

## **AUTOMATIC MEASUREMENT OF BLADDER DIAMETER: NON INVASIVE TRANSPERINEAL VOIDING CYST ULTRASONOGRAPHY-**

### Hypothesis / aims of study

Following on the report of a pressure-flow like urodynamic system based on the concept of Doppler ultrasonography (1), we developed non invasive measurement of bladder diameter during complete voiding.

### Study design, materials and methods

Thirty consecutive men with prostatic enlargement, who had estimated prostatic volume of 20g or more (BPE group), and 30 volunteer men (Control group) underwent transperineal voiding cyst ultrasonography. Patients sat on the lavatory chair. The ultrasound probe was operated transperineally using a specially equipped remote-controlled robotic manipulator. During voiding, the ultrasound image of median sagittal plain was consecutively recorded a picture in each 0.9sec, then analyzed by a custom software. After voiding, a rectangle region of interest (ROI) can be set to enclose the whole bladder in the retrieved B-mode image. The longest continuous black dots for anteroposterior (AP) direction and those for top-bottom (TB) direction were measured to determine as the AP diameter and the TB diameter, respectively. Automatic calculation of diameter was performed to compare the diameter measured by a ruler in the computer screen. Additionally change of length and contractile velocity in each diameter was plotted against time axis on the graph (Figure).

### Results

Automatic measurement of diameter in resting phase was coincided with practical length, in 95% of TB diameter and in 87% of AP diameter. The ratio of pre-voiding AP diameter just before start voiding and resting AP diameter (Pre-void AP / Resting AP) was 0.99 in control group, otherwise 0.97 in BPE ( $p=0.93$ ). However, pre-voiding TB diameter ratio (Pre-void TB/ Resting TB) in control group (1.10) was significantly higher than that in BPE (1.02) ( $p<0.05$ ). Although TB diameter increased significantly just before voiding in control group, it did not significantly increase in BPE group.

### Interpretation of results

Automatic measurement was reasonable reliability with practical measurement in the computer screen. In normal condition, detrusor shape is very variable in the resting phase and only when contracting at elevated detrusor pressure, it resembles a sphere. Contraction velocity curve of AP diameter in control group demonstrated pre-voiding contraction; however, it did not in the most cases of BPE group.

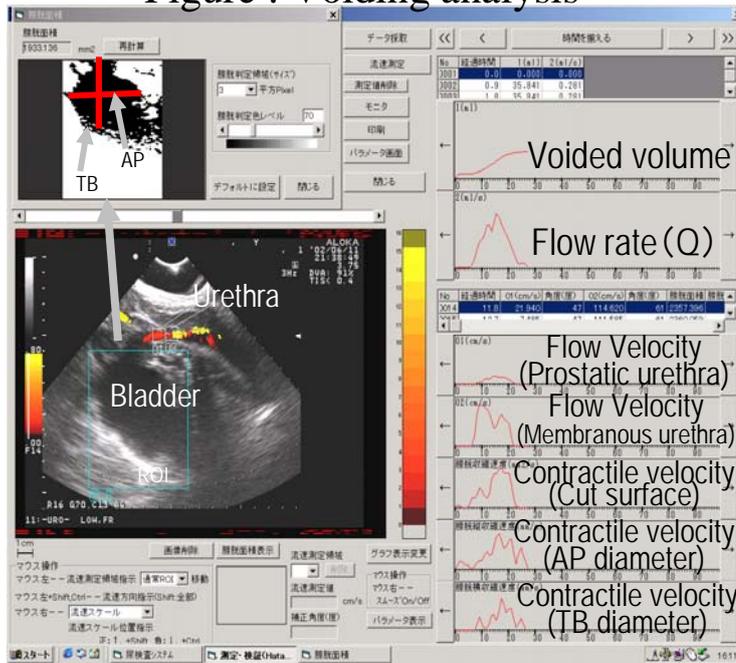
### Concluding message

Prostatic enlargement proved to affect not only to the bladder outlet obstruction of prostatic urethra but also to the detrusor function during voiding. Transperineal voiding cyst ultrasonography is non invasive, and provides a detailed analysis of the bladder shape during voiding.

### References

(1) J Urol 160,1787,1998

Figure : Voiding analysis



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**DISCLOSURES:** Equipment Loan

**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 approved the research protocol. and followed the Declaration of Helsinki Informed consent was obtained from the patients.