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# CLINICAL SIGNIFICANCE OF FEVER AFTER PERCUTANEOUS NEPHROLITHOTOMY

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## ABSTRACT

**Objectives.** In the immediate postoperative period after percutaneous stone removal, body temperature elevations are common. Pyrexia after a percutaneous nephrolithotomy (PCNL) generates concern because of the possibility of urinary extravasation and bacteremia. We reviewed our experience with PCNL to determine the clinical significance of a postoperative fever before discharge from the hospital.

**Methods.** Between July 1994 and December 1996, 63 patients underwent 69 PCNLs. Each had documented negative urine cultures preoperatively and received prophylactic antibiotics at the time of surgery. For each case, clinical and operative charts were reviewed to determine stone composition, fever during hospital stay, postoperative bacteriologic cultures, postoperative white blood cell count (WBC), and clinical course.

**Results.** Complete data were available for 66 procedures. Eight patients (12%) had at least one body temperature reading between 38.0 and 38.5°C. Eleven patients (16.7%) had at least one temperature greater than 38.5°C. Each patient with a temperature greater than 38.5°C was hemodynamically stable with negative blood and urine cultures. No patient with a fever between 38.0 and 38.5°C was cultured. Stone analysis did not demonstrate any association between postoperative fever and stone composition (including 22 struvite stones). Postoperative WBC also did not predict pyrexia. Fever alone did not prolong hospital stay.

**Conclusions.** In patients with negative urine cultures who are prophylaxed with immediate preoperative antibiotics and maintained on postoperative antibiotics, pyrexia after PCNL does not require an immediate bacteriologic evaluation in those who are hemodynamically stable. *UROLOGY* 52: 48-50, 1998. © 1998, Elsevier Science Inc. All rights reserved.

Mild to moderate body temperature elevations in the immediate postoperative period are common and often attributed to the release of inflammatory mediators. The urologist must also be aware of the possibility of bacteremia and endotoxemia. In the setting of percutaneous nephrolithotomy (PCNL), concern is heightened because bacteremia can be induced by the surgical manipulation and stone fragmentation. In fact, reports of both postoperative fevers and bacteremia are as high as 37% in some series.<sup>1,2</sup> As a result, despite negative urine cultures, perioperative antibiotics are routinely administered, and bacterio-

logic studies are routinely obtained when pyrexia occurs.

In reviewing the literature, the clinical significance of a postoperative temperature elevation, in terms of the appropriate bacteriologic evaluation, management, and impact on patient outcome, has not been well defined. We reviewed our experience with PCNL to assess the significance of postoperative pyrexia before discharge from the hospital.

## MATERIAL AND METHODS

Between July 1994 and December 1996, 63 patients (34 men, 29 women; mean age 52 years) underwent 69 PCNLs. Each patient had a documented negative urine culture preoperatively. All patients received intravenous ampicillin and gentamicin or a second-generation cephalosporin at the time of surgery, which was continued until nephrostomy tube removal. Antibiotic choice and dosage were based on surgeon preference. The operative technique was previously described.<sup>3</sup> Stones were removed intact or fragmented with either an electrohydraulic or ultrasonic lithotripter. An indwell-

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ing nephrostomy tube was placed at the conclusion of each procedure. On the second or third postoperative day (POD), a nephrostogram was performed, and any residual stone burden was removed via the nephrostomy. If there were no residual stones and if adequate antegrade drainage was demonstrated, the nephrostomy tube was removed before discharge. Otherwise, the nephrostomy tube was removed at a later date. Patients discharged home with the nephrostomy tube in place were maintained on a daily dose of a prophylactic antibiotic (eg, sulfamethoxazole and trimethoprim, quinolone) until the tube was removed.

Operative records were reviewed to identify intraoperative complications. Each patient's clinical record was reviewed to determine stone composition, the presence of a fever during hospital stay, postoperative cultures, the white blood cell count (WBC) on POD 1 (ordered at the surgeon's discretion [n = 44]), and clinical outcome. Body temperatures were measured orally in each case. A postoperative fever was defined as a body temperature greater than 38.0°C. For the purpose of analysis, those patients with a postoperative fever were separated into two groups: 38.0 to 38.5°C and greater than 38.5°C. This was based on the routine clinical practice at our institution where the clinical evaluation of each patient with a temperature greater than 38.5°C included documentation of heart rate, blood pressure, and blood and urine cultures. Those patients with a temperature between 38.0 and 38.5°C had their vital signs recorded, although bacteriologic evaluation was left to the discretion of the physician.

## RESULTS

Of the 69 PCNLs performed, clinical and operative records were available for 66 procedures. Nineteen cases (28.8%) had at least one body temperature recorded as greater than 38.0°C. Of these, 11 patients (16.7%) had at least one temperature recorded as greater than 38.5°C. In all cases, the first temperature elevation occurred by POD 4 (three occurred on the night of surgery, nine on POD 1, three on POD2, two on POD 3, and two on POD 4). In no case did a patient have a temperature greater than 38.0°C for more than three consecutive days, and in no case was it associated with tachycardia or hypotension. Fever alone did not prolong the length of stay (Table I). No patient with a temperature greater than 38.5°C had a blood or urine culture positive for bacteria. No patient with at least one body temperature recorded between 38.0 and 38.5°C had blood and urine cultured. Two patients with a history of recurrent urinary tract infections had empiric urine cultures performed postoperatively, which were positive for *Candida albicans*. Neither had a postoperative fever.

There was no association between postoperative pyrexia, either greater than 38.0 or 38.5°C, and the type of preoperative antibiotics administered. The distribution of stone composition and WBC on the first POD is demonstrated in Table I. There was no association between a postoperative temperature elevation (either 38.0 to 38.5°C or greater than 38.5°C) and stone composition or leukocytosis.

Four patients (6%) required a blood transfusion

**TABLE I. Demographic and laboratory data**

	Afebrile Group (n = 47)	Febrile Group* (n = 19)
Age (mean, years)	51	53
Preoperative urine cultures	Negative	Negative
Hospital stay (days) <sup>†</sup>	3.25	5.0
Stone analysis (%) <sup>‡</sup>		
Struvite	16 (34)	6 (32) <sup>  </sup>
Calcium oxalate/phosphate	26 (55) <sup>§</sup>	10 (53) <sup>  </sup>
Uric acid	5 (11)	2 (10) <sup>  </sup>
Cystine	0	1 (5)
POD 1 WBC (mean, cells/cc)	11,570 (n = 34)	11,550 (n = 10)

KEY: POD = postoperative day; WBC = white blood cell count.

\* Febrile group has patients with at least one body temperature measured as greater than 38.0°C. Separate evaluation of the 5 patients with greater than 38.5°C did not statistically differ from the afebrile group.

<sup>†</sup> P = 0.09.

<sup>‡</sup> Categorized by primary component of stone (defined as greater than 60% of stone).

<sup>§</sup> Four stones with large uric acid component.

<sup>||</sup> One stone in each group with large uric acid component.

postoperatively, of which two had a temperature greater than 38.5°C. In neither case was the fever temporally related to the transfusion. In 1 of the 2 cases, the fever was temporally related to an obstructed nephrostomy tube, which resolved after the tube was changed. There were six other perioperative morbidities; four of these patients had temperatures between 38.0 and 38.5°C (ileus, pleural effusion, myocardial infarction, ulnar nerve palsy) and one had a temperature greater than 38.5°C (air embolism). The remaining patient had an arteriovenous fistula requiring embolization.

## COMMENT

Mild to moderate pyrexia during the first or second POD is a frequent finding after most surgical procedures. In the case of PCNL, the presence of a postoperative fever is common, though clinical significance is not clear.<sup>1,2</sup> The primary hypothesis is that endoscopic instrumentation of the urinary tract in the presence of stones can induce bacteremia, endotoxemia, and septic shock.<sup>1,4,5</sup> Although anecdotal experience suggests that pyrexia in the absence of other clinical findings can be observed safely without bacteriologic evaluation, we reviewed our experience to objectively assess the significance of a fever after PCNL.

Laboratory evaluation of patients undergoing endoscopic procedures for calculi has documented the incidence of bacteremia as high as 37% after PCNL.<sup>1</sup> This is comparable to the incidence of postoperative fever reported by others.<sup>2</sup> To reduce the incidence of bacteremia and its sequelae, sterilizing the urine preoperatively is advocated.<sup>1</sup> Perioperative antibiotic prophylaxis is now routine,

though efficacy has not been well documented. In one study, Charton *et al.*<sup>6</sup> percutaneously extracted renal calculi from 107 patients with sterile preoperative urine who deliberately were not given prophylactic antibiotics and found that 37 (35%) had postoperative urinary tract infections. Of these, 11 patients (10%) presented with temperature readings greater than 38.5°C. Though lacking a control group, they concluded that short-term prophylactic antibiotics for PCNL are logical.

Despite perioperative antibiotics and negative preoperative urine cultures, bacteremia, endotoxemia, and septic shock have still been documented.<sup>1,5</sup> As a result, postoperative pyrexia continues to prompt surgeon concern and bacteriologic evaluations. The utility, though, of routine cultures is questionable because severe sepsis in this setting is rare.<sup>1,5</sup> O'Keefe *et al.*<sup>5</sup> reported only 9 cases of septic shock in 700 percutaneous or endoscopic extractions of upper urinary tract stones (1.2%) in which preoperative antibiotic prophylaxis was administered. Furthermore, of these, only 3 patients (0.4% of 700) had negative preoperative urine cultures, and in all 9 cases, pyrexia was accompanied by hemodynamic instability (eg, tachycardia, hypotensive).

Because the risk of severe sepsis after PCNL is small, we retrospectively evaluated the clinical significance of a postoperative fever in patients with negative preoperative urine cultures. In each case, the patient was hemodynamically stable, urine and blood cultures were negative, and the fever resolved spontaneously. Also, pyrexia alone did not statistically prolong hospital stay. The febrile patients with extended hospital stays (beyond 4 days) remained in the hospital for either observation of postoperative anemia or had another postoperative complication.

To better understand which patients may have been at risk for a postoperative fever, stone composition for all patients was reviewed with no correlation identified. In particular, struvite stones were not associated with a higher incidence of postoperative fever. The degree of leukocytosis on the first POD also did not predict a febrile episode or positive cultures. Finally, the possibility that a

postoperative morbidity evoked the febrile response was considered, but this group was too small (6 of 19 patients) and diverse to draw any specific conclusions. Nevertheless, in the hemodynamically stable patient with a fever after percutaneous nephrolithotomy, this experience suggests a noninfectious etiology or comorbidity may be considered as a possible source.

This report does not address the significance of a postoperative fever in patients with positive preoperative urine cultures where the possibilities of bacteremia and sepsis are higher. Also, this series is limited by its retrospective design and sample size. A larger prospective series with bacteriologic studies available for every case is required.

## CONCLUSIONS

Fevers and bacteremia after PCNL are common, though progression to sepsis is rare.<sup>1,5</sup> In patients who are given intraoperative antibiotics, pyrexia in the immediate postoperative period after PCNL does not mandate an immediate search for bacteremia or bacteriuria if the preoperative urine culture is negative. Unless the febrile patient exhibits other clinical abnormalities (eg, tachycardia, hypotension, dyspnea), observation is recommended, regardless of stone composition, because a culturable infectious etiology is unlikely.

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