

## URETHRAL SPHINCTER PROPERTIES MEASURED USING REFLECTOMETRY IN HEALTHY AND STRESS INCONTINENT WOMEN

### Hypothesis / aims of study

Previous studies have shown that measurement of related values of cross-sectional area (CA) and pressure in the urethra provides variables for characterization of the sphincter properties and defining pathophysiological conditions such as intrinsic sphincter deficiency (1). Urethral reflectometry is a new method based on modification of acoustic rhinometry (2) which enables synchronous measurement of pressure and cross-sectional area in the female urethra. The methodology implies only the introduction of a very thin plastic bag into the urethra and the technique is simple and easy to use (3). In vitro studies have shown that the error of the CA measurement is  $\pm 1.2 \text{ mm}^2$ , the error of the pressure measurements is  $\pm 1 \text{ cmH}_2\text{O}$  and the hysteresis of the plastic bag is  $1 \text{ cmH}_2\text{O}$ . CA's close to zero can be measured and the technique enables measurement along the entire urethra simultaneously. The aim of the study was to estimate the opening and closing pressure, the elastance (reciprocal of compliance) and hysteresis of the urethral high pressure zone in healthy and stress incontinent women.

### Study design, materials and methods

The study was approved by the local scientific ethical committee and informed consent was obtained from all participants. Thirty healthy volunteers (mean age 50 years and mean BMI 24,8) and 30 patients (mean age 53 years and BMI 25,1) with the condition stress incontinence underwent urethral reflectometry in the supine position with an empty bladder. The pressure was increased and decreased stepwise ( $5 \text{ cmH}_2\text{O}$  per step) from 0-150  $\text{cmH}_2\text{O}$  (or until the urethra was completely open) and the corresponding CA's were measured. This procedure was repeated 3 times at each investigation. The measurement took all together about 15 minutes. The obtained related pressures and CA's were plotted in a system of coordinates. From the most horizontal part of these curves the slope (elastance) and intercept with the y-axis was estimated blindly.

Methods, definitions and units conform to the standards recommended by the ICS 2002, except where specifically noted.

Mann-Whitney rank sum test for unpaired data was used to compare the data of the 2 groups.

### Results

Figure 1 shows a curve obtained in the high pressure zone. The elastance was defined as the slope of the most horizontal part of the curve, opening pressure as the intersection between the y-axis and the slope of the upper curve, closing pressure as the intersection between the y-axis and the slope of the lower curve and the hysteresis as the pressure difference between the opening pressure and the closing pressure. The results are shown in the table.

Mean (SD)	GSI N=30	Control N=30	P-Value
Opening pressure [ $\text{cmH}_2\text{O}$ ]	34.9 (11.7)	60.2 (19.1)	0.00001
Closing pressure [ $\text{cmH}_2\text{O}$ ]	27.6 (9.8)	48.4 (16.2)	0.00001
Elastance [ $\text{cmH}_2\text{O}/\text{mm}^2$ ]	1.8 (0.3)	2.4 (0.7)	0.0002
Hysteresis [ $\text{cmH}_2\text{O}$ ]	7.3 (3.4)	11.7 (5.9)	0.002

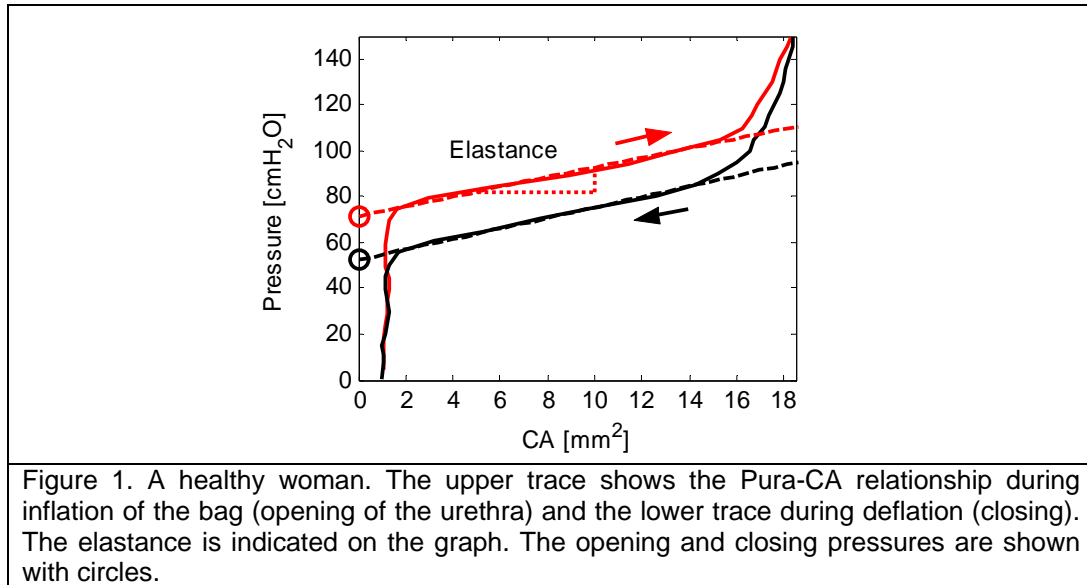


Figure 1. A healthy woman. The upper trace shows the Pura-CA relationship during inflation of the bag (opening of the urethra) and the lower trace during deflation (closing). The elastance is indicated on the graph. The opening and closing pressures are shown with circles.

### **Interpretation of results**

This study shows that the opening pressure, closing pressure, elastance and hysteresis of the high pressure zone are statistically significantly decreased in women with the condition stress incontinence.

### **Concluding message**

This methodology adds sphincteric parameters to those obtained by conventional urodynamics.

The parameters provide interesting physiological/pathophysiological information about the urethral sphincter function.

The clinical value of this new technique and the defined parameters remains to be documented.

### **References**

- 1 Simultaneous Recording of Pressure and Cross-sectional Area in the Female Urethra: A Study of Urethral Closure Function in Healthy and Stress Incontinent Women. *Neurourol Urodyn* 11, 2, 1992.
- 2 Technical abilities and limitations of acoustic rhinometry optimised for infants. *Rhinology* 1998; 36: 104-13
- 3 First experiences with urethral reflectometry – A new method for simultaneous measurement of pressure and cross-sectional area. ICS 33<sup>rd</sup> annual meeting. *Proceedings abstract book 2003*; abstract 426 p 367-369.

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