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ORIGINAL ARTICLE

Community-onset bacteremia in kidney transplant recipients: The recipients fare well in terms of mortality and kidney injury

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Background: Bloodstream infection is not uncommon in kidney transplant recipients (KTRs) and is associated with mortality, graft loss, and increased medical expenses. Whether these septic patients are more vulnerable to serious complications, resistant strains, or worse clinical outcomes than other patient groups in the community-onset settings remains undetermined.
Methods: A retrospective study was conducted at a medical center in southern Taiwan. Community-onset bacteremia in the KTRs and a control population at the emergency department were identified. Demographic data, clinical characteristics, bacteremic pathogens, antimicrobial resistance, and clinical outcomes were recorded.
Results: Forty-one bacteremic episodes in the KTRs and 82 episodes in control patients were studied. The KTR group had younger age, fewer malignancies, more urosepsis (61% vs. 22%, $p = 0.004$), and fewer biliary tract infections (0% vs. 13.4%, $p = 0.018$). *Escherichia coli* was the most commonly isolated pathogen in both the groups (51.2% and 41.5%, respectively). No *Klebsiella pneumoniae* bacteremia was noted in the KTRs, compared with 14 (17.1%) episodes in the control group ($p = 0.010$). Antimicrobial resistance profiles of bacteremic pathogens were similar (all $p > 0.6$). The KTRs with community-onset bacteremia did not have a worse outcome (in-hospital mortality rate: 2.4% vs. 10%, $p = 0.172$) nor more incomplete

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resolution of kidney injury after acute kidney injury events (21.1% vs. 25%, $p > 0.99$) than the control group.
Conclusion: KTRs with community-onset bacteremia did not fare worse in terms of clinical outcome and kidney injury.

Introduction

Bloodstream infection is not uncommon in kidney transplant recipients (KTRs) and could be lethal. The incidence ranges from 0.7 to 11 episodes/100 patient-year.[1,2] The mortality rate of septicemia was 63% in the 1960s and remained as high as 24.3% even in the 2000s.[1–3] The graft survival and medical expenses are also significantly impacted by the sepsis episodes.[4]

Medical care for KTRs with sepsis is more difficult because they are prone to kidney injury and drug—drug interaction caused by their immunosuppressive agents such as cyclosporin and tacrolimus. The condition is further complicated by the pathogens with variable resistance to cephalosporins and fluoroquinolones, as well as by a high prevalence of extended-spectrum beta-lactamase (ESBL)-producing strains among these patients.[5–7]

Also, the composition of patients visiting the emergency department (ED) changed due to the advances in chemotherapies, antiretroviral therapies, and care for chronic diseases. However, few reports compared the difference between KTRs and other patient groups with bacteremia. We conducted a retrospective study to assess the clinical characteristics, pathogen distribution, and clinical outcome of community-onset bacteremia among KTRs and general population.

Materials and methods

Study design and population

A retrospective study was conducted at a tertiary hospital with approximately 1200 beds in southern Taiwan. All patients older than 18 years with International Classification of Diseases-9 code V420 or kidney transplantation in the discharge diagnosis and positive blood cultures collected at the ED between 2005 and 2010 were included as the case group. All bacteremia episodes were included except those developing within 14 days after previous episodes with identical pathogens. Those patients with graft failure and regular hemodialysis were excluded as they often discontinued their immunosuppressants and had some type of vascular access. In addition, we excluded all cases of hospital-acquired bacteremic episodes.

For each bacteremic episode in the case group, we identified the earlier and following patient with community-onset bacteremia, according to the arrival time in the ED. Two control patients were included for each study case. Patients with regular renal replacement therapy, hospital-acquired infections, or incomplete medical record were replaced by the next eligible patient.

The medical records of the included bacteremic episodes were reviewed. Demographic data, underlying diseases, recent medical intervention, clinical manifestations, laboratory data within the first 24 hours upon presentation, microbiology studies, antimicrobial treatment, length of hospital stays, and clinical outcome were collected. Besides, serum creatinine level before and after the bacteremia episode was recorded. The sources of infection were determined by the investigators based on medical records and radiological or sonographic images.

Microbiology and antimicrobial susceptibility

Blood cultures were collected by the ED staff in two bottles and loaded into the BACTEC 9240 system (Becton, Dickinson and Company, Franklin Lakes, NJ, USA). Subcultures onto plates with Trypticase soy agar with 5% sheep blood (Becton, Dickinson and Company), eosin—methylene blue agar (Levine agar; Becton, Dickinson and Company), chocolate agar, and CDC anaerobic blood agar (Becton, Dickinson and Company) were performed when the initial results were positive. Biochemical tests and the VITEK automatic identification system (bioMérieux, Marcy-l'Étoile, France) were used for final identification. *In vitro* antimicrobial susceptibility tests of blood isolates were performed by the disc diffusion method on Müller—Hinton agar. The results were interpreted according to the Clinical Laboratory Standard Institute guidelines.[8]

Definitions

Bacteremia was defined as isolation of bacteria from at least one set of blood culture bottles; however, the following bacteria should be isolated from at least two sets of blood cultures in order to classify the infection as "true bacteremia"[9,10]: coagulase-negative staphylococci, aerobic Gram-positive bacilli, *Micrococcus* species, *Clostridium perfringens*, and *Propionibacterium* species. Polymicrobial bacteremia was defined as the isolation of more than one bacterial species from each bacteremic episode. Effective antimicrobial therapy was defined as administration of antibiotics to which the pathogen was susceptible *in vitro*.

The severity of bloodstream infections on presentation was measured by the Pittsburgh bacteremia score, a validated scoring system based on fever, hypotension, mental status, mechanical ventilation, and the presence of cardiac arrest.[11] With regard to the infection types, hospital-acquired infection was defined according to the World