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WHAT IS THE MOST PRECISE CUT-OFF VALUE OF DETRUSOR WALL THICKNESS MEASUREMENT TO CLASSIFY BLADDER OUTLET OBSTRUCTION?

Hypothesis / aims of study

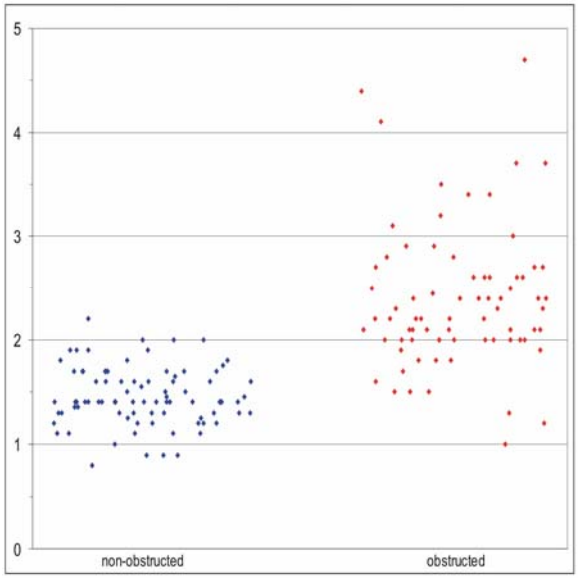
Studies with artificially obstructed animals and men with bladder outlet obstruction (BOO) demonstrated a significant enlargement of the bladder wall due to muscle cell hypertrophy, fibrocyte hyperplasia, and collagen deposition in the detrusor. The detrusor wall can be visualized with an ultrasound device very well. Increase of detrusor wall thickness (DWT) in patients with benign prostatic hyperplasia (BPH) indicates BOO. Therefore, measurements of DWT have been used lately to diagnose BOO non-invasively. However, it remains unknown what cut-off value for BOO classification of the individual patient should be used.

Study design, materials and methods

Every man with BPH who came during a two year period to the urological outpatient department because of lower urinary tract symptoms participated in this prospective study. All men with concomitant BPH treatment (α-blockers, 5α-reductase inhibitors), prostate carcinoma or a neurological disease were excluded. The study was conducted according to the regulations of the local ethical committee which works in accordance to the Helsinki declaration. During first visit of the patient, DWT was measured at the anterior bladder wall of a full bladder with a 7.5 MHz linear array at least a three different locations. The mean value of DWT was used for further calculation. During the second visit 1 to 3 weeks after initial presentation, a computer-urodynamic investigation was performed in all men and the BOO grade was determined using the CHESS classification. Positive and negative predictive values as well as sensitivity, specificity, and accuracy were calculated for DWT between 1.7 and 2.2 mm.

Results

160 men between 40 - 89 years of age (median 62 years) participated in this study. Pressure-flow analysis of urodynamic measurement revealed that 75 patients (46.9%) were obstructed and 85 patients (53.1%) were not obstructed. DWT was between 1.0 – 8.4 mm (median 2.2 mm) in men with BOO and between 0.8 – 2.2 mm (median 1.4 mm) in men without BOO (figure). DWT of obstructed men was significantly thicker than in unobstructed men ($p < 0.001$). Calculation of the diagnostic values showed that a cut-off value of 2 mm classifies 89% of men correctly as obstructed or unobstructed (table). With an increasing cut-off value, the positive predictive value and specificity increase but the negative predictive value and sensitivity decrease.



Cut-off value: no BOO/BOO	Positive predictive value [%]	Negative predictive value [%]	Sensitivity [%]	Specificity [%]	Accuracy [%]
<1.7 / ≥1.7 mm	76	90	91	75	83
<1.8 / ≥1.8 mm	86	90	89	87	88
<1.9 / ≥1.9 mm	90	88	85	91	88
<2.0 / ≥2.0 mm	**94**	**86**	**83**	**95**	**89**
<2.1 / ≥2.1 mm	98	78	68	99	84
<2.2 / ≥2.2 mm	98	72	57	99	79

Interpretation of results

A cut-off value of DWT ≥2 mm for determination of BOO and DWT <2 mm for determination of no BOO can classify 89% of men correctly with regard to the obstruction grade. Therefore, 11% of the patients are not correctly classified

with these cut-off values. If a DWT of ≥2.1 mm for BOO and a DWT of <1.8 mm for no BOO would be used for classification of the BOO grade, 94% of all men would be classified correctly with these cut-off values. However, all men with a DWT between 1.8 – 2.1 mm would not be classified. In this study, 27 men (16.9%) would have been without BOO classification.

Concluding message

A DWT of ≥2 mm indicates patients with BOO and a DWT of <2 mm indicated patients without BOO the best. 89% of patients are classified with these cut-off values correctly. This accuracy seems to be high enough to classify men in daily routine non-invasively.

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HUMAN SUBJECTS: This study was approved by the Local ethic committee of the Medical School Hannover, Germany and followed the Declaration of Helsinki Informed consent was obtained from the patients.