A Summary of the Evidence Behind the Detriments to Healing a Diabetic Foot Ulcer (DFU)

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Lefrancois, T.

My disclosure is in the Final AOFAS Mobile App. I have no potential conflicts with this presentation.
Detriments to Healing a DFU

- There are a number of commonly accepted factors that may serve as a deterrent to healing a Diabetic Foot Ulcer (DFU).
  - Deformity
  - Plantar Pressure
  - Poor Glycemic Control
  - Inadequate Vascular Supply
  - Infection
  - Smoking
  - Poor nutrition
Detriments to Healing a DFU

- **Objective** – complete an evidence based review of the literature and assign a grade of recommendation in support of each of the factors as true detriments to healing a DFU

- **Purpose** – validate the reversal or optimization of each of the potential detriments in the clinical setting.
Detriments to Healing a DFU

- **Methods:**
  - The relevant search terms were defined for each detriment to healing (employing both Mesh and Non-Mesh terms) from the hypothesis and research question
  - A separate literature review was performed using PubMed for each of the research questions
  - Articles were assessed for relevancy first on the title, then the abstract and finally the full article
  - Articles were excluded if: failed to answer the research question or were not available in English
  - Included articles were assigned a level of evidence as described by Wright et al. and noted whether it supported or refuted the hypothesis
  - The total number of articles by LOE were summated and the percent in agreement with the hypothesis was reported
  - The total body of evidence was assigned a grade of recommendation according to the technique described by Wright et al.
Research Questions for each of the Potential Detriments to Healing:

- **Glycemic Control** - Is poor glycemic control a detriment to the healing of a DFU?
- **Nutrition** - Is poor nutrition/abnormal biomarkers a detriment to the healing of a DFU?
- **Vascular Supply** - Does revascularization of the foot improve healing of DFU where ischemia is present?
- **Smoking** – Does smoking act as a detriment to the healing of a DFU?
- **Offloading** - Does offloading with a total-contact cast improve the healing of a DFU?
- **Deformity** - Does deformity correction (specifically a tendo-achilles lengthening for a tight tendon-achilles) improve DFU healing?
- **Infection** - Is a deep or superficial infection a detriment to the healing of a DFU?

*Note our hypothesis for each research question was that the detriment to healing would have a negative impact or that correcting the detriment would have a positive impact on the outcome.*
Results – Detriments to Healing a DFU

Summary of literature review for potential detriment to healing by number of articles with an assigned level of evidence (LOE I-V) and percent in agreement with hypothesis

<table>
<thead>
<tr>
<th>Detriment</th>
<th>LOE I (% support hypothesis)</th>
<th>LOE II (% support hypothesis)</th>
<th>LOE III (% support hypothesis)</th>
<th>LOE IV (% support hypothesis)</th>
<th>LOE V (% support hypothesis)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deformity</td>
<td>1 (100%)</td>
<td>0 (N/A)</td>
<td>1 (100%)</td>
<td>4 (75%)</td>
<td>7 (100%)</td>
</tr>
<tr>
<td>Glycemic Control</td>
<td>0 (N/A)</td>
<td>0 (N/A)</td>
<td>0 (N/A)</td>
<td>12 (67%)</td>
<td>11 (90%)</td>
</tr>
<tr>
<td>Smoking</td>
<td>0 (N/A)</td>
<td>0 (N/A)</td>
<td>0 (N/A)</td>
<td>5 (60%)</td>
<td>3 (100%)</td>
</tr>
<tr>
<td>Infection</td>
<td>0 (N/A)</td>
<td>0 (N/A)</td>
<td>0 (N/A)</td>
<td>3 (100%)</td>
<td>13 (100%)</td>
</tr>
<tr>
<td>Nutrition</td>
<td>0 (N/A)</td>
<td>0 (N/A)</td>
<td>0 (N/A)</td>
<td>4 (0%)</td>
<td>3 (100%)</td>
</tr>
<tr>
<td>Offloading</td>
<td>3 (100%)</td>
<td>2 (50%)</td>
<td>4 (50%)</td>
<td>5 (80%)</td>
<td>22 (100%)</td>
</tr>
<tr>
<td>Offloading</td>
<td>0 (N/A)</td>
<td>0 (N/A)</td>
<td>2 (50%)</td>
<td>15 (93%)</td>
<td>13 (77%)</td>
</tr>
</tbody>
</table>
# Results

Summary of the Grade of Recommendation assigned to the body of evidence in the literature in support of the hypothesis that a given detriment to healing does impact healing of a DFU

<table>
<thead>
<tr>
<th>Factor</th>
<th>Grade of Recommendation</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deformity</td>
<td>B</td>
<td>Fair evidence (Level II or III studies with consistent findings) for or against intervention</td>
</tr>
<tr>
<td>Glycemic Control</td>
<td>D</td>
<td>There is insufficient or conflicting evidence not allowing a recommendation for or against intervention</td>
</tr>
<tr>
<td>Smoking</td>
<td>D</td>
<td>There is insufficient or conflicting evidence not allowing a recommendation for or against intervention</td>
</tr>
<tr>
<td>Infection</td>
<td>C</td>
<td>Poor quality evidence (Level IV or V studies with consistent findings) for or against recommending intervention</td>
</tr>
<tr>
<td>Nutrition</td>
<td>D</td>
<td>There is insufficient or conflicting evidence not allowing a recommendation for or against intervention</td>
</tr>
<tr>
<td>Offloading</td>
<td>A</td>
<td>Good evidence (Level I studies with consistent findings) for or against intervention</td>
</tr>
<tr>
<td>Offloading</td>
<td>C</td>
<td>Poor quality evidence (Level IV or V studies with consistent findings) for or against recommending intervention</td>
</tr>
</tbody>
</table>
Conclusions and Discussion

- A thorough investigation of the literature proves again the complexity of the problem.
- There is variability in our ability to conclude whether each of the detriments needs to be addressed in the clinical setting when attempting to treat a DFU.
- Furthermore this study does not even begin to consider the role of the interactions between the potential detriments to healing.
- This is however, the first study to attempt to validate the concept of “7 Detriments to healing a DFU”.
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<tbody>
<tr>
<td></td>
<td>Chen 2009</td>
<td>Dos Santos 2006</td>
<td>Beuker 2006</td>
<td>Kelly 2013</td>
<td>Edmonds 2010</td>
</tr>
</tbody>
</table>

References

- Wright (JBJS) 2005
- Wright (JBJS) 2008
- Smoking
  - Apelqvist 1992
  - Kerstein 2001
  - Ramanujam 2010
  - Korzin-Burakowska 2011
- Offloading
  - Agas 2006
  - Ali 2008
  - Armstrong 1998
  - Armstrong 1998
- Glycemic Control
  - Highlander 2013
  - Holt 2013
- Vascular Supply
  - Forsythe 2013
  - Ricco 2013
- Deformity
  - Armstrong 1999
  - Batista 2011
  - Chen 2009
  - Chilvers 2007
  - Clark 2005
  - Colen 2013
  - Greenhagen 2012
  - Hastings 2000
  - Holstein 2004
  - Kaspar 2004
  - Kim 2010
  - La Fontaine 2008
  - Laborde 2009
  - Lewis 2013
  - Lin 1996
  - Lowery 2012
  - Mueller 2003
  - Nishimoto 2004
  - Sho 2011
  - van Schie 2005
  - Wilrich 2005
- Infection
  - Armstrong 1998
  - Armstrong 2004
  - Armstrong 2008
  - Edmonds 2010
  - Edmonds 2010
  - Fisher 2010
  - Frykberg 1998
  - Frykberg 2005
  - Cavanagh 2005
  - Cavanagh 2008
  - Cavanagh 2014
  - Cavanagh 2014
  - Faglia 2010
  - Faglia 2010
  - Faglia 2010
  - Faglia 2010
  - Faglia 2010
  - Faglia 2010
- Nutrition
  - Elfert 1999
  - Posthauer 2010
  - Pscherer 2012
  - Stadelmann 1998
  - Wissing 1999
  - Friedrich 2013

**References**

- Wright (JBJS) 2005
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