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Microbial profile of diabetic foot infections in Trinidad and Tobago

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ABSTRACT

Aims: To examine the microbiologic profile of diabetic foot infections in order to guide empiric antibiotic choices.
Methods: All patients with moderate–severe diabetic foot infections at a tertiary care facility were identified from July 2011 to June 2012. Culture samples were routinely collected before empiric antibiotics were commenced. Retrospective chart review was performed to extract the following data: demographics, clinical details, empiric antibiotic choice and microbiologic data. Descriptive analyses were performed using SPSS 12.0.
Results: There were 139 patients at a mean age of 56.9 ± 12.4 years. Mixed poly-microbial infections were present in 56.8% of cases. Of 221 organisms isolated, 64.7% were gram-negative aerobes, 32.1% were gram-positive aerobes and 3.2% were obligate anaerobes. Multidrug resistant organisms were encountered in 25.9% of cases and included ESBL producers (11.3%), MRSA (4.5%) and VRE (1.4%). Both ciprofloxacin and ceftazidime had good overall anti-microbial activity against gram-negative (68% and 62%, respectively) and gram-positive pathogens (69% and 48%, respectively). Obligate anaerobes were uncommonly isolated due to institutional constraints.
Conclusion: In this environment, both ciprofloxacin and ceftazidime provide good broad-spectrum anti-microbial activity against the commonly isolated pathogens. Either agent can be used as single agent empiric therapy in patients with moderate/severe diabetic infections in our setting. Although institutional limitations precluded isolation of anaerobes in most cases, there is sufficient evidence for anti-anaerobic agents to be recommended as a part of empiric therapy.

1. Introduction

When patients with Diabetes Mellitus develop foot infections, they require urgent control of the infectious process by appropriate debridement and antibiotic use in order to prevent potentially disastrous complications. It is important to be familiar with the usual pathogens in order to guide empiric antibiotics. This study aims to document the pathogens isolated in moderate and severe infections in a Caribbean Population.

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2. Methods

Ethical approval was obtained from the local institutional review board to collect data on all patients presenting with diabetic foot infections at a tertiary care facility in Trinidad between July 2011 and June 2012. These patients were identified from hospital admission registers and enrolled in a prospective study evaluating therapeutic outcomes. The study required an investigator to stage all wounds according to the classification system proposed at the International Consensus on the Diabetic Foot [1]. From that database, we identified patients with moderate and severe infections for this study.

These patients routinely had samples collected for wound cultures prior to the commencement of empiric antibiotics. The samples were attained through aspiration of abscess collections, debridement of necrotic tissues and/or the use of sterile wound swabs as appropriate.

Gram stains were routinely done on specimens. The specimens were then cultured on MacConkey agar and Robertson's cooked meat media for aerobic and anaerobic cultures. No anti-gas gangrene serum was used. Any significant growth after 24 h was isolated with conventional biochemicals (Urea, citrate). Sensitivity testing was done with the Kirby Bauer method. We used standardized methods recommended by the Clinical and Laboratory Standards Institute to identify multi-drug resistant organisms [2]. Isolates were cultured on a plate containing 6 μg/ml oxacillin in Mueller-Hinton agar with 4% sodium chloride to detect the presence of methicillin resistant *Staphylococcus aureus* (MRSA). Gram-negative organisms that were resistant to ceftazidime as the index cephalosporin with cross sensitivity to clavulanate (>5 mm increase in zone diameter on the ceftazidime/clavulanate disc vs. ceftazidime disc alone) were considered extended spectrum β-lactamase (ESBL) producers.

We used the standardized definition of multi-drug resistant organisms (MDRO) employed by the Centres for Disease Control [3] that included any microorganism resistant to ≥2 classes of antimicrobial agents such as MRSA, methicillin resistant staphylococcus epidermidis (MRSE), ESBL-producers, vancomycin resistant enterococci (VRE), *Stenotrophomonas* sp., *Burkholderia* sp. and *Ralstonia* sp.

Patients were routinely commenced on empiric broad-spectrum antibiotics after samples were collected for culture. We used metronidazole for anaerobic cover combined with amoxicillin-clavulanate or a third generation cephalosporin for mild and moderate infections. When the surgical team assessed the infection as severe, metronidazole was combined with piperacillin-tazobactam.

The hospital records of all patients were retrieved. A retrospective chart review was performed to extract the following data: patient demographics, details of infection, severity of infection, empiric antibiotic choice and microbiology culture report data. Data were entered into a Microsoft excel spreadsheet and analyzed with the Statistical Package for Social Sciences (SPSS) version 12.0. Descriptive statistics were generated as appropriate.

3. Results

There were 139 patients with diabetes at an average age of 56.9 ± 12.4 years with moderate or severe foot infections. Severe infections were present in 103 (74%) patients and 26% had moderate infections.

Mixed poly-microbial infections were present in 79 (56.8%) patients and solitary pathogens were present in the remaining 60 (43.2%). Mixed poly-microbial infections were commoner in patients with severe infections (65) than those with moderate infections (14) and this difference achieved statistical significance (82.3% vs. 17.7%, $p = 0.01$).

There were 221 individual organisms isolated and these included 143 (64.7%) gram-negative aerobes/facultative anaerobes, 71 (32.1%) gram-positive aerobes/facultative anaerobes and 7 (3.2%) obligate anaerobes.

Gram-negative organisms were more commonly isolated from patients with severe infections (94/103) than moderate infections (19/36), but the difference was not statistically significant. The commoner gram-negative isolates were *Klebsiella* spp. (25.2%), *Acinetobacter* spp. (18.2%), *Pseudomonas* spp. (17.5%), *Proteus* spp. (16.1%), and *Enterobacter* spp. (14.0%). The commoner gram-positive aerobes were *Staphylococcus aureus* (92.9%) and *Enterococci* spp. (7.0%). The sensitivity patterns of the common pathogens isolated are outlined in Tables 1 and 2.

There were 39 MDROs isolated in 36 (25.9%) patients, all of whom had severe infections. The individual organisms included 25 (11.3%) ESBL-producers, 10 (4.5%) MRSA and 3 (1.4%) VRE.

All 10 MRSA isolates were susceptible to vancomycin but there was poor in vitro sensitivity to ceftazidime (2), ciprofloxacin (2), imipinem (2), piperacillin-tazobactam (3), cefuroxime (3), amoxicillin-clavulanate (4) and trimethoprim-sulfamethoxazole (4).

All 3 VRE were resistant to the cephalosporins, ciprofloxacin, piperacillin-tazobactam and vancomycin, with only poor susceptibility to amoxicillin-clavulanate (1) and imipinem (1).

The 25 ESBL producers isolated were mostly sensitive to imipinem (22) but were generally not susceptible to ampicillin (0), ceftazidime (0), piperacillin-tazobactam (2), cefuroxime (3), trimethoprim-sulfamethoxazole (5), amoxicillin-clavulanate (5) or ciprofloxacin (5).

4. Discussion

Diabetic foot infections take a significant toll on health care systems in the Caribbean [4–7]. Limiting the consequences of these infections requires emergent correction of metabolic derangements, drainage of associated collections, debridement of necrotic tissues and commencement of appropriate antibiotic therapy.

The empiric antibiotic choice should take into account local microbiological data, recent antibiotic use and the prevalence of MDROs [8,9]. This is important information because antimicrobial resistance patterns are strongly correlated with the prevalence of MDROs [3] and the size, type and level of care offered at a hospital [10,11].