

RECONSTRUCTION OF THREE DIMENSIONAL STRUCTURE OF THE URETHRA FROM ENDOSCOPIC VIDEO IMAGE

Hypothesis / aims of study

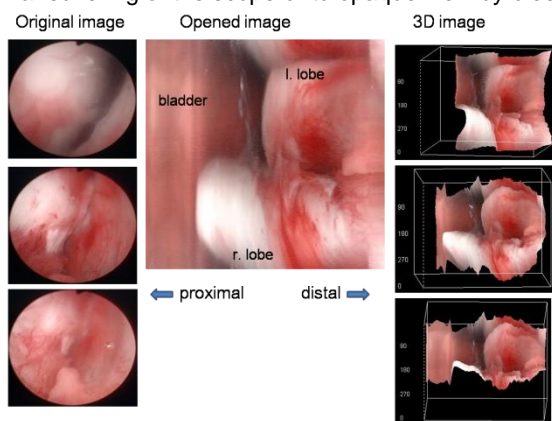
Recently, depiction of three dimensional (3D) structure of the urethra is attempted using CT¹, MRI² or ultrasound³) to diagnose urethral diseases. Since endoscopy is common in urological practice, and the image contains much information about colour and shape of the urethra, we developed novel method to extract 3D information of the urethra from the video image.

Study design, materials and methods

We made software that runs on Windows PC. The software is designed to calculate distance between the object and the endoscope by intensity of each pixel of the image. Before clinical trial, endoscopic image using irregular "dummy" pipe was processed and estimated its relevance. During examination or TUR, the urethra was observed using cystourethroscope pulled through slowly. The video image of the urethra was recorded, captured to PC, and processed using the software later.

Results

Opened image of "dummy" pipe is created automatically in every trial. Relevancy of 3D structure is confirmed using "dummy". In 9 of 39 video files of male urethra, opened 3D image was processed successfully (figures). Additionally, an opened 3D picture of whole length of the urethra can be processed in four female patients. Failure of processing image was attributable to inadequate maneuvering of the scope or to opaque view by bleeding.



Interpretation of results

Processing the 3D image of the urethra from the endoscopic video image indicates feasibility of acquiring 3D coordinates of the urethral channel using conventional endoscope. The processed 3D image would adjust to hydraulic model for calculating local resistance of urinary stream.

Concluding message

Processing an opened 3D image is achieved in an automated and real-time mode. This method will provide novel diagnostic tool for evaluating obstructive function of lower urinary tract and bladder function further.

References

- 1) CT voiding urethrography and virtual urethroscopy: preliminary study with 16-MDCT. *AJR Am J Roentgenol* 184: 1882-8, 2005.
- 2) Contrast-enhanced 3D MR voiding urethrography: preliminary results. *Magn Reson Imaging* 22: 1193-9, 2004.
- 3) Dynamic transurethral sonography and 3-dimensional reconstruction of the rhabdosphincter and urethra: initial experience in continent and incontinent women. *J Ultrasound Med* 25: 315-20, 2006.

Specify source of funding or grant	Grant from Japanese Ministry of Education, Culture, Sports, Science and Technology.
Is this a clinical trial?	Yes
Is this study registered in a public clinical trials registry?	No
What were the subjects in the study?	HUMAN
Was this study approved by an ethics committee?	Yes
Specify Name of Ethics Committee	Ethics Committee of Graduate School of Medicine, Chiba University
Was the Declaration of Helsinki followed?	Yes
Was informed consent obtained from the patients?	Yes