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# SACRAL NEUROMODULATION IN WOMEN WITH IDIOPATHIC DETRUSOR OVERACTIVITY INCONTINENCE: REDUCED OVERACTIVITY BUT UNCHANGED BLADDER CONTRACTION STRENGTH AND URETHRAL RESISTANCE

## Aims of Study

The long-term success rate of sacral neuromodulation (SNS) in patients with refractory idiopathic detrusor overactivity incontinence (IDOI) is about 60% and is probably limited by the fact that no variables predictive of outcome have been identified. This deficiency is related to the incomplete understanding of the mechanism of action of SNS. The current study examines how SNS affects voiding in women with IDOI. The results might have therapeutical consequences and contribute to the understanding of the physiology of neuromodulation.

## Methods

A video urodynamic examination at baseline and 6 months after implantation is part of the evaluation of SNS at our department. Room temperature contrast fluid is infused into the bladder via a 5F transurethral feeding tube. A second 5F tube and an 8F tube are used for measuring intravesical and rectal pressure, respectively. Flow rate is measured with a rotating disk flowmeter. The voided volumes are determined with a measuring glass. The residues are either determined by catheterisation or estimated from the fluoroscopic image and the difference between filled and voided volumes. The urodynamic study at baseline consists of two filling cystometries: one in the supine and one in the standing position. The study after 6 months includes the same cystometries with the implantable pulse generator (IPG) on. Each cystometry is followed by a pressure / flow (p/Q) study in the standing position. At follow-up, the IPG is on during the first void and off during the second void. The cystometries and p/Q studies are stored on computer disk since 1993.

Only female patients with urodynamically demonstrated idiopathic detrusor overactivity at baseline were included in this study. The urodynamic data of these patients was re-analysed with AUDACT™ software version 4.50. The parameters derived from the p/Q studies were the maximum flow rate $Q_{max}$, the associated detrusor pressure $p_{det.Qmax}$ and parameters characterizing the urethral resistance and the bladder contraction strength. The urethral resistance parameters used were the bladder outlet obstruction index BOOI (the former Abrams / Griffiths number), the urethral resistance factor URA and the average pressure $p_{low.ave}$ and the slope $s_{low}$ of the low pressure side of the p/Q plot. Bladder contraction strength was characterized by the parameter w. Both its maximum value $w_{max}$ and its value at maximum flow rate $w_{Qmax}$ were considered. The second p/Q study of the pre-treatment measurement was taken to determine the baseline voiding parameters. These were compared with the parameters derived from the first p/Q study (the one with the IPG on) of the post-treatment measurement.

The parameters derived from each filling cystometry were the maximum detrusor pressure $p_{max}$, the amplitude $A_{inv}$ of the highest involuntary contraction and the end fill volume $V_{end}$. The combined results of both cystometric studies, that is, the maximum of the two $p_{max}$ and $A_{inv}$ values and the minimum of the two $V_{end}$ values, were used to characterize the degree of detrusor overactivity. The maximum of the two $V_{end}$ values was taken as the maximum cystometric capacity (MCC).

Wilcoxon's matched pairs signed-rank test was used for statistical evaluation.

## Results

An IPG was implanted in 29 women with IDOI since 1993. Five of these patients did not yet pass the 6-month follow-up period. The results in 2 patients could not be used due to straining artifacts or the loss of a catheter during voiding. The mean age at implantation of the 22 evaluable patients was 48 (range: 19-70) years.

| | | baseline | 6 mo – IPG on | p |
|---|---|---|---|---|
| Filling | Maximal $p_{max}$ (cm $H_2O$) | 49 (35 – 66) | 33 (14 – 51) | 0.003 |
| | Maximal $A_{inv}$ (cm $H_2O$) | 41 (24 – 55) | 24 (0 – 40) | 0.002 |
| | Minimal $V_{end}$ (ml) | 264 (139 – 389) | 339 (203 – 448) | 0.032 |
| | MCC (ml) | 380 (200 – 510) | 437 (296 – 579) | 0.158 |
| Voiding | Voided volume (ml) | 222 (99 – 306) | 373 (265 – 514) | 0.001 |
| | Residue (ml) | 58 (0 – 72) | 37 (0 – 50) | 0.328 |
| | $Q_{max}$ (ml/s) | 12.1 (7.6 – 16.3) | 17.6 (11.7 – 21.6) | 0.006 |
| | $p_{det.Qmax}$ (cm $H_2O$) | 39 (26 – 48) | 38 (29 – 45) | 0.922 |
| | BOOI (cm $H_2O$) | 15 (0 – 28) | 3 (-8 – 19) | 0.007 |
| | URA (cm $H_2O$) | 21 (13 – 26) | 16 (11 – 20) | 0.006 |
| | $p_{low.ave}$ (cm $H_2O$) | 34 (23 – 47) | 32 (23 – 38) | 0.871 |
| | $s_{low}$ (cm $H_2O$/ml/s) | 1.9 (0.1 – 1.8) | 1.1 (0.2 – 1.5) | 0.754 |
| | $w_{max}$ ($W/m^2$) | 9.8 (8.1 – 11.8) | 11.4 (7.7 – 14.2) | 0.153 |
| | $w_{Qmax}$ ($W/m^2$) | 8.7 (7.7 – 11.0) | 9.3 (6.6 – 11.8) | 0.516 |

The table reports the mean values and interquartile ranges of the parameters considered. The well-known suppressive effect of SNS on detrusor overactivity was confirmed. This effect led to considerably higher voided volumes at follow-up, which may explain the higher $Q_{max}$ values. The parameters BOOI and URA were significantly lower at follow-up. All other voiding parameters were unaffected.

**Conclusions**

We previously demonstrated that in addition to $Q_{max}$, the parameters BOOI, URA and $s_{low}$ depend on the voided volume [1]. This makes them less suitable for the current study. The other voiding parameters mentioned in the table are not volume dependent [1]. It can therefore be concluded that SNS does not affect urethral resistance ($p_{low.ave}$) and bladder contraction strength ($w_{max}$, $w_{Qmax}$) in women with IDOI. This is remarkable considering the improved voiding in patients treated for non-obstructive retention. Also, the suppressive effect of SNS on involuntary detrusor contractions apparently does not diminish the strength of voluntary contractions. This underlines that different physiologic mechanisms are involved in these two kinds of contractions.

[1] Urological Research 28: 128-131, 2000