

URETHRAL PRESSURE REFLECTOMETRY REVEALS SIGNIFICANT CHANGES AFTER ANTERIOR COLPORRHAPHY.

Hypothesis / aims of study

The mechanism of continence remains an enigma in pelvic organ prolapse (POP) surgery. Some women develop stress urinary incontinence (SUI) after POP surgery; others have concomitant SUI and POP and find that their incontinence is either cured, worsened or the same after POP surgery. In women with anterior vaginal wall prolapse, the prolapse is thought to mask SUI (occult SUI) by kinking and/or compressing the urethra (1).

Urethral pressure reflectometry (UPR) (2) measures urethral opening pressure at rest, during squeezing and straining: it has recently proven highly reproducible in women with POP. We hypothesized that UPR may be used to reveal the changes in the urethra before and after anterior colporrhaphy.

Study design, materials and methods

We conducted a prospective, observational study where women with anterior vaginal wall prolapse were recruited from our outpatient clinic. The women were examined before and after anterior colporrhaphy. Both visits included POP staging according to POP-Q and UPR measurements. UPR was conducted at rest, during squeezing and straining with simultaneous recordings of abdominal pressure, rectally. The related values of urethral and abdominal pressures were plotted into an abdomino-urethral pressuregram, and the slope of the line called APIR (abdominal to urethral pressure impact ratio) was calculated. APIR expresses the effect that abdominal pressure increase has on urethral pressure (3). By using APIR, opening pressure can be calculated at any given abdominal pressure. Measurements during straining were evaluated by assessing both APIR and the opening pressure at a standardized abdominal pressure of 50 cmH₂O, P_{O-Abd 50}.

Principles of UPR:

UPR allows for simultaneous measurements of pressure and cross-sectional area in the urethra, using a polyurethane bag, connected to a 45 cm long PVC tube, inserted into the urethra. The cross-sectional area along the entire length of the urethra is measured continuously by means of acoustic reflectometry. As a result, the opening pressure, which is the pressure needed to open the collapsed urethra, is measured.

Results

Our study group consisted of 28 women with anterior vaginal wall prolapse with POP-Q grade ≥ 2 . One woman was excluded because her postoperative measurement revealed inaccurate measurements of abdominal pressure, probably due to a defect in the rectal catheter. The remaining 27 women had a mean age of 65 (49-80) years, all but one were postmenopausal and 15 women used local estrogen therapy. Median parity was two (1-4). The women were examined at a median of 29 (1-113) days before surgery and 53 (38-84) days after surgery. All women underwent anterior colporrhaphy: nine had concomitant cervical amputations. There were no other concomitant procedures.

Table I displays the results.

Table I. Changes in parameters before and after anterior colporrhaphy. The results show a significant decrease in P_{O-rest}, P_{O-Abd 50} and APIR and a borderline significant decrease in P_{O-squeeze} after surgery.

Parameter	Preoperative	Postoperative	Difference (95% CI)	p-value
P _{O-rest} , cmH ₂ O	46.7	43.8	2.9 (0.3-5.6)	0.03
P _{O-squeeze} , cmH ₂ O	57.6	53.9	3.7 (-0.1-7.5)	0.05
P _{O-Abd 50} , cmH ₂ O	77.1	64.9	12.2 (7.9-16.5)	<0.0001
APIR	0.9	0.7	0.3 (0.1-0.4)	<0.01

The numbers are reported as means. P_{O-rest}: opening pressure at rest, P_{O-squeeze}: opening pressure during squeezing, P_{O-Abd 50}: opening pressure at an abdominal pressure of 50 cmH₂O, CI: confidence limit.

Figure 1 shows how the decreases in urethral parameters are secondary to the fall in APIR.

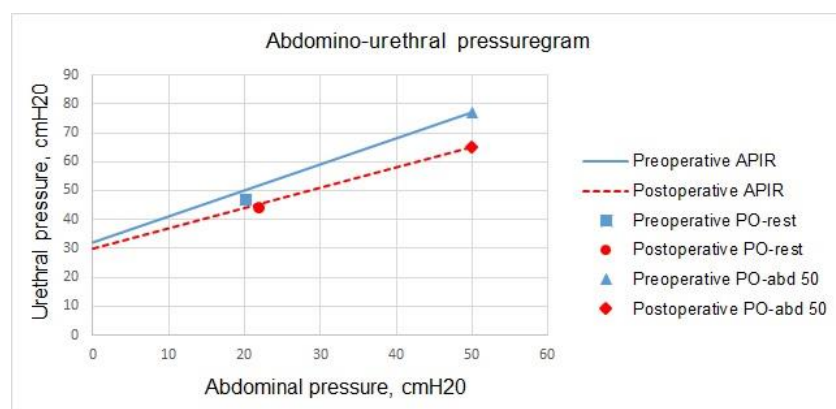


Figure 1. Abdomino-urethral pressuregram. APIR (the slope of the line), and thus $P_{O-Abd 50}$, decrease after POP surgery. The graph also shows that the decrease in P_{O-rest} is also secondary to the fall in APIR. APIR: abdominal to urethral pressure impact ratio, P_{O-rest} : opening pressure at rest, $P_{O-Abd 50}$: opening pressure at an abdominal pressure of 50 cmH₂O.

Since UPR measures along the entire length of the urethra, it provides a profile of the entire structure. Therefore a kinking of the urethra would be seen in the profile. Thorough analyses of all the women's urethral profiles during measurements with UPR revealed no signs of kinking of the urethra.

Interpretation of results

This study clearly shows that anterior colporrhaphy causes a decrease in all urethral parameters; both the one representing the permanent closure forces (P_{O-rest}) but especially the ones representing the adjunctive closure forces, namely APIR and $P_{O-Abd 50}$. The changes in P_{O-rest} and $P_{O-squeeze}$ are small and probably clinically irrelevant; they are a result of the decrease in APIR. As demonstrated in fig. 1, there is always a certain level of abdominal pressure at rest; therefore, no resting parameter is ever without the influence of the adjunctive closure forces.

Our results clearly indicate that the mechanism of continence in POP surgery is affected by reduced recruitment of the adjunctive closure forces that act on urethra, in order to keep it closed. This supports the theory of the prolapse compressing the urethra, as opposed to kinking the urethra, which was confirmed when we analyzed the women's urethral profiles.

Concluding message

This is the first study in which women with POP have been evaluated with UPR, before and after anterior colporrhaphy. It has shown that urethral closure function does in fact deteriorate after surgery, in these women.

References

1. Marinkovic SP, Stanton SL. Incontinence and voiding difficulties associated with prolapse. J Urol. 2004 Mar;171(3):1021–8.
2. Klarskov N. Urethral pressure reflectometry. A method for simultaneous measurements of pressure and cross-sectional area in the female urethra. Dan Med J. 2012 Mar;59(3):B4412.
3. Saaby M-L, Klarskov N, Lose G. Urethral pressure reflectometry during intra-abdominal pressure increase-an improved technique to characterize the urethral closure function in continent and stress urinary incontinent women. NeuroUrol Urodyn. 2013 Nov;32(8):1103–8.

Disclosures

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