

Introduction

Neurogenic lower urinary tract dysfunction (NLUTD) is a therapeutic challenge because of a scarce response to pharmacologic or invasive therapies.

Sacral neuromodulation (SNM) might be a therapeutic tool for refractory NLUTD patients.

Objectives

- To **describe** the characteristics of patients with NLUTD treated with SNM in a tertiary Hospital.

-To analyze long term **results and complications** of this technique in neurologic patients.

Results

A total of 22 patients were enrolled, 14 women (63.6%) and 8 men (36.4%). Mean age at implantation was 51 ($\pm$ 16.2) years old. Most frequent comorbidities were sexual dysfunction in 9 patients (40.9%) and neurogenic bowel in 11 patients (50%).

Neurologic conditions responsible for NLUTD are listed on **Table 1**. Clinical diagnosis (based on symptoms) are shown in **Table 2**, whereas Urodynamic findings are shown in **Table 3**. Patients had received a mean of 2.8 (range 1-9) treatments or combinations before SNM.

Table 1. NLUTD associated disorders

Neurologic disorders	Patients (%)
Incomplete spinal cord injury (SCI)	5 (22.7%)
Multiple Sclerosis and other demyelinating	4 (18.2%)
Myelitis	4 (18.2%)
Myelomeningocele	3 (13.6%)
Lumbar Spinal Stenosis	2 (9.1%)
Parkinson’s disease	1 (4.5%)
Others	3 (13.5%)

Table 2. Clinical diagnosis.

Clinical diagnosis	Patients (%)
Urgency Urinary Incontinence (UUI)	14 (63.6%)
Voiding Dysfunction (VD)	6 (27.3%)
Urgency-Frequency (without incontinence)	2 (9.1%)

Table 4. Success rate after test phase (1 month) and after permanent SNM implant (at latest follow-up)

NLUTD	Test Phase		Permanent Implant		
	success/tested patients	Success rate (%) (per-protocol)	success/implanted patients	Success rate (%) (per-protocol)	Success rate (%) (intention-to-treat)
UUI	9/14	64.3	8/9	88.9	57.1
Urgency-Frequency	1/2	50	1/1	100	50
Patients with Clean Intermittent Self-Catheterization (CISC)*	5/9	55.6	2/5	40	22.2
Global	13/22	59	11/13	84.6	50

* Patients with Voiding Dysfunction (alone or associated to other disorders) in need of CISC.

Table 5. Complications and their management

Complication	Patients (%)	Management
High impedance	1 (7.7%)	Electrode replacement
Extrusion	1 (7.7%)	Electrode replacement
Low compliance	1 (7.7%)	Onabotulinum toxin A
Aversion to implant	1 (7.7%)	Removal
IPG pain	1 (7.7%)	Corticosteroids injection

Materials and methods

This is an **observational, descriptive, retrospective, single center study** of patients with refractory NLUTD managed with SNM in our institution from **2008 to 2017**.

We registered medical background, type and degree of the **neurological condition**, clinical diagnosis and previous treatments for NLUTD. **Urodynamic evaluation** of every patient was performed and interpreted in accordance with the 2002 Good Urodynamic Practice guidelines of the International Continence Society.

We analyzed **the success rate (per protocol and intention-to-treat)** after a test phase (1 month) and one year after final implantation, when performed. **Complications** during follow-up and their management were recorded. All statistical analysis were performed with SPSS®v18.

Table 3. Urodynamic findings

Urodynamic diagnosis	Patients (%)
Detrusor Overactivity (DO)	8 (36.4%)
DO with urinary incontinence	4 (18.2%)
Detrusor acontractility	3 (13.6%)
Detrusor underactivity (DU)	2 (9.1%)
Detrusor Sphincter Dyssynergia (DSD)	1 (4.5%)
DSD + Low compliance bladder	1 (4.5%)
DO + DU	1 (4.5%)
Mixed urinary incontinence (MUI)	1 (4.5%)
Inconclusive	1 (4.5%)

Mean follow-up was 52.6 ($\pm$ 37.9) months (median 36 months). The average duration of the effect was 51.2 ($\pm$ 39.4) months. Battery replacement was required in 4 patients (30.8%) at mean time of 43.8 ($\pm$ 30.7) months.

Success rate during temporary stimulation period was 59% (13 patients). All of them received a definitive implant. The **global success rate** (improvement over 50%) was **84.6% per-protocol and 50% in intention-to-treat** patients at latest follow up (minimum 12 months). These results are summarized in **Table 4**.

No early postoperative complication was reported, but **5 patients (38.5%)** had some **late complications** (listed on **Table 5**) mainly due to the Implantable Pulse Generator (IPG), and all of them scoring below IIIa on Clavien-Dindo Classification. Our re-operation and removal rate were 23% and 7.7% respectively.

Conclusion

Among our patients, SCI was the main cause for NLUTD, and DO was the most frequent urodynamic finding.

Treating refractory NLUTD patients with NMS, our test phase and long term success rate are 59% and 84.6% respectively. Late, minor complications may appear.

In our experience, SNM is a safe and effective procedure to treat NLUTD in patients refractory to standard of care.