Effect of Bacteremia in Elderly Patients With Urinary Tract Infection

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ABSTRACT

Introduction: The clinical effect of bacteremia on outcomes in urinary tract infection (UTI) is still debated. This study aims to examine the clinical effect of bacteremia in elderly patients with UTI requiring hospital admission.

Methods: This retrospective observational study recorded the clinical features, microbiology and outcomes in a Spanish cohort of patients aged ≥65 years hospitalized for UTI in whom blood cultures were performed in the emergency department. The primary outcome of the study was in-hospital mortality.

Results: Of 333 patients, with a mean age of 81.6 years, 137 (41.1%) had positive blood cultures. *Escherichia coli*, with 223 (66.9%) cases, was the most common microorganism isolated. Independent risk factors of bacteremia were temperature >38°C, heart rate >90 bpm and inversely both *Enterococcus faecalis* and *Pseudomonas aeruginosa*. Bacteremia was not associated with the length of stay in hospital (6.96 ± 3.50 days versus 7.33 ± 5.54 days, $P = 0.456$). Mortality rate was 9.3% with no significant difference between bacteremic and nonbacteremic cases (8.8% and 9.7%, respectively, $P = 0.773$). In-hospital mortality analyzed by logistic regression was associated with McCabe index >2 (20.5% survival versus 66.7% death, adjusted odds ratio = 6.31, 95% CI: 2.71-14.67; $P < 0.001$) but not with bacteremia (41.4% survival versus 38.7% death, adjusted odds ratio = 0.99, 95% CI: 0.43-2.29; $P = 0.992$).

Conclusions: Our study suggests that the presence or absence of bacteremia in elderly people with UTI requiring hospitalization does not have an influence on outcomes such as in-hospital mortality or length of stay.

Key Indexing Terms: Bacteremia; Urinary tract infection; Elderly. **[Am J Med Sci 2016;352(3):267–271.]**

INTRODUCTION

Urinary tract infection (UTI) is the second most common cause of infections in the general population and is the most common bacterial infection occurring in elderly people.[1,2] In young people, UTIs are usually noncomplicated and mainly occur in healthy women as cystitis or pyelonephritis.[3] The UTIs in elderly people, however, can present with unspecific manifestations such as acute confusion. Also, the spectrum of the infection is more extensive, ranging from mild urinary symptoms to severe sepsis or septic shock and has a mortality rate of 7-33%.[1,4-8]

The UTI is the most common cause of community-acquired bacteremia and sepsis.[5,9] In all, 40-57% of community-acquired bacteremias in elderly people are of urinary origin.[10,11] On the contrary, bacteremia is confirmed in 15-42% of patients with UTI.[6,11] Bacteremia has commonly been considered as a marker of severe infection,[12,13] however, the clinical effect of bacteremia on outcomes in UTI is still debated.[5-7,13-15] In young women with uncomplicated UTI, bacteremia was not associated with the severity of the infection or with the outcomes.[9,16] A total of 2 studies conducted on the clinical effect of bacteremia on prognosis in complicated UTI in adults showed contradictory results.[6,16] Nevertheless, to our knowledge, no study of this subject has been conducted to date with elderly people. The aim of this study is to assess the effect of bacteremia on the outcomes of community-acquired severe UTI in elderly people.

METHODS

Design and Setting

This is a retrospective cohort study of patients with community-acquired UTI or community-onset healthcare-associated UTI (HA-UTI) admitted to a university hospital over a 6-year period (from January 2008-January 2014). Only those cases that met the following criteria were included: all patients were admitted directly from the emergency department of the hospital; age ≥65 years; 1 or 2 microorganisms were isolated from urinary samples; blood cultures were performed in the emergency department at admission before the administration of antibiotics, a discharge diagnosis of acute pyelonephritis or sepsis, severe sepsis or septic shock of urinary origin were established and there was no other apparent source of infection.

This study was conducted in the Department of Internal Medicine of the University Hospital Dr. Peset in Valencia, Spain. The Department of Internal Medicine accounts for 50 beds of the total of 549 beds in the hospital.

This study was approved by the hospital's Clinical Investigation Ethics Committee and complies with ethical standards. The Committee waived the need to obtain informed consent because of the fact that it was a retrospective observational study and that all data were kept confidential and information identifying patients were removed.

Data Collection

Clinical, epidemiological and microbiological data were retrospectively obtained from the review of electronic medical records. The clinical outcomes evaluated were in-hospital mortality rate and length of hospital stay.

Definitions

Pyelonephritis was diagnosed if a patient had the following symptoms: temperature of 38°C, pyuria, flank pain or costovertebral angle tenderness or all of these. Sepsis, severe sepsis and septic shock were defined following the criteria of the American College of Chest Physicians and Society of Critical Care Medicine Consensus Conference.[17] Bacteremic UTI was defined if the same organism was isolated from both urine and blood specimens of the same patient within 48 hours of each other.[18] Isolation of coagulase-negative *Staphylococcus* in blood cultures was considered as a contaminant and these cases were included in the negative blood culture group. Definitions of community-acquired UTI, HA-UTI, a modified McCabe and Jackson's classification and inadequate empirical antimicrobial treatment (IEAT) have been described in previous publications of our group.[15,19] Empirical antimicrobial therapy was considered inappropriate when the causative microorganism was reported as nonsusceptible (intermediate susceptibility or resistant) to the antimicrobial agent.[20]

Statistical Analysis

Continuous variables were expressed as means ± standard deviation and Student's *t* test was used for comparing means. For the comparison of categorical variables, we used the chi-squared test or Fisher's exact test when appropriate. A $P < 0.05$ was considered significant. Logistic regression analysis was used to determine risk factors of in-hospital mortality. All statistical analyses were performed by using the statistical pack SPSS v22.0.

RESULTS

From a total of 736 patients admitted to the internal medicine department with UTI as the principal hospital discharge diagnosis during the period of the study, 333 (45.2%) patients aged ≥65 years in whom blood cultures were performed were included in this study. A total of 184 patients (55.3%) were women and the average age of the patients was 81.6 ± 6.8 years. Blood cultures were positive in 137 (41.1%) cases. Epidemiological, clinical and microbiological characteristics of the patients according to whether blood cultures were positive or negative are shown in Table 1. The bacteremic group presented a higher proportion of women (62.0% versus 50.5%, $P = 0.037$), a higher proportion of patients with temperature at admission greater than 38°C (48.9% versus 30.6%, $P = 0.001$) and heart rate at admission higher than 90 bpm (71.5% versus 58.2%, $P = 0.013$). Urinary catheter was more common in patients in the nonbacteriemic group (20.4% versus 31.6%, $P = 0.024$).

Escherichia coli, with 223 (66.9%) cases, was the most common microorganism isolated, followed by *E. faecalis* ($n = 47$, 15%), *Klebsiella pneumoniae* ($n = 33$, 9.9%), *P. aeruginosa* ($n = 29$, 8.7%) and *Proteus mirabilis* ($n = 17$, 5.7%). In all, 28 (8.4%) of the UTI cases were polymicrobial. Microorganisms isolated in the urine and blood samples coincided in every case. The proportion of *E. coli* and *K. pneumoniae* isolates that were extended-spectrum beta-lactamase–producing were 20.1% and 36.3%, respectively. None of the cases of *E. faecalis* was vancomycin-resistant. *P. aeruginosa* and *K. pneumoniae* were both more common in patients who had a urinary catheter (18.9% versus 12.3%, $P < 0.001$ and 18.9% versus 6.6%, $P = 0.001$, respectively). The UTI caused by *E. coli* was statistically associated with bacteremia ($P = 0.004$), whereas *E. faecalis* ($P = 0.001$) and *P. aeruginosa* ($P = 0.017$) were more common in nonbacteremic cases (Table 1). Independent risk factors of bacteremia analyzed by logistic regression were temperature >38°C, heart rate >90 bpm and inversely both *E. faecalis* and *P. aeruginosa* (Table 2).

Bacteremia was not associated with the length of stay in hospital (6.96 ± 3.50 days versus 7.33 ± 5.54 days, $P = 0.456$). Mortality rate was 9.3% with no significant difference between bacteremic and nonbacteremic cases (8.8% and 9.7%, respectively, $P = 0.773$). McCabe index > 2, septic shock, APACHE II ≥ 15 and inappropriate empirical antimicrobial therapy were associated with mortality, but only McCabe index > 2 was associated with mortality by multivariate analysis (odds ratio = 6.31, 95% CI: 2.71-14.67; $P < 0.001$) as is shown in Table 3.

In all, 86 (25.8%) cases received inappropriate empirical antimicrobial therapy, and this was associated with chronic pulmonary obstructive disease (30.2% versus 12.1%, $P < 0.001$), solid neoplasia (22.1% versus 9.3%, $P = 0.002$), polymicrobial infections (18.6% versus 4.9%. $P < 0.001$), HA-UTI (80.2% versus 53.0%, $P < 0.001$), *E. faecalis* (36.0% versus 6.5%, $P < 0.001$) and *P. aeruginosa* (15.1% versus 6.5%, $P = 0.014$).

DISCUSSION

In our study, elderly patients with community-acquired UTI and HA-UTI admitted to hospital had a