ENDOUROLOGY SOCIETY
2013 Summer Student Scholarship

The Endourology Society is pleased to announce the following recipients of this year's **2013 Summer Student Scholarship**:

1. Michael Glamore
   University of Miami Miller School of Medicine
   Mentors: Raymond Leveillee, M.D. and Nelson Salas, M.D.
   Project: "Development of a Thermal Model for Radiofrequency Ablation with Pyelo-Perfusion"

2. Alexandra Mecklenburg
   Asklepios Klinik Barmbek
   Mentor: Prof. Andreas Gross
   Project: "Percutaneous Nephrolitholapaxies – An Innovative System to Fill the Renal Pelvis Retrograd"

3. Taile Jing
   Shanghai Changhai Hopsital
   Mentor: Prof. Yinghao Sun
   Project: Removal of Ureteral Catheters with a Novel Noninvasive Device Safely and Economically"

Non-invasive Removal Device for Ureteral Stents

Taile Jing, Yinhao Sun

Introduction

Ureteral stents are commonly used for maintaining ureteral patency. Rigid cystoscopy assistant catheters-retrieval or exchange has been recommended as the standard procedure for almost semi centuries. However, it cannot be well accepted by patients and urologists because of its limitation, such as lithotomy position, risk of urethral false passage, risk of urethral stricture, urinary tract infection and discomfort associated with the procedure, etc. This study investigated a novel noninvasive ureteral retrieval device under ultrasound guidance without cystoscopy or fluoroscopic guidance in patients, and also investigated the success rate, procedure time, pain and complications compared with the standard technique of cystoscopy.

Methods

The Non-invasive Removal Device for Ureteral Stents (NRDUS) was made of latex (Fig 1). Hydrophilic coating was applied in an attempt to reduce urethral trauma and infection risks. The NRDUS was a three-way catheter (Fig 2). The basic channel permitted urinary drainage or irrigation with side hole and drainage port. Additional lumen was added to permit addition of a balloon with one-way valve. The third lumen has been used to hold metal guidewire.

This study included 12 male patients with ages ranging from 23 to 65 years (mean age, 39.16) referred to our department for removal of double-J ureteral stents (diameter, 6~8 Fr; length, 22cm for 2, 24cm for 9, 26cm for 1) during a 3-month period. Eleven patients had unilateral stents and 1 had bilateral stents. Control group including 11 male patients with the similar background, were used for comparison purpose. Written informed consent was obtained from all patients prior to participation in this study.

We did not use fluoroscopy in this study. The working principal of Noninvasive Removal Device for Ureteral Stents (NRDUS) contained two parts: insertion of device and extraction of ureteral stents. Part 1: Insertion of device. Patients were placed in a supine position, and local asepsis was performed with povidone-iodine. In addition, "Frog-leg" position was most comfortable for male. Fasten the metal guidewire to make sure the wire clings to the tip of device. Lubricant was utilized on the surface to reduce urinary tract injury. Indwelling the NRDUS until urine drained from drainage port. After clamping it, instillation of balloon with 10 to 20ml saline fixed the device at the neck of bladder. To

improve technical manipulation, the bladder was slightly distended by residual urine or injection of 150-200ml of normal saline solution to prevent mucosal folds from covering the stent. Part 2: Extraction of ureteral stents. Using a hand-held 3.5- or 5-MHz ultrasound transducer inspected the distal end of ureteral stents. Released the wire until the tip becomes a suitable snare (Fig 3). Under ultrasound guidance, with rotation of the NRDUS, the snare was manipulated to make sure the stent tip would be inside the loop of the snare. For stents with the end located at the lateral bottom of the bladder, the snare was advanced straight up to the upper wall of the bladder and allowed the loop downward to reach the stent abutting on the mucosa. Lassoed stents and fixed it to the device. Drained the urine and extracted the device with fixed ureteral stents simultaneously. The ureteral stent was removed using fluoroscopy guidance or cystoscopy if it could not be withdraw using the NRDUS.

Statistical analysis

All continuous variables are expressed as the mean ± SD. The numerical data were compared by Student's t-test. A p-value of 0.05 or less was considered to be significant.

Result

Nine of 13 stents were successfully removed (69.23%) using the NRDUS technique. In addition, 9 of 11 stents (81.82%) were successfully removed except for 2 migrated stents, which could not be removed using standard procedure of ureteral stent removal by means of cystoscopy with alligator jaws. For the 2 migrated stents, it was necessary to perform URS for removal.

Minor complications, including gross hematuria occurred in 1 patient (1 stent: 27.27%), which was also complication of URS. There is no active bleeding or injury of bladder mucosa happened in NRDUS group. None of the outpatients complained of gross hematuria after NRDUS procedures. The rate of complications did not differ from the control group with standard technique using cystoscopy. The mean VAPS was 1.8 for stent removal using the NRDUS technique, and 3.7 for cystoscopic group. ($p<0.001=$.

Discussions

Under ultrasound guidance, a total of 11 of 13 stents were successfully grasped and pulled out except for 2 proximal migrated stents. Stents that could not be removed by NRDUS were retrieved by ureteroscopy with grasp forceps. The procedure might be technically advantageous in that supine position means more comfortable and achievable than lithotomy position for elder, paralysis, serious osteoporosis and hip osteoarthritis patients. After two to four

experiences, each surgeon can easily obtain technical success, indicating the easy of learning the procedure under the ultrasound guidance.
The complication rate of NRDUS was extremely low. Only 2 patients' urine test showed urosepsis. One of them suffered urosepsis before ureteral stent insertion. Another urosepsis may have been secondary to PCNL with infected renal calculi. Gross hematuria occurred in 1 patient (1 stent: 27.27%), which was also complication of URS. The whole retrieval procedure seems to be more tolerable than cystoscopy assisted removal. The VAPS of NRDUS group was significantly lower than that observed in controls($P<0.001$). Most patient experienced mild transient pain as the stent was withdrew through the urethra, but none of them required pain management. This is mainly due to the latex material character in comparison to rigid metal of cystoscopy.

NRDUS has the advantage of that cystoscopy is not required in the whole procedure. According to the Shanghai insurance system, performing the ureteral stent retrieval procedure with cystoscopy assistant costs ¥650 (about $110). Chang et al. reported that ureteral stent retrieval under cystoscopic and fluoroscopic guidance costs $433 in comparison to $335 cost by procedure under fluoroscopic guidance without cystoscopy.

A major limitation of this study is that the NRDUS needs ultrasound guidance operated by ultrasound physician or urologist with basic ultrasound knowledge. The benefit of the NRDUS is that it is easy to perform, more comfortable, no radiation exposure, requires no cystoscopy is cost effective. Further studies are needed to confirm the efficiency of NRDUS in ureteral stent retrieval by comparing the benefits and the success rate.

In conclusion, ureteral stent retrieval using NRDUS is usually well tolerated with less complication due to abandoning fluoroscopy and cystoscopy. The whole procedure is safe and easy for urologist to perform. This technique is also suitable for use in outpatient department.

Fig 1 Non-invasive Removal Device for Ureteral Stents (NRDUS) was made of latex

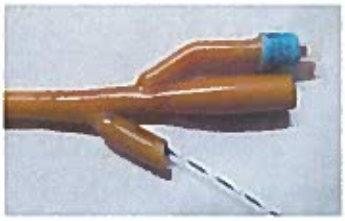

Fig 2 The NRDUS was a three-way catheter. The basic channel permitted urinary drainage or irrigation with side hole and drainage port. Additional lumen was added to permit addition of a balloon with one-way valve. The third lumen has been used to hold metal guidewire

Fig 3 Released the wire until the tip becomes a suitable snare