Deep Venous Arterialization (DVA):
advantages of open vs endovascular procedures based on a single center experience

Richard F. Neville, MD, FACS, DFSVS
Associate Director; INOVA Schar Heart and Vascular
Chief of Vascular Surgery, Wound and Hyperbaric Medicine
Professor of Surgery, George Washington University
Professor of Medical Education, University of Virginia

Faculty Disclosures

Scientific Advisory Board – WL Gore

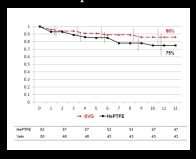
Increasing complexity of cases

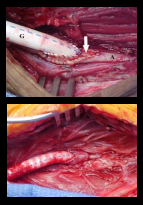
- Absence of quality saphenous vein
- "Desert foot"
- Failed (multiple) procedures
  - 40% of current bypass experience
    - 31% Endovascular
    - 9% Prior bypass
  - More distal bypass (21%)[1]
  - Altered distal target anatomy (29%)[2]

1. *Sandford, et al. Eur J Vasc Endo Surg. 2007;34:29-34.*
2. *Joels, et al. J Vasc Surg. 2008;47:162-165.*

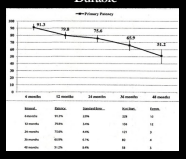
Distal Vein Patch bypass
Lack of saphenous conduit

Comparable to GSV





Durable

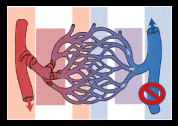


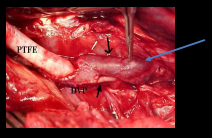
Neville RF, et al. J Vasc Surg 2012; 54(4): 1008-1014

Neville, Eur J Vasc Endovasc Surg 2012;44:177-182

Distal Vein Patch-AV Fistula
Poor outflow target artery

- Reduce outflow resistance
- Increase flow in the graft above the ***critical thrombotic threshold***





Neville RF, Dy B, Singh N, DeZee K. J Vasc Surg 2009;50:83-88.

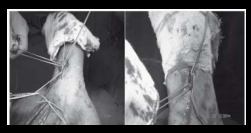
Deep Venous Arterialization (DVA)
"Desert foot"

- 1906 Alexis Carrel
  - "Flow passed through the capillaries, and the arteries filled retrograde demonstrating flow reversal"

Nobel Prize in Physiology/Medicine in 1912

Deep Venous Arterialization
In situ vein bypass to the venous arch of the foot

- 18 patients
- **In situ saphenous vein bypass to the deep venous arch of the foot**
- Limb salvage 55%



César Roberto Busato, et al. Journal Vascular Brasileiro (J. Vasc. Bras. vol.9 no.3 Porto Alegre set. 2010)

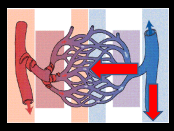
Deep Venous Arterialization
Vein bypass to the Deep veins of the foot

- 26 patients with "un-reconstructable" distal arteries
- Vein bypass to para-malleolar deep veins
- **Destruction of valve competency**
- Limb salvage 76% at 24 months

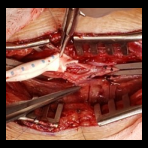
Mutirangura P, et al. Vascular 2011 Dec; 19(6):313-9.

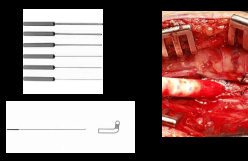
Deep Venous Arterialization (DVA)
DVP technique

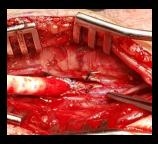
- Disrupt distal tibial vein valves
- Arterial, hydrostatic pressures force vein valve incompetence
- Distal vein recruitment (angiogenesis)
- Direct tissue nutrition by retrograde blood flow



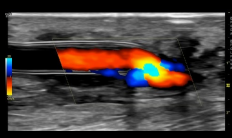
Deep Venous Arterialization
DVP Technique

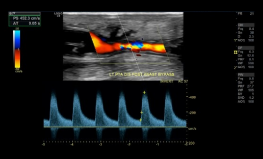




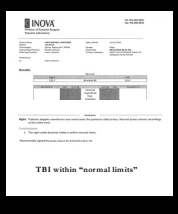


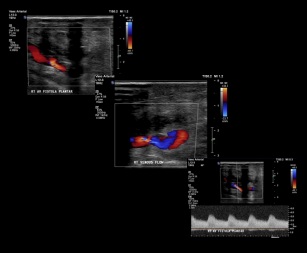
Deep Venous Arterialization with DVP
Vascular lab at 3 months





Deep Venous Arterialization with DVP
Vascular lab at 6 months





Soft tissue therapy critical

- Delayed, tension free closure
- Avoid proximal TMA

Deep Venous Arterialization with DVP

- **DVA with 19 tibial bypasses**
  - Mean follow up: 18 months (32 m longest)
- Demographics
  - 13 Male, 6 female
  - 9 Insulin Dependent Diabetes Mellitus
  - 4 ESRD on dialysis
- Symptoms of CLTI (100%)
- Failed prior intervention (79%)
  - Failed endovascular therapy 9
  - Failed prior bypass 6
- Proximal anastomosis
  - Common Femoral 11
  - Superficial Femoral 8
- Distal anastomosis
  - Posterior tibial 10
  - Anterior tibial/DP 8
  - Peroneal 1
- Post –op medications
  - 7 Dual Antiplatelet Therapy (ASA/Clopidogrel)
  - 6 Antiplatelet / DOAC
  - 2 ASA/Apixaban (Plavix resistance)

Deep Venous Arterialization with DVP

- **Outcome**
  - 13 grafts remain patent
  - 6 grafts occluded
    - 2 perioperative
    - 2 at 3 months
    - 2 at 6 months
  - 5 major amputations (BKA)
  - 2 deaths
- **Patency 68%**
- **AFS 63%**

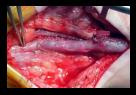
Deep Venous Arterialization: Transcatheter

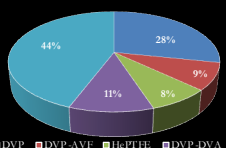
- **Six cases**
- Technique (off the shelf)
  - Retrograde approach
  - Lateral plantar vein
  - Viabahn 5mm
  - Coronary DES
- Results
  - 1 technical failure
    - Inability to access deep venous system
  - 5 technical successes
  - 2 amputations
    - Infection
    - Nonhealing calcaneal wound

ORIGINAL ARTICLE

Transcatheter Arterialization of Deep Veins in Chronic Limb-Threatening Ischemia

Current role of Surgical DVA





11% Deep Venous Arterialization

N=163 distal bypasses

Summary

DVA has a role in limb preservation

- **Surgical DVA has a role in a CLTI practice**
  - Much still to learn
  - Post op soft tissue management is critical
- **Techniques to increase bypass options**
  - Saphenous Vein first choice
  - No vein DVP
  - Poor arterial target DVP-AVF
  - "Desert foot" DVA
    - Surgical
    - Endovascular