Original Contributions

PROSPECTIVE EVALUATION OF PREDICTIVE PARAMETERS FOR URINARY TRACT INFECTION IN PATIENTS WITH ACUTE RENAL COLIC

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□ Abstract—Background: Acute renal colic (ARC) is an emergency that can mostly be treated conservatively, but can be life threatening in combination with urinary tract infection (UTI). Assessment for infection includes white blood cell (WBC) count and C-reactive protein (CRP), but these parameters are often unspecifically elevated and might lead to antibiotic over-therapy. In times of increasing antibiotic resistance, however, unnecessary antibiotic therapy should be avoided. Objectives: The goal of the study was to investigate the prevalence of UTI proven by urine culture (UC) in patients with ARC and to identify predictive factors in the emergency setting. Patients and Methods: We prospectively enrolled 200 consecutive patients with ARC and evaluated blood test results, urinalysis, UC, symptoms suspicious for UTI, and time between symptom onset and admission, as well as body temperature. Logistic regression analyses were performed to identify predictive factors. Results: There were 196 patients eligible for statistical analysis. UTI proven by positive UC was detected in 26 patients (13%). On multivariate logistic regression analysis, suspicious urinalysis (positive nitrite or bacteria > 20/high-power field [hpf] or WBC > 20/hpf), patient age ≥ 54 years and CRP ≥ 1.5 mg/dL (fivefold increase) were significant predictors for the presence of UTI. Neither elevated WBC count nor typical UTI symptoms were associated with UTI. Conclusions: Based on our results, a routine antibiotic prophylaxis in patients with ARC does not seem to be appropriate. Patient age and CRP can help to decide if antibiotic treatment might be indicated, even in case of a not clearly suspicious urinalysis. © 2018 Elsevier Inc. All rights reserved.

□ Keywords—acute renal colic; urinary tract infection; leukocytosis; C-reactive protein

INTRODUCTION

Acute renal colic (ARC) due to a ureteric stone is a common issue in urologic emergency units worldwide (1). In many cases of ARC, a conservative treatment strategy is feasible as many ureteric stones will be small enough to pass spontaneously (2). In a recent study by Jendeberg et al. including 392 patients, an 80% spontaneous stone passage rate was reported and size was proven to be an independent predictor for stone passage (3). One contraindication for a conservative treatment strategy is a manifest urinary tract infection (UTI) due to potentially life-threatening septic complications of an infected

hydronephrosis (4). Yet the identification of patients with manifest UTI in the emergency setting can be difficult, as the definite proof of UTI is based on urine culture (UC) results, which are not obtained immediately. In general, clinical and laboratory parameters might help to assess the presence of UTI. Therefore, urinalysis, blood tests, and the history of UTI symptoms are commonly evaluated. However, unspecific symptoms like frequent voiding and inconclusive urine sediment results can be observed in ARC patients even in the absence of UTI. Moreover, white blood cell (WBC) count and C-reactive protein (CRP) can be unspecifically elevated in patients with ARC (5). All these unspecific findings might even lead to routine antibiotic use in daily practice even though there is no guideline recommendation for this (2,6). In a recent retrospective analysis of 50 patients with ARC, about 80% of the patients without signs of UTI in the urinalysis were unjustifiably commenced on antibiotics based solely on an elevated WBC count (7). Moreover, it has been reported that antibiotics were prescribed in over 20% of all ARC cases in U.S. emergency departments (EDs) (8). In times of increasing antibiotic resistance worldwide, however, unnecessary antibiotic usage should ideally be avoided (9).

Until now, there are only few data about UTI prevalence in ARC patients. Therefore, the aim of our study was to prospectively evaluate 1) the prevalence of UTI in patients with ARC by UC and 2) to identify predictive factors for UTI within the routine blood and urine tests done in an emergency setting. In this context, we designed this study to clarify if WBC count or CRP elevation justify a routine usage of antibiotic prophylaxis.

PATIENTS AND METHODS

We prospectively included 200 consecutive patients with ARC due to a ureteral stone presenting in our ED between December 2015 and October 2016. Exclusion criteria were chronic UTI, indwelling urinary tract stents or catheters, signs of infection other than UTI, or antibiotic treatment within the last 7 days. We considered a period of 7 days sufficient to rule out an unwanted effect of prior antibiotic intake during washout phase.

The ED of our hospital is a multidisciplinary unit with a general patient volume of > 30,000 cases per year, and all patients presenting with ARC were primarily seen by an experienced urologic resident.

We evaluated the results of ultrasound, blood tests, urinalysis, UC, symptoms suspicious for UTI, and time between symptom onset and presentation in our ED, as well as auricular body temperature in every patient. Comorbidities like diabetes and immunosuppression, which are known as risk factors for UTI and might be complicating factors, were also analyzed. Furthermore, we checked the presence of UTI symptoms like more frequent voiding, alguria, or feeling of residual urine after voiding. Ultrasound examination focused on the kidneys and bladder to check for hydronephrosis and proximal or prevesical ureteral stones. At our ED, routine laboratory tests include hemogram, CRP value, renal function tests, sodium, potassium, and liver parameters in all patients. For urinalysis and UC, we obtained a clean-catch spontaneous mid-stream urine from the patient. We defined a positive UC as $\geq$ 10,000 colony-forming units/mL of typical UTI pathogens.

We first investigated sensitivities and specificities for leukocyturia, urine nitrite, and urine bacteria regarding UC-proven UTI prevalence. According to these results, we then decided to define urinalysis as suspicious in case of either positive nitrite in dipstick analysis or bacteria > 20/hpf (high-power field) or WBC >20/hpf in urine sediment. According to the definitions of our analyzing laboratory we defined WBC count and CRP elevation as WBC count > 11.0 $\times$ 10^9/L and CRP > 0.32 mg/dL, respectively.

After achieving pain control in the ED, the majority of patients were treated as inpatients and admitted to the ward to monitor the conservative treatment. All patients were instructed to filter their urine to confirm a spontaneous stone passage. Patients with persistent hydronephrosis underwent intravenous urography or non-contrast-enhanced computed tomography for stone confirmation. Patients with refractory colic pain underwent a double-J placement and the stone was confirmed by intraoperative retrograde urography. Other indications for double-J placement were signs of sepsis, hydronephrosis with deterioration of renal function, detection of ureteral stone unlikely to pass spontaneously, or patient's wish. In case of double-J placement we collected a selective UC from the obstructed upper urinary tract.

All patients with sufficient pain control willing to be treated as outpatients were referred to cooperating outpatient urologists, who did the further surveillance and diagnostics within some days. If the conservative outpatient treatment failed, patients were readmitted to our hospital.

Patient data were collected by one single investigator, pseudonymized, and transferred to a password-secured database. We used SPSS 21.0 (SPSS Inc., Chicago, IL) for statistical analyses, applying t-test for variables with normal distribution and Mann–Whitney U test for variables with nonnormal distribution. For binary variables, chi-squared test was used. Moreover, we used receiver operating characteristic (ROC) curve analysis and the Youden Index for metric variables to reveal a cut-off with optimal predictive value. Uni- and multivariate logistic regressions were performed to identify potential predictors for UTI.