

ASSESSING SURGICAL OUTCOME: URETHRAL FUNCTION REVISITED

Hypothesis / aims of study

At present there is no objective method to predict the outcome of surgery for Urodynamic Stress Incontinence (USI). Urethral Pressure Profilometry (UPP), whilst not diagnostic, is useful in the assessment of urethral function and previous work has demonstrated that women with a 'low pressure urethra' have an increased risk of failure following continence surgery **(1)**. Three-dimensional ultrasound (3D) is an accurate and reproducible method of assessing urethral sphincter volume in women **(2)** and a decrease has been associated with USI **(3)**. Furthermore urethral sphincter volume has been shown to correlate with the area under the UPP curve **(4)** – suggesting a relationship between structural and functional anatomy. The aim of this study was to determine if pre-operative 3D urethral sphincter volume is prognostic of outcome following continence surgery

Study design, materials and methods

Women were recruited prospectively from a tertiary referral urodynamic clinic. All complained of troublesome lower urinary tract symptoms and all underwent videocystourethrography including uroflowmetry, cystometry and pressure/flow voiding studies using a Laborie Aquarius urodynamic system. Urethral Pressure Profilometry (UPP) was performed in the supine position with the bladder comfortably full. A Galtec solid state 7 French microtransducer with two pressure transducers 6cm apart was withdrawn at a rate of 2mm/second and the subtracted urethral pressure profile recorded. Measurements were repeated, with the pressure transducers orientated at the 3 o'clock or 9 o'clock position, until the trace was reproducible and the Maximum Urethral Closure Pressure (MUCP) and Functional Urethral Length (FUL) recorded. A 3-D transvaginal ultrasound scan of the urethra was performed in all the women using a Kretz Combison 530 ultrasound machine with a 7.5 MHz mechanical sector probe. The scan image allows simultaneous visualization of sagittal, transverse and coronal sections and enables the image to be manipulated through 360°. The active plane can be altered and the image repositioned allowing analysis of a cross sectional area. In addition the images can be rotated 360° in all three planes. The total urethral sphincter volume, urethral volume and cross sectional area were measured and rhabdosphincter volume calculated. Those women with an objective urodynamic diagnosis of USI who failed to respond to conservative measures were offered continence surgery and all underwent modified Burch colposuspension using a standard technique under the direct supervision of the senior author. Post-operative clinical assessment was performed using repeat videocystourethrography at 6 months follow-up. Statistical analysis was performed using SPSS (v10, USA) and means compared using an independent sample t test. Ethical committee approval was granted for this study. All investigations were performed in accordance with ICS guidelines for good urodynamic practice.

Results

In total 87 women were recruited to the study of which 32 (36.8%) had had previous continence surgery. The mean age was 56.1 yrs (range: 37-88). Pre-operatively all women had objective evidence of USI on videocystourethrography. The overall objective cure rate in women undergoing primary surgery at 6 months was 95%. In the group having 'redo' surgery the cure rate was 68.8%. Overall the rates of 'de novo' detrusor overactivity were 11.5% and 9.5% respectively. Those women with recurrent USI were found to have a significantly smaller urethral sphincter than those who had an objective cure **[Table 1], [Figure 1]**.

	Post Op Dry	Post Op USI	p value
Mean Total sphincter Volume (cm³)	4.23	1.94	0.000
Mean Rhabdosphincter Volume (cm³)	3.75	1.09	0.000
Mean Cross Sectional Area (cm²)	2.57	2.05	0.007

TABLE 1: URETHRAL SPHINCTER AS A PREDICTOR OF CONTINENCE SURGERY OUTCOME

Whilst there was a tendency for those women with recurrent USI post operatively to have a lower MUCP there was no statistically significant difference between groups (46.6cmH₂O Vs 41.0 cmH₂O; **p = 0.429**) [Figure 2] and thus it was not found to be predictive of outcome

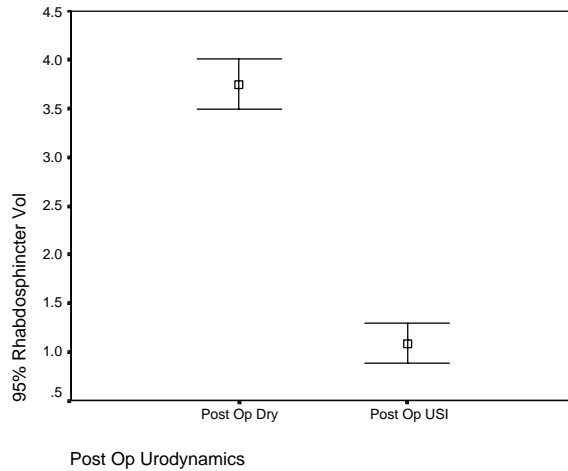


FIGURE 1: PREDICTION OF CONTINENCE SURGERY OUTCOME BY RHABDOSPHINCTER VOLUME

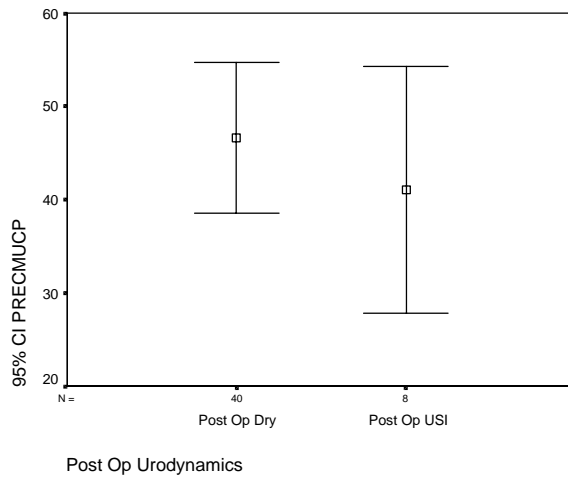


FIGURE 2: PREDICTION OF CONTINENCE SURGERY OUTCOME BY MUCP

Interpretation of results

Tests of urethral function remain unreliable, correlate poorly with one another, and are not predictive of outcome. To the best of our knowledge this is the first study to assess the predictive value of 3D urethral sphincter volumes in women having continence surgery. Our findings would suggest that women who have recurrent stress incontinence following surgery have significantly smaller urethral sphincters than those who are dry and that this is a more useful diagnostic test than using traditional measures of urethral function such as MUCP.

Concluding message

Three dimensional ultrasound assessment of the urethral sphincter is predictive of outcome following continence surgery and may be useful in the pre-operative counselling of women.

References

1. Neurourol Urodyn 1997; 16: 354-355.
2. Ultrasound Obstet Gynaecol 2001; 17: 421-424.
3. Neurourol Urodyn 1996; 15: 339-340.
4. Ultrasound Obstet Gynaecol 2004; 23: 272-276.