Global Exchange Forum  
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A comprehensive approach to diabetic patient treatment

How to arrange the follow-up and how should wound healing guide re-intervention decisions

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Disclosure

Speaker name:
Katja S. Mühlberg

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
3 problems to resolve within 8 minutes…

• What about „follow-up“?

• How to measure wound healing?

• How to decide on re-intervention generally?
Follow-up

European Society for Vascular Surgery
International Working Group for the Diabetic Foot

„ … diabetic patients benefit from a close long-term surveillance during follow-up…“
Basic diagnostics and therapy of every diabetic foot ulcer

Examination for the presence of:
- ischaemia
- neuropathy
- infection

Standard therapy:
- improvement of perfusion
- offloading technique
- treatment of infection
- wound debridement
- moist dressings
- reduction of oedema
- metabolic control
- general conditions
## Follow-up Arrangement

<table>
<thead>
<tr>
<th>category</th>
<th>findings</th>
<th>follow-up</th>
<th>risc stratification</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>no sensory neuropathy</td>
<td>every 12 months</td>
<td>low</td>
</tr>
<tr>
<td>1</td>
<td>sensory neuropathy</td>
<td>every 6 months</td>
<td>increased</td>
</tr>
<tr>
<td>2</td>
<td>sensory neuropathy and PAD and/or deformity of the foot</td>
<td>every 3 months</td>
<td>increased</td>
</tr>
<tr>
<td>3</td>
<td>History of any ulcer</td>
<td>every 1-3 months</td>
<td>very high-risk</td>
</tr>
</tbody>
</table>
The First Follow-up after 4 weeks of standard care

classify a patient as either healed or not healed by the 20th week of care
(as an indirectly sign of sufficient perfusion and offloading technique)
Follow-up and wound healing

Standard therapy

healing wound  non-healing wound

What does it mean: „non-healing“?
Follow-up and wound healing

What does it mean: "non-healing"?

50-60% healed at 20 weeks
>75% at 1 year

Median time to complete tissue healing:
Non-diabetics 159d
Diabetics 213d

"...fails to heal with standard therapy in an orderly and timely manner."
Troxler M *Worldwide Wounds* 2006

TIME IS TISSUE
Follow-up and wound healing

Is there a possibility to (early) recognize non-healing wounds?

prognostic factors:
• size > 2cm²
• duration > 2 months
• depth (penetrating skin to expose tendon ligament, joint…) → Wagner > 3

66% probability of healing by 20 weeks

22% probability of healing by 20 weeks

Margolis DJ Am J Med 2003
Follow-up and wound healing

Is the non-healing wound associated with poor arterial perfusion?

- Standard therapy
  - healing wound
  - non-healing wound

Prognostic factors:
- presence of ischaemia
  - doubles the time taken to heal
  - triples the risk of amputation

Oyibo SO Diabet Med 2001
Follow-up and wound healing

Is the non-healing wound associated with poor arterial perfusion?

prognostic factors:
• presence of ischaemia

healing rate 2.4 times faster than neuroischaemic ulcers
7 times arterial ulcers
Follow-up and wound healing
Is there a possibility to early recognize non-healing wounds?

Endpoint:
Median time to complete tissue healing:

Diabetics 213d

Valid surrogate end point, that reflects the effect of the treatment

→ the percentage change in wound area after 4 weeks of care

Margolis D Diabetes Care 2003

Zimny S J Diabetes Complications 2002
Follow-up and wound healing

→ multiplying the longest diameters and calculate the radius
Follow-up and wound healing

Is there a possibility to early recognize non-healing wounds?

→ area measurement with perimeter

The changes in wound within the first 4 weeks reflect the effect of your treatment.
1. Arrange the first follow-up after 4 weeks with measurement of wound area.

no changes in wound area or even progress → re-evaluate your therapy strategy!

Why re-evaluation after such a short period?
Revascularization and wound healing

Why re-evaluation after such a short period?

TIME IS TISSUE

not only revascularization *per se* but also timing of revascularization is important

Elgyri T *Eur J Vasc Endovasc Surg* 2014
2. Record additional predictors to early recognize failing revascularisations

**ABI**  drop of >0.2
   „Trust ABI when low - but not when high!“

**TBI**  toe pressure <30mmHg

**tcpO₂**  <30mmHg; infection will not resolve itself

Colour duplex sonography

Norgren L 
*J Vasc Surg* 2007
Inter-Society Consensus for the Management of Peripheral Arterial Disease (TASC II)

Apelqvist JA 
*Diabetes Metab Res Rev* 2012
International Working Group on the diabetic foot
2.a  Additional predictors before and after revascularisation

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
</table>
| ABI       | drop of >0.2
            | „Trust ABI when low - but not when high!“ |
| TBI       | toe pressure <30mmHg |
| tcpO₂     | <30mmHg; infection will not resolve itself |

→ measure before and after revascularisation in order to document the first effect and in order to create the „new baseline parameters“ for the next follow-up
3. **Re-evaluate Offloading technique and wound healing**

Insoles, orthosis, protective/therapeutic footwear

*Feet are changing!*

Pedography
Summary

- detect ischaemia
- neuropathy
- infection
and treat them

- detect impaired perfusion
- suboptimal offloading
- infection
and treat them

- no response to treatment

- measure change in wound area

- first follow-up after 4 weeks

- additional predictors +

- next follow-ups according to success after 4-8 (12) weeks

- measure change in wound area etc.

- first visit

- additional predictors +
Summary II

Every diabetic foot ulcer should always be considered to have vascular impairment unless otherwise proven.

The diabetic foot patient will be your patient not only for the time of ulcer healing. He belongs to you for the rest of his life.

Consider co-morbidities, e.g. endstage renal-disease, congestive heart failure.
Thank you for your attention & have an exciting time in Leipzig

„Mein Leipzig lob ich mir! Es ist ein Klein-Paris und bildet seine Leute.“
J. W. v. Goethe
Faust I
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