

THE EFFECT OF ALPHA-ADRENERGIC BLOCKER ON PROSTATIC ENLARGEMENT: NON INVASIVE ULTRASOUND URODYNAMIC EVALUATION OF VELOCITY-FLOW PLOTS

Hypothesis / aims of study

To assess the usefulness of non invasive Doppler ultrasound urodynamics, this observational study compares the velocity-flow plots between patients with benign prostatic enlargement (BPE) and age-matched healthy volunteers. The findings were used to analyze the effect of alpha-adrenergic blocker therapy in the patient group.

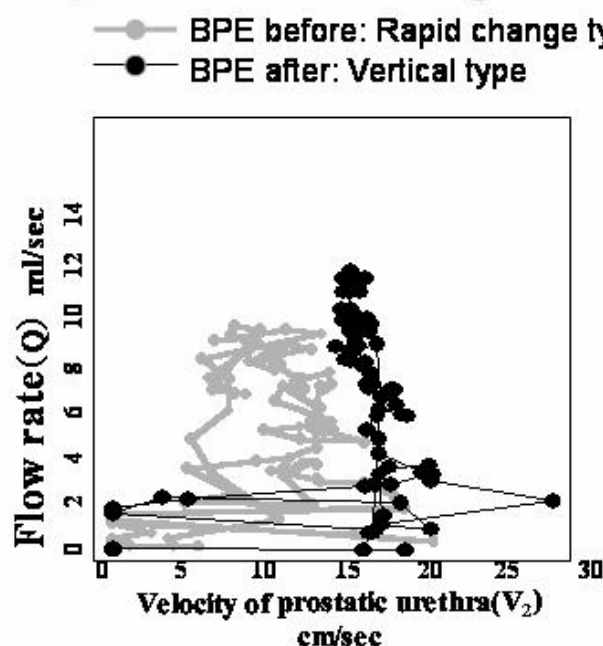
Study design, materials and methods

Sixteen men with BPE, who had an estimated prostatic volume >20g underwent transperineal Doppler ultrasound urodynamics before and at 4 weeks after receiving an alpha-blocker. The data of 16 age-matched men (control group) were selected from previously recorded voiding of volunteers. A 3.5 MHz micro-convex electroprobe (Aloka SSD5500) was remotely controlled to achieve gentle contact with the perineal skin. Subjects with full bladders were asked to sit on a uroflow micturition chair for ultrasound monitoring of natural micturition. Uroflow rates (Q) from the urethral meatus were measured with a uroflowmeter. Information on Doppler shift frequencies from different flow velocities was converted to color encoded data by the Doppler ultrasound system [1]. After voiding, two square sample areas on the color-flow images (1cm²) were set to calculate the velocities at prostatic urethra (V₁) and at the membranous urethra (V₂), and corresponding functional cross-sectional areas at these two sites (A₁ and A₂) were calculated as Q/V [2]. Measures of velocity-flow parameters and corresponding flow rates during complete voiding were plotted against each other on an x-y graph [3]. The wave patterns of velocity-flow plots (VF plots) were divided into rapid change type, vertical type, proportional type, and wide type.

Results

Q_{max} and A₁ in the control group were significantly higher than those of the BPE group. In the graph of V₁ and Q, the wide pattern that appeared in the control group and in a small percentage of the BPE group before treatment, disappeared after treatment. V₂ and Q showed a vertical type pattern in 81% of the control group, but in only 38% of the BPE group before treatment, which increased to 88% after administration (Figure).

Figure Correlation between V₂ and Q



In A₁ and Q, none of the control group had a vertical type pattern, which was present in the BPE group and remained unchanged after treatment. In A₂ and Q, the proportional type was the dominant type in all three groups. It was high in the control group, lowest in the BPE group before treatment, and rose to a higher level than in the control group after treatment. In VR and Q, the wide type pattern was dominant in the control group, present in a small percentage of the BPE group before treatment, and absent after treatment.

Interpretation of results

Alpha-blocker therapy is based on the hypothesis that clinical BPE is partly caused by alpha1-adrenergic mediated contraction of prostatic smooth muscle, resulting in bladder outlet obstruction. Alpha-adrenergic receptor antagonists inhibit this process, thereby relieving the bladder outlet obstruction. V₂ in the control group, however, indicated consistent velocity during voiding. Normal urinary sphincter controls urinary flow to maintain adequate tension. The rapid change in V₂ before administration of the alpha blocker in the BPE group was replaced by a near normal flow pattern after administration. The flow controlling function might be at the urinary sphincter in the normal condition. However, BPE impeded the function, which was regained after the alpha-blocker treatment. This study showed that new urodynamic information can be obtained using a simple and painless velocity-flow videourodynamic method. Non

invasive and informative transperineal Doppler ultrasound urodynamics is expanding the range of urodynamic application.

Concluding message

This study shows the feasibility of conducting a robust prospective study of the diagnostic accuracy of BPE using the V₂-Q or the A₂-Q plots of the transperineal Doppler ultrasonography.

[1] JU160: 1787-1796, 1998 [2] Urology56: 408-412, 2000 [3] JU173: A354, 2005

FUNDING: NONE

DISCLOSURES: NONE

CLINICAL TRIAL REGISTRATION: This clinical trial has not yet been registered in a public clinical trials registry.

HUMAN SUBJECTS: This study was approved by the The Institutional Ethics Review Board of Okayama University and followed the Declaration of Helsinki Informed consent was obtained from the patients.