

Risk factors of infectious complication after ureteroscopic procedures of the upper urinary tract

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Abstract Ureteroscopic procedures are being commonly performed in urology, but only a few clinical studies have been conducted on infectious complications after these procedures, and overall understanding on the preoperative use of prophylactic antibiotics is insufficient. This study examined the incidence rate of infectious complications and the risk factors affecting incidence after ureteroscopic procedures. We retrospectively reviewed the medical records of 531 patients who underwent ureteroscopy and ureteroscopic lithotripsy in our hospital, including age, sex, past history, comorbidity, urine analysis, urine culture, blood test, hydronephrosis, urethral catheter or ureteral stent, and percutaneous nephrostomy placement from January 2002 to December 2011. A total of 20 patients (3.8 %) contracted infectious complications after various procedures in the upper urinary tract. Preoperative bacteriuria, hydronephrosis, and the placement of a urethral catheter or ureteral stent, and percutaneous nephrostomy are significant risk factors of infectious complication. No significant differences were shown in the types and start time of prophylactic antibiotics. Diagnostic ureteroscopy exhibited a higher incidence rate of infectious complications compared to ureteroscopic lithotripsy.

Keywords Ureteroscopy · Infectious complication · Risk factor

Introduction

Prophylactic antibiotics are commonly and conventionally used to prevent general or local infections and complications during various invasive examinations or surgical procedures in urology. The purpose of prophylactic antibiotic use is to prevent wound infection, as well as the occurrence of febrile infectious complications such as pyelonephritis, prostatitis, epididymitis, and urosepsis [1, 2]. Urologists frequently perform ureteroscopic procedures and ureteroscopic lithotripsy for the purpose of examining and treating the upper urinary tract. Those procedures are generally performed in cases of urinary stones or tumor and congenital anomalies, and they are also conducted for the evaluation of ureter stricture or hydronephrosis. Febrile infectious complications and urinary tract infections can occur during those procedures and have negative impact on the surgical outcome. For these reasons, urologists administer prophylactic antibiotics to prevent such complications. However, those alternative measures are not always desirable. Patient resistance on bacteriuria and bacteremia and potential complications must be taken into consideration to decide the needs of prophylactic antibiotic administration. Moreover, risk factors also need to be considered such as the type of ureteroscopic procedure, older age, anatomical abnormalities, history of chemotherapy or radiation therapy, or long-term hospital stay to determine the types of prophylactic antibiotics, their start time, and duration of administration [3]. Although ureteroscopic procedures are being commonly performed in urology, only a few clinical studies have been conducted on infectious complications after these procedures, and overall understanding on the preoperative use of prophylactic antibiotics is insufficient. Therefore, this study examined the incidence rate of infectious complications

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and the risk factors affecting incidence after ureteroscopic procedures.

Patients and methods

Ureteroscopic procedures are mainly classified into diagnostic ureteroscopy and ureteroscopic lithotripsy that were performed in our hospital from January 2002 to December 2011. An 8-Fr. semi-rigid ureteroscope was utilized during the diagnostic ureteroscopy and ureteroscopic lithotripsy. We retrospectively reviewed the medical records of 531 patients who underwent ureteroscopy and ureteroscopic lithotripsy in our hospital, including age, sex, past history, comorbidity, urine analysis, urine culture, blood test, hydronephrosis, urethral catheter or ureteral stent, and percutaneous nephrostomy placement. The occurrence of infectious complication was defined as incidence within a 1-month period of surgery, a fever higher than 38 °C or chills, positive results in urine or blood bacterial culture, and the presence of sepsis. In addition, pyelonephritis, prostatitis, and epididymitis were included in the determination [4]. When a patient underwent different procedures, patient number was counted by taking each procedure as a case during the assessed period. The authors investigated the types and usage frequency of prophylactic antibiotics in each procedure, the postoperative incidence rate of infectious complications, and risk factors. Risk factors were established as male, older age, diabetes, history of chemotherapy or radiation therapy, renal insufficiency, hydronephrosis, preoperative bacteriuria, previous hospitalization, the placement of percutaneous nephrostomy, ureteral stent, or urethral catheter, procedure time, and start time of administering antibiotics, by reviewing references based on the criteria mentioned by Grabe et al. [5] and Yoon [6]. Patients aged more than 65 years were defined as old. A history of chemotherapy or radiation therapy implied a state of low immunity resulting from chemotherapy or radiation therapy. Renal insufficiency was defined as a glomerular filtration rate less than 60 ml/min/1.73 m². The journal article of Cietak and Newton [7] was used as a reference to classify hydronephrosis: grade 1 is no enlargement of the urinary tract; grade 2 is mild enlargement of the pelvis of the kidney but no deformation of the calyces; grade 3 is moderate enlargement of the pelvis and calyces simultaneously; grade 4 is severe enlargement of the pelvis and calyces simultaneously. Grade 2 and higher was defined as hydronephrosis. Also, bacteriuria was defined as more than 10⁴ CFU/ml before the surgery. Previous hospitalization indicated a long-term admission or hospital admission in the time period near to and preceding the surgical procedure. The time of antibiotic administration was categorized into a minimum of

12 h and immediately before the procedure (within 1 h) and a minimum of 3 h after the procedure. Levofloxacin 250 g was administered intravenously as prophylactic fluoroquinolone antibiotic, ceftriaxone 1 g was administered intravenously as cephalosporin antibiotic, and tobramycin 100 mg was administered intramuscularly as aminoglycoside antibiotic. One hour was set as the standard for the duration of the procedure. Statistical analysis was performed using a Fisher's exact test in the cross-tabulation analysis between the incidence rates of infectious complications caused by different surgical procedures and the start time of antibiotic administration. *P* values less than 0.05 were considered statistically significant. Statistical analysis was performed using the software SPSS version 18.0 (SPSS, Chicago, IL, USA).

Results

Analysis of patient characteristics

A total of 531 patients were classified according to the foregoing criteria. The results are shown in Table 1. The mean age of subjects was 59.07 years (range, 32–83), comprising 310 men (58.4 %) and 221 women (41.6 %). Of these patients, 205 (38.6 %) were more than 65 years old. There were 89 patients (16.8 %) with a history of

Table 1 Baseline characteristics of patients

Characteristics	Total (%)
Patients (number)	531
Mean age (years)	59.07 (32–83)
Sex	
Male	310 (58.4)
Female	221 (41.6)
Risk factors	
Old age (≥65 years)	205 (38.6)
Diabetes mellitus	59 (11.1)
History of chemotherapy or radiation therapy	89 (16.8)
Renal insufficiency ^a	38 (7.2)
Hydronephrosis	440 (82.9)
Bacteriuria	111 (20.9)
Previous hospitalization	47 (8.9)
Ureteral stent or nephrostomy	101 (19.0)
Duration of procedure (≤1 h)	469 (88.3)
Timing of antibiotic prophylaxis	
≥12 h before procedure	125 (23.5)
Just before procedure	340 (64.0)
≥3 h after procedure	28 (5.3)
No antibiotic prophylaxis	38 (7.2)

^a Glomerular filtration rate less than 60 ml/min/1.73 m²

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