JOMH
Journal of Men's Health

J. Mens. Health **2022**; 18(2): 050
http://doi.org/10.31083/j.jomh1802050

Original Research

Urological Chronic Pelvic Pain Syndrome improves when underlying neuromuscular dysfunction is addressed in an outpatient, multimodal treatment protocol

Soha Patil[1,2,*], Gabrielle Daniel[1,2], Julia Gonzalez Engle[1,2], Janaki Natarajan[1,2], Yogita Tailor[1,2], Rakhi Vyas[1,2], Neha James[1,2], Erika Moody[1,2], Allyson Shrikhande[1,2]

[1]Department of Physical Medicine and Rehabilitation, Pelvic Rehabilitation Medicine Clinical Research Foundation, West Palm Beach, FL 33409, USA
[2]Department of Physical Medicine and Rehabilitation, Feinstein Institute for Medical Research, Manhasset, NY 11030, USA
*Correspondence: spatil@prmrf.com (Soha Patil)
Submitted: 27 September 2021 Accepted: 8 November 2021 Published: 10 February 2022

Abstract

Background: Urological chronic pelvic pain syndrome (UCPPS) combines two of the most widespread chronic urological pain disorders: interstitial cystitis (IC)/bladder pain syndrome (BPS) and chronic prostatitis (CP)/chronic pelvic pain syndrome (CPPS). This manuscript aims to assess the effectiveness of an outpatient, multimodal treatment protocol for men with UCPPS. **Methods**: A retrospective study of 58 male patients was done on an institutional review board approved protocol consisting of pelvic floor physical therapy (PFPT) in concomitance with the pelvic floor muscles receiving ultrasound guided trigger point injections and peripheral nerve blocks weekly for six weeks. Patients rated their levels of pelvic pain, performance, and quality of life via Visual Analogue Scale (VAS), Functional Pelvic Pain Scale (FPPS), and NIH-Chronic Prostatitis Symptom Index (NIH-CPSI) at their new patient consult and 3-month follow up. **Results**: Initial average VAS was 6.24 $\pm$ 2.26 and average VAS after treatment reduced to 4.25 $\pm$ 2.8. Initial average FPPS score was 9.21 $\pm$ 5.24. Final average FPPS reduced to 7.28 $\pm$ 5.03. Initial average total NIH-CPSI score was 24.55 $\pm$ 6.43 and after treatment reduced to 18.36 $\pm$ 7.62. Initial average NIH-CPSI pain, urinary symptoms, and quality of life sub scores were 11.28 $\pm$ 3.46, 3.41 $\pm$ 3.31, and 9.86 $\pm$ 2.05, respectively. After treatment, they decreased to 8.34 $\pm$ 4.14, 2.47 $\pm$ 2.45, and 7.55 $\pm$ 2.74. Differences in pre and post treatment outcomes were statistically significant. **Conclusions**: This shows the protocol was successful at improving pain and performance in male UCPPS patients. This supports the validity of a multimodal treatment protocol given patients failed to improve after a full course of PFPT by itself. However, they improved once PFPT was combined with other treatment modalities, alleviating the underlying neuropathic and myofascial pain seen in UCPPS.

Keywords: Chronic pelvic pain syndrome; Chronic prostatitis; Pelvic floor muscle dysfunction; Male pelvic pain; Multimodal therapy; Psychometrics; Questionnaire

1. Introduction

Urological chronic pelvic pain syndrome (UCPPS) combines two of the most widespread chronic urological pain disorders: interstitial cystitis (IC)/bladder pain syndrome (BPS) and chronic prostatitis (CP)/chronic pelvic pain syndrome (CPPS). This disorder is exemplified by chronic pain in the pelvic region, accompanied by urinary frequency and urgency. In men, pain in the perineum, testicles, penis, and/or suprapubic area is common [1]. UCPPS detrimentally affects 2%–16% of men worldwide and is responsible for 90% of prostatitis related outpatient visits [2].

UCPPS is among the most challenging conditions in urologic practice given the uncertain etiology, significant subjective criteria, and exclusion-based diagnosis. Furthermore, patients presenting with UCPPS do not only present with symptoms of IC/BPS and CP but also urethral pain syndromes, pudendal nerve (and other regional nerve) entrapment, pelvic floor pain, irritable bowel syndrome (IBS), and pain syndromes of the external genitalia [3]. A proposed etiology of the symptoms of UCPPS is a pluricausal, composite mechanism of an original stimulus such as a pelvic and/or perineal trauma, infection, reflux of a toxic/immunogenic urine material, and/or psychological stress triggering a cascade of events in anatomically/genetically sensitive men causing a local reaction of inflammation and/or neurogenic damage [4]. In addition, upregulation of the central nervous system leading to neuroplasticity and central sensitization have been noted as contributing factors in the underlying etiology of UCPPS [5,6].

Present pharmacological treatment options in UCPPS are experimental with often inadequate clinical outcomes. These pharmacological modalities include antibiotics, alpha blockers, and anti-inflammatories. Neurologic treatments consist of neuropathic pain drugs such as amitriptyline, gabapentin, and pregabalin. Opioids are not first line treatment for UCPPS [2]. Nonpharmacological treatments options consist of acupuncture, lifestyle changes, prostatic massage, shockwave therapy, pelvic floor physical therapy (PFPT), and trigger point release [7,8]. PFPT consists of acupressure, nerve gliding, biofeedback, muscle energy,

muscle control exercises, manual therapy, and mobilization techniques to alleviate pelvic floor tenderness/myalgia, increasingly noted in male UCPPS patients [9]. Evidence suggests PFPT for pelvic floor muscle hypertonia corrects local arterial blood flow, improving UCPPS symptoms and pelvic floor pain in men [10]. Although there is no gold-standard algorithm, a multimodal treatment approach can be developed for symptom relief [8]. The recently improved UPOINT (urinary (U), psychosocial (P), organ-specific (O), infection (I), neurologic/systemic (N) and tenderness of pelvic floor skeletal muscles (T)) system for example, encompasses the following domains: "urinary, psycho-social, organ specific, infection, neurological, muscle tension and tenderness, and sexuality" to separate patients and recommend relevant therapeutic treatments [11].

This study aims to demonstrate the effects of a multimodal, neuromuscular treatment protocol created to heal neuropathic pain and myofascial dysfunction experienced by UCPPS patients. The effects of our protocol have been studied for 200 males and female CPP patients [12] and the current study places an emphasis on men with UCPPS while additionally recording their quality-of-life improvements by adding the NIH-CPSI questionnaire.

2. Methods

2.1 Participants

58 male patients (aged 20 to 74) with a diagnosis of UCPPS who approached an outpatient pelvic rehabilitation private practice between September 2020 and May 2021 were participants of this study. Demographics and related comorbidities of the 58 patients are presented in Table 1, Figs. 1 and 2 record the past medications used and surgeries undergone by the patient pool. One of eleven physiatrists performed pretreatment evaluations consisting of detailed history and physical examination, which included an internal pelvic floor examination.

The complete physical examination involved a lumbosacral exam which evaluates for lumbar pain, coccydynia, and joint pathology. Hip and pelvic girdle pain generators are discovered by a bilateral hip exam. Trigger points in the external obliques and rectus abdominus and allodynia or hyperalgesia along the ilioinguinal, iliohypogastric, and the genital branch of the genitofemoral nerves are confirmed by the abdominal exam. Global pelvic floor hypertonicity and myofascial trigger points (MTrP) are assessed with the internal pelvic floor examination where superficial and deep pelvic floor muscles are palpated to evoke tenderness. MTrPs are tender, palpable taut bands in a muscle that occasionally have referred pain patterns and a twitch response [13].

Table 1. Demographics, pain duration, and comorbidities for 58 UCPPS patients.

Demographics and clinical characteristics	
Participants (n)	58
Age (mean ± SD)	41.02 ± 13.96
Minimum age	20
Maximum age	74
Average duration of pain in years (mean ± SD)	5.92 ± 7.54
Minimum average duration of pain (y)	0.5
Maximum average duration of pain (y)	38
Comorbidities	
Depression/anxiety	35
Straining	28
Urinary urgency/frequency	34
Hernia	14
Weightlifting/high intensity exercise	22
Migraines	7
Hypermobility	4
Temporomandibular joint (TMJ) dysfunction	10
Hip pathology	7
Lumbar spine pathology	20

2.1.1 Inclusion criteria

(1) History of UCPPS of longer than 6 months.
(2) NIH-CPSI score of more than 9.
(3) Completion of a minimum of 6 weeks of PFPT.
(4) Extensive urologic consultation with workup described:
(a) Urinalysis
(b) Prostate ultrasound
(c) Midstream culture
(d) 2-glass prostate test
(5) Presence of the following during physical examination:
(a) Allodynia along the pudendal nerve and its branches and along the posterior femoral cutaneous nerve
(b) MTrPs
(c) Pelvic floor dysfunction
(6) Participation in full treatment protocol.

2.1.2 Exclusion criteria

(1) Not concurrently attending PFPT.
(2) Pudendal Nerve Entrapment (PNE) with scar tissue on MR Neurography.
(3) Indwelling catheter.
(4) Ureterostomy.
(5) Diagnosis of benign prostatic hyperplasia.
(6) Persistent opioid use.
(7) Malignancy.
(8) Active infection.
(9) Incomplete VAS, FPPS, or NIH-CPSI Questionnaires.

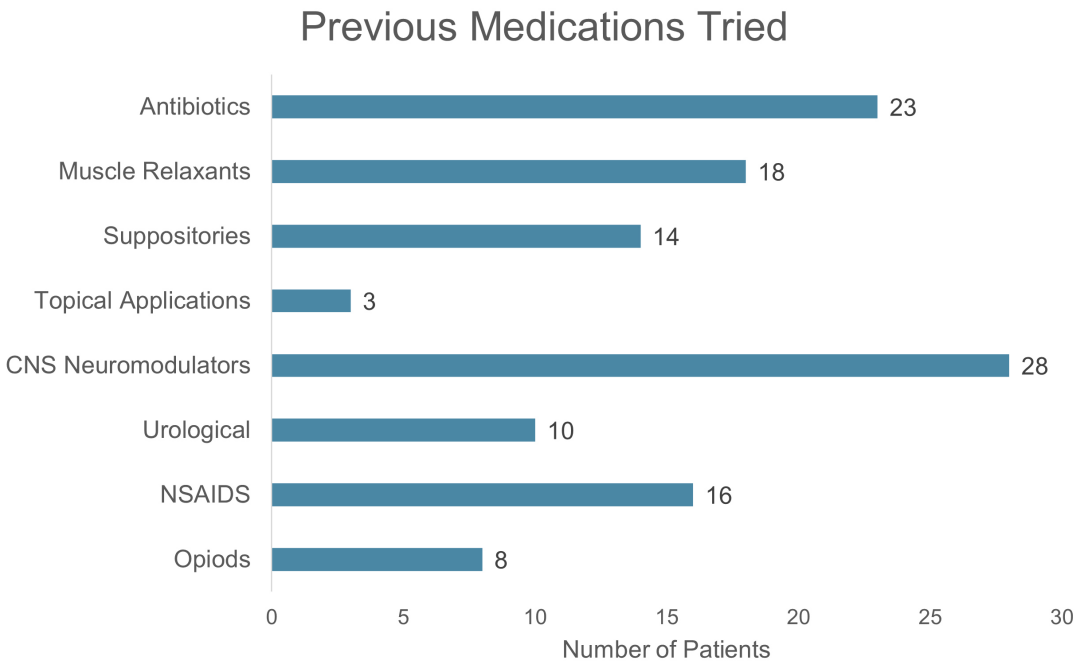

Fig. 1. Previous medications tried before presenting to Pelvic Rehabilitation Medicine for new patient consult.

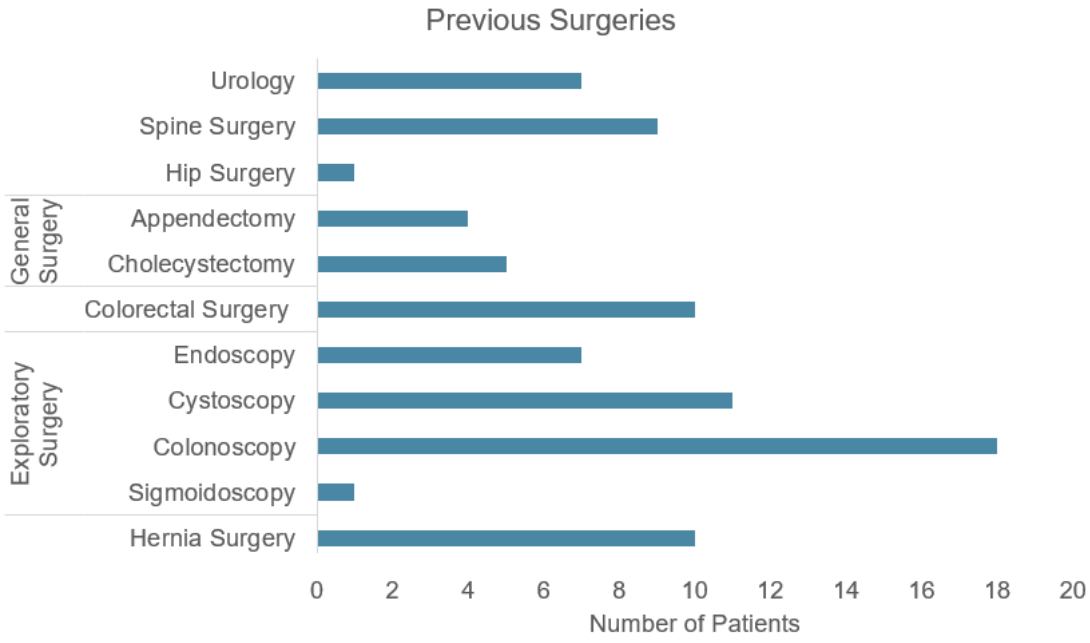

Fig. 2. Previous surgeries underwent before presenting to Pelvic Rehabilitation Medicine for new patient consult.

2.2 Procedures

A retrospective chart review based on an institutional review board (IRB) approved (IRB# 17-0761) protocol. There is no clinical trial number due to retrospective study design. This was created for patients with UCPPS who failed to improve after six weeks of PFPT. The protocol includes external ultrasound-guided trigger point injections using 1cc of Lidocaine (2102079, Pfizer (Lake Forest, IL, USA) targeting the pelvic floor musculature, peripheral nerve blocks, and continuation of PFPT.

Once weekly for six weeks, a global injection to the iliococcygeus, pubococcygeus, and puborectalis was administered unilaterally [14]. With the patient lying in prone position, the targeted muscle from the subgluteal posterior approach, (using an aseptic technique under ultrasound guidance) was injected by a flexible, 6-inch, 27-guage needle.

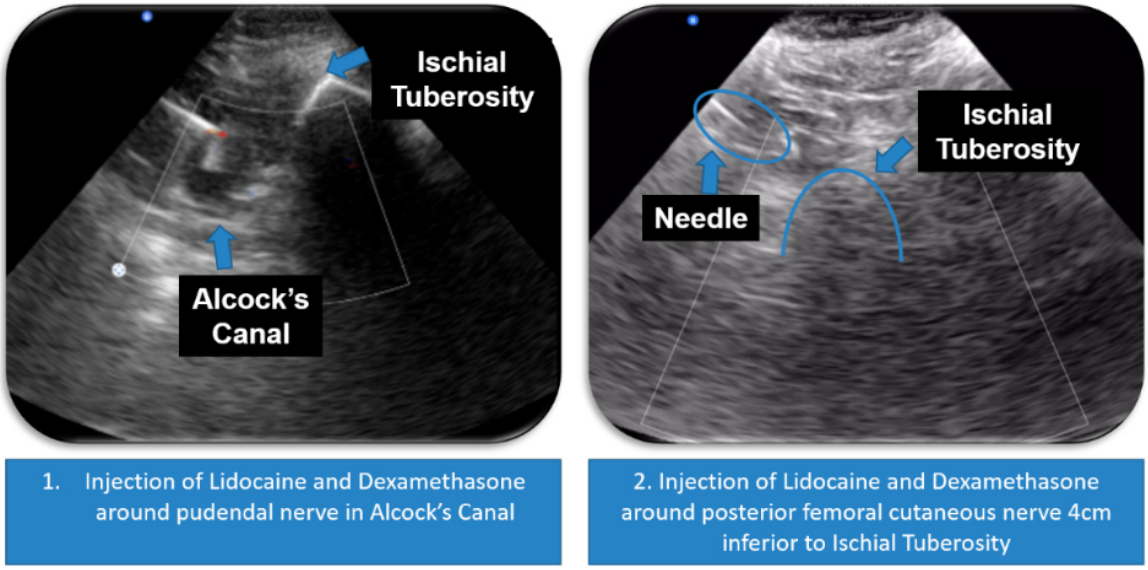

Fig. 3. Ultrasound images of Alcock's canal and obturator canal. (1) Injection of Lidocaine and dexamethasone around pudendal nerve in Alcock's canal. (2) Injection of Lidocaine and dexamethasone around posterior femoral cutaneous nerve 4 cm inferior to ischial tuberosity.

On ultrasound, MTrPs appear as focal, hypoechoic regions with reduced vibration amplitude on vibration sonoelastography (Fig. 3). [13] Ultrasound-guided, peripheral nerve blocks of the pudendal nerve at Alcock's canal are also administered. Then, in supine position ultrasound-guided peripheral nerve blocks of the posterior femoral cutaneous nerve at obturator canal were administered. This occurred at every visit, alternating right and left each time. At the initial treatment, 2 mL of dexamethasone (081058, Fresenius Kabi, LLC (Lake Zurich, IL, USA) with 7 mL of 1% Lidocaine was placed around each nerve, on each side. At following treatment appointments normal saline was used in lieu of dexamethasone for peripheral nerve blocks. Regardless of the laterality of pain, this is an attempt to reduce peripheral neurogenic inflammation and attenuation of central sensitization. For these six weeks' patients attended PFPT at facilities of their choosing. These sessions were attended within 7 days after each injection, and they were one-on-one sessions for 1 hour with a physical therapist. The guiding principle behind referring patients to PFPT in conjunction with the injections is concomitant release of hypertonic pelvic floor musculature, subsequent release of myofascial ischemia around pelvic peripheral nerves in combination with "down training" of the central nervous system. PFPT comprised of diaphragmatic breathing, visceral mobilization, internal release of the hypertonic pelvic floor muscles, skin rolling along the lower abdomen and buttocks, scar tissue mobilization, and nerve gliding along the pudendal and posterior femoral cutaneous nerves [12].

The protocol was tolerated by all patients as it utilized a 27-gauge needle with topical anesthetic spray prior to the treatment. Patients were also premedicated with diclofenac 75 mg P.O. Patients returned to work the same day after sitting on ice for 10 minutes.

2.3 Outcome measures

Patients rated their treatment outcomes on three self-assessment scales: Visual Analogue Scale (VAS), Functional Pelvic Pain Scale (FPPS), and NIH-Chronic Prostatitis Symptom Index (NIH-CPSI). These responses were taken at their new patient consult and 3-month follow up. Experimenter bias was limited by maintaining identical follow up questions for all patients.

VAS: 0 to 10 scale quantifies average pain intensity throughout the last 24 hours where 0 signifies no pain and 10 is worst pain imaginable.

FPPS: Pelvic performance is gauged via eight categories: sleeping, bowel, intercourse, walking, bladder, running, working, lifting. Each category is rated from 0 to 4, where 0 is normal function and 4 is severe debilitation. Every patient has a total pelvic performance score of 0 to 32.

NIH-CPSI: Total score of 0 to 43 is divided into three symptom fields:

- Pain (location, occurrence, and intensity; 0–21 score)
- Urinary Symptoms (voiding frequency and disruptive symptoms; 0–10 score)
- Quality of Life Impact (negative quality of life experiences; 0–12 score)

2.4 Statistical analyses

The statistical significance between VAS, total FPPS, FPPS categories, total NIH-CPSI, and NIH-CPSI subscores of participants' new patient consults and 3-month follow

ups was established using the paired two sample *t*-test. Average values of these outcome measures were compared to determine if there was a statistically significant difference after the treatment protocol. Null hypothesis states that the two averages of pre and post treatment scores are equal and there is no improvement. A one-tailed *p* value of less than 0.05 represents statistical significance and rejects the null hypothesis in one direction. If the average decreases and the *p* value is less than 0.05, a statistical significance in that direction is confirmed (i.e., reject the null hypothesis because there is an improvement in pain and pelvic performance). Descriptive Statistics data are presented as mean ± standard deviation with a 95% confidence interval. All analyses were conducted using SPSS software version 26 (IBM, Chicago, IL, USA).

3. Results

The average VAS score before treatment was 6.44 ± 2.26 (CI = 5.66 to 6.82). A statistically significant decrease to 4.25 ± 2.84 (CI = 3.52 to 4.98) was seen after treatment. The average total FPPS before and after treatment was 9.21 ± 5.24 (CI = 7.86 to 10.56) and 7.28 ± 5.03 (CI = 6.94 to 7.62) respectively. Sleeping, bowel, and intercourse accounted for the most statistically substantial performance improvements. Average score was 1.12 ± 1.06 (CI = 0.85 to 1.39) before treatment and 0.66 ± 0.78 (CI = 0.45 + 0.86) after treatment for sleeping. For bowel, average score before treatment was 1.10 ± 1.22 (CI = 0.79 to 1.42) which decreased to 0.72 ± 0.95 (CI 0.48 to 0.97) after treatment. With intercourse, average score before treatment was 1.31 ± 1.27 (CI = 0.98 to 1.64) and after treatment reduced to 0.93 ± 1.32 (CI = 0.59 to 1.27) (Fig. 4). The average total NIH-CPSI score was 24.55 ± 6.43 (CI = 22.90 to 26.21) and after treatment reduced to 18.36 ± 7.62 (CI = 16.40 to 20.32). Average of NIH-CPSI pain, urinary symptoms, and quality of life subscores before treatment were 11.28 ± 3.46 (CI = 10.38 to 12.17), 3.41 ± 3.31 (CI = 2.56 to 4.27), and 9.86 ± 2.05 (CI 9.34 to 10.39), respectively. After treatment, the averages dropped to 8.34 ± 4.14 (CI 7.28 to 9.41), 2.47 ± 2.45 (CI 1.83 to 3.10), and 7.55 ± 2.74 (CI 6.85 to 8.26), respectively. Table 2 illustrates these results. Post hoc power analysis was conducted which showed 0.90 for VAS, 0.89 for total FPPS, and 0.93 for total NIH-CPSI suggesting the t tests had enough power. However, post-hoc power analysis is only indicative.

4. Discussion

58 male patients underwent the outpatient, comprehensive treatment protocol of ultrasound-guided trigger point injections and peripheral nerve blocks to the pelvic floor muscles in combination with Pelvic Floor Physical Therapy. The statistically significant decrease of VAS, FPPS, and NIH-CPSI scores by 2.19, 1.93, and 6.19 points respectively provides evidence for the efficacy of our protocol. This protocol takes a multimodal approach toward the treatment of UCPPS; combining outpatient treatment modalities aimed at alleviating the underlying neurogenic and myofascial pain seen in this patient population [2,15].

Neurogenic pain from peripheral, central, and cross sensitization is addressed by reversing the incorrect peripheral nerve firing patterns, central pain perception and ultimately returning the nervous system to a non-sensitized state. Peripheral sensitization is treated by (1) alleviating neural ischemia [16]; (2) using dexamethasone to diminish Substance P [17]; (3) repetitive exposure of Lidocaine to the peripheral pelvic nerves which depletes the mast cell discharge of the pro-inflammatory mediator histamine [18]. Central sensitization is treated by downregulating the peripheral nervous system's feedback loop to the central nervous system [6,19]. Cross sensitization, which refers to a hyperexcited or sensitized structure upregulating a "non-sensitized" structure [5], is treated with concomitantly blocking the posterior femoral cutaneous nerve and pudendal nerve on the ipsilateral side.

Myofascial pain seen in UCPPS patients [15] encompasses underlying myofascial trigger points (MTrPs) which when present, emit signals to the nervous system which extend the chronic pain cycle. In addition, treating this myofascial compression of the nerves reverses the neural ischemia that contributes to neurogenic inflammation [16]. Using ultrasound-guided trigger point injections to the pelvic floor musculature resets the hypertonic behavior allowing patients to release the contracted levator muscles and re-establish normal motion ranges for establishing necessary strength and support of the pelvic structures.

Patients with UCPPS can present with anorectal pain, chronic prostatitis symptoms, and bladder pain syndrome/interstitial cystitis. These functional disorders are characterized by symptoms such as pain and/or straining with bowel movements, urinary frequency/urgency, and pain during/after sexual climax [20]. These symptoms are common in our patient pool demonstrated in the fact that urinary frequency/urgency was experienced by 59% (34/58) of patients; pain and/or straining with bowel movements in 48% (28/58); and pain during/after sexual climax affected 36% (21/58) of patients. The improvement seen in our patients' bowel FPPS category is explained by (1) the ultrasound-guided trigger point injections which reduce pain from MTrPs by restoring the pelvic floor musculature of invoked tenderness, supporting the release of contracted pelvic floor muscles to reestablish strength and normal function; and (2) decreasing the neurogenic inflammation around the pudendal nerve which is involved in pain with bowel movements [21,22]. Thereby, improving bowel movement mechanical flow and reducing pain with bowel movements. The improvement seen in our patient's bladder FPPS category is secondary to (1) a non-hypertonic pelvic floor now supporting the bladder neck and (2) downregulated peripheral pelvic nerves innervating the bladder which prevents dysfunctional voiding and hypersensitive periph-

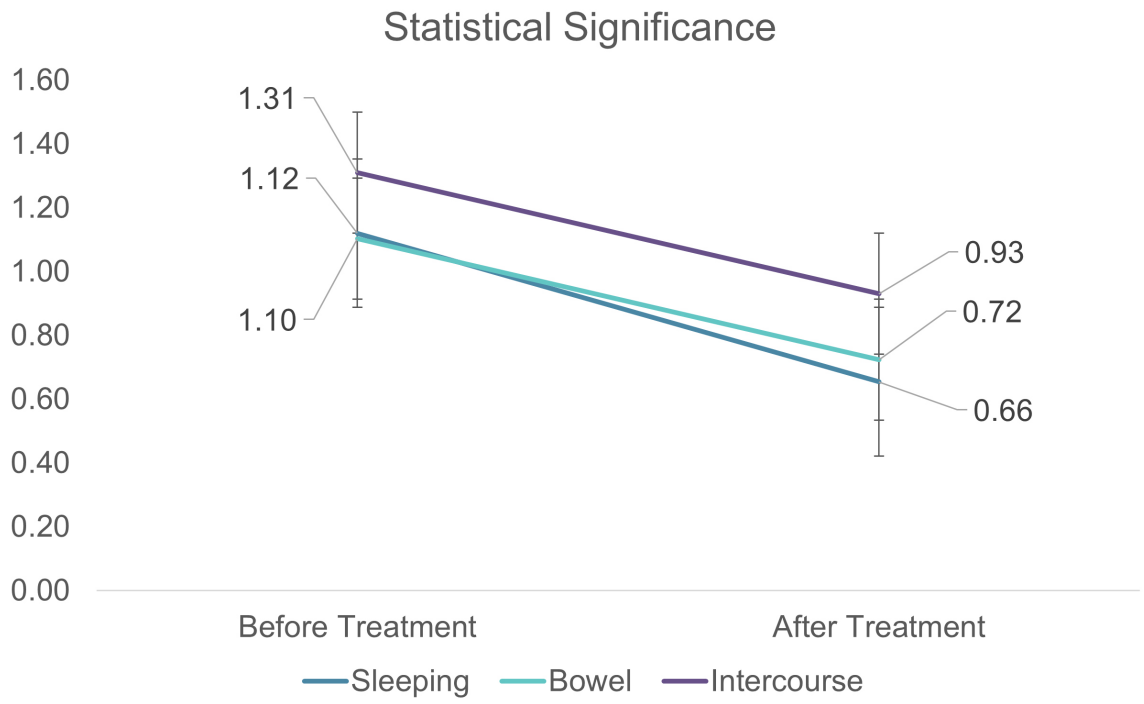

Fig. 4. Average VAS, FPPS, and NIH-CPSI before and after treatment. "Before" refers to new patient consult and "After" refers to 3 month follow up.

Table 2. Results table.

	Before treatment	Standard deviation	After treatment	Standard deviation	*p*-value
VAS	6.24	2.26	4.25	2.84	<0.05
FPPS (total)	9.21	5.24	7.28	5.03	<0.05
Sleeping	1.12	1.06	0.66	0.78	<0.05
Bowel	1.10	1.22	0.72	0.95	<0.05
Intercourse	1.31	1.27	0.93	1.32	<0.05
Walking	0.95	0.94	0.74	0.85	<0.05
Bladder	1.10	1.18	0.84	0.93	<0.05
Running	1.02	1.30	0.81	1.25	0.11
Working	1.71	1.08	1.60	1.02	0.23
Lifting	0.90	1.18	0.97	1.09	0.30
NIH-CPS (total)	24.55	6.43	18.36	7.62	<0.05
Pain subscore	11.28	3.46	8.34	4.14	<0.05
Urinary subscore	3.41	3.31	2.47	2.45	<0.05
QOL subscore	9.86	2.05	7.55	2.74	<0.05

*$p < 0.05$.

eral nociceptor firing induced urinary frequency/urgency [23,24]. This improvement in pain and function permits a restorative sleep, explaining the improvement in the sleep category.

Sexual dysfunction is common in patients with UCPPS [25]. Our patients showed statistically significant improvements in the intercourse FPPS category which demonstrates the treatment protocol's effectiveness in having patients return to functional and pain-free intercourse when the pelvic floor musculature and the peripheral pelvic nerves undergo rehabilitation.

The inclusion of the NIH-CPSI questionnaire is common in studies of such conditions. It allowed us to get specific insights into the improvements within pain, urinary symptoms, and quality of life which our previous studies were not able to [12]. The highest improvements were seen in pain, then quality of life, and finally urinary symptoms. Decreasing the peripheral neurogenic inflammation helps

decrease pain. However, with a continued neuro-muscular re-education home program the urinary symptoms will continue to improve once the pain has subsided [26]. Our results point toward the importance of a multimodal protocol that decreases pain, improves functionality, and improves quality of life.

The FPPS categories of running and lifting did not show statistically significant improvements, and this is due to the short follow up time of 3 months. 3 months is a short period of time to see improvements in such high intensity activities because the muscles and nerves are still being down trained from their spastic state. At their 3-month follow up, their muscles and nerves become ready to begin a neuromuscular re-education so our patients are asked to start a neuromuscular re-education home program with the guidance of their physician for the next 3 months so response can be measured at 6 months. Patients are also informed on self-awareness and using methods such as stretching, taking a warm bath/muscle relaxant suppository, and diaphragmatic breathing. Thus, we expect to see more clinically significant improvements in running and lifting after 6 months and aim to include these results in our future studies.

Another limitation of our study is the retrospective design which prevents randomized controlled trials. The effects of our treatment protocol can only be studied via a non-comparative single cohort. While this is a limitation, it is a necessary measure taken to maintain the ethics and trust of our patients who are pursuing relief from their long-lasting pain. The use of a placebo control group would infringe trust of our patients as we would purposely not be treating control group patients who also need relief. Additionally, although our results are statistically significant, and the addition of NIH-CPSI questionnaire shows the clinical significance of our results, a future consideration is to include another validated questionnaire: PROMIS-29. This would allow us to further validate the quality-of-life improvements which the NIH-CPSI score indicates.

5. Conclusions

Our study demonstrated that UCPPS improves when the underlying neurogenic and myofascial pain is treated. The treatment protocol was effective for men aged 20 to 74 diagnosed with UCPPS. Quality of life improvements and pelvis performance improvements seen in sleep, bowel, and intercourse were especially encouraging. This study favors the use of multimodal treatment modalities for treating conditions such as UCPPS and its related pan disorders: interstitial cystitis/bladder pain syndrome and chronic prostatitis/chronic pelvic pain syndrome since patients showed improvements once PFPT was combined with other treatment modalities.

Abbreviations

UCPPS, Urological chronic pelvic pain syndrome; IC, interstitial cystitis; BPS, bladder pain syndrome; CP, chronic prostatitis; CPPS, chronic pelvic pain syndrome; IBS, irritable bowel syndrome.

Author contributions

GD, JN, YT, RV, NJ, EM, and AS designed the research study and performed the research. SP and JE analyzed the data. SP and JE wrote the manuscript. All authors contributed to editorial changes in the manuscript. All authors read and approved the final manuscript.

Ethics approval and consent to participate

The protocol for this research project has been approved by a suitably constituted Ethics Committee of the institution and it conforms to the provisions of the Declaration of Helsinki. Committee of The Feinstein Institutes for Medical Research, Approval No. IRB# 17-0761. Our study does not have a clinical trial number and consent forms were waived due to study design.

Acknowledgment

The study was performed at Pelvic Rehabilitation Medicine, Atlanta, Chicago, Dallas, Houston, Miami, New York City, New Jersey, Michigan, and Washington DC. Patient data was gathered from these clinics.

Funding

This research received no external funding.

Conflict of interest

The authors declare no conflict of interest.

References

[1] Clemens JQ, Mullins C, Ackerman AL, Bavendam T, van Bokhoven A, Ellingson BM, *et al*. Urologic chronic pelvic pain syndrome: insights from the MAPP Research Network. Nature Reviews Urology. 2019; 16: 187–200.

[2] Smith C. Male chronic pelvic pain: an update. Indian Journal of Urology. 2016; 32: 34.

[3] Nickel J C, Tripp D, Gordon A, *et al*. Update on urologic pelvic pain syndromes: highlights from the 2010 international chronic pelvic pain symposium and workshop, august 29, 2010, kingston, ontario, Canada. Reviews in urology. 2011, 13: 39–49.

[4] Nickel JC, Alexander RB, Anderson R, Berger R, Comiter CV, Datta NS, *et al*. Category III chronic prostatitis/chronic pelvic pain syndrome: insights from the National Institutes of Health Chronic Prostatitis Collaborative Research Network studies. Current Urology Reports. 2009; 9: 320–327.

[5] Malykhina AP. Neural mechanisms of pelvic organ cross-sensitization. Neuroscience. 2008; 149: 660–672.

[6] Woolf CJ. Central sensitization: Implications for the diagnosis and treatment of pain. Pain. 2011; 152: S2–S15.

[7] Franco JV, Turk T, Jung JH, *et al*. Non-pharmacological interventions for treating chronic prostatitis/chronic pelvic pain syndrome. Cochrane systematic review. 2019;124: 197–208.

[8] Shrikhande A, Ullger C, Seko K, Patil S, Natarajan J, Tailor Y, *et al*. A physiatrist's understanding and application of the current literature on chronic pelvic pain: a narrative review. PAIN Reports. 2021; 6: e949.
[9] Yang CC, Miller JL, Omidpanah A, Krieger JN. Physical Examination for Men and Women with Urologic Chronic Pelvic Pain Syndrome: a MAPP (Multidisciplinary Approach to the Study of Chronic Pelvic Pain) Network Study. Urology. 2018; 116: 23–29.
[10] Shoskes DA, Prots D, Karns J, Horhn J, Shoskes AC. Greater endothelial dysfunction and arterial stiffness in men with chronic prostatitis/chronic pelvic pain syndrome–a possible link to cardiovascular disease. The Journal of Urology. 2011; 186: 907–910.
[11] Magri V, Boltri M, Cai T, Colombo R, Cuzzocrea S, De Visschere P, *et al*. Multidisciplinary approach to prostatitis. Archivio Italiano di Urologia e Andrologia. 2018; 90: 227–248.
[12] Natarajan J, Ahmed T, Patil S, Mamsaang M, Kapadia R, Tailor Y, *et al*. Pain and functionality improved when underlying neuromuscular dysfunction addressed in chronic pelvic pain patients. Neurourology and Urodynamics. 2021; 40: 1609–1615.
[13] Bonder JH, Chi M, Rispoli L. Myofascial Pelvic Pain and Related Disorders. Physical Medicine and Rehabilitation Clinics of North America. 2018; 28: 501–515.
[14] Marcus NJ, Shrikhande AA, McCarberg B, Gracely E. A preliminary study to determine if a muscle pain protocol can produce long-term relief in chronic back pain patients. Pain Medicine. 2014; 14: 1212–1221.
[15] Hetrick DC, Ciol MA, Rothman I, Turner JA, Frest M, Berger RE. Musculoskeletal dysfunction in men with chronic pelvic pain syndrome type III: a case-control study. The Journal of Urology. 2003; 170: 828–831.
[16] Prendergast SA, Weiss JM. Screening for musculoskeletal causes of pelvic pain. Clinical Obstetrics and Gynecology. 2003; 46: 773–782.
[17] McDonald DM, Bowden JJ, Baluk P, Bunnett NW. Neurogenic inflammation. a model for studying efferent actions of sensory nerves. Advances in Experimental Medicine and Biology. 1997; 410: 453–462.
[18] Yanagi H, Sankawa H, Saito H, Iikura Y. Effect of lidocaine on histamine release and Ca2+ mobilization from mast cells and basophils. Acta Anaesthesiologica Scandinavica. 1996; 40: 1138–1144.
[19] Staud R, Nagel S, Robinson ME, Price DD. Enhanced central pain processing of fibromyalgia patients is maintained by muscle afferent input: a randomized, double-blind, placebo-controlled study. Pain. 2009; 145: 96–104.
[20] Bharucha AE, Lee TH. Anorectal and Pelvic Pain. Mayo Clinic Proceedings. 2016; 91: 1471–1486.
[21] Labat J, Riant T, Robert R, Amarenco G, Lefaucheur J, Rigaud J. Diagnostic criteria for pudendal neuralgia by pudendal nerve entrapment (Nantes criteria). Neurourology and Urodynamics. 2008; 27: 306–310.
[22] Kaur J, Singh P, Pudendal Nerve Entrapment Syndrome. Treasure Island: FL. 2021.
[23] Ustinova EE, Fraser MO, Pezzone MA. Cross-talk and sensitization of bladder afferent nerves. Neurourology and Urodynamics. 2010; 29: 77–81.
[24] Christianson JA, Liang R, Ustinova EE, Davis BM, Fraser MO, Pezzone MA. Convergence of bladder and colon sensory innervation occurs at the primary afferent level. Pain. 2007; 128: 235–243.
[25] Li H, Kang D. Prevalence of sexual dysfunction in men with chronic prostatitis/chronic pelvic pain syndrome: a meta-analysis. World Journal of Urology. 2016; 34: 1009–1017.
[26] 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; 56: 951–955.