated the effects of an outpatient, multimodal protocol that included ultrasound-guided trigger point injections, peripheral nerve blocks of the pudendal nerve and the posterior femoral cutaneous nerve, and pelvic floor physical therapy. The protocol addresses the underlying myofascial pain and neuropathic pain seen in CPPS patients.[2] As shown in Figure 4, 186 female patients diagnosed with CPPS showed an average decrease of 2.14 and 3.38 for their VAS and FPPS scores, respectively. Considering the complexity of the pelvis and interrelated organ system dysfunctions, timely diagnosis and appropriate treatments are rare in this patient population.[4] Patients in this study have experienced an average duration of pain for 6.37 ± 6.78 years. Since the pain is chronic and not acute, improvements of even 2.14 and 3.38 points give patients significant relief.

It is important to note that the 186 participants previously completed the traditionally recommended treatment of pelvic floor physical therapy[2] without seeing improvements in their pain and pelvic functionality. Once it was combined with other modalities creating a comprehensive treatment protocol, these patients experienced alleviations in the pain and function.

Myofascial dysfunction seen in the pelvis is correlated to bowel, bladder, and sexual dysfunction and it creates pelvic pain from myofascial trigger points.[6] These trigger points are palpable rigid bands of muscle with an uninhibited response to stimuli that act as a supply of constant nociception. Thus, treating the underlying myofascial pain and pelvic floor dysfunction with ultrasound-guided trigger point injections to each muscle of the levator ani sling will remove the source of ongoing nociception as well as create space for the pelvic peripheral nerves to flow with less intrusion and increased blood flow.[12]

The neuropathic features of pelvic pain include central sensitization, peripheral sensitization, and cross-sensitization. These are all addressed by our outpatient

protocol. Central sensitization refers to membrane excitability and an exaggerated response to benign/nociceptive stimuli. This arises from neural plasticity within the central nervous system because of continued contact to neurogenic inflammation or a neural insult.[3] Therefore, we address central sensitization by treating the peripheral sensitization and its associated concomitant neurogenic inflammation, inhibiting the feedback loop from the peripheral nervous system to the central nervous system. This is accomplished with serial peripheral nerve blocks along the two major sensory peripheral nerves of the pelvis, the pudendal and posterior femoral cutaneous nerves. Conceptually, we are (1) decreasing neurogenic inflammation by placing dexamethasone locally to deplete substance P[13] and with repetitive exposure to lidocaine 1% which has been shown to decrease the mast cell release of histamine (2) desensitizing hyperactive peripheral nociceptors with repetitive exposure to lidocaine 1%.[14]

The proximity and considerable overlap in pain patterns and innervation between the pudendal and posterior femoral cutaneous nerves[15] leads to cross-sensitization. This phenomenon is known to occur in the pelvis where a sensitized structure can upregulate an adjacent, normal structure.[16] Consequently, we treat both peripheral pelvic nerves simultaneously to inhibit cross-sensitization from occurring.

Productivity loss characterized by absenteeism and presenteeism is a significant disadvantage for CPPS patients. A study analyzing 5879 women diagnosed with endometriosis showed a positive correlation between severity of symptoms experienced and hours of employment productivity lost. A weekly loss of 1.9 h for mild severity of symptoms was recorded compared with a loss of 15.8 h of employment for severe symptoms.[17] This suggests a decrease in the severity of symptoms would decrease hours of productivity lost. Thus, the clinical relevance of the improvement in FPPS category of work refers to the reduced pain levels that will allow patients to work with decrease productivity loss. This, however, needs to be studied in the future using validated questionnaires such as PROMIS-29[18] where measurements of "Fatigue," "Physical Function," and "Pain Interference" would provide deeper clinical insight.

Pain before, during, and after intercourse in women is known as Dyspareunia and can be categorized as superficial or deep, and primary or secondary. Fifty percent of women with endometriosis suffer from deep dyspareunia[19] and since 30% of our patient population had a pathology confirmed endometriosis diagnosis, dyspareunia is a common symptom among our patient population. A study of 309 women uncovered higher prevalence of deep dyspareunia in women with endometriosis independent of lesion location, showing the potential connection to the secondary sensitization and myofascial pain seen in endometriosis.[8,19] When women with endometriosis with lesions were compared with those without lesions and the control group, higher pain scores, a decreased frequency of intercourse, and less fulfillment after intercourse was observed.[19] Moreover, a study on 411 women with confirmed endometriosis noted that dyspareunia's severity was related to underlying painful bladder syndrome and pelvic floor tenderness/myofascial pain.[20] This concept aligns with ours in that the study suggested the importance of not only treating the underlying endometriosis but also addressing the underlying myofascial pain and neuropathic pain seen in endometriosis patients.[8] This myofascial dysfunction and sensitization experienced by patients is maintained by the hypertonic pelvic floor[6] suggesting the importance of releasing the tight muscles and downregulating the pelvic floor nerves for patients to start feeling better. To gather clinical significance of our results, a future consideration involves the use of the Female Sexual Function Index (FSFI). Additionally, it would allow focused analysis on our patients with endometriosis that have dyspareunia.

The improved sleep functionality is related to both the decrease in pain symptoms and the statistically significant decrease in symptoms noted in the bladder category resulting in minimal nocturia. Dysfunctional voiding due to the hypertonic pelvic floor is avoided since the bladder neck no longer sits on the spastic pelvic floor. This keeps urinary urgency and frequency controlled and allows our patients uninterrupted sleep. Although the improvement is statistically significance, to measure clinical significance a future consideration is to include the PROMIS-29,[18] where improvements in the "Sleep Disturbance" category would validate patient's sleep quality and associated improvements or deteriorations.

Our patients observed an improvement in the categories of walking, running, and lifting which refers to the functionality of exercising. Traditionally, physical activity is a vital component of the rehabilitation process of patients enduring an array of chronic pain disorders.[21] Therefore, allowing our patients to return to exercise is a vital aspect in the rehabilitation of their pelvis because within the pelvis is traditionally observed in elite athletes. A study which focused on the prevention of CPPS investigated the relationship between physical activity and the occurrence of pelvic pain and noted an inverse association between the two variables.[22] Therefore, allowing our patients to return to exercise will facilitate rehabilitation of their pelvis as a strong, coordinated pelvic floor arranged at an optimum level will not only improve organ and musculoskeletal support it may also help to prevent pelvic pain symptoms.

A limitation of our study is the retrospective nature which does not allow for randomized control groups. To maintain our patients' trust and ethics, we cannot assess the effectiveness of our protocol against placebo control groups as we would intentionally not be treating control group CPPS patients who are also seeking relief from their pain.

Although our results are statistically significant, they do not represent clinical significance since the FPPS is under-researched and not adequately validated.[23] Additionally, the reliability of the one-dimensional VAS pain scale needs to be confirmed as there currently is not a universally agreed on minimum clinically important difference in chronic pain.[24] A systematic review investigating the use of placebo compared with invasive procedures for chronic pain concluded a higher improvement for placebo over actual treatments.[25] The fact our results are statistically significant suggests our patients do see an improvement. However, to gauge the clinical impact of our results, we aim to add the following questionnaires: PROMIS-29, FSFI, and Absenteeism. This would help quantify our patients quality of life improvements, sexual frequency/satisfaction increases, and decreased work hours missed due to pain. The addition of these questionnaires would also help support/deny any findings from the FPPS which may be skewed. As the FPPS measures pelvic functionality in eight categories ranging between 0 and 4, patients are represented by a score of 32. The baseline of our patient population is 11.26 (*SD* 6.51; $p < .05$, 95% CI = 10.32–12.19) which may imply low dysfunction. However, this is because some patients present with pain in only one organ system such as the bladder: scoring it a 4 and everything else a 0 which could skew our data.

Additionally, our follow-ups are at 3 months after receiving treatment which reflects short-term outcomes. To maintain the progress made, patients are given a neuromuscular re-education home program guided by their physical therapist. They are educated on self-efficacy and pain management techniques such stretching, diaphragmatic breathing, taking a warm bath, or using a muscle relaxant for occasional flare-ups.

5 | CONCLUSION

To conclude, our study reported statistically significant results for our comprehensive, outpatient, neuromuscular protocol in women aged 17–76 with a diagnosis of CPPS. The progress noted in the functional categories of working, intercourse, and sleep were promising. Clinical significance of these results needs to be further studied.

ACKNOWLEDGMENTS

The study was performed at Pelvic Rehabilitation Medicine, Atlanta, Chicago, Dallas, Houston, Miami, New York City, New Jersey, Michigan, and Washington DC. There is no funding to report.

CONFLICT OF INTERESTS

The authors declare that there are no conflict of interests.

AUTHOR CONTRIBUTIONS

Substantial contributions to conception and design: All authors (Soha Patil; Gabrielle Daniel; Rakhi Vyas; Yogita Tailor; Melanie Howell; Tayyaba Ahmed; Christian Reutter; and 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: Allyson Shrikhande and Soha Patil.

PATIENT CONSENT

Due to the study's nature (retrospective), individual consent was waived.

CLINICAL TRIAL

Our study does not have a clinical trial number.

ETHICS OF APPROVAL

The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. The study was approved by The Feinstein Institutes for Medical Research, IRB# 17-0761.

DATA AVAILABILITY STATEMENT

Data are not available.

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