

The Technique of Tibial Artery Puncture and Retrograde Recanalization: *Step-by-Step*



“the miracle of healed foot”

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The Retrograde Puncture

- This strategy consists in a direct retrograde puncture of a distal patent vessel, followed by the insertion of wires and catheters with the aim to achieve the proximal open lumen were the antegrade approach failed.
- When antegrade and retrograde devices are connected, the procedure can continue with a standard antegrade angioplasty and hemostasis of the distal puncture site.
- A retrograde puncture can be done in every segment of the below-the-groin vessel, from the SFA to the foot vessels, providing good technical and clinical results.

Key points in retrograde puncture (1)

1. **Choice of the puncture site.** Accurate angiographic evaluation using different oblique views is necessary to identify the best target vessel.
2. **Vasodilators.** Especially for the distal vessels, the use of vasodilator (nitroglycerine, verapamil) is essential in avoiding spasm of the vessel. Vasodilators can be administered intra-arterially, as close as possible to the puncture site, and subcutaneously around the needle entry point.
3. **Puncture technique.**
 - The puncture is performed with a 21 Gauge needle, under fluoroscopic guidance with contrast medium injection and at the maximum magnification. The length of the needle must be chosen according to the depth of the target vessel.
 - The operator must keep in mind the concept of parallax technique: the needle should be advanced by maintaining a perfect overlap with the target vessel.
 - Once chosen the correct projection for the puncture, a 90° angulated projection can be useful to check the distance of the needle to the target vessel.

Key points in retrograde puncture (2)

4. **Sheath.** In SFA and popliteal artery a 4F sheath is sometimes necessary to permit retrograde approach with the support of a 4 French catheter. In BTK vessels we avoid standard sheaths and prefer to use a sheathless approach or a micro sheath.
4. **Retrograde crossing strategy.** Every 0.014” and 0.018” wire can be used for retrograde crossing of the CTO. We generally prefer to start with a 0.018” wire, because of the enhanced support. Low profile, support catheters are very useful for wire support, orientation and exchange.

Key points in retrograde puncture (3)

Artery	Preferred oblique view	Preferred segment	Skin puncture site	Needle length
SFA	Controlateral, 30-45°	Distal	Medial aspect of the thigh at the level of the superior edge of the rotula	9-15 cm
Popliteal	Antero-posterior Maintain the supine position with the knee gently flexed and rotated	Medium-distal	Posterior aspect of the knee	7-9 cm
Anterior tibial	Omolateral 20-40°	Every segment	Antero-lateral aspect of the leg	4-7 cm
Posterior tibial	Lateral	Distal, retromalleolar segment, proximal plantar arteries	Medial aspect of the ankle	4-7 cm
Peroneal	Omolateral 20-40°	Every segment	Antero-lateral aspect of the leg; the needle crosses the interosseus membrane	7 cm
Dorsalis pedis	Antero-posterior	Every segment	Dorsum of the foot	4 cm
Foot arteries	Antero-posterior	<ul style="list-style-type: none"> – First metatarsal artery – Tarsal arteries – Collaterals 	Dorsum of the foot Plantar access is not practical because of skin thickness	4 cm

Retrograde approach: Milan experience 2010-2013



2063 PTA

- Rut 4-5-6
- 85% DM
- 19% ESRD-HD
- Mean age 71 ± 14.3 yy
- Only below-the-groin vessel considered

3351 successfully treated lesions

1943 (58%) stenosis
mean length
 $11,6 \pm 10.9$ cm
Standard endoluminal approach

1408 (42%) CTOs
mean length
 23.2 ± 11.7 cm

Retrograde approach in 1402 CTOs

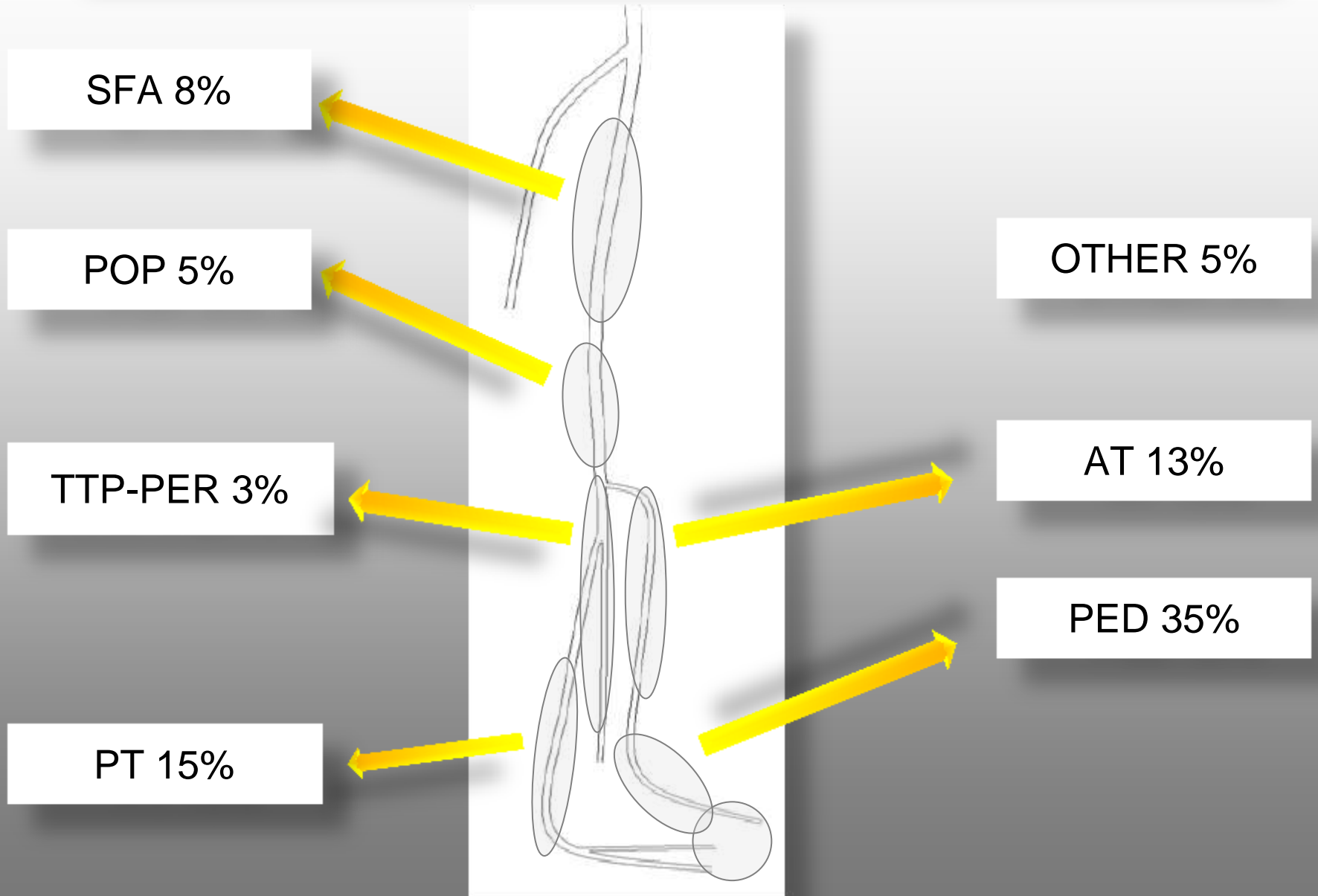
Milan experience 2010-2013



- Retrograde puncture
- Transcollateral
 1. Pedal-plantar loop technique
 2. Peroneal artery branches PTA

Successful
RETRO 147
(10%)

Retrograde approach: Milan experience 2010-2013



CASE RETRO 1

*Failure of PTA antegrade
approach*

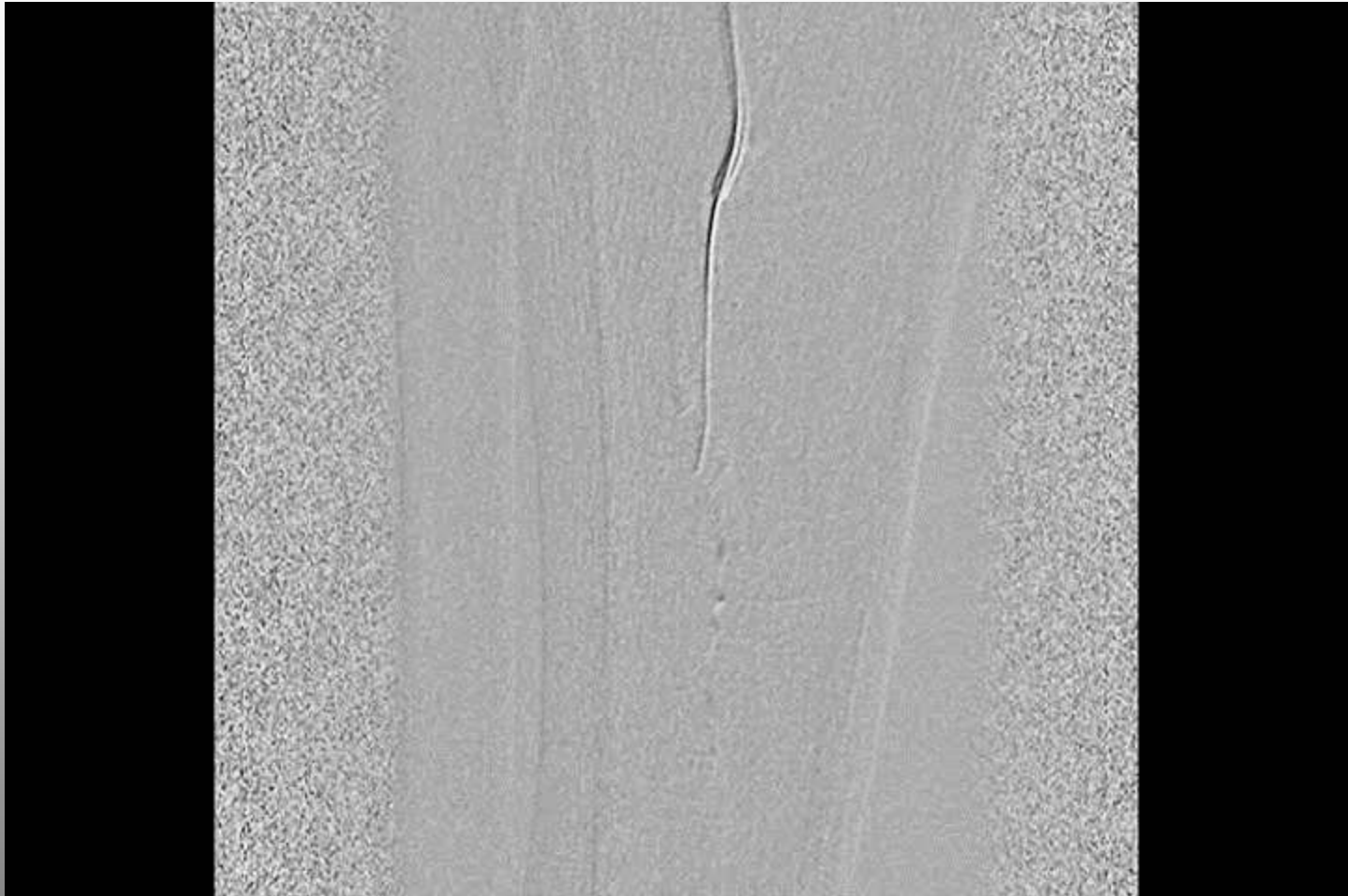
Baseline angio





- Complete occlusion of BTK vessels
- Good distal PTA

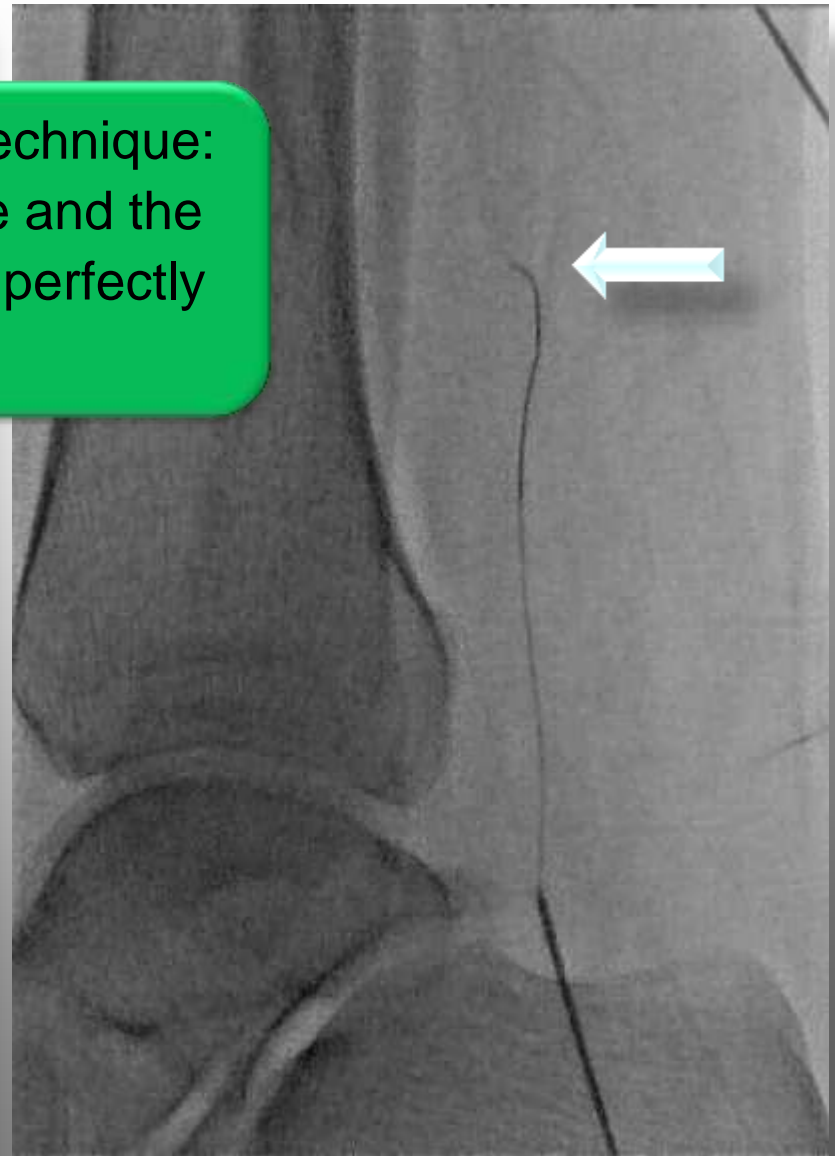
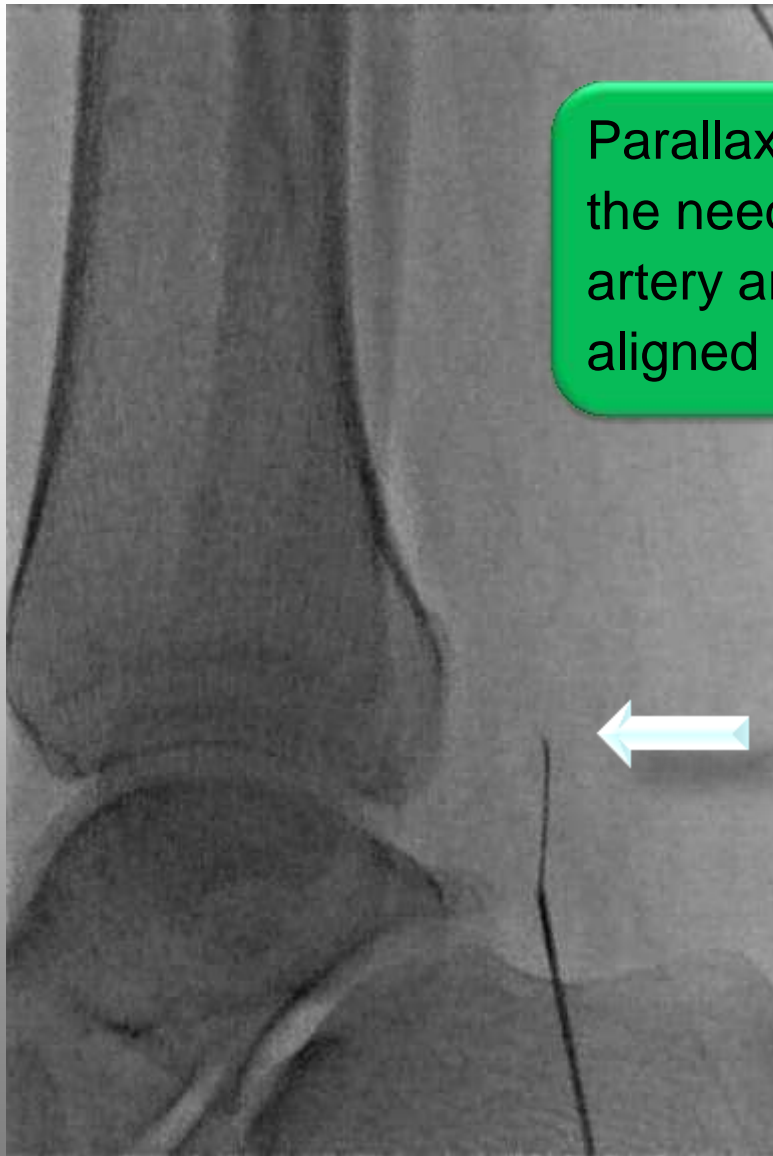
Antegrade approach



Retrograde puncture



Parallax technique:
the needle and the
artery are perfectly
aligned



How to catch the retrograde wire: 1° method



How to catch the retrograde wire: 2° method



Spasm of the medial plantar artery at the puncture site



CASE RETRO 2

*Failure of antegrade
approach due to unfavorable
ATA take off*

Baseline angio



Baseline angio



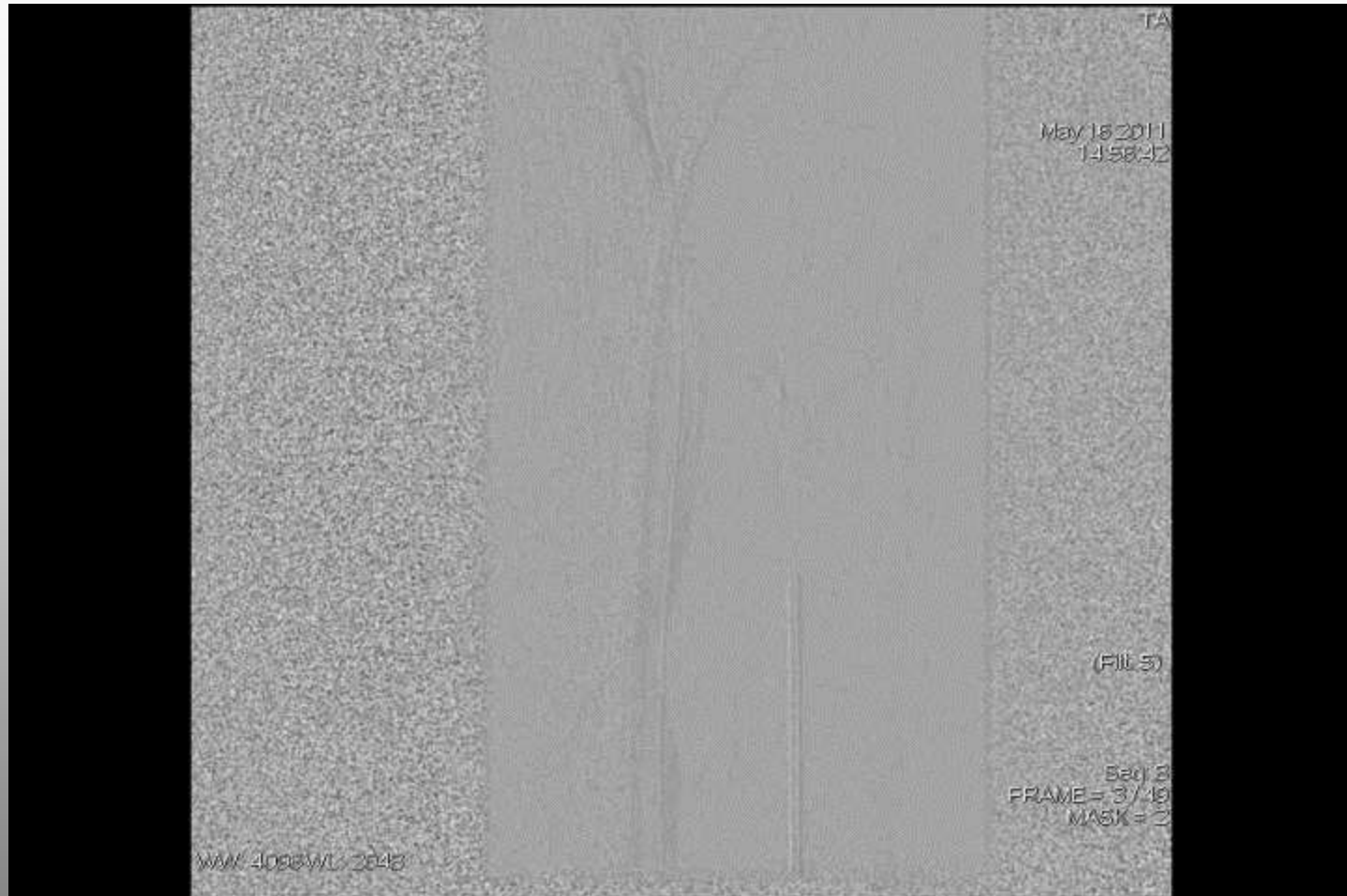
Failure to enter the ATA ostium



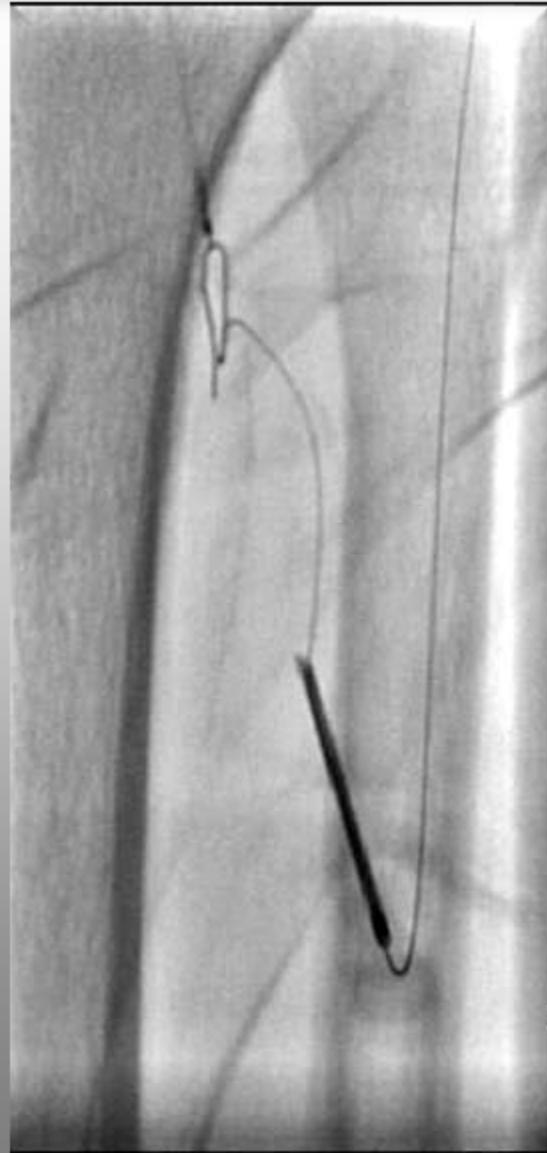
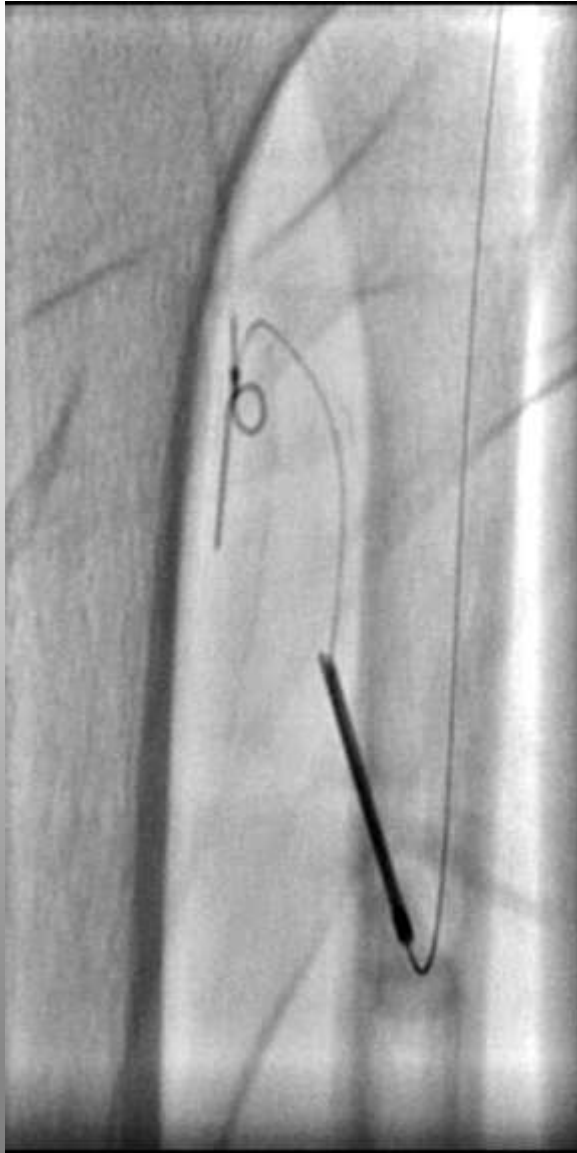
Failure to enter the ATA ostium



Retrograde ATA puncture



Retrograde ATA puncture



Snare kit capture of the retrograde wire

Kissing balloons



Baseline angio



Final result



CASE RETRO 3

*Failure to find the ostium of
PTA*

Baseline angio



Impossible to identify the ostium of PTA



Retrograde puncture of PTA



Shift to antegrade approach



Shift to antegrade approach



Kissing balloon on TPT bifurcation



Final result



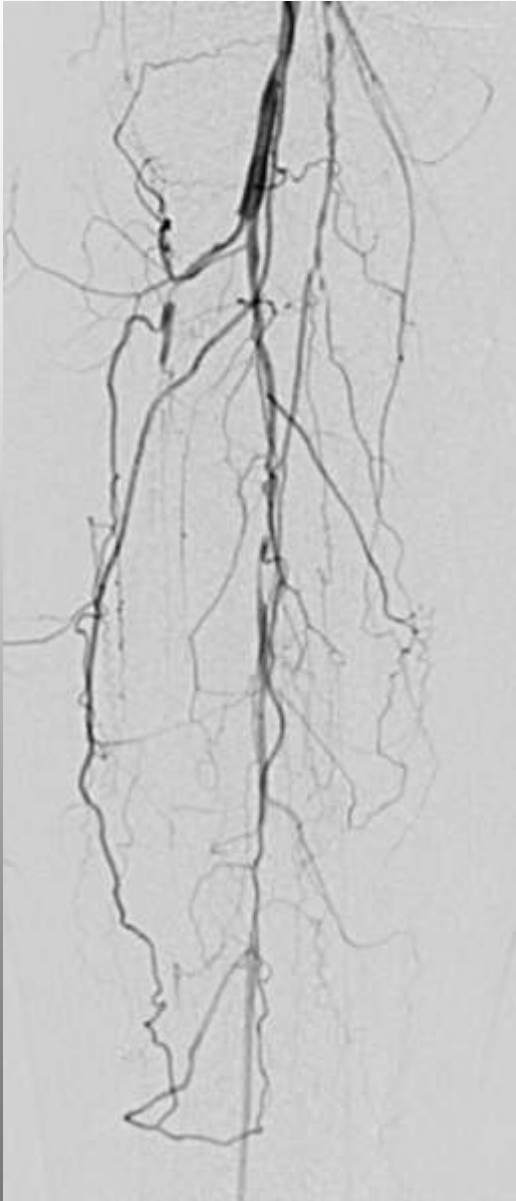
CASE RETRO 4

*Diffuse calcific disease of dorsalis
pedis*

Baseline angio



Baseline angio

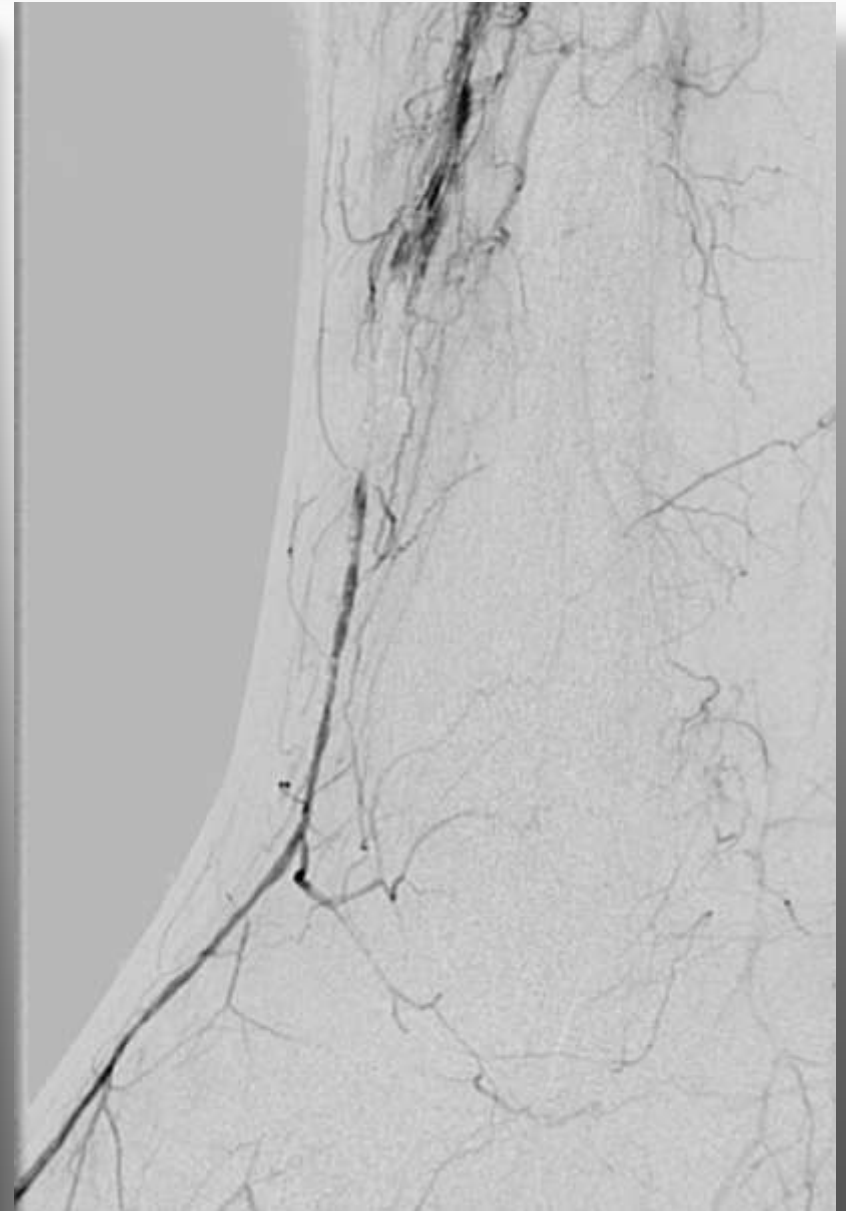
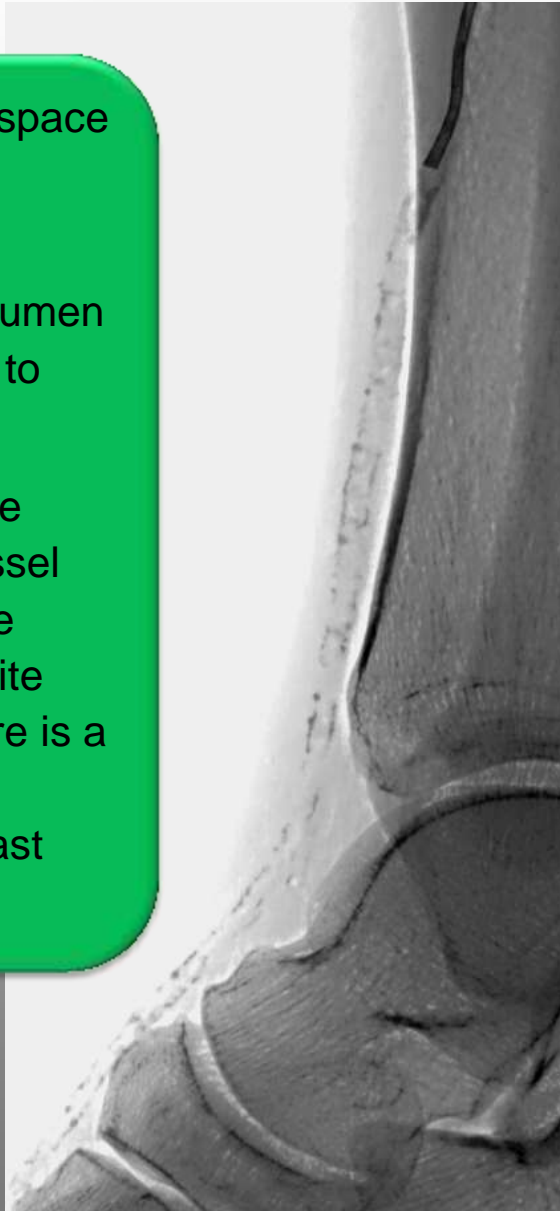


Failure of ATA approach



Failure of ATA approach

- The subintimal space is outside the calcifications
- The true distal lumen is very thin due to diffuse disease
- Re-entry into the distal target vessel by an antegrade approach is quite impossible: there is a high risk of damaging the last foot vessel!



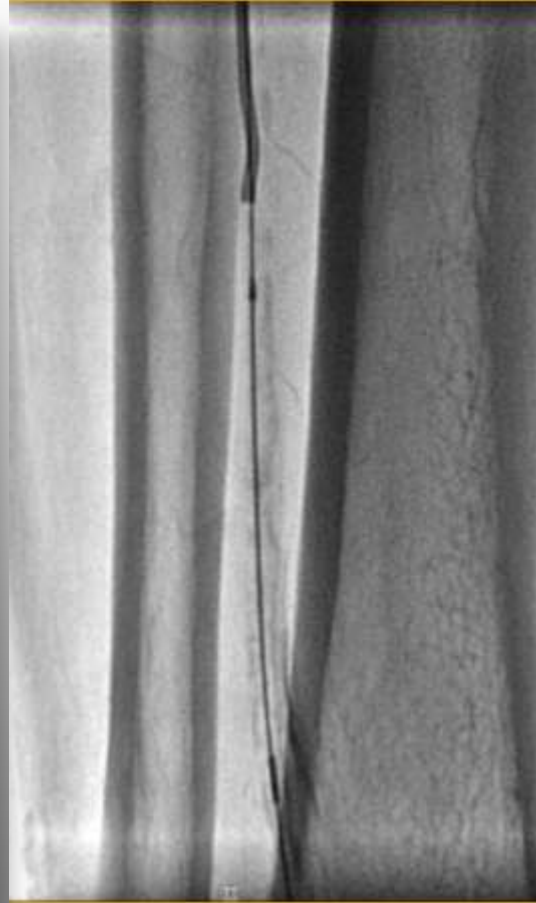
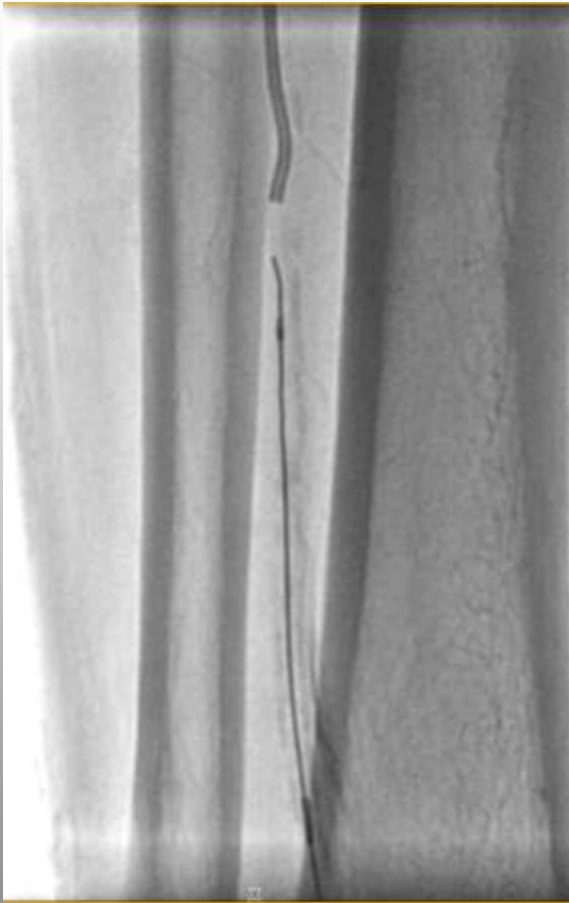
Retrograde puncture of ATA



Retrograde puncture of ATA



Retrograde advancement of a support catheter



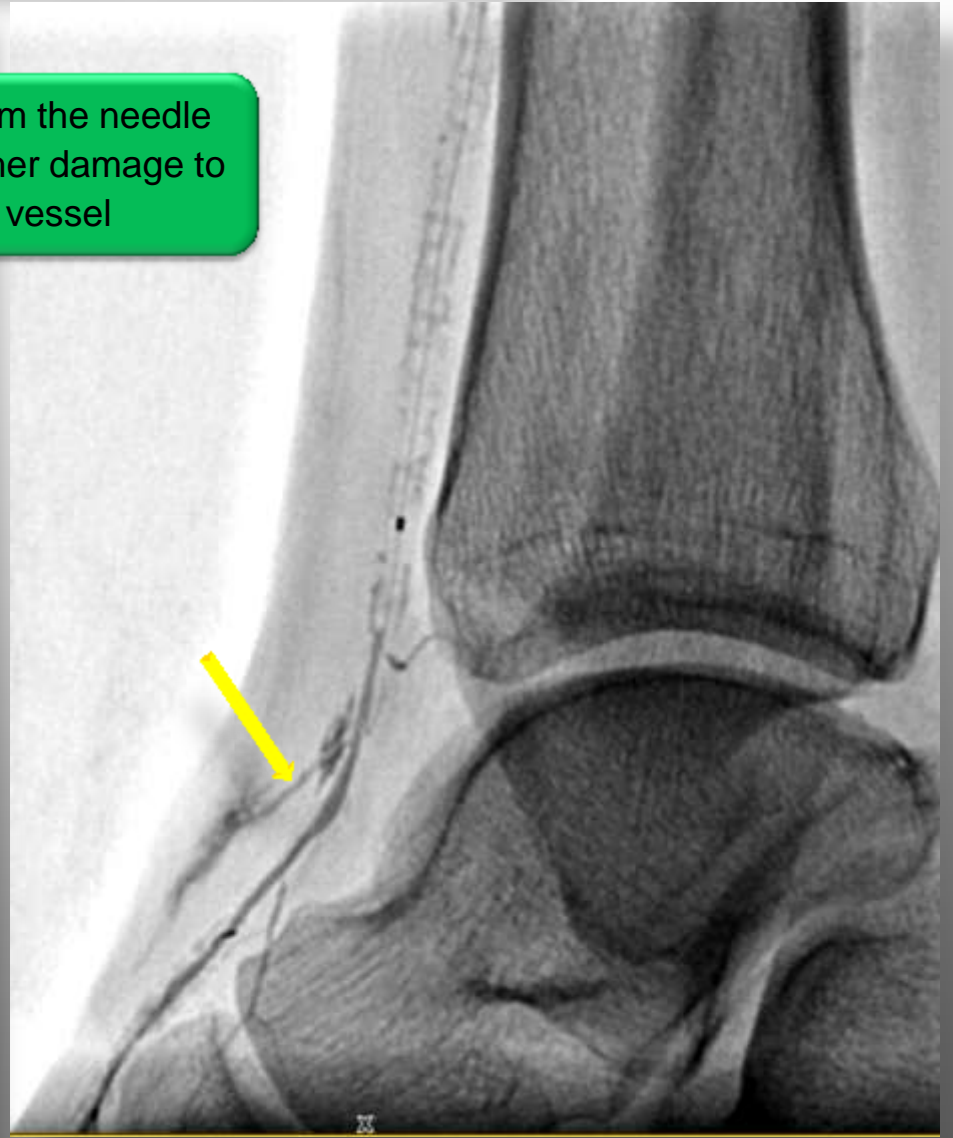
A support catheter (65 cm long, 2.6 Fr, 0.018", angulated tip) is easily advanced on the 0.018" retrograde wire and is able to enter into the antegrade Berenstein catheter. The 0.018" wire is exchanged with a 0.014" antegrade wire.

Shift to antegrade approach and sealing

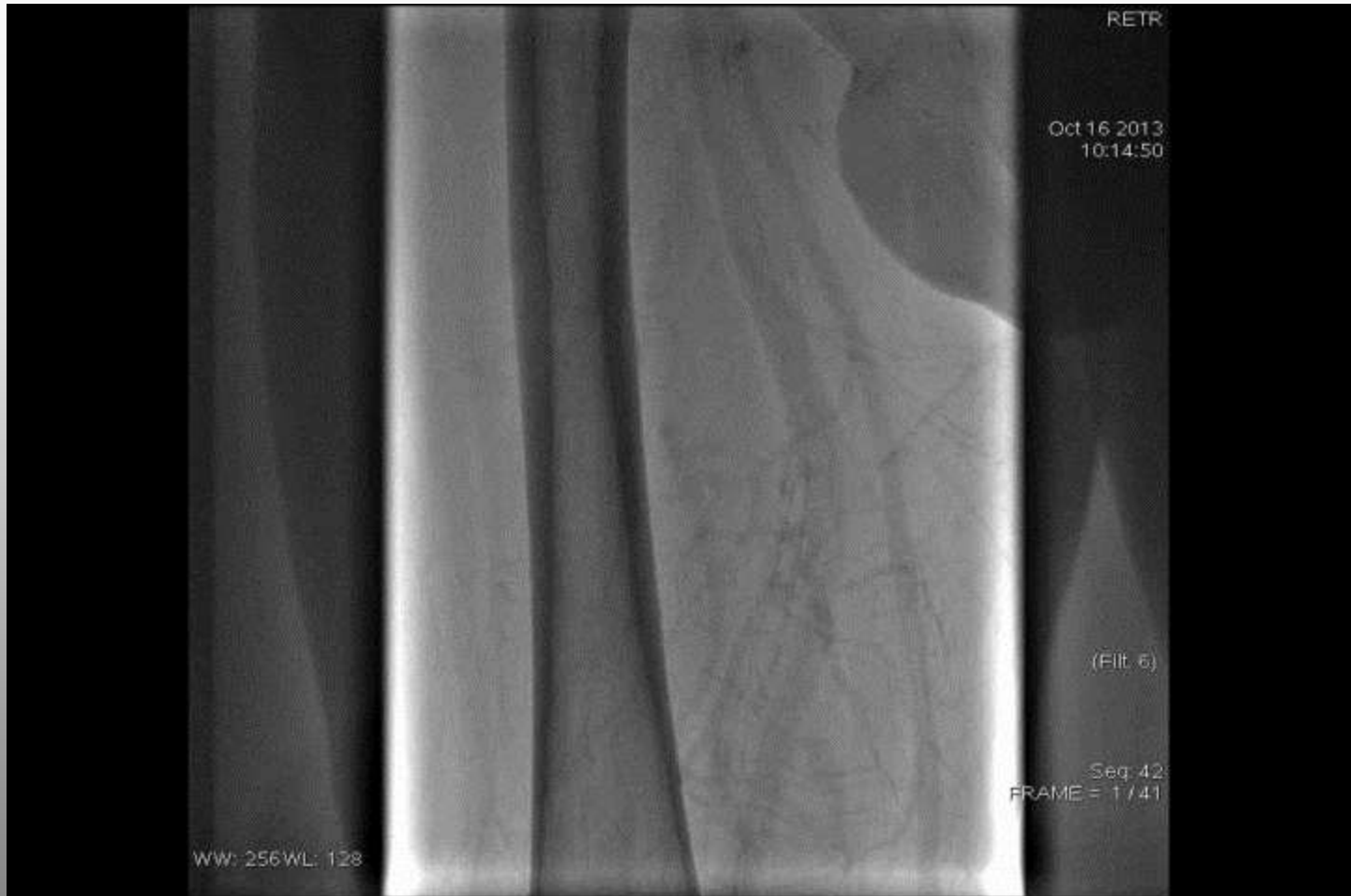


Shift to antegrade approach and sealing

Thin leaking from the needle hole: no any other damage to the distal target vessel



Final result



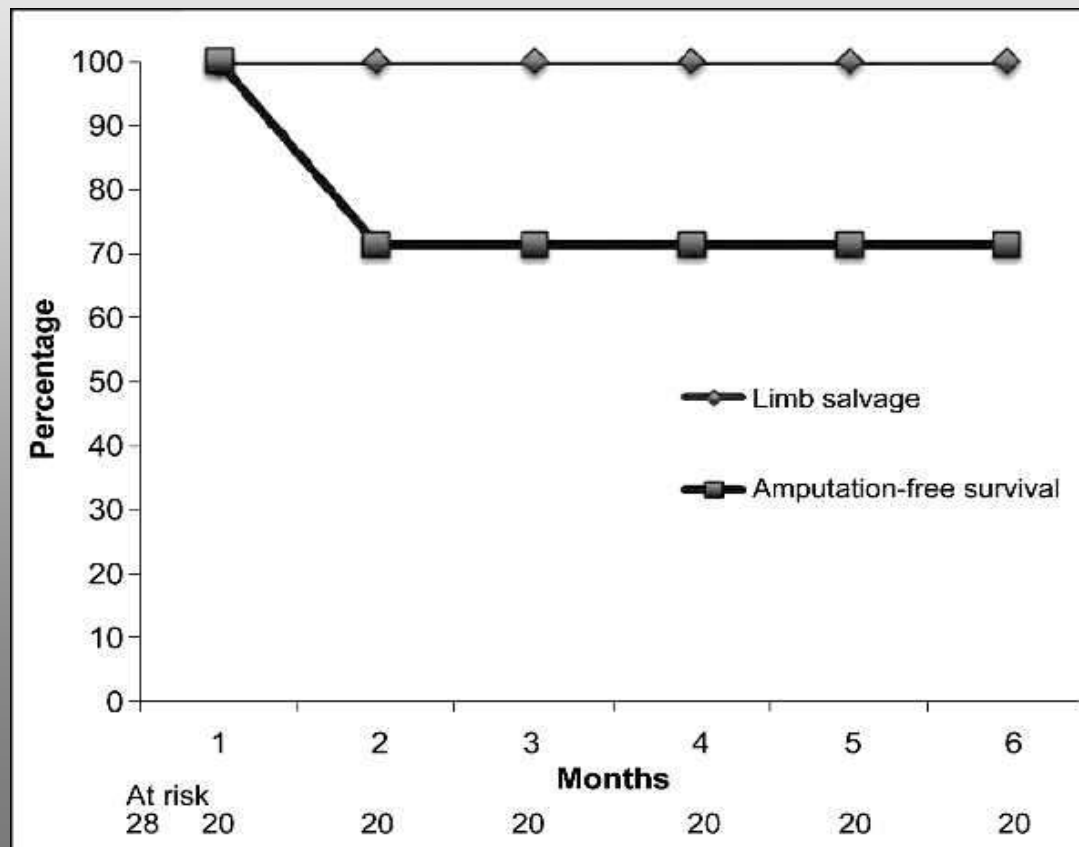
Final result



Extreme BTK Interventions

Technical Success

- *Transmetatarsal* = 88%
- *Transplantar Arch* = 67%



Retrograde approach: essential bibliography

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Thank You!