

Can Urodynamic Parameters Predict Outcomes of Sacral Neuromodulation in Non-obstructive Urinary Retention?

Oldenhof A¹, Kleiterp V¹, Engberts M², Witte L¹

1. Department of Urology, Isala Zwolle, The Netherlands

2. Department of Gynaecology and Obstetrics, Isala Zwolle, The Netherlands

Hypothesis / aims of study

Non-obstructive urinary retention (NOUR) is the inability to (completely) empty the urinary bladder without the presence of bladder outlet obstruction. The etiology of NOUR is not clear, but it is hypothesized that an exaggerated pro-continence guarding response prevents relaxation of the urethral sphincter, resulting in an inability to void.(1) In order to make a correct diagnosis, these women are often examined by means of a urodynamic study (UDS) including urethral sphincter electromyography (EMG). However, this is an invasive and burdensome examination. A previous study comparing urethral sphincter EMG with urethral pressure profile (UPP) showed that a pulsatile UPP is a good predictor for an abnormal urethral sphincter EMG (positive predictive value of 0.82) and is less stressful than a sphincter EMG.(2)

A treatment option for NOUR is sacral neuromodulation (SNM). In a randomized study, 69% of patients were able to completely stop catheterization after SNM.(3) SNM is a two-stage procedure. If the trial proves successful (≥50% improvement of complaints), the definitive internal pulse generator is implanted subcutaneously in the second phase.

It is still unclear if UDS before SNM can identify parameters that predict success. The aim of this study was to determine which UDS parameters, including UPP, are predictors of successful TLP in patients with NOUR.

Study design, materials and methods

This single site retrospective study encompassed women aged 18 years and over with NOUR who underwent a unilateral staged TLP between September 4, 2017, and July 10, 2023. Data were obtained from UDSs of women with NOUR before treatment with SNM. All patients in this study underwent UDS according to ICS standards, including a UPP. A pulsatile pattern of the UPP is defined as a phasic, pulsatile variation in pressure observed at the external sphincter (peak of profile), with a peak to peak pressure of 10 cmH2O or greater.(2) Exclusion criteria were neurologic disorders like Parkinson's disease, Multiple Sclerosis, (partial) spinal cord injury, Spina Bifida or absence of representative UDSs.

Results and interpretation

Baseline characteristics

A total of 28 patients were enrolled in the study. The cohort had a mean age of 46.4 years (± 3.0 years) (Table 1).

Urodynamic parameters

Before treatment, a total of eight (28,6%) patients had a pulsatile UPP, 15 (53,6%) patients did not have a pulsatile UPP, and in three (10.7%) patients it was unknown. TLP was successful in 20 (71.4%) patients. In six (75,0%) patients with a pulsatile UPP, TLP was successful. Urodynamic parameters were analyzed before TLP and compared between responders and non-responders (Table 2). Only 12 out of 28 (42.9%) patients voided spontaneously during the first UDS. In two cases this data was missing. No significant differences were found between responders and non-responders in all urodynamic parameters. In a secondary analysis, we observed a significant difference in UPP maximum urethral closure pressure (MUCP) between patients with a pulsatile UPP and patients with non-pulsatile UPP (p=0.02). A logistic regression analysis was performed to compare if a pulsatile UPP is a predictive value for clinical outcome of TLP. Confounding factors such as age, psychiatric disorders and PTSD were added to the analysis. No significant associations in odds were found (p=0.72).

Table 1. Baseline characteristics

n (%) Total patients 26 (100) Age (mean ± SD) 46.4 ± 3.0 DM 3 (11.5) Pelvic surgery 13 (50.0) Psychiatric disorder 6 (23.1) PTSD^a 6 (23.1)

Table 2. Urodynamic parameters before TLP including UPP

Urodynamic parameters	n	Non-responders Median (IQR: Q1-Q3)	n	Responders Median (IQR: Q1-Q3)	P-value ^a
First desire bladder filling (mL)	7	454 (314-565)	19	380 (224-645)	0.75
Strong desire bladder filling (mL)	6	573 (441-767)	10	502 (323-665)	0.39
Strong desire Pdet (cmH ₂ O)	6	4 (2-6)	10	1 (-3 - 4)	0.14
Max. capacity (mL)	8	660 (472-834)	19	650 (327-752)	0.40
UPP MUCP (cmH ₂ O)	8	79 (50-99)	19	90 (63-114)	0.20
UPP MUP (cmH ₂ O)	8	112 (76-130)	19	121 (90-141)	0.63
Pulsatile UPP peak to peak	2	14 (12-x)	17	14 (13-x)	0.56
UPP post void residual (mL)	8	593 (472-769)	19	469 (327-679)	0.20

^a PTSD is a term used to describe a negative sexual experience Abbreviations: DM, Diabetes Mellitus; PTSD; Post-traumatic Stress disorder; SD, standard deviation; TLP, Tined lead procedure

^a Based on Mann Whitney U test for nonnormal unpaired continuous outcomes.

Abbreviations: MUCP; maximum urethral closure pressure, MUP; maximum urethral pressure, TLP; tined lead procedure, UPP; urethral pressure profile.

Interpretation of results

We did not find any significant difference in urodynamic parameters between responders and non-responders, therefore we have not been able to identify any urodynamic predictors of successful TLP. It was noticeable that patients with a pulsatile UPP had a significantly higher MUCP than patients with a non-pulsatile UPP, but a clear cut-off value is still to be determined for patients with NOUR. It seems that there is a strong correlation between a positive outcome of TLP and patients with a pulsatile UPP. However, our analysis did not show any correlation between a pulsatile UPP and the outcome of TLP. This may be explained by a small study size and the limited number of patients with a pulsatile UPP. Previous studies showed that a pulsatile UPP is a good predictor for an abnormal EMG, however our study showed that the aspect of the UPP was not predictive of successful TLP. More than three quarters of the patients studied benefited from TLP, regardless of the aspect of the UPP. Further research is needed with a larger study population to see if there is a positive correlation between pulsatile UPP and success of TLP and if there are predictors of success based on urodynamic parameters.

Conclusions

Our study showed no urodynamic predictors of successful TLP in patients with NOUR. More research in a larger study population is needed to confidently state that there is no correlation.

References

1. Panicker JN, Anding R, Arlandis S, et al. Do we understand voiding dysfunction in women? Current understanding and future perspectives: ICI-RS 2017. Neurourology and Urodynamics. 2018;37:S75–S85.

2. Sihra N, Malde S, Panicker J, Kightley R, Solomon E et al. Does the appearance of the urethral pressure profile trace correlate with the sphincter EMG findings in women with voiding dysfunction? Neurourology and Urodynamics. 2018;37:751-757.

3. Jonas U, Fowler CJ, Chancellor B, Elhilali MM, Fall M et al. Efficacy of sacral nerve stimulation for urinary retention: results 18 months after implanation. The Journal of Urology. 2001; 165:15-19.