

DETRUSOR FORCE IN WOMEN. EVALUATION FROM VBN ANALYSIS OF PRESSURE-FLOW STUDIES.

Hypothesis / aims of study

Evaluation of detrusor force in women is a difficult challenge. In man, voiding is mainly governed by the detrusor force and a "urethral resistance"; a range of detrusor force has been obtained from pressure-flow studies of men with bladder outlet obstruction [1]. Our hypothesis was that female voidings were dependent on similar parameters. Thus, using the VBN mathematical model of micturition [2] to analyze pressure-flow recordings, the aims of our study were to evaluate the detrusor force in women and to search for a correlation with a "urethral resistance" simulated by an obstruction.

Study design, materials and methods

Pressure-flow studies of non-neurogenic women referred for evaluation of lower urinary tract dysfunction (LUTD) to our urodynamic center were retrospectively analyzed.

Criteria for inclusion were pressure-flow tracings providing a maximum flow rate $Q_{\max}$ and detrusor pressure at $Q_{\max}$ ($p_{\det, Q_{\max}}$), without significant abdominal pressure changes ($< \pm 3$ cm H₂O between onset of flow and $Q_{\max}$), an initial bladder volume (voided volume plus post void residual) > 100 mL, and a non-interrupted flow.

VBN simulations needed to know the initial bladder volume and the urethral catheter diameter. Evaluated parameters were the VBN parameter of detrusor force k (without unit) and a "urethral resistance" U (unit cm H₂O). Standard values were $k = 1.0$ and $U = 0$.

Results

The population comprised 154 women with a mean age: 58.8 ± 17.0 . Two sub-groups were identified based on the standard VBN analysis (A: 125 women, mean age 58.0 ± 17.2 y) or not possible (B: 29 women, mean age 62.1 ± 15.5 y).

In sub-group A, the VBN parameter k and U were identified. k range was $[0.14 - 1.55]$ and U range $[0.0 - 73.0$ cm H₂O]. There was a significant correlation between k and U ($p < .0001$) (Fig): $k = .259 + .015 \cdot U$ ($R^2 = .723$). That result was independent of the main complaint (stress, mixed or urge incontinence, frequency, and other LUTD). On the opposite, there was a great scattering when a correlation was search between k and age or maximum urethral closure pressure (MUCP).

Sub-group B was identified as a low $p_{\det, Q_{\max}}$ -high $Q_{\max}$ (respectively, comparing sub-group B vs. sub-group A: 8.9 ± 3.6 vs. 30.0 ± 12.4 cmH₂O and 16.7 ± 7.1 vs. 12.3 ± 5.3 mL/s). The low pressures could not be restored with the hypothesis of a "urethral resistance".

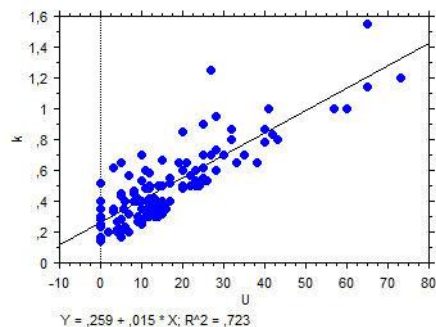
Interpretation of results

The detrusor force in women (range 0.14 - 1.55) is smaller than the detrusor force in men (range 0.4 - 4.0) [1] and the range less spread out. Eighty one percent of the studied population obeyed the same voiding conditions than men and there is an adjustment of the detrusor to compensate a "urethral resistance".

On the other hand, for 19% of the population (sub-group B), the voiding process greatly differs. A possible explanation is a funneling of both bladder neck and urethra; these conditions need to be verified by video-urodynamics because 1) the percentage of incontinence is similar in both groups and 2) the percentage of low MUCP is twice in sub-group B.

Concluding message

The VBN analysis can evaluate the detrusor force in women who void without major straining efforts and have a voiding volume over 100 ml, with a non-interrupted flow. As in men, there is an adjustment of the detrusor force to compensate a "urethral resistance". Further study will be devoted to analyze the mechanisms underlying the voiding tracings at low pressure.



References

- 1- Valentini FA, Zimmern PE, Besson GR, Nelson PP. Modelized analysis of pressure-flow studies of patients with lower urinary tract symptoms (LUTS) due to benign prostatic enlargement (BPE). NAU 2003; 22 : 45-53
- 2- Valentini FA, Besson GR, Nelson PP, Zimmern PE. A Mathematical Micturition Model to Restore Simple Flow Recordings in Healthy and Symptomatic Individuals and Enhance Uroflow Interpretation. NAU 2000; 19:153-176

Disclosures

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