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MEASUREMENT OF BLADDER WALL THICKNESS IN THE HEALTHY KOREAN ADULTS AND ITS FEASIBILITY IN DIAGNOSING BLADDER OUTLET OBSTRUCTION IN THE PATIENTS WITH LOWER URINARY TRACT SYMPTOMS

Hypothesis / aims of study

Bladder wall thickness (BWT) and detrusor wall thickness (DWT) are currently investigated as alternative tools to diagnose bladder outlet obstruction (BOO) in the patients with lower urinary tract symptoms (LUTS). But it is suggested that BWT and DWT might show racial differences. There are sparse data on the BWT in Korean. The aim of this study was to determine BWT and DWT in healthy Korean adults and to assess the feasibility of them in diagnosing BOO in the patients with LUTS.

Study design, materials and methods

1) To assess normal value of BWL and DWT

A total of 110 healthy adult volunteers (age 20-49) without any urinary symptoms were enrolled to evaluate normal value of BWT and DWT. At first, to find the bladder filling point at which BWT and DWT show constant values, in thirteen of those volunteers, bladder was filled with normal saline and BWT and DWT were measured in steps of 50ml until 300 ml and in steps of 100 ml until the maximum bladder volume. BWT and DWT were measured in all volunteers once with full bladder and after that uroflowmetry were performed to confirm the bladder filling volume.

2) To determine the clinical usefulness of BWT and DWT in male patients with LUTS

Thirty patients with LUTS were prospectively recruited. A 3-day voiding diary, international prostate symptom score (IPSS), transrectal prostate sonography (TRUS) and urodynamic study were performed. BWT and DWT were measured once with full bladder.

The measurement of BWT and DWT: BWT and DWT were measured transabdominally at the anterior bladder wall using a 7.5 MHz linear array ultrasound probe (Samsung Medicine, ACCUVIX A30, Korea). After we identified the bladder and adjacent structures at low magnification, the digital picture was enlarged to factor 9 and BWT and DWT were measured at least three different sites and the mean value of those was used (Figure 1). Polymonorrial regression analysis and chow test were used to find the bladder filling point at which BWT and DWT show constant values.

Results

1) To assess normal value of BWT and DWT

BWT and DWT decreased rapidly during the first 250 ml of bladder filling but, thereafter, remained almost stable until the maximal bladder capacity. Mean BWT and DWT in the healthy Korean adults were similar between male and female, 2.2/1.0 mm and 2.1/1.0 mm, respectively ($p>0.005$). The age and BMI did not have a significant impact on BWT and DWT (Table 1).

2) To determine the clinical usefulness of BWT and DWT in male patients with LUTS

Patients with LUTS were classified according to BOO index (Abrams-Griffiths number: PdetQmax-2Qmax): 0-40 unobstructive (n=18) and ≥40 obstructive (n=12). After univariate analysis, IPSS voiding score (3.4 vs 8.1) and BWT (2.5 mm vs 1.9 mm) of obstructive patients were significantly increased compared with unobstructive patients, ($p=0.018$ and $p=0.012$, respectively). BWT greater than 2.2 mm was significantly more common in the obstructive patients ($p=0.17$). DWT was not statistically different between two groups, 0.9 mm vs 1.2 ($p=0.328$), albeit numeral difference. In multivariate logistic regression analysis, BWT was the only independent risk factor for BOO (odds ratio [OR] 49.6; 95% confidence interval [CI] 7.48-161.8; $p=0.041$). Receiver operating characteristic (ROC) curve analysis of the BWT for predicting BOO showed that 0.882 and 2.3 mm was the most accurate value of BWT that predict the present of BOO with 83.3% sensitivity and 77.8% specificity (Figure 2).

Interpretation of results

BWT and DWT showed racial differences. In Korean healthy adults, mean BWT and DWT were 2.2/1.0 mm and 2.1/1.0 mm in men and women, respectively. BWT was the independent risk factor for BOO and BWT larger than 2.3mm was an independent risk factor for BOO in men with LUTS.

Concluding message

In the healthy Korea adults, mean BWT and DWT were thinner than other races (1), 2.2/1.0 mm and 2.1/1.0 mm in men and women, respectively. BWT and DWT remained stable at a bladder filling of 250 ml and over. BWT larger than 2.3mm was an independent risk factor for BOO in men with LUTS.

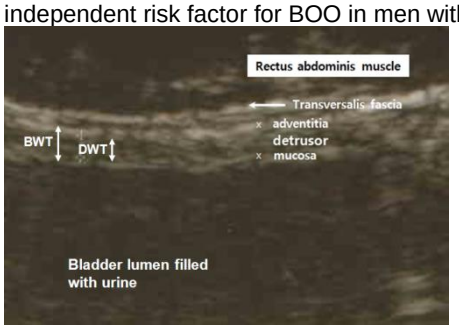

Figure 1. The structures of the anterior bladder wall were analyzed at enlarged digital ultrasound image (9x).

Table 1. The mean value of BWT and DWT in the healthy Korean adults. (mean ± SD)

Gender	Age	Height (cm)	Weight (kg)	BMI (kg/m^2)	Qmax (ml/sec)	DWT (mm)		BWT (mm)	
Male	20-30	179±4.5	78.6±3.1	24.3±1.8	17.2±7.2	0.9±0.3		2.2±0.09	
	31-40	175±5.6	73.2±4.2	23.8±0.9	15.6±4.8	1.0±0.2	1.0 ±0.3	2.3±0.04	2.2 ±0.06
	41-50	173±5.9	73.5±2.7	25.7±2.0	13.6±4.5	1.0±0.2		2.3±0.06	
Female	20-30	156±4.2	48.5±2.1	20.7±2.0	20.3±5.0	0.9±0.3		2.1±0.02	
	31-40	152±2.1	47.0±3.2	21.2±1.9	16.1±10.9	1.0±0.3	1.0 ±0.3	2.3±0.03	2.1 ±0.06
	41-50	150± 3.4	50.5±2.7	23.7±2.5	18.4±10.1	1.2±0.2		2.1±0.08	

SD; standard deviation, BMI; body mass index (weight (kg)/height x height (m^2)), Qmax; maximum urinary flow, DWT; detrusor wall thickness, BWT; bladder wall thickness

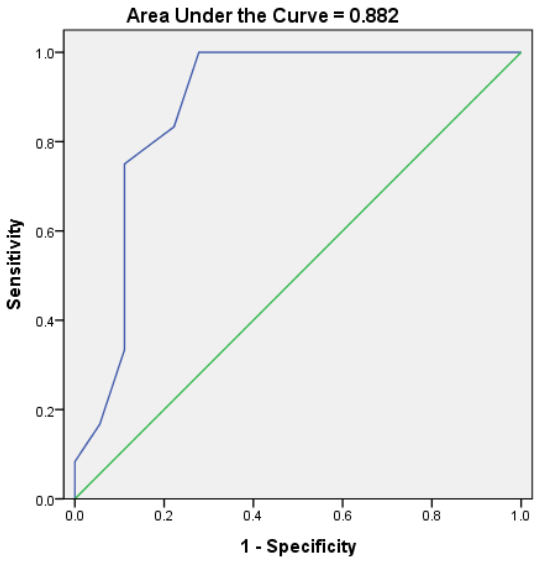

Figure 2.ROC analysis showed that the area under the curve was 0.882 and 2.3 mm was the most accurate value of BWT that predict the present of BOO with 83.3% sensitivity and 77.8% specificity.

References

1. Hakenberg OW, Linne C, Manseck A et al: Bladder wall thickness in normal adults and men with mild lower urinary tract symptoms and benign prostatic enlargement. Neurourol Urodyn 2000; 19: 585

Disclosures

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