THERE IS NO PROOF FOR THE ANGIOSOME CONCEPT

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Disclosures

Speaker name: Huppert, Peter

I have the following potential conflicts of interest to report:

- Consulting: - Boston Scientific
  - Abbott Vascular
  - Johnson&Johnson/Cordis
  - Merritt Medical
Concept of Angiosomes

- Taylor GI, Pan WR (1998) Taylor GI, Palmer JH (1987) „Angiosomes – threedimensional composite vascular territories that span between the skin and bone... ...supplied by named source arteries"

...studies at 16 cadaver legs; no description of any preexisting vascular occlusion
In CLI patients, direct RV of angiosome-related arteries is more effected than indirect RV of another artery.

Limitations

- Anatomical rationale
- Proof of concept
Multilevel System of Anastomoses between 3 Major Source Arteries

Attinger CE et al. 2006 Plast Reconstr Surg 117 (Suppl.) 261S-293S

- Anastomoses between distal source arteries
  - R. perforans ant. – R. mall. lat. (PTA – ATA)
  - Rr. transversi (PA - PTA)
  - DPA – A. plant. lat. (ATA - PTA)
  - R. mall med, post./ant. (PTA – DPA)
  - Rr. calcanei (AP – ATP)

- Intermetatarsal perforators (ADP – ATP)

- Cross anastomoses at DI (ADP – ATP)

- Subdermal plantar arteriolar network

- Choke-Vessel
Breakdown of Angiosome Borders

- Activation of multilevel anastomoses between major source arteries in case of occlusions
- Collateral circulation to adjacent angiosomes
- Modifications due to occlusions of distal source arteries
- Considerable overlap of major source artery related territories at digiti and heel
# Major and distal Source Arteries

<table>
<thead>
<tr>
<th>Major source arteries</th>
<th>Distal source arteries</th>
<th>Angiosomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anterior tibial artery</td>
<td>Dorsal pedal artery</td>
<td>Dorsum pedis, <strong>digiti</strong></td>
</tr>
<tr>
<td>Posterior tibial artery</td>
<td>Medial plantar artery</td>
<td>Plantar medial, <strong>digiti</strong></td>
</tr>
<tr>
<td></td>
<td>Lateral plantar artery</td>
<td>Plantar lateral, <strong>digiti</strong></td>
</tr>
<tr>
<td>Medial calcaneal branch</td>
<td></td>
<td><strong>heel</strong></td>
</tr>
<tr>
<td>Peroneal artery</td>
<td>Lateral calcaneal branch</td>
<td><strong>heel</strong></td>
</tr>
<tr>
<td></td>
<td>Anterior perforating branch</td>
<td>Lateral malleolar region</td>
</tr>
</tbody>
</table>
Impact of distal Source Arteries

- Dorsal pedal artery
- Lateral plantar artery
- Medial calcaneal branch
Angiosome-oriented RV

<table>
<thead>
<tr>
<th>Lesion location</th>
<th>Major source artery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heel</td>
<td>PA, PTA</td>
</tr>
<tr>
<td>Plantar region</td>
<td>PTA</td>
</tr>
<tr>
<td>Lateral malleolar region</td>
<td>PA</td>
</tr>
<tr>
<td>Dorsum pedis</td>
<td>ATA/DPA</td>
</tr>
<tr>
<td>Digiti</td>
<td>PTA, ATA</td>
</tr>
</tbody>
</table>

Depending on status of distal source arteries: dorsal pedal, lateral/medial plantar, calcaneal branches
Limitations of Studies demonstrating Proof of Concept

- Definition of direct / indirect RV of lesions at AS borderlines: digiti and heel
- Exclusion of large lesion involving multiple AS
- Impact of distal source artery occlusions
- Consideration of major prognostic risk factors (diabetes, ESRD, Rutherford stage 6)
- Retrospective study design
## Study Limitations

<table>
<thead>
<tr>
<th>Study design</th>
<th>RV</th>
<th>Borderline lesions</th>
<th>Risk adjust.</th>
<th>Clinical success rate DR/IR outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neville `09</td>
<td>r</td>
<td>op heel</td>
<td>no</td>
<td>91/62%  0.5 a - healing</td>
</tr>
<tr>
<td>Alexandrescu `11</td>
<td>(r)</td>
<td>ev n.r.</td>
<td>no</td>
<td>89/79%  3 a - limb salvage</td>
</tr>
<tr>
<td>Azuma `12</td>
<td>r</td>
<td>op digiti, heel</td>
<td>yes</td>
<td>98/92%  2 a - limb salvage</td>
</tr>
<tr>
<td>Iida `12</td>
<td>r</td>
<td>ev digiti 85%</td>
<td>yes</td>
<td>82/68%  18 m - limb salvage</td>
</tr>
<tr>
<td>Söderström `13</td>
<td>r</td>
<td>ev digiti, heel</td>
<td>yes</td>
<td>86/77%  74/74% 1 a - limb salvage</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>74/74%  1 a - AFS</td>
</tr>
</tbody>
</table>
Conclusions

- Chronic BTK artery occlusions cause activation of multilevel collateral pathways changing strict relations between major source arteries and dependent vascular territories.

- Atherosclerotic lesions of distal source arteries, large lesions overlapping borderlines of AS and major risk factors of healing strongly modify effects of peripheral RV.

- AS concept may guide intention to direct RV but is no dogma to ignore benefits of indirect RV.
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