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 \( Q_{\text{max}} \) and detrusor pressure at \( Q_{\text{max}} \) (\( p_{\text{det},Q_{\text{max}}} \)), without significant abdominal pressure changes (<±3 cm H\(_2\)O between onset of flow and \( Q_{\text{max}} \)), 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 H\(_2\)O). 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) or not possible (B: 29 women, mean age 62.1 ± 15.5). 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 H\(_2\)O]. There was a significant correlation between \( k \) and \( U \) (p<0.001) (Fig): \( k = .259 + .015^*U \) (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 \( p_{\text{det},Q_{\text{max}}} \)-high \( Q_{\text{max}} \) (respectively, comparing sub-group B vs. sub-group A: 8.9 ± 3.6 vs. 30.0 ± 12.4 cm H\(_2\)O 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 funnelling 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

Disclosures
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