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Treatment of non-monosymptomatic nocturnal enuresis by transcutaneous parasacral electrical nerve stimulation

Patrícia Lordêlo, Igor Benevides, Eric Goodwin Kerner, Alcina Teles, Maurício Lordêlo, Ubirajara Barroso Jr*

Department of Urology and Physical Therapy, Bahiana School of Medicine and Public Health, Salvador, Bahia, Brazil

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KEYWORDS

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Abstract *Objective:* To evaluate the effectiveness of transcutaneous parasacral electrical stimulation (TCPSE) in the treatment of non-monosymptomatic nocturnal enuresis (NMNE). Also, we evaluated possible pretreatment predictors of TCPSE failure.

Materials and methods: Nineteen children diagnosed with NMNE who underwent TCPSE were studied prospectively. There were 6 boys and 13 girls with a mean age of 9.05 ± 3.153 years (range 5–17 years). The sessions were performed three times per week for a maximum of 20 sessions, for 20 min each and at a frequency of 10 Hz.

Results: For eight children (42%) the nocturnal enuresis resolved, four (21%) presented a reduction in nocturnal episodes to less than one a week, six (32%) presented no change and one (5%) had increased frequency of NMNE. Symptoms present before treatment, such as daytime incontinence, frequency, constipation and occurrence of urinary tract infection, were not predictors of failure after TCPSE.

Conclusion: TCPSE can be an effective treatment for NMNE, but about a third of patients will need another kind of treatment. No pretreatment factor was determined that predicted TCPSE failure.

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* Corresponding author. Rua Alameda dos Antúrios, 212, apt 602, Cidade Jardim, 40280620 Salvador, Bahia, Brazil. Tel.: +55 71 2108 4670; fax: +55 71 2108 4919.

E-mail addresses: pvslordelo@hotmail.com (P. Lordêlo), igor_benevides@yahoo.com.br (I. Benevides), ericgk05@yahoo.com.br (E.G. Kerner), alcinateles@superig.com.br (A. Teles), mslordelo@yahoo.com.br (M. Lordêlo), ubarroso@uol.com.br (U. Barroso Jr.).

Introduction

In accordance with the International Children's Continence Society (ICCS), nocturnal enuresis (NE) is an intermittent loss of urine during sleep characterized as a symptom and a condition [1]. This condition can be subdivided into monosymptomatic nocturnal enuresis (MNE), when the only symptom is loss of urine during sleep, and non-monosymptomatic nocturnal enuresis (NMNE), when nocturnal enuresis is associated with any other lower urinary tract symptom, such as urgency, urge incontinence or frequency [1].

Children with MNE and NMNE are affected by emotional disorders and compromised quality of life [2]. Even with a high rate of spontaneous remission, MNE requires treatment in older children. However, in cases of NMNE, treatment is recommended at an earlier age. In cases of children with low self-esteem that have both NE and daytime urinary incontinence, it has been shown that there is a psychological improvement after successful treatment of the incontinence [3]. In addition, an overactive bladder that is associated with NMNE can cause UTI and is associated with VUR [4].

Because one possible cause of NMNE is an overactive bladder (OAB), the treatment has been based on the use of anticholinergics, with which a 50% rate of resolution of NE has been reported [5]. In addition to this low success rate, side effects such as dry mouth, flushing, constipation and fever are common [6,7].

Electrotherapy has emerged as an alternative to treat patients with OAB. Recently, we published a pilot study of children with OAB using ambulatory transcutaneous parasacral electrical stimulation (TCPSE) [8]. We showed that 63% of the patients symptomatically resolved completely and 20% improved significantly. In a long-term follow up, continued success was demonstrated in 84% for urgency, 74% for daytime incontinence and 78% for all daytime symptoms [9].

The objective of the present study is to evaluate the effectiveness of TCPSE in the treatment of NMNE without the use of medication. To our knowledge no other series has evaluated this method as the only treatment of NMNE. We also evaluated possible pretreatment predictors of TCPSE failure.

Material and methods

Nineteen children, 6 boys and 13 girls, diagnosed with NMNE, who underwent TCPSE were studied prospectively. The mean age of the patients was 9 years, ranging from 5 to 17 years.

The protocol for initial evaluation was composed of: a detailed, non-validated questionnaire which evaluated the lower urinary tract symptoms; a 3-day voiding diary; a modification of the Toronto score [10]; a simple abdominal plain film; uroflowmetry; and kidney and bladder ultrasound with measurement of post-voiding residual urine.

The inclusion criteria were: 5 years or more history of at least one episode of NE per week; symptoms of OAB (urgency with or without urge incontinence); uroflowmetry

with a bell-shaped curve; post-void residual urine that is less the 10% of the expected bladder capacity on ultrasonography; and more than three voids per day recorded in the voiding diary. The criteria for exclusion from the study were any sign or symptom of neurological disorder or anatomical alteration of the lower urinary tract such as PUJ, ureterocele or ectopic ureter.

TCPSE was administered in the office, and consisted of two superficial electrodes of 3.5 cm, placed on each side of S3 (Fig. 1), with electrical energy produced by a generator (Dualpex Uro 961, Quark®, Piracicaba-São Paulo, Brazil). The frequency used was 10 Hz with a generated pulse of 700 μ s. The intensity of the current was increased to the maximum level tolerated by the child. TCPSE was performed three times a week, with sessions of 20 min. The number of sessions varied according to the outcome, up to a maximum of 20 sessions.

One month before beginning TCPSE, all patients were given behavioral treatment support (urotherapy). The children were oriented to urinate every 3 h and avoid coffee, tea, citric fruits, soft drinks and chocolate. An attractive booklet was presented to reinforce the idea of a healthy daily intake of liquids and, in the cases of constipation, the importance of fiber. There was encouragement not to retain urine when urgency arises and to return for follow up medical appointments at the scheduled times. The children also received behavioral orientation for NE, involving urination before going to bed, avoidance of liquids 3 h before lying down to sleep, and the avoidance of a list of certain irritating foods. The orientation also included instructions that they were not to be awakened during the night to go to the bathroom. In addition, the number of NE episodes was recorded. Only patients who did not show improvement of OAB symptoms and maintained NE at least once a week underwent TCPSE.

The intervals for follow-up appointments were 1, 3 and 6 months after treatment. After the first 6 months, follow-up appointments were fixed at 6-month intervals. Patients were instructed to return sooner in the event that any type of infection or other urinary problem developed.

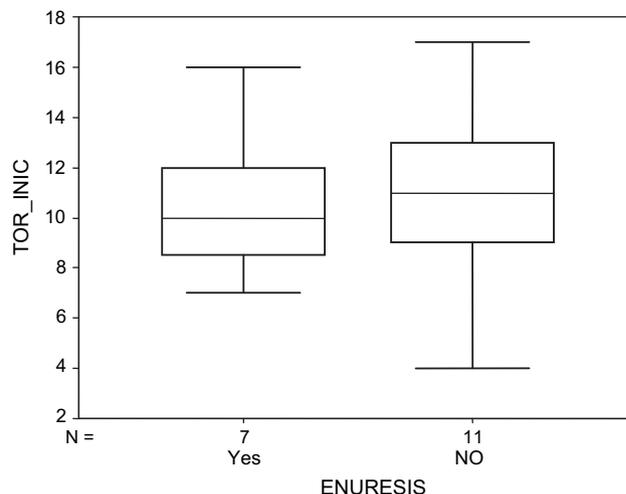


Figure 1 Box plot comparing the pretreatment modified Toronto score for patients cured (Yes) and patients not cured (No) of NE.

To evaluate the effectiveness of the method, caregivers were questioned regarding the presence of OAB symptoms according to the definition of ICCS[2] as follows: non-response 0%–49%, partial response 50%–89%, response 90% or greater, full response 100% decrease in symptoms.

The analysis of the data was performed using SPSS software, version 13.0. For evaluation of predictive factors of treatment failure, univariate analysis was performed. If any variable reached statistical significance ($P < 0.05$), multivariate analysis was to be applied.

Results

For eight (42%) patients the NE completely resolved, four (21%) presented a reduction in NE episodes to less than one a week, six (32%) showed no change, and one (5%) had increased NE intensity. As shown in Table 1, there was no pretreatment variable that was able to predict TCPSE failure.

Regarding severity before treatment, 10 children had NE more than three times a week and nine between one and three times a week. In these two subgroups, five (50%) and three (33.3%) children, respectively, showed complete NE resolution after treatment; this difference was not statistically significant ($P = 0.65$). We evaluated the influence of daytime symptom persistence after TCPSE upon the success rate of NE. Thirteen (68.4%) children gave a full response, being 100% resolution of daytime symptoms. Of these, seven (54%) also showed complete resolution of NE. Of the six patients who did not register a full response regarding daytime symptoms after treatment, one (17%) had their NE episodes completely resolved ($P = 0.17$).

Fig. 1 demonstrates that the Toronto score level before treatment did not predict the persistence of NE after treatment ($P = 0.649$). The mean number of voids per day and the maximum volume as noted in the voiding diary did not influence the cure rate.

Discussion

The practical mechanics of electrical stimulation in the lower urinary tract are not yet well determined. However, it is known that there is not only an effect directly on the muscle fibers but also on the reflexes [11]. Recently, supraspinal action of parasacral stimulation has been demonstrated [12]. Our previously published data demonstrate that TCPSE is effective in the treatment of OAB [8,9].

We have demonstrated that children with NMNE associated with daytime symptoms of OAB can be treated by

TCPSE. In our study, the rate of complete resolution of the NE was 42%, while 21% showed a reduced number of episodes to one or less per week. Gladh et al. evaluated 37 children with daytime and nocturnal urinary incontinence who were treated with oxybutynin [13]. The authors reported that only 30% of patients were cured of NE by this treatment.

If NE associated with OAB shared the physiopathology of OAB, we would expect that all children cured of OAB symptoms would also have the NE resolved. In the present series, 46% of patients whose OAB symptoms resolved after TCPSE were not cured of their NE. The physiopathology of NMNE is not clear. It seems that in these patients who failed to show resolution of NE after TCPSE, daytime detrusor-inhibited contractions do not play a major role in the NE mechanism. Alterations in sleep arousal or high production of urine during the night may be the factors responsible for the NE in these patients.

We observed that no pretreatment variable predicts which patients would be most prone to failure of treatment. To our knowledge no other study has evaluated the influence of OAB symptoms in the persistence of NE. If we could identify predictive factors of treatment failure, it would be possible to select those children who would benefit from an associative treatment, such as TCPSE plus alarm or desmopressin. It may be that the small number of patients studied influenced the analysis. For instance, 54% of the patients who had daytime symptoms resolved after treatment also showed NE resolution. However, NE was resolved in only 17% of those patients in whom daytime symptoms persisted after treatment. Despite a difference of almost 30%, there was no statistical significance. Perhaps this could be attained with a higher number of patients.

Conclusions

Our data demonstrate that in patients with NMNE treated by TCPSE, we can expect a rate of complete and partial resolution of the NE of 43% and 21%, respectively. There was no pretreatment factor that predicted TCPSE failure.

Conflict of interest

None.

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Table 1 Distribution of pretreatment variables in patients cured and not cured of NE.

	Cured	Not cured	<i>P</i>
UTI	5 (62.5%)	5 (45.5%)	0.650
Urge incontinence	6 (75%)	11 (100%)	0.164
Frequency	5 (62.5%)	9 (81.8%)	0.603
Voiding difficulty	1 (12.5%)	2 (18.2%)	1.00
Nocturia	3 (37.5%)	2 (18.2%)	0.603
Constipation	4 (50%)	2 (18.2%)	0.319

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