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Review Article

Preliminary Assessment of Sacral Transcutaneous Electro Stimulation in Pediatric Patients Undergoing Colorectal Surgery

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Abstract

Purpose: The aim of this study was to assess the changing on anorectal manometry pattern and clinical outcome of patients who underwent sTENS to treat constipation after a pull-through procedure for congenital megacolon or who underwent a posterior sagittal approach for anorectal malformations. Method: Eighteen patients, 12 boys and 6 girls, 8.5 years mean age (1-17 years), who developed constipation on postoperative evolution and did not respond to medical therapy were submitted to sacral transcutaneuos electrical nervous stimulation from January 2015 to December 2015 and had their charts evaluated.

Results: There was remission of constipation in 11.1% of patients (2 out of 18). Manometrically, the resting pressure values (p=0.0125) and maximal contraction (p=0.0217) showed statistically significant differences between pre and post TENS and the percentage of asymmetry of the anal canal, here translated as asymmetry index (%), was lower after performing sTENS and has established a statistically significant difference against pre-sTENS (p = 0.0148).

Conclusion: sTENS has significantly altered some manometrical parameters and has influenced the outcome of these patients. Anorectal manometry is a useful tool in the physiological and functional assessment of the anal canal and sphincter muscle complex in pre and post sTENS.

Introduction

Sacral Transcutaneous Electrical Neural Stimulation (sTENS) was initially used as a treatment of bladder dysfunction and as a side effect; the authors realized that there was improvement in symptoms of constipation and fecal incontinence in patients undergoing sTENS [1]. Since then, some studies were conducted using various parameters to evaluate these derangements, mostly in patients whose primary complaint was fecal incontinence [2-6].

Neuromodulation is a term applied to the change in the function of an organ by modulation of neuronal activity that is obtained by electrical stimulation. Nerve and muscle cells are electrically excitable since the ion channels open, enabling the flow of current between the extracellular fluid and the cytoplasm. The site of application and the intensity of current determine the effects [2].

The aim of this study was to evaluate the assessment of changing on anorectal manometry pattern and clinical outcome of patients who underwent sTENS to treat constipation after a pull-through procedure for congenital megacolon or who underwent a posterior sagittal approach for anorectal malformations.

Methods

Eighteen patients, 12 boys and 6 girls, 8.5 years mean age (1-17 years), which developed constipation on postoperative evolution of a pull-through procedure or posterior sagittal approach and did not respond to medical therapy were submitted sTENS from January 2015 to December 2015 and had their charts evaluated. Patients with a diagnosis of true fecal incontinence or anal stenosis, those who missed the follow-up and those still under stimulatory therapy were not included (Table 1).

A pulse generator Accurate 195, LAUTZ®, produced the sacral electrical stimulation at a frequency of 20 Hz. Four 3.5cm surface electrodes were placed in the corresponding S2 and S3 dermatomes, bilaterally. They were weekly stimulated for a period of 1 session of 30 minutes each/week for 8 weeks. The patient's pain threshold was determinative of the intensity of the applied

Table 1: Casuistics.

Initials	Age	Sex	D	I	ARM1						ARM2						Outcome
					RP	RCP	VCP	RS	RSR	Sym	RP	RCP	VCP	RS	RSR	Sym	
JDCV	11	M	HD	Constipation	69	120	180	y	p	16	76	146	164	Y	p	6	Normal bowel movement
MFA	4	M	ARA	Constipation	17	22	58	Y	a	46	28	31	70	Y	a	21	Normal bowel movement
VSP	11	M	ARA	Constipation	16	19	61	Y	p	55	19	26	95	Y	p	31	Improvement of constipation
BCS	7	F	ARA	Constipation	32	65	109	Y	p	14	39	42	82	Y	p	16	Improvement of constipation
PBF	11	F	ARA	Constipation	43	66	137	Y	a	17	44	69	118	Y	a	16	Unaltered
MDOS	8	F	HD	Constipation	25	36	76	Y	a	20	36	48	97	Y	a	21	Unaltered
GHC	11	M	HD	Constipation	53	75	178	Y	p	32	79	107	208	Y	p	13	Improvement of constipation
PHAP	8	M	ARA	Constipation	35	62	151	Y	a	20	16	53	153	Y	a	20	Improvement of constipation
GSN	7	M	HD	Constipation	25	61	125	Y	a	31	58	60	121	Y	a	23	Improvement of constipation
JVSH	8	M	ARA	Constipation	33	38	104	Y	a	31	62	65	154	Y	a	24	Improvement of constipation
WBSC	17	M	HD	Constipation	66	77	199	Y	a	23	77	165	243	Y	a	15	Improvement of constipation
PHDV	5	M	HD	Constipation	33	63	128	y	a	33	57	72	121	Y	a	22	Improvement of constipation
CEOS	12	F	ARA	Constipation	16	40	44	N	a	40	22	26	89	Y	p	20	Improvement of constipation
ACABG	6	F	ARA	Constipation	41	83	77	Y	p	28	42	54	85	Y	p	34	Improvement of constipation
FCS	13	M	ARA	Constipation	28	35	65	Y	p	40	24	40	77	Y	p	40	Improvement of constipation
MFA	4	M	ARA	Constipation	17	31	70	N	p	47	13	23	55	N	p	38	Unaltered
BGAB	5	M	ARA	Constipation	31	45	99	Y	p	16	64	84	119	Y	p	22	Improvement of constipation
GAAS	5	F	HD	Constipation	52	68	107	Y	p	19	29	78	136	Y	p	27	Improvement of constipation
Mean	8.5				35.11	55.89	109.33			29.33	43.61	66.06	121.5			22.74	
SD	3.59				16.24	25.15	45.95			12.36	22.03	39.55	48.89			8.68	

D= Diagnosis; I=indication to sTENS; ARM1=Anorectal manometry previous to sTENS; ARM2: Anorrectal Manometry after sTENS; RP= Resting Pressure (mmHg); RCP=Reflex Contraction Pressure (mmHg); VCP= Voluntary Contraction Pressure (mmHg); RS= Rectal Sensitivity; Y= Yes; N=No; RSR= Rectosphincteric Reflex; p=Present; a= Abscent; Sym= Anal Canal Symmetry (%); SD=Standard Deviation

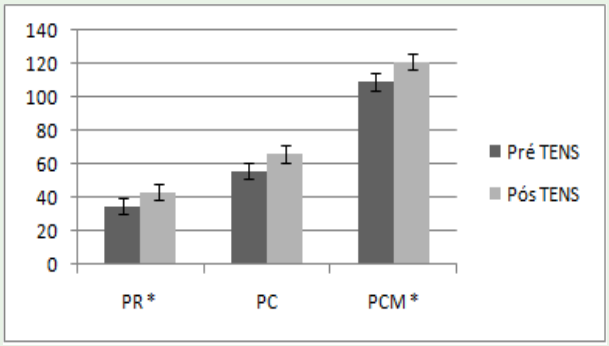

Figure 1: Mean pressure values (mmHg) on resting, contraction and maximal contraction pressures of the area on sphincter muscle complex higher pressure zone. (* $p \leq 0.05$ in pre and post sTENS comparison).

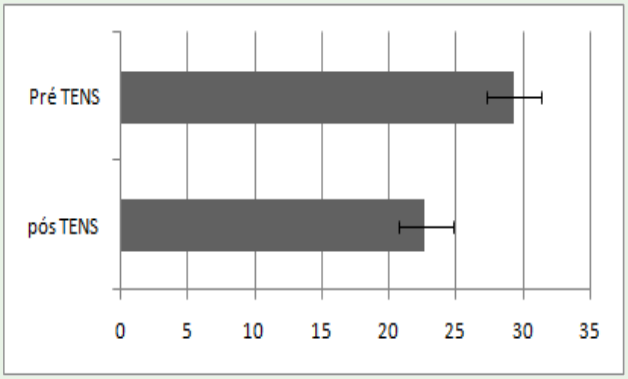

Figure 2: Asymmetry index (%) of the anal canal in the higher pressure zone.

electric current in each session. The assessment of patients was carried out by means of 8-channel open tip perfusion anorectal manometry, previously described [7], and by the clinical report of bowel function status before and after the sTENS sections.

Results

There was remission of constipation in 11.1% of patients (2 out of 18) that started to evacuate daily or on alternate days without loss of feces. The improvement of constipation, with regular episodes of bowel movement three or four times a week, without soiling, occurred in 72.2% of patients (13 out of 18). Only three patients (16.6%) showed no change in bowel habits after the use of sTENS. of the three patients in whom rectal sensitivity to inflation of the rectal balloon was not present, two developed sensitivity after receiving TENS, but a statistically significant difference was not determined (p = 0.0899).

The manometric assessment shows increased values on resting pressure, contraction pressure and maximum contraction pressure. Only the resting pressure values (p=0.0125) and maximal contraction (p=0.0217) showed statistically significant differences between pre and post sTENS, as shown in Figure 1. The percentage of asymmetry of the anal canal, here translated as asymmetry index (%), was lower after performing TENS and has established a statistically significant difference against pre-sTENS (p = 0.0148) as shown in Figure 2.

Discussion

While percutaneous sacral stimulation, in which there is surgical introduction of electrodes under the skin at the sacral roots, has a high rate of complications (15%), sTENS, with surface skin electrodes, which is already an accepted tool in the treatment of bladder instability, provides low cost and is free of the most feared complications of surgical percutaneous application of sacral stimulation electrodes such as infection of the surgical site, for example [2]. Electrical stimulation of the pelvic floor through the pelvic plexus (S2-S5) seems to stimulate the autonomic nervous system and cause direct and reflex responses mediating the fecal continence mechanism [7]. The outcome of the analysis of resting and contraction pressure presents conflicting results. The present study demonstrated an increase in the sphincteric complex pressure both at rest and at maximal contraction. Increased, as well as decreased resting and contraction pressure has been reported, in a way that the stimulation action directly to skeletal muscle cannot be determined [2]. These results suggest that the response to the sacral stimulation is not only a consequence of amendments of the sphincter function, but there is also a reflex response involved.

The measurement of rectal sensitivity (ie, the action of afferent sensory nerves), although not statistically significant, has come into existence in patients who did not recognize this sensitivity. In previous reports, the study of rectal sensitivity produced contradictory results: decrease and increase the sense of maximum tolerated volume, or no change [9,10].

It has been shown that sTENS has significantly altered some manometrical parameters and has influenced the outcome of these patients. Anorectal manometry as a useful tool in the physiological and functional assessment of the anal canal and sphincter muscle complex in pre and post sTENS, but we believe that only those parameters are not sufficient to determine the effectiveness of the method. Therefore, there are ongoing prospective studies using anorectal manometry combined with other assessment criteria such as quality of life index, visual analog scales and intestinal function indexes at our institution.

In this preliminary study it was not possible to separate patients from different malformations or surgical approach due to sample size. The casuistic is related to patients who experienced constipation after a pull-through procedure.

Further studies might bring new information's to light of Knowledgements.

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