Deep venous arterialization: how does it work? Latest insights

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“The miracle of the salvaged foot”
Cappella Portinari, S. Eustorgio Church
Milan, Italy
Disclosure
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Conflict of interest with this presentation:
Limflow consultant
Bypass/PTA $\rightarrow$ immediate result: no more ischemia

TADV $\rightarrow$ blood flow is jailed inside the vein “fortress”, locked by a multitude of small vein valves

Patient’s symptoms can worsen, and pain control is a fundamental part of post-procedural care
After TADV we need time…

Kum et al. in their first-in-man study, observed the rise of TcPO2 levels starting 2 to 4 weeks after treatment and reaching >40 mm Hg only 6 to 8 weeks later, demonstrating a timelapse between the acute TADV procedure and the physiological effect.

Clair et al. affirmed that management of the maturation process to achieve maximum effectiveness and minimal ischemic complications will be more frequent in TADV than in conventional open and endovascular arterial reconstruction.


If I cannot see, by angio, blood flow into the tissues I cannot believe in TADV!

After TADV we need time to escape from the fortress and get tissues…
How can we escape from the fortress and get the tissues?

1. Arterialized circuit expansion in venous network

2. Opening AVFs & recruitment of hibernated arteries

3. Self-pruning of vein outflow

4. Remodeling of the foot vascular network

Early mechanical remodeling

Late biological remodeling
We estimate each venula with a diameter of 30μm is surrounded by tissue cylinder with a radius of 268μm.

When retrograde arterial blood flow reaches 30μm venulae, oxygen diffusion front reaches 587μm at rest, which exceeds tissue cylinder radius, so sufficient oxygen is transported to resting ischemic skeletal muscle.

Sasajima T, Koyama T. Oxygen Transport to Tissue 34: Springer, NY. pp245-250; 2012

If arterial blood does not reach venulae in microcirculation, DVA is only AVF, not DVA.
Patient
Baseline

Acute result

2 months later after open TMA
Acute result 2 months later
How can we escape from the fortress and get the tissues?

1. Arterialized circuit expansion in venous network

2. Opening AVFs & recruitment of hibernated arteries

3. Self-pruning of vein outflow

4. Remodeling of the foot vascular network

Early mechanical remodeling

Late biological remodeling
patient
Baseline

2 months after TADV
AVF or VAF?
patient
2 months after TADV
1 year ago

2 months after TADV
How can we escape from the fortress and get the tissues?

1. Arterialized circuit expansion in venous network

2. Opening AVFs & recruitment of hibernated arteries

3. Self-pruning of vein outflow

4. Remodeling of the foot vascular network

Early mechanical remodeling

Late biological remodeling
Patient
How can we escape from the fortress and get the tissues?

1. Arterialized circuit expansion in venous network

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Early mechanical remodeling

Late biological remodeling
patient
<table>
<thead>
<tr>
<th></th>
<th>Early venous circuit expansion</th>
<th>Late biological remodeling</th>
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<tbody>
<tr>
<td><strong>Timing</strong></td>
<td>Fast → Days or weeks?</td>
<td>Slow → months or years?</td>
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<td><strong>Technical targets</strong></td>
<td>Small vein devalvulation?</td>
<td>Not necessary to pursue</td>
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<td>Pruning could help?</td>
<td>small vein and/or pruning:</td>
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<td>Targets: forefoot &amp; superficial</td>
<td>the vascular remodeling</td>
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<td></td>
<td>plantar vein network?</td>
<td>will grow up a new vascular</td>
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<tr>
<td></td>
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<td>distribution system</td>
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<td><strong>Wound</strong></td>
<td>No wound necessary: we could</td>
<td>Maybe a big wound is an</td>
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<tr>
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<td>use TADV in RTF 4 &amp; 5</td>
<td>essential factor to start</td>
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<td></td>
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<td>vascular remodeling</td>
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<td>(TMA)</td>
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<td><strong>Patency</strong></td>
<td>Long term patency needed!</td>
<td>A temporary patency is</td>
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<td>Occlusion means redo CLTI</td>
<td>sufficient</td>
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