Diabetic Foot Syndrome
Diagnosis and Treatment

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Disclosure

Speaker name: Jennifer Fahrni

I have the following potential conflicts of interest to report:

- Consulting
- Employment in industry
- Stockholder of a healthcare company
- Owner of a healthcare company
- Other(s)

☒ I do not have any potential conflict of interest
Diabetic Foot Syndrome

Definition

A foot with pathologies that result from diabetes, such as neuropathy, arthropathy, ischemia, infection and ulcers.
Diabetic Foot Syndrome

Multifactorial Pathogenesis

Peripheral neuropathy

- Altered biomechanics of foot

Chronic pressure

Trauma

Angiopathy (Micro- and/or macroangiopathy)

- Tissue ischemia

Ulcer Formation

Infection

Immunopathy
Diabetes with neuropathy and PAD are predisposed for foot ulcerations.

For a diabetic patient, the lifetime risk of developing a foot ulcer may be as high as 25 percent.

Risk factors for developing foot ulcers:

- Peripheral neuropathy (loss of protective sensation)
- Foot deformity
- Peripheral vascular disease
- Visual impairment
- Diabetic nephropathy (especially patients on dialysis)
- Poor glycemic control
Diabetic Foot Syndrome
Diabetic Foot Syndrome

Diagnosis

Assess for predisposing factors in every diabetic patient:

- Inspection of feet
- Examen for neuropathy
- Examen for signs of PAD (lack of symptoms is frequent in diabetics)

If a wound is present:

- Depth of wound
- Signs of infection including of the bone
- Assess for ischemia
Diabetic Foot Syndrome

Diabetic foot ulcer and PAD

<table>
<thead>
<tr>
<th>Predictor variables</th>
<th>Outcome: healing</th>
<th></th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, per 10 year increase</td>
<td>1.32</td>
<td>1.17–1.49</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Sex, men vs women</td>
<td>1.50</td>
<td>1.07–1.97</td>
<td>0.018</td>
</tr>
<tr>
<td>Duration of diabetes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5–10 vs &lt;5 years &lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.96</td>
<td>0.56–1.65</td>
<td>0.712</td>
</tr>
<tr>
<td>&gt;10 vs &lt;5 years &lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.05</td>
<td>0.69–1.60</td>
<td></td>
</tr>
<tr>
<td>Depth of ulcer, deep vs superficial</td>
<td>1.66</td>
<td>1.25–2.20</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Size of ulcer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1–5 vs &lt;1 cm&lt;sup&gt;2a&lt;/sup&gt;</td>
<td>2.25</td>
<td>1.60–3.17</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>&gt;5 vs &lt;1 cm&lt;sup&gt;2a&lt;/sup&gt;</td>
<td>4.22</td>
<td>2.64–6.72</td>
<td></td>
</tr>
<tr>
<td>Duration of ulcer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 week to 3 months vs &lt;1 week &lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.81</td>
<td>1.15–2.85</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>&gt;3 months vs &lt;1 week &lt;sup&gt;a&lt;/sup&gt;</td>
<td>2.61</td>
<td>1.60–4.27</td>
<td></td>
</tr>
<tr>
<td>Location, plantar vs non-plantar</td>
<td>0.73</td>
<td>0.55–0.98</td>
<td>0.035</td>
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<tr>
<td>Pretibial oedema, yes vs no</td>
<td>1.79</td>
<td>1.27–2.51</td>
<td>0.001</td>
</tr>
<tr>
<td>Heart failure (NYHA III–IV), yes vs no</td>
<td>2.03</td>
<td>1.35–3.05</td>
<td>0.001</td>
</tr>
<tr>
<td>Neurological disorder, yes vs no</td>
<td>1.44</td>
<td>0.85–2.46</td>
<td>0.176</td>
</tr>
<tr>
<td>Inability to stand or walk without help, yes vs no</td>
<td>2.50</td>
<td>1.62–3.79</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Visual impairment, yes vs no</td>
<td>1.36</td>
<td>0.94–1.98</td>
<td>0.105</td>
</tr>
<tr>
<td>ESRD, yes vs no</td>
<td>2.20</td>
<td>1.30–3.73</td>
<td>0.004</td>
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<tr>
<td>Polyneuropathy, yes vs no</td>
<td>1.41</td>
<td>0.98–2.04</td>
<td>0.065</td>
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<tr>
<td>Infection, yes vs no</td>
<td>1.47</td>
<td>1.09–2.00</td>
<td>0.012</td>
</tr>
<tr>
<td>PAD, yes vs no</td>
<td>2.31</td>
<td>1.72–3.10</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

<sup>a</sup>Reference category

Prompers L et al. Prediction of outcome in individuals with diabetic foot ulcers: focus on the differences between individuals with and without peripheral arterial disease. The EURODIALE Study. Diabetologia 2008
Diabetic Foot Syndrome

Classifications

Wagner Classification

University of Texas Diabetic Wound Classification
Diabetic Foot Syndrome

Treatment

Prevention!

- Patient education
- Check feet every day
- Keep skin soft and smooth
- Smooth corns and calluses gently
- If you can see, reach, and feel your feet, trim your toenails regularly. If you can’t, visit a podiatrist regularly
- Wear shoes and socks at all times
- Protect your feet from hot and cold

- Regular assessment of feet by primary care provider or endocrinologist

- Pressure reduction if indicated (professionally fitted footwear)
Diabetic Foot Syndrome

Amputation rate in diabetic foot ulcer

Moulik PK et al. Amputation and Mortality in New-Onset Diabetic Foot Ulcers Stratified by Etiology. Dia Care 2003
Cost of diabetic foot ulcers

<table>
<thead>
<tr>
<th>Resource use</th>
<th>Healed (n=647)</th>
<th>Deceased, unhealed (n=34)</th>
<th>Major amputation (n=36)</th>
<th>Not healed within 12 months (n=104)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Direct costs</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hospitalisation (hotel cost)</td>
<td>2,647 (34)</td>
<td>4,771 (55)</td>
<td>10,953 (43)</td>
<td>8,907 (44)</td>
</tr>
<tr>
<td>Amputations</td>
<td>602 (8)</td>
<td>498 (6)</td>
<td>6,907 (27)</td>
<td>718 (4)</td>
</tr>
<tr>
<td>Revascularisation</td>
<td>538 (7)</td>
<td>238 (3)</td>
<td>624 (2)</td>
<td>734 (4)</td>
</tr>
<tr>
<td>Other interventions and surgery</td>
<td>712 (9)</td>
<td>949 (11)</td>
<td>2,894 (11)</td>
<td>2,042 (10)</td>
</tr>
<tr>
<td>Diagnostic procedures and investigations</td>
<td>126 (2)</td>
<td>104 (1)</td>
<td>289 (1)</td>
<td>345 (2)</td>
</tr>
<tr>
<td>Antibiotics</td>
<td>1,060 (14)</td>
<td>959 (11)</td>
<td>1,208 (5)</td>
<td>2,120 (11)</td>
</tr>
<tr>
<td>Off-loading/orthopaedic appliances</td>
<td>449 (6)</td>
<td>165 (2)</td>
<td>360 (1)</td>
<td>636 (3)</td>
</tr>
<tr>
<td>Topical treatment</td>
<td>473 (6)</td>
<td>470 (5)</td>
<td>922 (4)</td>
<td>1,780 (9)</td>
</tr>
<tr>
<td>Consultations/outpatient visits</td>
<td>540 (7)</td>
<td>473 (5)</td>
<td>383 (2)</td>
<td>1,508 (8)</td>
</tr>
<tr>
<td><strong>Total direct costs</strong></td>
<td>7,147</td>
<td>8,628</td>
<td>24,540</td>
<td>18,790</td>
</tr>
<tr>
<td>Indirect costs</td>
<td>574 (7)</td>
<td>25 (0)</td>
<td>681 (3)</td>
<td>1,275 (6)</td>
</tr>
<tr>
<td><strong>Total direct and indirect cost</strong></td>
<td>7,722 (100)</td>
<td>8,653 (100)</td>
<td>25,222 (100)</td>
<td>20,064 (100)</td>
</tr>
</tbody>
</table>

The direct and indirect costs per patient with diabetic foot ulcers are presented in Euros (% of total), according to 2005 prices, and have been weighted by purchasing power standards. Out of the 1,088 patients who were available for evaluation, 821 were included in the costing analysis.
Management of foot ulcers in diabetics requires an interdisciplinary approach that addresses glycemic control, pressure relief, infection, lower-extremity vascular status and local wound care.
Diabetic Foot Syndrome

Treatment of diabetic foot ulcer

- Pressure reduction

- Treatment of infection (antimicrobial therapy, surgical debridement)

- Treatment of ischemia (endovascular or open revascularization if possible)

- Adequate local wound care
Diabetic Foot Syndrome

Figure 1: Rapid healing of an uncomplicated neuropathic ulcer
The ulcer had been present for 8 weeks and was treated by weekly applications of total contact casting. Scale in cm.
Diabetic Foot Syndrome

Treatment

[Images of medical scans showing before and after procedures]
Diabetic Foot Syndrome

Conclusions

Foot problems are a major cause of morbidity and mortality in people with diabetes.

The feet of diabetic patients need special attention!

Prevention is the most important part of diabetic foot syndrome treatment.

Diabetic foot ulcers require an interdisciplinary approach.

Once a wound is present, reduce pressure.
Treat ischemia if found.
Look for infection.
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