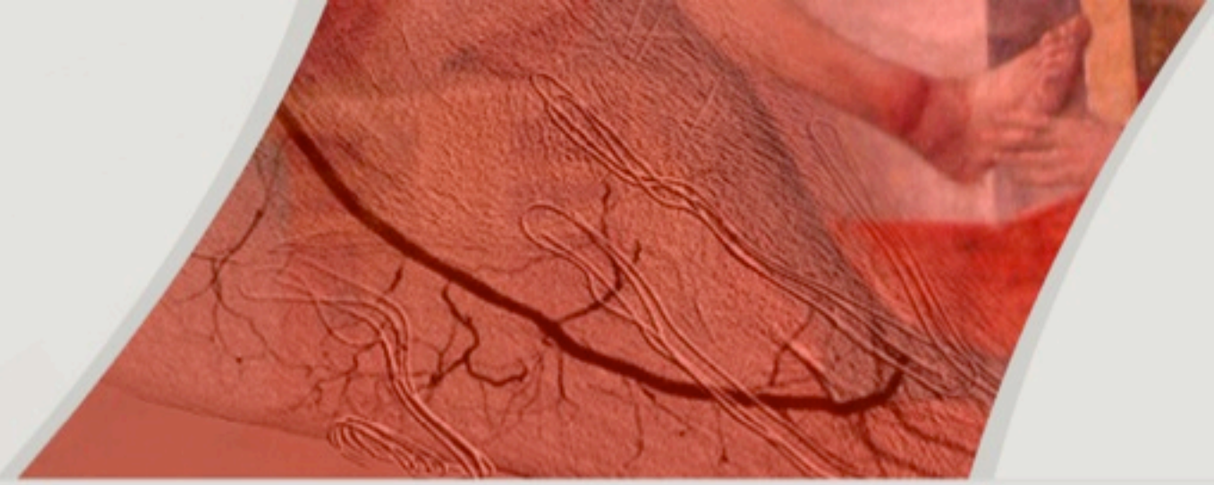
Anatomical Variability
of BTK & Foot Vessels

Roberto Ferraresi
Peripheral Interventional Unit
www.robertoferraresi.it

HUMANITAS GAVAZZENI
Bergamo
Italy

Anatomical Variability

of BTK & Foot Vessels



POP bifurcation
- Patterns and Angiographic Study

Distal BTK vessels distribution patterns
- Standard Distribution
  - Case 1
  - Case 2
  - Case 3

Anterior dominant PER Artery
  - Case 1
  - Case 2
  - Case 3

Posterior Dominant PER Artery
  - Case 1
  - Case 2

Single PER artery
  - Case 1
  - Case 2

FOOT vessels distribution patterns

Anatomical variability of BTK & FOOT vessels

- POP bifurcation
- Distal BTK vessels distribution
- FOOT vessels distribution

POP-bifurcation pattern

Surgical Significance of Popliteal Arterial Variants

A Unified Angiographic Classification

DUCKSOO KIM, M.D.,* DAN E. ORRON, M.D.,* and JOHN J. SKILLMAN, M.D.†

Ann. Surg. • December 1989

Clinical Anatomy 13:347–383 (2000)

Clinical Anatomy of the Popliteal Blood Vessels

LEANNE CROSS,[1] JOHN HALL,[2] THOMAS R. HOWDIESHELL,[3] GENE L. COLBORN,[4] AND THOMAS F. GALE[4]*

Surg Radiol Anat (2009) 31:357–362
DOI 10.1007/s00276-008-0454-y

ORIGINAL ARTICLE

Branching patterns of the popliteal artery and its clinical importance

Zuhal Ozgur · Hulya Ucerler · Z. Asli Aktan Ikiz

Clinical Radiology (2006) 61, 696–699

Popliteal artery branching patterns—an angiographic study

C.P. Day*, R. Orme

Vascular Diagnostics

Variations in Anatomy of the Popliteal Artery and Its Side Branches

Rogier H. J. Kropman, MD[1], Geraldine Kiela, MD[2], Frans L. Moll, MD, PhD[2], and Jean-Paul P. M. de Vries, MD, PhD[1]

Vascular and Endovascular Surgery
45(6) 536-540
© The Author(s) 2011
Reprints and permission:
sagepub.com/journalsPermissions.nav
DOI: 10.1177/1538574411409065
http://ves.sagepub.com
SAGE

Cardiovasc Intervent Radiol (2009) 32:233–240
DOI 10.1007/s00270-008-9460-z

CLINICAL INVESTIGATION

Anatomical Variations of the Popliteal Artery and its Tibial Branches: Analysis in 1242 Extremities

Sung-Won Kil · Gyoo-Sik Jung

POP-bifurcation pattern

Standard

Pure trifurcation

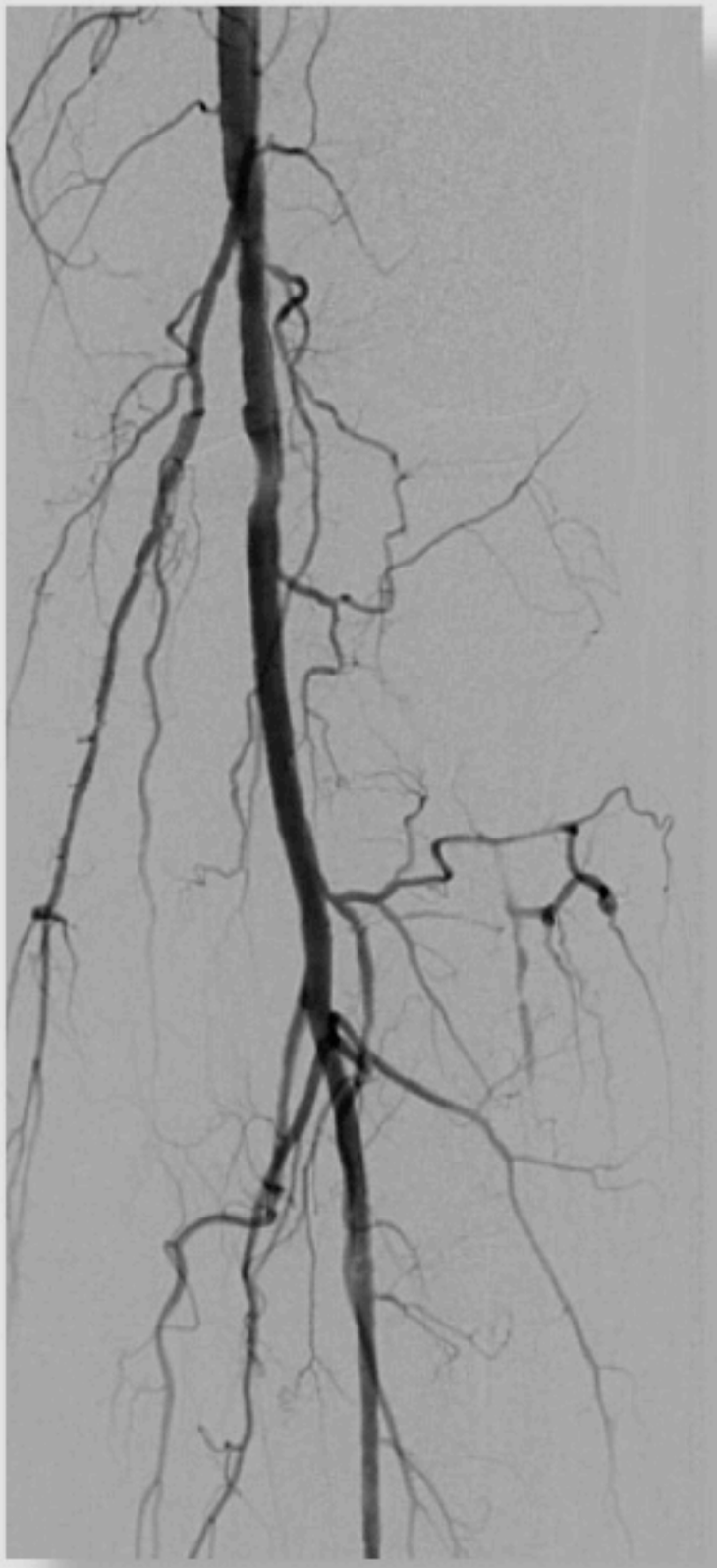
High origin of ATA

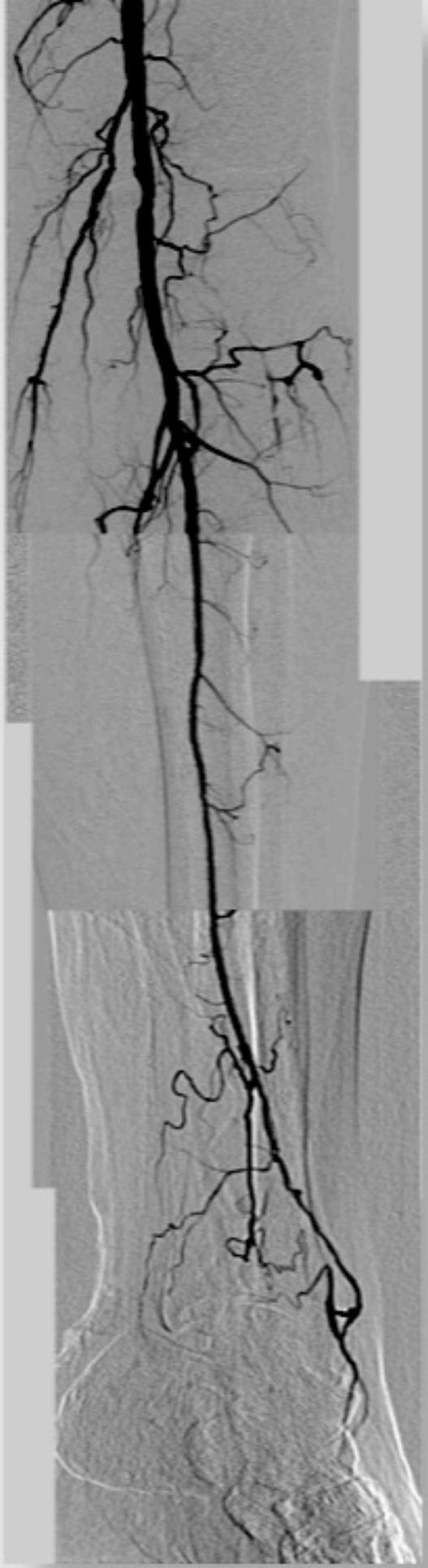
High origin of PTA

High origin of ATA

High origin of ATA

Where is the ATA origin?





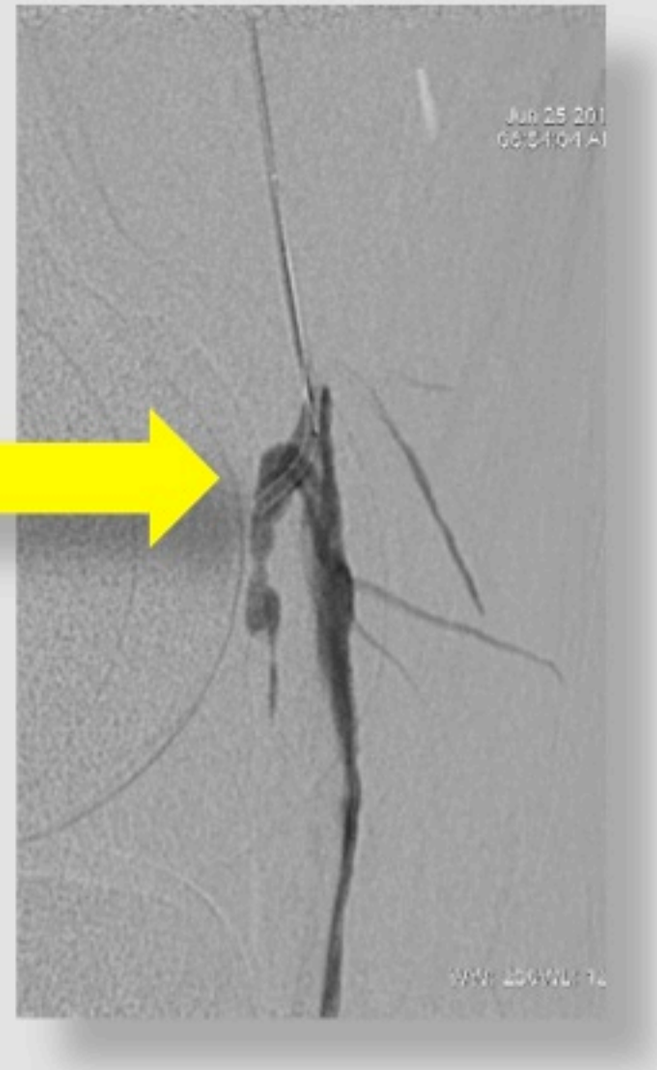
High origin of ATA

Lateral angio

High origin of ATA

AP

Lateral



High origin of ATA

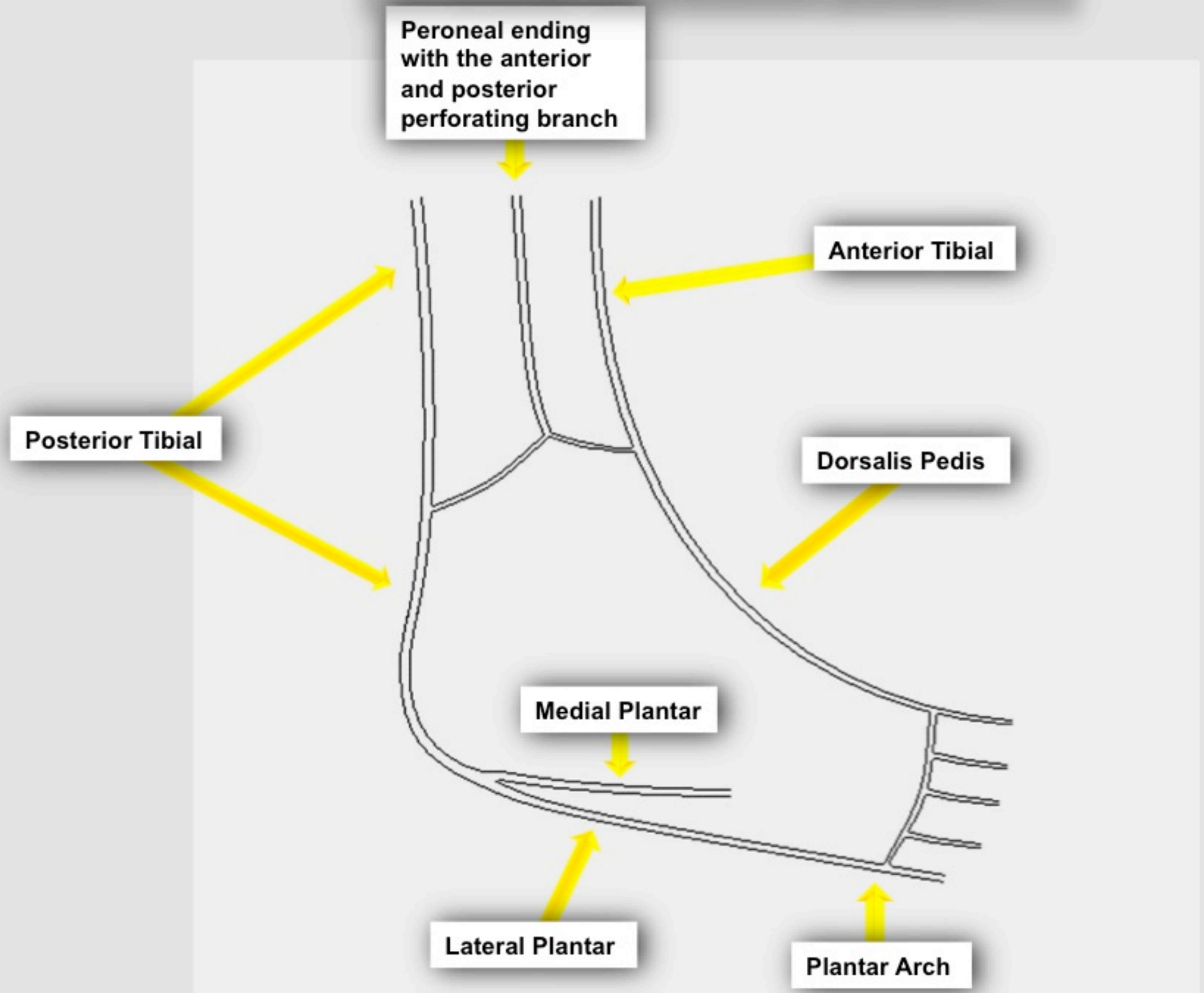
Final result

High origin of ATA

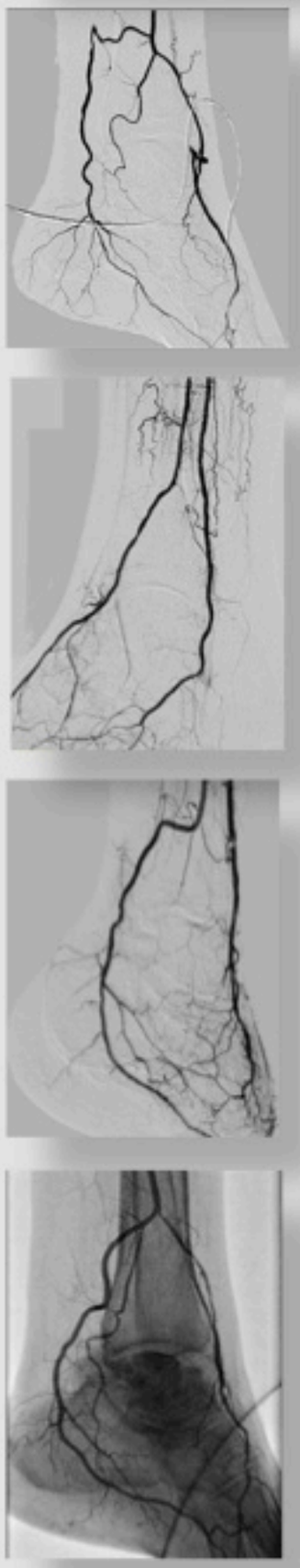
Anatomical variability of BTK & FOOT vessels

- POP bifurcation
- Distal BTK vessels distribution
- FOOT vessels distribution

Distal distribution pattern



Distal distribution pattern: 3,150 studied legs (2000-2012)



1) Standard distribution: "balanced circulation" **94.8%**

2) Anterior dominant PER artery **2.4%**

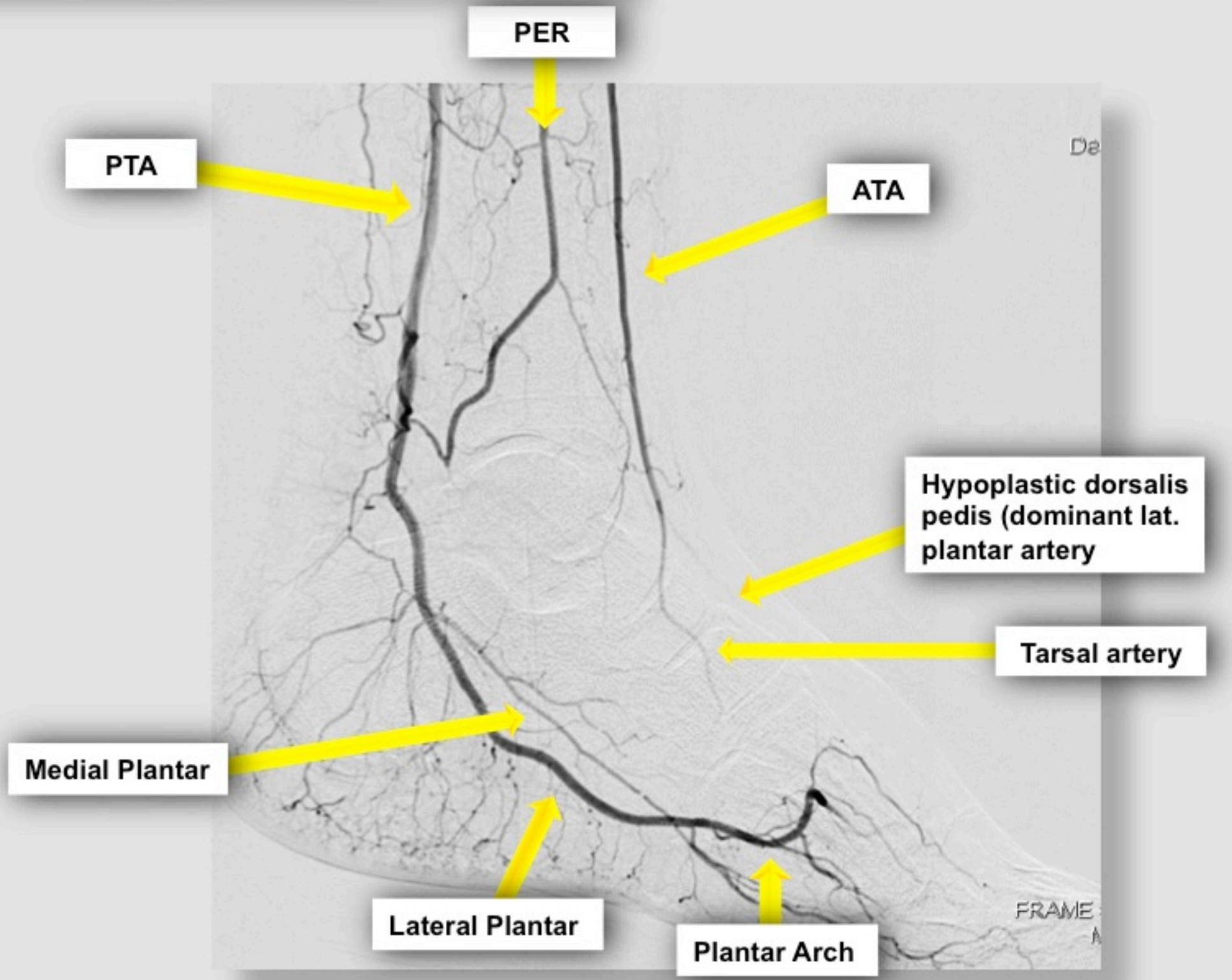
3) Posterior dominant PER artery **1.9%**

4) "Single" PER artery **0.9%**

Anatomical variations: **5.2%**

CASE 1

1) Standard distribution: “balanced circulation” **94.8%**



1) Standard distribution: “balanced circulation” **94.8%**

CASE 2

PER

The posterior perforating branch of PER gives blood to the retromalleolar segment of PTA

ATA occluded: the anterior perforating branch of PER gives blood to the dorsalis pedis

Medial Plantar

Lateral Plantar

Plantar Arch

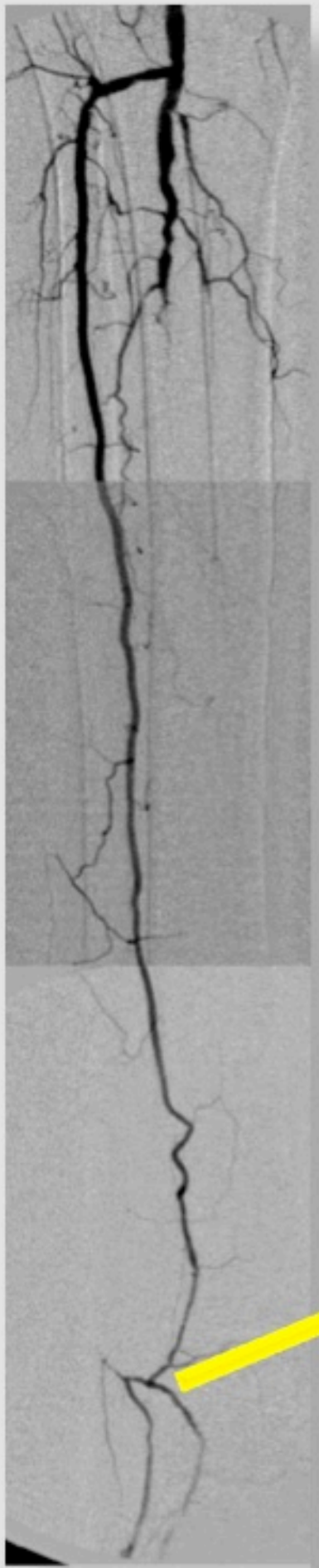
CASE 3

1) Standard distribution: “balanced circulation” **94.8%**

2) Anterior dominant PER artery **2.4%**

CASE 1

CASE 1



- Occlusion of PER and PTA
- Hypoplastic ATA that is typically thin & tortuous
- Note the “termino-lateral” end of ATA in a tarsal artery
- Where is the origin of dorsalis pedis?

Berenstein catheter in the subintimal space of distal PER

CASE 1

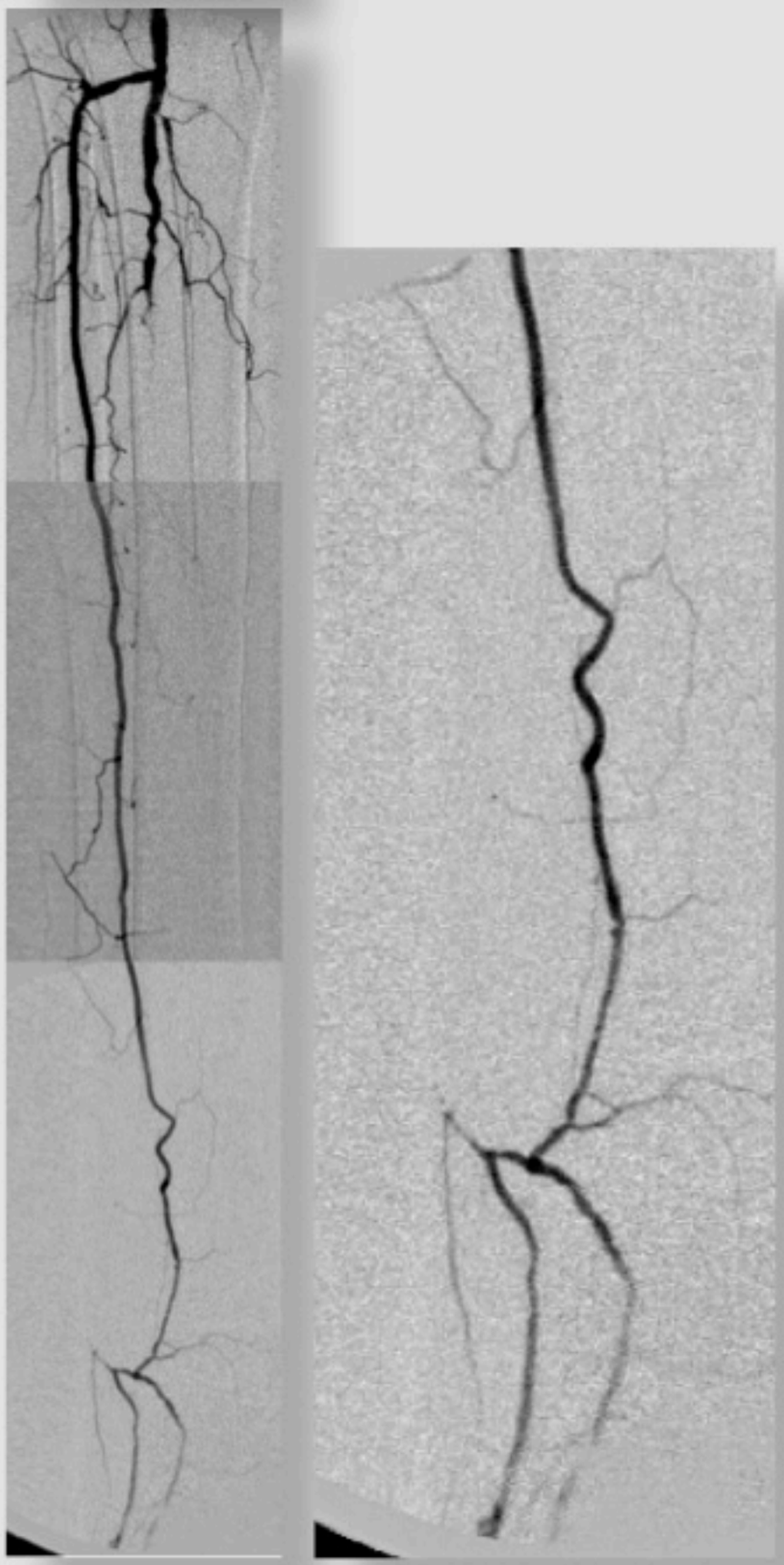
Final result after subintimal angioplasty of PER

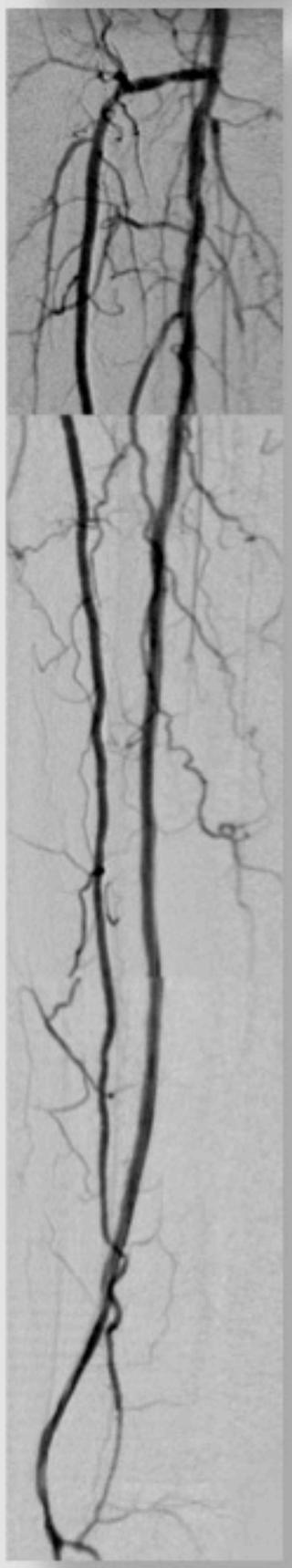
CASE 1

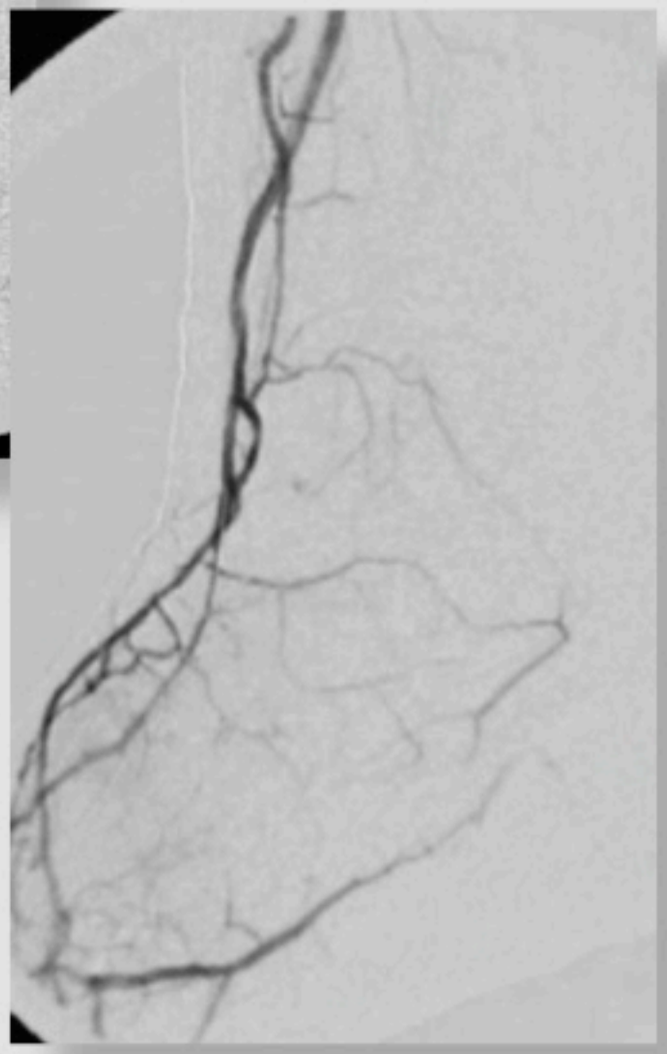
Before

After

CASE 1



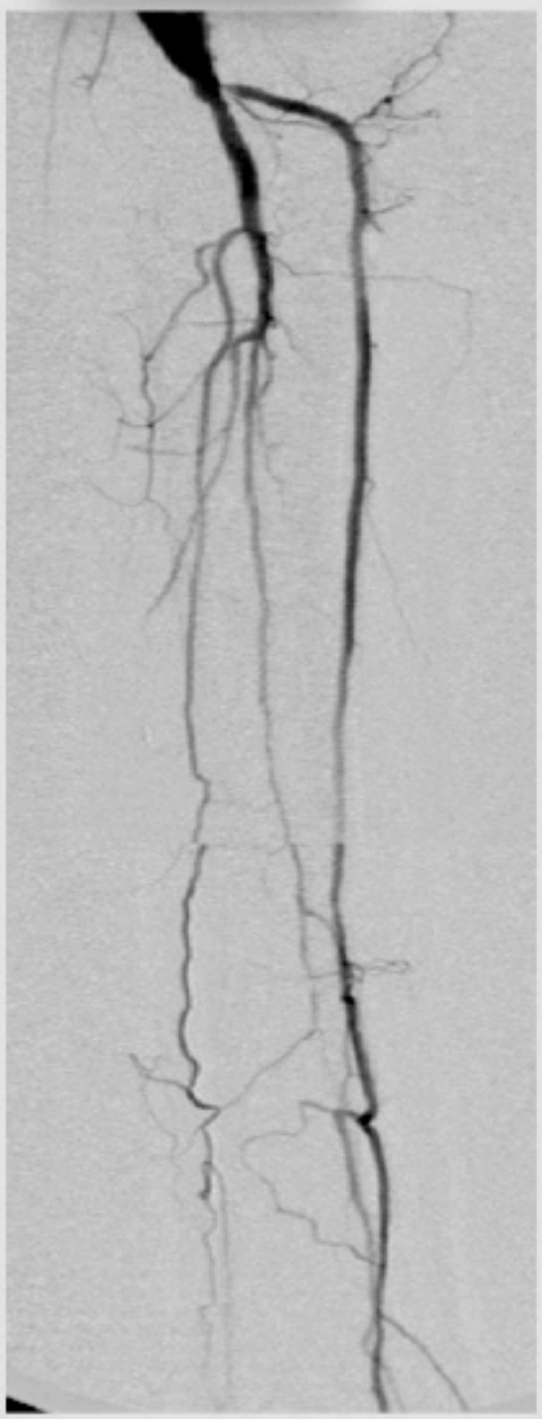




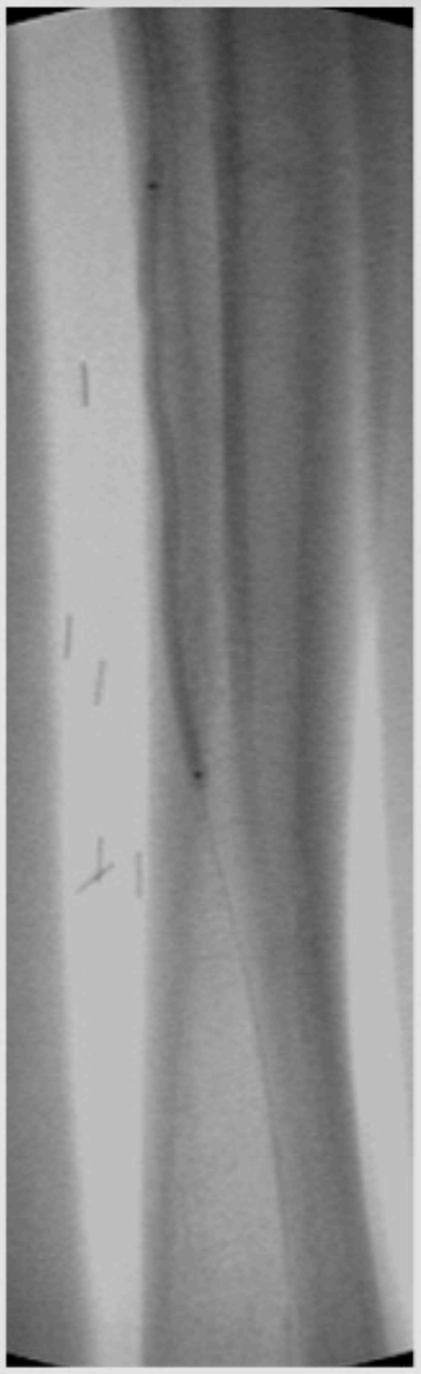
2) Anterior dominant PER artery **2.4%**

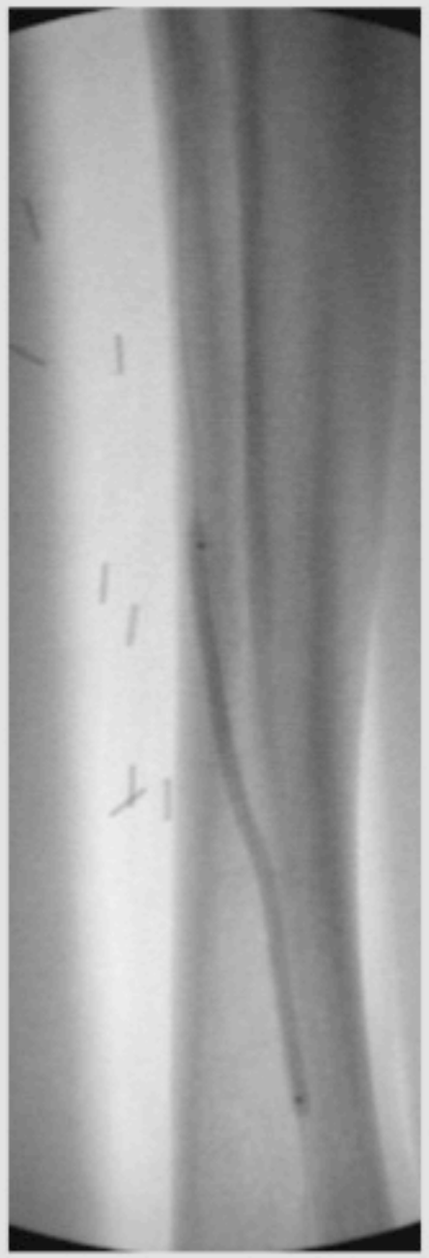
CASE 2

Basal

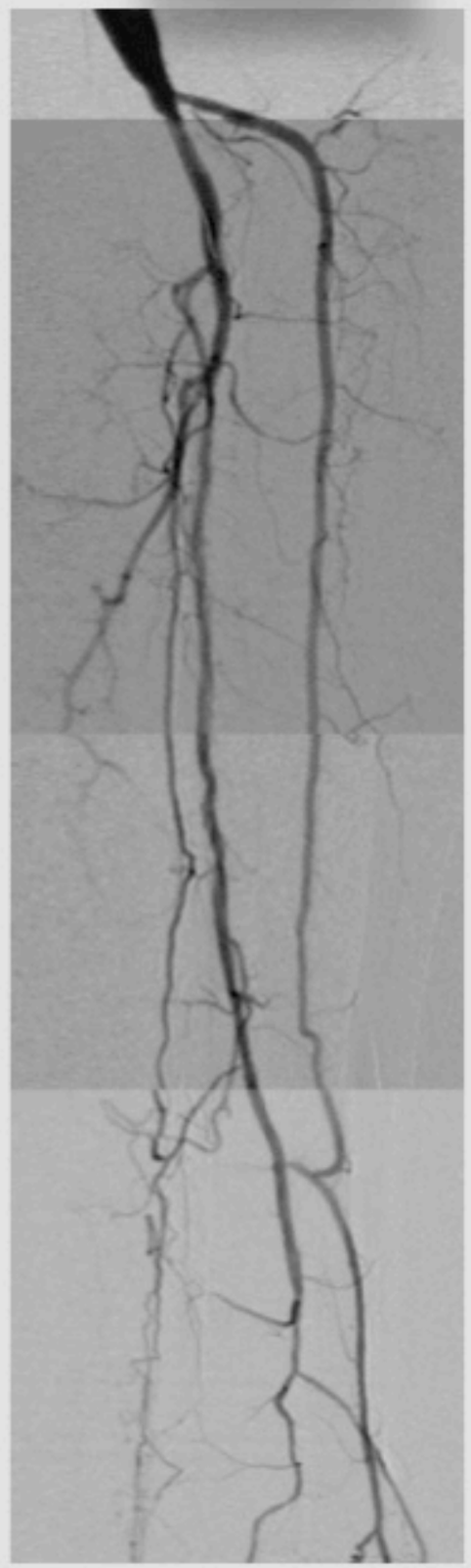


Balloon angioplasty of PER

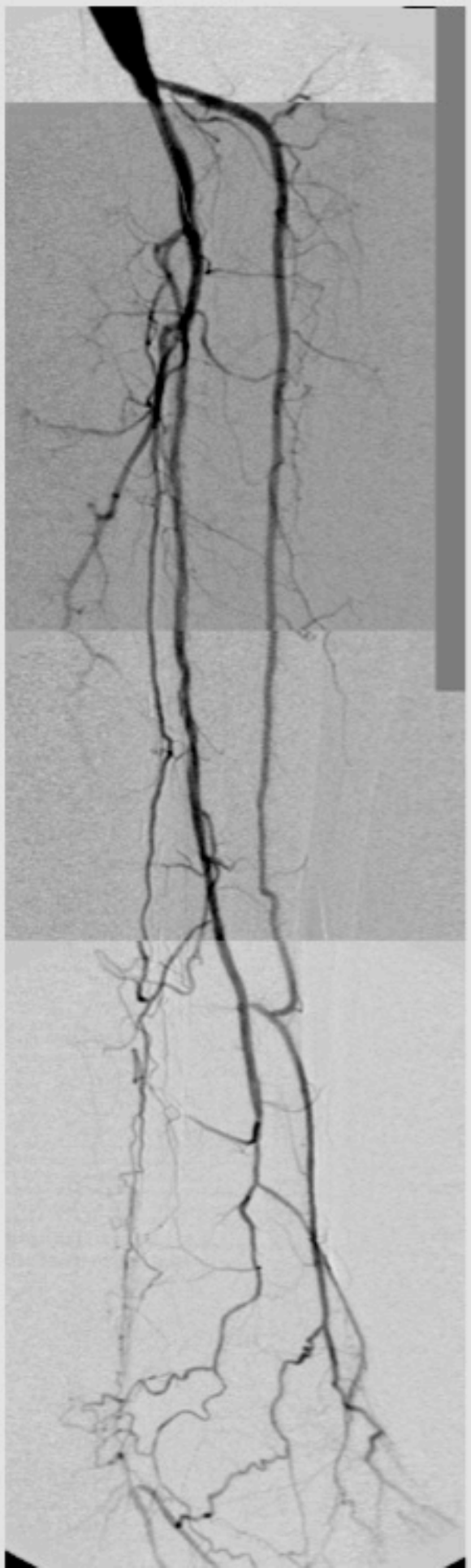


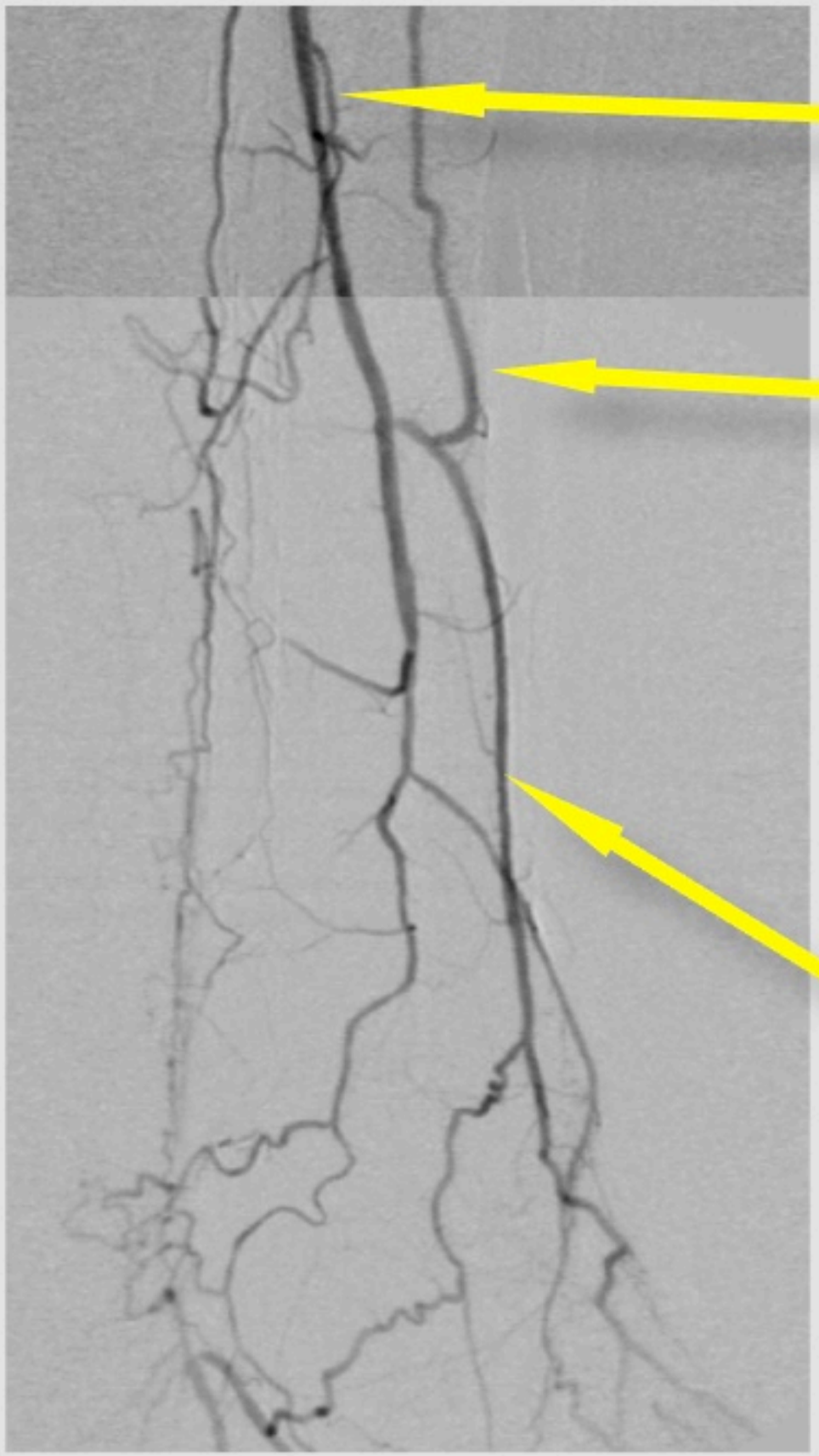


After



CASE 2





Dominant PER

Distal end of hypoplastic ATA

Dorsalis pedis comes from PER

2) Anterior dominant PER artery **2.4%**

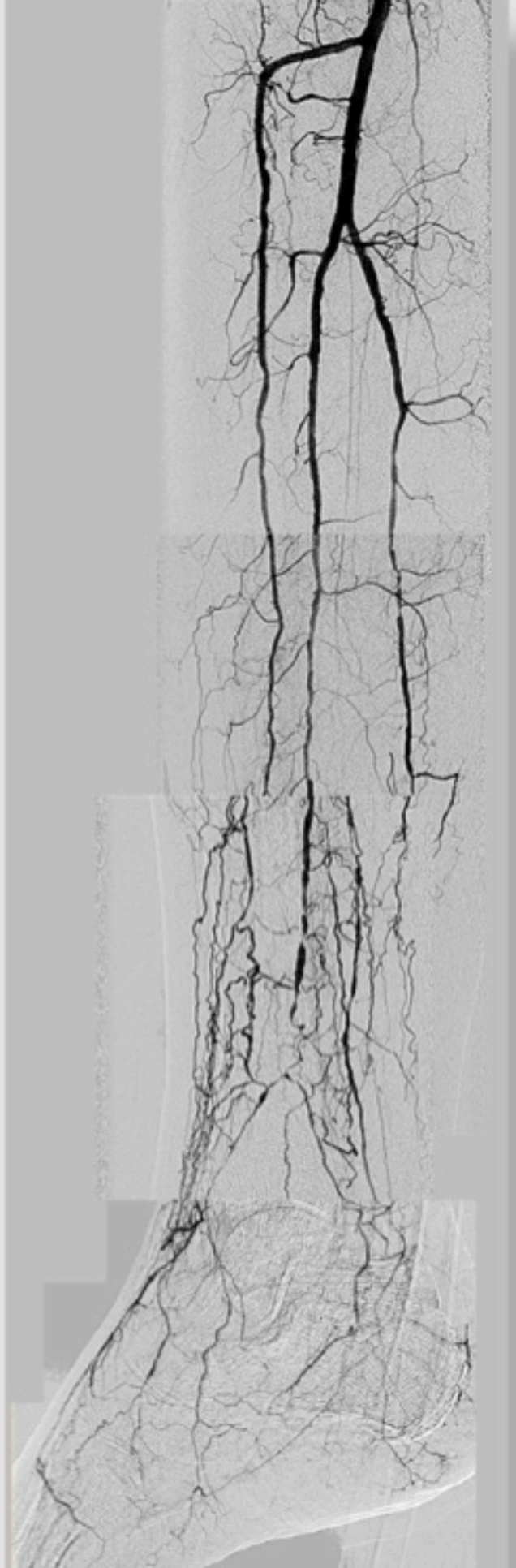
CASE 3

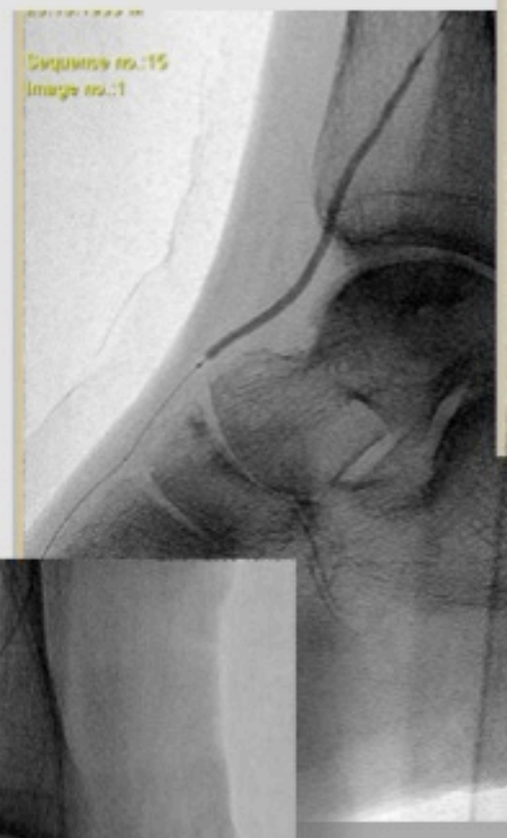
hypoplasic ATA

Distal PER bifurcation

PER balloon angioplasty

CASE 3

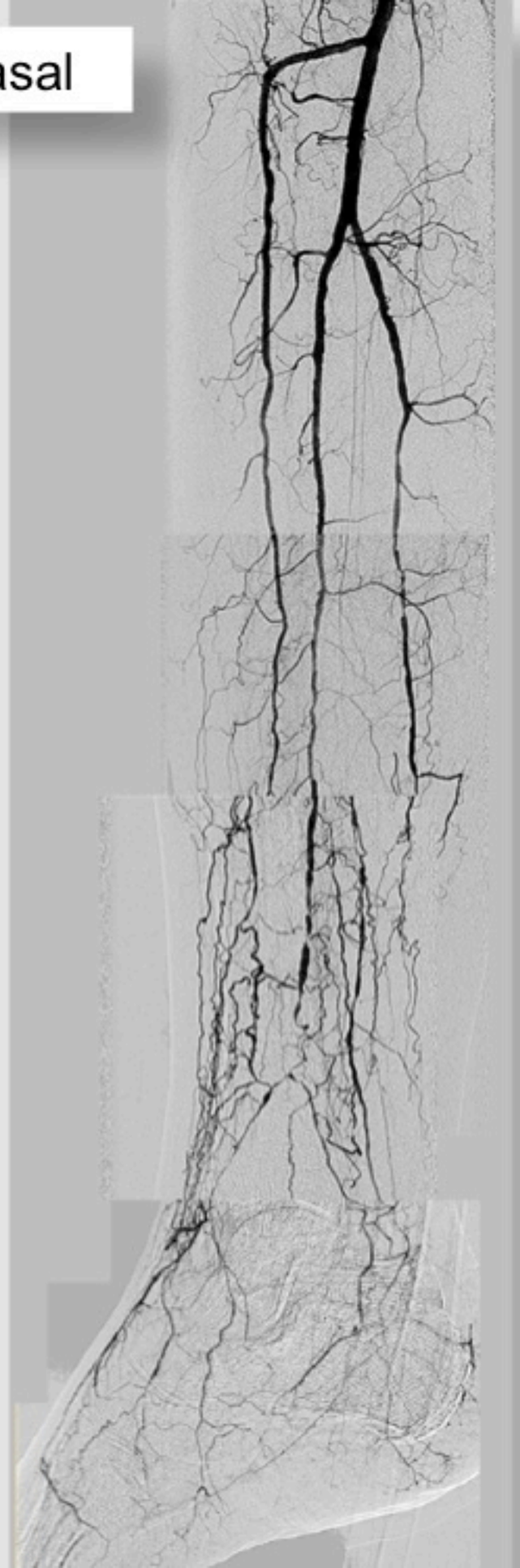




Final result

CASE 3

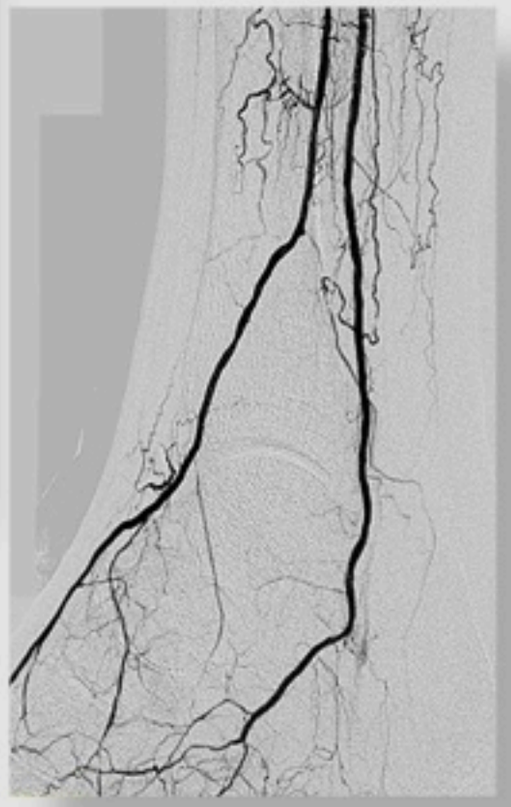
Basal



After angioplasty of PER and PTA

CASE 3

2) Anterior dominant PER artery **2.4%**



CASE 1

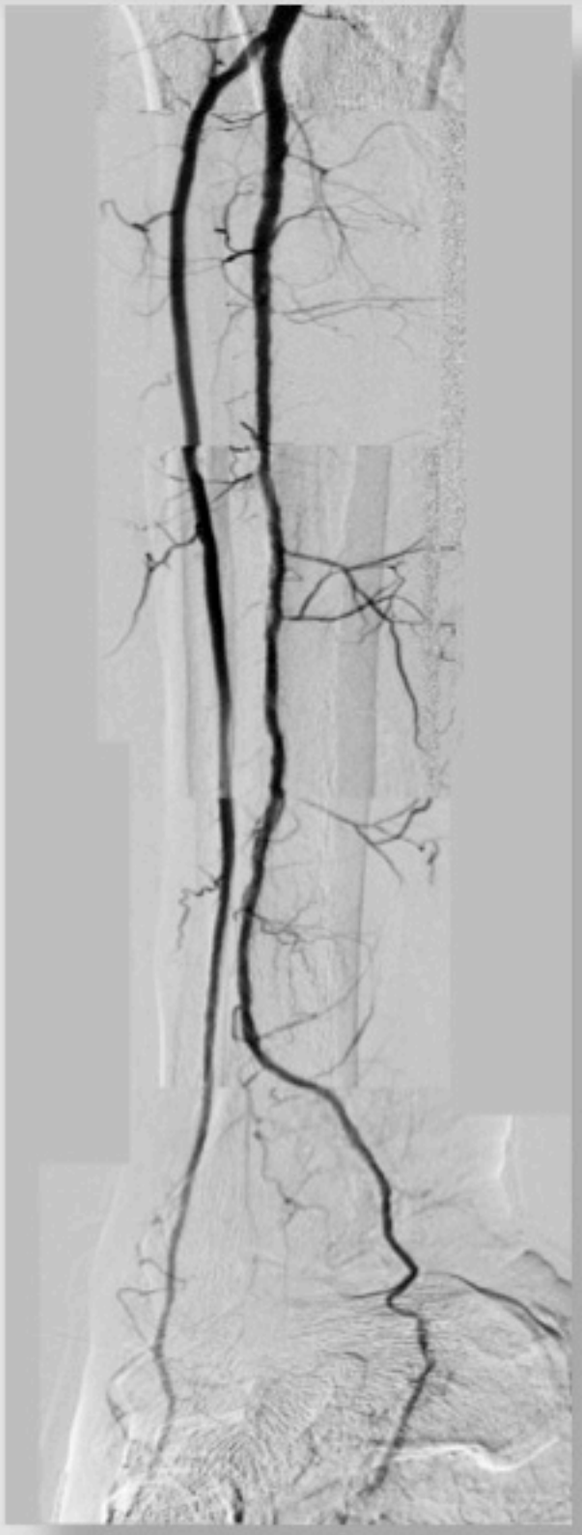
3) Posterior dominant PER artery 1.9%

- No signs indicating the origin of PTA
- Big size of PER

Balloon angioplasty of PER and lateral plantar

CASE 1

3) Posterior dominant PER artery **1.9%**



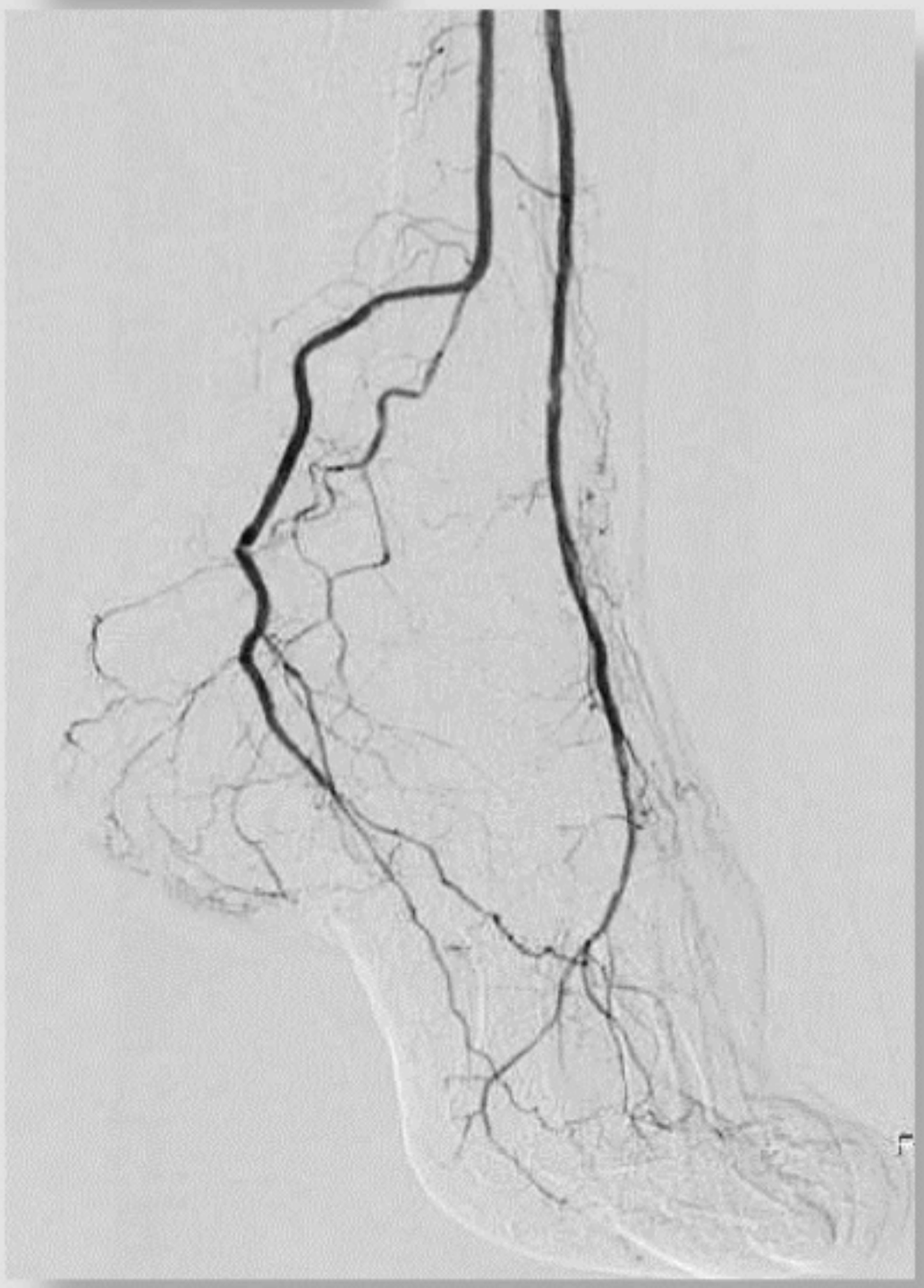
Final result

3) Posterior dominant PER artery **1.9%**

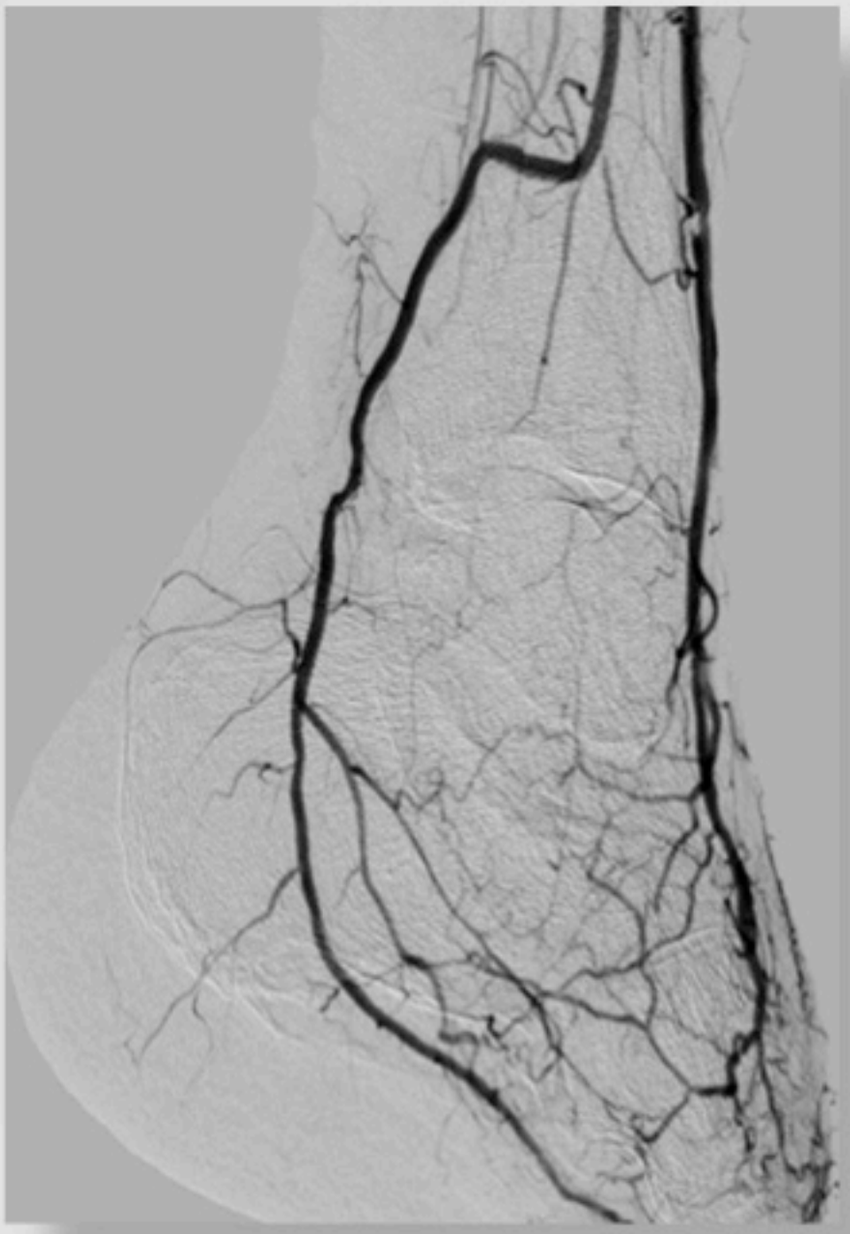
CASE 2

Basal

Final result

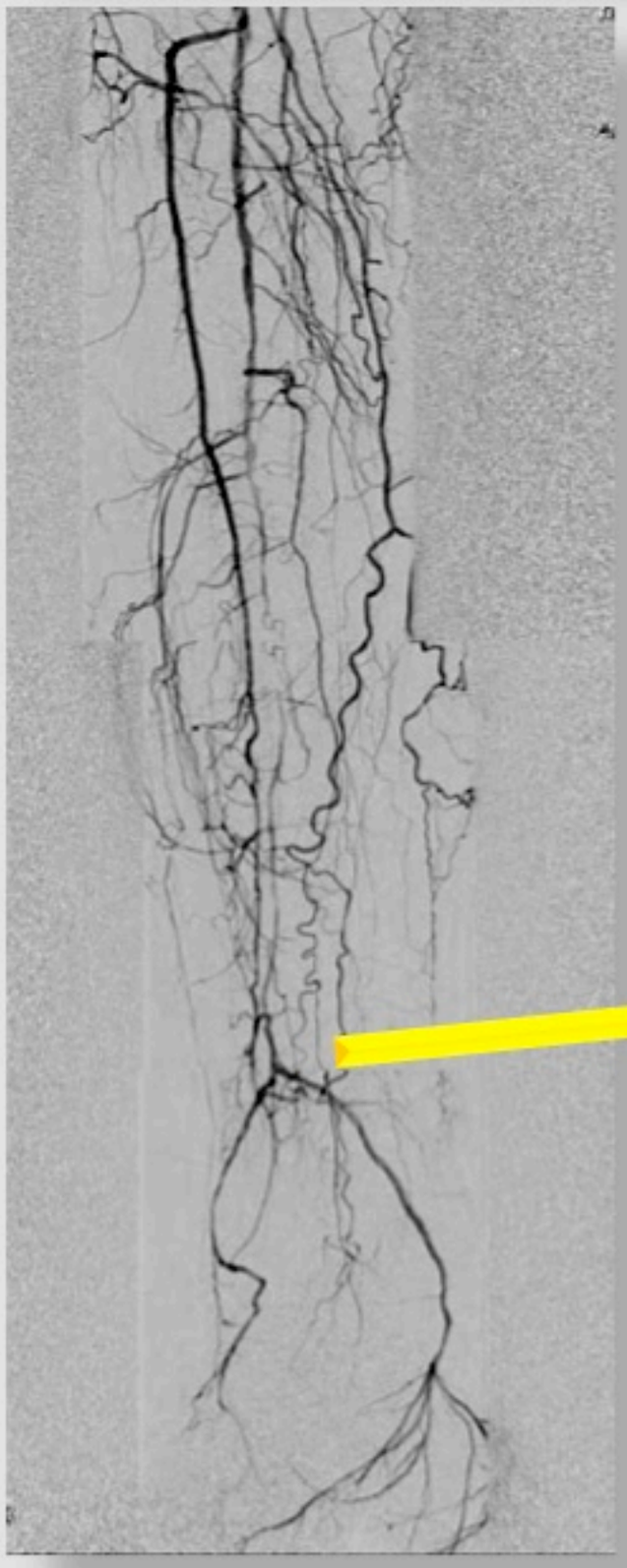


3) Posterior dominant PER artery **1.9%**

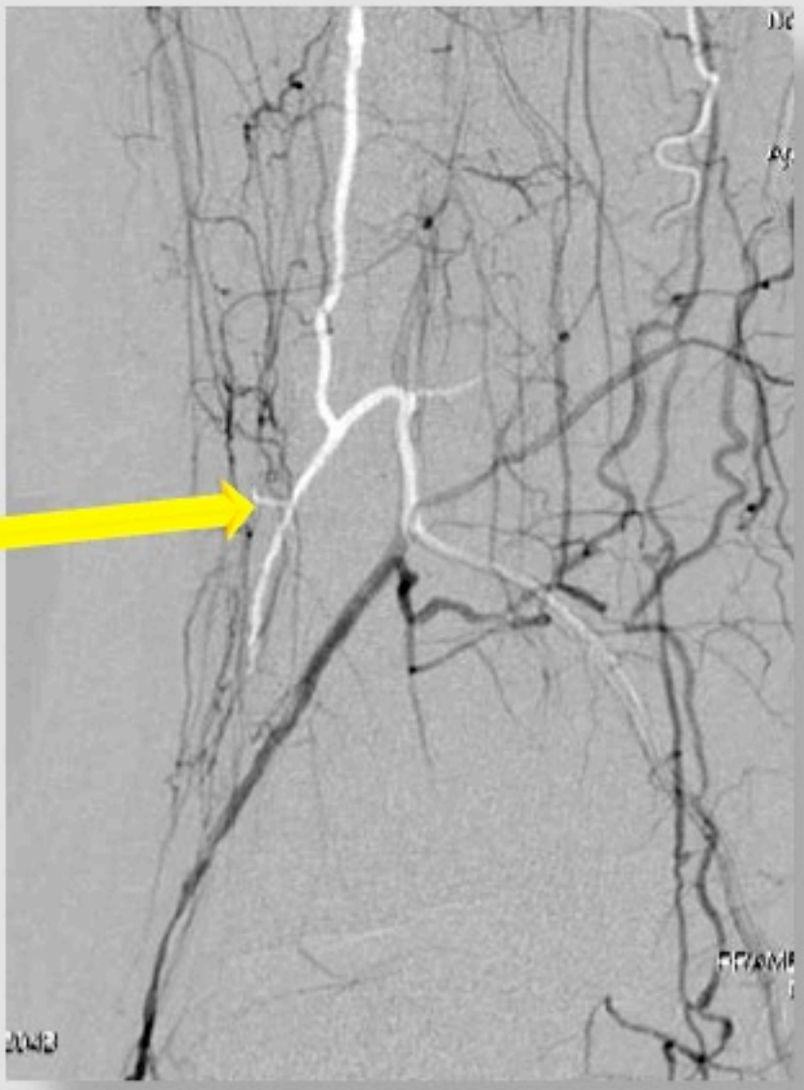


4) "Single" PER artery 0.9%

CASE 1

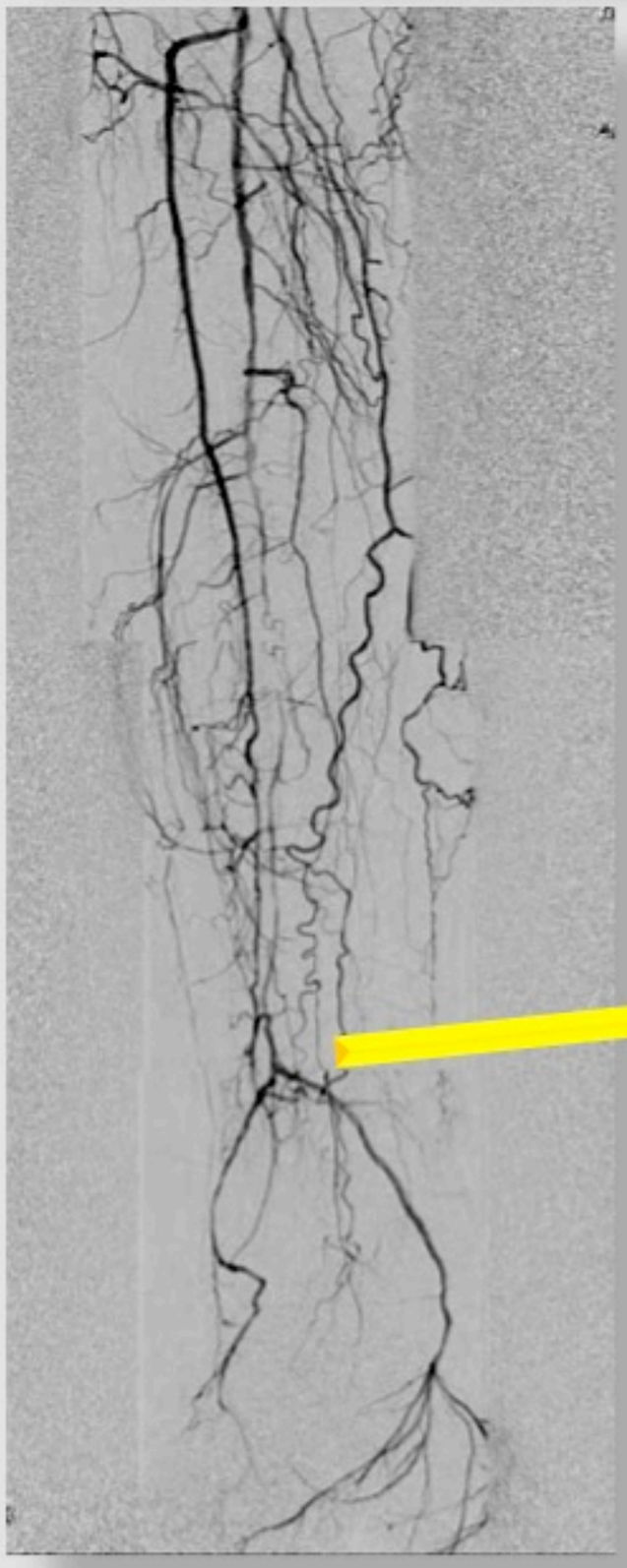


- No signs indicating the origin of PTA
- ATA thin & tortuous



4) "Single" PER artery **0.9%**

CASE 1



Final result after angioplasty of PER

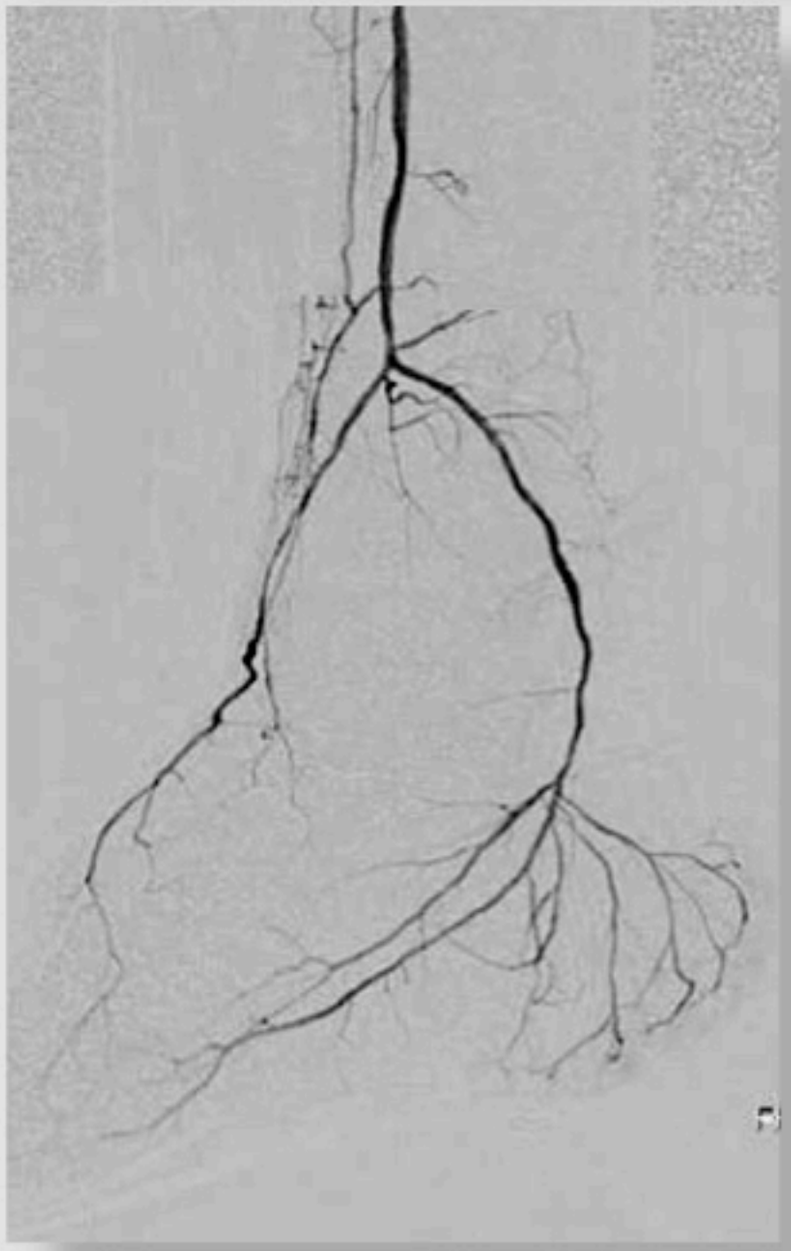
4) “Single” PER artery **0.9%**

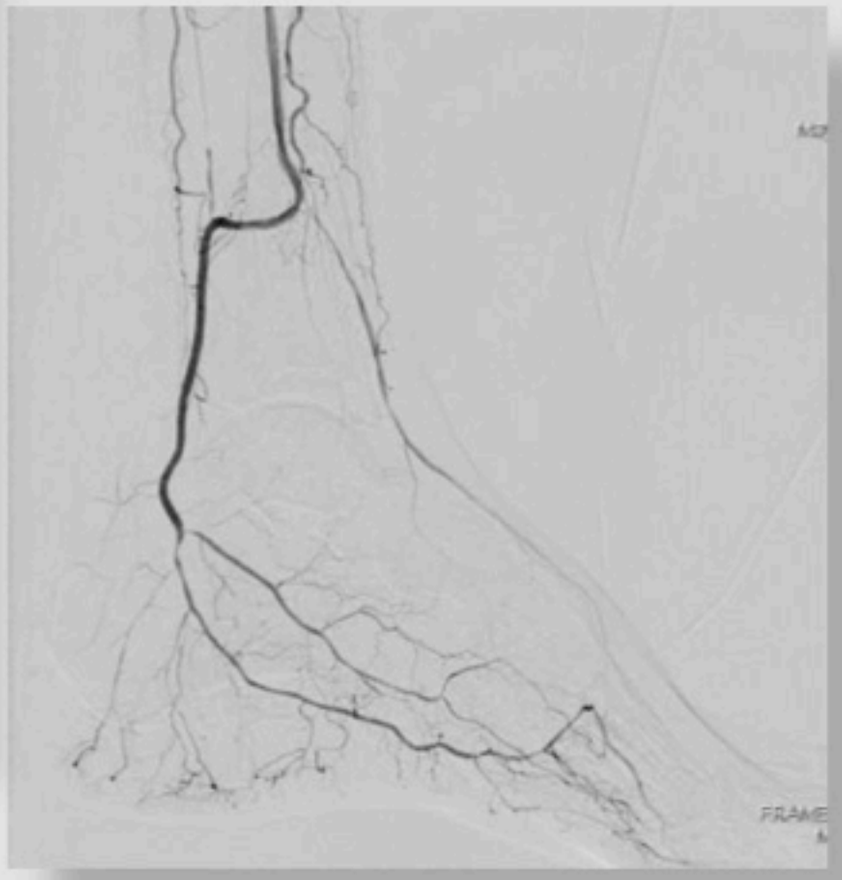
CASE 2

4) “Single” PER artery **0.9%**

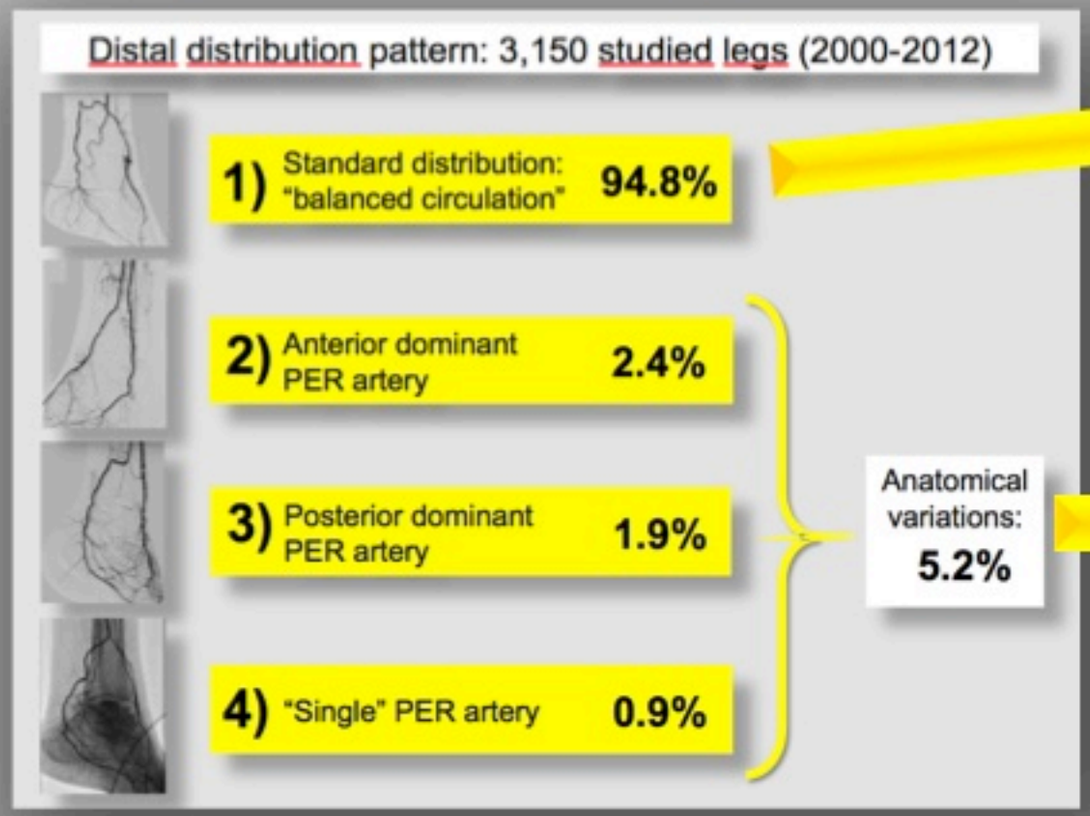
CASE 2

4) “Single” PER artery 0.9%





Why is it important to recognize the anatomical variations of distal BTK vessels distribution?



When we treat the distal PER and its perforating branches in a "balanced circulation" we must be very careful, because they are very thin vessels (1.0-2.0 mm size).

When we treat distal PER and its branches in a "dominant circulation" we can use a "tibial-like" approach:

- Endo-luminal angioplasty
- Subintimal angioplasty
- Big balloons (2.5-3.5 mm)
- Bailout stenting

Anatomical variability of BTK & FOOT vessels

- POP bifurcation
- Distal BTK vessels distribution
- FOOT vessels distribution

FOOT vessels distribution patterns

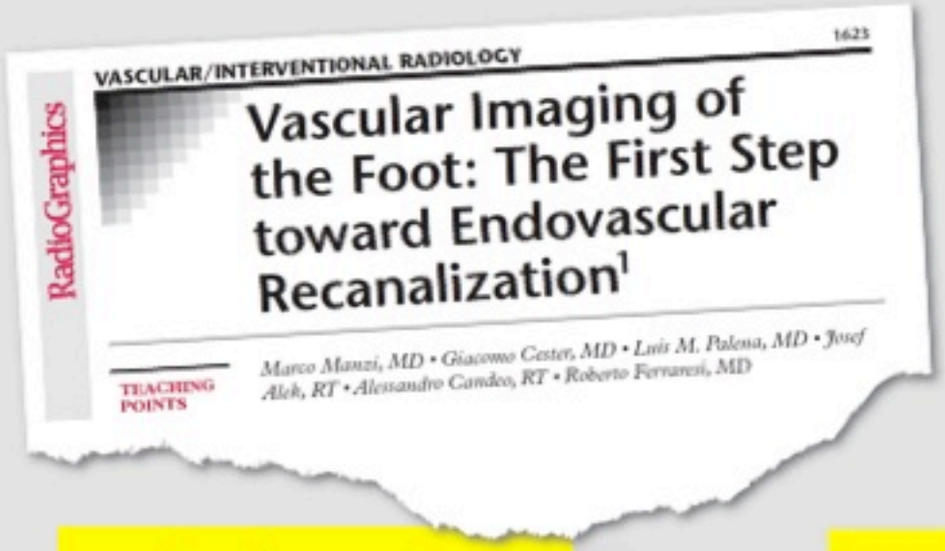
VASCULAR/INTERVENTIONAL RADIOLOGY

RadioGraphics

Vascular Imaging of the Foot: The First Step toward Endovascular Recanalization[1]

Marco Manzi, MD • Giacomo Cester, MD • Luis M. Palena, MD • Josef Alek, RT • Alessandro Candeo, RT • Roberto Ferraresi, MD

TEACHING POINTS


RadioGraphics
VASCULAR/INTERVENTIONAL RADIOLOGY
1623

Vascular Imaging of the Foot: The First Step toward Endovascular Recanalization[1]

Marco Manzi, MD • Giacomo Cester, MD • Luis M. Palena, MD • Josef Aleh, RT • Alessandro Candeo, RT • Roberto Ferraresi, MD

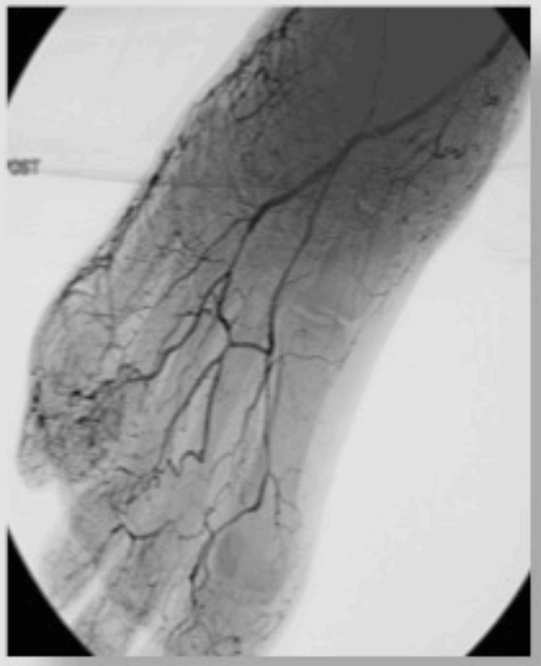
TEACHING POINTS

Foot vessel patterns

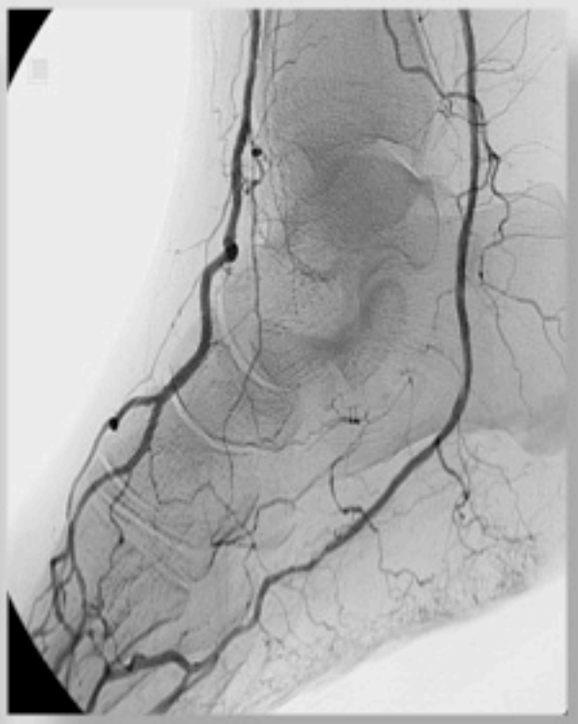
Angiosome: Anterior Tibial

Angiosome: Peroneal Calcanear Branch

Angiosome: Posterior Tibial

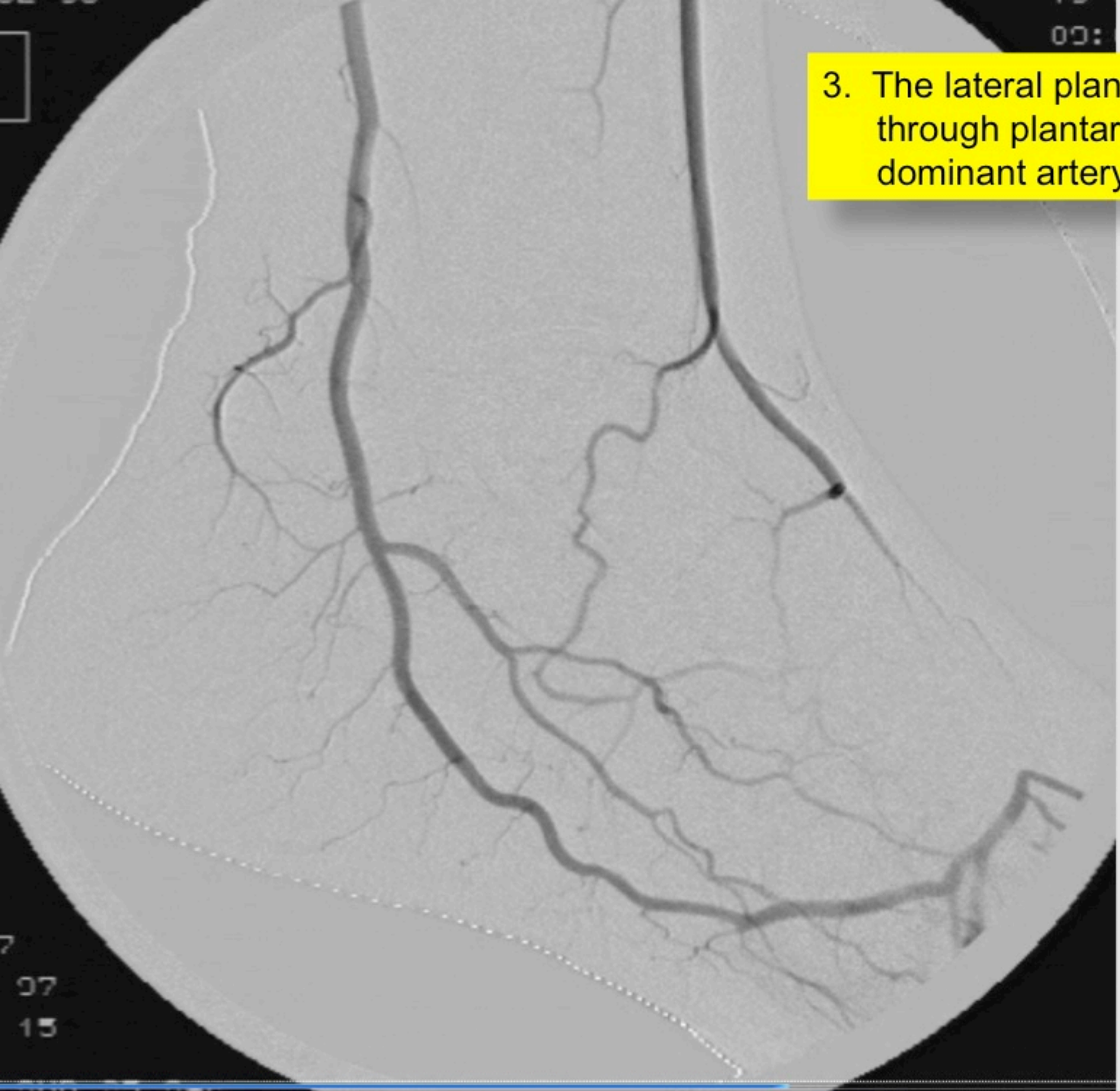


1. Dorsalis pedis, through first dorsal metatarsal artery, is the predominant artery for the first toe



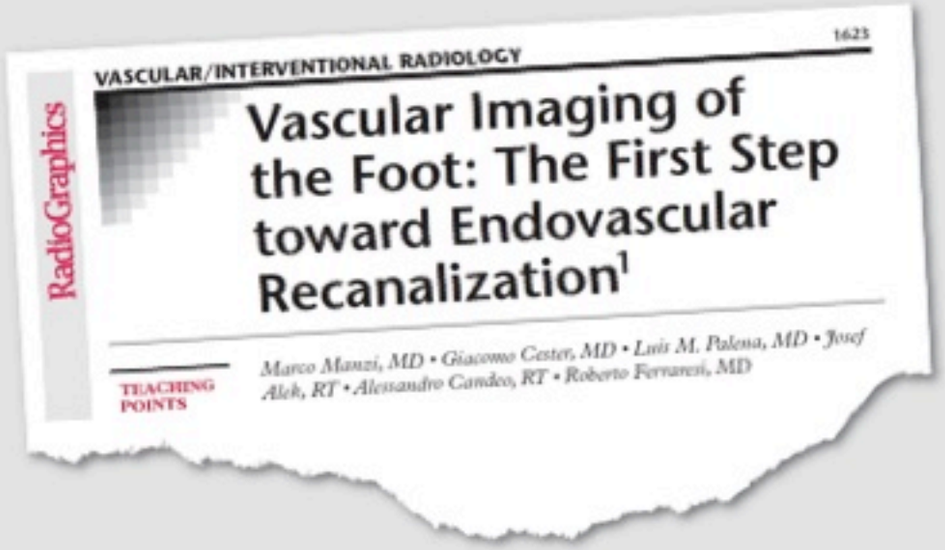
2. The dorsalis pedis artery is absent in 12% of the cases; in this patient the lateral tarsal artery is the predominant artery for the first toe


3. The lateral plantar artery, through plantar arch, is the dominant artery of the foot
(Flt. 5)
Seq: 10
FRAME = 76 / 158
MASK = 2
WW: 4096WL: 2048



3. The lateral plantar artery, through plantar arch, is the dominant artery of the foot

4. Absence of plantar arch. The dorsalis pedis is the predominant artery for the first and second toe. The lateral plantar artery is the predominant artery supplying the third, fourth and fifth toe.



Every patient is different!
We must adapt our revascularization strategy to the real vascular pattern of the patient

We must follow the anatomy because the anatomy cannot follow us!!!