Enterococcal Urinary Tract Infections in a University Hospital: Clinical Studies

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Although urinary tract infections (UTI) represent the most common infection caused by enterococci, some aspects remain to be fully clarified. The aim of this study was to determine the clinical characteristics present in UTI caused by *Enterococcus* spp. in patients followed up at the *Prof. Edgard Santos* Teaching Hospital of the Federal University of Bahia. All patients consecutively examined between 1997 and 2005, who received a diagnosis of UTI caused by *Enterococcus* spp. were included in the study. UTI was defined as the presence of ≥ 10^5 colony-forming units per mL of urine. Standard microbiological techniques were used. During the study period, 6.2% of the urine cultures were positive for *Enterococcus* spp. The mean age of the patients was 48.9 years and 57% were male. At initial evaluation, 13% of the patients had complaints suggestive of UTI. Nineteen patients had a history consistent with obstructive uropathy and 26 with neurogenic bladder. At final evaluation, UTI was the diagnosis in 48 patients. In 36 patients (29%), the primary diagnosis was related to urogenital diseases, consisting of obstructive uropathy in 23 of these cases, while in 32 patients (25.8%) primary diagnosis was related to neurologic diseases, frequently neurogenic bladder. UTI caused by *Enterococcus* spp. is not infrequent, is usually associated with few or no symptoms and occurs in sick patients who have anatomical or functional obstructive uropathy associated or not with urinary tract catheterization or instrumentation. The diagnosis of enterococcal UTI may indicate a urinary tract abnormality yet to be diagnosed.

Key-Words: Enterococcal infections, urinary tract, teaching hospital, Bahia, Brazil.

Urinary tract infection is one of the most common infectious conditions in clinical practice and an important cause of nosocomial infection [1]. *E. coli*, other Gram-negative rods and *Staphylococcus saprophyticus* are the most frequent infecting organisms of the urinary tract [1,2]. *Enterococcus* spp., although less common, has been recognized as an important uropathogen [1,3].

Enterococci are Gram-positive cocci, frequently referred to as facultative anaerobes. The habitat of these organisms is the gastrointestinal tract where they form part of the normal intestinal flora in humans [4]. In the last few years, enterococcal infections have become frequent occurrences in hospital settings. Currently they are an important cause of nosocomial infections [4-6] with increasingly common isolates that are resistant to multiple antibiotics [6-9]. Urinary tract infections constitute the most common type of disease produced by *Enterococcus* spp. [4-6].

In view of the increasing importance of enterococcal infections and the current scarcity of pertinent clinical data in the medical literature, the purpose of the present study was to analyze urinary tract infections caused by *Enterococcus* spp. in patients followed up at a general hospital.

Material and Methods

All patients with a diagnosis of urinary tract infection caused by *Enterococcus* spp., who were followed up at the Teaching Hospital of the Federal University of Bahia between 1997 and 2005, were consecutively included in the present study. At the time of initial evaluation, the following data were recorded: a) demographic variables, b) complaints that could be related to the urinary tract, c) presence of comorbidities such as diabetes mellitus, d) evidence of genitourinary or/and neurological diseases, e) laboratory data including urinalysis, serum creatinine and urea, and d) imaging evaluations, as appropriate.

Urinary tract infection was defined as the presence of ≥ 10^5 colony-forming units per mL in the culture of an appropriately collected urine specimen. Enterococci were identified by standard microbiological methods including Gram staining, colony morphology, growth in 6.5% sodium chloride broth and esculin hydrolysis [10]. Antimicrobial susceptibility of each isolate was tested by disk diffusion method according to National Committee for Clinical Laboratory Standards [11]. Renal failure was defined as serum creatinine levels > 1.3 mg/dL and /or blood urea > 45 mg/dL.

Results

A total of 124 patients were included in the study, corresponding to 6.2% of all positive urine cultures. In 98% of the cultures a single uropathogen was identified. Most strains were susceptible to ampicillin (67 %), amoxicillin (78 %), aminoglycoside (62 %), trimethoprim-sulfamethoxazole (64 %); 62% were resistance to ciprofloxacin. Vancomycin-resistant enterococci were identified in 4 % of the isolates.The mean age of the patients was 48.9 years; however, 17 patients were under 10 years of age. Males constituted 57% of the study sample. Twenty-three patients had a previous diagnosis of diabetes mellitus. Some of the demographic and clinical data are presented in Table 1 and Figure 1.

At the time of initial evaluation, 16 patients (13%) had irritative symptoms of the lower urinary tract and 8 (6%) complained of gross hematuria. Forty-five patients had a

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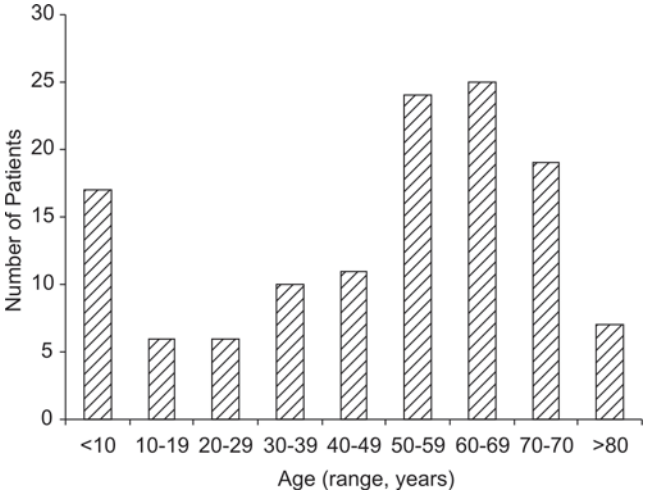
Table 1. Selected demographic and clinical data in patients with enterococcal urinary tract infection.

	#
Number of patients	124
Single uropathogen	122
Age, years (mean+ SD)	48.9 ± 24.5
Gender M/F	71/35
Urinary tract symptoms:	
Irritative	16
Obstructive	45
Fever	26
Gross hematuria	8
Elevated white blood cell count	1
Proteinuria	19
Pyuria (>5 leukocytes/hpf)	114
Hematuria (>5 red blood cells/hpf)	21
Abnormal serum creatinine/urea	22

Figure 1. Age of patients with enterococcal urinary Tract infection.



history consistent with obstructive uropathy, 19 of which were related to urogenital diseases and 26 to neurogenic bladder. During follow-up, low-grade fever was documented in 26 patients (21%) and complete urinary tract obstruction in 34 (27.4%). No patient was diagnosed with acute pyelonephritis. Low-grade proteinuria was recorded in 15% of the patients, ≥ 5 leukocytes per high power field (HPF) in 92% and ≥ 5 red blood cells per HPF in 17%. White blood cell count was elevated in 1.5% of the patients (Table 1).

At final evaluation, 36 patients (29%) had a diagnosis of urinary tract obstruction related to urinary tumors, calculi and genitourinary congenital anomalies, and 32 patients (25.8%) had neurogenic bladder. It is important that in 6 patients an underlying disease was unmasked by the enterococcal urinary tract infection (obstructive uropathy in 2 patients, urinary calculi in 2 patients and neurogenic bladder in 2). Twenty-seven patients (21.8%) were diagnosed with diabetes mellitus and 27 (21.8%) with mild renal failure.

Discussion

Urinary tract infections are the most common cause of infectious disease produced by enterococci, both within and outside hospital settings [8,12-15].

The reported frequency of enterococcal urinary tract infection is variable in the different studies. Bagshaw et al. [16] recorded enterococci as the third most frequent uropathogen in intensive care unit-acquired urinary tract infections after *E. coli* and *P. aeruginosa.* In renal transplant recipients, Alangaden [17] reported Enterococcus as an emergent and important cause of urinary tract infections, although *E. coli* remains the most common pathogen in these patients. On the other hand, Cornia et al. [18] investigated the microbiology of bacteriuria in a large cohort of elderly male inpatients and outpatients and identified Enterococcus as the most frequent uropathogen, this pathogen having been isolated in 22.5% of the patients. It is of note, however, that approximately 45% of the infections were catheter-related.

In the present study, enterococcal urinary tract infection was less frequent than has been reported in other series. This difference may be related to the characteristics of the study, which was conducted in a general university hospital in which children and adults were treated both as inpatients and outpatients. These characteristics may also explain the low mean age of patients in this series. It is well-known that enterococcal-caused urinary tract infections are more frequent prior to 10 years of age and after 60 years of age when genitourinary anomalies and obstructive uropathy are more frequent [19]. Interestingly, Bitsori et al. [20] studied community-acquired enterococcal urinary tract infection in children and reported a high rate of anatomical abnormalities of the urinary tract and a poorer prognosis with respect to renal scarring. These investigators concluded that enterococcal urinary tract infection in children is highly indicative of urinary tract abnormalities and related complications.

Although urinary tract infection was the main diagnosis in 39% of the patients in the present series, irritative symptoms of the lower urinary tract such as dysuria, frequency, urgency and suprapubic discomfort were recorded in 13% of cases. Although pyuria was frequent (92%), it is a nonspecific manifestation of urinary tract infection in the absence of symptoms. In some of the patients, the urine cultures were performed as part of an investigation for leukocyturia or hematuria or as follow-up after single/short term catheterization. As already reported, genitourinary symptoms are mild or even absent in enterococcal urinary tract infections [15,21] and are frequently associated with urinary catheterization and/or instrumentation [22,23]. Indeed, obstructive uropathy related to urologic or neurologic diseases was frequent, being documented in 55% of the patients.

Although diabetes mellitus was diagnosed in 22% of patients, its possible role as a predisposing factor [24,25] for enterococcal urinary tract infection was not evaluated in the present study.

Enterococcal urinary tract infection is not infrequent, although its diagnosis is not readily apparent. As it is usually associated with obstructive uropathy caused by urological and/or neurological disorders, its clinical manifestations may be mild or even absent. Although pyuria was frequent, its presence is difficult to interpret in patients with obstructive uropathy who frequently undergo urinary catheterization and/or instrumentation. In diagnosing enterococcal urinary tract infection, a high degree of suspicion is necessary and the mild and nonspecific symptoms and abnormalities detected at urinalysis must be taken into consideration. In addition, the diagnosis of urinary tract infection caused by *Enterococcus* spp. may indicate an abnormality of the urinary tract that has yet to be diagnosed.

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