Urodynamics and sacral neuromodulation efficacy in patients with neurogenic lower urinary tract dysfunction: Results from a single surgeon cohort

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Hypothesis & aims of study

- The implantation of Sacral neuromodulation (SNM) devices in individuals with neurogenic lower urinary tract dysfunction (NLUTD) remains a topic of debate, given the limited availability of high-quality evidence in this area.

The objective of this study was to evaluate the **efficacy of SNM** therapy in a cohort of patients with **neurogenic lower urinary tract dysfunction**, all treated by a single surgeon, and whether urodynamic parameters could help in predicting SNM response in this cohort of patients.

Study Design

- Retrospective review of data of patients with NLUTD treated with SNM in a university hospital between 2019 and 2023
- All procedures, namely test-phase and 2nd stage (SNM device implantation) were performed under local anesthesia by a single surgeon
- Outcome measures:
  - Bladder Diary data of patients before neuromodulation and at 6-12 months after treatment
  - Urodynamic or Video-Urodynamic exams before treatment
  - Medical records review

Study Group

- A total of 31 patients with NLUTD who underwent SNM
  - 7 excluded due to lack of data
- **24 patients** in the analysis group
  - 12 men, 12 women; mean age of 45.7 ± 16.0 years
  - **8** patients performing intermittent self-catheterization (**ISC**)

Patients' neurologic conditions: spinal cord injury (6 patients), multiple sclerosis (4), myelomeningocele (4), encephalitis (2), stroke (2), herniated disk (1), caudal regression syndrome (1), cerebral glioblastoma (1), Parkinson's (1), *miastenia gravis* (1) and cauda equina syndrome (1)

Mean/24h	Pre-SNM	Post-SNM	Change	*p-value*
Daily voiding episodes	9,4	6,2	-3,2	<0,001
Nocturia	2,4	1,4	-1,0	<0,001
Bladder Sensation Scale 3	2,3	1,2	-1,1	0,128
Bladder Sensation Scale 4	5,2	1,9	-3,3	<0,001
Mean volume (mL)	176	237	+61	0,011

Table 1. Mean values and changes in Bladder Diary pre/post-SNM

Results

- **19/24** patients proceeded to the implantation of the permanent implant (**successful test-phase**)
- Changes in Bladder Diary parameters displayed in Table 1
- 8 patients were performing ISC
  - 5 proceeded to 2nd stage (permanent device)
  - 1/5 stopped performing ISC (able to void spontaneously)
  - 4/5 continued performing ISC (but reported better continence)
- Change in Bladder Diary data was not different in males vs females, nor variable with age

Urodynamic Features and influence in SNM results

- Patients with higher **Bladder Contractility Index** experienced a better improvement in Bladder Diary parameters, namely:
  - Greater reduction in nocturia (r^2=0.209, p=0.019)
  - Tendency for a greater decrease in the number of daily micturitions (r^2=0.106, p=0.077)
  - Stronger increase in volume of micturitions (r^2=0.141; p=0.070)
- Other Urodynamic features, namely cystometric capacity, presence of non-inhibited detrusor contractions, urgency, incontinence, Qmax, PdetQmax, post-micturition residue and Bladder Outlet Obstruction Index did not show any influence on Bladder Diary parameters change.

Discussion

- Emerging evidence suggests a potential utility for sacral neuromodulation in the management of NLUTD, although the prediction of efficacy remains very challenging
- In this study, 21% of patients did not experience sufficient improvement during the test phase to proceed to permanent device implantation, a proportion **similar** to the observed in the literature for non-neurogenic patients.
- Only a preserved **Bladder Contractility Index** has shown an association with better outcomes, suggesting that the preservation of bladder contractility is a good prognostic factor for patients undergoing treatment with SNM
- Additionally, SNM appeared to positively impact other important outcomes such as the need of ISC, bowel-related symptoms, and quality of life.

Conclusions

In this cohort of patients with neurogenic lower urinary tract dysfunction, Sacral neuromodulation proved to be **safe** and **effective**. Urodynamics may be of use in predicting efficacy of SNM, since patients with a good detrusor contractility seem to respond better to SNM, with a greater improvement in bladder diary parameters.

References

Chan G, Qu LG, Gani J. Evaluation of pre-operative bladder contractility as a predictor of improved response rate to a staged trial of sacral neuromodulation in patients with detrusor underactivity. World J Urol. 2021 Jun;39(6):2113-2119. doi: 10.1007/s00345-020-03380-z. Epub 2020 Jul 28. PMID: 32725304.

Rademakers KL, Drossaerts JM, van Kerrebroeck PE, Oelke M, van Koeveringe GA. Prediction of sacral neuromodulation treatment success in men with impaired bladder emptying-time for a new diagnostic approach. Neurourol Urodyn. 2017 Mar;36(3):808-810. doi: 10.1002/nau.23010. Epub 2016 Apr 6. PMID: 27062496.

Drossaerts J, Rademakers K, van Koeveringe G, Van Kerrebroeck P. The value of urodynamic tools to guide patient selection in sacral neuromodulation. World J Urol. 2015 Nov;33(11):1889-95. doi: 10.1007/s00345-015-1479-6. Epub 2015 Feb 14. PMID: 25680936; PMCID: PMC4617837.