Differences in Ulcer Location in Diabetic Foot Syndrome

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Background:

• The foot ulcerations are among the most debilitating complications in diabetic patients.
• The diabetic foot can be divided into three entities:
  • the neuropathic foot (neuropathy predominates and the circulation is good)
  • the neuroischaemic foot (both neuropathy and ischaemia are present)
  • the purely ischaemic foot (without concomitant neuropathy).

Aim:

• The aim of our study was to assess the possible differences in location of diabetic ulcers with regard to their origin.
• Could the location of the ulcer predict the etiology of diabetic foot syndrome?

Methods:

• Retrospective evaluation of first clinical examination in patients who present new diabetic ulcer
• 5-year period (November 2001 – 2006)

First clinical examination:

• History (age, concomitant diseases, medication)
• Diabetes history (duration, HbA1c, type of treatment, history of diabetic complications)
• History of the diabetic foot
• Neurological screening: tuning fork, monofilaments, hot/cold sensitivity
• Digital photoplethysmography including peripheral (ankle and toe) pressure measurement
• Number, size and location of ulcers

Digital photoplethysmography

• ankle-brachial index ABI
• toe-brachial index TBI
• interbranch index according to Oliva (= A/B)
  < 0.29 = normal finding in peripheral circulation
  0.29 – 0.39 = intermediate changes
  > 0.39 = significant changes in peripheral circulation

Patients:

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>women</th>
<th>mean age (years)</th>
<th>mean duration of diabetes (years)</th>
<th>HbA1c (% IFCC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>neuropathic ulcers</td>
<td>233</td>
<td>83</td>
<td>66.1 ± 12.8</td>
<td>15.0 ± 9.0</td>
<td>7.5 ± 2.1</td>
</tr>
<tr>
<td>neuroischaemic ulcers</td>
<td>197</td>
<td>70</td>
<td>66.9 ± 9.3</td>
<td>16.6 ± 9.3</td>
<td>7.9 ± 1.9</td>
</tr>
<tr>
<td>ischaemic ulcers</td>
<td>72</td>
<td>36</td>
<td>73.5 ± 9.3</td>
<td>13.7 ± 10.1</td>
<td>7.7 ± 2.9</td>
</tr>
</tbody>
</table>

Results:

<table>
<thead>
<tr>
<th></th>
<th>neuropathic (n = 366)</th>
<th>neuroischaemic (n = 344)</th>
<th>ischaemic (n = 115)</th>
<th>total (n = 835)</th>
</tr>
</thead>
<tbody>
<tr>
<td>tips of toes</td>
<td>2.5</td>
<td>35.1</td>
<td>63.6</td>
<td>25.0</td>
</tr>
<tr>
<td>interdigital spaces</td>
<td>1.7</td>
<td>7.8</td>
<td>41.0</td>
<td>20.3</td>
</tr>
<tr>
<td>plantar surface of toes</td>
<td>40.4</td>
<td>15.7</td>
<td>3.4</td>
<td>24.6</td>
</tr>
<tr>
<td>sole and plantar head region</td>
<td>39.1</td>
<td>21.4</td>
<td>4.3</td>
<td>26.7</td>
</tr>
<tr>
<td>lateral part of sole and heel</td>
<td>9.3</td>
<td>7.1</td>
<td>1.7</td>
<td>7.3</td>
</tr>
<tr>
<td>dorsal part of toes and foot</td>
<td>6.2</td>
<td>5.2</td>
<td>8.7</td>
<td>6.1</td>
</tr>
</tbody>
</table>

p < 0.0001 (Fisher’s exact test, modification Monte Carlo)

Previously healed ulcer in history:

Conclusions:

The location of diabetic foot ulcers differs significantly according to their cause and could predict the etiology of the diabetic foot.
In addition more than 75% of all ulcerations were located in toes and forefoot area.
This fact could change approach to the preventive strategy in the diabetic foot.