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SACRAL NEUROMODULATION IN THE MANAGEMENT OF LOWER URINARY TRACT DYSFUNCTIONS: A NEUROPHYSIOLOGICAL EVALUATION

Hypothesis / aims of study
Currently, sacral neuromodulation (SNM) stands as the single licensed second-line treatment for the management of intractable overactive bladder syndrome (OAB). SNM can be considered a promising, potential solution to bladder dysfunctions which have a serious impact on patients' health status and quality of life, in carefully selected patients. However several questions are still unanswered, regarding the following topic: patient selection, prognostic factors, mechanism of action, complications and revision rates, effects on central and peripheral nervous system. Neurophysiology studies could be employed to provide more evidence on SNM mechanism of action and peripheral effect. The aim of this study was to evaluate clinical and neurophysiologic characteristics of patients with lower urinary tract dysfunctions (LUTD) undergone SNM implant trying to better understand neurophysiologic modification pre- and post-implant, defining responders' pre-implant neurophysiological characteristics.

Study design, materials and methods
Data (demographics, medical history,urologic investigations, and diagnosis) from all patients attending our institution from February 2006 to September 2009 for a SNM implant were collected. All patients underwent a pre-implant neurophysiologic evaluation as follows: Pudendal Nerve Somatosensory Evoked Potentials (PN-SSEPs); bilateral external anal sphincter electromyography (EAS-EMG); evaluation of the bilateral pudendal-anal reflex (PAR); Electromyographic and neurographic studies of lower limbs. A post-implant neurophysiological evaluation was performed in all implant removal candidates. For comparison Student's t test was used.

Results
A total of 22 consecutive patients (mean age 63.1 years) attending our institution (19 women and 3 men), with refractory overactive bladder (OAB) (54.5%), non-obstructive urinary retention (UR) (27.3%), mixed urinary incontinence (9.1%); chronic pelvic pain (CPP) (9.1%) underwent a permanent SNM implant. At a mean follow-up of 3.5 months (range 2-24 months), half of the patients have their implants removed (tables I-II). Table III shows pre- and post-implant PN-SSEPs findings in patients with durable beneficial from SNM. In patients undergone implant removal, values of PN-SSEPs, EAS-EMG and PAR were normal apart one case with an increase in bilateral pudendal nerve latency. Figure I shows pre-implant EAS-EMG findings in patients having beneficial from SNM. Pre-implant EAS-EMG findings were normal in 90.9% of patient undergone implant removal. Table IV summarizes pre- and post-implant R1 and R2 latencies of PAR in patients with effective SNM implant.

Interpretation of results
The greater effectiveness of SNM has been observed in patients with neurological damage neurophysiologically documented. To date there are no definitive data about the exact mechanism of action of SNM although it is conceivable a modulation on the somato-sensory afferents as well as a secondary effect on both somatic (pudendal nerve) and autonomic efferent motor pathways.

Concluding message
Our results suggest that the neurophysiologic exploration of the pelvic floor is an important step for the identification of suitable candidates for treatment with SNM. Further well-designed trials are needed in order to better define the role of neurophysiology in SNM, not just in identifying appropriate candidates for intervention, but also to guide the surgeon in more accurate positioning of the electrodes, using intraoperative monitoring, and to change the parameters of stimulation in patients unresponsive to treatment.

Table I. Characteristics of patients undergone implant removal

Patients	Age	Gender	LUTD	Time interval from temporary implant to removal (months)
CA	53	Female	UR	4
FM	78	Female	UR	3
BAR	71	Female	UR	32
MRG	37	Female	UR	26
MM	66	Female	OAB	2
DFL	21	Female	OAB	19
FA	68	Female	OAB	1
CM	48	Female	CPP	1
OM	53	Female	OAB	3
BL	50	Male	UR	3
MM	83	Female	UR	2

Table II. Characteristics of patients having durable beneficial from SNM

Patients	Age	Gender	LUTD	Follow-up (months)
GM	37	Male	OAB	26
RL	75	Female	OAB	27
BA	71	Female	OAB	54

FP	73	Female	OAB	55
GR	77	Female	OAB	33
BP	28	Female	CPP	31
ZL	58	Female	OAB	26
FG	80	Female	OAB	26
CA	73	Female	OAB	21
MA	66	Female	OAB	15
BA	40	Female	UR	21

Table III. Pre- and post-implant PN-SSEPs findings in patients with durable beneficial from SNM (SD*: Standard Deviation)

Parameter	Right side (pre-implant) mean (SD*)	Right side (post-implant) mean (SD*)	P value	Left side (pre-implant) mean (SD*)	Left side (post-implant) mean (SD*)	P value
Latency	38.52 (3.74)	37.11 (4.2)	0.17	37.11 (4.2)	34.92 (29.33)	0.10
Distal amplitude	3.29 (2.99)	3.95 (0.99)	0.01	2.07 (3.23)	1.79 (0.96)	0.05

Figure I. Pre-implant EAS-EMG findings in patients having beneficial from SNM.

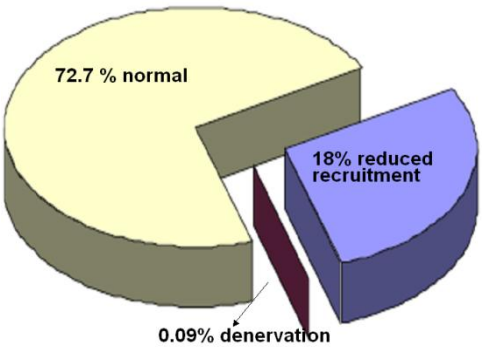

Table IV. Pre- and post-implant R1 and R2 latencies of PAR in patients with effective SNM implant. (NS*: Not Significant)

Parameter	Right side (pre-implant) mean	Right side (post-implant) mean	P value	Left side (pre-implant) mean	Left side (post-implant) mean	P value
R1 Latency	34.05	39.10	NS*	34.78	38.40	NS*
2 Latency	60.47	61.25	NS*	61.14	63.84	NS*

Disclosures
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