Peripheral angioplasty for critical hand ischemia due to pure below-the-elbow artery disease in patients in hemodialysis

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Pathophysiology

Metacarpal & fingers vessels disease

Radial artery disease

Ulnar artery disease

AVF
Pure BTE disease CHI patients

Unselected patients

<table>
<thead>
<tr>
<th>24 patients</th>
<th>30 hands</th>
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<tbody>
<tr>
<td>DM+Dialysis</td>
<td>19 (79%)</td>
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<tr>
<td>Pain &amp; fingers gangrene or ulcer</td>
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Mean age: 59 yrs
<table>
<thead>
<tr>
<th>Vascular pattern</th>
<th>N</th>
<th>%</th>
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</thead>
<tbody>
<tr>
<td>Radial artery disease</td>
<td>28</td>
<td>93</td>
</tr>
<tr>
<td>Ulnar artery disease</td>
<td>29</td>
<td>97</td>
</tr>
<tr>
<td>Interosseous artery disease</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Ipsilateral closed AVF</td>
<td>7</td>
<td>23</td>
</tr>
<tr>
<td>Ipsilateral functioning AVF</td>
<td>2</td>
<td>7</td>
</tr>
</tbody>
</table>
Technique

1. 4F antegrade humeral approach
2. Lidocaine 100 mg intra-arterial
3. Hydrophilic 0.014” wire
4. Long, low profile balloon

Coronary and below-the-knee tips & tricks
Results

- 24 pts / 30 hands
  CHI due to BTE vessels disease

7/30 23%
Unsuccessful PTA

Unsuccessful PTA

- 5/30 uncrossable calcified CTO
- 2/30 no reflow

Not healing
Results

24 pts / 30 hands
CHI due to BTE vessels disease

7/30 23%
Unsuccessful PTA

Unsuccessful PTA

Not healing
Results

24 pts / 30 hands
CHI due to BTE vessels disease

7/30 23%
Unsuccessful PTA

23/30 (77%)
Successful PTA

5/30 (17%)
Small hand vessels disease

Unsuccessful PTA

Successful PTA +
Small vessel disease

Not healing
• Male, 60 yy
• DM
• ESRD → hemodyalisis
• Ischemic heart disease
• Left hand: gangrene

Successful PTA + Small vessel disease = not healing
- Radial artery disease
- Ulnar artery disease
- Metacarpal & fingers vessels disease
8 months later
In 5/30 patients (17%) a successful BTE vessels PTA was clinically insufficient to determine hand healing. In all these patients there was a **calcified occlusive small vessels disease** involving all metacarpal and digital vessels without a significant improvement of the distal flow.
Results

- 24 pts / 30 hands
  CHI due to BTE vessels disease

  - 7/30 23%
    Unsuccessful PTA
      - 5/30 (17%)
        Small hand vessels disease
        Not healing
  - 23/30 (77%)
    Successful PTA
      - 18/30 (60%)
        Good hand vessels run off
        Healing
      - 5/30 (17%)
        Successful PTA + Small vessel disease
Case 1

- 62 yy, male
- DM type 2
- ESRD (haemodialysis)
- Presentation: pain, 4° finger ulcer → osteomyelitis
Before

R. Ferraresi et Al
Percutaneous Transluminal Angioplasty for Treatment of Critical Hand Ischemia
*Circulation*. 2006;114:e232-e234
<table>
<thead>
<tr>
<th>Case 2</th>
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<tbody>
<tr>
<td>Successful PTA + Good run off</td>
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<tr>
<td>62 yy, male</td>
<td></td>
</tr>
<tr>
<td>DM type 2</td>
<td></td>
</tr>
<tr>
<td>ESRD (haemodialysis)</td>
<td></td>
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<tr>
<td>Presentation: continuous pain, pallor and skin lesion</td>
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</table>
Case 3

- Male, 65 yy
- 1986 Type 1 DM
- 2006 haemodialysis
- Ischemic heart disease
- Presentation: gangrene

Successful PTA + Good run off
Basal

Post DEB-PTA
3 months later
Case 4

- Male, 70 yy
- Type 2 DM
- ESRD → hemodialysis
- Ischemic heart disease
- Right hand: gangrene + infection
Results

24 pts / 30 hands
CHI due to BTE vessels disease

7/30 23%
Unsuccessful PTA

Not healing

5/30 (17%)
Small hand vessels disease

18/30 (60%)
Good hand vessels run off

23/30 (77%)
Successful PTA

Healing

Successful PTA +
Small vessel disease

Successful PTA +
Good run off
Critical hand ischemia due to below-the-elbow vessels disease is an emerging issue in diabetic patients in hemodialysis.
We must understand the physiopathology of the hand before planning a treatment strategy: PTA is successful (tissue healing) in only 60% of the cases.
Conclusion 3

- Radial, ulnar and arch arteries can be treated with conventional POBA.
- Uncrossable calcific CTO & stenosis are the main problem.
- Consider the use of DEB.
Steal syndrome must be treated with AVF reduction or closure
Small vessels disease (calciphylaxis) is the main cause of failure in these patients; in some cases fingers amputation is unavoidable. A future role for angiogenetic therapies?