Techniques of Healing the Diabetic Foot
Local and Systemic

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Outline

✓ Etiology
✓ Vascular Assessment
✓ Offloading
  • External
  • Internal
✓ Surgical vs conservative management
✓ Long term
**Etiology – “The Triads”**

Peripheral Neuropathy; Fixed Deformity; Repetitive Stress
Callus; Ulceration; Infection  ➔  AMPUTATION

Significant Confounding Factors
Arterial Insufficiency
Infection

These Confounding Factors are often the catalyst for amputation
Limb Preservation Initiative
“Stop the Cycle”

ULCER  INFECTION  AMPUTATION
In the World there Is an Amputation every 30 sec as a result of Diabetes

Aggressive Evaluation and treatment of DFUs is a critical component of a Limb Preservation Program
Vascular Assessment and revascularization when required is a critical component of Diabetic Ulcer Management and a Limb Preservation Program.

- Surgery should not be performed without assuring adequate perfusion.
- Amputation in a dysvascular patient should not be performed without attempting revascularization – even if it is to lower the amputation level.
Vascular Assessment

✔ Palpation
✔ Doppler
✔ Non-invasive studies
✔ Invasive studies

<table>
<thead>
<tr>
<th>ABI</th>
<th>Finding</th>
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<tbody>
<tr>
<td>&gt;1.30</td>
<td>Noncompressible</td>
</tr>
<tr>
<td>0.9 – 1.30</td>
<td>Normal</td>
</tr>
<tr>
<td>0.60 – 0.89</td>
<td>Mild</td>
</tr>
<tr>
<td>0.40 – 0.59</td>
<td>Moderate</td>
</tr>
<tr>
<td>0.45 – 1°</td>
<td>1° healing likely</td>
</tr>
<tr>
<td>0.00 – 0.40</td>
<td>Severe</td>
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<thead>
<tr>
<th>Ankle/Toe Pressures</th>
<th>Healing</th>
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<tbody>
<tr>
<td>AP &gt;100 mm Hg,</td>
<td>&gt;80%</td>
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<tr>
<td>biphasic waveforms</td>
<td></td>
</tr>
<tr>
<td>AP &lt;100 mm Hg,</td>
<td>&gt;50%</td>
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<tr>
<td>monophasic waveforms</td>
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<tr>
<td>TP &gt;50mm Hg</td>
<td>&gt;90%</td>
</tr>
<tr>
<td>TP &lt;50mm Hg</td>
<td>50%</td>
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<table>
<thead>
<tr>
<th>TcPO2</th>
<th>Recommendation</th>
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<tr>
<td>&gt;30</td>
<td>1° healing likely</td>
</tr>
<tr>
<td>20-30</td>
<td>Vascular consultation</td>
</tr>
<tr>
<td>&lt; 20</td>
<td>Requires vascularization</td>
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Current methods utilized to evaluate tissue perfusion are often limited by medial calcinosis, scarring, wounds, prior amputations and infection.

Current methods can be technically challenging, costly and time consuming and don’t measure global perfusion of the foot.

Fluorescent Angiography offers an additional option to measure tissue perfusion.
Fluorescent Angiography

Visualize and quantitate micro circulation
See what the eye can’t see
External Offloading

- Total Contact Cast (Gold Standard)
- Off loading shoes or boots
What is internal offloading?

✓ Removal of bony prominences or reduction of deformities by surgical means to minimize the risk for ulceration

• Exostectomy/fusion
• Soft tissue procedures

01 Dec 2013 – 2nd toe wound probes to bone
30 Dec 2013 - flexor tenotomies
10 Jan 2014
17 Jan 2014
Advanced Wound Care

✓ It is more important what you take off from an ulcer than what you put on (OFF LOADING)
✓ If not healing by 50% in 4 weeks consider advanced wound care products
  • Tissue-engineered Products
  • Mechanical Adjuncts
    Wound VAC, Electrotherapy, Electromagnetic Therapy, Ultrasound, External Heating Device, Ultraviolet, Infrared, Low Energy Laser, Radiofrequency Stimulation
Obliterative Treatment vs. Ongoing Wound Care

- Once Adequate perfusion is documented, Obliterative treatment may give better results than on going wound care
- Obliterative surgery with a well planned minor amputation may lead to more rapid healing and more rapid return to function
- Prolonged wound care with an open ulcer may lead to infection, osteomyelitis and emergent amputation
“A Tale of Two Toes”

✓ 88 yo male with similar presentation 18 months apart:
  • Monophasic Peroneal
  • Non-audible DP/PT

✓ Obilerative vs ongoing care
  • “Whittling” disease
“A Tale of Two Toes”

Left side
- CFA endarterectomy/SFA
- 5th digit open amputation
- Delayed wound healing/osteomyelitis
- Open partial 5th ray resection
- NPWT/advanced wound care – took 6 more months until final healing
- Hypertrophic scar with tendency for callus formation

Right side
- Fem to pop bypass with PTFE
- Healed in 6 weeks
- Remains healed without callus formation
“A Tale of Two Toes”

✓ Chronic wound care vs. limited amputation
✓ Select procedure that will result in the most rapid healing and limited morbidity and mortality (May include a more aggressive index procedure/minor amputation)
The patient remains at high risk for further ipsilateral or contralateral foot complications

- PVD, history of ulceration, duration of diabetes, history of amputation, etc.

Maintain follow up for:

- Ongoing patient education, prevention, and the ability to intervene early if necessary
Summary

✓ Etiology triads
✓ Thorough vascular assessment
✓ Offloading
  • External – Total Contact Cast (Gold Standard)
  • Internal – Tendon balancing/bone removal/fusion
✓ Obliterative treatment vs ongoing wound care
✓ Long term – follow up and patient education
THANK YOU!

Mt. Rainier at Sunrise

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Slide deck prepared by V. Marmolejo, DPM at vlsdpm@gmail.com