

NON INVSIVE TRANSPERITONEAL URODYNAMIC TECHNIQUE USING DOPPLER ULTRASONOGRAPHY FOR EVALUATION OF BLADDER OUTLET OBSTRUCTION

Hypothesis / aims of study

We developed a completely non invasive transperitoneal urodynamic technique using Doppler ultrasonography with a remote control robotic manipulator. Using this newly developed technique, bladder outlet obstruction (BOO) was evaluated by measuring flow velocity in the urethra.

Study design, materials and methods

We used an ultrasonic image-directed color Doppler system (SSD-3500; Aloka), composed of a 3.75 MHz micro-convex electroprobe. The probe is operated transperineally and remotely controlled by a robotic arm, with a pressure regulating function and a touch panel manipulator on the display panel accompanying the probe position indicator (Coretec Inc.). The digital uroflow data signals and color Doppler ultrasound images were processed on a computer. The flow velocity curves from two sites: the distal prostatic urethra just above the external sphincter (S1) and the sphincteric urethra (S2) were plotted against time. The maximum flow velocities at both sites (V1 representing the velocity at S1, V2 representing the velocity at S2) were recorded simultaneously. From these data, the VR = $V1/V2$, and the functional cross-sectional area at S1 (A1) were computed from the following formula: $A1 = Q_{max}/V1$.

Results

Fifty-one of 61 patients (83.6%) could void during study without complain of perineal discomfort and 45 patients (73.7%) were evaluated. The average time for measurement to adjust to an adequate probe position prior to voiding was 9.8 ± 5.2 sec. Mean prostate volume was 56.1 ± 22.7 ml in BOO (+) group (n=20), and 28.8 ± 20.5 ml in BOO(-) group (n=25). Mean IPSS was 21.1 ± 7.1 in BOO (+) group, and 9.5 ± 6.0 in BOO (-) group. Flow velocity was reduced through the sphincter in the BOO(+) group. The mean VR is significantly higher in BOO (+) group (1.89 ± 1.3) than in BOO(-) group (0.41 ± 0.3). Functional cross-sectional area of the prostate (A1) was significantly smaller in BOO (+) group (0.06 ± 0.03 cm²) than in BOO(-) group (0.36 ± 0.38 cm²).



Interpretation of results

Our study demonstrated that although flow was accelerated through the sphincter in the BOO(-) group, flow velocity was reduced through the sphincter in the BOO(+). The results of our study have provided evidence to suggest that VR and A1 can be used as a parameter for the diagnosis of BOO.

Concluding message

Remote control robotic manipulator was able to adjust to an adequate probe position to detect urinary stream in the urethra, regardless of whether the examiner is skilled or not. Doppler ultrasound urodynamic is a promising non invasive technique to diagnose the degree of bladder outlet obstruction.

Specify source of funding or grant	none
Is this a clinical trial?	No
What were the subjects in the study?	HUMAN
Was this study approved by an ethics committee?	Yes
Specify Name of Ethics Committee	Okayama University Ethics Committee
Was the Declaration of Helsinki followed?	Yes
Was informed consent obtained from the patients?	Yes