Footwear and orthoses in neuropathic foot ulceration: Prevention and management

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Aetiology

- 15% Patients with diabetes develop foot ulcers\(^1\)
- Neuropathic foot ulcers develop secondary to presence of \( \geq 2 \) risk factors\(^2,3\):
  - Peripheral sensorimotor neuropathy
  - Peripheral autonomic neuropathy
  - Increased plantar pressure
  - Foot deformity
  - Plantar callous
  - Limited joint mobility
  - Peripheral vascular disease
  - Trauma
Pathway to Ulceration

(Adapted from Boulton, Connor & Cavanaugh, 2000, Fig. 3.1, p 21)
Management

- Pressure reduction = main treatment\textsuperscript{2,3,4,5,6,7}
  - Neuropathy is irreversible
  - Surgery is expensive and invasive

- Pressure reducing modalities
  - Footwear
  - Foot orthoses
  - Felt padding
  - Total contact casting
Footwear - Objectives

- Protection
- Stability
- Facilitate ambulation
- Reduce & redistribute plantar pressure
- Provide shock absorption
- Balance Limb Length Discrepancy
- Accommodate foot deformity & oedema
- Accommodate orthoses or prostheses
- Maintain foot function
- Easy to get on & off
- Essential long-term management
# Footwear - Options

<table>
<thead>
<tr>
<th></th>
<th>ADVANTAGES</th>
<th>DISADVANTAGES</th>
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</thead>
<tbody>
<tr>
<td><strong>OFF-THE-SHELF</strong></td>
<td>• Relatively cheap&lt;br&gt;• Readily available&lt;br&gt;• Some can be modified</td>
<td>• Inappropriate if not fitted&lt;br&gt;• Ill-fitting footwear -&gt; ulceration&lt;br&gt;• Difficult to accommodate some orthoses</td>
</tr>
<tr>
<td><strong>EXTRA-DEPTH/WIDTH</strong></td>
<td>• Accommodate minor foot deformity&lt;br&gt;• Accommodate orthoses&lt;br&gt;• Choice of materials&lt;br&gt;• Modifiable&lt;br&gt;• Range of sizes, widths, depths &amp; styles</td>
<td>• Expensive&lt;br&gt;• Often heavy &amp; bulky&lt;br&gt;• Not suitable for all patients</td>
</tr>
<tr>
<td><strong>CUSTOM-MADE</strong></td>
<td>• Guaranteed fit&lt;br&gt;• Accommodate orthoses&lt;br&gt;• Choice of materials</td>
<td>• Expensive&lt;br&gt;• Time consuming manufacture&lt;br&gt;• Aesthetically unappealing&lt;br&gt;• Often heavy &amp; bulky</td>
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Footwear - Options
Footwear - Modifications

- Rocker sole
  - Restore range of motion
    - Non-enzymatic glycosylation
    - Arthritis
    - Arthrodesis
  - Reduce plantar pressure
  - Increase propulsion
- Medial or lateral flare = stability
- Steel shank = stability
- Heel raise = equalise limb length discrepancy
Orthoses - Functional

Advantages
- Correct abnormal foot function
- Treatment of painful lower limb & foot pathologies
- Durable
- Custom-made
  - Flexible
  - Semi-rigid
  - Rigid

Disadvantages
- Limited shock absorption
- Hard
Orthoses - Accomodative

**Advantages**
- Accommodate
  - Foot deformity
  - Ulceration
- Protect & cushion
- Reduce plantar pressure
- Can restore foot function
- Manufactured from soft materials i.e. EVA

**Disadvantages**
- Bulky -> difficult to fit to footwear
- Poor durability
Felt Padding$^{4,17}$

**Advantages**
- Reduce & redistribute plantar pressure
- Accommodate foot deformity
- Useful in infected ulcers
- Cheap

**Disadvantages**
- Short-term or adjunctive treatment
- Compresses quickly
- Displacement
- Bulky
Total Contact Casting\textsuperscript{18,19}

**Advantages**
- “Gold standard” pressure relief in neuropathic foot ulceration
- Reduce & redistribute plantar pressure
- Reduce oedema
- Protection
- Forced patient compliance

**Disadvantages**
- Bulky
- Heavy
- Instability
- Muscular atrophy
- Osteoporosis
- Iatrogenic lesions
- Contraindicated for infected & deep ulcers
- Negative impact quality of life
- Time consuming
Total Contact Casting
References


References


