

URETHRAL SPHINCTER VOLUME AND URODYNAMIC DIAGNOSESHypothesis / aims of study

To find the urethral sphincter volume in women with different urodynamic diagnoses.

Study design, materials and methods

Women attending the urogynaecology department of a tertiary referral centre for urinary and pelvic organ prolapse symptoms were recruited for the study. All women underwent filling cystometry. Women with voiding dysfunction and bladder oversensitivity were excluded from the study. A 3D transperineal ultrasound scan was performed using a GE voluson-I machine and a 4-8 MHz transperineal transducer with the women in recumbent position with their legs flexed and abducted.

The outer and inner margins of the rhabdosphincter were traced in planes 1 mm apart and the total sphincter volume and core volume were calculated. The rhabdosphincter volume was calculated by subtracting core volume from the total sphincter volume. The length of the rhabdosphincter and the maximum trans-sectional area were also measured for all women. Data analysis was performed using SPSS software version 23 by IBM Company. The outliers were excluded from the analysis. Kruskal-Wallis test was used for analysis and significance is tested at P value of 0.05.

Results

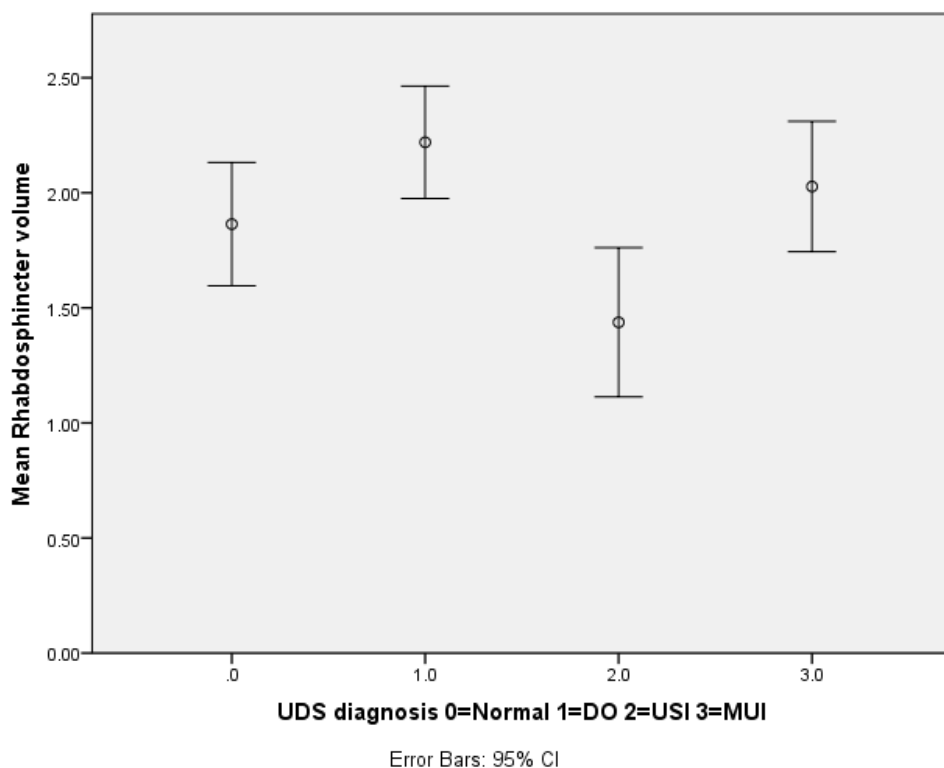
145 women were recruited for the study. 34 women had normal bladder function on urodynamic studies. The diagnosis was detrusor overactivity, urodynamic stress incontinence and mixed incontinence in 52, 22 and 37 women respectively. The urethral sphincter measurements were as shown in table 1. The distribution of rhabdosphincter measurements in women with different urodynamic diagnoses is shown in figure 1.

Table 1: Urethral sphincter measurements and urodynamic diagnoses

Measurement	Normal bladder function Mean (SD)	Detrusor overactivity Mean (SD)	USI Mean (SD)	Mixed incontinence Mean (SD)	P value
Total sphincter volume cm ³	2.31 (0.99)	2.67 (1.08)	1.74 (0.87)	2.53 (1.07)	0.004
Rhabdosphincter volume cm ³	1.86 (0.77)	2.22 (0.88)	1.44 (0.73)	2.03 (0.85)	0.004
Core volume cm ³	0.45 (0.26)	0.48 (0.25)	0.31 (0.20)	0.50 (0.29)	0.022
Sphincter length cm	1.37 (0.41)	1.48 (0.38)	1.15 (0.36)	1.43 (0.34)	0.006
Maximum trans-sectional area cm ²	2.19 (0.68)	2.37 (0.66)	1.94 (0.73)	2.30 (0.73)	0.082

Figure 1: Rhabdosphincter volume in women with different urodynamic diagnoses.

DO=Detrusor overactivity, USI=Urodynamic stress incontinence, MUI=Mixed urinary incontinence



Interpretation of results

This study gave us the comparative values of sphincter measurements and volumes in women with urodynamically confirmed normal bladder function and different urodynamic diagnoses for the first time. A non-invasive transperineal approach was used for the scanning. There was statistically significant difference in the total sphincter volume, rhabdosphincter volume, core volume and rhabdosphincter length. The sphincter measurements and volumes were smallest in women with urodynamic stress incontinence (USI) in our study. A smaller and weaker sphincter was unable to resist the rising pressures on stress resulting in stress incontinence. A rise in total sphincter volume was seen in a study on women with stress urinary incontinence after successful pelvic floor physiotherapy (1). The volume of the urethral core which includes subepithelial vascular tissue and smooth muscle layer was increased after successful therapy with duloxetine (2). The sphincter in women with detrusor overactivity (DO) was larger than other groups of women. Women with DO contract the sphincter during episodes of detrusor contraction to prevent urgency incontinence. This may result in increased muscle mass and hence increased muscle volume. 3D transperineal ultrasound studies confirmed the close relationship between urethral pressure profile and size and shape of the sphincter (3). A larger sphincter in women with DO could produce a higher closure pressure and thus could resist the increase in bladder pressure. The sphincter measurements in women with mixed incontinence were in between those for USI and DO. The relative effect of both the conditions could not be assessed by this study.

Concluding message

Women with USI have smaller sphincter than women with normal bladder function on urodynamic studies. The sphincter volume was largest in women with DO probably owing to the voluntary sphincter contractions during episodes of DO.

References

1. Int Urogynecol J 2015; 26:277–283
2. Ultrasound Obstet Gynecol 2008; 31: 206–209
3. Int Urogynecol J 1994; 5:319

Disclosures

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