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URETHRAL PRESSURE REFLECTOMETRY; EXPERIENCE IN MEN WITHOUT BOTHERSOME LUTS

Hypothesis / aims of study

Urethral Pressure Reflectometry (UPR) was introduced in 2005. It has since been used in the female urethra for direct simultaneous measurement of pressure (P) and cross-sectional area (CA). It has shown to be more reproducible than conventional pressure measurement when assessing incontinent women [1]. Recently, it has also been tested in the anal canal [2] and the prostatic urethra [3].

With UPR, a thin and flexible plastic-bag (polyurethane) is introduced into the urethra. The CA of the urethra is continuously measured with sound waves, while the pressure in the bag can be changed with a pump, thus the pressure needed to just open the closed urethra can be measured (opening pressure). In addition a stress-strain relation for the urethra can be made from the simultaneous measurements of pressure and CA. From the stress-strain relation biomechanical properties as the elastance and the hysteresis of the urethra can be obtained. The catheter consist of a very thin distensible approximately 5 cm long welded polyurethane-bag glued to a 45 cm long rigid PVC tube. The wall thickness of the bag is 0.025 mm. The diameter of the bag when fully inflated is 7.5 mm and fully deflated 0.6 mm. The range of measurement is 0.6 to 45 mm^2. The inner diameter of the PVC tube is 3.7 +/- 0.3 mm, and the outer diameter 5.3 +/- 0.3 mm. Pressures can be applied and measured between 0 and 200 cm H_2O. Approximately 13 measurements are made per second at every mm of the bag.

The aim of this study was to describe UPR measurements in a group of healthy volunteers not bothered by lower urinary tract symptoms (LUTS).

Study design, materials and methods

We tested 18 men, median age 59 and range 50-77. Inclusion criteria were no bother from LUTS and no former surgery in the urinary tract. Besides UPR, investigation with pressure-flow analyses with the AG-nomogram, the International Prostate Symptom score (IPSS),the Danish version of the score DAN-PSS, flow rate, residual urine measurement, trans-rectal ultrasound (TRUS) and urethral pressure profilometry (UPP) was conducted. UPR measurements were performed in the supine position, with empty bladder, and the valuables measured were opening and closing pressure, opening and closing elastance and hysteresis. Three consecutive measurements were made at every point from the bladder neck to the high-pressure zone with 0.5-1.0 cm between measuring points.

Results

Table 1

Parameters	**Total Median (Range) (n = 18)**	**Unobstructed Median (Range) (n = 11)**	**Obstructed Median (Range) (n = 7)**
Age	59 (50-77)	59 50-77	59 (50-65)
IPSS	6 (0-22)	7 (1-20)	6 (0-22)
DAN-PSS	4 (0-18)	4 (0-18)	4 (0-15)
Flow rate (ml/sec)	15.2 (6.7-29.1)	15 (6.7-29.1)	15.4 (7.4-17.1)
Res urine (ml)	25 (0-300)	25 (0-300)	25 (0-100)
Voided volume (ml)	267 (87-593)	235 (87-593)	277 (126-398)
Prostatic volume (cm^3)	30.5 (21-59)	32 (22-59)	28 (21-48)
Prostatic length (cm)	4.5 (4-6.5)	4 (4-5)	5 (4.5-6.5)

Seven men were obstructed according to pressure-flow analyses. Table 1 shows the range and median values of all acquired parameters for the 18 men including a subdivision into unobstructed and obstructed groups. There was no difference between the two groups. Table 2 shows the mean values of UPR parameters including the difference between the UPR values in the unobstructed and obstructed group. All parameters obtained with UPR increased from the bladder neck to the high-pressure zone, except for the obstructed hysteresis in the high-pressure zone (distal sphincter) where the value dropped, and also were significantly lower than the unobstructed group.

Table 2

Parameters	**Mean Total (n = 18)**	**Mean unobstructed (n = 11)**	**Mean obstructed (n = 7)**	**P-value unobstructed vs. obstructed**
Opening pressure cm H_2O				
Bladder neck	15.0	15.1	14.8	0.9

Prostate	44.7	46.2	43.4	0.8
Sphincter	55.9	56.7	53.5	0.7
Closing pressure cm H_2O				
Bladder neck	9.8	9.8	9.8	1.0
Prostate	22.9	22.0	24.3	0.6
Sphincter	28.1	25.2	33.1	0.2
Opening elastance cm H_2O/mm^2				
Bladder neck	0.35	0.37	0.32	0.4
Prostate	1.13	1.12	1.17	0.8
Sphincter	1.94	1.76	2.05	0.4
Hysteresis %				
Bladder neck	33.8	33.7	34.0	0.9
Prostate	45.9	48.4	43.2	0.6
Sphincter	49.0	56.6	37.7	**0.005**

Interpretation of results

The increase in all parameters from the bladder neck to the high-pressure zone correlates with earlier trials measuring the same parameters in the prostatic urethra.

Even though none of the men were bothered by LUTS, pressure-flow analyses found seven of them to be obstructed which correlates well with the literature. There was no difference between the obstructed and unobstructed subjects in regards to age, symptom score, flow parameters or prostate size. The lower hysteresis found in the sphincter area might explain why the subject is obstructed in the pressure-flow study; when the urethra has been forced open by a pressure, a lower pressure is needed to keep the urethra open. The hysteresis expresses the decline in pressure needed to keep the urethra open. The higher the hysteresis is the lower pressure is needed to keep the urethra open. Thus the lower hysteresis indicates that the obstructed subjects need a higher pressure to keep the sphincter area open compared to the unobstructed.

Concluding message

UPR may provide objective parameters of the type and level of obstruction in the prostatic urethra. However studies on patients with benign outlet obstruction are needed.

References

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Is this study registered in a public clinical trials registry?	**Yes**
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Is this a Randomised Controlled Trial (RCT)?	**No**
What were the subjects in the study?	**HUMAN**
Was this study approved by an ethics committee?	**Yes**
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Was the Declaration of Helsinki followed?	**Yes**
Was informed consent obtained from the patients?	**Yes**