



SHOULD IMPORTANCE BE GIVEN TO REGULAR VARIATIONS

OF ABDOMINAL PRESSURE FROM THE BASELINE DURING VOIDING?

Françoise A. VALENTINI<sup>1</sup>, Brigitte G. MARTI<sup>1</sup>, Gilberte ROBAIN<sup>1</sup>

<sup>1</sup>Sorbonne Université Paris

HYPOTHESIS / AIMS OF STUDY

After completion of a voiding cystometry, the study interpretation leading to a urodynamic diagnosis is mainly based on pressure recordings and the value of detrusor pressure at maximum flow ( $p_{det,Qmax}$ ). Detrusor pressure is calculated by subtracting the abdominal pressure  $p_{abd}$  from the vesical pressure ( $p_{ves}$ ). Hence, there is a critical role for abdominal pressure in this process.

During voiding, the changes in abdominal pressure can be threefold, decreased, unchanged, or increased. Two of these three processes, increase or decrease  $p_{abd}$ , can have an effect on the final urodynamic diagnosis, especially for the diagnoses of detrusor underactivity (DU) or bladder outlet obstruction (BOO) which rely primarily on  $p_{det,Qmax}$ .

The goal of this study was to analyze the changes in abdominal pressure during voiding in women, to search for incidence on detrusor pressure at maximum flow and possible misdiagnosis urodynamics.

STUDY DESIGN, MATERIAL AND METHODS

Urodynamic tracings of 271 non-neurologic women age range [20-88 years old] who were referred for investigation of various LUTS to our specialized unit were retrospectively analyzed. Exclusion criteria were advanced cognitive impairment (MMSE  $\leq 20$ ), diabetes mellitus, grade  $\geq 2$  pelvic organ prolapse, complete urinary retention and/or severe mobility impairment. Each patient file comprised demographic data, medical history, 3-day bladder diary, and current medications. Main complaint was categorized as stress urinary incontinence (SUI), urge urinary incontinence (UUI) mixed urinary incontinence (MUI), and "OTHER" (dysuria-frequency complaint, meaning LUTS but no urinary incontinence). Each analyzed file included a filling cystometry followed by an intubated flow (IF), then UPP with bladder filled at 250 mL. Abdominal pressure was recorded using a punctured intrarectal balloon catheter filled with 2 mL of saline according to the report of Good Urodynamic Practice guidelines.

After the urodynamic session a urodynamic diagnosis (UD) was posed according to the ICS/IUGA recommendations: bladder outlet obstruction (BOO), detrusor hyperactivity with impaired contractility (DHIC), detrusor overactivity (DO), detrusor underactivity (DU). Some investigations were found "normal" (N) and other related to urethral dysfunction (intrinsic sphincter deficiency (ISD)) or voiding triggered by urethral relaxation (URA)). Diagnoses of BOO and DU are based on the following criteria:

- 1-  $p_{det,Qmax} \geq 25$  cm H<sub>2</sub>O and  $Q_{max} \leq 12$  mL.s<sup>-1</sup> for BOO [1]
- 2- for DU, due to the lack of consensus for terminology and definition, two cutoff criteria were used: the first  $p_{det,Qmax} < 20$  cm H<sub>2</sub>O,  $Q_{max} < 15$  mL.s<sup>-1</sup> and BVE < 90% usable for all women [2], the second PIP1 ( $p_{det,Qmax} + Q_{max}$ ) < 30 mainly proposed for elderly females suffering of urge incontinence. Evaluation of the VBN detrusor contractility parameter k was added as it had been demonstrated that PIP1 and k gave consistent evaluations of detrusor contractility for females [3].

After evaluation of  $p_{abd}$  at maximum flow, a correction of  $p_{det,Qmax}$  erasing the artificially increase or decrease of  $p_{det,Qmax}$  was made. Then, with this evaluation of  $p_{det,Qmax}$  independent of change of  $p_{abd}$  from baseline, we investigated possible changes in UD.

RESULTS

1- Decreasing abdominal pressure during voiding

Among the whole population, 73 women (26.9%) had a significant decrease ( $\geq 5$  cmH<sub>2</sub>O) in  $p_{abd}$  from baseline at the time of  $Q_{max}$  resulting in artificially increase in  $p_{det,Qmax}$ .

After correction of  $p_{det,Qmax}$ : all BOO remained BOO, among 51 N, 3 gained DU and had significant decrease of PIP1 and k.

2- No change of abdominal pressure during voiding

Forty five (16.6%) patients had no change of detrusor pressure during voiding and thus no new evaluation of urodynamic diagnosis.

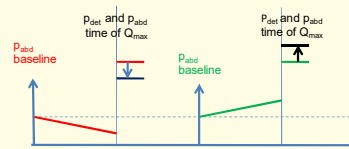
3- Increasing abdominal pressure during voiding

Among the whole population, 52 women (19.2%) had a significant increase ( $\geq 5$  cmH<sub>2</sub>O) in  $p_{abd}$  from baseline at the time of  $Q_{max}$  resulting in artificially decrease in  $p_{det,Qmax}$ . Among these patients, and after exclusion of tracings with spikes of  $p_{abd}$  during voiding, UD were 5 N and 3 DU.

After correction of  $p_{det,Qmax}$ , among the 5 patients with N diagnosis, 1 gained BOO diagnosis and among the 3 patients with DU diagnosis, 1 gained BOO diagnosis. All had significant increase of PIP1 and k.

In total, change of UD was 5/271 (1.84%) for the whole population, 3/145 (2.07%) for the patients with decrease of abdominal pressure during voiding and 2/81 (0.6%) for the patients with increase of abdominal pressure during voiding.

| N (number of patients)(%) | Decrease in $p_{abd}$                     | N (number of patients)(%) | Increase in $p_{abd}$                   |
|---------------------------|---|---------------------------|---|
| 145 (53.5%)               |   | 81 (29.9%)                |   |
| 72 (49.6%)                | -1 $\rightarrow$ -4 cm H <sub>2</sub> O   | 29 (35.8%)                | 1 $\rightarrow$ 4 cm H <sub>2</sub> O   |
| 36 (24.8%)                | -5 $\rightarrow$ -9 cm H <sub>2</sub> O   | 17 (21.0%)                | 5 $\rightarrow$ 9 cm H <sub>2</sub> O   |
| 22 (15.2%)                | -10 $\rightarrow$ -14 cm H <sub>2</sub> O | 9 (11.1%)                 | 10 $\rightarrow$ 14 cm H <sub>2</sub> O |
| 8(5.5%)                   | -15 $\rightarrow$ -19 cm H <sub>2</sub> O | 9 (11.1%)                 | 15 $\rightarrow$ 19 cm H <sub>2</sub> O |
| 7 (4.8%)                  | $\geq -20$ cm H <sub>2</sub> O            | 17 (20.9%)                | $\geq 20$ cmH <sub>2</sub> O            |



INTERPRETATION OF RESULTS

Changes of abdominal pressure during voiding are very frequent in women whether it be decrease or increase. Small fluctuations are frequently due to live signals and are rubbed out with acute examination of the traces. This study is interested in the permanent and regular variations during voiding. Muscular relaxation causes decrease of abdominal pressure with consequence a rise of detrusor pressure while rectal contraction causes increase in abdominal pressure without change in vesical pressure but decrease in detrusor pressure. In our non neurologic female population, 145 (53.5%) have a decrease and 81 (29.9%) an increase of abdominal pressure without significant association with one complaint.

Some decreases and increases between the beginning of voiding and the time of  $Q_{max}$  are of low amplitude (+5 to -5 cm H<sub>2</sub>O) so are without consequence, mainly due to accuracy of static pressure measurement in urodynamic system and don't need detrusor pressure correction. More care should be taken in the population with increase of  $p_{abd}$  because there are possible straining episodes.

CONCLUDING MESSAGE

Although a high percentage in that non-neurologic female population who had changes of abdominal pressure during voiding, that condition has low incidence on urodynamic diagnosis.

REFERENCES

1- Dehais GA, Zimmern PE, Lemack GE, Sherail SF. Refining diagnosis of anatomic female bladder outlet obstruction: comparison of pressure-flow study parameters in clinically obstructed women with those of normal controls. Urology 2004; 64: 675-679.  
 2- Gammie A, Kaper M, Dorrajal C,Kios T, Abrams P. Signs and Symptoms of Detrusor Underactivity: An Analysis of Clinical Presentation and Urodynamic Tests From a Large Group of Patients Undergoing Pressure Flow Studies. Eur Urol. 2016; 69(2): 361-369. doi:10.1016/j.euro.2015.08.014  
 3- Valentini FA, Marti BG, Robain G, Zimmern PE, Nelson PP. Comparison of indices allowing an evaluation of detrusor contractility in women.Prog Urol 2020 ; 30 : 396-401 https://doi.org/10.1016/j.purol.2019.11.004