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EFFECT OF POSTERIOR TIBIAL NERVE STIMULATION (PTNS) ON PELVIC FLOOR STRENGTH AND ELECTROMYOGRAPHY ACTIVITY IN ELDERLY WOMEN

Hypothesis / aims of study
The posterior tibial nerve is a mixed sensory-motor nerve, containing axons passing through the L4–S3 spinal roots. The sacral roots also contain the peripheral nerves involved in the sensory and motor control of the bladder and pelvic floor, and are the same spinal tracts targeted by sacral neuromodulation. Electrical stimulation of these nerves inhibits bladder activity by stimulating large diameter somatic afferent fibers, which in turn evokes a central inhibition of the micturition reflex pathway in the spinal cord or the brain. Although it is likely that stimulation of the sacral roots, (SNS), stimulation of the pudendal nerve, and stimulation of the tibial nerve (PTNS) all affect central components of the neural circuits controlling the bladder, there may be significant differences. Nowadays, we know that electrical pudendal nerve stimulation (EPNS) can contract the pelvic floor muscle. But we don't have any studies with PTNS. Therefore the aim of this study was to evaluate whether are difference on pelvic floor strength and electromyography activity after 8 sessions of posterior tibial nerve stimulation (PTNS) in elderly women.

Study design, materials and methods
Elderly women with overactive bladder syndrome were prospectively treated with PTNS weekly for a total of 8 sessions. OAB symptoms were the main clinical presentation reported by all women. OAB symptoms were assessed using a 3-day voiding diary and Overactive Bladder -Validated 8 - question (OAB-V8). Women with 8 points or less in OAB-V8 was excluded, just as patients who did not consent or were unable to complete the weekly treatment sessions, and women that used drugs to treat overactive bladder in the last six months, women who presented some neurological disease, with heart pacemaker, with lower urinary tract infection, were excluded. We chose to use the protocol described previously [1]: two self-adhesive electrodes, positioned with gel, one immediately behind the medial malleolus and another 10cm above. It begins with a frequency of 1Hz and seeks to correctly identify the posterior tibial nerve. This position is confirmed with the rhythmic movement of flexion of the fingers. The frequency is then changed to 10Hz, pulse width fixed at 200μs and intensity adjusted according to each patient's threshold. Assessment was performed before and after treatment by the same examiner, in which he did not know whether the patient had received treatment or not. The PFM were assessed in supine position with hips and knees flexed by digital palpation. To quantify muscle strength, a score from 0–5 was given based on the previously validated Oxford Scale. The electrical activity was measured by surface electromyography (sEMG), which was conducted in the private laboratory area. The electrode pairs were positioned along the line of perineal body. With the electrodes in situ, three maximum voluntary and successive contractions were required from the pelvic floor. Each contraction was recorded in microvolt (μV). The parameter used was the square root of the mean of three contractions. All evaluations were carried out in 2-min intervals. For the statistical analysis, SPSS (Statistical Package for Social Sciences) version 20.0 was used. To determine normality of the data and to analyze the differences between pre and pos treatment, Komogorov-Smirnov and test-t Student's was used, respectively, as appropriate. A P-value of <0.05 was considered statistically significant.

Results
From November 2012 to march 2013, 15 women were included in this research. The mean age was 66.0 (±6.4). Regarding adherence, the patients in the treatment groups had 100% adherence once they were allocated, with no dropouts. Only 4 patients were not obese, and the number of pregnancies average was 4,2 (table I)

TABLE I. Distribution of the Patients According to Demographic Characteristics.

Patients	Age	BMI (kg/m2)	Number of pregnancies
MA	72	26,6	2
DM	81	30,7	0
IB	63	28,3	0
ME	65	42,2	0
RB	62	28,5	8
MR	62	32,0	5
MAR	55	24,6	3
ML	64	34,5	7
DI	60	24,6	5
MTT	68	34,8	4
CRS	66	43,1	0
ML	78	23,7	4
MAS	69	35,5	14
MNS	64	36,4	6

DIM	60	24,6	5
Average	66	31,3	4,2
Standard-deviation	±6,8	±6,2	±3,7

No statistically significant differences were observed when analyzing pre and post-treatment variables, regarding Oxford score (p= 0,271) and muscle activity evaluated by SEMG (p= 0,365). (Table II)

TABLE II: Outcome Measures at Baseline and at 8 sessions (Final)

Assessment	Before intervention	After intervention	P-value
Oxford	2,46	2,66	p= 0,271
EMG	4,05	4,42	p= 0,365

Interpretation of results

PTNS is believed to relieve symptoms due to an overactive and underactive bladder. The underlying neurophysiologic mechanisms have not yet been elucidated. To our knowledge, there are no studies demonstrating that tibial posterior stimulation has any influence on PFM function. Conversely, there is a study that demonstrate that EPNS can contract the PFM and simulate PFMT.[2] The evaluation parameters included PFM function and we evaluated by digital palpation using the Oxford scale and muscle activation using SEMG. These methods measure different aspects of PFM function. Besides, all of these methods have their place in physical therapy evaluation, but all have their limitation. Although we observed a slight improvement on subjects, no statistically significant differences were observed when analyzing pre and post-treatment variables, regarding Oxford score (p= 0,271) and muscle activity evaluated by SEMG (p= 0,365), however greater numbers of patients are needed to substantiate these findings.

Concluding message

Based on our data, we can conclude that posterior tibial nerve stimulation does not improve function and PFM electromyography activity.

References

1. Urodynamic effects of acute transcutaneous posterior tibial nerve stimulation in overactive bladder. J Urol, 169: 2210, 2003.
2. Wang S, Zhang S. Simultaneous perineal ultrasound and vaginal pressure measurement prove the action of electrical pudendal nerve stimulation in treating female stress incontinence. BJU Int. 2012 Nov;110(9):1338-43.

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