COMPARISON OF INTRAVAGINAL NEUROMUSCULAR ELECTRICAL STIMULATION AND PERCUTANEOUS TIBIAL NERVE STIMULATION IN THE TREATMENT OF LOWER URINARY TRACT SYMPTOMS IN WOMEN WITH MULTIPLE SCLEROSIS

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Hypothesis / aims of study: Up to 90% of the patients with multiple sclerosis (MS) present lower urinary tract symptoms (LUTS) at some time in the course of their disease. Invasive treatments and anticholinergic drugs are not always well tolerated or curative. Pelvic floor muscle training (PFMT) is a conservative treatment that has been reported to be effective for LUTS in patients with MS, improving symptoms and suppressing detrusor overactivity (1). Neuromuscular electrical stimulation (NMES), most commonly applied intravaginally stimulating the pudendal nerve, is another conservative treatment that assists with the management of LUTS (2). An alternative to intravaginal NMES treatment is posterior tibial nerve stimulation (PTNS) (3). Both vaginal NMES and PTNS appear to be beneficial in the treatment of LUTS in patients with MS, however no study has directly compared both treatments. This prospective randomised controlled trial aimed at investigating the impact of intravaginal NMES and PTNS on lower urinary tract function in women with MS.

Study design, materials and methods: Thirty women with MS and LUTS were randomized into one of the three treatment groups: Group I: PFMT and sham NMES (GI, n= 10); Group II: PFMT and intravaginal NMES (GII, n= 10) and Group III: PFMT and PTNS (GIII, n= 10). Evaluation consisted 24-hour Pad test, 3 day bladder diary, pelvic floor muscle function according to Perfect scheme, pelvic floor muscle tone, flexibility of vaginal opening and ability to relax pelvic floor muscles, maximum cystometric capacity, bladder compliance, maximum amplitude of detrusor activity, maximum flow rate (Qmax), bladder pressure at maximum flow rate (Pdet Qmax) and post void residual volume outcomes of urodynamic. All patients were assessed before and after treatment by a physiotherapist blinded to participant group assignment. The intervention was performed by a physiotherapist for a period of 12 weeks in both groups with participants attending twice a week. GI received sham NMES treatment by placing a pair of surface electrodes over the sacrum with no physiological effect parameters (2). GII underwent vaginal NMES with a pulse width of 200 μs at a frequency of 10 Hz. GIII underwent PTNS with a pulse width of 200 μs at a frequency of 10 Hz. All groups received electrostimulation treatment over a period of 30 minutes. After the electrotherapy session, all groups performed 30 slow pelvic floor muscle contractions and 3 minutes of fast contractions in supine position with the assistance of an electromyographic biofeedback (Miotec, Brazil). Due to the lack of normal distribution of the variables, a Kruskal-Wallis test was employed to compare baseline measures among the three groups. Wilcoxon test were used to compare the treatment before and after intervention in each group and Kruskal-Wallis followed by Mann-Whitney U Test, when overall difference was statistically significant, were used to find differences in groups. A p-value of 0.05 was considered significant.

Results: There were no significant differences between groups at baseline. After the intervention, all groups demonstrated significant differences in pad weight on the 24 hour pad test (GI, p=0.01; GII, p=0.01; GIII, p=0.01), but these reductions were not statistically significant between groups (p=0.16). Results of 3 day - bladder diary assessment are showed in Table I. In the end of the treatment all groups showed improvements of all parameters of the PERFECT scheme, there were no differences between groups. Table II reveals the median and range scores of pelvic floor muscle palpation before and after the intervention. After the treatment, Qmax was increased in GII (p=0.01) and GIII (p=0.01); Pdet Qmax decreased in GIII (p=0.01), post void residual volume decreased in GII (p=0.01) and in GIII (p=0.02) and maximum cystometric capacity increased in GIII (p=0.02). There no statistical differences between groups on any of these variables.

Table I - Median and range values recorded on the 3-day bladder diary before and after treatment. P-values indicate that there was no difference between groups after the treatment. GI Pelvic floor muscle training and placebo electrotherapy, GII Pelvic floor muscle training and intravaginal NMES, GIII Pelvic floor muscle training and PTNS.

	GI		GII		GIII		p-value
	Baseline	12 weeks	Baseline	12 weeks	Baseline	12 weeks	
SYMPTOMS							
Frequency	7.8 (6.7-11.7)	7.5 (6.7-9.0)	8.5 (6.7- 11.7)	7.83 (6.3-8.7)	9.3 (5.7-11.3)	7.7 (7-9.7)	0.78
Urgency	3.7 (2.7-5.7)	2.0* (0.7-3.0)	4.0 (2.7- 6.7)	1.3* (0.3 -2.0)	3.7 (2.7-7.3)	1.7* (0.3 -3.0)	0.84
Urge Urinary incontinence	3 (1.7-6.3)	0.5* (0- 3.0)	5.0 (0- 8.3)	0.2* (0- 2.3)	4.0 (1.7- 5.7)	0.7* (0- 4.3)	0.83
Nocturia	2.0 (0- 4.3)	0 (0- 2.0)	2.5 (0- 6.0)	0* (0- 2.0)	2.0 (0- 4.3)	0* (0-1.3)	0.87
Hesitancy	2.0 (0- 3.3)	0.5 (0- 3.7)	1.8 (0- 4.3)	0* (0- 0.7)	2.3 (0- 3.7)	1.0* (0-3.0)	0.47
Incomplete emptying	2.7 (0- 4.7)	1.23 (0- 4.3)	2.7 (0- 5.0)	1.0* (0- 3.3)	3.0 (0- 6.3)	1.3* (0-5.0)	0.89

* Statistically significant difference after the treatment.

Table II - Median and range values of pelvic floor muscle tone, flexibility of vaginal opening and ability to relax pelvic floor muscles after a contraction. The p-values indicate that there was difference between groups after the treatment in terms of pelvic floor muscle tone, flexibility of vaginal opening and ability to relax pelvic floor muscles after a contraction. GI Pelvic floor muscle training and placebo electrotherapy, GII Pelvic floor muscle training and intravaginal NMES, GIII Pelvic floor muscle training and PTNS.

	GI		GII		GII		p-value
	Baseline	12 weeks	Baseline	12 weeks	Baseline	12 weeks	
Pelvic floor muscle tone	2 (0-3)	1[+] (0-2)	2 (0-3)	0* (0-1)	2 (1-3)	1[·] (1-2)	0.01
Flexibility	3 (1-4)	3[+] (2-4)	3 (2-4)	4* (3-4)	2 (2-3)	3[·] (2-4)	0.12
Ability to relax pelvic floor muscles	1.5 (0-2)	1[+] (0-2)	2 (0-3)	0* (0-1)	2 (1-2)	1*[·] (0-2)	<0.00

* Statistically significant difference after the treatment.
\+ Statistically significant difference between GII and GI, (p=0.03 for pelvic floor muscle tone, p=0.01 for flexibility and p=0.01 for ability to relax).
[·]Statistically significant difference between GII and GIII, (p=0.00 for pelvic floor muscle tone, p=0.00 for flexibility and p=0.00 for ability to relax).

Interpretation of results: In this study, PFMT with our without NMES or PTNS resulted in improvements in signs and symptoms of urgency and urge urinary incontinence in women with MS. A combination of PFMT and intravaginal NMES was found to be more effective in decreasing PFM tone and in contributing to PFM flexibility and relaxation after a maximal PFM contraction than PFMT alone or in combination with PTNS. These results suggest that NMES has a stronger effect on central inhibition of the pudendal nerve, than PTNS.

Although a lack of correlation between PFM function and urodynamic data has been observed, it was suggested that the presence of PFM hypertonia is indicative of sphincter dissynergia, which is responsible for empting dysfunction such as a low Qmax and high post-void residual volume. The improvements in urodynamic study results seen in our study may have been influenced by the reduction of PFM tone and improved flexibility and ability to relax the pelvic floor muscles, as these muscle changes would allow the bladder to empty with less resistance, which will increase Qmax and reduce post void residual volume.

Concluding message: Results suggest that PFMT alone or in combination with intravaginal NMES or PTNS is effective in the treatment of LUTS in MS patients, with the combination of PFMT and NMES offering some advantage in the reduction of PFM tone and increase in PFM flexibility and ability to relax after a maximal contraction.

References

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