

URETHRAL REFLEX DUE TO A 7F TRANSURETHRAL CATHETER.

Hypothesis / aims of study

Potential irritant and/or obstructive effect of a transurethral catheter on the voiding phase has not been widely studied in women. It is frequent to observe a dramatic decrease of the maximum flow rate Q_{max} during intubated flow (IF) compared with that during free uroflowmetry (FF) while the initial bladder volume (V_{ini}) and/or the voided volume (V_v) are non significantly different [1].

Our objective was to search for the causes of such unexplained differences between the observed Q_{max} using the VBN mathematical model of micturition [2].

Study design, materials and methods

The studied population consisted of 42 women with lower urinary tract symptoms (LUTS) due to frequency or incontinence (all kinds) who underwent an urodynamic testing using the Dorado unit from Laborie. All were free of neurological condition or/and previous pelvic surgery. The urodynamic session included a FF at arrival, an IF after filling cystometry at 50 mL/min filling rate (urethral catheter 7F in seated position) and a urethral pressure profilometry (lying position, bladder empty before cystometry and bladder filled at functional bladder capacity after IF). All women had $Q_{max}FF \geq 1.5 * Q_{max}IF$; among these, 28 had similar V_{ini} . Thirty one women, who had same LUTS and for whom similar Q_{max} and V_{ini} during FF and IF had been recorded, were a control group.

VBN analysis [2] was conducted using the usual protocol. Criteria for acceptable conclusions were 1) a good fitting between recorded and computed curves (quadratic error less than 5%) and 2) same value of the mechanical parameters (detrusor contractility k and urethral parameter in case of compression or constriction) for FF and IF in a given file.

Results

Studied group (Figure): 1) Among the 28 files with similar V_{ini} , analysis could be achieved for 22 files; in the remaining 6 files, a high frequency non rhythmic rectal activity during IF prevented reliable analysis. Mean age was 63 ± 17 y [18-91]. Analyzed flow parameters were V_v , average Q (Q_{ave}), voiding time (t_{void}) and time to Q_{max} (t_{Qmax}).

	V_v mL	Q_{ave} mL/s	t_{void} S	t_{Qmax} S
FF	321 ± 100	18 ± 7	21.2 ± 8.4	7.9 ± 3.6
IF	267 ± 36	6 ± 3	60.2 ± 30.1	18.2 ± 10.8
p	n.s.	<.0001	<.0001	<.0001

The detrusor contractility k was 0.57 ± 0.23 [0.20-1.0]. Urethral compression was found in 4 women [3-14 cm H₂O] and urethral constriction only in 1 (0.6 *standard cross-section area).

VBN analysis was consistent with an incomplete sphincter relaxation during IF voiding with a remaining sphincter pressure of 17.8 ± 12.4 cm H₂O.

2) Among the 14 files with different V_{ini} , analysis could be achieved for 12 files. VBN analysis was consistent with an incomplete sphincter relaxation during IF with a remaining sphincter pressure of 20.7 ± 12.2 cm H₂O ($k=0.63 \pm 0.27$ [0.35-1.0]).

Control group: analysis of all files showed a complete sphincter relaxation during FF and IF.

Theoretical analysis: The obstructive mechanical effect of a 7F urethral catheter was theoretically analyzed for $V_{ini} = 370$ mL: the computed decrease of Q_{max} (standard mechanical parameters for detrusor and urethra) was 4 mL/s, i.e. very lower than the decrease observed.

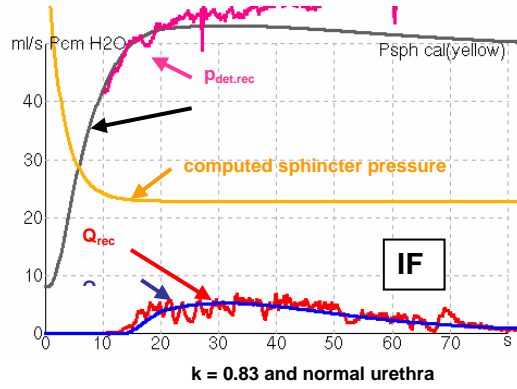
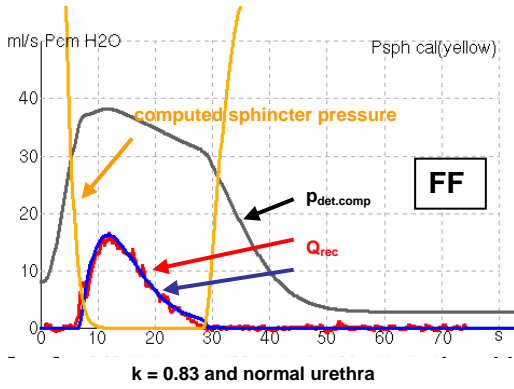
Interpretation of results

Transurethral catheterization is known to adversely affect the flow curves, inducing polyphasic flow, low Q_{max} and longer flow time. Possible explanations such as dysfunctional voiding due to anxiety or urethral obstruction can be proposed but none can be verified. Applying VBN mathematical micturition model allows testing the hypotheses of an obstruction induced by the catheter and of a remaining sphincter contraction. Theoretical computation allows excluding the mechanical effect of the catheter. The decrease of Q_{max} during IF is clearly related to an incomplete sphincter relaxation. Thus, it is possible to evoke a urethral reflex induced by the catheter in situ.

A consequence of the decreased Q_{max} is an increased flow time leading to an inhibition of the voiding process and a large post void residual volume [3].

Concluding message

The decrease in Q_{max} observed during IF when compared with that during FF at arrival (same urodynamic session) does not result from the mechanical effect of the catheter. It must be related to an incomplete sphincter relaxation during voiding and could involve, in addition to the anxiety of the patient, a urethral reflex. Other flow parameters (Q_{ave} , t_{void} and t_{Qmax}) are also modified. These findings underline the necessity to combine a FF with an IF during an urodynamic session in order to increase the reliability of the conclusions of the urodynamic investigation.



incomplete sphincter relaxation during flow

References

1. J Urol 2000; 169:109-114
2. NAU 2000; 19: 153-176
3. NAU 2008; 27: 297-300

Specify source of funding or grant	None
Is this a clinical trial?	No
What were the subjects in the study?	HUMAN
Was this study approved by an ethics committee?	No
This study did not require ethics committee approval because	It involved retrospective analysis of urodynamic studies from a database
Was the Declaration of Helsinki followed?	Yes
Was informed consent obtained from the patients?	No