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RISK FACTORS FOR INFECTIOUS COMPLICATIONS OF URETEROSCOPY FOLLOWINGOBSTRUCTIVE ACUTE PYELONEPHRITIS

Dr Sanjay Choudhuri[1], Dr Sridhar Panda[2], Dr Niranjan Mohapatra[3]

Assistant Professor, Department of Urology, SCB Medical college and Hospital[1]

Assistant Professor, Department of Medicine, SCB Medical college and Hospital[2]

Assistant Professor, Department of Medicine, SCB Medical college and Hospital[3]

Corresponding Author

Dr Niranjan Mohapatra

Assistant Professor, Department of Medicine, SCB Medical college and Hospital

drniranjan0782@gmail.com

8637201257

Background and Objective:
Kidney stone disease is a common issue in urology practice. UTI is often associated with KSD, both as a cause (e.g. struvite and carbonate apatite stones) and as a possible consequence (e.g. obstructive pyelonephritis, post-operative UTI). It is worth mentioning that a significant portion of the financial burden produced by KSD is mostly focused on stones associated with infection. Our research aims to explore the outcomes of URS after OAPN in a large patient group. Furthermore, we sought to assess possible risk variables such as RIRS and the time gap between OAPN and URS. The ultimate objective was to enhance the care of patients who required stone removal after OAPN.

Materials and Methods:
The research lasted one year and took place in a Department of General Surgery at a Tertiary Care Teaching Institute in India. A data analysis was performed on patients who were sent to the Study Hospital and diagnosed with OAPN due to urinary calculi. The research focused on those who had emergency drainage during the last three years. Patient records were reviewed to acquire critical information on numerous variables that might lead to postoperative problems. These variables were age, sex, body mass index (BMI), diabetes mellitus, leucocyte counts, and C-reactive protein at OAPN presentation, type of preoperative drainage, days from drainage to surgery, operating time, and stone considerations.
Results:
Twelve patients had supplementary shockwave lithotripsy. There were no fatalities during the perioperative phase. Several characteristics were identified as possible risk factors for postoperative UTI, including diabetes mellitus, a one-month interval between drainage and surgery, a high stone load, simultaneous RIRS, and an operation length of more than 75 minutes. These results were statistically significant, with a p-value of <0.05.
Conclusion:
People who had previously had OAPN were more likely to have postoperative infectious problems. Diabetes mellitus, a delay of more than one month between drainage and surgery,

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and concurrent RIRS were all identified as significant predictors of postoperative UTI. Our studies revealed a possible link between.
Keywords: Acute Pyelonephritis, Body Mass Index, Diabetes Mellitus, Ureteroscopy.

Introduction

According to statistics, a large percentage of individuals will have kidney stones at some time in their life. The likelihood of developing a stone varies depending on age, gender, race, and where a person lives. [1]
For those suffering from ureteral or renal stones, the standard treatment is to provide pain relief, offer medical expulsive therapy, and monitor the stone's position and check for hydronephrosis. However, if people continue to have symptoms including pain, nausea, and renal insufficiency, they may need to seek final therapy for their stones. Stone disease may be treated surgically using ureteroscopy (URS), shockwave lithotripsy, and percutaneous nephrolithotomy. Treatment is mostly determined by the patient's preferences, symptoms, and the size and placement of the stone.
Obstructive acute pyelonephritis (OAPN) induced by ureteral stones is a dangerous urological illness that requires rapid treatment. It is critical to empty the urine collecting system as soon as possible, either by stenting or a percutaneous nephrostomy. OAPN may be a dangerous disorder with the possibility of escalating to sepsis. It is crucial to note that recorded fatality rates are about 2%, emphasising the potentially fatal severity of this illness. [2,3] The increased incidence of OAPN patients and the sepsis they may induce have made OAPN management more important. [4] Patients who have recovered from OAPN should have obstructive stones removed. Nonetheless, the ongoing problem of infection reoccurring after the surgical operation has caused alarm. Patients with a history of OAPN are at a greater risk of postoperative complications, but the optimum way to manage these patients remains uncertain. [5-7]
In recent study, the outcomes of URS with preceding OAPN were investigated. [8-10] These studies found a number of risk variables for postoperative problems. According to one research, thoroughly removing the stone is critical for preventing OAPN recurrence. Nonetheless, the safety of retrograde intrarenal surgery (RIRS) for the removal of concurrent renal stones is unclear.
Furthermore, a short duration between OAPN and surgery may result in additional problems, whilst keeping the drainage tube in place for an extended period has been associated to an increased risk of postoperative infection. The management of contaminated stones remains unclear, leaving many concerns unsolved. In this research, we wanted to look at the outcomes of URS after OAPN in a large number of patients. In addition, we investigated possible risk variables such as RIRS and the period between OAPN and URS. Our objective was to enhance the care of patients who required stone removal after OAPN.

Material and Methods

The research lasted one year and was carried out at a reputed Department of General Surgery in India. Over the last three years, data from patients who were sent to the Study Hospital, diagnosed with OAPN due to urinary calculi, and underwent emergency drainage were analysed. One of the requirements for OPN is the presence of apparent obstructive stones. If the body temperature rises beyond 38°C or there are symptoms that clearly imply systemic inflammation, rapid intervention is required. Patients who did not obtain final therapy or who received a treatment other than URS were excluded from this research.

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The primary method for draining OAPN was ureteral stenting. A 6-Fr ureteral stent was inserted retrogradely while the patient was under transurethral or sacral spinal anaesthesia. When retrograde implantation was not possible, a PNS surgery was performed under local anaesthesia with a 7-Fr pigtail stent. The infection was successfully treated with the right antibiotics, as established by the urine culture. Following the completion of the recommended medicines, the URS stone removal treatment was carried out successfully. Preoperative administration of first-generation cephalosporins or other susceptible antibiotics based on urine culture was performed. During URS, the ureter was extensively checked for stones and strictures using semi-rigid ureteroscopy. During the surgery, a ureteral access sheath was used. A 200-mm Holmium laser fibre was used for renal calculi fragmentation using flexible ureteroscopy. Following the procedure, a double-J stent was placed and remained in place for several days. Antibiotics were also administered for a brief amount of time after the procedure.

The primary emphasis was on postoperative infectious complications, which were assessed using stringent criteria developed from previous literature.11 A postoperative urinary tract infection (UTI) is one that needs antibiotic treatment in addition to the preventive dosage. Medical practitioners use specific criteria to diagnose sepsis. These include high body temperature, increased heart rate, fast breathing, and an abnormal white blood cell count. These indications aid in the detection of a urinary tract infection in conjunction with a systemic inflammatory response. Sepsis with organ failure is referred to as severe sepsis. Patient records were utilised to gather basic patient information as well as previously identified risk factors for postoperative complications. These included age, sex, body mass index (BMI), Eastern Cooperative Oncology Group performance status (ECOG-PS), diabetes mellitus, leucocyte counts, and C-reactive protein at OAPN presentation, intensive care unit admission, type of preoperative drainage, days from drainage to surgery, operative time, and stone factors.

The parameters studied were the size of the stone, the quantity of stone present, the location of the stone, whether the patient was stone-free following surgery, and the composition of the stone. Urine culture findings were excluded from the study since all patients with OAPN are anticipated to have bacteriuria.

Statistical analysis.

The data was collected and input into a spreadsheet programme (Microsoft Excel 2007), which was then exported to the data editor page of SPSS version 15 (SPSS Inc., Chicago, Illinois, USA). The quantitative variables were given as means and standard deviations or median and interquartile range, depending on their distribution. The data was presented as counts and percentages to emphasise the qualitative characteristics. For all tests, the confidence and significance levels were set at 95% and 5%, respectively.

Results

In all, 378 patients were sent to our hospital with OAPN caused by urinary calculi and required emergency drainage. Following the elimination procedure, 200 patients were enrolled in the research.

The patient characteristics are shown in Table 1. The patients' average age was 70.12 years, and 124 (62%) of them were female. This research included 38 (19%) individuals with diabetes mellitus and 80 (40%) with an ECOG-PS score of 2 or above. The median values of C-reactive protein and leucocyte counts were 11.3 mg/dL and 11100/mL, respectively. 24 patients, or 12.0% of the total, required hospitalisation in the critical care unit. In 188 patients (94%), emergency draining was accomplished using a ureteral stent, whereas

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12 patients (6%) had a percutaneous nephrostomy tube. Out of all the patients, 26 (13% of the total) had a waiting period that exceeded one month. On average, the time from drainage to URS was 21 days. An average maximal stone.

Size and stone load measured 12.3 and 21.9 mm, respectively. During surgery, 58 (29%) stones were discovered in the ureter, 28 (14%) in the kidneys, and 114 (57%) in both the ureter and kidneys. Among the 200 individuals with kidney stones, 168 (84%) had RIRS. Of the 58 patients with ureteral stones alone, 28 (48.2%) required RIRS for pieces pushed up after surgery.

As a result, the average operational duration was 62.1 minutes, with 168 (84%) patients achieving stone-free status after a single session. Auxiliary shockwave lithotripsy was used in twelve instances. There was no perioperative mortality detected. Of the total number of patients, 32 (16%) were diagnosed with UTI. Among these individuals, 16 (8%) developed sepsis, with 6 (3%) experiencing severe sepsis. Three individuals required their drainage tubes changed.

Several characteristics were identified as possible risk factors for postoperative UTI. These include diabetes mellitus, a more than one-month delay between drainage and surgery, stone load, simultaneous RIRS, and an operation length of more than 75 minutes. These results were obtained using univariate analysis, which yielded a significant p value of less than 0.05. Meanwhile, a multivariate analysis found that the greatest AIC values were related with a combination of diabetes mellitus, a delay of more than one month between drainage and surgery, and the presence of RIRS.

Table 1: Characteristics of the study population

Variables	Number
Age, years	70.12 ± 14.12
Gender, female	124 (62%)
BMI, kg/m2	21.7 ± 4.2
Diabetes mellitus	38 (19%)
ECOG-PS ≥ 2	80 (40%)
C-reactive protein, mg/dL	11.3 (5.6–20.6)
Leukocyte counts, 103 /mL	11.7 (8.3–15.1)
Type of drainage	
Stent	188 (94%)
PNS	12 (6)
Drainage to op >1 month, yes	26 (13)
Stone location at surgery	
Ureter	58 (29)
kidney	28 (14)
ureter + kidney	114 (57)

Table 2: Surgical outcomes of ureteroscopy

Variables	Number
Operation time, min	62.1 ± 34.2
Stone-free status	168 (84%)
Infection stone	64 (32%)
Auxillary treatment	12 (6%)
Postoperative complications	36 (18%)
UTI	32 (16%)
Sepsis	16 (8%)
Severe sepsis	6 (3%)
Infection other than UTI	2 (1%)
Cardiovascular	1 (0.5%)

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Perirenal hemorrhage	1 (0.5%)

Discussion

Given the enormous clinical and economic cost associated with this complication, identifying risk factors for urosepsis after URS would be useful information for patients, clinicians, and health-care policymakers. Some have highlighted the elements that lead to widespread infectious consequences. [12,13]

The research examined the results of 200 individuals after OAPN. The percentage of patients without stones was 84%, with 16% developing sequelae, predominantly UTIs. Diabetes mellitus, a wait time of more than one month between drainage and surgery, and RIRS were all identified as significant predictors of postoperative UTI.

Our results revealed a 16% incidence of urinary tract infections (UTIs) after ureteroscopy (URS) in individuals with a history of obstructive acute pyelonephritis (OAPN). In addition to the present research, several investigations have looked into the effects of URS on patients who have undergone OAPN. [14-16]

A recent research assessed 82 URS surgeries and found a complication risk of 4%. A retrospective analysis of 115 URS providers following OAPN revealed a postoperative UTI incidence of 27.8%. [17] The different complication rates indicate that variations in patient characteristics or techniques used in these trials have a considerable impact on postoperative morbidity.

According to recent study, there is a strong relationship between RIRS and postoperative UTIs. There have been instances of significant intrarenal pressure during renal stone therapy, resulting in the absorption of bacteria-containing irrigation fluid. This absorption may cause urinary tract infections (UTIs). A particular investigation discovered that intrarenal pressures were greater during RIRS compared to PCNL. [18,19] Infectious consequences may include fever, urinary tract infection, pyelonephritis, systemic inflammatory response syndrome, and urosepsis. Antibiotics should be tailored to local resistance profiles in order to reduce infection and urosepsis rates. [20]

According to Baboudjian et al., applying techniques such as reducing surgical hours and managing preoperative UTIs might possibly

resulting in reduced incidence of postoperative infections.

[21] Patients who had surgery without prior OAPN did not regard RIRS as a risk factor for infectious complications. Even after a complete course of antibiotics for OAPN, biofilms on the stent may still promote bacterial development. It is worth noting that sick kidneys may be more vulnerable to intrarenal hypertension. Patients who have previously received OAPN should be carefully prepared before having RIRS. Given that the stone-free rate had no significant influence, individuals with both ureter and renal stones may benefit from a two-stage operation. However, more study is required to confirm the safety of the phased procedure.

This research found that when the duration between drainage and URS surpassed one month, there was a strong connection with postoperative UTI. According to studies, when a stent is in place for more than a month, the likelihood of suffering post-URS sepsis increases. Our data indicated no link between being female and developing infectious problems, despite multiple recent systematic studies highlighting it as a key risk factor. [22,23] Female patients may be more vulnerable to bacterial invasion owing to anatomical changes in the urethra. Given that all OAPN patients had contaminated urine, sex seemed to have no relevance. When evaluating the findings, it is critical to acknowledge the present study's limitations. The

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retrospective approach and extended research duration resulted in a lack of standardisation in surgical and perioperative treatment.

Conclusion

Individuals who have previously had OAPN had an increased risk of developing postoperative infectious problems. Several variables were identified as significant predictors of postoperative UTI, including diabetes mellitus, a drainage to surgery time of more than one month, and concurrent RIRS. According to our research results, simultaneous RIRS should be carefully planned, especially for patients with diabetes mellitus or extended URS wait periods.

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