



ORIGINAL ARTICLE

Significance of preoperative neutrophil–lymphocyte count ratio on predicting postoperative sepsis after percutaneous nephrolithotomy



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Sepsis;
Systemic inflammatory response syndrome;
Urolithiasis

Abstract We evaluated the usefulness of preoperative neutrophil–lymphocyte count ratio (NLCR) in predicting postoperative sepsis after percutaneous nephrolithotomy (PCNL). In total, 487 patients who underwent PCNL for renal stones were included in the present retrospective study. The stone burden, number of tracts and location, operation time, fluoroscopy time, presence of residual stones, and blood transfusion rates were postoperatively recorded in all patients. All patients were followed up for signs of systemic inflammatory response syndrome (SIRS) and sepsis. The association of sepsis/SIRS with the risk factors of infectious complications, including NLCR, was evaluated. SIRS was detected in 91 (18.7%) patients, 25 (5.1%) of whom were diagnosed with sepsis. Stone burden, operation time, irrigation rate, previous surgery, nephrostomy time, access number, blood transfusion, residual stone, postoperative urinary culture, renal pelvis urinary culture, and stone culture were found to be predictive factors for SIRS and sepsis development. Receiver operating characteristic curve analysis revealed an NLCR cutoff of 2.50 for predicting the occurrence of SIRS/sepsis. We found that the incidence of sepsis was significantly higher in patients with $NLCR \geq 2.50$ than in patients with $NLCR < 2.50$ ($p = 0.006$). Preoperative and postoperative urine culture positivity were associated with high NLCR ($p = 0.039$ and $p = 0.003$, respectively). We believe that preoperative NLCR may be a promising additive predictor of bacteremia and postoperative sepsis in patients who

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undergo PCNL for renal stones. This marker is simple, easily measured, and easy to use in daily practice without extra costs.

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Introduction

Percutaneous nephrolithotomy (PCNL) was first described by Fernström and Johansson [1] in 1976. With subsequent technological developments, PCNL has become the standard treatment for large renal stones [2]. This procedure is minimally invasive, generally safe, and associated with low complication rates. The reported incidence rates of various infectious complications following PCNL are as follows: bacteremia, 23%; endotoxemia, 34%; fever, 25%; and septic shock, 0.3%–2.5% [3,4]. Perioperative antibiotic prophylaxis is widely used to prevent infectious complications in patients who undergo PCNL. Nevertheless, sepsis rates of 0.25–1.5% have been reported, and sepsis has been found to be the most common cause of perioperative mortality after PCNL [4–6]. Thus, it is important to identify patients who are at risk of developing sepsis after undergoing PCNL. In recent reports, the presence of infected stones, positive renal pelvis urine culture (RPUC), large stones, and hydronephrosis were the most common evaluated risk factors for predicting infectious complications [4–6].

The neutrophil–lymphocyte count ratio (NLCR) is a potentially interesting parameter in predicting bacteremia in patients admitted with suspected community-acquired infections [7]. The utility of the NLCR in predicting the prognosis of patients with inflammatory and malignant diseases is well researched; however, the role of NLCR in predicting infectious complications after PCNL has not yet been investigated. In the present study, we aimed to determine the usefulness of the preoperative NLCR in predicting postoperative sepsis in patients who underwent PCNL for renal stones.

Methods

This retrospective study was approved by the hospital ethics committee. A total of 487 patients who underwent PCNL for renal stones were included in the present study. Laboratory investigations including urine analysis, midstream urine culture (UC), complete blood count, and renal function tests were performed during the week prior to the surgery. The NLCR was also calculated at this time. Renal stones were preoperatively evaluated with low-dose computed tomography. Patients with negative UCs were intravenously administered with a single dose of a broad-spectrum antibiotic from the time of anesthesia induction until the time of nephrostomy removal. Patients with positive cultures (>100,000 CFU/mL) were treated with appropriate antibiotics based on a sensitivity profile, for at least 7 days prior to the surgical intervention. PCNL was performed after culture negativity had been established. In

these patients, the same antibiotic was continued until nephrostomy removal. Stones located in the upper ureter, a single calyx, or the renal pelvis only were defined as simple, whereas coralliform stones were defined as complex. The stone burden was calculated by multiplying the longest diameter by the perpendicular diameter of the stone. In patients with multiple stones, the total stone burden was calculated as the sum of the burden of each stone.

The stone burden, number of tracts and location, operation time, fluoroscopy time, presence of residual stones, and blood transfusion rates were recorded in all patients postoperatively. All patients were followed up postoperatively for systemic inflammatory response syndrome (SIRS) criteria (leukocyte count, 4000 or >12,000; fever, >38°C or <36°C; heart rate, >90 beats/min; respiratory rate, >20 breaths/min), and blood cultures were provided as indicated [8]. SIRS was diagnosed in patients who met two or more criteria. Sepsis was defined as the presence of a source of infection together with SIRS [8].

Statistical analyses were performed using the Statistical Package for the Social Sciences version 21.0 (SPSS, Chicago, IL, USA). Statistical significance was set at a p value < 0.05. Categorical variables were presented as numbers, and compared with the chi-square test and Fisher exact test. Continuous variables were presented as means and standard errors, and compared with the Mann–Whitney U test. Correlation analyses were performed using the Pearson correlation coefficient (R). In order to define potential risk factors for postoperative SIRS and sepsis, we performed multivariate logistic regression analysis. Prior to multivariate analysis, the possible association of each independent variable with the outcome variables was evaluated with univariate analysis by means of linear regression analysis. The beta (β) regression coefficient, and the odds ratios (ORs) and their 95% confidence intervals (CIs) were calculated. Receiver operating characteristic (ROC) curves were generated to assess the predictive role of NLCR in postoperative sepsis. The threshold was developed with an equal emphasis on sensitivity and specificity, by means of the Youden index. The area under curve was used to quantify the effectiveness of NLCR in predicting sepsis.

Results

The most common stone types were whewellite, weddellite, as well as mixed and uric acid stones. SIRS was detected in 91 (18.7%) patients. *Escherichia coli* (46.7%) was the pathogen most commonly isolated from stone cultures (SCs), followed by *Pseudomonas aeruginosa* (31.1%), *Enterococcus* (13.3%), and *Klebsiella* spp. (8.9%). The demographic characteristics of the patients and correlation of risk factors with SIRS are presented in Table 1.

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