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A NEW METHOD FOR URETHRAL PRESSURE REFLECTOMETRY MEASUREMENTS DURING SQUEEZE

Hypothesis / aims of study.

Urethral Pressure Reflectometry (UPR) is used for simultaneous measurements of pressure and cross-sectional in the urethra (1). A very thin and highly flexibly polyurethane bag is placed in the urethra during the measurements, the pressure and thereby the cross-sectional area (CA) is changed by changing the air pressure inside the bag. The CA is measured with acoustic reflectometry for every mm along the length of the bag. The method has better reproducibility than conventional urethral pressure measurements and the method provides sound physiological parameters which describe the function of the urethra (1).

Hitherto, the examination of the female urethra has been made stepwise, which implies that the CA in the polyurethane bag was measured at a pressure level, then the pressure was increased to a new level and the CA was measured once again at the new pressure level. This procedure was continued until the bag in the urethra was completely open. Such an examination takes at least 90 seconds which is longer than most subjects can squeeze/strain. Therefore, to measure during squeeze and strain, the squeeze/strain has to be repeated at each pressure level (figure 1a). This may lead to inaccuracy as the squeeze/strain might be of different strength each time and the subject might be fatigued. A full measurement might be completed during only one squeeze/strain if the CA is measured during a continuous pressure change in the polyurethane bag (figure 1c). The UPR technique was modified so that measurements can be obtained during pressure changes. The aims of the present study were: A) Compare the parameters measured during squeeze by the modified technique with measurements made by the conventional technique. B) Measure the reproducibility of the modified technique.

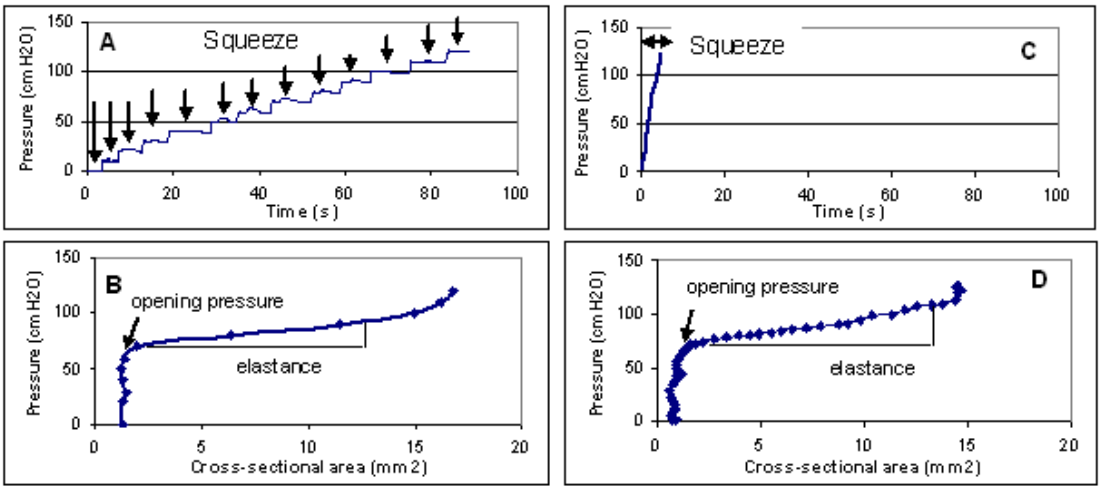

Figure 1. A shows the pressure inside the polyurethane bag during a squeeze using the step method. The subject squeezes at each pressure level (indicated with an arrow). B shows the pressure and the corresponding minimum cross-sectional area from the squeeze measurement in A .The opening pressure and elastance (slope of the curve) are indicated. C shows a squeeze measurement using the continuous method. The subject holds the squeeze during the pressure increase. D shows the pressure and the corresponding minimum cross-sectional area measured with the continuous method.

Study design, materials and methods

Eight healthy women and 25 women with stress urinary incontinence were included in the study. All the measurements were made with the subjects in the supine position. The measurements with the conventional technique (called step method) were conducted before the measurements with the modified technique (called continuous method). Two measurements during squeeze were made with the step method while five measurements were made with the continuous method.

Results

The squeezing opening pressure was a little higher when using the continuous method but the difference was not significant (67 vs. 64 cmH_2O, P=0.07). The squeezing elastance was significantly higher with the continuous method compared to the step method (2.7 vs. 1.9 cmH_2O/mm^2, p<0.001).

Table I shows the variability of the continuous method.

Table I. The reproducibility of the continuous method.
The SEM was calculated for 5 consecutive measurements

	Mean	SD	CV %	SEM
Squeezing				
Opening pressure, cmH_2O	67	4.4	6.5 %	2.0
Elastance, cmH_2O/mm^2	2.7	0.4	14.8 %	0.2

SD: Standard Deviation, CV coefficient of variation, SEM: Standard error of mean

Interpretation of results

The two methods differ widely regarding the measuring technique. The step method demands about 12 squeezes while only one squeeze is needed per measurement with the continuous method. Regardless of the differences between the methods there was no statistical difference between the mean opening pressure during squeeze measured with the two methods. However, the elastance was significantly higher with the new method.

The reproducibility of the squeezing opening pressure measured with the continuous method was very good (CV: 6.5%), while the elastance had acceptable reproducibility (CV: 14.8%). With the continuous method it is possible to perform many squeeze measurements without fatiguing the subject, thus increasing the precision of the mean value. With five repetitions in this study the SEM of the squeezing opening pressure was 2 cmH_2O and the SEM of the elastance was 0.2 cmH_2O/mm^2.

Concluding message

A new method for performing UPR measurements during squeeze and strain has been described. With the new method a UPR measurement can be conducted in about 7 seconds, thus the examination can be made during one squeeze or one strain.

The squeezing opening pressure is the same with the new method as with the conventional method while the opening elastance is significantly higher with the new method.

References

1. Klarskov, N.: Urethral pressure reflectometry. Dan Med J, 59: B4412, 2012

Disclosures

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