Pedal Bypass & Deep Venous Arterialization
To Salvage The Unreconstructable Limb

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No disclosure

Aorto-bipopliteal a. bypass

Arterial bypass
Arterial reconstruction requiring appropriate
• proximal artery
• vascular conduit
• distal artery
to provide adequate circulation in distal tissue.

Pedal bypass
The most extensive arterial reconstruction for critical
limb ischemia requiring optimal status of distal pedal arteries

Poor distal outflow artery

Calcified post-tibial a.

Heavy calcification & long occlusion of distal artery
Venous arterialisation (concept)

- Use of the disease-free venous bed as an alternative conduit for perfusion of the peripheral tissue with arterial blood.

Venous systems in foot

Dorsal surface
- Venous dorsal arch
- Venous plantar arch
- Greater saphenous v.
- Medial plantar v.
- Lateral plantar v.
- Posterior tibial v.

Plantar surface
- Superficial v. system
- Deep v. system

PBDVA
Principle of surgical technique

Common femoral artery
PTFE graft
Common femoral vein
Long saphenous vein

Proximal artery ➔ composite graft ➔ distal pedal vein

PBDVA: pedal bypass & deep venous arterialization
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PBDVA
Distal anastomosis

Preoperative CTA
Postoperative CTA

PBDVA
Foot circulation

Preoperative CTA
Postoperative CTA
Ankle pressure = 60 mmHg
ABI = 0.4
Transcutaneous oxygen pressure = 16 mmHg

Technical points of PBDVA
1. Selection of pedal deep v. for arterialization
2. Preservation of superficial v. for circulatory outflow
3. Use of composite graft as vascular conduit
4. Creation of complete distal valve incompetency
5. Meticulous surgical technique

1. Selection of pedal deep vein for arterialization

Selection of pedal deep vein for arterialization
Selection of pedal deep vein for arterialization

Preservation of superficial v. for circulatory outflow

2. Preservation of superficial v. for circulatory outflow
3. Use of composite graft as vascular conduit

- Proximal vascular anastomosis
- Anastomosis of composite graft
- Harvested long saphenous vein
- Composite graft
- Blood flow through composite graft

4. Creation of complete distal valve incompetency

- Posterior tibial venotomy
- Vascular dilator
5. Meticulous surgical technique
Closure of surgical wounds

Should proximal vein at distal anastomosis be ligated?

Why did forefoot become necrosis in some patients?

Long term outcome of PBDVA

Postoperation 1 year Postoperation 5 years
VDO & Sound

Postoperation 1 year Postoperation 5 years
VDO & Sound
Transcutaneous oxygen pressure

Preoperative: O₂ pressure = 16 mmHg
Postoperative: O₂ pressure = 63 mmHg

Transcutaneous oxygen pressure measurement

- Preoperative: 15 mmHg
- Postoperative: 5 years
- Immediate postoperation: 41 mmHg

Foot level:
- <20 mmHg: Poor healing
- 20-40 mmHg: Equivocal
- >40 mmHg: Good healing

Postoperation 1 year
Postoperation 5 years

Postoperation 1 year
Postoperation 5 years
Conclusions

- PBDVA has been proved to enhance limb salvage in critical limb ischemia with unreconstructable distal artery.
- PBDVA could tremendously increase not only blood supply to the ischemic foot but also collateral circulation of the whole ischemic leg.
- This hemodynamic change could maintain healthy foot circulation and provide limb salvage in the long term outcome.
**Intraoperative angiography**

- Distal anastomosis at Rt. dorsalis pedis artery bypass (plantar arterial arch)
- Distal anastomosis at Lt. posterior tibial vein bypass (plantar venous arch)

**Surgical procedure**

**Venous system in foot**

- Dorsal venous arch
- Plantar venous arch
- Greater saphenous v.
- Medial plantar v.
- Lateral plantar v.
- Posterior tibial v.
- Plantar surface

**Vascular isolation**

- distal v.
- proximal a.
- Posterior tibial vein
- Femoral artery