Visualization and Analysis of Urine Flow Dynamics through the Urethra & Development of a Novel Surgical System with Water Filled Surgical Field

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Speaker:
Takuro Ishii, Ph.D.
Project Assistant Professor
Center for Frontier Medical Engineering
Chiba University

Abstract:
Minimally invasiveness is one of major challenging topics in both biomedical engineering and medical field. To conserve patients’ QOL after therapies, preservation of function of organ around surgical site and controlling inflammatory response are important as well as improvement of esthetic outcome by such as smaller size incision and access via natural orifice. In this presentation, I will introduce two topics concerning the minimally invasive therapy progressing in the Center for Frontier Medical Engineering (CFME), Chiba University. The first topic is analysis of urine flow dynamics through the prostatic urethra to detect the critical lesions for voiding dysfunction, especially in male patients. The shape of the prostatic urethra was constructed by processing the cystourethroscopic video images and the internal urine flow was calculated. The proposed method suggested the calculated indices would correspond to the voiding parameters in clinical practice and would afford to detect the critical lesions responsible to the symptoms, providing the optimized shape of urethra for the lesser invasive trans-urethral resection of the prostate.

The second subject is the novel surgical system which make the surgical field “water-filled” condition. We named the surgical concept as “Water Filled Laparoscopic Endoscopic Surgery (WaFLES).” In WaFLES, the surgical area, e.g. abdominal cavity, is filled with the isotonic fluid and a developed irrigation system that supply the irrigant continuously, replacing the CO2 gas for the conventional laparoscopic surgery. The system provides the physiological environment for organs during the surgery and controls bleeding by fluid pressure. It is expected to apply to wide-range of surgery including gastrointestinal, urological, gynecological and orthopedic field, and a surgical navigation for soft organs using ultrasound images would be possible in WaFLES modality.

Biography of the Speaker:
Takuro Ishii received B.Eng., M.Eng. and Ph.D. in Biomedical Engineering from Chiba University, Japan in 2009, 2011 and 2014, respectively. He was a JSPS research fellow between 2012 and 2014. His research interests include endoscopic image processing especially for image-based organ modeling and assisting surgeons’ spatial recognition of surgical field.

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