40

Robinson D[1], Anders K[1], Cardozo L[1], Dixon A[1]
1. Kings College Hospital

BLADDER WALL THICKNESS AND THE OVERACTIVE BLADDER: DO CONTRACTIONS COUNT?

Aims of Study

Measurement of bladder wall thickness (BWT) using transvaginal ultrasound has been shown to discriminate between women with detrusor overactivity and those with urodynamic stress incontinence (1). A mean bladder wall thickness of greater than 5mm has been found to be a sensitive screening method for diagnosing detrusor overactivity in symptomatic women without outflow obstruction (2) and is a useful adjunct to laboratory urodynamics (3). Women with detrusor overactivity have a thicker bladder wall than those with urodynamic stress incontinence suggesting that this change may be due to hypertrophy of the detrusor muscle secondary to repeated detrusor contractions against a closed urethral sphincter. The aim of this study was to test this hypothesis.

Methods

Women with lower urinary tract symptoms were recruited prospectively from a tertiary referral ambulatory urodynamic clinic as a consecutive series. All complained of irritative symptoms such as frequency and urgency with or without urge incontinence. Transvaginal ultrasound scans were performed in the supine position after asking the patient to empty the bladder. All measurements were made at maximum magnification, the bladder wall being measured perpendicular to the luminal surface in three places at the thickest part of: (1) the trigone, (2) the dome of the bladder, and (3) the anterior wall of the bladder. Mean BWT was then calculated as an average of the three measurements.

Ambulatory urodynamics were performed by a second observer blinded to the results of the ultrasound bladder wall measurements. A single, solid-state 7F Galtec microtransducer with two pressure transducers was inserted into the bladder and a separate transducer was inserted into the rectum. The pressures were recorded on a solid-state ambulatory system (MPR2, Gaeltec). The test lasted four hours and the women were asked to drink 200 mls of fluid every 30 minutes and to keep a diary of events and symptoms. The results were analysed using a personal computer and detrusor instability was only diagnosed if a detrusor pressure rise was recorded in association with urgency or urge incontinence (4). In addition the number of detrusor contractions, mean amplitude, maximum amplitude and episodes of leakage were documented for each trace. Correlation was performed using the Pearson method.

Results

In total 128 women were recruited to the study. The ambulatory urodynamic diagnoses are shown below **[Table 1]**. Those women who were found to have urodynamic stress incontinence, voiding difficulties or a normal study were excluded, leaving 47 women with detrusor overactivity for analysis.

Ambulatory Urodynamic Diagnosis	No.	%
Normal	37	28.9
Urodynamic Stress Incontinence	43	33.6
Detrusor Overactivity	21	16.4
Voiding Difficulties	1	0.8
Mixed Incontinence	26	20.3

Table 1: Ambulatory Urodynamic Diagnosis

Bladder wall thickness was correlated with number of detrusor contractions, mean amplitude, maximum amplitude and episodes of leakage and the results are shown below **[Table 2]**.

Whilst there was a significant correlation with the mean detrusor contraction amplitude there was no correlation with number of contractions, maximum amplitude and episodes of leakage.

Sub group analysis of correlations in women with an intact sphincter and those with sphincter incompetence were also performed **[Table 3 and Table 4]**. There was no correlation in those patients with detrusor overactivity and an intact sphincter although there was an association in those patients with mixed incontinence.

	Correlation Coefficent	p value
Number of Detrusor contractions	r = 0.104	p = 0.486
Maximum Amplitude of contraction	r = 0.007	p = 0.966
Mean Amplitude of contractions	r = 1.000	**p = 0.01**
Episodes of leakage	r = -0.155	p = 0.299

Table 2: Correlation of BWT with Ambulatory Findings in all Patients

	Correlation Coefficent	p value
Number of Detrusor contractions	r = -0.256	p = 0.276
Maximum Amplitude of contraction	r = 0.087	p = 0.716
Episodes of leakage	r = 0.035	p = 0.883

Table 3: Correlation of BWT in Patients with Detrusor Overactivity

	Correlation Coefficent	p value
Number of Detrusor contractions	r = 0.408	**p = 0.039**
Maximum Amplitude of contraction	r = 0.136	p = 0.547
Mean Amplitude of contractions	r = 1.000	**p = 0.01**
Episodes of leakage	r = -0.223	p = 0.273

Table 4: Correlation of BWT in Patients with Mixed Incontinence

Conclusions

This is the first reported study to examine the hypothesis that increased BWT is caused by hypertrophy of the detrusor muscle secondary to repeated detrusor contractions against a closed urethral sphincter. Overall there would appear to be an association between mean amplitude of contractions and increasing hypertrophy of the bladder wall. However, sub-group analysis does not support the theory that an intact sphincter is a pre-requisite for this to occur. Whilst this is only a small study and is limited by the accuracy and reproducibility of ambulatory testing this may have implications when assessing the effect of anti-muscarinic therapy on bladder wall thickness.

References

1. A novel technique for measuring bladder wall thickness in women using transvaginal ultrasound. Ultrasound Obstet Gynaecol 1994; 4: 220-223.
2. Ultrasound: a non-invasive screening test for detrusor instability. Br J Obstet Gynaecol 1996; 103: 904-908.
3. Can ultrasound replace ambulatory urodynamics when investigating women with irritative urinary symptoms? Br J Obstet Gynaecol 2002; 145-148.
4.Reducing artefacts in ambulatory urodynamics. Br J Urol. 1998; 81: 211-214.