

INCREASE IN DETRUSOR WALL THICKNESS (DWT) IS SIGNIFICANTLY ASSOCIATED WITH INCREASE IN BLADDER OUTLET OBSTRUCTION (BOO) GRADE AND DETRUSOR CONTRACTION POWER (W_{max}) IN ADULT MEN WITH LOWER URINARY TRACT SYMPTOMS

Hypothesis / aims of study

Bladder outlet obstruction (BOO) leads to bladder wall hypertrophy which can be visualized by ultrasound measurement of detrusor or bladder wall thickness; therefore, a significant increase in ultrasound detrusor wall thickness (DWT) indicates BOO in both animals and humans. Studies in experimental animals have revealed an increasing contractility/detrusor contraction power with increasing BOO-grade. It was hypothesized that increasing contractility/detrusor contraction power is necessary to maintain voiding in the presence of BOO. However, the relationship between BOO and contractility/detrusor contraction power has never been investigated in humans. It also remains unknown whether detrusor overactivity (DO) leads to bladder wall hypertrophy in men and alters contractility/detrusor contraction power during voiding. This study aimed to investigate in men with lower urinary tract symptoms (LUTS) whether (1) there are relationships between BOO-grade, ultrasound derived DWT, and detrusor contraction power and (2) DO has an influence on DWT or contractility/contraction power.

Study design, materials and methods

Unselected, treatment naïve male patients aged 40 years or older with uncomplicated LUTS were prospectively evaluated. Men previously or currently treated with alpha-blockers, 5alpha-reductase inhibitors, or antimuscarinics were excluded from the study. Furthermore, patients with neurogenic bladder dysfunction, previous surgeries of the prostate or pelvic organs, urinary retention, bladder catheters, bladder diverticula, bladder stones, or signs or symptoms of prostate cancer were not qualified for the study. All suitable men initially received - besides standard assessment of male LUTS - ultrasound DWT measurements at the anterior bladder wall with a bladder filling of 250 ml or more and, afterwards, computer-urodynamic investigations for baseline assessment. Investigators of the computer-urodynamic measurements were blinded to the results of the previous clinical assessments and ultrasound DWT measurements. The bladder was filled with a 5 F transurethral catheter with physiological saline solution of 37°C and a filling speed of 25 ml/min. Urodynamic assessment was performed according to the 'good urodynamic practice' standards recommended by the International Continence Society. The Schäfer-classification was applied to define the BOO-grade; Schäfer grades 2 to 6 were considered as obstruction. At least two pressure-flow measurements were recorded and the lowest BOO-grade was used for further calculation. W_{max} was used to determine detrusor contraction power. Results were analyzed using the Chi-Square test, Mann-Whitney U test, ANOVA, or Spearman correlation (significance level ≤ 0.05).

Results

The study population consisted of 143 men with a median (interquartile range) age of 62 years (59 - 70), IPSS of 16 (10- 21) and prostate volume of 35 ml (26 - 45). During computer-urodynamic investigation, DO was detected in 85 patients (59.4%) and BOO was found in 100 patients (69.9%). 26 men without BOO (60.5%) and 59 men with BOO (59.0%) had DO during cystometry. Median DWT (W_{max}) values continuously increased from 1.3 mm (5.2 W/m^2) in Schäfer grade 0 to 3.8 mm (20.0 W/m^2) in Schäfer grade 6 (Figure). DWT ($p < 0.001$) and W_{max} ($p = 0.002$) were significantly different between Schäfer grade 0 and the other BOO-grades. Additionally, DWT showed a significant correlation with W_{max} ($p < 0.001$), whereas no significant differences were found between DO and W_{max} ($p = 0.780$) or DO and DWT ($p = 0.816$).

Interpretation of results

Our prospective study showed for the first time that (1) detrusor wall thickness and bladder contractility/detrusor contraction power (W_{max}) significantly increase with increasing bladder outlet obstruction grade, (2) W_{max} is significantly associated with detrusor wall thickness, and (3) detrusor overactivity no influence on detrusor wall thickness or W_{max} .

Concluding message

Our results indicate that bladder contractility/detrusor contraction power (W_{max}) increases to maintain voiding in the presence of bladder outlet obstruction in men as well and increasing W_{max} is generated by increasing detrusor mass (DWT). Determination of threshold values for the definition of detrusor underactivity has to be done in each BOO-grade separately.

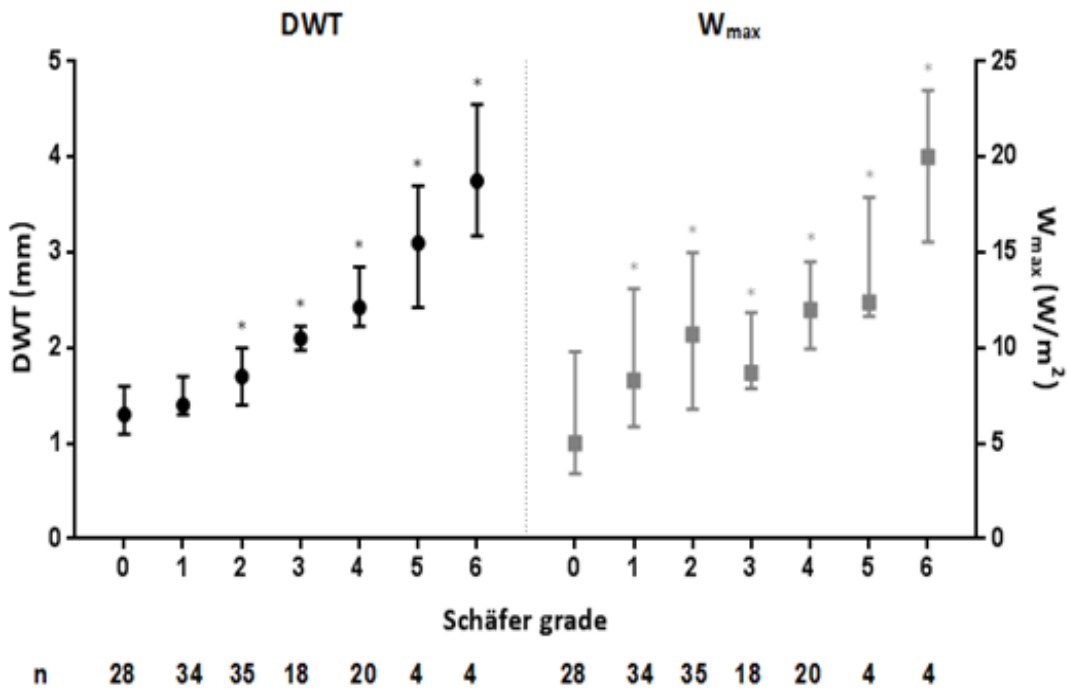


Figure 1. Detrusor Wall Thickness (mm) and W_{max} (W/m²) in relation to different BOO-grades (Schäfer 0-6), presented as median values with the interquartile range (IQR) values in each BOO subgroup. * represents a significant difference compared to Schäfer grade 0.

Disclosures

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