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A URETHRAL REFLEX INDUCING AN INCOMPLETE SPHINCTER RELAXATION CAN EXPLAIN THE DECREASE OF MAXIMUM FLOW RATE DURING INTUBATED FLOW IN WOMEN.

Hypothesis / aims of study

A large decrease of maximum flow rate (Q_{max}) during intubated flow (IF) is frequently observed while in some patients that phenomenon is missing. If the decrease of Q_{max} is not debatable, its cause remains discussed: impaired detrusor contractility or incomplete sphincter relaxation leading to a residual sphincter pressure (RSP).
Our purpose was, using the VBN mathematical micturition model [1], to give arguments allowing to choose between these 2 hypotheses.

Study design, materials and methods

We reviewed a urodynamic database of women referred for the evaluation of lower urinary tract dysfunction. Criteria of exclusion were a neurological disease or grade ≥2 prolapse. All eligible women performed free uroflow (FF1) before cystometry and IF (7F urethral catheter), and a second FF (FF2) at the end of the session. Analysis of FF and IF was made using the VBN model (requirements: voided volumes ≥100 ml and continuous flow curves). Criteria for acceptable result: same value of the mechanical parameters (VBN parameters for detrusor contractility (k) and urethra (constriction □ or/and compression □) during the session and fitting between recorded and computed curves with a quadratic error less than 5%.
Additional analysis of the data was made from theoretical simulations using the VBN model.

Results

1- Urodynamics

Among 472 women, 157 met the criteria for inclusion. For each women the 3 uroflows were analyzed. Effect of the urethral catheter was only a geometric one in 60 (38.1%) patients with $Q_{maxIF} \approx Q_{maxFF1}$ (Group I). An additional effect of the urethral catheter was observed in 97 (61.9%) patients with $Q_{maxIF} < 1.5 * Q_{maxFF1}$ (Group II) (Fig).
There was a small increase (non significant) in detrusor pressure at Q_{max} ($p_{det.Qmax}$) in the Group II (21.7±17.7 vs. 18.3±22.6 cm H_2O); the difference in Q_{max}IF was significant (10.2±6.1 vs. 19.9±8.8 ml/s p<.0001) while the initial bladder volume (V_{ini}) did not differ (395±132 vs. 426±146 ml).

2- Simulations

The value of each VBN parameter was obtained from mean data ($p_{det.Qmax}$ and Q_{max}IF) of Group I and V_{ini}=400 ml (Table):

	$p_{det.Qmax}$ (cm H_20)	Q_{max}IF (ml/s)	k	σ	γ (cm H_20)
Simulation from sub-group I	18.3	19.9	**0.30**	**1.1**	0
First trial with urethral compression	**22** (observed 21.7)	10.2	0.30	1.1	**9.0**
Second trial with decrease of detrusor contractility	**15** (observed 21.7)	10.2	**0.15**	1.1	0

Thus the effect of the catheter was identified as an incomplete sphincter relaxation.

3- Remaining sphincter pressure

The ratio RSP/maximum urethral closure pressure was 0.39±0.25. Among the Group II, the same remaining sphincter pressure was found in 30 (30.97%) during FF2 (Fig b).

Interpretation of results

The geometric effect of a catheter can be modeled as a constrictive obstruction. Theoretical computations for women show that this effect is too much weak to explain the high differences observed between Q_{max}FF1 and Q_{max}IF. In our study, we observe similar Q_{max} for FF1 and IF in 38.1% of our files. To explain the large decrease of Q_{max} during IF in 62% of our files, we have to search for an additional phenomenon. Two hypotheses can be proposed: a decrease of detrusor contractility or a urethral obstruction. The first one is associated with a decrease of $p_{det.Qmax}$, the second with a slight increase of $p_{det.Qmax}$ (due to the Hill-Griffiths'law). The value of $p_{det.Qmax}$ is not significantly different between the 2 groups. However the small increase observed in the group with lower Q_{max}IF is consistent with a urethral cause, not with a detrusor one. The mechanic status of the bladder and the urethra cannot change during a urodynamic session but the nervous control can differ (without any pathological meaning) for successive voidings. So, we assume the possibility of an incomplete sphincter relaxation during voiding and we conclude that the presence of a urethral catheter can at times evoke a urethral reflex mechanism. That residual sphincter excitation is a nerve-mediated phenomenon due to the presence of a foreign material in the urethra.

Concluding message

When comparing IF with FF1 using the VBN model, a large decrease in Q_{max} did not appear to result from the mechanical effect of the catheter but from an incomplete sphincteric relaxation during voiding, possibly because of patient's anxiety or a urethral reflex induced by the presence of the catheter. These findings underscore the need to perform a FF before the IF to strengthen the reliability of the conclusions of a urodynamic investigation.

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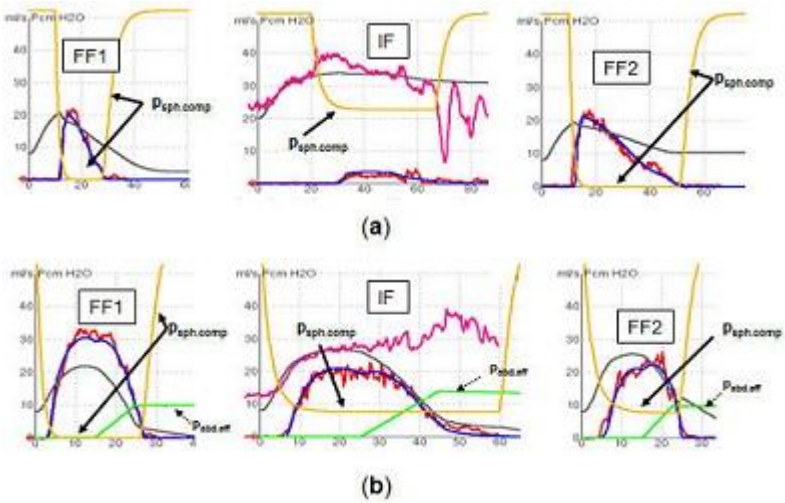

References
1. NAU 2000; 19(2): 153-76

Disclosures
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