

# CAIR Case of the Month

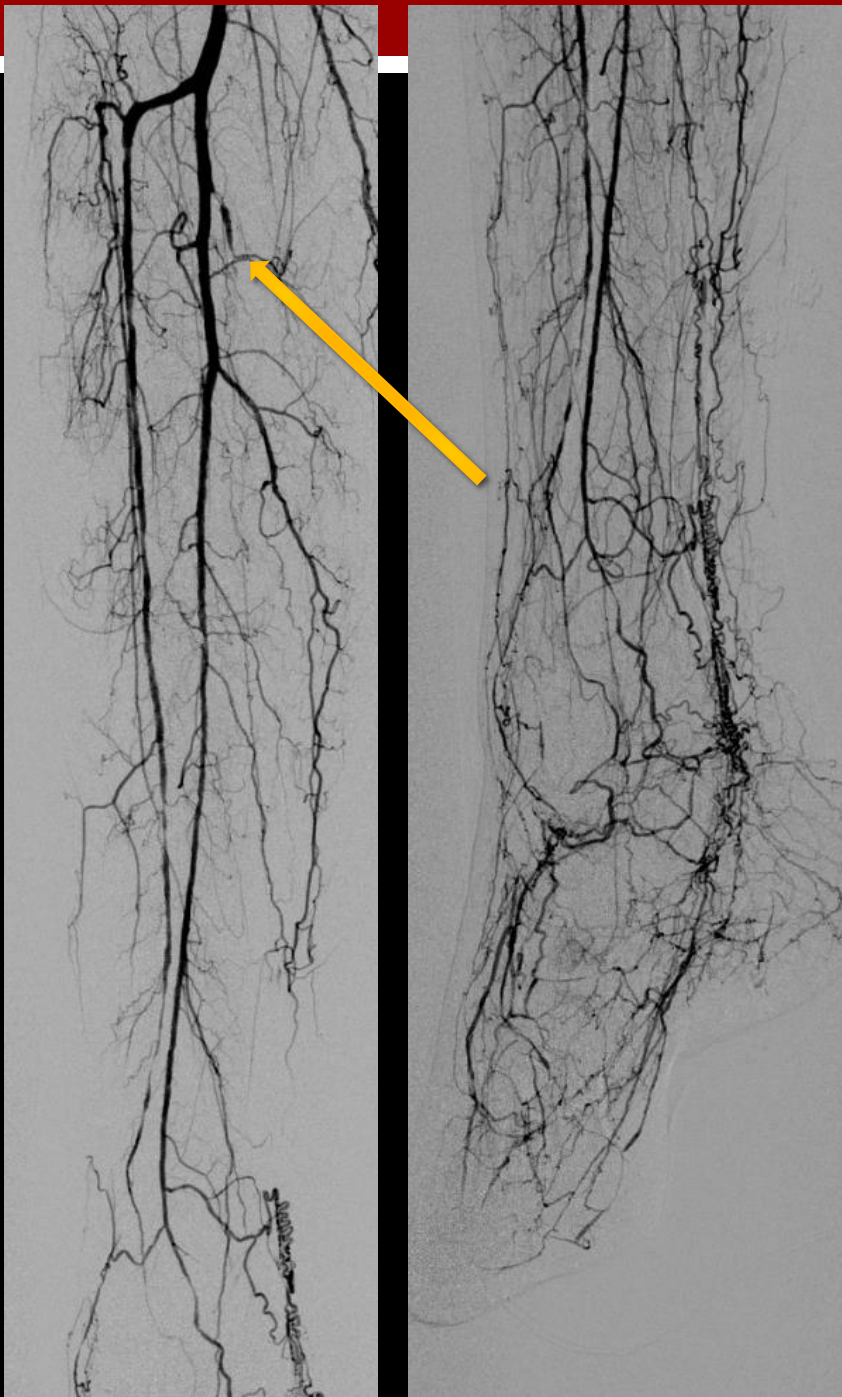
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Case courtesy of Drs. S. Bradette, M. Béland  
and C. Lalonde  
Laval University

# Clinical History

- 61 year old female
- Right critical limb ischemia (CLI)
  - Rest pain
  - Non-healing wounds
  - Wet gangrene with tissue loss
- Pertinent past medical history
  - Non-smoker
  - Long-term dialysis





- Normal AK vessels (not shown)
- Very poor vascularization BK
  - Proximal occlusion of posterior tibial artery
  - Multiple peroneal and anterior tibial arteries stenoses
  - “Desert foot”
    - Poor distal runoff
    - Occlusion of all main foot arteries
    - Collaterals



- Many previous recanalization attempts with no significant clinical result
  - Anterior tibial artery recanalization, including SAFARI technique
  - Balloon angioplasty of the peroneal artery
- No limb salvage surgical option
- What can IR offer?

Endovascular venous arterialization  
of the foot



# Procedure

- ① Antegrade catheterization of **posterior tibial artery**
  - Antegrade right common femoral artery access
  - 7 Fr sheath
  - Outback re-entry catheter positioned
- ② Retrograde catheterization of posterior tibial vein
- ③ Through-and-through access obtained by CART
- ④ Stents deployed
- ⑤ Valvulotomy of the deep venous arcade





# Procedure

- ① Antegrade catheterization of posterior tibial artery
- ② Retrograde catheterization of **posterior tibial vein**
  - 4 Fr sheath
  - 3 x 40 mm balloon inflated at the same level
    - Target for the Outback re-entry catheter
- ③ Through-and-through access obtained by CART
- ④ Stents deployed
- ⑤ Valvulotomy of the deep venous arcade





# Procedure

- ① Antegrade catheterization of posterior tibial artery
- ② Retrograde catheterization of posterior tibial vein
- ③ Through-and-through access obtained by CART
  - Controlled Antegrade and Retrograde Tracking
- ④ Stents deployed
- ⑤ Valvulotomy of the deep venous arcade

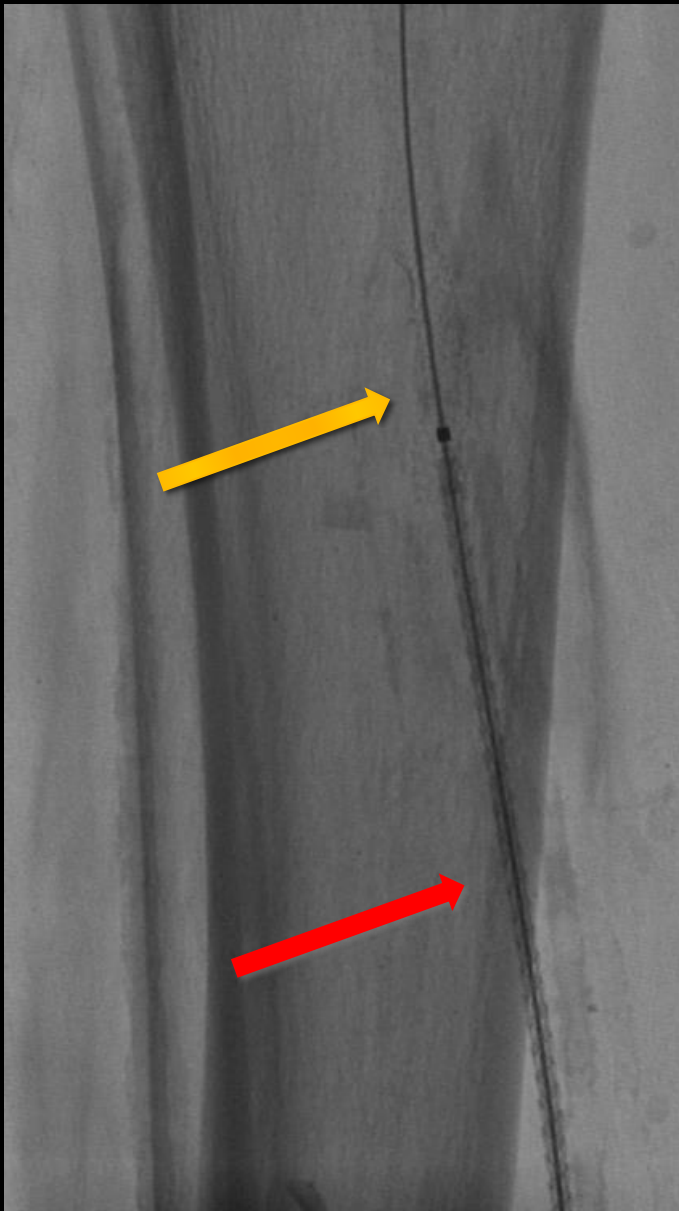




# Procedure

- ① Antegrade catheterization of posterior tibial artery
- ② Retrograde catheterization of posterior tibial vein
- ③ Through-and-through access obtained by CART
- ④ Stents deployed
  - 2.5 x 20 mm balloon-expandable covered stent
    - To create AV fistula
  - 5 x 250 mm auto-expandable covered stent
    - Down to the malleolus
    - To exclude communicating veins and to disrupt valves
- ⑤ Valvulotomy of the deep venous arcade



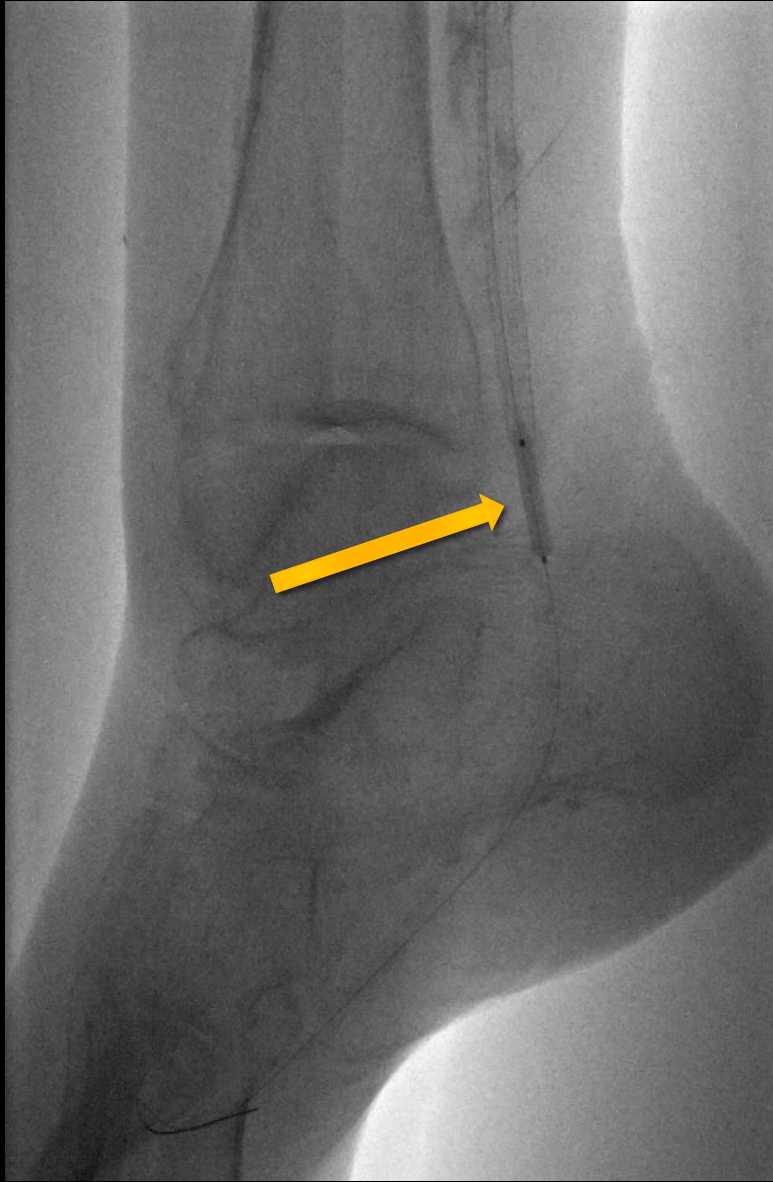




# Procedure

- ① Antegrade catheterization of posterior tibial artery
- ② Retrograde catheterization of posterior tibial vein
- ③ Through-and-through access obtained by CART
- ④ Stents deployed
- ⑤ Valvulotomy of the deep venous arcade
  - 3.5 mm slightly inflated cutting balloon advanced rapidly in the vein
  - Down to the origin of the 1<sup>st</sup> toe





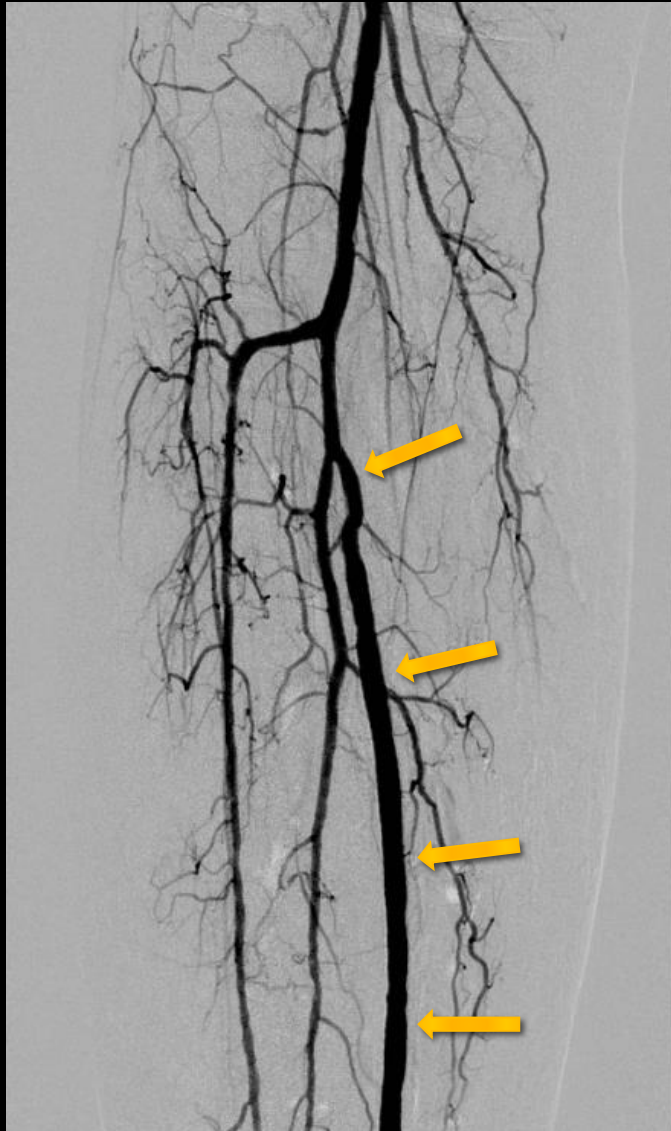
Before valvulotomy



After valvulotomy



# Final Result



# Clinical Outcome

- Put on lifelong warfarin and aspirin
- Patient developed mild leg edema
- After 2 weeks: resolution of rest pain
- After a few months
  - Wet gangrene turned to dry gangrene
  - Mummification of the necrotic toes, one of them fell off
  - Patency of the fistula after 6 months on Doppler
- Healing still in progress



# DISCUSSION

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# No-Option Critical Limb Ischemia

- Revascularization needs a target outflow vessel
  - 14-20% of CLI patients lack outflow<sup>1,2</sup>
    - “Desert” foot
  - No-option CLI (NO-CLI)
- Mortality higher than symptomatic CAD<sup>3</sup>
- Poor prognosis, often culminates in major amputation<sup>3,4</sup>
  - Up to 40%
- Amputation has high mortality and morbidity, low rate of prosthetic rehabilitation



# Surgical Venous Arterialization

- Efficacy has already been studied and proven for NO-CLI
- Meta-analysis of 56 studies (2006)<sup>5</sup>
  - 71% limb salvage at 12 months
  - 46% secondary patency at 12 months
  - Most patients in whom major amputation was avoided experienced successful wound healing and resolution of rest pain
- Recent retrospective study (2014)<sup>6</sup>
  - **Surgical venous arterialization** (21 patients)
    - 71% patency and 53% limb salvage at 12 months
  - **Conventional distal arterial bypass** (19 patients)
    - 75% patency and 47% limb salvage at 12 months



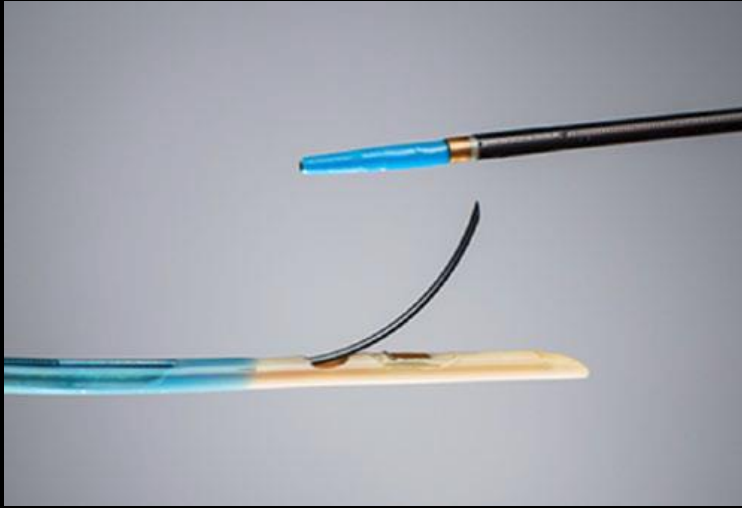
# Endovascular Venous Arterialization

- Kum *and al.* (2017)<sup>4</sup>
  - 7 patients
  - Limb salvage in 71% at 12 months
  - Complete wound healing
    - 6 months: 4 (57%)
    - 12 months: 5 (71%)
    - Median healing time: 4.6 months
- Del Giudice *and al.* (2018)<sup>7</sup>
  - 5 patients
  - Clinical improvement (resolution of rest pain and complete wound healing) in 3 (60%)
  - Median healing time: 39 weeks (9 months)

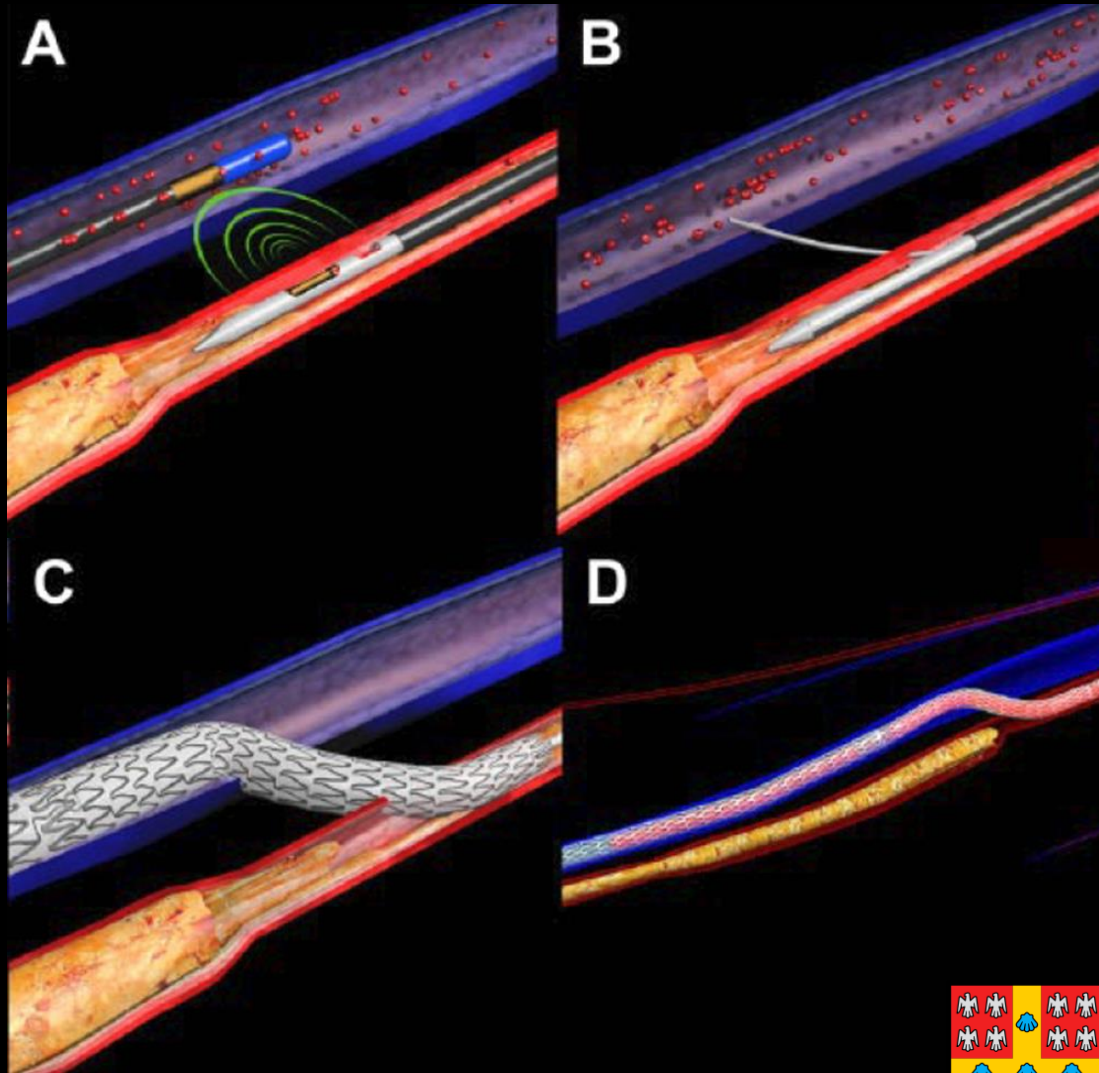
With LimFlow®  
device



# LimFlow

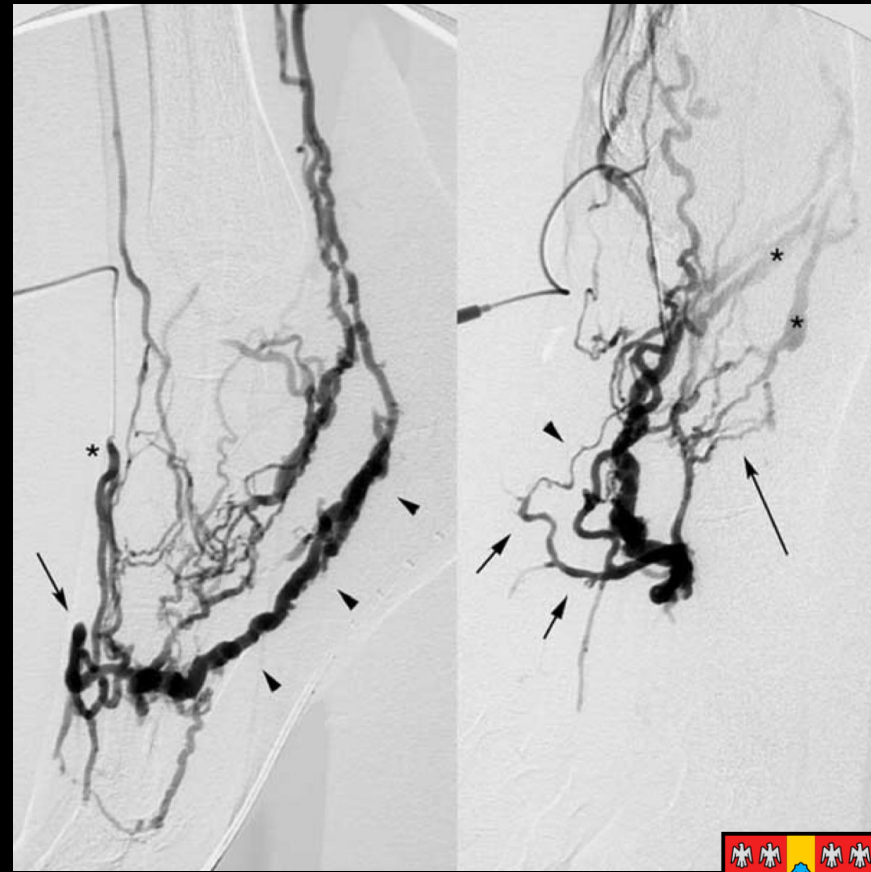


*J Endovasc Ther.* 2017 Oct;24(5):619-626. doi: 10.1177/1526602817719283. Epub 2017 Jul 12.



# Mechanism of Action<sup>9</sup>

- ① Reversal of flow through venules, which improves tissue nutrition
- ② Stimulation of angiogenesis
- ③ Recruitment of “hibernating” collaterals



# Take-Home Messages

- Surgical venous arterialization effective for NO-CLI
- Endovascular venous arterialization is a promising technique
- To our knowledge, first published case of endovascular venous arterialization not using the LimFlow device
  - Commonly available devices
    - Outback for AV fistula creation
    - Cutting balloon for valvulotomy



# References

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