



ORIGINAL ARTICLE

Risk factors for fever and sepsis after percutaneous nephrolithotomy



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Abstract *Objective:* Percutaneous nephrolithotomy (PCNL) is commonly used in the management of large renal stones. Postoperative infections are one of the most common complications of this procedure. The present study is to determine and assess the factors that may increase the risk to develop fever and urinary sepsis after PCNL.

Methods: A total of 60 patients (38 males and 22 females) with a mean age of 40.25 years enrolled in this study in Sulaimani Teaching Hospital. Patients had renal stone disease need operation with different socioeconomic status, body mass index and different type and size of stones were included in this study. Patients with preoperative positive urine culture and sensitivity were excluded. Preoperative investigations done for all patients. All Patients received prophylactic antibiotic gentamicin intravenously at the induction of anaesthesia. Renal pelvis urine sample were taken from all patients after puncturing the pelvicalyceal system and send for culture and sensitivity. Patients were monitored closely in the postoperative period for the development of fever and sepsis.

Results: Mean duration of the operations was 77.08 min ranged 40–120 min. All patients had postoperative nephrostomy tube. Seventeen (28.33%) patients developed post PCNL fever and the statistically significant factors for post PCNL fever were diabetes mellitus (DM) ($p = 0.001$), stone burden ($p = 0.001$), number of the stones ($p < 0.001$), degree of hydronephrosis ($p = 0.001$), duration of the operation ($p < 0.001$), residual stones ($p = 0.001$) and number of tracts ($p = 0.038$). Three (5.00%) patients developed post PCNL sepsis, and the statistically significant risk factors for post PCNL sepsis were duration of the operation ($p = 0.013$) and intraoperative blood loss, postoperative drop in haemoglobin (HB) level ($p = 0.046$).

Conclusion: DM, staghorn stones, degree of hydronephrosis, duration of the operation and number of tracts are risk factors for post PCNL fever, while number of stones, intraoperative blood loss, duration of the operation and residual stones are risk factors for post PCNL sepsis.

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1. Introduction

Stone disease is common and affects 0.131% of the population at any time [1]. Numerous factors influence choice of treatment, such as stone characteristic, availability of equipment, complications and additional procedures required together with patient preference [2]. Percutaneous nephrolithotomy (PCNL) is an effective, safe and preferred treatment option for complex or large volume nephrolithiasis [3,4]. However, PCNL carries a considerable risk, fever occur in 21%–39.8% of the patients [5].

Fever following PCNL may be secondary to urinary tract infection (UTI) which is significant clinically regarding the development of post-PCNL sepsis [6]. Determining which patients are at greatest risk is extremely important [7,8]. However, fever may also originate from the release of the inflammatory mediators during surgical manipulation, systemic inflammatory response syndrome (SIRS) [8,9]. Several studies showed post-PCNL urosepsis occurs in 0.3%–9.3% of patients, it is potentially life threatening condition and the most common cause of death [6,8,10]. Factors found to increase the risk of urosepsis are female sex, diabetes mellitus (DM), body mass index (BMI), and pelvicalyceal system dilatation [9,11]. Several intraoperative factors are average renal pressure sustained during PCNL, operative time, number of tracts and degree of blood loss [6,8]. Urosepsis that occur as a result of manipulation during PCNL can be catastrophic despite negative preoperative bladder urine culture and prophylactic antibiotic [9,12]. Positive renal pelvis urine culture is regarded as a significant risk factor for post PCNL fever [12,13]. Positive stone and pelvic urine culture is better predictors of the potential post-PCNL sepsis than bladder urine culture. One of the most important aspects of study in the management of complications of PCNL is the use of prophylactic antibiotic for prevention of sepsis [14,15]. The use of short course of preoperative antibiotic has been found to significantly decrease the rate of post-PCNL fever and sepsis. American Urological Association (AUA) guidelines recommend the use of prophylactic antibiotic preoperatively for a duration of less than 24 h [8]. The Clavien grading system is an excellent classification system that provides an objective grading system for complications of PCNL. The simplicity and ease of use of the Clavien classification system to 8 grade postoperative complications has resulted in its widespread adoption in surgery [16–18].

2. Patients and methods

2.1. Clinical data's collection

We performed a prospective clinical study in 60 patients, 38 males (63.3%) and 22 females (36.7%), who underwent PCNL in the Sulaimaniyah Teaching Hospital between June 2013

and June 2014. The study was approved by the Iraqi Board of Urology and Local Ethical Committee of the hospital. Patients with different age, gender, socioeconomic status, weight, different type and size of stones were included in this study. Preoperative fever, positive urine culture and nephrostomy tube were excluded from the study.

2.2. Patient preparation and operation

Patients were evaluated by history, physical examination, and investigations. All patients had mid-urine exam and culture. Haematological and biochemical determination, bleeding profiles, viral screen, blood group and cross match with compatible blood preparation were performed in all the patients. All patients had ultrasound examinations of the kidney and bladder and imaging study like KUB and excretory urography. In some patients with unclear anatomy of urinary tract, computed tomography (CT) with contrast enhancement was performed. Preoperative information including age, sex, BMI, DM, degree of hydronephrosis, number and size of the stones were recorded. All patients received a single dose of prophylactic antibiotics at the induction of anaesthesia. After patient intubation and induction of anaesthesia, the ipsilateral ureter was catheterized, then the patient turned prone. The costovertebral area prepared for needle puncture. Once percutaneous access achieved into the pelvicalyceal of the kidney, urine from the pelvicalyceal system was aspirate and sent to the laboratory as a pelvic urine for culture. Any growth of more than 100,000 bacteria was regarded as a positive urine culture (infected urine). The tract then dilated using concentric metal dilators (20–30 Fr) according to the stone burden and a suitable Amplatz sheath size was placed in the tract to continue the procedure using pneumatic lithotripsy under low pressure irrigation.

2.3. Post-operative management

All patients were left with a nephrostomy tube for at least 48 h with or without double J (JJ) stent insertion. Postoperatively the number of tracts, operative time and results of pelvic urine culture were collected. Postoperative International Sepsis Definitions Conference of 2001 was used to identify patients with SIRS. According to it if there is development of two or more of four criteria, namely fever less than 36 °C or greater than 38 °C, heart rate greater than 100 beats/min, respiratory rate greater than 20 breaths/min or PaCO₂ lower than 32 mmHg, and white blood cell (WBC) count greater than $12 \times 10^9/L$ or less than $4 \times 10^9/L$, the patient is documented to have fever and sepsis when there is SIRS with documented infection. Any development of fever were followed. Development of persistent rising fever, rigor, tachycardia, tachypnoea and changing level of consciousness, the patient was regarded as entering a state of

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