Subintimal approach

Roberto Ferraresi
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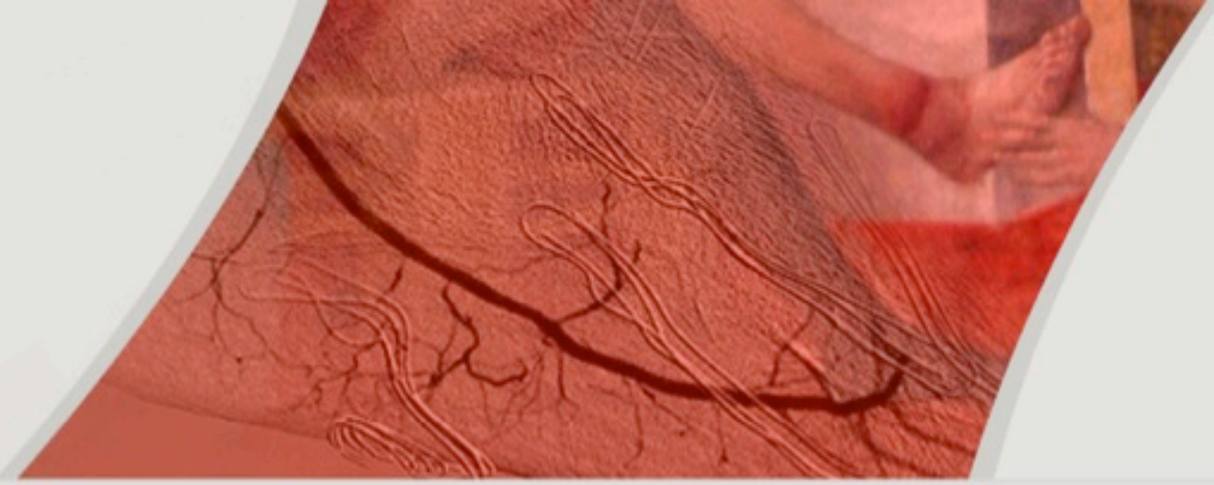
Subintimal approach



General principles

How to get the subintimal space

- Case 1
- Case 2
- Case 3

Subintimal space dissection

- Case 4

Bifurcation treatment

- Case 5

Looking for a “good distal target vessel”

- Case 6
- Case 7
- Case 8
- Case 9

Re-entry into the true distal lumen

- Case 10
- Case 11

Subintimal approach

1. **General principles**
2. **How to get the subintimal space**
3. **Subintimal space dissection**
4. **Bifurcation treatment**
5. **Looking for a “good distal target vessel”**
6. **Re-entry into the true distal lumen**

Subintimal approach

Subintimal Angioplasty

Indications:

- Predominantly Atheromatous disease
- Not much Ca++
- Long occlusions
- Good distal target vessels (SIA = Bypass)

Courtesy Dr. Amman Bolia

Subintimal approach

Subintimal Angioplasty

Materials

- 0.035 / 1.5mmJ hydrophilic wire
- 5F
- 3mm / 2cm long balloon
- Short balloon inflation
- vasodilator (Tolazoline)

Courtesy Dr. Amman Bolia

"Modified" Bolia technique

Materials & Technique

- 0.035" & 0.014" nitinol, hydrophilic wire; 1.5mm "U" shaped tip
- 4 Fr introducer sheath
- Berenstein 4 Fr, hydrophilic, diagnostic catheter
- 0.014", low-profile, long balloons
- Nitroglycerine

Subintimal approach

Subintimal Angioplasty (Tibial)

THE FINER POINTS

- Keep the loop short to avoid perforation
- 0.035 wire/ 5F system for strength
- Wire may be in Half-Stiff or Stiff format
- New 1.5mm J wire very effective

Courtesy Dr. Amman Bolia

Follow Amman, the master…

BTK vessels

Eur J Vasc Endovasc Surg **9**, 341–345 (1995)

Infrapopliteal Percutaneous Transluminal Angioplasty: A Safe and Successful Procedure

K. Varty[1], A. Bolia[2], A. R. Naylor[1], P. R. F. Bell[1] and N. J. M. London[1]

Eur J Vasc Endovasc Surg **14**, 212–216 (1997)

Subintimal Angioplasty of Infrapopliteal Occlusions in Critically Ischaemic Limbs

S. Nydahl[1], T. Hartshorne[1], P. R. F. Bell[1], A. Bolia[2] and N. J. M. London*[1]

Eur J Vasc Endovasc Surg **20**, 441–446 (2000)

Subintimal Angioplasty of Tibial Vessel Occlusions in the Treatment of Critical Limb Ischaemia: Mid-term Results

H. Vraux*[1], F. Hammer[2], R. Verhelst[1], P. Goffette[2] and B. Vandeleene[3]

J ENDOVASC THER
2002;9:411–416

◆ CLINICAL INVESTIGATION ◆

Subintimal Angioplasty of Isolated Infragenicular Vessels in Lower Limb Ischemia: Long-term Results

Hemant Ingle, MS, FRCS; Ahktar Nasim, MD, FRCS; Amman Bolia, FRCR; Guy Fishwick, FRCR*; Ross Naylor, MD, FRCS; Peter R.F. Bell, MD, FRCS; and Matthew M. Thompson, MD, FRCS

Foot vessels

J ENDOVASC THER
2009;16:604–612

◆ CLINICAL INVESTIGATION ◆

Subintimal Angioplasty for Below-the-Ankle Arterial Occlusions in Diabetic Patients With Chronic Critical Limb Ischemia

Yue-Qi Zhu, MD, PhD[1]; Jun-Gong Zhao, MD, PhD[1]; Fang Liu, MD[2]; Jian-Bo Wang, MD, PhD[1]; Ying-Sheng Cheng, MD, PhD[3]; Ming-Hua Li, MD, PhD[1]; Jue Wang, MD[1]; and Jie Li, MD[1]

European Journal of Radiology 28 (1998) 199–204

Percutaneous intentional extraluminal (subintimal) recanalization of crural arteries

A. Bolia *

Eur J Vasc Endovasc Surg 32, 663–667 (2006)

Subintimal Angioplasty of Tibial Vessel Occlusions in Critical Limb Ischaemia: A Good Opportunity?

H. Vraux* and N. Bertoncello

J ENDOVASC THER
2009;16:617–618

◆ COMMENTARY ◆

Below-the-Ankle Subintimal Angioplasty: How Far Can We Push This Application for Lower Limb Preservation in Diabetic Patients?

Vlad-Adrian Alexandrescu, MD

BTK vessels

Subi-PTA in BTK-CLI is safe, effective, and offers a low-risk alternative to distal reconstructive surgery. Subi-PTA can be extended to foot arteries

Eur J Vasc Endovasc Surg 9, 341–345 (1995)

Infrapopliteal Percutaneous Transluminal Angioplasty: A Safe and Successful Procedure

K. Varty[1], A. Bolia[2], A. R. Naylor[1], P. R. F. Bell[1] and N. J. M. London[1]

Eur J Vasc Endovasc Surg 14, 212–216 (1997)

Subintimal Angioplasty of Infrapopliteal Occlusions in Critically Ischaemic Limbs

J ENDOVASC THER
2002;9:411–416

◆ CLINICAL IN

Subintim
Vessels i

Hemant Ingle
Guy Fishwick
Matthew M.

J ENDOVASC THER
2009;16:604–612

w-the-Ankle Arterial
With Chronic Critical

Fang Liu, MD[2]; Jian-Bo Wang, MD, PhD[1]; Ying-Sheng Cheng, MD, PhD[3]; Ming-Hua Li, MD, PhD[1]; Jue Wang, MD[1]; and Jie Li, MD[1]

Percutaneous intentional extraluminal (subintimal) recanalization of crural arteries

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2009;16:617–618

◆ COMMENTARY

Below-the-Ankle Subintimal Angioplasty: How Far Can We Push This Application for Lower Limb Preservation in Diabetic Patients?

Vlad-Adrian Alexandrescu, MD

Subintimal approach

1. General principles
2. How to get the subintimal space
3. Subintimal space dissection
4. Bifurcation treatment
5. Looking for a “good distal target vessel”
6. Re-entry into the true distal lumen

good vessel stump

short vessel stump

Subintimal approach: enter the subintimal space: good vessel stump

When the selected artery presents a good stump, the access to the subintimal space can be done by pushing and rotating the Berenstein catheter and/or advancing the looped wire.

ELSEVIER

European Journal of Radiology 28 (1998) 192–198

EJR

Percutaneous intentional extraluminal (subintimal) recanalization: how to do it yourself

Jim A. Reekers [a,*], Amman Bolia [b]

Subintimal approach: enter the subintimal space: good vessel stump

SUB-CASE 1

PATIENT DATA

- 69-year-old male
- Type 2 DM
- HBP
- Forefoot lesions

Basal ANGIO

SUB-CASE 1

DIAGNOSIS

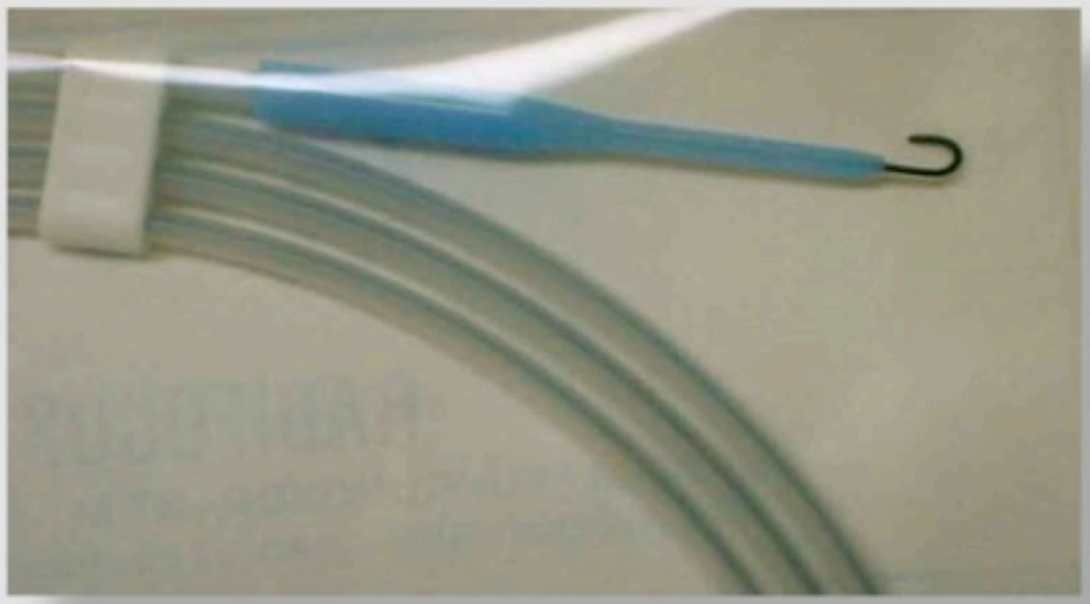
- Good FEM-POP patency
- ATA & PTA CTOs
- Disease of proximal PER
- Good distal target vessel: dorsalis pedis

Basal ANGIO

SUB-CASE 1

Materials & Technique:

- Ber 4 Fr, hydrophilic, diagnostic catheter
- 0.035” nitinol, hydrophilic wire; 1.5 mm “U” shaped tip



Subintimal approach

SUB-CASE 1

Final result

SUB-CASE 1

SUB-CASE 1

Subintimal approach

1. General principles
2. How to get the subintimal space
3. Subintimal space dissection
4. Bifurcation treatment
5. Looking for a “good distal target vessel”
6. Re-entry into the true distal lumen

good vessel stump

short vessel stump

Subintimal approach: enter the subintimal space: short stump

When the selected artery presents a good stump, the access to the subintimal space can be done by pushing and rotating the Berenstein catheter and/or advancing the looped wire.

This maneuver is not feasible in cases where the stump is very short or the ostium of the artery completely hidden. In these situations, roughly pushing of the catheter or loop could damage the main artery. We prefer to cross the ostium of the occluded artery using a more delicate approach with CTO-dedicated wires and parallel-wire technique, shifting to the looped-wire technique only after definitive demonstration of the correct subintimal position of the wire.

Subintimal approach: enter the subintimal space: short stump

SUB-CASE 2

PATIENT DATA

- 75-year-old male
- Type 2 DM
- HBP
- Toe gangrene, TMT amputation

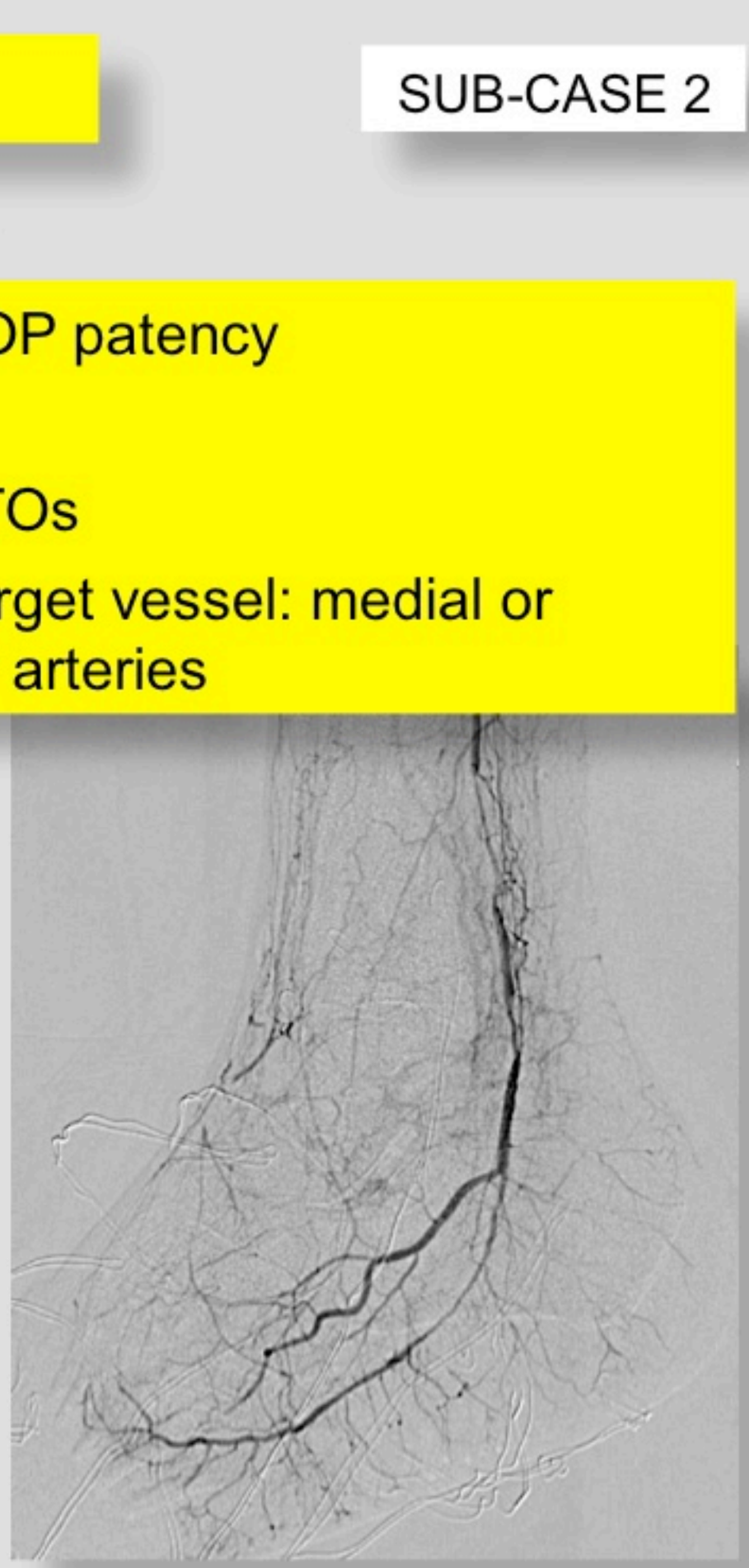
Basal ANGIO

SUB-CASE 2

Basal ANGIO

DIAGNOSIS

- Good FEM-POP patency
- TPT stenosis
- ATA & PTA CTOs
- Good distal target vessel: medial or lateral plantar arteries



Basal ANGIO

SUB-CASE 2

Looking for the subintimal space

SUB-CASE 2

Materials & Technique

- Berenstein 4 Fr, hydrophilic, diagnostic catheter
- 0.014” CTOs dedicated wire, 12 g tip load; parallel wire technique

SUB-CASE 2

RAO 30°

AP

LAO 30°

Materials & Technique

Looking for the ostium of PTA: different oblique views

SUB-CASE 2

Materials & Technique

- Berenstein 4 Fr, hydrophilic, diagnostic catheter
- 0.014” CTOs-dedicated wire, 12 g tip load; parallel wire technique

Opening the subintimal space

SUB-CASE 2

Materials & Technique

- 1.5x20 mm OTW balloon, 0.014” wire compatible, 1 marker.
- Injection into the subintimal space through the balloon. Dilatation of the ostium of the subintimal space

SUB-CASE 2

Materials & Technique

After dilatation of the ostium of the subintimal space the Berenstein catheter is able to cross it

SUB-CASE 2

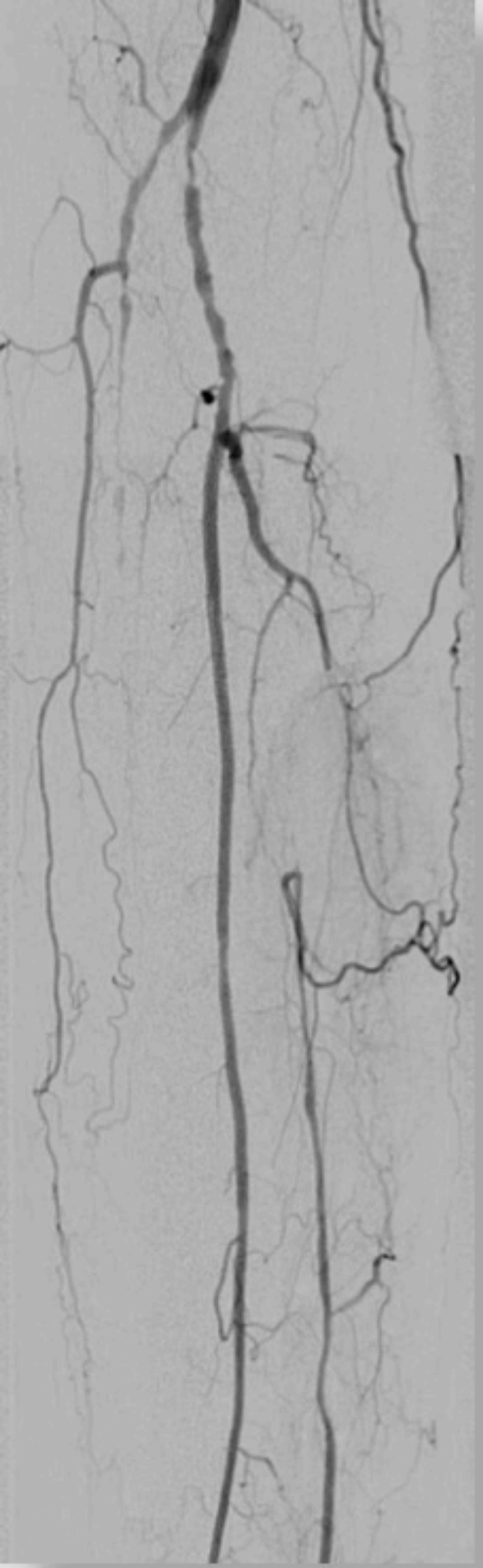
Materials & Technique

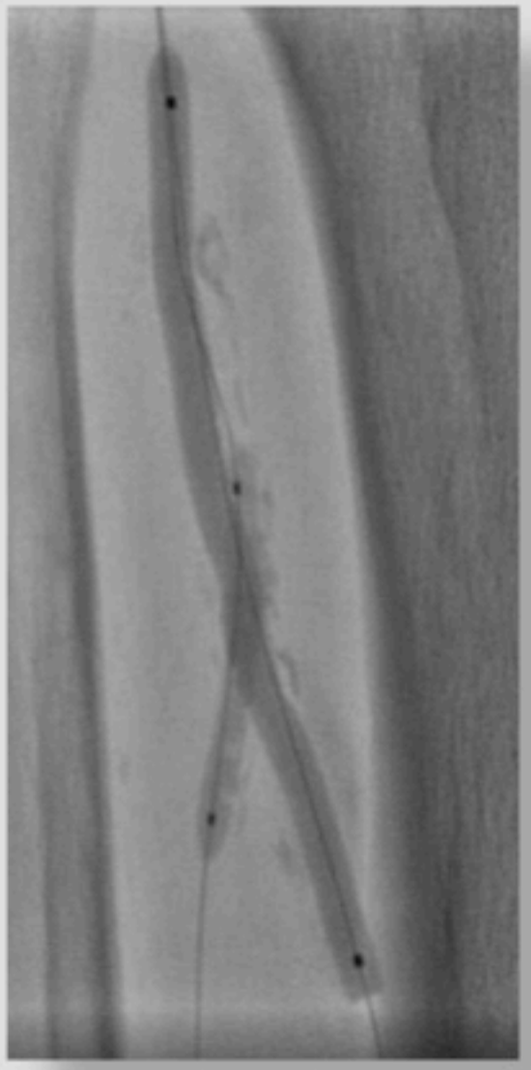
Shift to standard subintimal approach using a 0.035” nitinol hydrophilic wire

SUB-CASE 2

Materials & Technique

True lumen found in the mid-PTA





SUB-CASE 2

Materials & Technique

TPT bifurcation: balloon dilatation and kissing balloon technique:

- Low profile, 0.014” balloon
- TPT-PTA 3.5x60 mm, 12 atm
- TPT-PER 2.5x20 mm, 10 atm

Eur J Vasc Endovasc Surg (2008) 36, 197–202

ELSEVIER

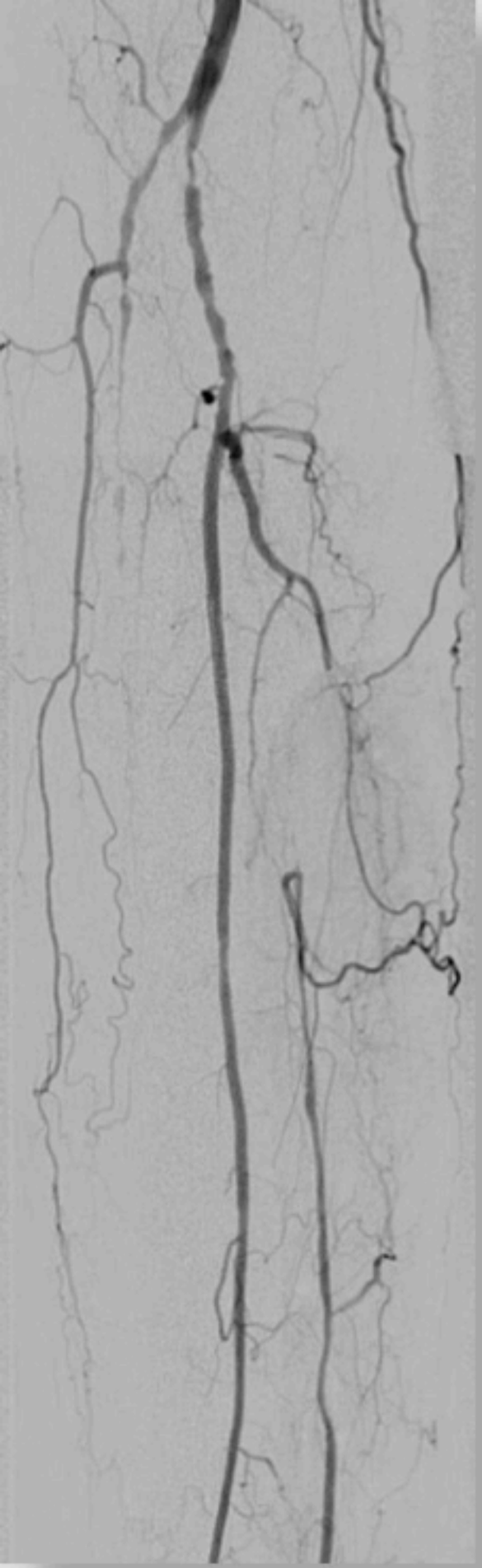
SHORT REPORT

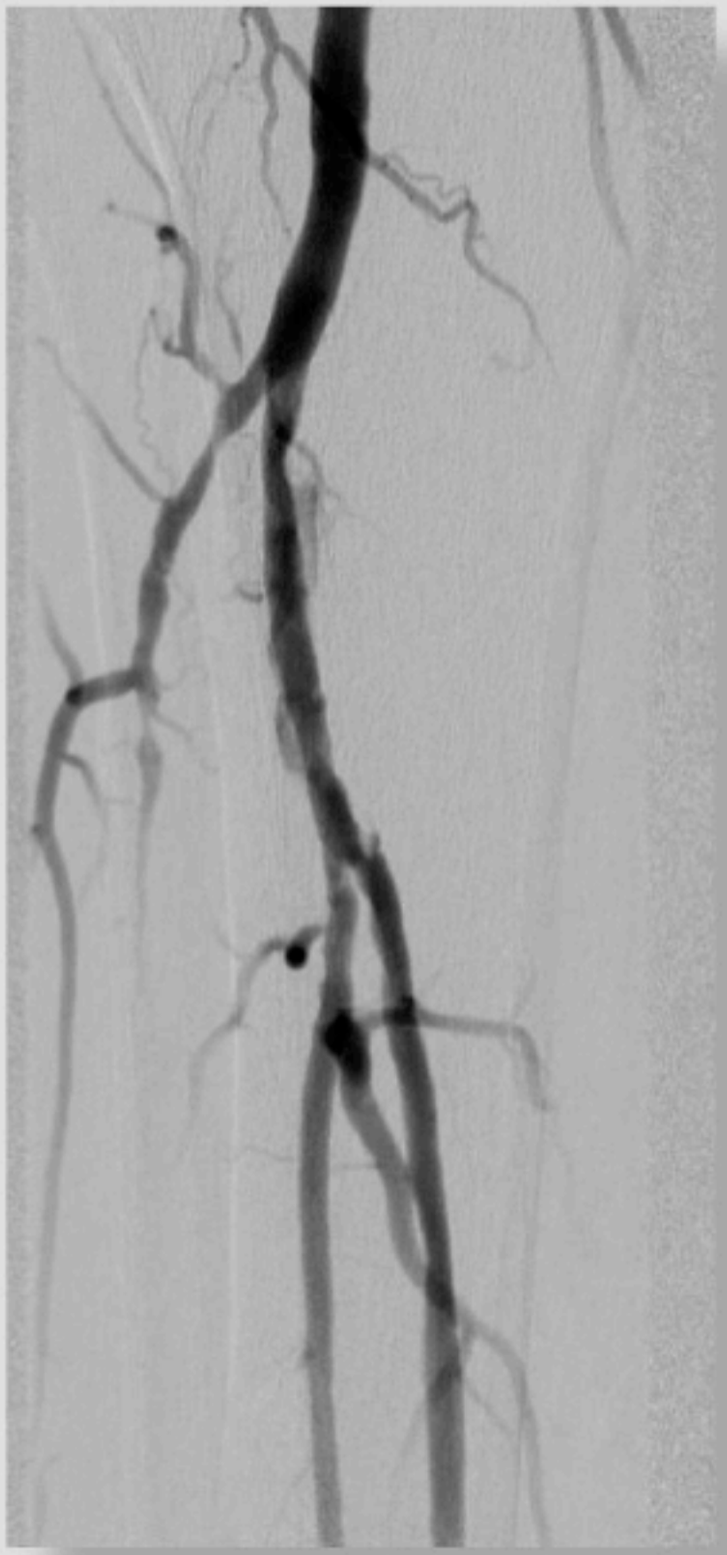
Kissing Balloon Technique for Angioplasty of Popliteal and Tibio-peroneal Arteries Bifurcation

M. Gargiulo*, F. Maioli, G.L. Faggioli, A. Freyrie, T. Ceccacci, A. Stella

Final result

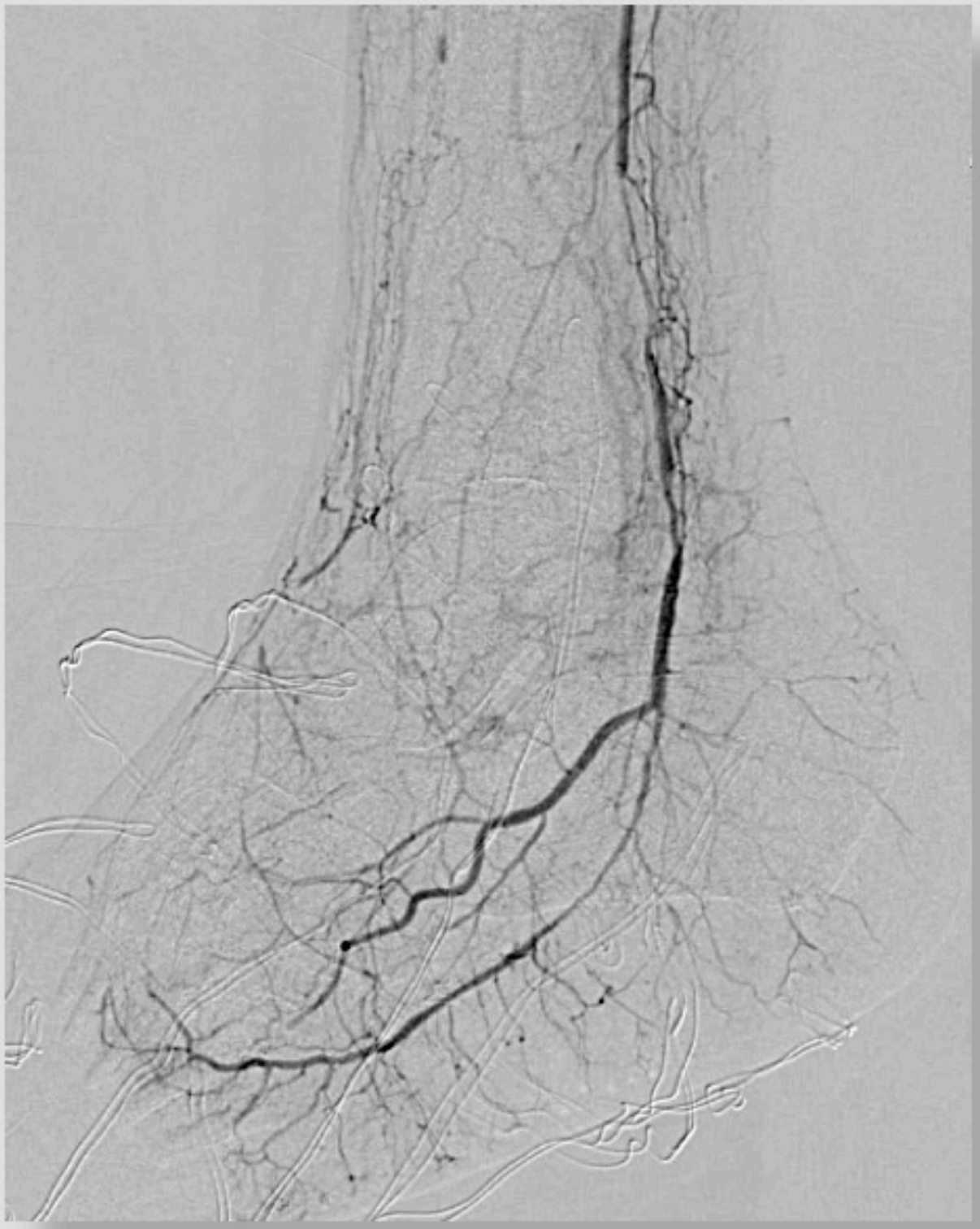
SUB-CASE 2





SUB-CASE 2

SUB-CASE 2



Subintimal approach: enter the subintimal space: short stump

SUB-CASE 3

PATIENT DATA

- 70-year-old male
- Type 2 DM
- Forefoot plantar ulcer

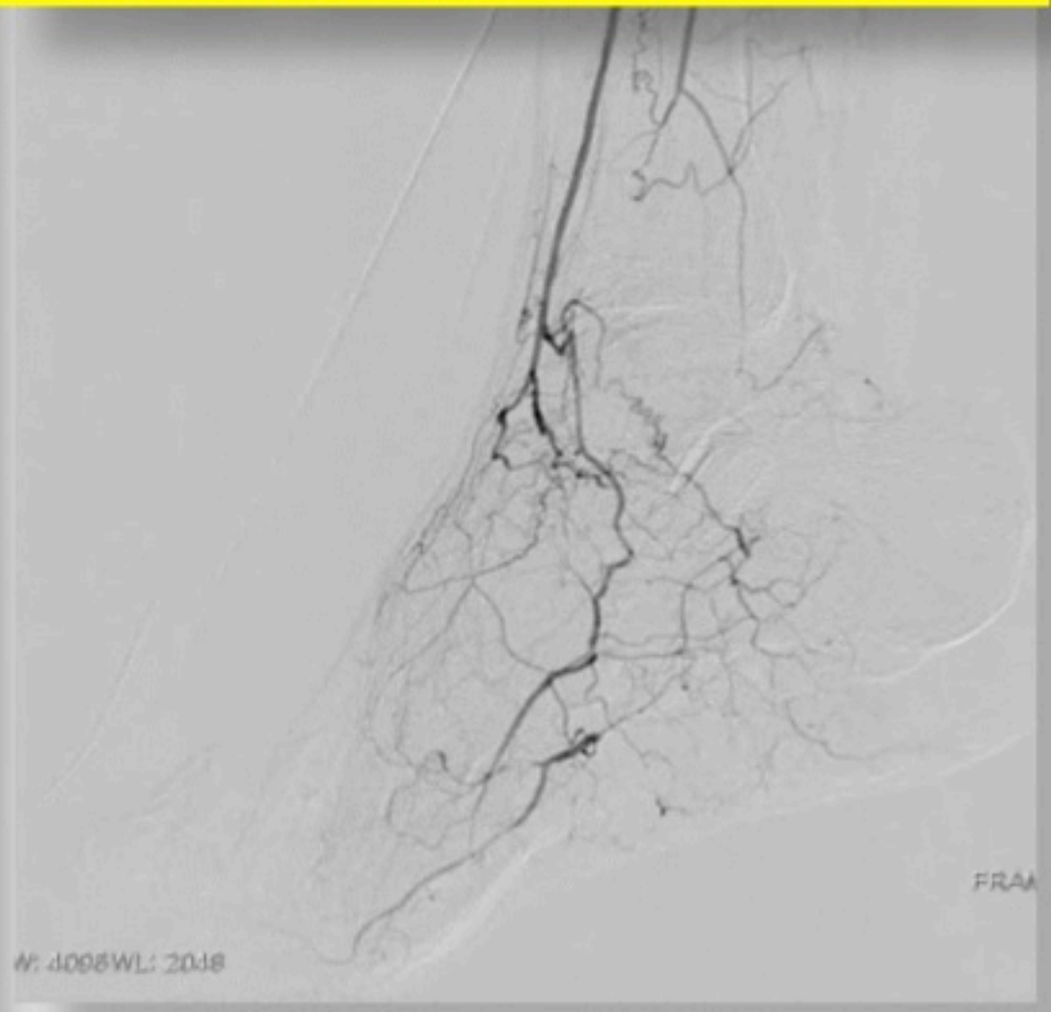
Basal ANGIO

SUB-CASE 3

SUB-CASE 3

DIAGNOSIS

- Occlusion of PTA: the ostium of PTA is not visible in different oblique views
- Hypoplastic or occluded dorsalis pedis
- Open distal plantar arteries



Looking for the ostium of PTA

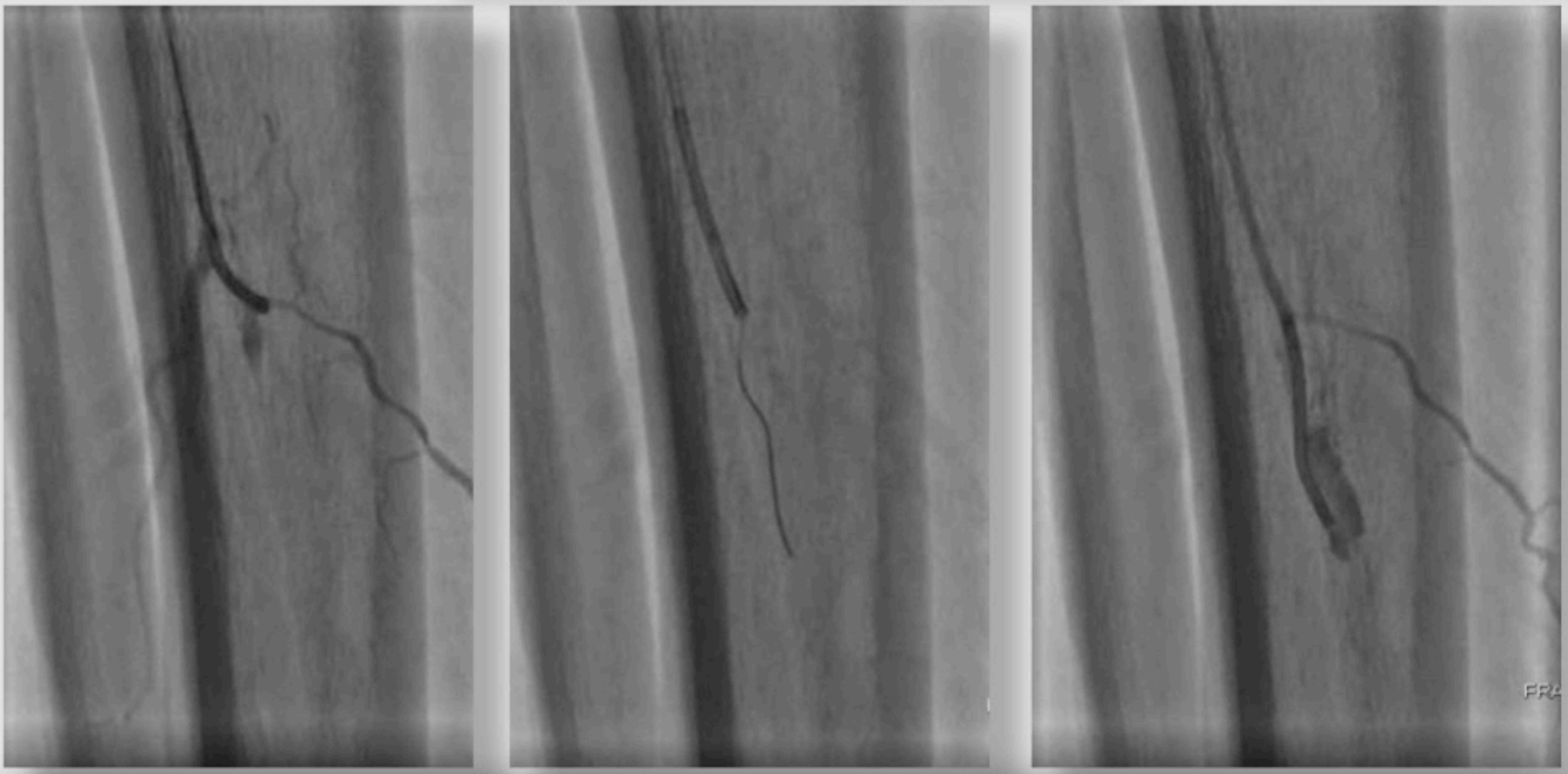
SUB-CASE 3

Materials & Technique

- Berenstein 4 Fr hydrophilic diagnostic catheter
- 0.014" CTOs-dedicated wire, 12 g tip load

Subintimal approach

SUB-CASE 3



Materials & Technique

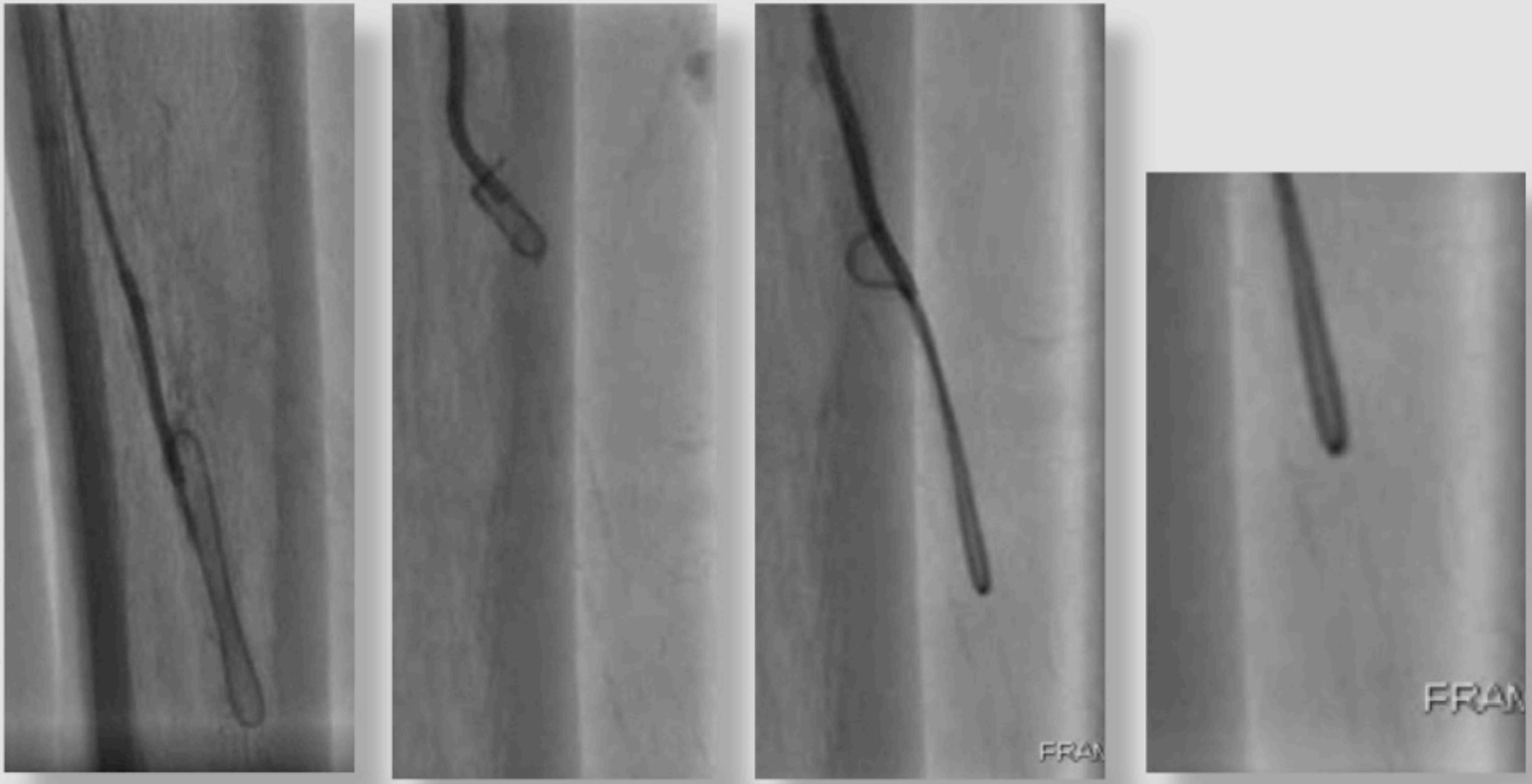
1. Check your position with very careful injection (0.5-1.0 mL) of contrast dye. The subintimal space is very variable (collaterals, veins etc.) but always different from the non-vascular spaces-
2. When you are near the ostium of the vessel and you are not sure of your position, better to advance 2-3 cm using CTOs-dedicated wire than the traditional loop dissection.

Subintimal approach

SUB-CASE 3

Subintimal approach

SUB-CASE 3



Materials & Technique

Shift to traditional 0.035” loop dissection. Observe: the wire is always outside the calcification of the vessel

Subintimal approach

SUB-CASE 3

Materials & Technique

Shift to a 0.014” nitinol wire supported by a low-profile, OTW, 0.014” compatible balloon, 1.5x20 mm. In foot vessels, this approach is more delicate.

Balloon dilatation

SUB-CASE 3

Materials & Technique

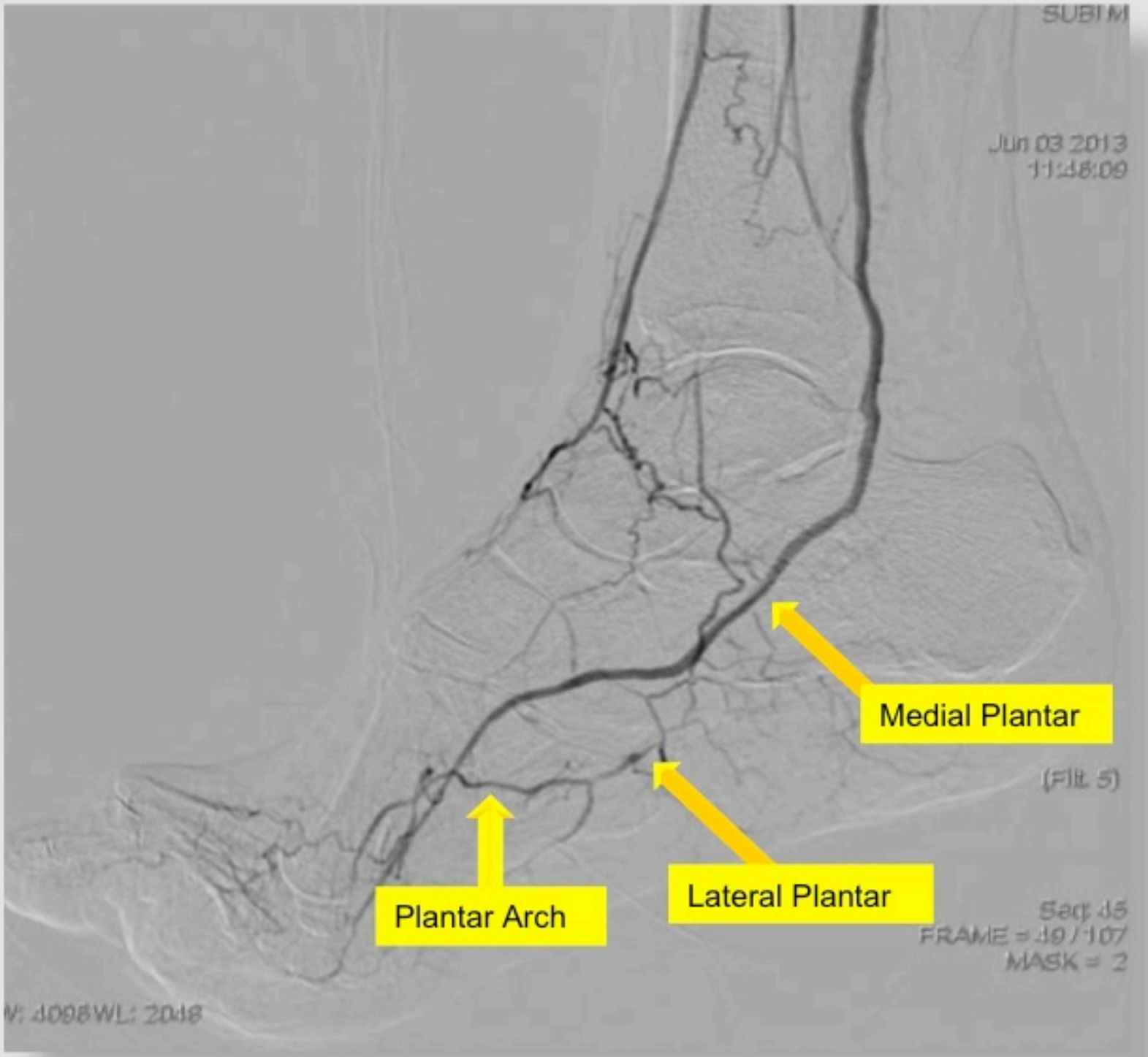
Low-profile, 0.014” compatible balloon, tapered (2.5 mm distal, 3.0 mm proximal, 21 cm long); 14 atm, 2 minutes inflation

Final result

SUB-CASE 3

Final result

SUB-CASE 3



Subintimal approach

1. **General principles**
2. **How to get the subintimal space**
3. **Subintimal space dissection**
4. **Bifurcation treatment**
5. **Looking for a “good distal target vessel”**
6. **Re-entry into the true distal lumen**

Materials & Technique

Once we get into the subintimal space, our preferred strategy is to continue the dissection using the described Berenstein catheter supporting the 0.035”, hydrophilic, looped wire, from SFA to BTK and foot vessels.

This approach reflects personal habits because many operators prefer 0.018” wires or 0.014” wires, especially in the small BTK and foot vessels.

Be sure to choose a strong wire, because the mechanical stress due to subintimal space dissection is often hard.

Subintimal approach

1. **General principles**
2. **How to get the subintimal space**
3. **Subintimal space dissection**
4. **Bifurcation treatment**
5. **Looking for a “good distal target vessel”**
6. **Re-entry into the true distal lumen**

Materials & Technique

In case of difficulty in advancing the catheter, which may be entrapped into the thick subintimal space, the 0.035” wire is exchanged with a 0.014” wire, a low-profile balloon is advanced and inflated to dilate the subintimal space.

In some cases it is impossible to proceed with the loop, even applying some force; in this case one must retract the wire, change the position of the catheter tip and try to re-establish a new loop in another direction.

Eventually in many situations we must change our approach, shifting from a “sliding & dissecting” approach to a “perforating” approach.

Subintimal approach: dissecting the subintimal space

SUB-CASE 4

PATIENT DATA

- 68-year-old female
- Type 2 DM; ex-smoker; HBP
- 2008 claudication →prosthetic FEM-POP bypass
- **Presentation: gangrene of the 1° and 3° toes → amputation → not healing**
- Absence of pulses
- $TcPO_2$ 3 mmHg

Basal ANGIO

SUB-CASE 4

SUB-CASE 4

DIAGNOSIS

- Good SFA patency
- Complete occlusion of POP & BTK vessels
- Foot vessels patency

Treatment

SUB-CASE 4

How to enter into the subintimal space?

SUB-CASE 4

Materials & Technique: sliding or perforating?

How to enter into the subintimal space?

SUB-CASE 4

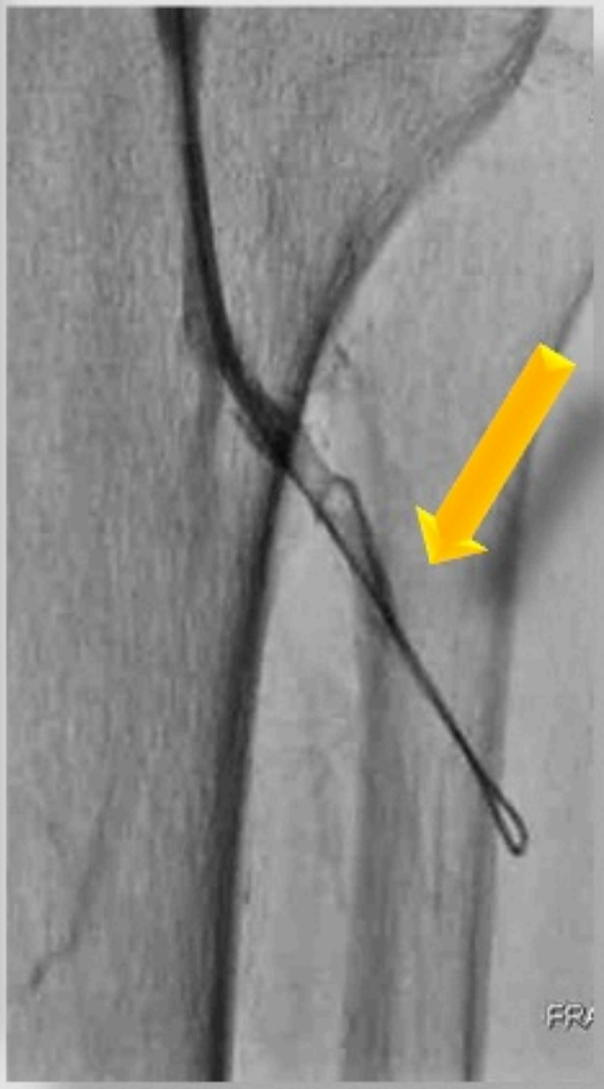
Perforating → 0.018”, 30 g tip load, stiff wire

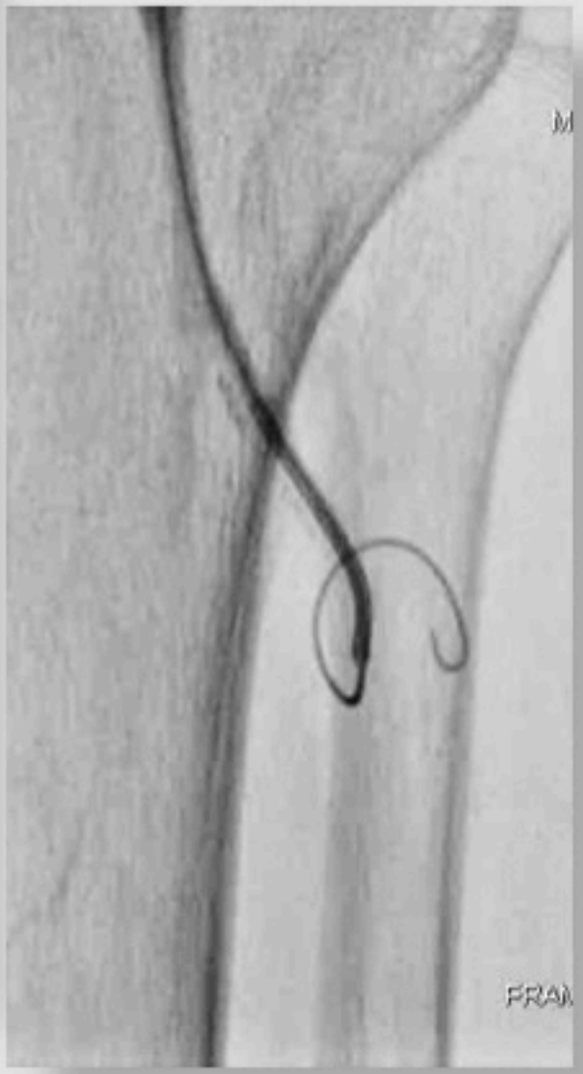
How to enter into the subintimal space?

SUB-CASE 4

Shift to sliding and dissecting → 0.035”, hydrophilic, half-stiff wire

Out of the vessel wall: how to find again the subintimal space?

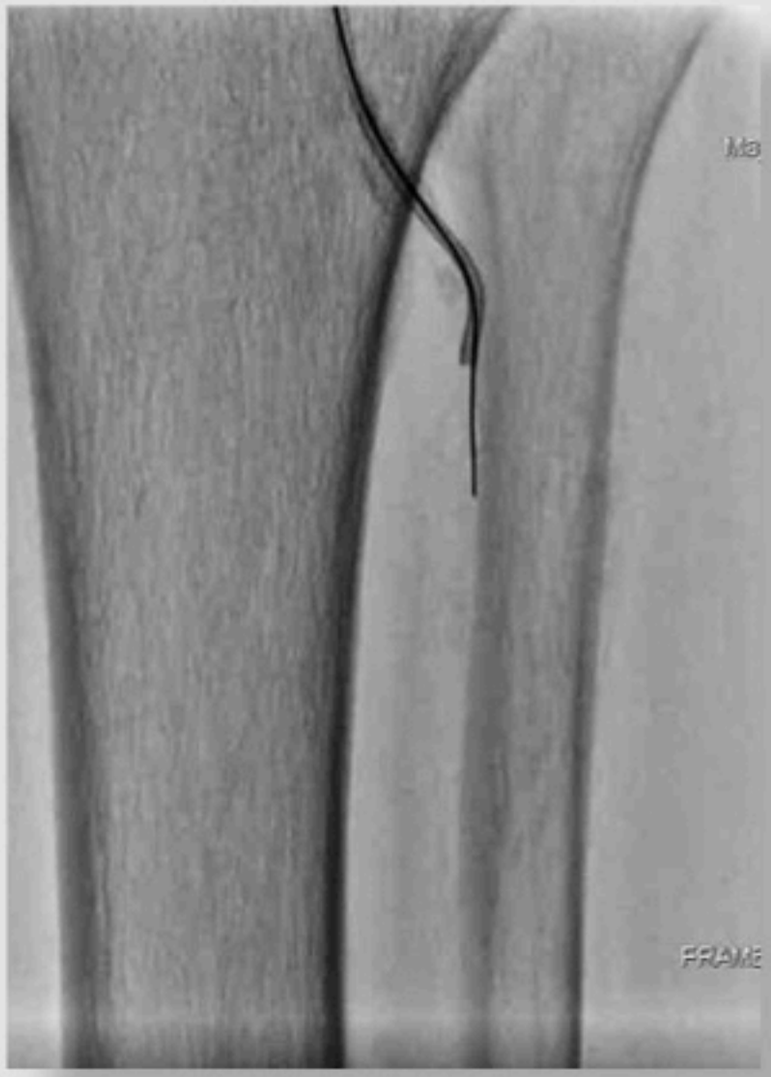


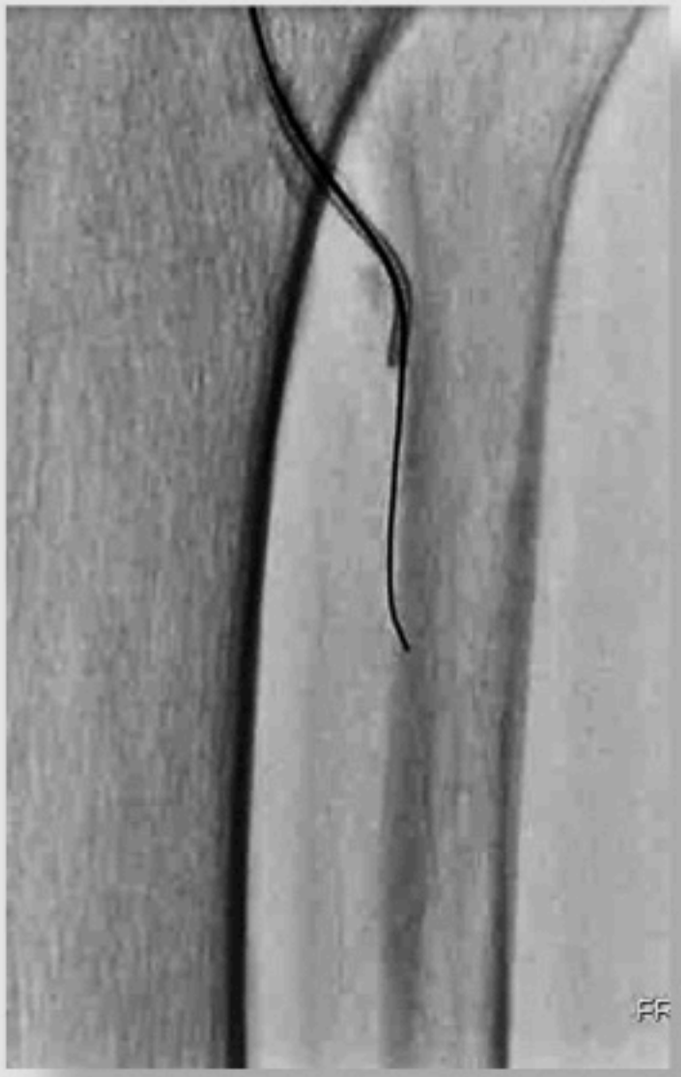


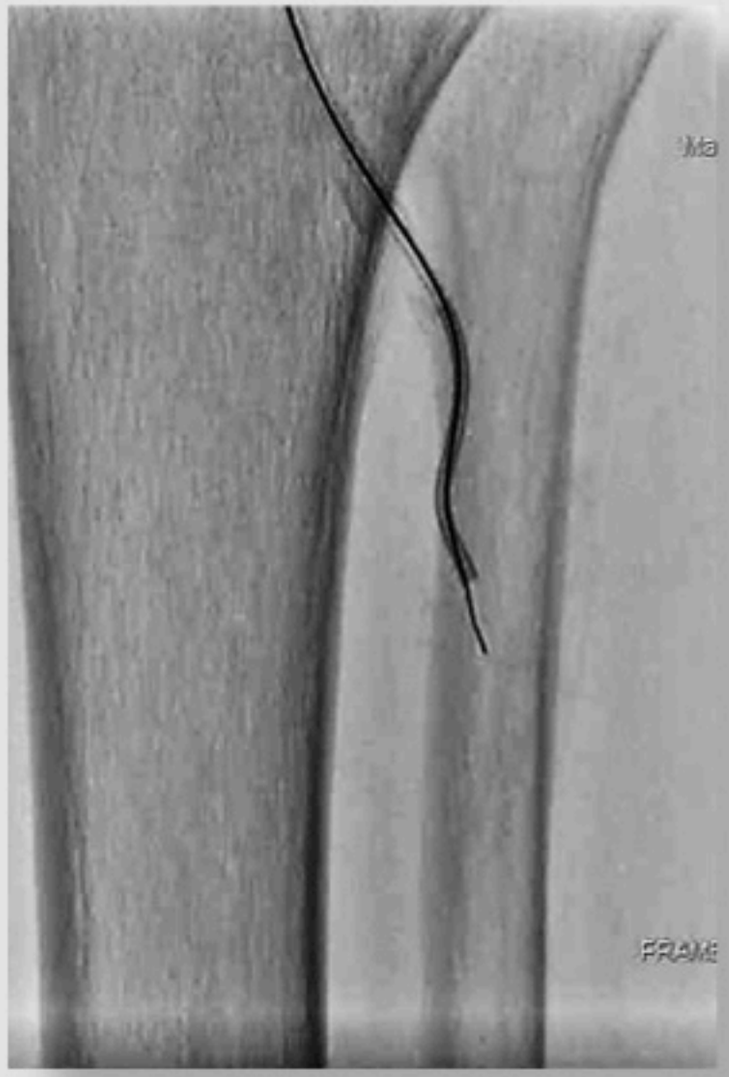
Out of the vessel wall: how to find again the subintimal space?

Perforating → 0.018”, 30 g tip load, stiff wire

Out of the vessel wall: how to find again the subintimal space?







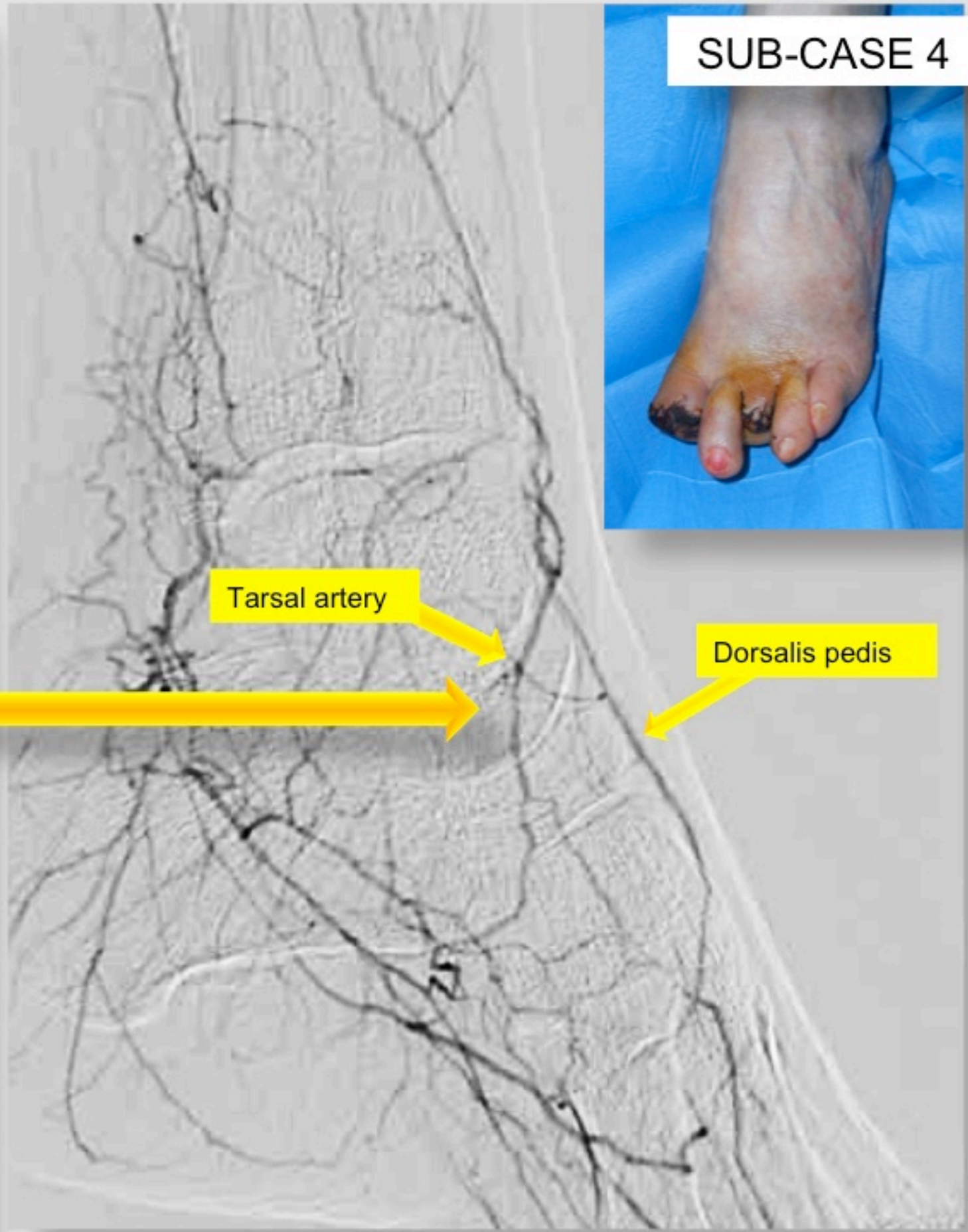
Perforating → 0.018”, 30 g tip load, stiff wire

Continue subintimal dissection

SUB-CASE 4

Shift to sliding and dissecting → 0.035”, hydrophilic, half-stiff wire

SUB-CASE 4


Tarsal artery
Dorsalis pedis

SUB-CASE 4

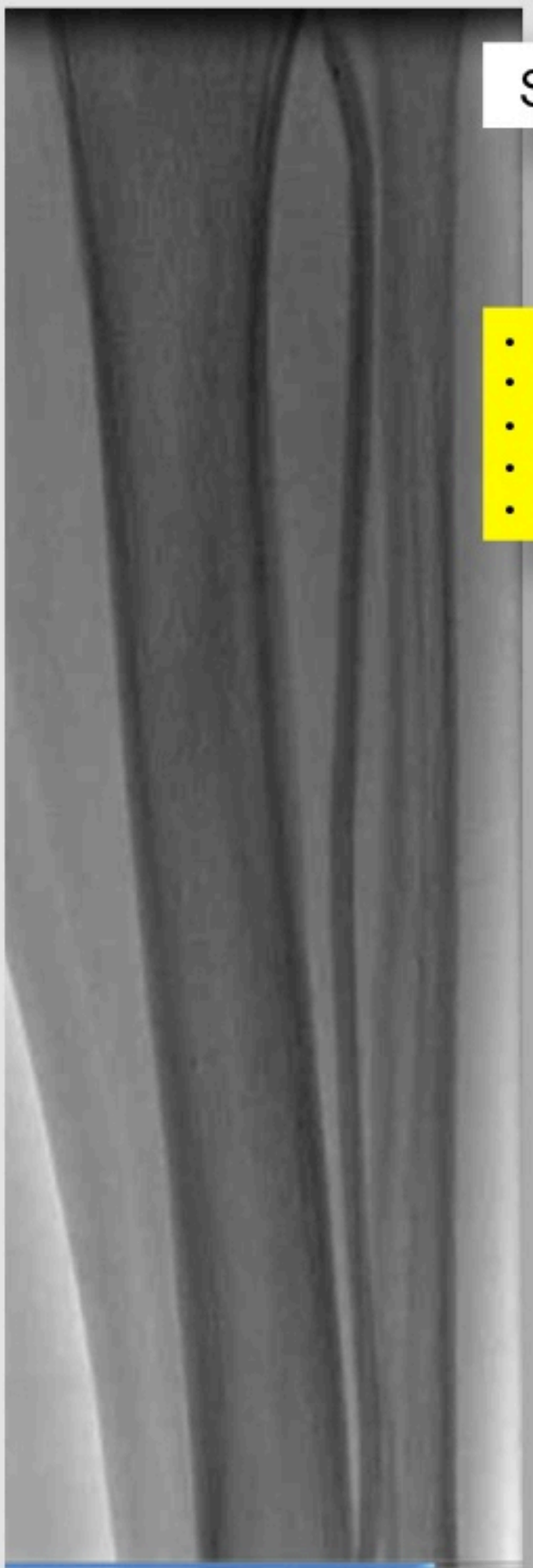
Re-entry into the true distal lumen

SUB-CASE 4

Shift to 0.014” hydrophilic, nitinol wire

SUB-CASE 4

- 0.014”
- Low-profile
- Tapered
- 2.5-3.0mm x 21cm
- 14 atm



- 0.014”
- Low-profile
- Tapered
- 3.0-3.5mm x 21cm
- 14 atm

Final result

SUB-CASE 4

SUB-CASE 4

Collateral vessels are spared

SUB-CASE 4

Before

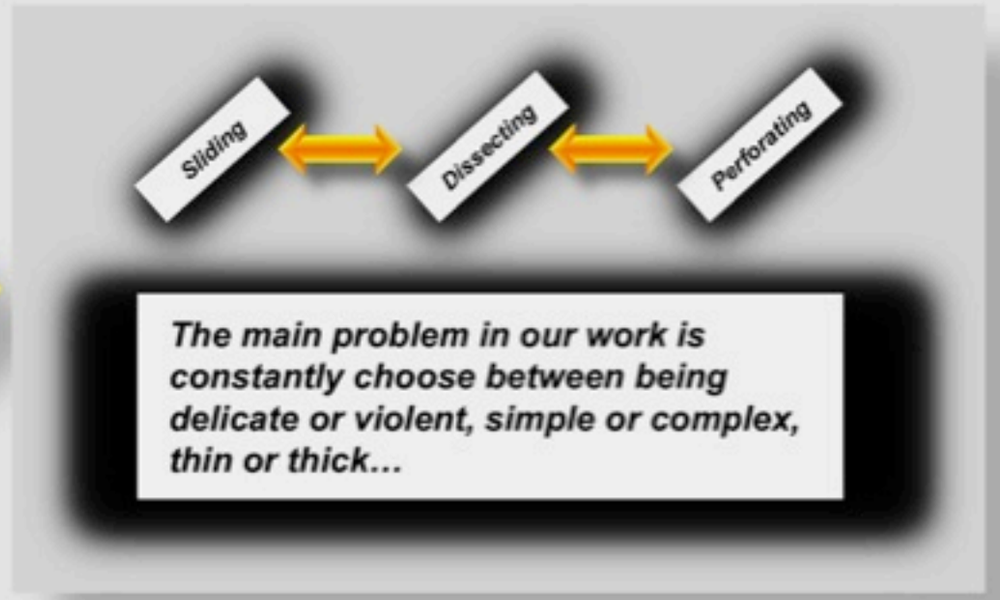
After

6 months later

SUB-CASE 4

Subintimal approach

1. General principles
2. How to get the subintimal space
3. Subintimal space dissection
4. Bifurcation treatment
5. Looking for a “good distal target vessel”
6. Re-entry into the true distal lumen



Subintimal approach

1. **General principles**
2. **How to get the subintimal space**
3. **Subintimal space dissection**
4. **Bifurcation treatment**
5. **Looking for a “good distal target vessel”**
6. **Re-entry into the true distal lumen**

Bifurcation can be treated changing the direction of the subintimal dissection.

Bifurcation treatment

SUB-CASE 5

PATIENT DATA

- 68-year-old female
- Type 2 DM
- HBP
- Creatinine 2.6 mg/dL
- 1°toe gangrene

Basal ANGIO

SUB-CASE 5



SUB-CASE 5

DIAGNOSIS

- Occlusion of POP bifurcation, TPT, ATA, PER, proximal PTA
- Patent dorsalis pedis
- Occluded plantar system

TPT & PER subintimal approach

SUB-CASE 5

Materials & Technique

- Ber 4 Fr hydrophilic diagnostic catheter
- 0.035”/1.5mm, nitinol, hydrophilic wire

TPT & PER subintimal approach

SUB-CASE 5

Materials & Technique

- Ber 4 Fr hydrophilic diagnostic catheter
- 0.035”/1.5mm, nitinol, hydrophilic wire

ATA subintimal approach

SUB-CASE 5

Materials & Technique

- Ber 4 Fr hydrophilic diagnostic catheter
- 0.018”, CTOs-dedicated wire, 30 g tip load → entering proximal ATA
- 0.035”/1.5mm, nitinol, hydrophilic wire → dissecting subintimal space

ATA subintimal approach

SUB-CASE 5

Materials & Technique

- Ber 4 Fr hydrophilic diagnostic catheter
- 0.018”, CTOs-dedicated wire, 30g tip load → entering proximal ATA
- 0.035”/1.5mm, nitinol, hydrophilic wire → dissecting subintimal space

PTA subintimal approach

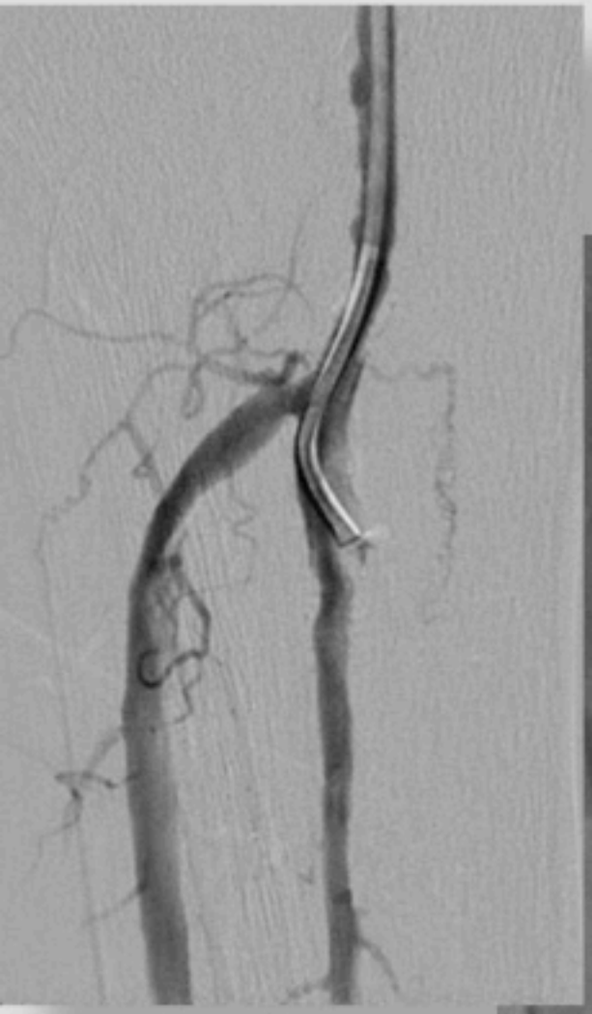
SUB-CASE 5

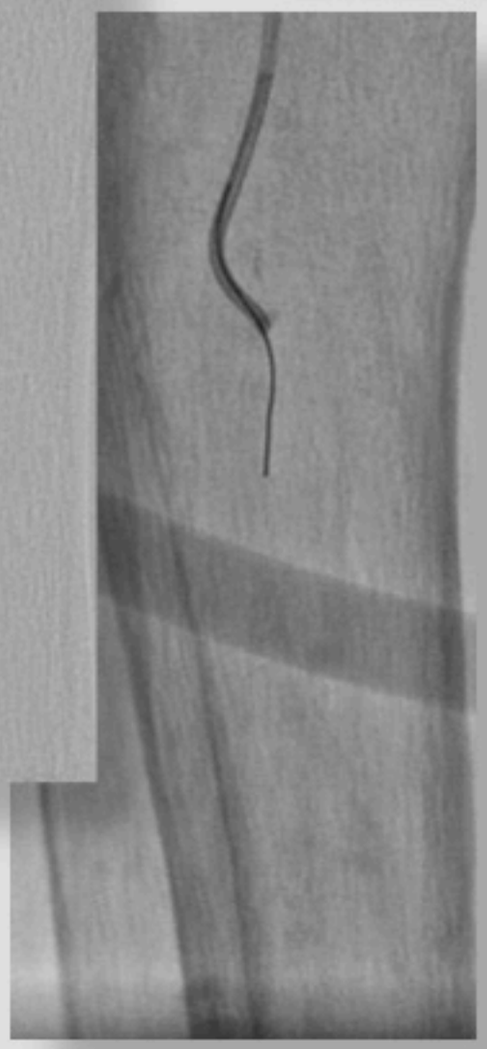
Materials & Technique

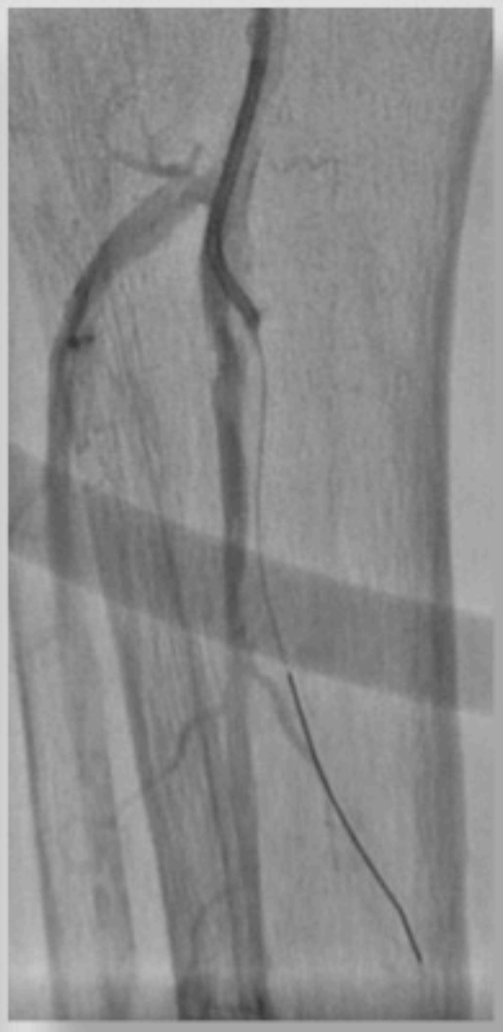
- Ber 4 Fr hydrophilic diagnostic catheter
- 0.018”, CTOs-dedicated wire, 30g tip load → entering proximal ATA
- 0.035”/1.5mm, nitinol, hydrophilic wire → dissecting subintimal space

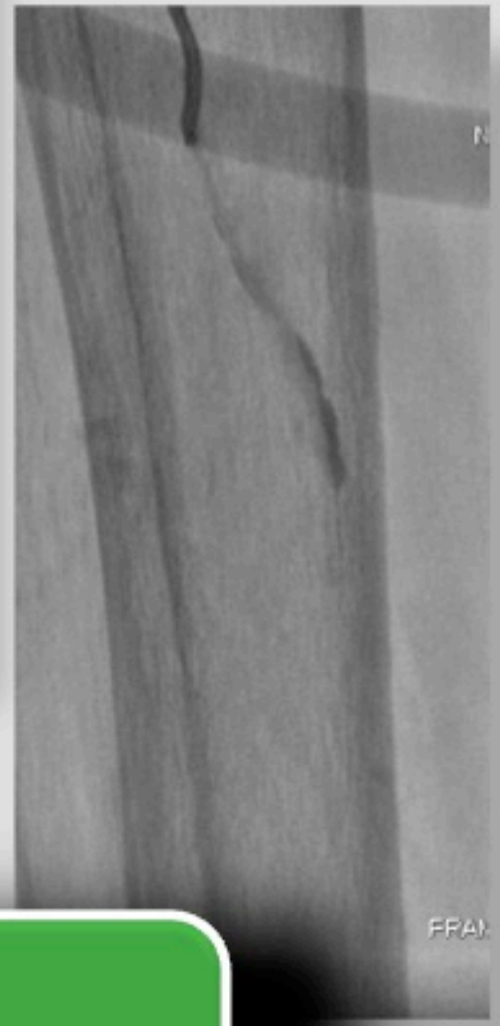
PTA subintimal approach

SUB-CASE 5









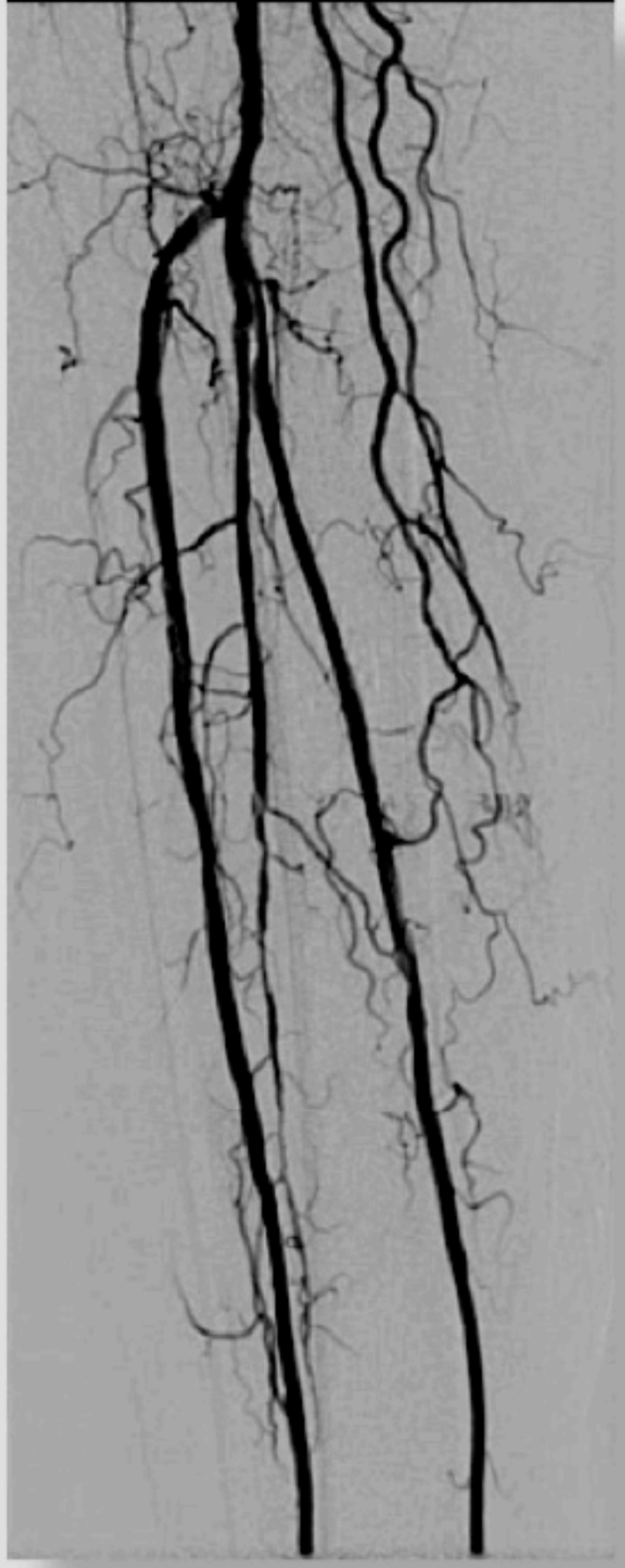
Materials & Technique

- Ber 4 Fr hydrophilic diagnostic catheter
- 0.018”, CTOs-dedicated wire, 30g tip load → entering proximal PTA
- 0.035”/1.5mm, nitinol hydrophilic wire → dissecting subintimal space

Final result

SUB-CASE 5

SUB-CASE 5

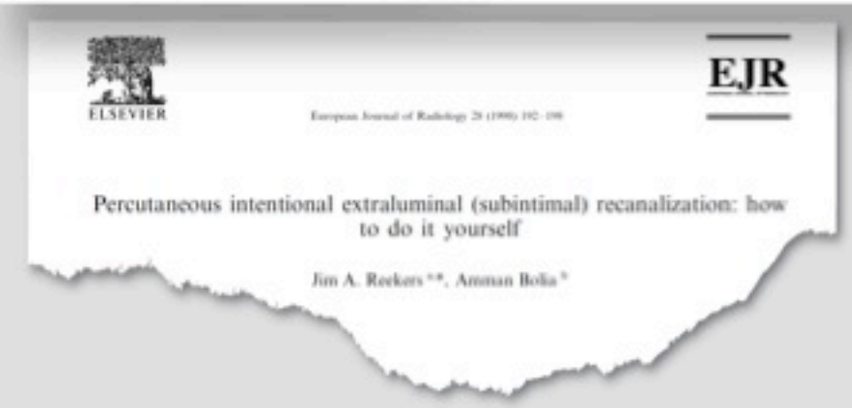


Subintimal approach

1. **General principles**
2. **How to get the subintimal space**
3. **Bifurcation treatment**
4. **Looking for a "good distal target vessel"**
5. **Re-entry into the true distal lumen**

Similar to the identification of a good landing zone for a distal bypass, subintimal angioplasty needs a good distal distribution system to maintain an adequate flow rate into the new subintimal lumen.

This crucial step starts with the angiographic study of the foot vessels: "the better the quality of the distal vessel, the greater the chances of a successful recanalization".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Percutaneous intentional extraluminal (subintimal) recanalization: how to do it yourself

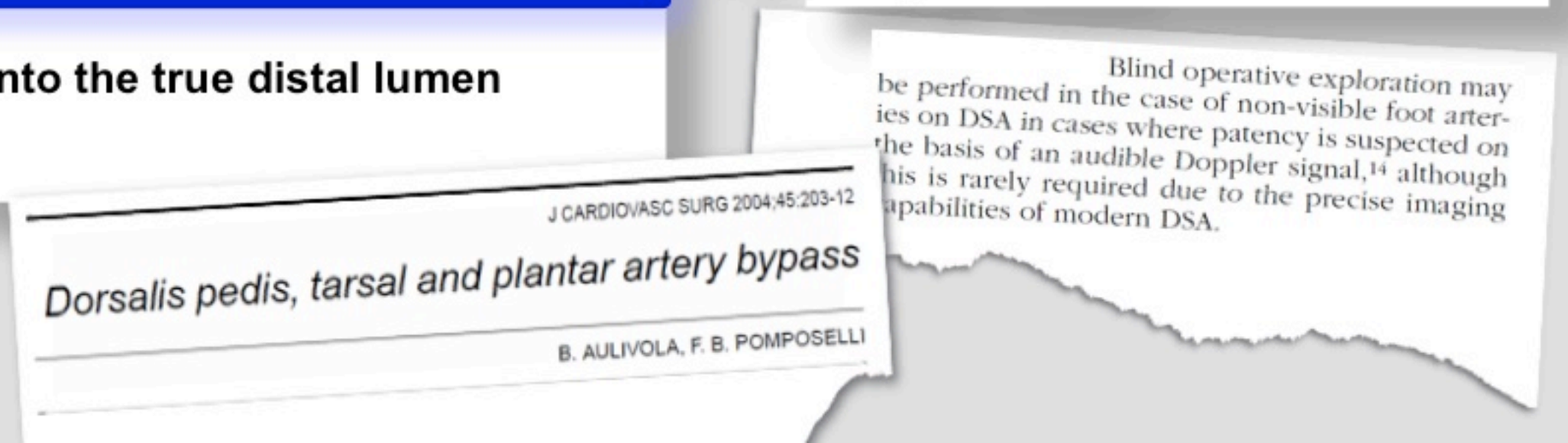
Jim A. Reekers *,*, Amman Bolia *

Subintimal approach

1. **General principles**
2. **How to get the subintimal space**
3. **Subintimal space dissection**
4. **Bifurcation treatment**
5. **Looking for a "good distal target vessel"**
6. **Re-entry into the true distal lumen**

An adequate imaging of the distal vessels can be difficult to obtain, especially in patients with multilevel vessel disease.

In these cases very long X-ray movies, waiting for late opacification and very distal injection through the exploring catheter at the ankle level can help in identifying a good distal target vessel.



J CARDIOVASC SURG 2004;45:203-12

Dorsalis pedis, tarsal and plantar artery bypass

B. AULIVOLA, F. B. POMPOSELLI

Blind operative exploration may be performed in the case of non-visible foot arteries on DSA in cases where patency is suspected on the basis of an audible Doppler signal,[14] although this is rarely required due to the precise imaging capabilities of modern DSA.

Subintimal approach

1. **General principles**
2. **How to get the subintimal space**
3. **Subintimal space dissection**
4. **Bifurcation treatment**
5. **Looking for a “good distal target vessel”**
6. **Re-entry into the true distal lumen**

Lastly, we must consider that, unlike bypass surgery, in some cases the very distal plantar arch can represent a successful landing zone for a subintimal angioplasty.

Fusaro M et Al. Plantar to dorsalis pedis artery subintimal angioplasty in a patient with critical foot ischemia: a novel technique in the armamentarium of the peripheral interventionist. J Cardiovasc Med (Hagerstown) 2007;8:977-80

Zhu YQ et Al. Subintimal angioplasty for below-the-ankle arterial occlusions in diabetic patients with chronic critical limb ischemia. J Endovasc Ther 2009;16:604-12.

Alexandrescu VA. Below-the-ankle subintimal angioplasty: how far can we push this application for lower limb preservation in diabetic patients? J Endovasc Ther 2009;16:617-8.

Subintimal approach: looking for a “good distal target vessel”

SUB-CASE 6

PATIENT DATA

- 66 year-old male
- Type 2 DM
- Forefoot plantar ulcer

Basal ANGIO

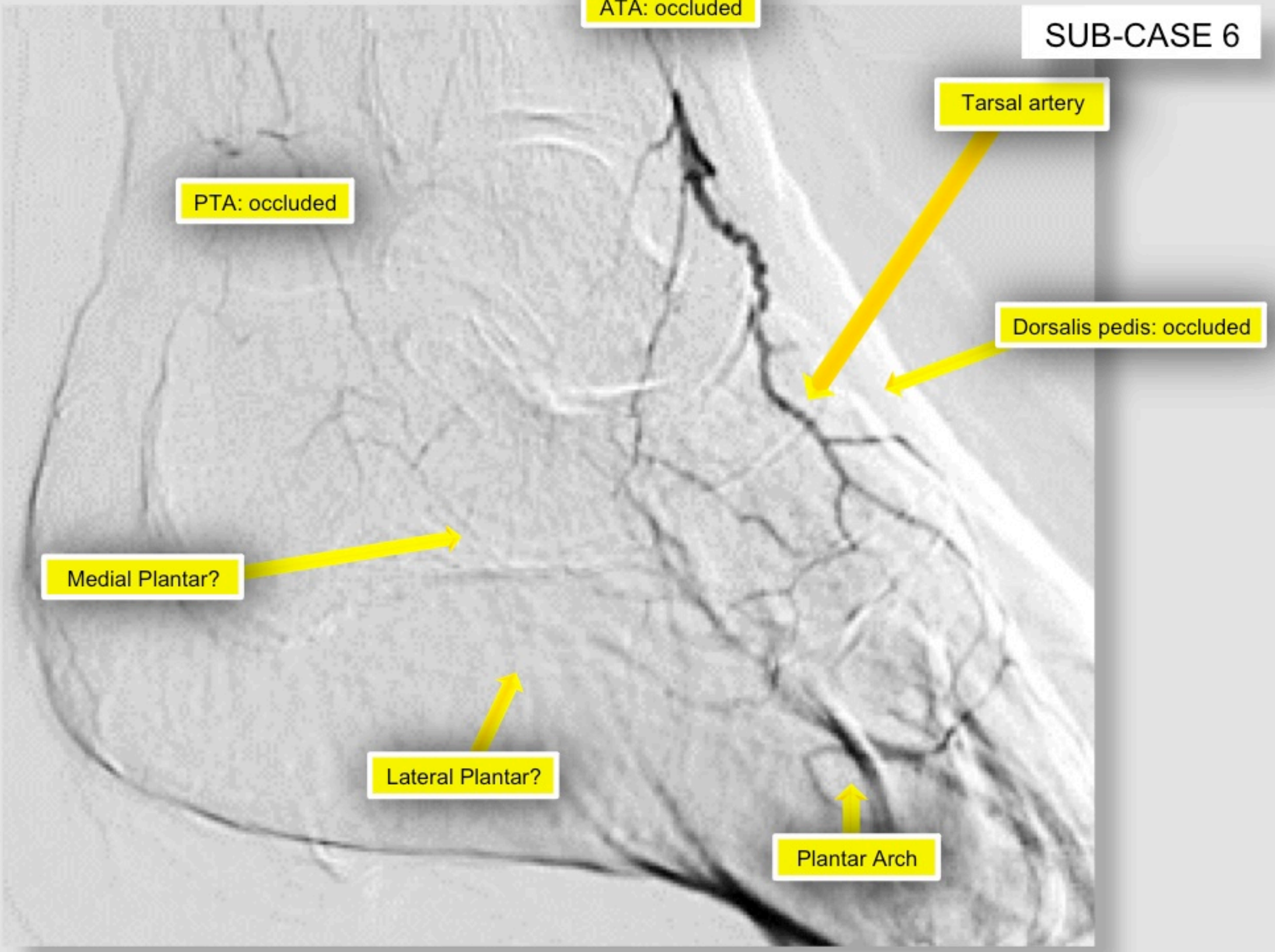
SUB-CASE 6

SUB-CASE 6

DIAGNOSIS

- Mid-SFA stenosis
- ATA & PTA CTOs
- Diffuse FOOT vessel disease

SUB-CASE 6


ATA: occluded
Tarsal artery
PTA: occluded
Dorsalis pedis: occluded
Medial Plantar?
Lateral Plantar?
Plantar Arch

Subintimal Angioplasty

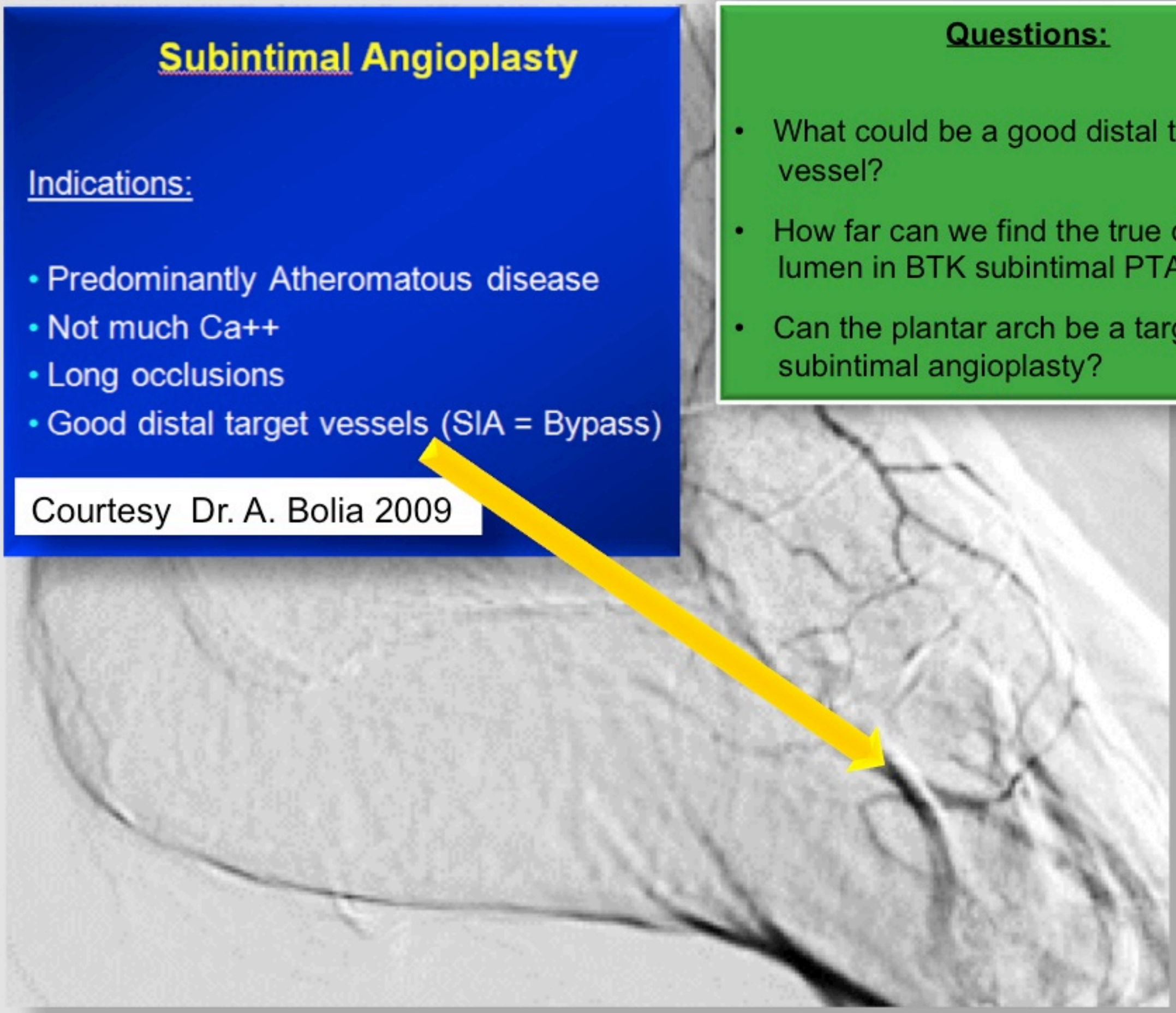
Indications:

- Predominantly Atheromatous disease
- Not much Ca++
- Long occlusions
- Good distal target vessels (SIA = Bypass)

Courtesy Dr. A. Bolia 2009

Questions:

- What could be a good distal target vessel?
- How far can we find the true distal lumen in BTK subintimal PTA?
- Can the plantar arch be a target of a subintimal angioplasty?



Observe the foot angiography

SUB-CASE 6

Looking for the subintimal space of PTA

SUB-CASE 6

Materials & Technique

- Ber 4 FR hydrophilic diagnostic catheter
- 0.014, soft tip, hydrophilic wire

Subintimal approach

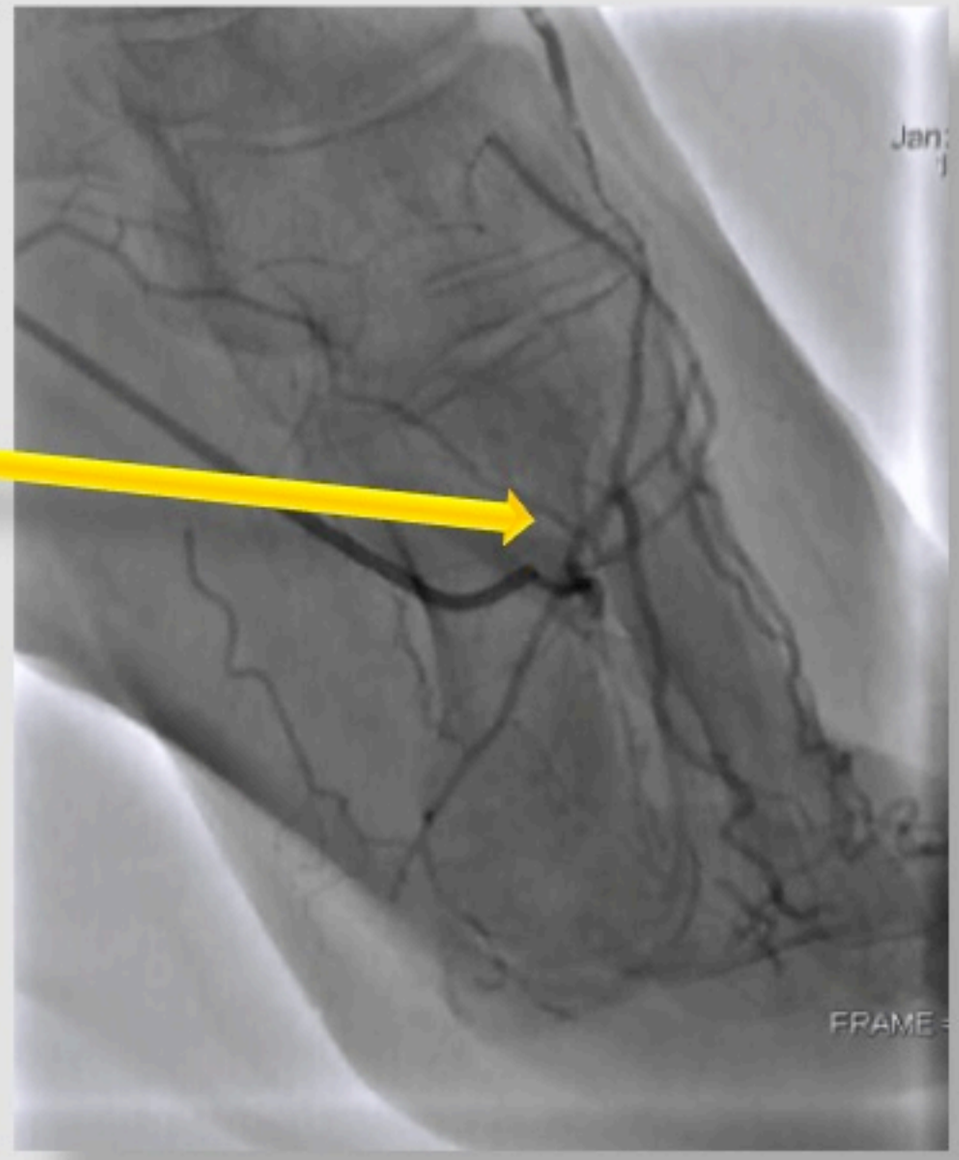
SUB-CASE 6

Materials & Technique

0.035” nitinol hydrophilic wire subintimal dissection of the lateral plantar artery

Subintimal approach

SUB-CASE 6



Materials & Technique

The " good distal target vessel": the plantar arch, forefoot distribution system

Balloon dilatation

SUB-CASE 6

Materials & Technique

Low-profile, 0.014”, tapered (2.5 mm distal, 3.0 mm proximal, 21 cm long); 14 atm, 2 minutes inflation

Subintimal approach: final result

SUB-CASE 6

Subintimal approach: final result

SUB-CASE 6

Subintimal approach: final result

SUB-CASE 6

Materials & Technique

Observe in the venous phase how good is the distribution of blood flow to the midfoot and forefoot

Today we are unable to guarantee a good longtime patency of this vessel, but in the future new devices (drug-eluting balloons, drug-eluting stents, bioabsorbable stent etc.) will probably increase the patency rate of this vessel.

This means that we can treat this type of “surgically untreatable patients” using angioplasty

Subintimal approach: looking for a “good distal target vessel”

SUB-CASE 7

PATIENT DATA

- 68-year-old male
- Type 2 DM
- Dorsal forefoot ulcer with tendon exposure

Basal ANGIO

SUB-CASE 7

SUB-CASE 7

Basal ANGIO

DIAGNOSIS

- ATA & PTA CTOs
- Proximal PER stenosis
- Dorsalis pedis CTO

Ulcer with tendons exposure

SUB-CASE 7

Materials & Technique

Peroneal artery PTA, easy, cheap & fast but… is it enough?

Do we stop here or not?

Result after PER angioplasty

SUB-CASE 7

SUB-CASE 7

DIAGNOSIS

- Occluded dorsalis pedis
- Distally occluded PTA
- Very thin tarsal and plantar arteries

Subintimal approach to ATA

SUB-CASE 7

Materials & Technique

- Ber 4 Fr hydrophilic diagnostic catheter
- 0.035/1.5 mm, nitinol, hydrophilic wire

Balloon dilatation

SUB-CASE 7

Materials & Technique

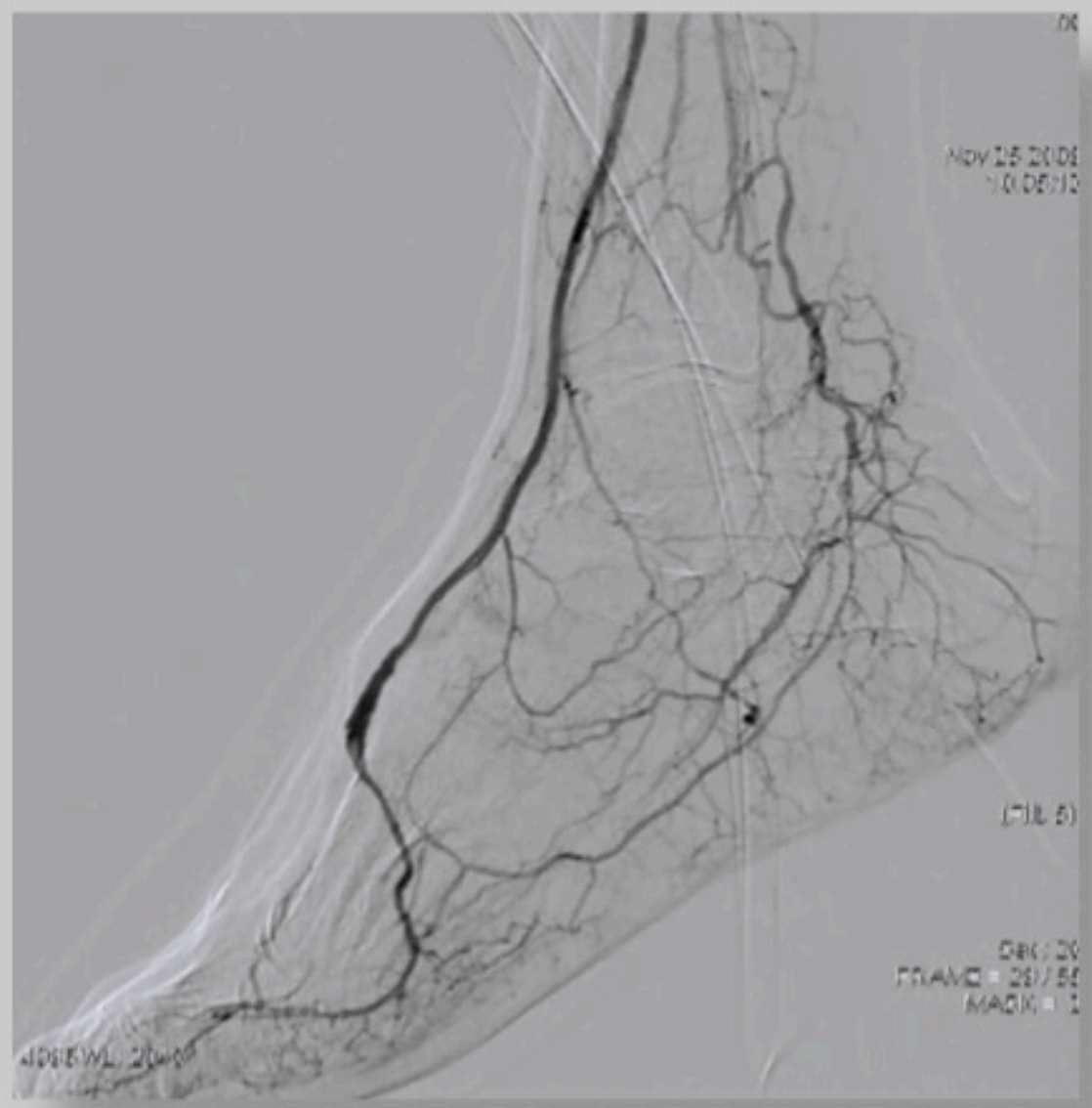
- Low-profile, 0.014”, tapered (2.5-3.0 mm x 21 cm); 14 atm

Final result

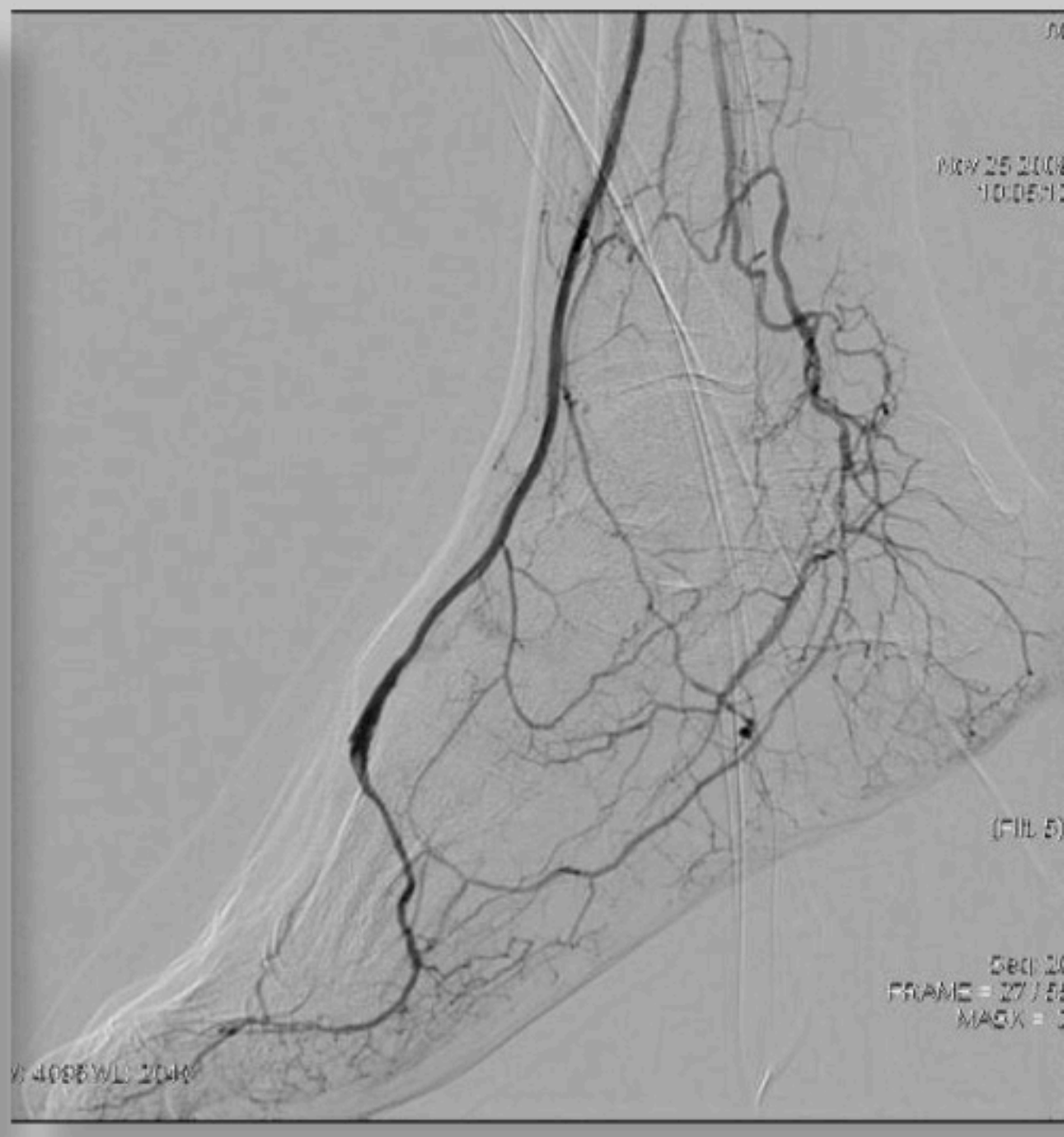
SUB-CASE 7

Final result

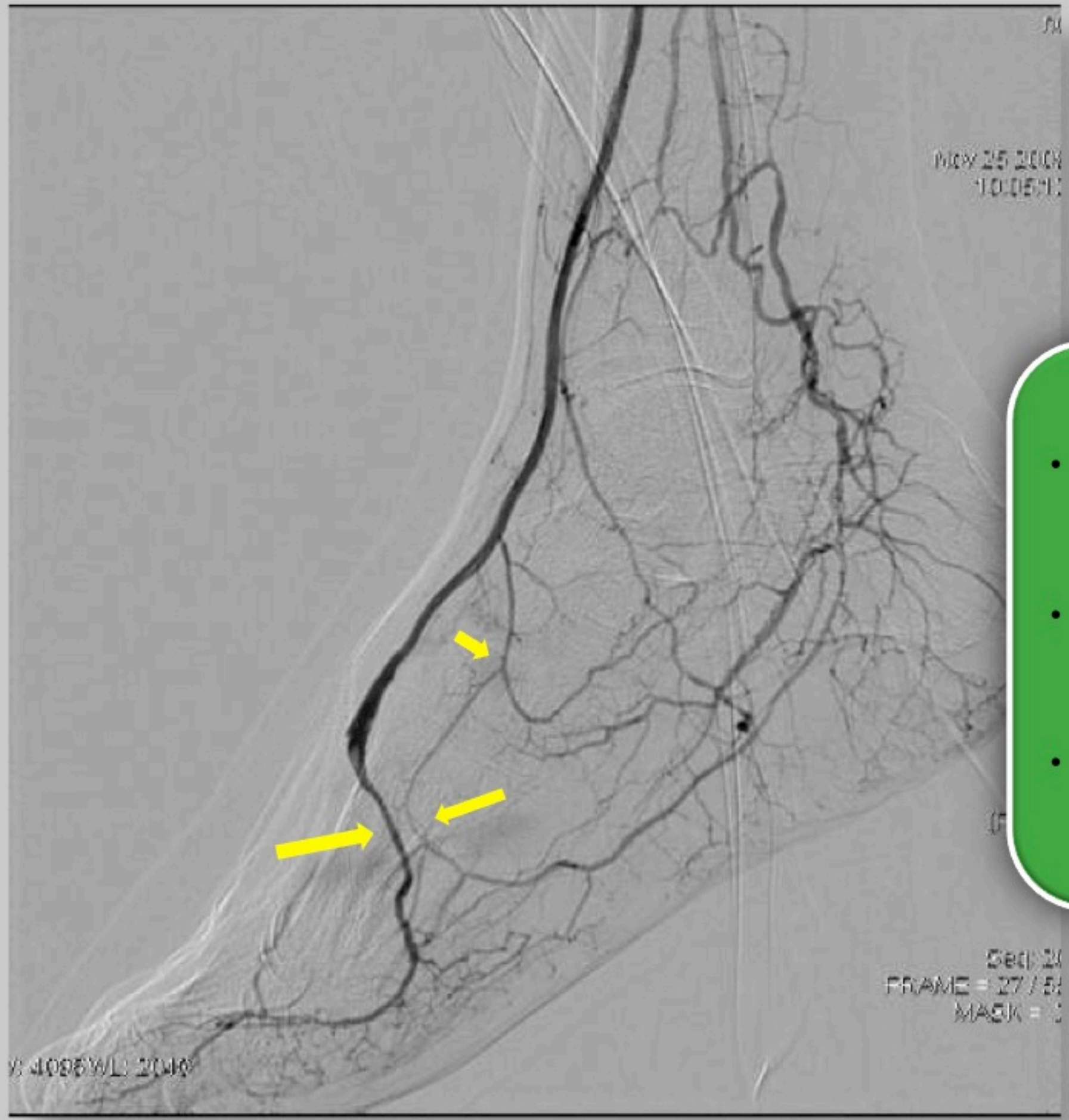
SUB-CASE 7



SUB-CASE 7



SUB-CASE 7



Observe:

- dorsalis pedis and plantar arch are separated
- The plantar arch has a connection with a tarsal artery
- The distal distribution system of the PER artery is untouched

Subintimal approach: looking for a “good distal target vessel”

SUB-CASE 8

PATIENT DATA

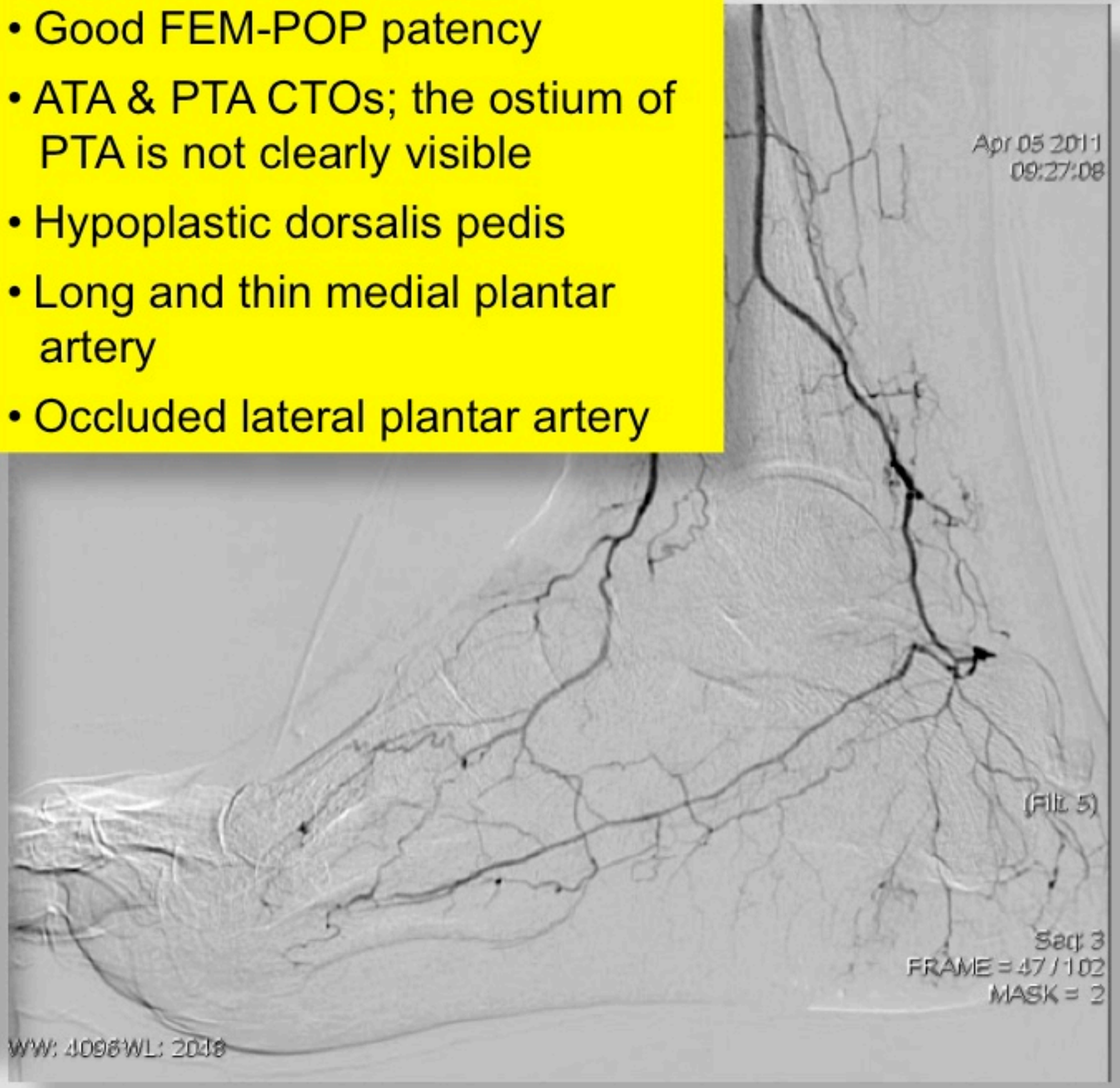
- 72-year-old male
- Type 2 DM
- 1° toe gangrene

Basal ANGIO

SUB-CASE 8

DIAGNOSIS

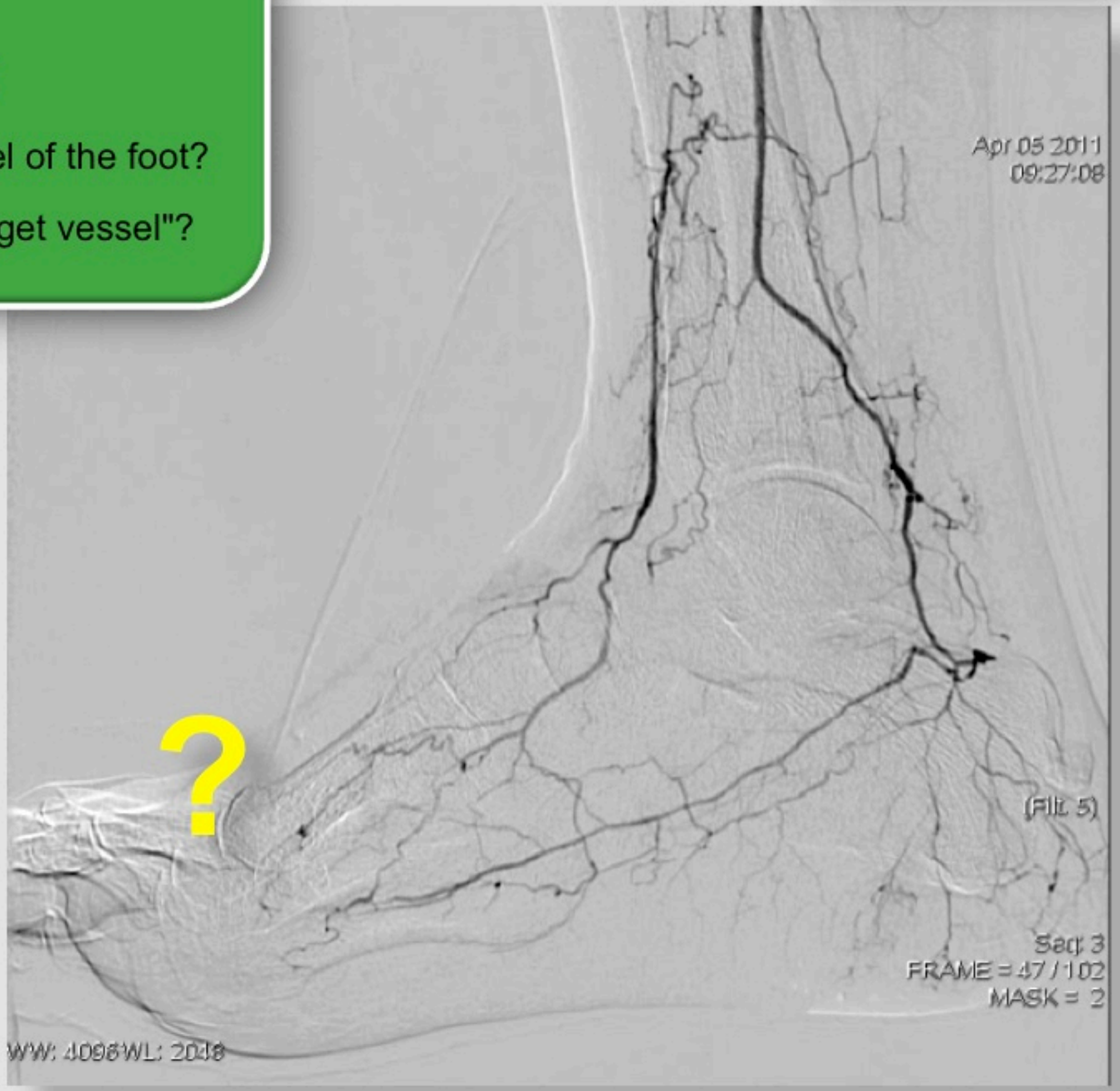
- Good FEM-POP patency
- ATA & PTA CTOs; the ostium of PTA is not clearly visible
- Hypoplastic dorsalis pedis
- Long and thin medial plantar artery
- Occluded lateral plantar artery



SUB-CASE 8

Questions:

- Is the plantar arch open?
- What was the main vessel of the foot?
- What is a "good distal target vessel"?



Basal ANGIO

SUB-CASE 8

Posterior tibial artery treatment

SUB-CASE 8

Materials & Technique

- Ber 4 Fr hydrophilic diagnostic catheter
- 0.014, soft tip, hydrophilic wire

Subintimal approach

SUB-CASE 8

Materials & Technique

- Ber 4 Fr hydrophilic diagnostic catheter
- 0.035”/1.5mm, nitinol, hydrophilic wire

Subintimal approach

SUB-CASE 8

Materials & Technique

Slow injection of 1-2 mL of contrast dye to check the position of the catheter. The imaging of the parallel veins is typical of the subintimal space

Subintimal approach

SUB-CASE 8

Materials & Technique

- Ber 4F hydrophilic diagnostic catheter
- 0.035”/1.5mm, nitinol, hydrophilic wire: dissection of the lateral plantar artery

Subintimal approach

SUB-CASE 8

Materials & Technique

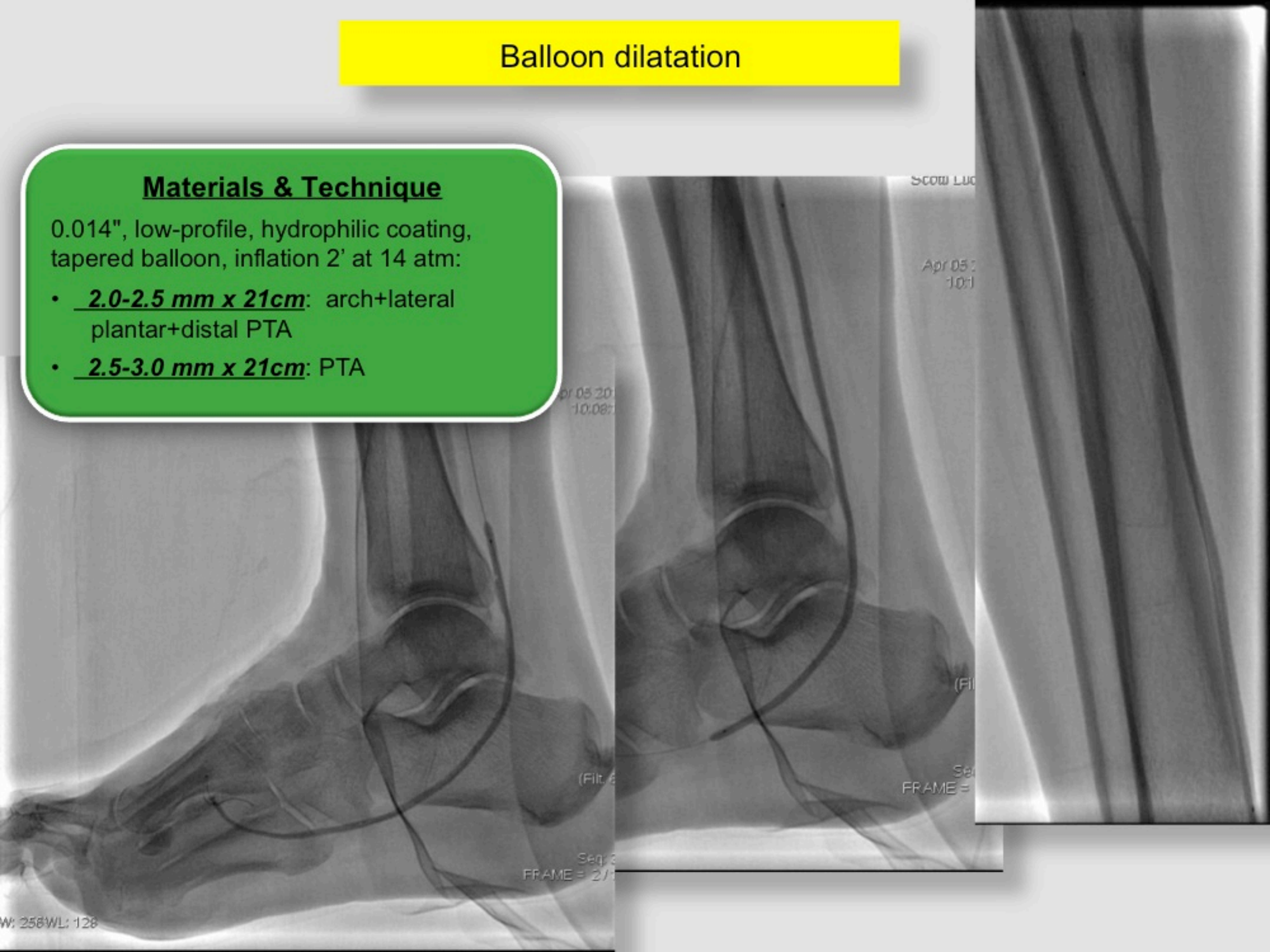
Shift to a 0.014" nitinol wire supported by a low-profile, 0.014", OTW balloon

Balloon dilatation

Materials & Technique

0.014", low-profile, hydrophilic coating, tapered balloon, inflation 2' at 14 atm:

- ***2.0-2.5 mm x 21cm***: arch+lateral plantar+distal PTA
- ***2.5-3.0 mm x 21cm***: PTA

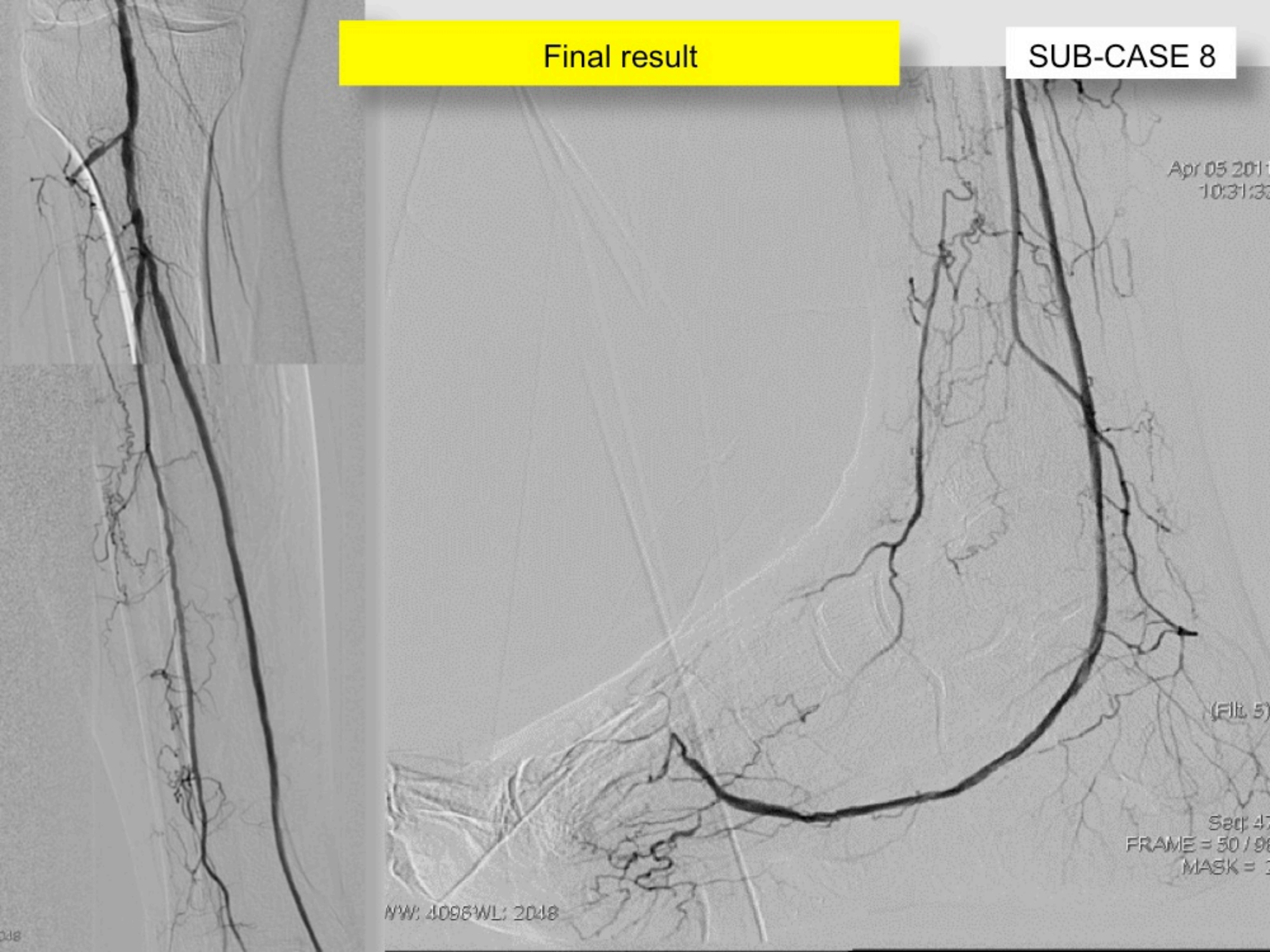


Final result

SUB-CASE 8

Final result

SUB-CASE 8

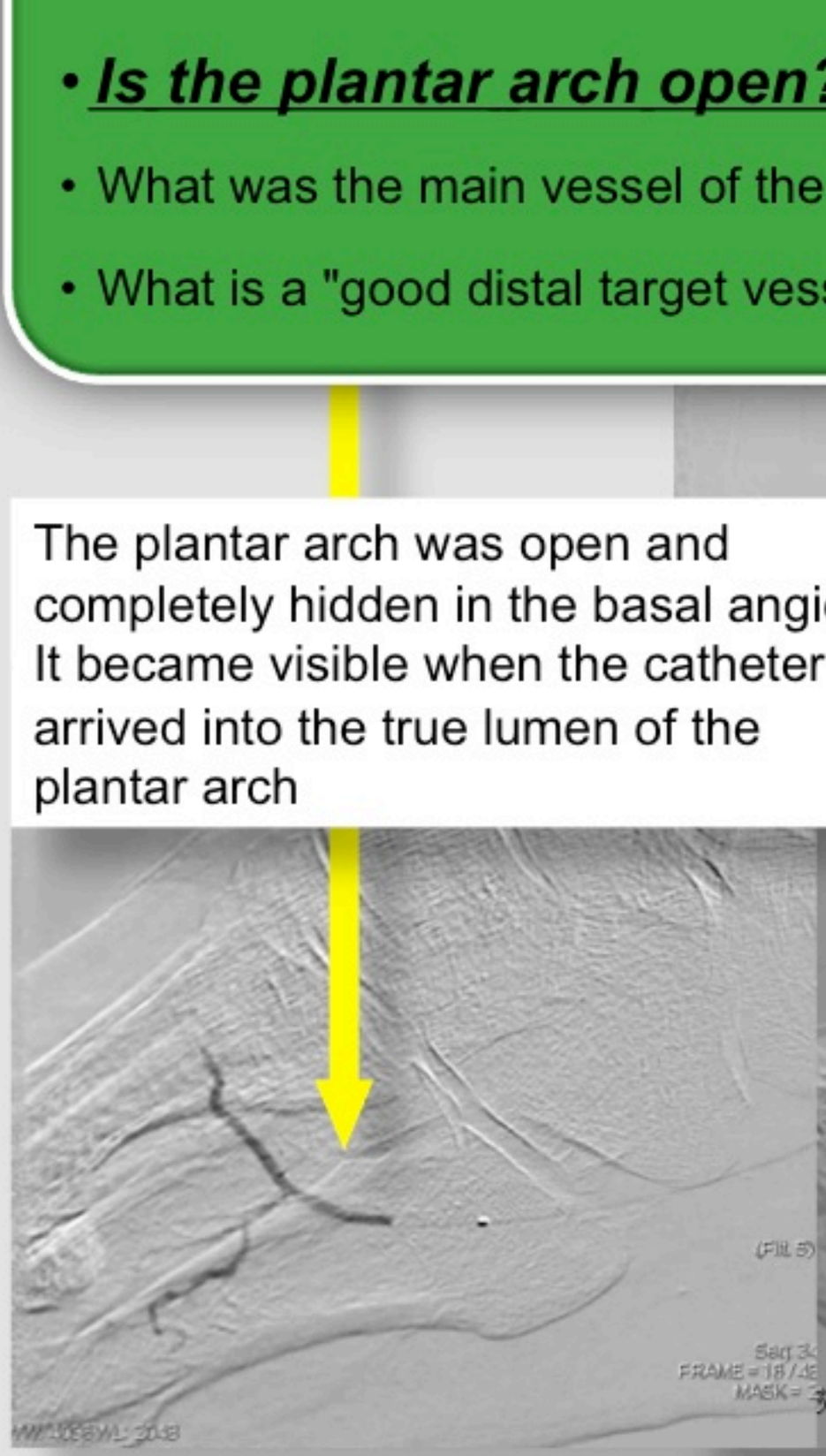


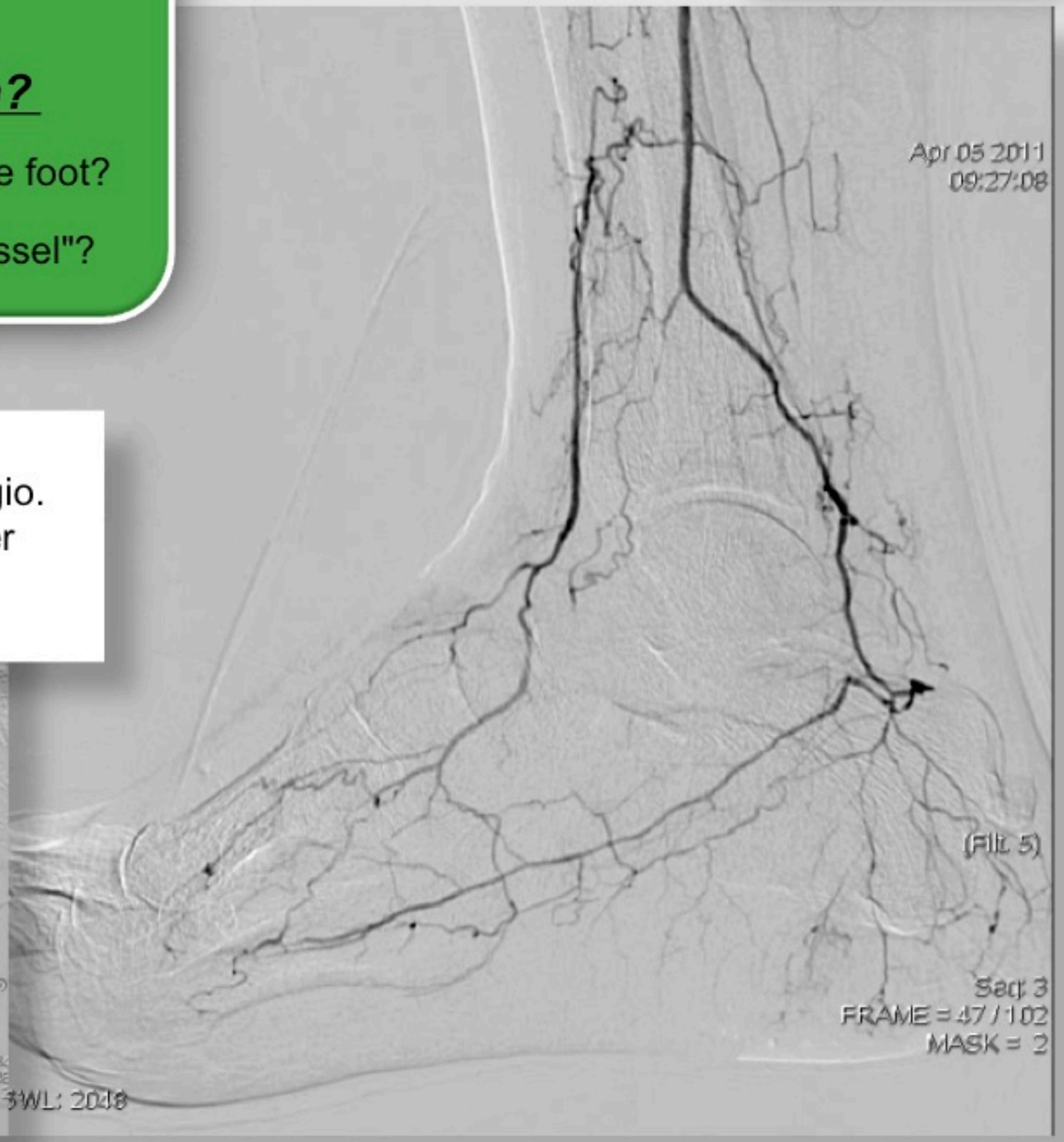
SUB-CASE 8

Questions

- ***Is the plantar arch open?***
- What was the main vessel of the foot?
- What is a "good distal target vessel"?

The plantar arch was open and completely hidden in the basal angio. It became visible when the catheter arrived into the true lumen of the plantar arch





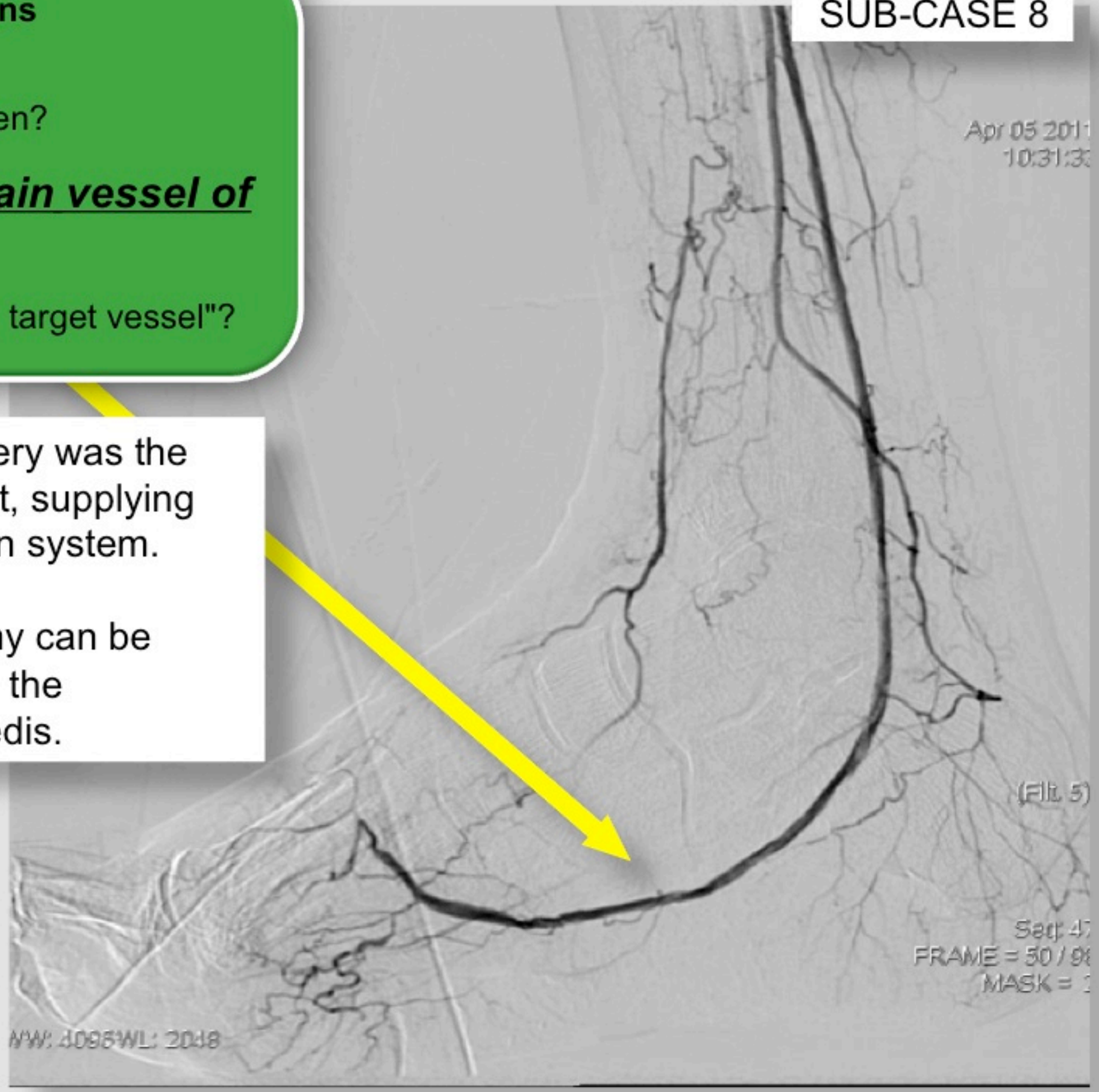
SUB-CASE 8

Questions

- Is the plantar arch open?
- ***What was the main vessel of the foot?***
- What is a "good distal target vessel"?

The lateral plantar artery was the main vessel of the foot, supplying the forefoot distribution system.

This «hidden» anatomy can be supposed considering the hypoplasic dorsalis pedis.



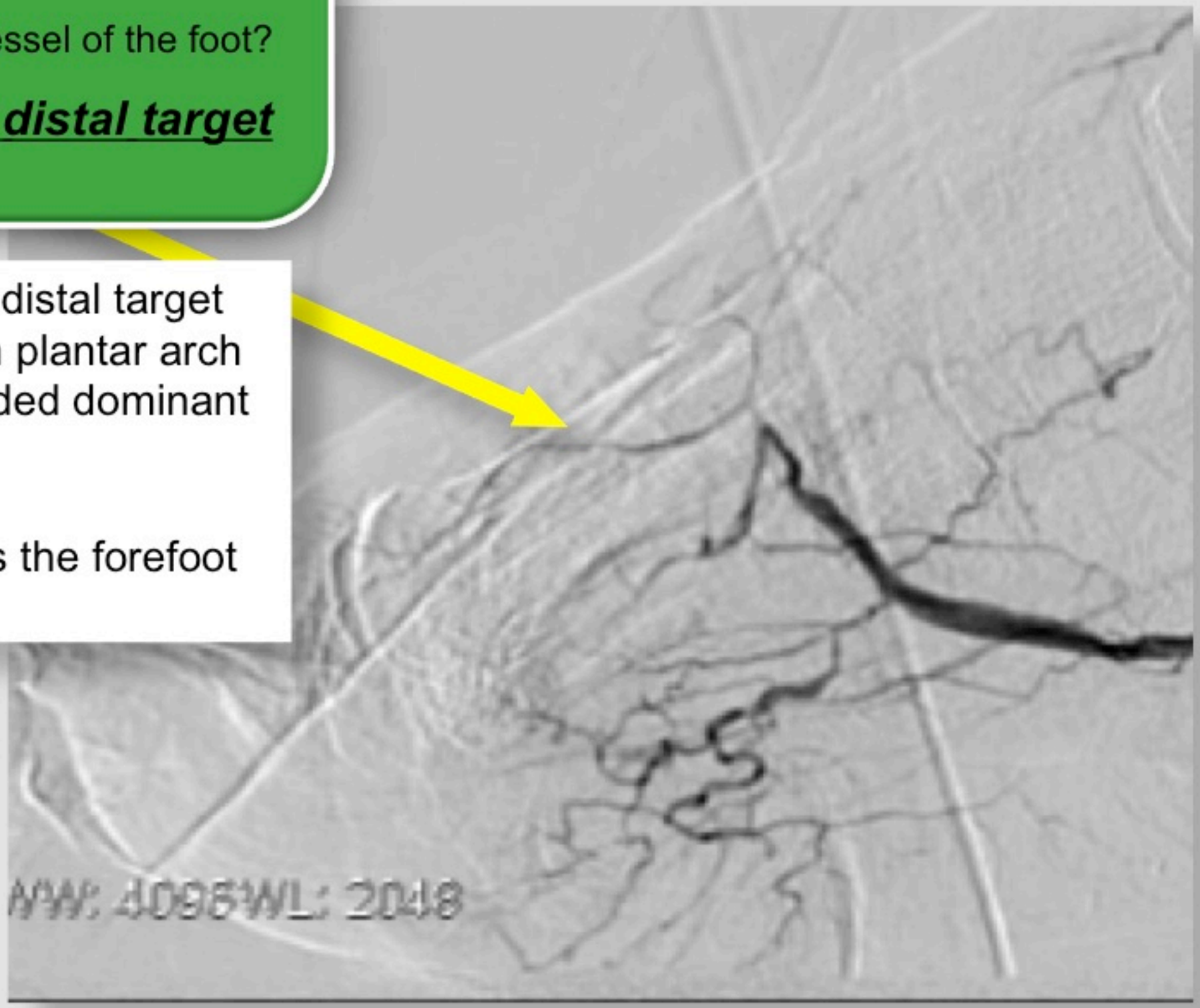
SUB-CASE 8

Questions:

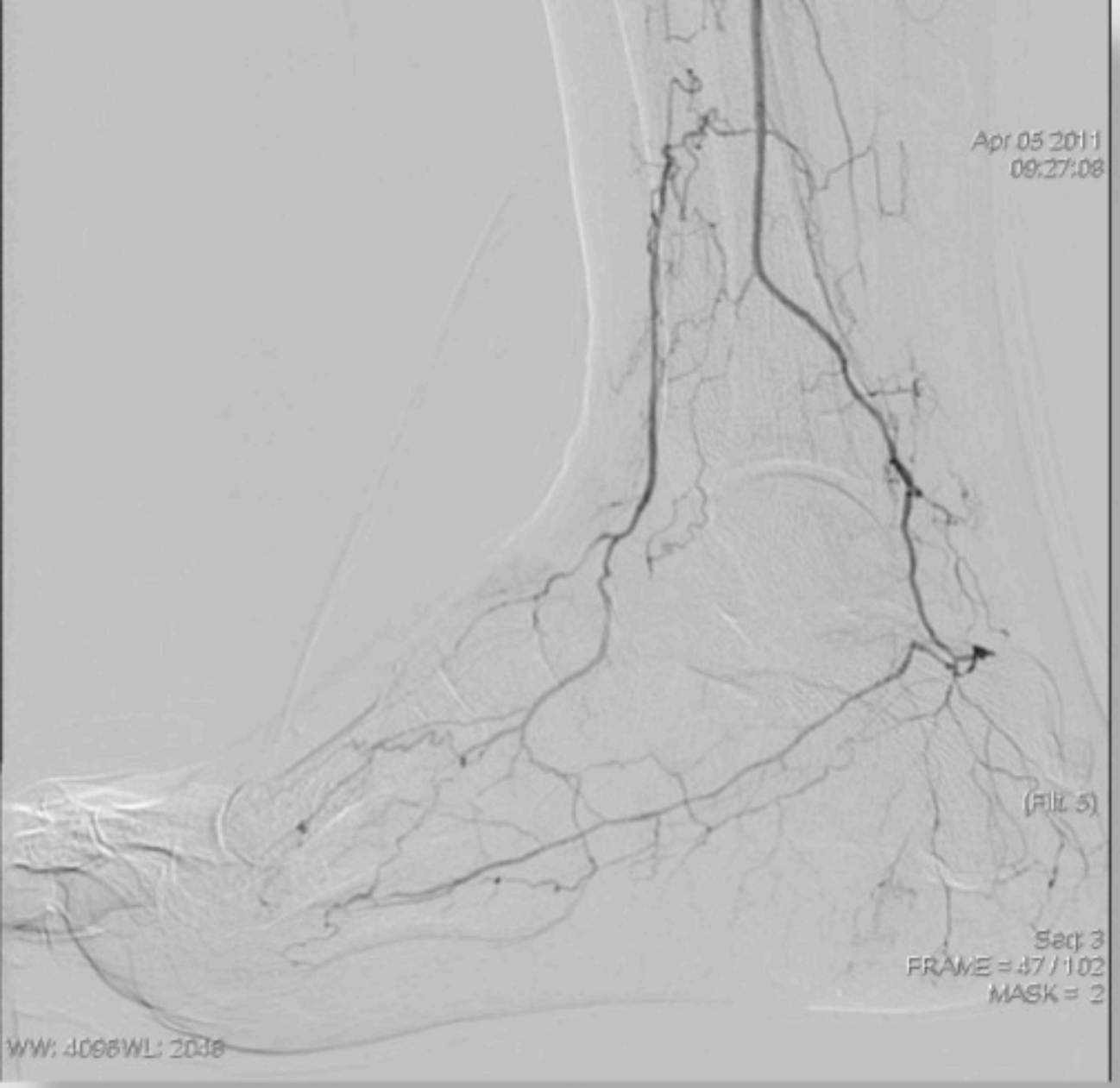
- Is the plantar arch open?
- What was the main vessel of the foot?
- ***What is a "good distal target vessel"?***

In this case the “good distal target vessel” was an hidden plantar arch derived from an occluded dominant lateral plantar artery.

This vessel represents the forefoot distribution system.



SUB-CASE 8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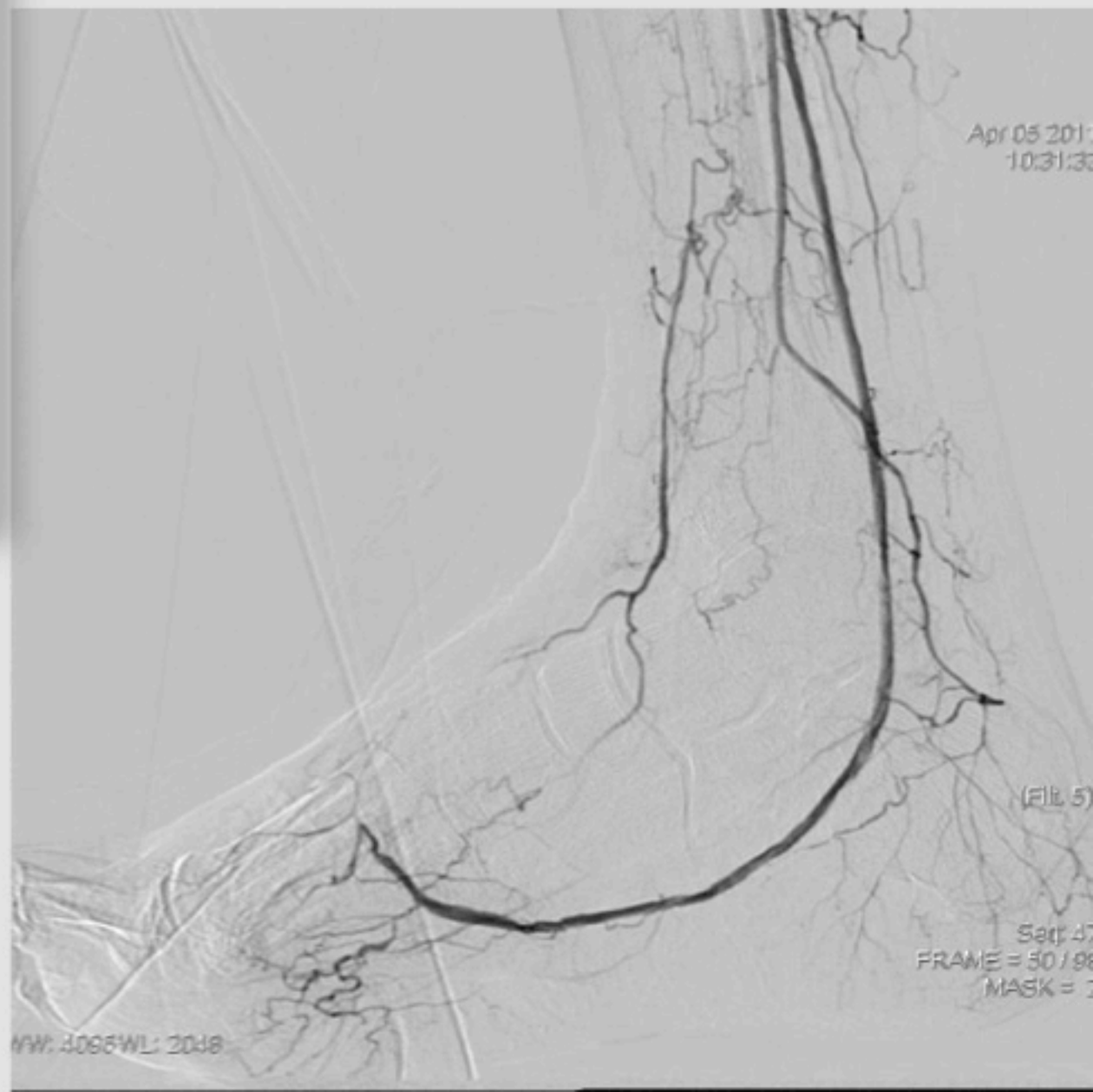
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WW: 4096 WL: 2048

Subintimal approach: looking for a “good distal target vessel”

SUB-CASE 9

PATIENT DATA

- 66-year-old male
- Type 2 DM
- HBP
- Toe ulcers

DIAGNOSIS

SUB-CASE 9

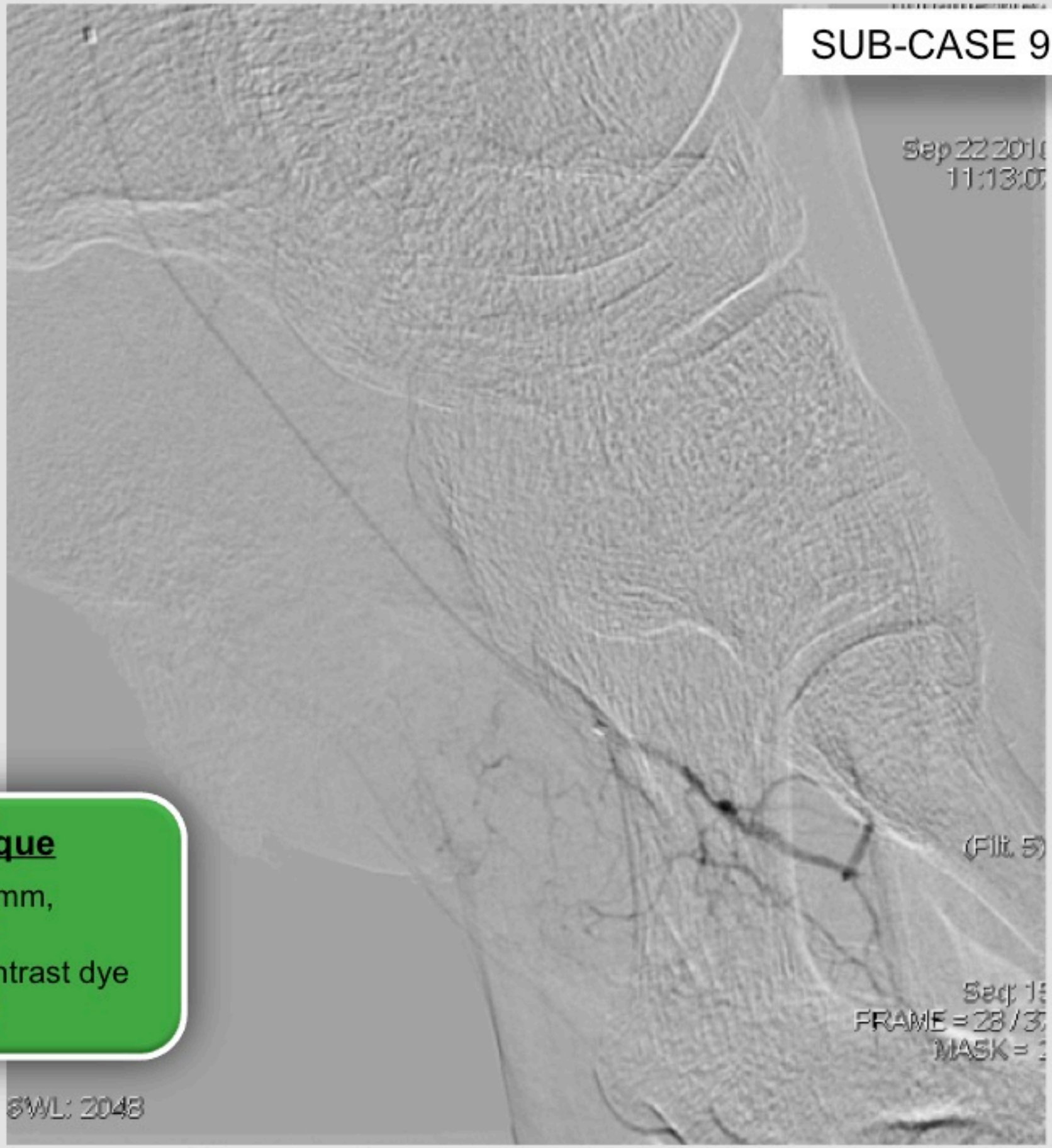
- Good FEM-POP patency
- PTA CTO
- Occluded lateral plantar artery

SUB-CASE 9

Materials & Technique

- Ber 4 Fr hydrophilic diagnostic catheter
- 0.035”/1.5mm, nitinol, hydrophilic wire

SUB-CASE 9

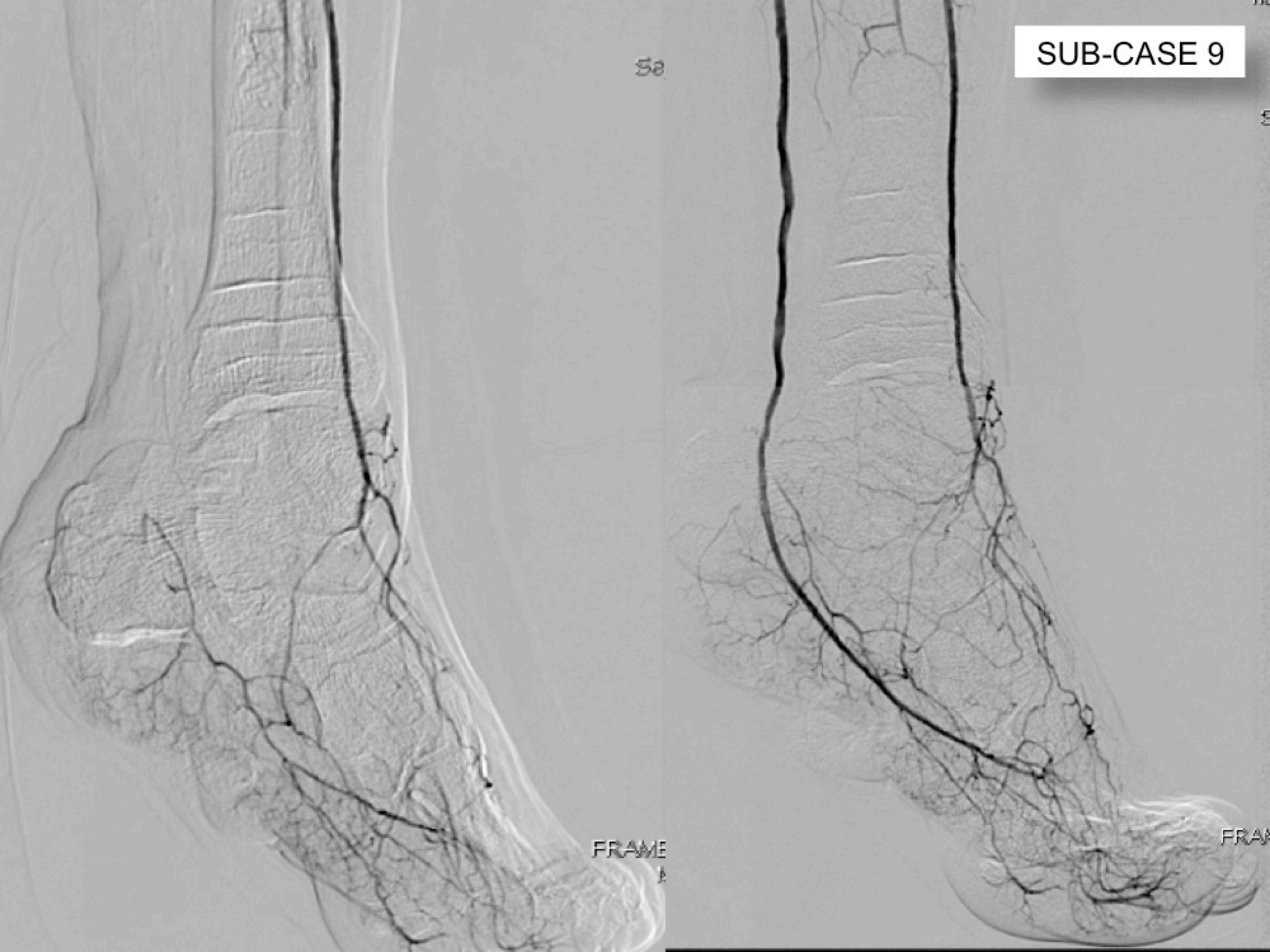


Materials & Technique

- Low-profile, 0.014”, 2.0x80mm, hydrophilic-coated balloon
- Slow injection of diluted contrast dye through the balloon lumen

SUB-CASE 9

SUB-CASE 9



Subintimal approach

1. General principles
2. How to get the subintimal space
3. Bifurcation treatment
4. Looking for a “good distal target vessel”
5. Re-entry into the true distal lumen

Traditional way

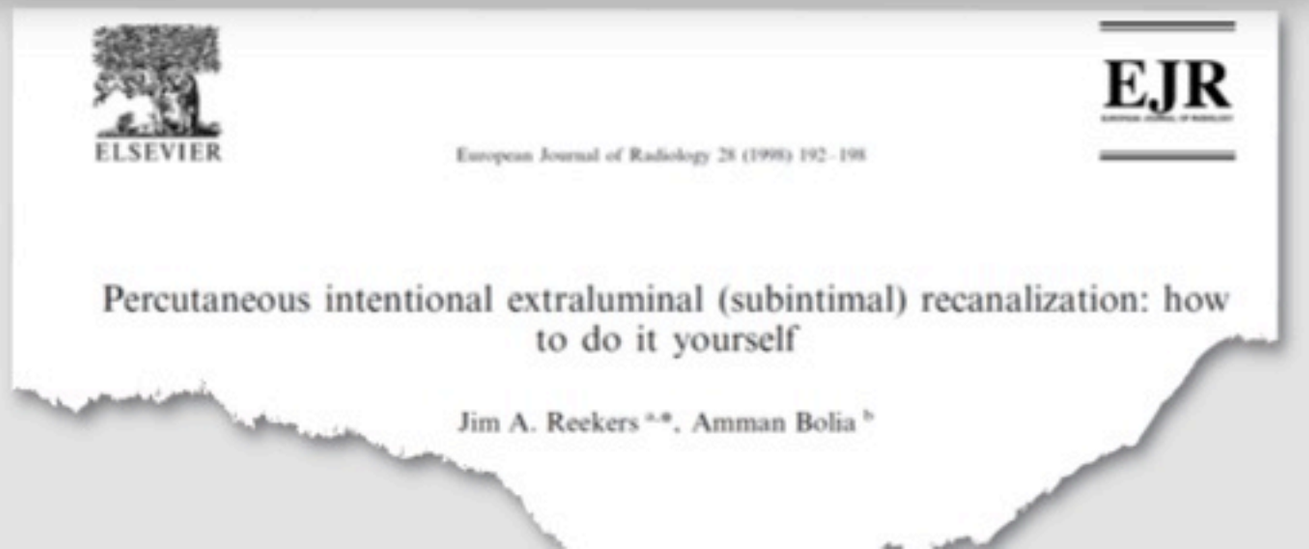
New approaches

Re-entry into the true distal lumen: traditional approach

One of the major issues of the subintimal approach is how and where to re-enter into the true distal lumen, the main imperative being not to damage the healthy distal vessel, which might be the target for a surgical bypass. The traditional way to re-enter consists in a simple pushing of the looped wire towards the patent distal vessel.

Bolia said ***"this is actually not a real step but only a phase that you are not able to control".***

This blind maneuver is appropriate when the open distal lumen is far from a hypothetical landing zone of a distal bypass and there is not calcium or a very low calcium burden.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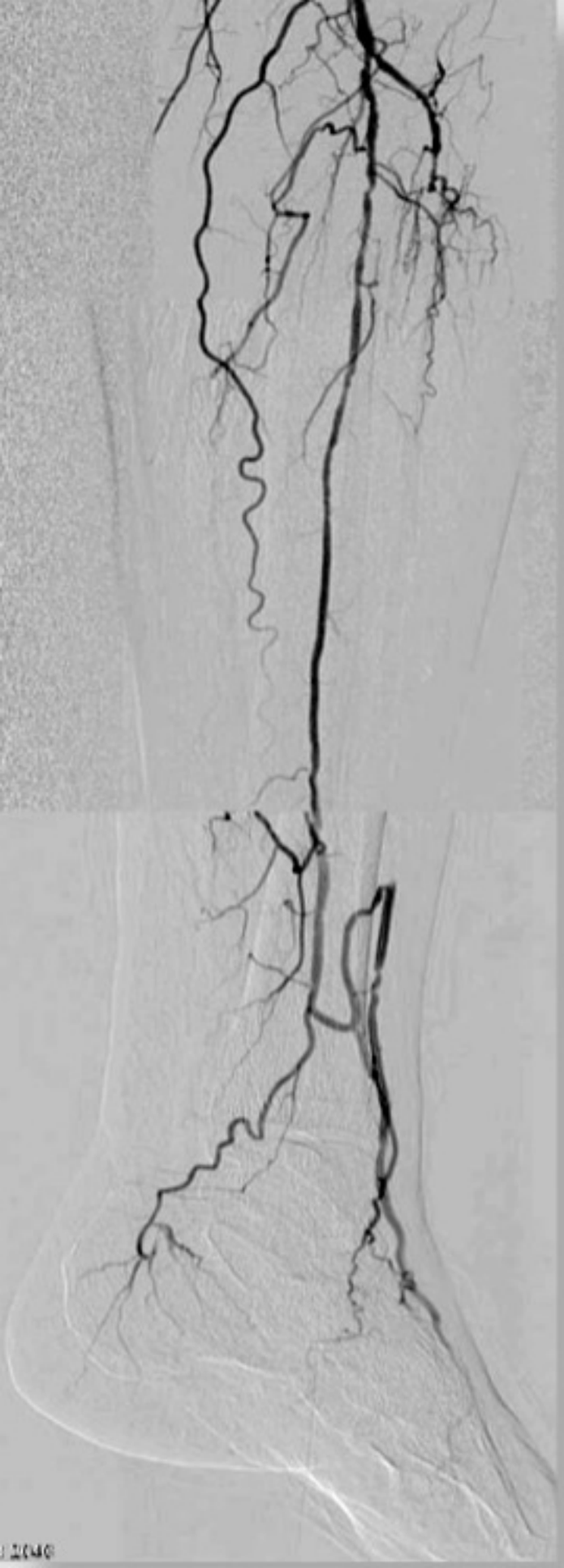
European Journal of Radiology 28 (1998) 192–198

Percutaneous intentional extraluminal (subintimal) recanalization: how to do it yourself

Jim A. Reekers [a,*], Amman Bolia [b]



SUB-CASE 10

Push, push, push…..

Subintimal approach

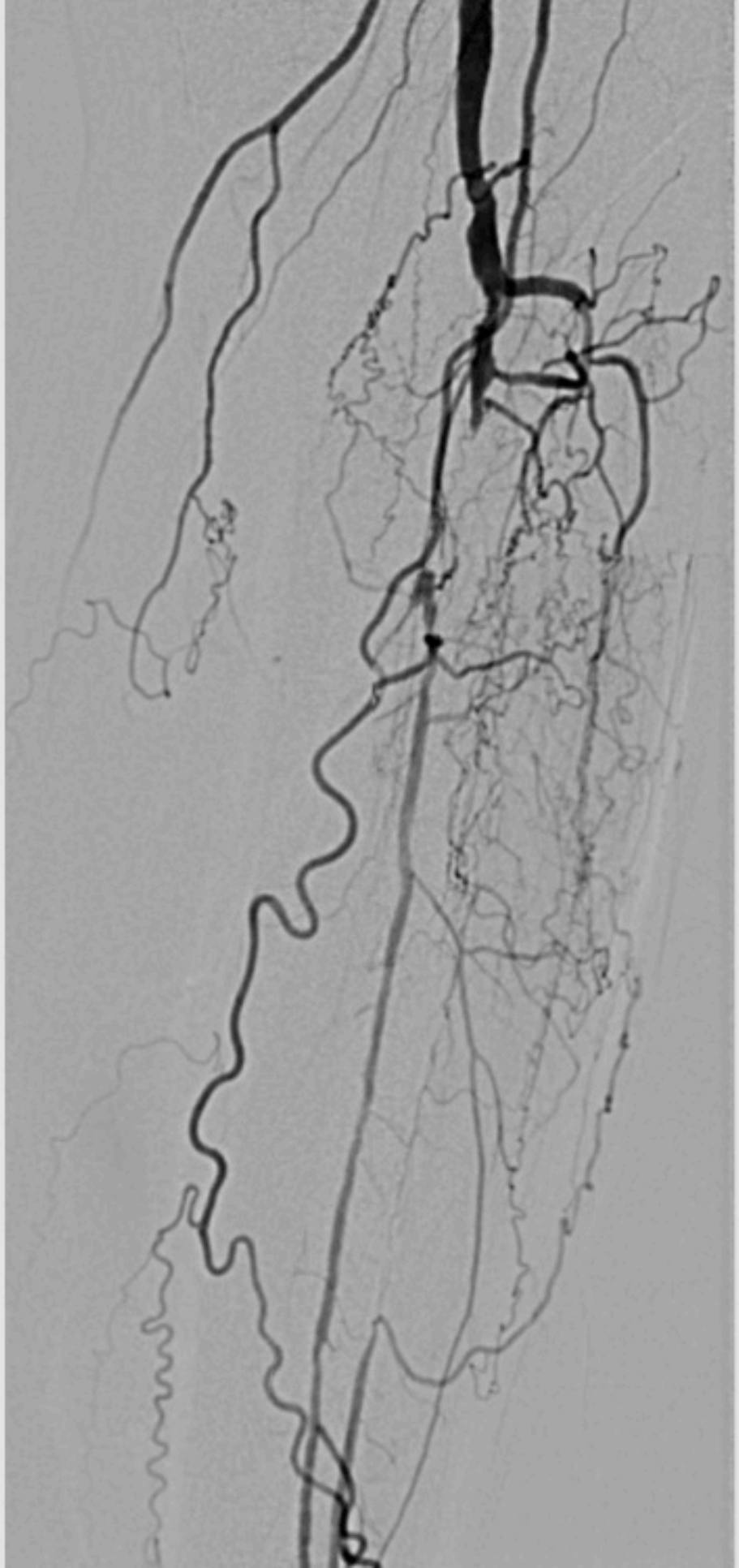
1. **General principles**
2. **How to get the subintimal space**
3. **Bifurcation treatment**
4. **Looking for a "good distal target vessel"**
5. **Re-entry into the true distal lumen**

In case of calcified vessel or poor landing zone or an open distal vessel suitable for a surgical anastomosis (popliteal, dorsalis pedis, distal posterior tibial arteries etc.) re-entry can be dangerous due to the risk of dissecting and damaging the distal artery without entering into the true lumen and precluding a rescue bypass. In these cases we prefer to change approach using a CTO dedicate wire or a retrograde approach.

New approaches

Respect the "landing zone"!!!

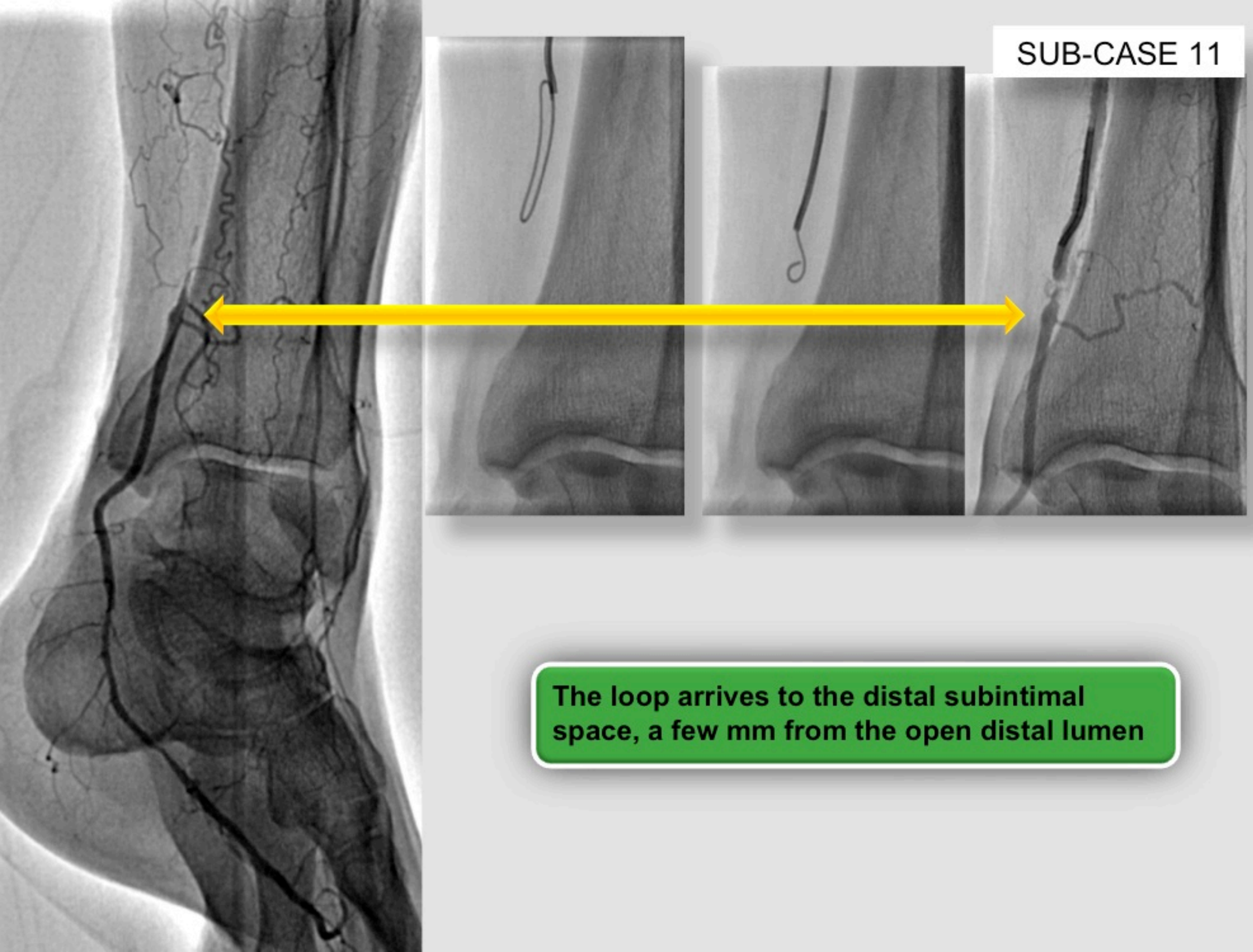
SUB-CASE 11




SUB-CASE 11

SUB-CASE 11

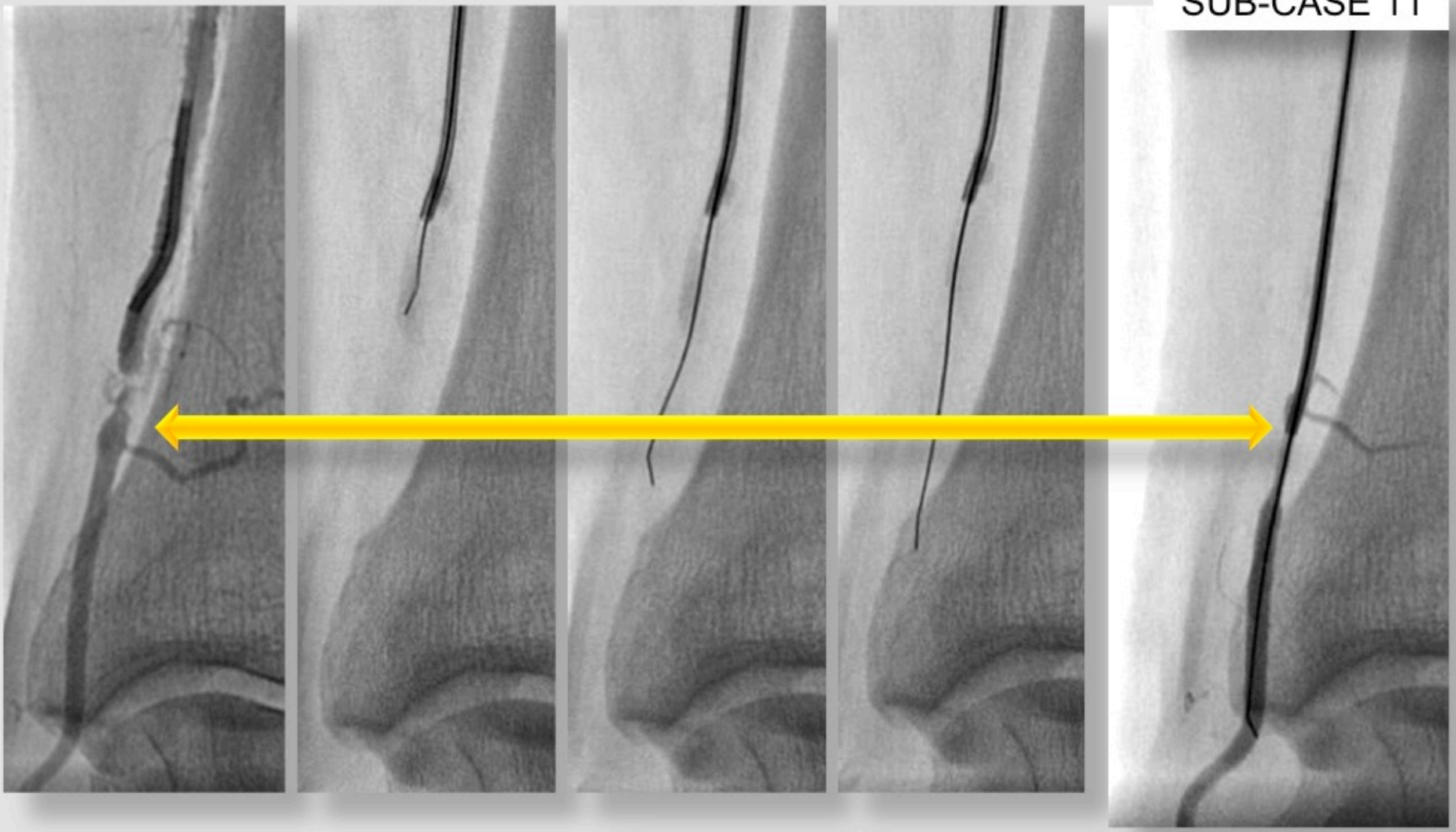
SUB-CASE 11



The loop arrives to the distal subintimal space, a few mm from the open distal lumen

SUB-CASE 11

SUB-CASE 11



0.014”, 12 g tip load, CTOs dedicated wire

SUB-CASE 11

0.014”, low-profile, 2.5-3.0 tapered, 21 cm long balloon, 14 atm.
Note: healthy vessel was not touched: respect the landing zone!

SUB-CASE 11

Final result

SUB-CASE 11

Final result

SUB-CASE 11

Subintimal approach

The main problem in our work (and life…) is constantly choosing between being delicate or violent, simple or complex, thin or thick…

Subintimal approach

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European Journal of Radiology 28 (1998) 192–198

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EUROPEAN JOURNAL OF RADIOLOGY

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“We hope that after this introduction you will feel more reassured to start with this interesting technique”

Subintimal approach

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