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Capitanucci M L[1], Demelas F[2], Mosiello G[1], Zaccara A[1], Camanni D[1], De Gennaro M[3]
1. Urodynamic Unit, Department of Nephrology and Urology, Ospedale Pediatrico Bambino Gesu', Roma, Italy, 2. Paediatric Urology Unit, Department of Paediatrics, Ospedale G. Brotzu, Cagliari, Italy, 3. Urodynamic Unit, Department of Nephrology and Urology, Ospedale Pediatrico Bambino Gesu'

EFFICACY OF PERCUTANEOUS TIBIAL NERVE STIMULATION TO TREAT LOWER URINARY TRACT DYSFUNCTION IN CHILDREN

Hypothesis / aims of study

Percutaneous Tibial Nerve Stimulation (PTNS) is a low invasive and effective technique of neuromodulation to treat non-neurogenic lower urinary tract dysfunction in adult patients. Good tolerability to PTNS needle insertion and tibial nerve stimulation in children has been clearly demonstrated in 2004 [1]. Nevertheless, data on PTNS efficacy in children are scant in literature [1,2]. Aimed to evaluate efficacy and clarify indications in paediatric age, we analysed results of PTNS on lower urinary tract symptoms (LUTS) and urodynamic parameters in children with non-neurogenic and neurogenic lower urinary tract dysfunction refractory to conventional therapy.

Study design, materials and methods

Among 500 patients followed during the last 4 years at our Urologic Clinic, all children who underwent PTNS have been analysed in regard of age, types of dysfunction (neurogenic and non-neurogenic) and main LUTS (incontinence, nocturnal enuresis), urinary tract infection and flowmetry parameters response to PTNS. Inclusion criteria were: age 5-18 years; unsatisfactory results after 6-12 months conventional (drugs, physiochinesitherapy and Biofeedback, profilaxis) treatment for non-neurogenic dysfunction and walking patients with occult (closed) spinal dysraphism with incomplete lesion, for neurogenic ones.

Fifty-five (31 female and 24 male) patients averaged 11.3 (SD: 6.08) years were enclosed. All patients underwent bladder diary (BD), flowmetry (FLW), completed by pelvic floor electromyography (EMG) and ultrasound post-voiding residual urine (PVR) evaluation, and urodynamic study to define lower urinary tract dysfunction. A cycle of PTNS consisted in 30 minutes session, weekly, for 12- weeks. Device and technique were those recommended by Stoller [3]. Children were followed by means of non-invasive urodynamic instruments (BD, FLW/EMG and PVR) and scheduled urinalysis. Morphology of the flow curve, PVR and bladder capacity (BC), as voided volume plus PVR, were analysed. PVR > 20 ml and increase or reduction of BC ≥ 50% of the expected capacity for age [(30 x age) ± 30] were considered as pathologic. Data recorded before the first session and after the last cycle of PTNS were analysed and statistically compared using Chi-square and Student's t test. Moreover, 3 age groups were considered: 5-9 years, 10-14 years and > 14 years.

Results

Forty-four patients (average age: 10.4 years; SD: 4.2 years) completed at least one PTNS cycle (response rate: 80%). Fourteen children had idiopathic overactive bladder (OAB) and 23 non-obstructive urinary retention (UR), due to dysfunctional voiding in 14, non-neurogenic neurogenic bladder in 5 and underactive valve bladder in 4 patients, following neonatal resection of posterior urethral valves; the remaining 7 children had neurogenic bladder (NB), 2 with overactive and 5 with underactive detrusor. Eighteen (7OAB, 7 UR and 4 NB) children were in 5-9, 20 (6 OAB, 11 UR and 3 NB) in 10-14 and 6 (1 OAB and 5 UR) patients in > 14 years group. Twenty-seven patients (8 OAB, 15 UR and 4 NB) underwent 1 PTNS cycle while the remaining 17 children (6 OAB, 8 UR and 3 NB) needed two or more cycles ($p=.05$). Subjective improvement was reported by 75% of children (77% in OAB, 75% in UR and 71% in NB and 83% in 5-9 years, 60% in 10-14 years and 100% in > 14 years group). Resolution rate of incontinence, nocturnal enuresis and urinary tract infections were 33%, 38% and 70,5%, respectively. Resolution rate of LUTS and urinary tract infections did not change significantly ($p>.5$) among age group 5-9 (n= 18 children) and 10-14 years (n= 20 children). The number of patients in age group > 14 years (n=6) did not allow statistical comparison. Results on LUTS and urinary tract infections in children with OAB, UR and NB are shown in table 1. Incontinence ($p<.02$) and urinary tract infection ($p<0.09$) improved significantly in children with UR, while a significant improvement was found in children with OAB for nocturnal enuresis only ($<p .02$); no significant changes were found in children with NB (tab.1). Thirty-one children (12 with OAB and 19 with UR) out of the 37 children with non-neurogenic bladder dysfunction underwent FLW after the last PTNS cycle. We did not found significant ($p<.05$) improvement in mean BC (OAB: 129 ± 87.9 ml versus 149.2 ± 75.3 ml; UR: 258.7 ± 188.1 ml versus 278 ± 163.5 ml) and PVR (OAB: 39 ± 65.2 ml versus 32.5 ± 41 ml ; UR: 75.7 ± 124 ml versus 42.9 ± 76 ml). Nevertheless, BC improved in 4/8 OAB and 4/8 UR children with previous pathologic values; among patients improved, 1 children with OAB and 3 children with UR achieved normal BC. PVR reduced in 2/3 OAB and 9/9 UR children, becoming as normal in 1/3 OAB and 6/9 UR children. Curve morphology became bell-shaped in 4/12 OAB and 3/19 UR children. We did not found relevant change in FLW pattern of children with NB.

Table 1: Results on LUTS and urinary tract infections in children with OAB, UR and NB

CLINICAL RESULTS	**BEFORE PTNS**	**AFTER PTNS**		χ^2
		Unchanged	**Improved (Cured)**	
	Patients	Patients	Patients	
Incontinence				p
• OAB (14 pts.)	13	3	10 (5)	0.07
• UR (23 pts.)	9	2	7 (4)	**0.02**
• VN (7 pts.)	5	2	3 (1)	0.2

Nocturnal Enuresis				
• OAB (14 pts.)	13	4	9 (6)	**0.02**
• UR (23 pts.)	5	4	- (1)	0.3
• VN (7 pts.)	3	-	3 (1)	0.08
Urinary Tract Infections				
• OAB (14 pts.)	3	-	- (3)	0.08
• UR (23 pts.)	14	5	- (9)	**0.009**
• VN (7 pts.)	-	-	-	

Interpretation of results

Response rate and prevalence of subjective improvement reported by children of different ages and with different lower urinary tract dysfunctions confirm the acceptability of PTNS in paediatric patients. Differently from urinary tract infection (70,5%), resolution rate of incontinence and nocturnal enuresis were less than 40%. Nevertheless, the overall improvement rate was high as 90% for incontinence and 57% for nocturnal enuresis (tab 1). Therefore, PTNS was effective to improve chronic and severe LUTS and recurrent urinary tract infection, avoiding chronic chemotherapy, in children refractory to conventional treatment. Clinical efficacy of PTNS was confirmed in children with non-neurogenic lower urinary tract dysfunction while not significant change was found in patients with neurogenic bladder. The improvement reported in some patients with neurogenic bladder due to incomplete lesions could be explained with heterogeneity of neurological lesion. Symptoms strictly related with non-neurogenic lower urinary tract dysfunction significantly improved in children with UR (incontinence and urinary tract infections) but not in children with OAB. Curve morphology did not relevantly changed but more than half of children showed improvement in the remaining flowmetry parameters. Particularly, a good correlation was found among disappearance of PVR (67%) and resolution of urinary tract infections (70,5%) in children with UR. Therefore, efficacy seemed to be better in children with UR than in those with OAB. This observation is difficult to explain being the PTNS effect on micturition reflex unclear.

Concluding message

PTNS is well accepted and effective for treating non-neurogenic lower urinary tract symptoms in children with chronic and refractory dysfunctions. Efficacy of PTNS seems to be better in children with non-obstructive urinary retention than in those with overactive bladder. Being PTNS procedure minimally invasive and effective in difficult patients, an extensive use of PTNS, at symptoms presentation, seems to be advisable to achieve the best results.

References

1. J. Urol. (2004) 171;1911 - 1913
2. J. Urol. (2002) 168(6); 2605 – 2607
3. J. Urol. (1987) 137, suppl.; 104A

FUNDING: No source of funding or grant

HUMAN SUBJECTS: This study was approved by the Ethics Committee of Children's Hospital Bambino Gesu' and followed the Declaration of Helsinki Informed consent was obtained from the patients.