Bacteriological Analysis of Deep Tissue Cultures of Diabetic Foot Patients: Evaluation of 86 Cases

Ekrem Keskin1, Tolgahan Kuru2, Elif Seda Keskin3, Serdar İpek4

1Department of Aesthetic Plastic Surgery, Sultan Abdülhamid Han Training and Research Hospital, İstanbul, Turkey.
2Department of Orthopaedic Surgery and Traumatology, Başakşehir Government Hospital, İstanbul, Turkey
3Department of Aesthetic Plastic Surgery, Ahi Evren Training and Research Hospital, Kırşehir, Turkey.
4Department of Orthopaedic Surgery and Traumatology, Aksaray Training and Research Hospital, Aksaray University, Aksaray, Turkey.

Corresponding Author: Tolgahan Kuru
drtolgahankuru@gmail.com

ABSTRACT

The aim of our study was to evaluate the clinical characteristics of patients with diabetic foot infections according to Wagner Classification, the microorganisms cultured in deep tissue culture and their antibiotic susceptibility. 86 cases with diabetic foot infection between August 2016 and December 2017 were reviewed retrospectively. Demographic characteristics (age and gender) of the cases, detailed narrative (duration of diabetes and treatment, trauma, previous hospitalization and antibiotic use, duration of the wound) determined. The relationship between these parameters and the wound stage according to Wagner classification. Isolated microorganisms were identified. The average age of patients were 59,9. 13 patients had a history of antibiotic using before the application. Polymicrobial infection in 20 patients, monomicrobial infection in 62 patients; the cultures of 4 patients came as sterile culture. Gram positive bacterial recurrence was present in 40 of the patients studied, gram negative reproduction occurred in 63 patients. The most common single bacterial growth was S. aureus (24,27%), E. coli (20,38%) and Enterococcus spp. (14.56%) followed (Table-3). 37/63 (58,7%) of gram negative basils were ESBL positive, and MRSA 10/25 (40%) and VRE 4/15 (26,6%). As a result, deep tissue cultures are indispensable in diabetic foot patients with osteomyelitis or soft tissue infection. We think that swab cultures should be taken in cases when surgical debridement is contraindicated.

Keywords: Diabetic foot, foot ulcer, amputation, osteomyelitis

1. INTRODUCTION

Foot infections are a major cause of morbidity and mortality in diabetic cases. These infections are a major cause of hospitalization for diabetic patients; this patient group hospitalized with diabetic foot diagnosis due to many preventable complications. The most important consequence of diabetic foot problems are foot ulcers, unhealed wounds and amputations depending to circulatory failure. Diabetic patients have a 12-25% risk of developing foot ulcers throughout their lives. Annual incidence of foot ulcers in diabetic patients is 1-4%, with a prevalence of 5-12% [1]. In the USA, 50-70% of non-traumatic amputations occur in diabetic patients [2,3]. More than 85% of these amputations have developed infection and gangrene on the foot wound [4].
The result of treatment of wounds and extremity amputation; long term hospitalization, rehabilitation, home care and loss of work power; when it comes to health economics, it is clear that preventive measures will provide significant gains in the social and economic direction [5].

In swab specimens taken from the wound surface or surface-related parts of patients with diabetic foot infection, breeding bacteria often fail to determine the cause of the infection because it reflects surface collinearity. The aim of our study was to evaluate the clinical characteristics of patients with diabetic foot infections according to Wagner Classification (table-1), the microorganisms cultured in deep tissue culture and their antibiotic susceptibility.

<table>
<thead>
<tr>
<th>Wagner classification</th>
<th>Grade 0: Bony protrusion and / or callus formation with firm skin (risk for ulceration)</th>
<th>Grade 1: Superficial ulcer without spread to deep tissues</th>
<th>Grade 2: Deep ulcer involving tendon, bone, ligament or joint</th>
<th>Grade 3: Deep ulcer with abscess and / or osteomyelitis</th>
<th>Grade 4: Gangrene involving finger and / or metatars</th>
<th>Grade 5: The gangrene of the heel and / or the whole of the foot, which requires amputation and cannot be recovered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Patients</td>
<td>14</td>
<td>19</td>
<td>36</td>
<td>12</td>
<td>5</td>
<td>86</td>
</tr>
<tr>
<td>Average age (year)</td>
<td>52 (39-84)</td>
<td>65 (44-81)</td>
<td>61(46-88)</td>
<td>58(41-90)</td>
<td>60(56-78)</td>
<td>59,9(39-90)</td>
</tr>
<tr>
<td>Sex</td>
<td>10</td>
<td>15</td>
<td>27</td>
<td>9</td>
<td>4</td>
<td>65</td>
</tr>
<tr>
<td>Male</td>
<td>4</td>
<td>4</td>
<td>9</td>
<td>3</td>
<td>1</td>
<td>21</td>
</tr>
<tr>
<td>Female</td>
<td>6</td>
<td>11</td>
<td>17</td>
<td>9</td>
<td>5</td>
<td>42</td>
</tr>
<tr>
<td>Duration of wound</td>
<td>32(22-60)</td>
<td>45 (20-80)</td>
<td>30 (10-70)</td>
<td>46 (30-90)</td>
<td>82 (30-330)</td>
<td>38,8 (20-330)</td>
</tr>
<tr>
<td>Treatment of Diabet Insulin Oral antidiabetic</td>
<td>7</td>
<td>9</td>
<td>22</td>
<td>5</td>
<td>3</td>
<td>46</td>
</tr>
<tr>
<td>Insulin</td>
<td>7</td>
<td>10</td>
<td>14</td>
<td>7</td>
<td>7</td>
<td>40</td>
</tr>
<tr>
<td>Oral antidiabetic</td>
<td>7</td>
<td>9</td>
<td>22</td>
<td>5</td>
<td>3</td>
<td>46</td>
</tr>
</tbody>
</table>

2. METHODS

86 cases with diabetic foot infection between August 2016 and December 2017 were reviewed retrospectively. Demographic characteristics (age and gender) of the cases, detailed narrative (duration of diabetes and treatment, trauma, previous hospitalization and antibiotic use, duration of the wound) determined. The relationship between these parameters and the wound stage according to Wagner classification. Isolated microorganisms were identified by standard methods and antimicrobial susceptibilities were determined by disk diffusion method according to Clinical and Laboratory Standards Institute (CLSI) criteria [6]. In the analysis of the data, the program SPSS Statistics 22.0 (IBM Corp., Armonk, NY, USA) was used. Fisher's exact test was used to compare the Wagner classification with parametric data, and Kruskal-Wallis H test was used to compare nonparametric data.

3. RESULTS

The clinical characteristics of 86 patients included in the study are summarized in table-2. The average age of patients were 59,9. 65 of the patients were male and 26 were taking oral antidiabetic drugs. 13 patients had a history of antibiotic using before the application. 10 of these patients had oral antibiotherapy and 3 of them had systemic antibiotherapy usage story. When the accompanying diseases are examined; diabetic polyneuropathy in 44 cases, chronic renal failure requiring dialysis in 9 patients and 8 patients had peripheral vascular disease. 52 of the patients were active smokers.
Polymicrobial infection in 20 patients, monomicrobial infection in 62 patients; the cultures of 4 patients came as sterile culture. Gram positive bacterial recurrence was present in 40 of the patients studied, gram negative reproduction occurred in 63 patients. The most common single bacterial growth was S. aureus (24.27%), E. coli (20.38%) and Enterococcus spp. (14.56%) followed (Table-3). 37/63 (58.7%) of gram negative basils were ESBL positive, and MRSA 10/25 (40%) and VRE 4/15 (26.6%).

4. DISCUSSION

Diabetic foot is one of the most common chronic complications of diabetes affecting quality of life [7]. 85% of non-traumatic foot amputations are due to diabetic foot [8]. Apart from this, treatment is delayed especially in underdeveloped and developing countries due to social, cultural and financial problems. Amputation rates are also increasing with this delay [9].

In our country, the number of diabetic patients is increasing more rapidly than the previous years, especially due to the increase in the elderly population, and there is a marked increase in the frequency as well as chronic microvascular complications [10].

The most important pathogens in the diabetic foot are gram positive cocci (especially Staphylococcus aureus), beta hemolytic streptococci (especially group B) and coagulate negative staphylococci. Gram-positive cocci are often associated with monomicrobial infection, but also in chronic ulcers or previously treated wounds are as a form of mixinflection. Anaerobic bacteria can be observed as mixed infection, especially in ischemic and gangrenous injuries, although they are rarer. Pseudomonas and enterococci strains are often colonizing agents [11,12].

Antibiotic therapy is initially empirical and is directed to mixed infection. Clinical response on follow-up of the patient is modified according to culture results and antibiotic susceptibility [13]. Even if the culture end result is different, clinical is basis. Local antibiotic resistance patterns should be considered when choosing treatment (for example the presence of methicillin-resistant Staphylococcus aureus). Hepatic, renal functions, and drug allergy may affect antibiotic selection. While intravenous therapy is given to patients with severe infections, mild infections can be treated with oral antibiotics [14]. Although there is not enough data on topical antibiotics, it is thought to be effective only in mildly infected superficial wounds [15]. Some of the antiseptic applications can disrupt tissue healing. However, silver or iodine containing antiseptics appear safe and usable. Antiseptics need to be applied to the periphery from the wound site. They can be applied on the wound in severe infections. As a result, deep tissue cultures are indispensable in diabetic foot patients with osteomyelitis or soft tissue infection. We think that swab cultures should be taken in cases when surgical debridement is contraindicated.

REFERENCES
