

Changes of abdominal pressure during voiding in women. Can abdominal pressure decrease modify the urodynamic diagnosis?

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Introduction

- The diagnosis of voiding dysfunction in women is very challenging:
due to the narrow difference of pressures to differentiate bladder outlet obstruction (BOO) from detrusor underactivity (DU)
because straining to void can increase urinary flow
- Some attention has been given to the participation of abdominal muscles during voiding but almost nothing has been said about abdominal pressure decrease, which doesn't modify intravesical pressure but increases the calculated detrusor pressure artificially.
- The aim of this study was: to describe the changes of abdominal pressure during voiding in women
to evaluate if the correction of the abdominal pressure decrease can modify the diagnosis
to study if there is an association between the symptom "strain to void" and abdominal muscle participation during voiding

Methods and Materials

- In a three year period, 565 consecutive women underwent conventional cystometry following "good urodynamic practices".
- Voiding symptoms (slow stream, straining to void, intermittent stream and feeling of incomplete emptying) were obtained by a directed anamnesis.
- BOO was defined using the cutoff criteria of $pdetQ_{max} \geq 25 \text{ cm H}_2\text{O} + Q_{max} \leq 12 \text{ mL/s}$ (1).
DU was defined as a projected isovolumetric pressure 1 ($PIP_1 = pdetQ_{max} + Q_{max}$) less than 30 (2).
- Detrusor contraction: increase of detrusor pressure at maximum flow rate $\geq 10 \text{ cm H}_2\text{O}$ over baseline
Abdominal contraction: increase of abdominal pressure at maximum flow rate $\geq 10 \text{ cm H}_2\text{O}$ over baseline.
- Change of abdominal pressure during voiding: abdominal pressure at maximum flow rate minus pre-voiding abdominal pressure.
- Exclusions: POP > stage II, pelvic radiotherapy, medications active on the lower urinary tract, BPS/IC, insulin-dependent diabetes mellitus, neurological diseases (n=184) and technical problems (n=21).
- In women with or without abdominal pressure decrease $\geq 5 \text{ cm H}_2\text{O}$ and $\geq 10 \text{ cm H}_2\text{O}$ we compared: 1) age, 2) parity, 3) history of forceps delivery, 4) of hysterectomy, 5) of anti-incontinence surgery, 6) of anorectal surgery, 7) presence of any voiding symptom and 8) strain to void.
- In women with $\geq 5 \text{ cm H}_2\text{O}$ abdominal pressure decrease during voiding, $pdetQ_{max}$ was corrected subtracting this negative pressure value, which was used to diagnose BOO and DU again.
- Wilcoxon rank-sum test was used to compare the numerical variables and chi-square test or Fisher's exact test was used to compare the categorical variables.

Results

Table 1. Clinical characteristics and urodynamic diagnosis (n=360)

Variable	Results
Age (years)	58.38 ± 13.18 (18 – 89)
Parity	2.50 ± 1.44 (0 – 8)
Forceps delivery	71 (19.7%)
Previous hysterectomy	80 (22.2%)
Previous anti-incontinence surgery	84 (23.3%)
Previous anorectal surgery	11 (3.1%)
Any voiding symptom	249 (69.4%)
Strain to void	81 (22.5%)
Bladder outlet obstruction	43 (11.9%)
Detrusor underactivity	40 (11.1%)
Voiding with detrusor contraction	284 (78.9%)
Voiding with abdominal contraction	83 (23.1%)

Table 2. Changes of abdominal pressure during voiding in women (n=360)

Changes of abdominal pressure	Number of patients
$\geq 20 \text{ cm H}_2\text{O}$	51 (14.1%)
10 – 19 $\text{cm H}_2\text{O}$	32 (8.9%)
1 – 9 $\text{cm H}_2\text{O}$	73 (20.3%)
-4 – 0 $\text{cm H}_2\text{O}$	104 (28.9%)
-9 – -5 $\text{cm H}_2\text{O}$	73 (20.3%)
$\leq -10 \text{ cm H}_2\text{O}$	27 (7.5%)

- In patients with abdominal pressure decrease $\geq 5 \text{ cm H}_2\text{O}$: history of anti-incontinence surgery was significantly higher (38.1% versus 24.6%, $p=0.016$).
- In patients with abdominal pressure decrease $\geq 10 \text{ cm H}_2\text{O}$: parity was significantly lower (1.74 ± 1.48 versus 2.56 ± 1.43 , $p=0.013$).
- When using the corrected $pdetQ_{max}$: 2 patients lost diagnosis of BOO
7 patients gain diagnosis of DU
- Diagnostic modification: 9/360 (2.5%)
- No association between the symptom "strain to void" and abdominal contraction during voiding ($p=0.691$).

Interpretation of results

- Abdominal pressure decrease during voiding in women is frequent: more than a quarter of them had $\geq 5 \text{ cm H}_2\text{O}$ decrease.
- Factors related to abdominal pressure decrease (history of anti-incontinence surgery and parity) are difficult to interpret.
Accurate knowledge of posterior compartment prolapse and anal sphincter function might have delivered additional information.
- Abdominal pressure increase during voiding is related to abdominal muscles participation, increasing not only intravesical pressure but also urinary flow. This explains the special attention it receives in studies that attempted to define BOO and DU in women (1, 2).
- As abdominal pressure decrease doesn't modify intravesical pressure but increases the calculated detrusor pressure artificially, its correction would seem justified.
- In patients with $\geq 5 \text{ cm H}_2\text{O}$ abdominal pressure decrease during voiding, the correction of $pdetQ_{max}$ led to a 2.5% diagnostic modification, which although infrequent, it can be very important for the patients involved.
- The symptom "strain to void" can't be used to select women who don't use abdominal muscles to urinate.

Concluding message

- A high proportion of women had abdominal pressure decrease during voiding.
- In women with $\geq 5 \text{ cm H}_2\text{O}$ abdominal pressure decrease during voiding, $pdetQ_{max}$ correction led to 2.5% diagnostic modification.
- There was no association between the symptom "strain to void" and abdominal contraction during voiding.

References

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