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BIOFEEDBACK, PELVIC FLOOR RE-EDUCATION, AND BLADDER TRAINING FOR MALE CHRONIC PELVIC PAIN SYNDROME

J. QUENTIN CLEMENS, ROBERT B. NADLER, ANTHONY J. SCHAEFFER, JAY BELANI, JEFF ALBAUGH, AND WADE BUSHMAN

ABSTRACT

Objectives. Pelvic floor tension myalgia may contribute to the symptoms of male patients with chronic pelvic pain syndrome (CPPS). Therefore, measures that diminish pelvic floor muscle spasm may improve these symptoms. Based on this hypothesis, we enrolled 19 patients with CPPS in a 12-week program of biofeedback-directed pelvic floor re-education and bladder training.

Methods. Pre-treatment and post-treatment symptom assessments included daily voiding logs, American Urological Association (AUA) symptom score, and 10-point visual analog pain and urgency scores. Pressure-flow studies were obtained before treatment in most patients. Instruction in pelvic floor muscle contraction and relaxation was achieved using a noninvasive form of biofeedback at biweekly sessions. Home exercises were combined with a progressive increase in timed-voiding intervals.

Results. Mean age of the 19 patients was 36 years (range 18 to 67). Four patients completed less than three treatment sessions, 5 patients completed three to five sessions, and 10 attended all six sessions. Mean follow-up was 5.8 months. Median AUA symptom scores improved from 15.0 to 7.5 ($P = 0.001$), and median bother scores decreased from 5.0 to 2.0 ($P = 0.001$). Median pain scores decreased from 5.0 to 1.0 ($P = 0.001$), and median urgency scores decreased from 5.0 to 2.0 ($P = 0.002$). Median voiding interval increased from 0.88 hours to 3.0 hours ($P = 0.003$). Presence of detrusor instability, hypersensitivity to filling, or bladder-sphincter pseudodyssynergia on pretreatment urodynamic studies was not predictive of treatment results.

Conclusions. This preliminary study confirms that a formalized program of neuromuscular re-education of the pelvic floor muscles together with interval bladder training can provide significant and durable improvement in objective measures of pain, urgency, and frequency in patients with CPPS. UROLOGY **56:** 951–955, 2000. © 2000, Elsevier Science Inc.

Chronic pelvic pain syndrome (CPPS), or NIH type IIIA/IIIB prostatitis,[1] is characterized by pelvic pain and voiding symptoms. The source of these symptoms is still poorly understood, but pain associated with chronic tension and spasm of the pelvic floor muscles (pelvic floor tension myalgia) has been hypothesized to be a contributing factor.[2,3] We and others have observed that patients with CPPS frequently exhibit tenderness of the levator ani muscles on rectal examination and that measures that decrease pelvic floor muscle tension, such as sitz baths and relaxation techniques, may be used to treat CPPS with anecdotal success.

Biofeedback-assisted techniques of neuromuscular re-education have been used successfully to treat chronic pain syndromes,[4–6] including those with a tension myalgia component.[7] We hypothesized that a formalized program that combines biofeedback-assisted pelvic floor re-education with interval bladder training may improve symptoms in patients with CPPS.

MATERIAL AND METHODS

Between July 1995 and July 1998, 19 patients were treated with the biofeedback regimen described below. Mean age was 38 years (range 18 to 67). All patients were diagnosed with nonbacterial CPPS based on the presence of symptoms with a

From the Department of Urology, Northwestern University Medical School, Chicago, Illinois

Reprint requests: Wade Bushman, M.D., Ph.D., Department of Urology, Northwestern University Medical School, 303 East Chicago Avenue, Tarry 11-715, Chicago, IL 60611

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negative expressed prostatic fluid (EPF) or VB3 urine culture. Symptoms included pain (perineal, testicular, suprapubic, scrotal, ejaculatory, abdominal) and voiding complaints (frequency, urgency, nocturia, decreased force of stream, hesitancy, sense of incomplete emptying). Six patients had pain only, 6 had voiding symptoms only, and 7 had both pain and voiding symptoms. Six patients were diagnosed with inflammatory CPPS (NIH type IIIA prostatitis) and 13 were diagnosed with noninflammatory CPPS (NIH type IIIB prostatitis) based on the presence or absence of white blood cells in the EPF, respectively. All patients had failed prior treatments, including antibiotics (16 patients), alpha-adrenergic blockers (10), anticholinergic agents (7), pentosan polysulfate (1), and transurethral resection of the prostate (1).

Pretreatment evaluation included pressure-flow urodynamic studies, 24-hour voiding diaries, American Urological Association (AUA) symptom scores, and 10-point visual analog pain and urgency scores with ranges of 0 (no pain/urgency) to 9 (unbearable pain/urgency). Pressure-flow studies were performed by infusing sterile 0.9% normal saline into the bladder through a 10F triple channel urethral catheter at a rate of 50 mL/min. Abdominal pressure was recorded through a 9F rectal catheter. Sphincter activity was recorded from cutaneous electrodes placed on the perineum. The presence or absence of bladder outlet obstruction was determined according to the Abrams and Griffiths nomogram.[8] Detrusor instability was defined as an involuntary rise in detrusor pressure of more than 15 cmH_2O; diminished bladder capacity was defined as a bladder capacity of less than 250 mL. Detrusor-sphincter pseudodyssynergia was defined as the presence of increased electromyographic (EMG) activity during voiding in the absence of abdominal straining.

The biofeedback program is a standardized protocol of bladder training combined with pelvic floor re-education. It is an 11-week program comprised of six biweekly visits, each lasting 1 hour. During the course of the program, the nurse therapist works with the patient to accomplish three goals: (1) teach the patient to focus attention on the pelvic floor, and to learn to selectively contract and relax these muscles; (2) teach the patient to perform these exercises on a daily basis to interrupt a syndrome of chronic pelvic myofascial pain; and (3) work with the patient to progressively increase the voiding interval toward a target of not less than 4 hours. At all visits, a noninvasive method of biofeedback monitoring of pelvic floor muscular activity is used to help the patient identify muscular activity in the pelvic floor muscles. The biofeedback apparatus is an EMPI Innova Clinical EMG System, Version 1.25. This apparatus is used with a specially designed brief that contains surface electrodes for EMG recording. We elected to use this device rather than internal probes because its noninvasive character increased patient acceptance of the therapy. The EMPI biofeedback program is used as recommended by the manufacturer to instruct the patient in contraction and relaxation of the pelvic floor musculature. The patient is instructed to perform the exercises at home, three times daily, using the same combination of fast and slow contractions and relaxations as during the instructional session. At the first visit, the patient's 24-hour voiding diary is reviewed and a target voiding interval, which is the 75th percentile of the patient's maximum daytime voiding interval, is selected as the initial target. The patient is instructed to try to void at that interval or greater throughout the waking hours for the next 2 weeks. The patient is instructed to use pelvic floor contractions as the mechanisms to delay voiding. No attempt is made to regulate the patient's voiding after retiring to bed. He is asked to maintain a daily voiding log that records the time (but not volume) of each micturition. At each subsequent visit, the patient's voiding log is reviewed and if the compliance is greater than 80%, the interval is increased by 30 minutes. If compliance is less than 80%, the reasons for lack of compliance are explored and a determination made whether to reattempt the same goal or alter the goal. Throughout the program, patients are encouraged to pursue the integrated goal of increased voiding interval, a more physiologic voiding effort, and decreased pelvic floor spasm and pain. Patients are instructed to continue pelvic floor exercises after the formal protocol is completed to maintain therapeutic efficacy.

Following treatment, questionnaires and voiding logs were repeated to assess the success of therapy. Differences between pre-treatment and post-treatment symptom scores and voiding frequencies were calculated using the Wilcoxon signed-ranks test.

RESULTS

Fourteen of the 19 patients underwent pretreatment urodynamics in our laboratory. Five exhibited detrusor instability (DI) and an additional 4 had diminished bladder capacity. No patients were obstructed based on Abrams-Griffiths criteria,[8] but 6 patients demonstrated dysfunctional voiding as evidenced by incomplete relaxation of the external urethral sphincter with voiding (pseudodyssynergia). Despite these findings, no postvoid residual urine volume was more than 60 mL. Three patients had a combination of cystometric abnormalities and pseudodyssynergia.

Ten patients completed all six biofeedback sessions, 5 completed three to five sessions, and 4 completed fewer than three sessions. Reasons for noncompliance in these last 4 patients were sufficient improvement (2 patients), insurance issues (1), and unknown (1). Complete post-treatment follow-up was obtained in 16 patients with a mean follow-up of 5.8 months after the last biofeedback session (median 3.5, range 1.6 to 14.8). No follow-up information was available for 3 patients who attended two, three, and six sessions, respectively.

Comparisons of pre-treatment and post-treatment results are shown in Figures 1 through 3. There was a statistically significant improvement in all outcomes. No patient reported a higher AUA symptom score after treatment. Eleven of 16 patients reported improvement by more than five points, and the median symptom scores decreased from 15.0 before treatment to 7.5 at follow-up. Eleven patients reported a decrease in pain scores of at least three points; 3 patients reporting no change from pretreatment values had very low initial pain scores (0, 1, and 2, respectively). The median values for pretreatment and post-treatment pain scores were 5.0 and 1.0, respectively. Ten patients reported at least a three-point improvement in urgency scores; 3 patients reporting no improvement had very low initial urgency scores (0, 1, and 2, respectively). The median urgency score decreased from 5.0 before treatment to 2.0 at follow-up.

Most responses from the 7 patients with both voiding symptoms and pain showed significant re-

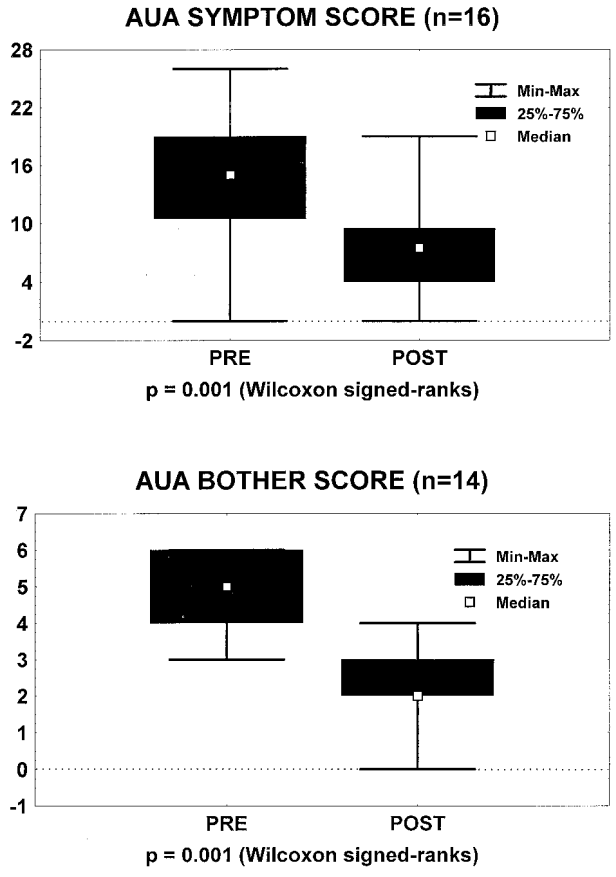

FIGURE 1. *Pre-treatment and post-treatment AUA symptom scores and bother indices. Median symptom scores decreased from 15.0 to 7.5, and median bother scores decreased from 5.0 to 2.0.*

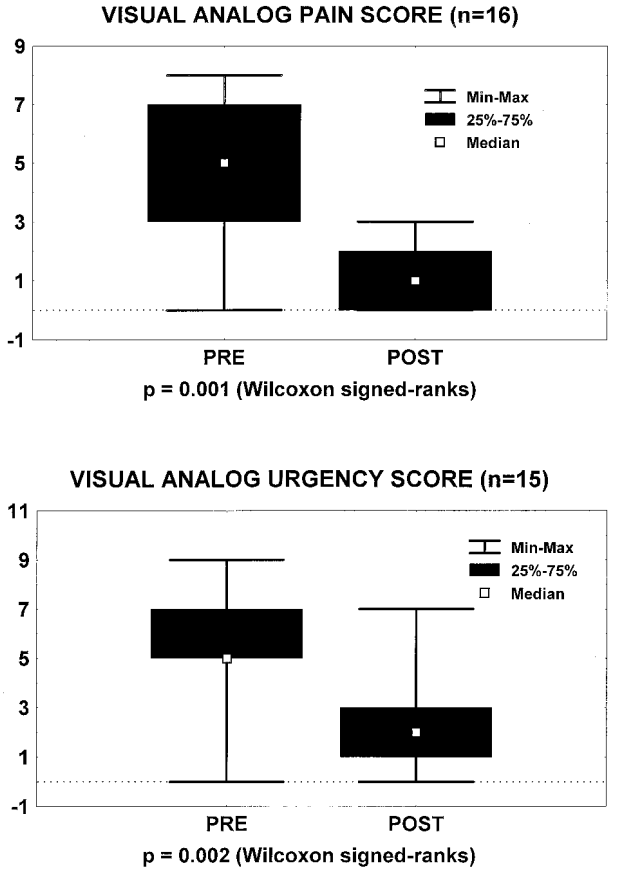

FIGURE 2. *Pre-treatment and post-treatment pain and urge scores. Median pain scores decreased from 5.0 to 1.0, and median urge scores decreased from 5.0 to 2.0.*

ductions in both complaints. Four patients demonstrated at least 3-point reductions in pain and urgency scores combined with at least 6-point reductions in AUA symptom scores. Another had a 2-point reduction in pain score, a 3-point reduction in urgency score, and a 6-point reduction in AUA symptom score. Two patients had significant improvements in pain scores (4 and 7 points, respectively), with less improvement in voiding symptoms. The first had a 5-point improvement in urge score, but only a 3-point improvement in AUA symptom score. The second had no change in either score (urgency 7, AUA score 19). Overall quality of life was not assessed by the present study, so it is not known whether these patients with improvement in only one area were satisfied with their treatment outcomes.

Patients were grouped according to the presence or absence of cystometric abnormalities (DI or decreased bladder capacity) and the presence or absence of pseudodyssynergia. For each subgroup analysis, there was no difference in median pretreatment or post-treatment scores for all measured outcomes (data not shown).

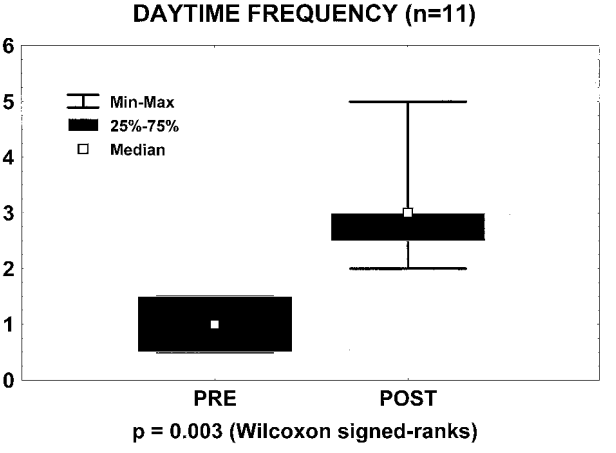

FIGURE 3. *Pre-treatment and post-treatment daytime voiding frequencies from voiding diaries. Median voiding interval increased from 0.88 to 3.0 hours.*

COMMENT

The connection between pelvic pain and voiding dysfunction is poorly understood. In a recent study of 103 men with pelvic pain, Zermann *et al.*[9] found

pathologic tenderness of the pelvic floor muscles associated with the inability to contract and relax the pelvic floor muscles in 88%. Urodynamic testing on 84 of these men demonstrated abnormal pelvic floor function, including increased urethral sensitivity and tonicity, and pseudodyssynergia during attempted voiding. They hypothesized that functional compromise of the pelvic floor musculature may trigger aberrant plasticity changes within the central nervous system and result in a chronic pain state.[9] If true, this hypothesis provides a rationale for the success of biofeedback-assisted pelvic floor re-education in treating both voiding dysfunction and pain.

Biofeedback is frequently recommended as treatment for CPPS,[10–12] but few data have been published to support that recommendation. Kaplan *et al.*[13] reported excellent short-term results using biofeedback to treat 43 men with bladder-sphincter pseudodyssynergia who had previously been diagnosed with CPPS. In that study, biofeedback was used to teach patients to recognize and correct pelvic floor contraction during voiding. The goal of our treatment protocol was different. We first taught patients to identify the pelvic floor muscle group and then use contraction/relaxation exercises to put the muscle through its normal dynamic range. These range of motion exercises help break the cycle of spasm and pain. We encouraged home exercises to strengthen the muscles because better muscle health may result in less spasm and pain. We taught patients to perform voluntary pelvic floor muscle relaxation, a technique that is used during episodic exacerbations of pain. Finally, we combined pelvic floor re-education with voiding interval training aimed at achieving a gradual, progressive increase in voiding interval. This method addresses the problem of urinary frequency and obviates the dysfunctional voiding efforts that many patients display when attempting to void at small bladder volumes. Our results, albeit in a small patient cohort, suggest that a formalized pelvic floor re-education program together with interval bladder training can provide significant improvement in objective measures of pain and voiding symptoms in patients with CPPS. These benefits were seen regardless of the presence or absence of pseudodyssynergia or cystometric abnormalities on urodynamic testing. There are three possibilities: (1) abnormalities seen during urodynamic testing represent clinically insignificant testing artifacts; (2) urodynamic abnormalities resolve as a result of improved control of the pelvic floor muscles and voiding interval training; or (3) urodynamic abnormalities persist despite treatment but do not preclude symptomatic improvement.

Our positive results are encouraging but must be viewed with a realistic appreciation that the treatment regimen described requires a high level of commitment by the patients and the nurses who administer the training. Furthermore, some insurance carriers do not cover the expenses. We make a specific effort to counsel patients about these issues prior to referring them for biofeedback. Despite our efforts to maximize patient compliance, nearly half of the patients did not complete all six sessions. Interestingly, 2 of the 4 patients who attended fewer than half of the treatments cited sufficient improvement as their reason for not attending further. All patients continued to use the exercises intermittently for symptomatic exacerbations following completion of the formal biofeedback program, but it is not known how many continued performing the exercises on a daily basis. The long-term durability of biofeedback is not known, nor is it known whether attendance for the entire teaching regimen or long-term daily performance of pelvic floor exercises results in improved long-term results.

None of our patients who were treated with biofeedback had overt bladder neck obstruction. In young men with long-standing, refractory voiding dysfunction, as many as 50% may be found to have obstruction on pressure-flow studies.[14] These patients' symptoms usually respond well to transurethal incision of the prostate,[15,16] albeit at the possible expense of retrograde ejaculation. It is not known whether biofeedback would be beneficial in these patients.

To accurately compare the efficacy of treatments for a given disease process, it is mandatory to have a standard outcome measure. Subsequent to the accrual and treatment of our patient cohort, a validated quality-of-life instrument for male CPPS has been developed and published.[17] We encourage the use of this instrument in future analyses of treatment results for this enigmatic condition.

CONCLUSIONS

At 6 months' follow-up, a structured program of biofeedback-assisted pelvic floor exercises and timed voiding resulted in significant improvement in voiding symptoms and pain in a group of men with CPPS refractory to other treatments. Measurable effects were seen following as few as two treatments. Our results suggest that this treatment approach may benefit CPPS patients with dysfunctional voiding, detrusor instability, and/or chronic pelvic pain. The long-term durability of these outcomes is unknown.

REFERENCES

1. Executive summary: *NIH Workshop on Chronic Prostatitis*. Bethesda, National Institutes of Health, 1995.

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

3. Segura JW, Opitz JL, and Greene LF: Prostatosis, prostatitis or pelvic floor tension myalgia? J Urol **122:** 168–169, 1979.

4. Grimaud JC, Bouvier M, Naudy B, *et al:* Manometric and radiologic evaluation and biofeedback treatment of chronic idiopathic anal pain. Dis Colon Rectum **34:** 690–695, 1991.

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

6. Glazer HI, Rodke G, Swencionis C, *et al:* Treatment of vulvar vestibulitis syndrome with electromyographic biofeedback of pelvic floor musculature. J Reprod Med **40:** 283–290, 1995.

7. Flor H, and Birbaumer N: Comparison of the efficacy of electromyographic biofeedback, cognitive-behavioral therapy, and conservative medical interventions in the treatment of chronic musculoskeletal pain. J Consult Clin Psychol **61:** 653–658, 1993.

8. Abrams PH, and Griffiths DJ: The assessment of prostatic obstruction from urodynamic measurements and from residual urine. Br J Urol **51:** 129–134, 1979.

9. Zermann D-H, Ishigooka M, Doggweiler R, *et al:* Neurourological insights into the etiology of genitourinary pain in men. J Urol **161:** 903–908, 1999.

10. Nickel JC: Effective office management of chronic prostatitis. Urol Clin North Am **25:** 677–684, 1998.

11. Britton JJ Jr, and Carson CC: Prostatitis. AUA Update Series **17**(Lesson 20): 154–159, 1998.

12. Rosen SI, and Seidmon EJ: Lower urinary tract infections in men, in Hanno PM, and Wein AJ (Eds): *Clinical Manual of Urology*, 2nd ed. New York, McGraw-Hill, 1994, pp 189–204.

13. Kaplan SA, Santarosa RP, Meade D'Alisera P, *et al:* Pseudodyssynergia (contraction of the external sphincter during voiding) misdiagnosed as chronic nonbacterial prostatitis and the role of biofeedback as a therapeutic option. J Urol **157:** 2234–2237, 1997.

14. Kaplan SA, Ikeguchi EF, Santarosa RP, *et al:* Etiology of voiding dysfunction in men less than 50 years of age. Urology **47:** 836–839, 1996.

15. Norlen LJ, and Blaivas JG: Unsuspected proximal urethral obstruction in young and middle-aged men. J Urol **135:** 972–976, 1986.

16. Kaplan SA, Te AE, and Jacobs BZ: Urodynamic evidence of vesical neck obstruction in men with misdiagnosed chronic nonbacterial prostatitis and the therapeutic role of endoscopic incision of the bladder neck. J Urol **152:** 2063–2065, 1994.

17. Litwin MS, McNaughton-Collins M, Fowler FJ, *et al:* The National Institutes of Health chronic prostatitis symptom index: development and validation of a new outcome measure. J Urol **162:** 369–375, 1998.