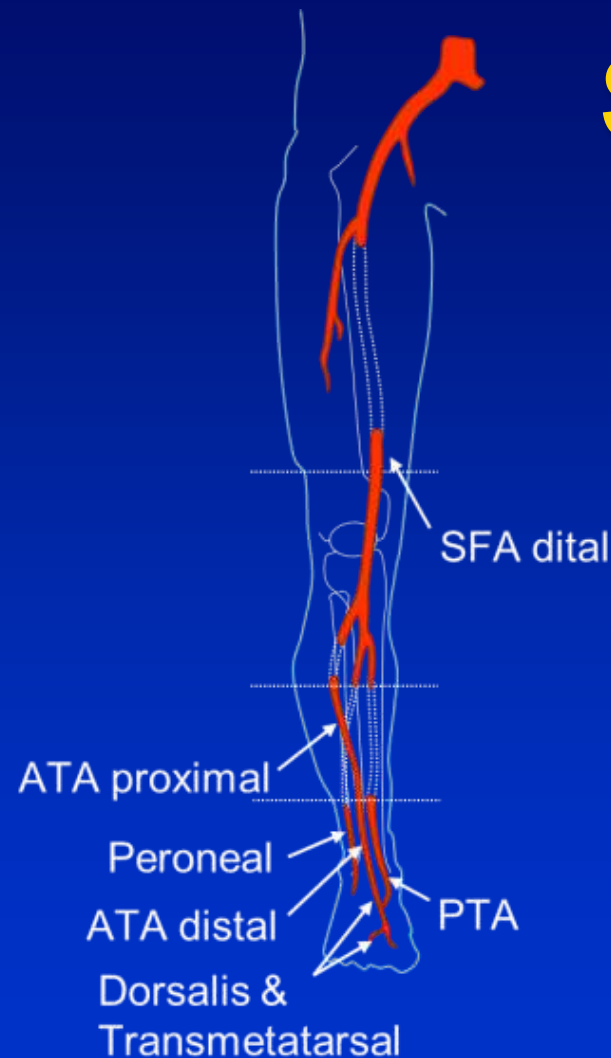


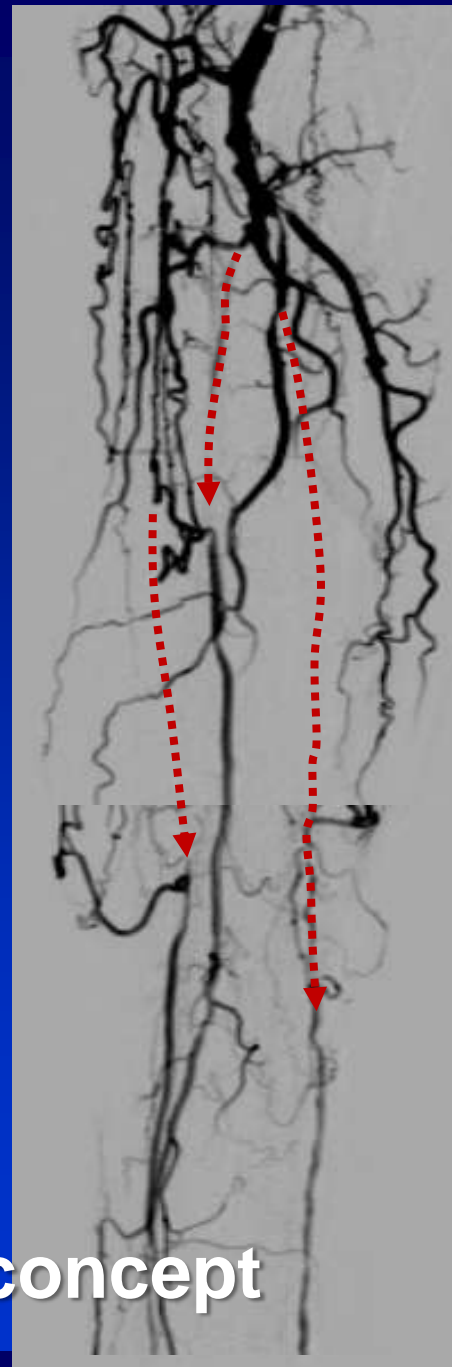
Strategy for Success in Critical Limb Ischemia

Jae-Hwan Lee, MD, PhD

Cardiovascular Center in
Chungnam National University Hospital



What is the Correct Route?



The 1st step is anatomic concept

Intraluminal Approach with SSD

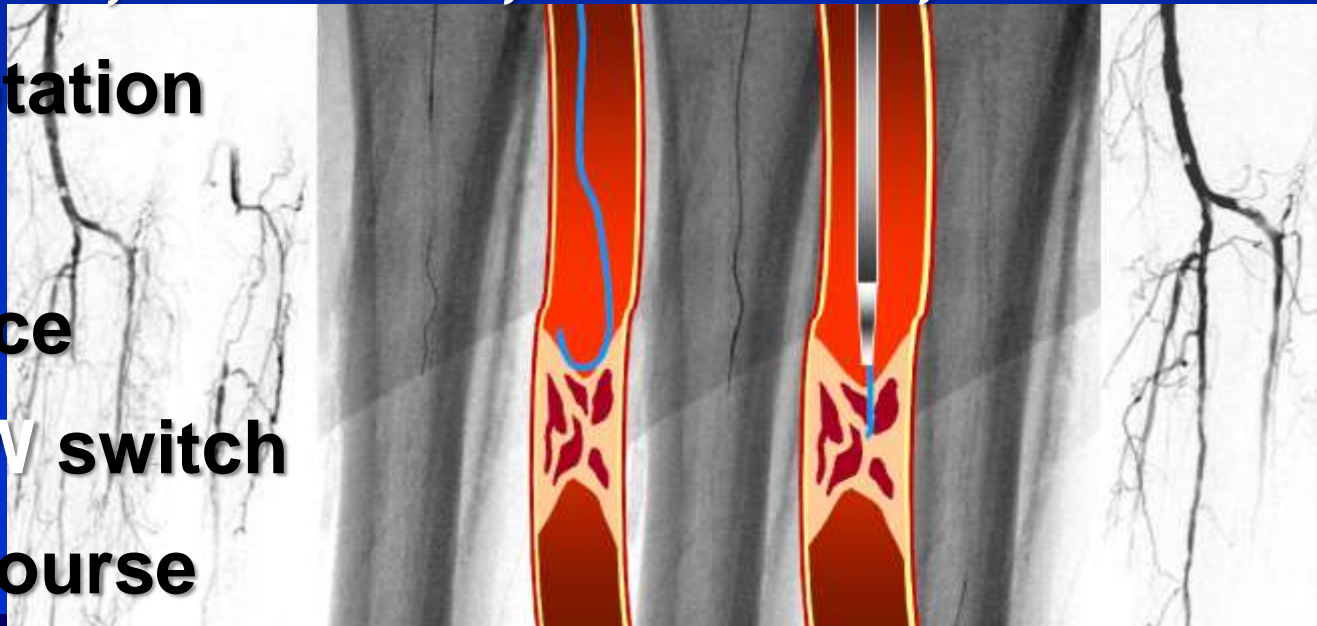
- **SuperSpeed Drilling (SSD)**

- Less calcified & visible islands in CTO segment
- Microcatheter backup mandatory

GW; Fielder XT, FC, Regalia ↔ Ultimate, Astato

Microcatheter; Finecross, Trailblazer, CXI ...

- Rapid GW rotation
with or w/o
torque device
- Transient GW switch
during the course



Guidewire Tip for Intraluminal Approach

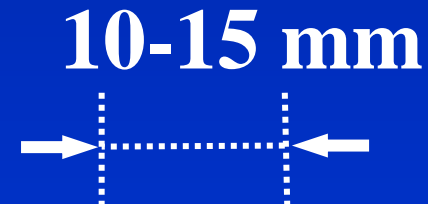
Usual shape



CTO wire



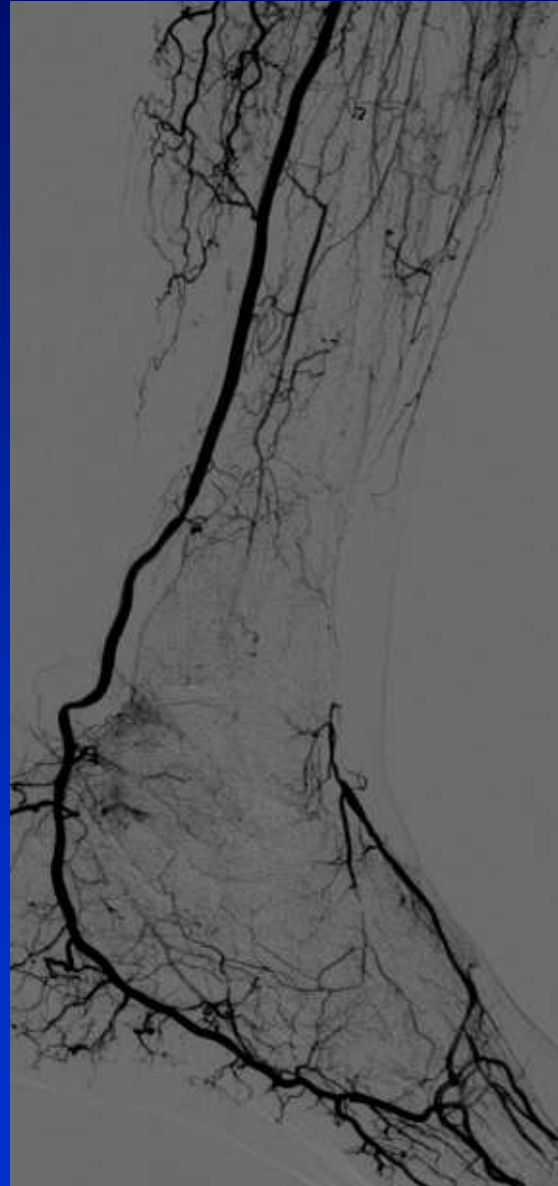
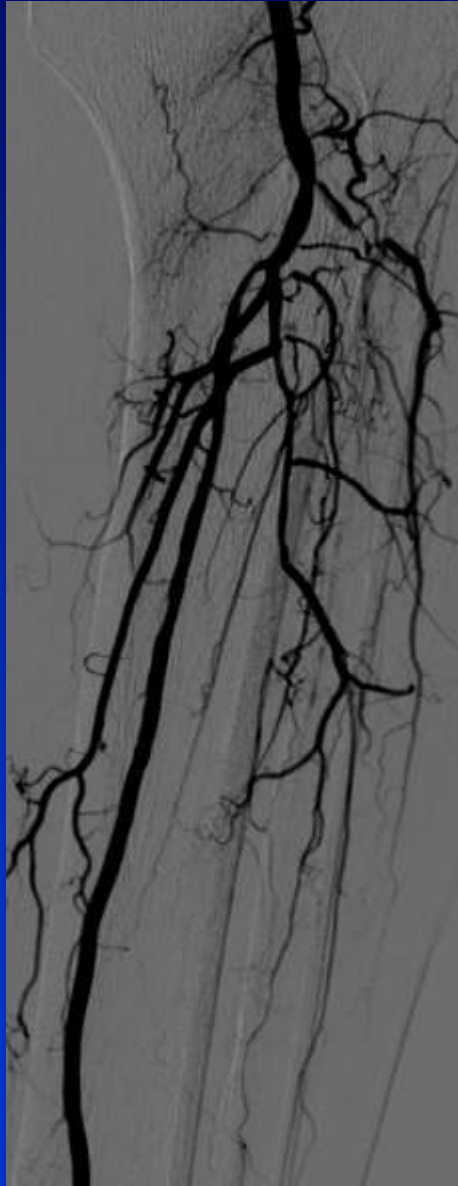
2nd bend



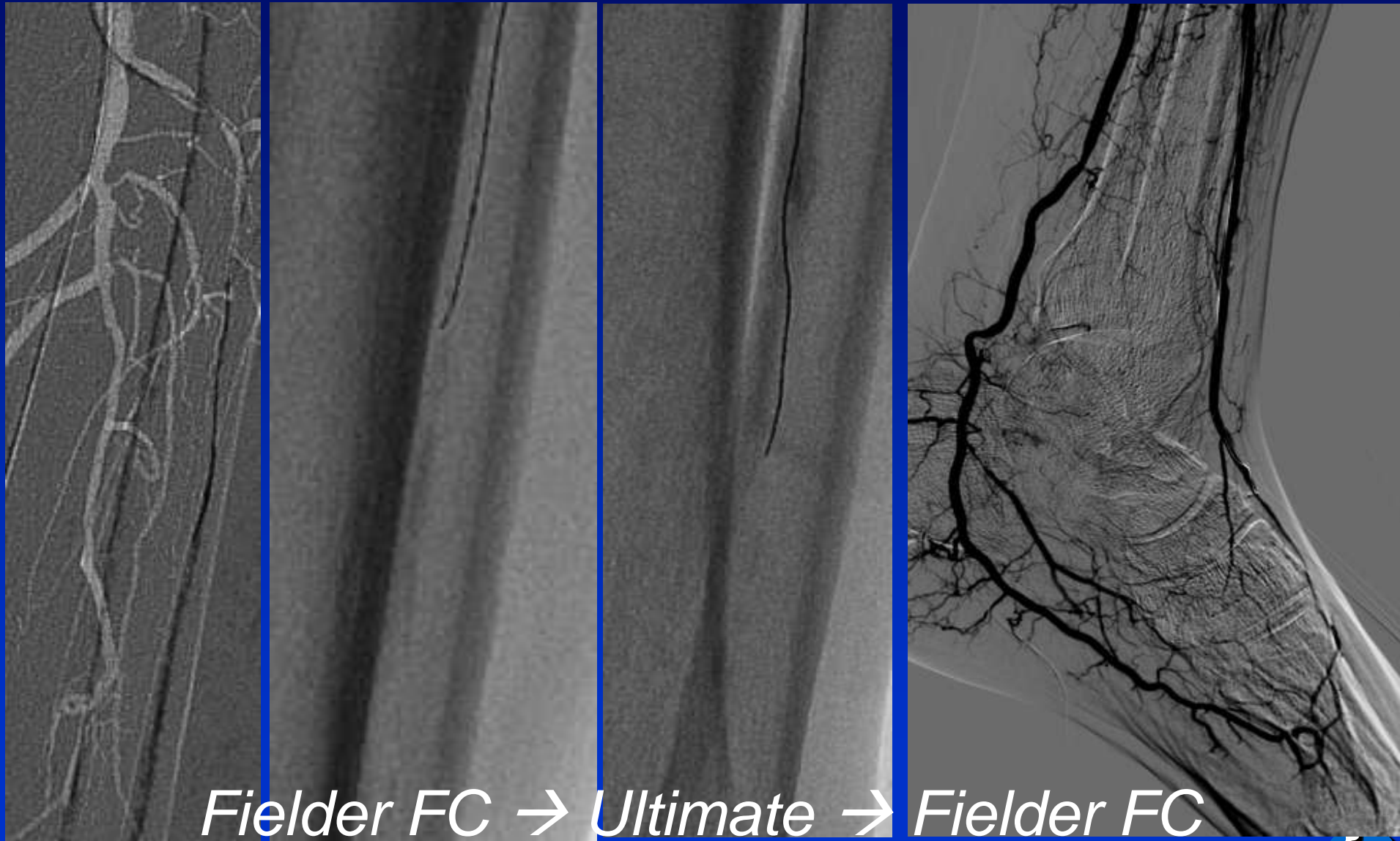
Microcatheter



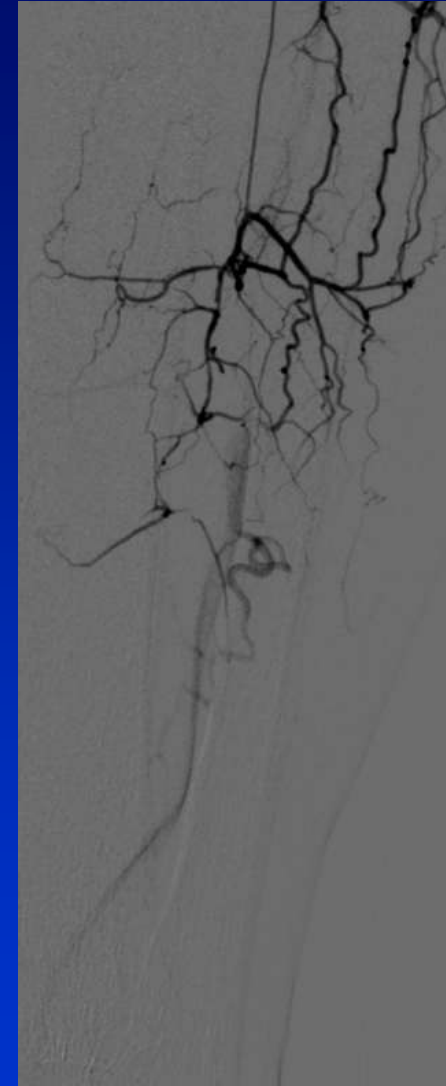
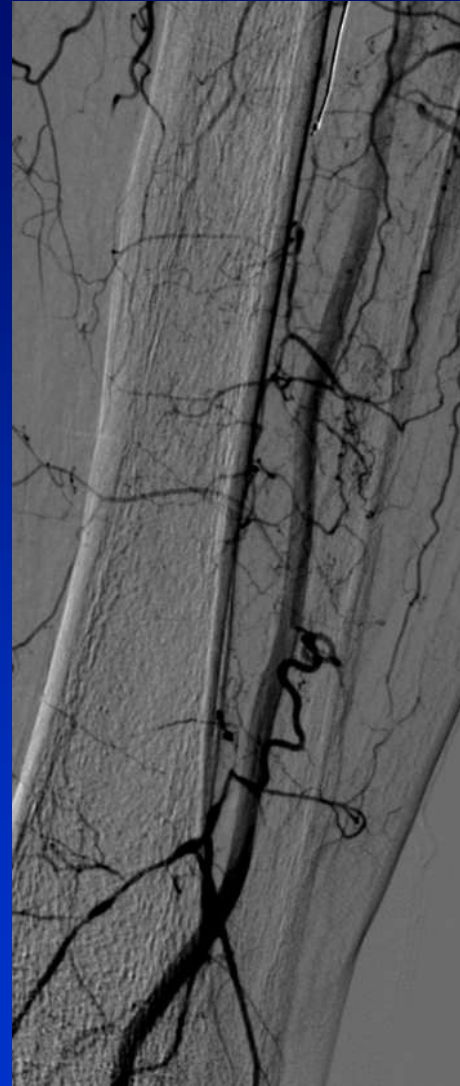
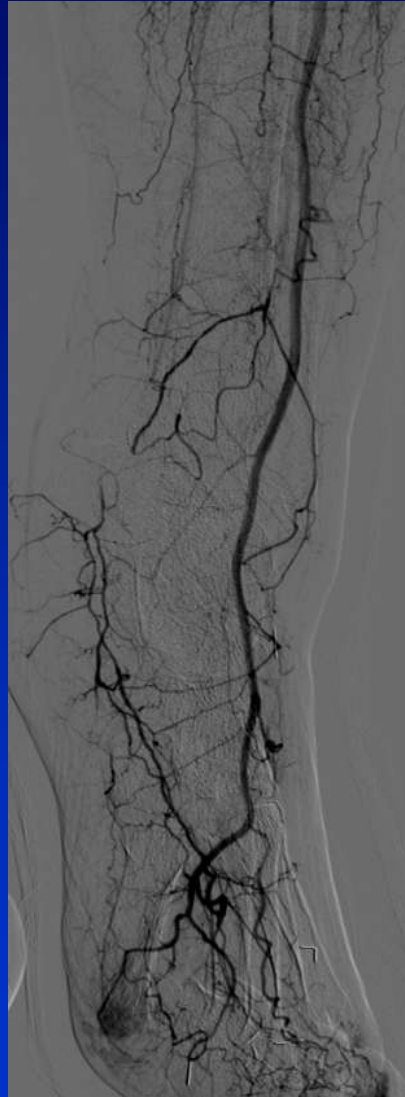
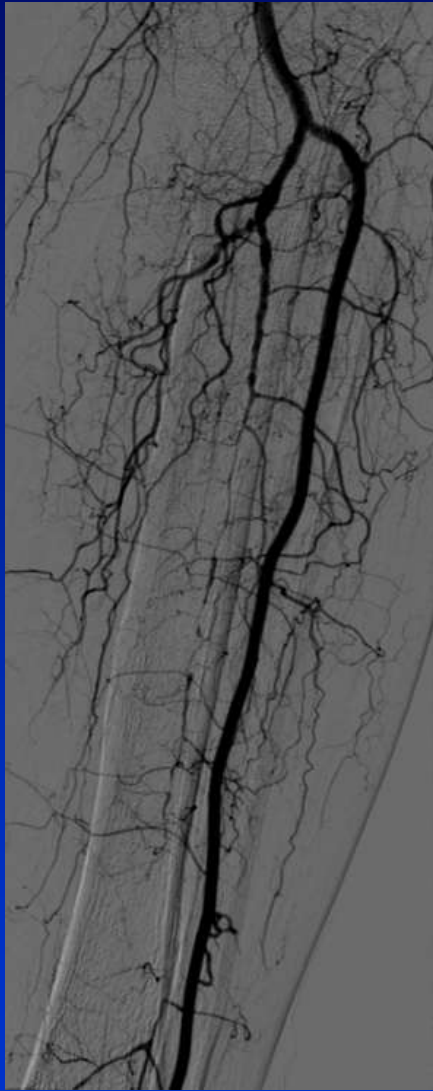
Intraluminal Approach with SSD



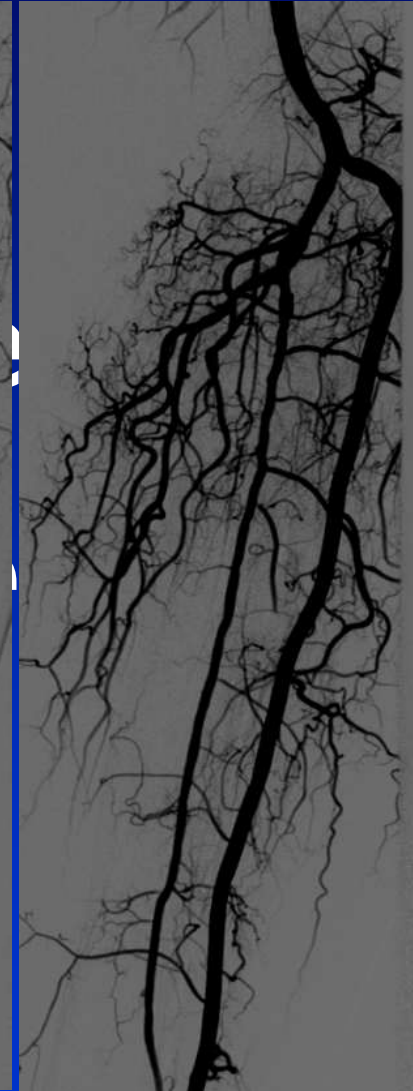
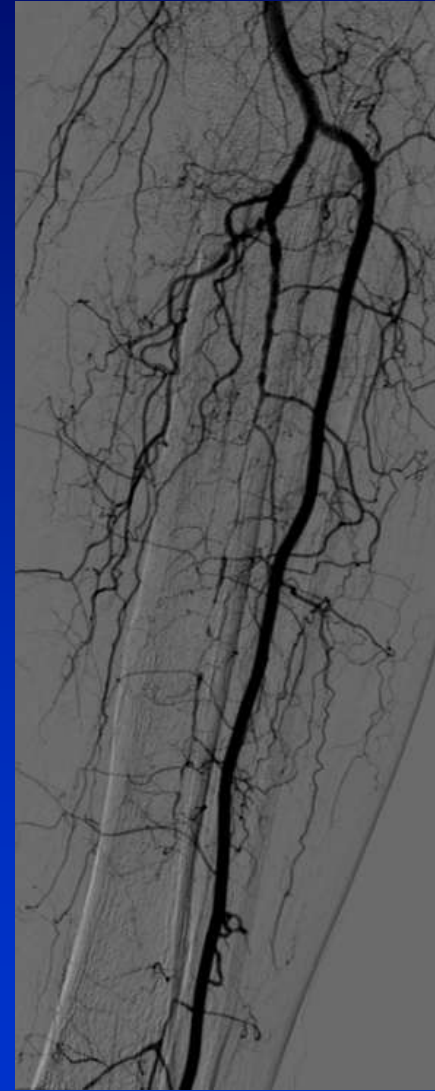
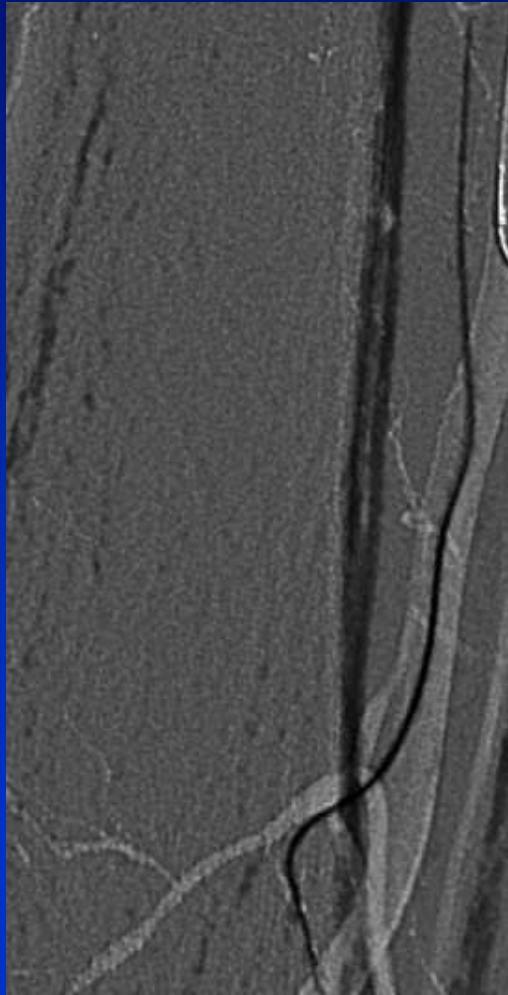
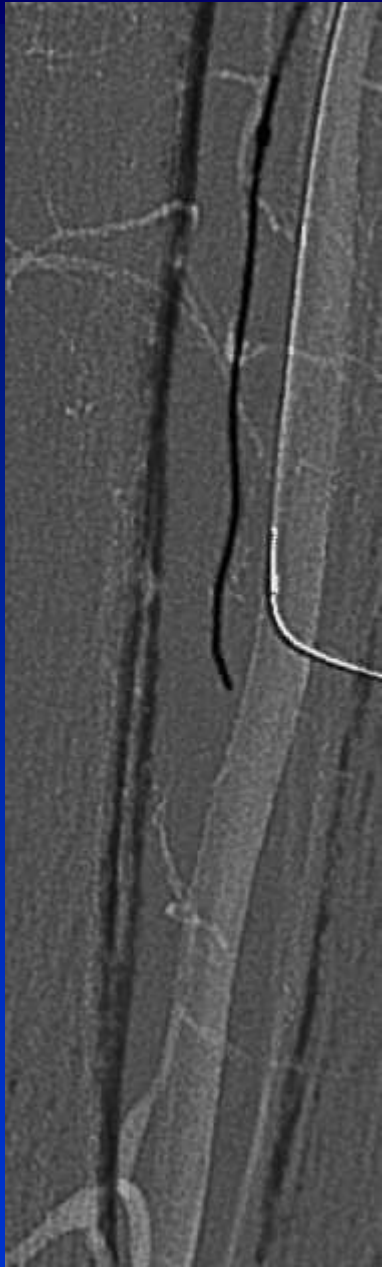
Intraluminal Approach with SSD



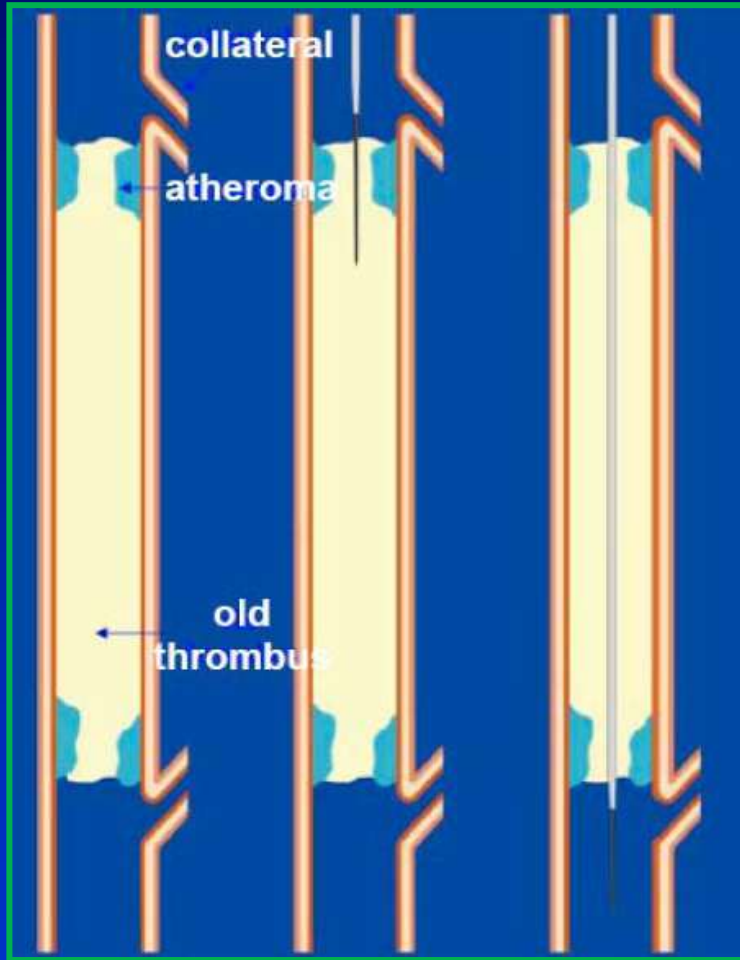
Intraluminal Approach with SSD



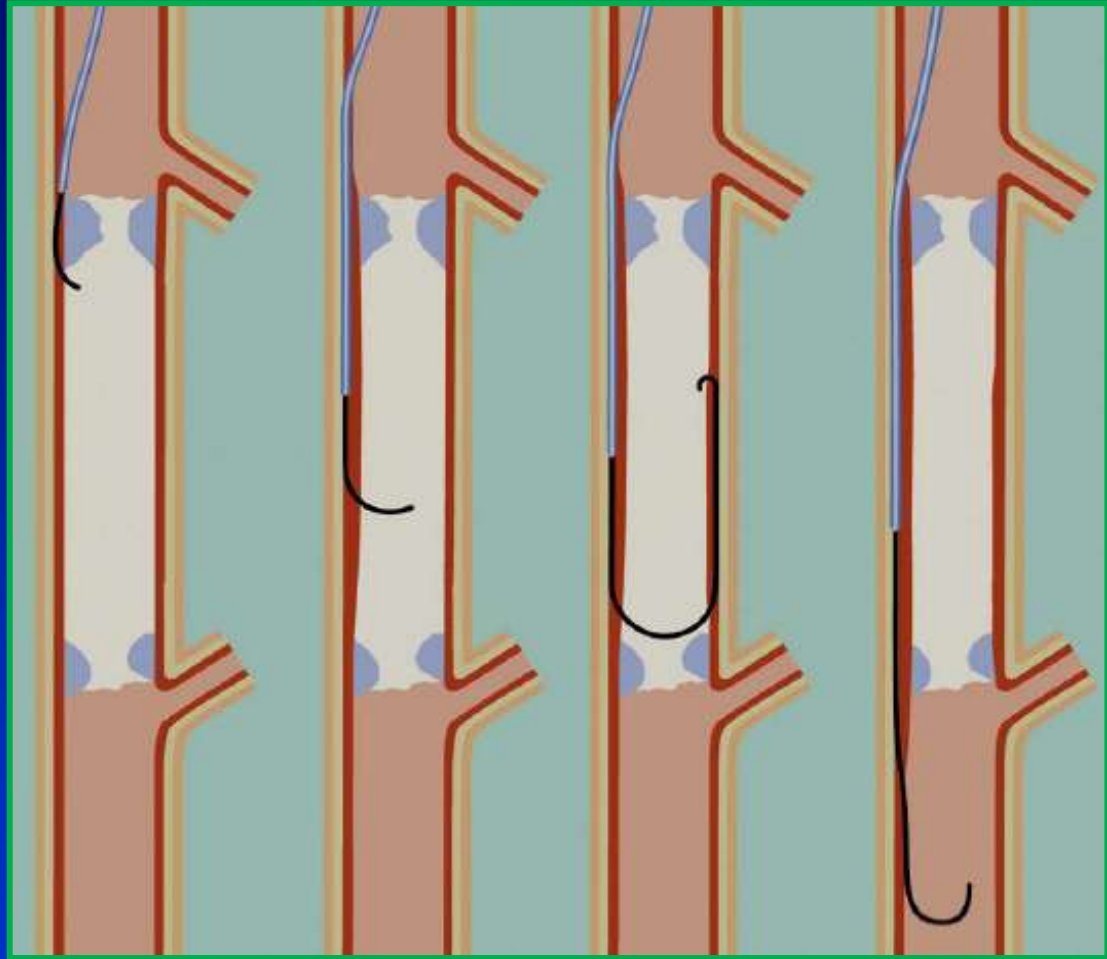
Intraluminal Approach with SSD



Intraluminal vs. Subintimal Approach

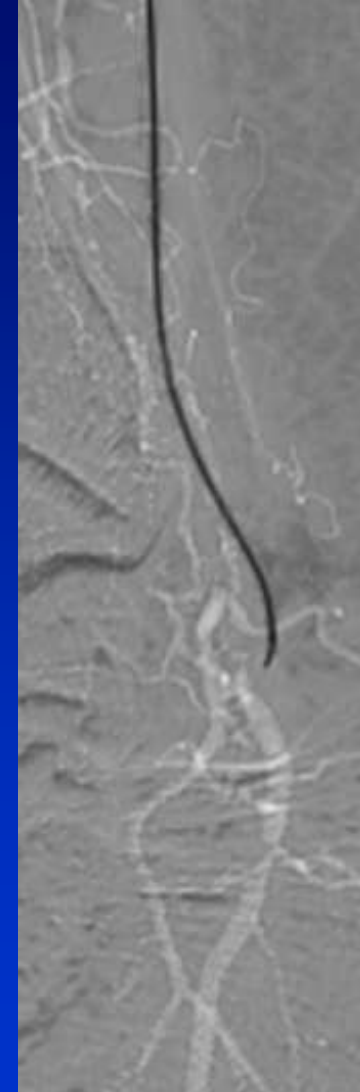
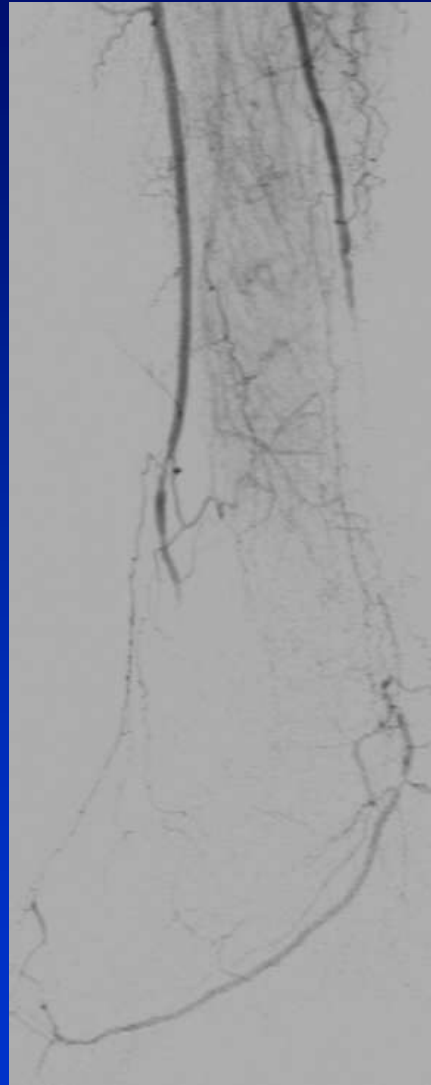


Short CTO, less calcified
Visible islands

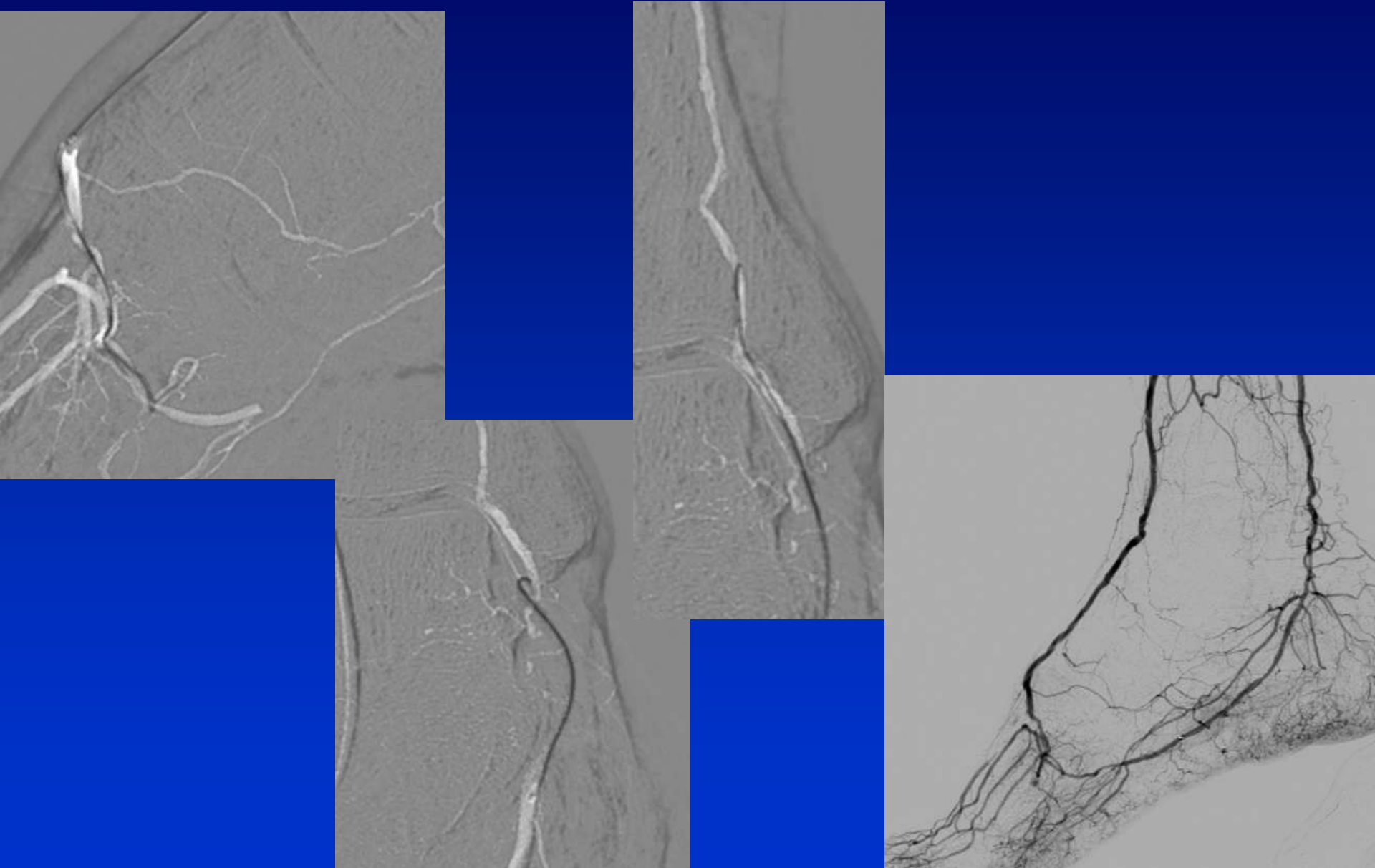


Long CTO, Save time
Reentry is matter

Retrograde Pedal-Plantar Loop Approach



Retrograde Pedal-Plantar Loop Approach



TASC IIb Classification

Tibial Disease – Type D Lesions

- Need for retrograde tibial access
 - Flush occlusion of tibial vessel
 - Distal popliteal occlusion extending into origin of all tibial vessels



+ *Failure of endovascular treatment*

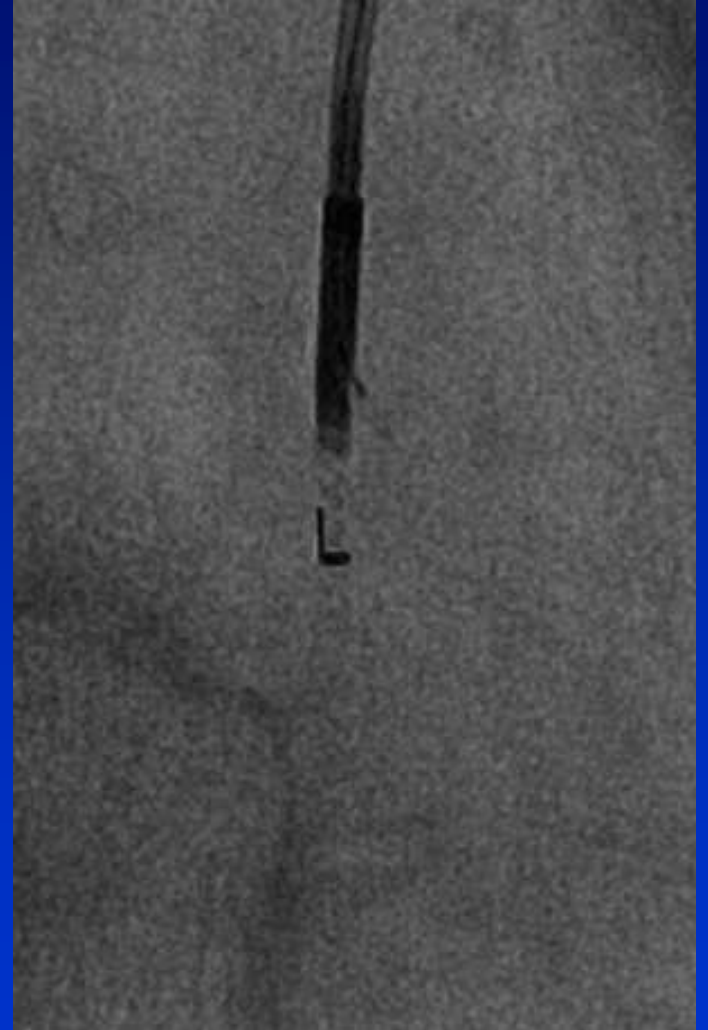
Outback reentry for distal SFA



T

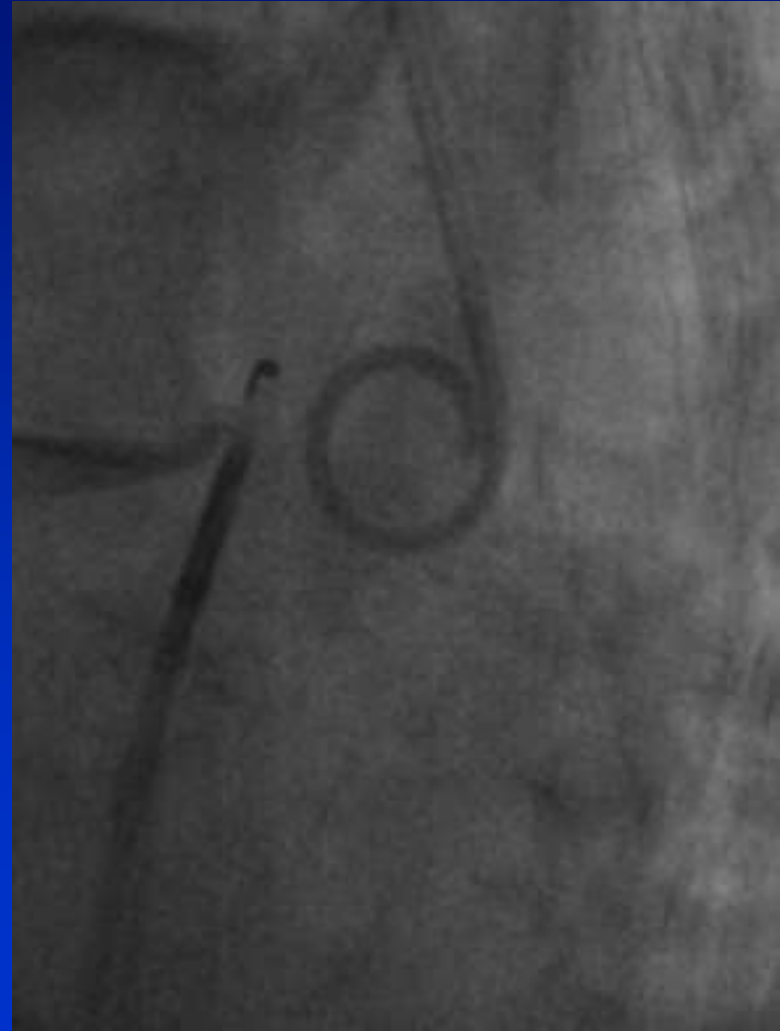


L



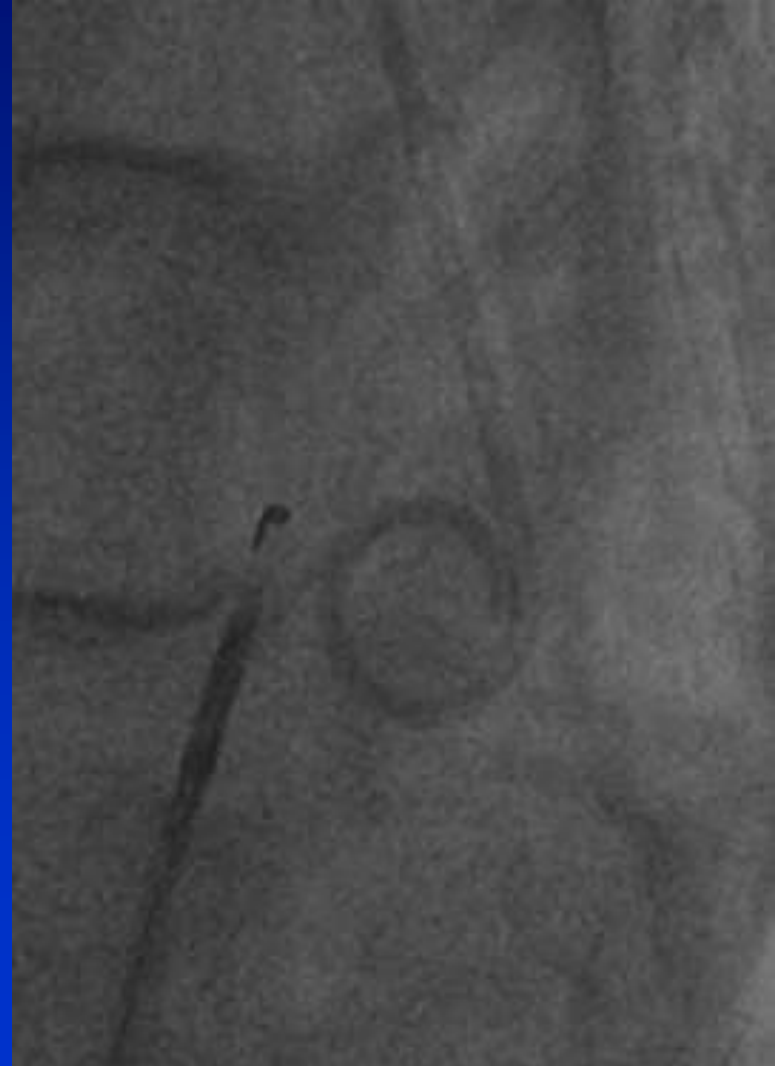
Iliac CTO Communication

Outback to aorta (flush occlusion)

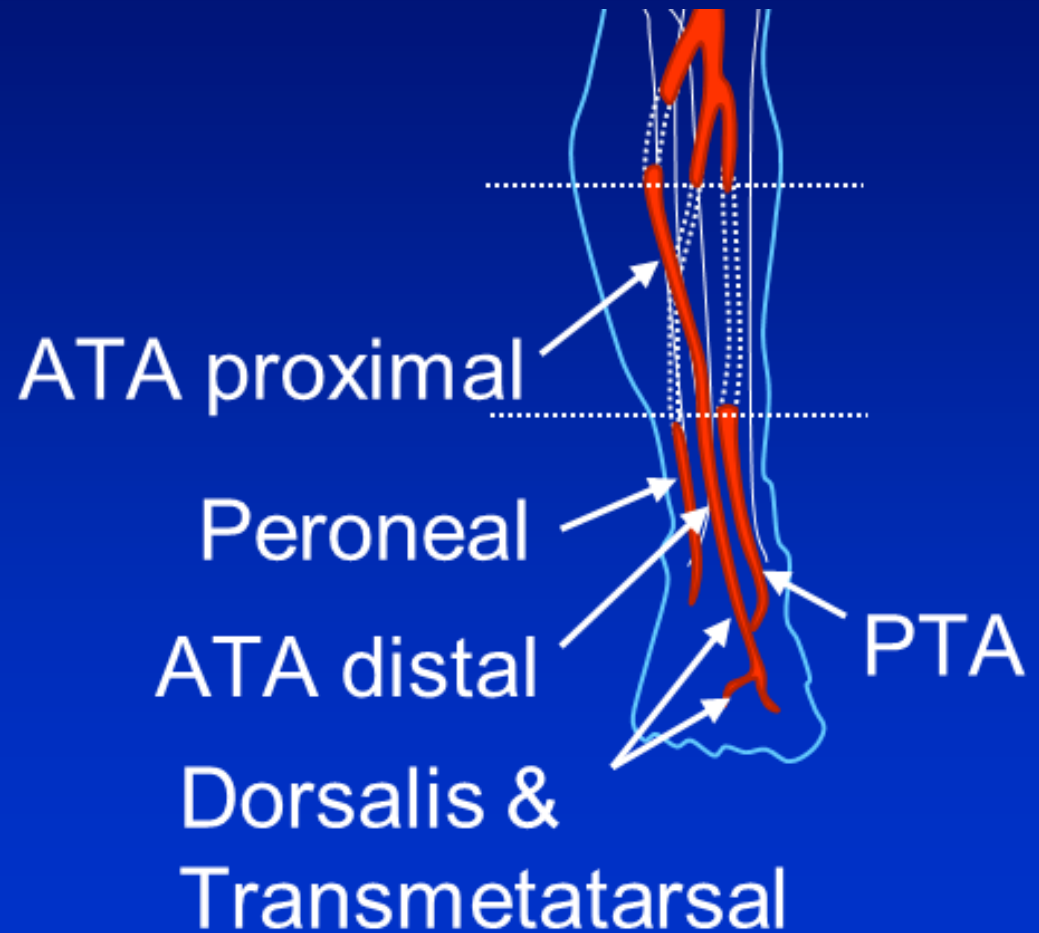
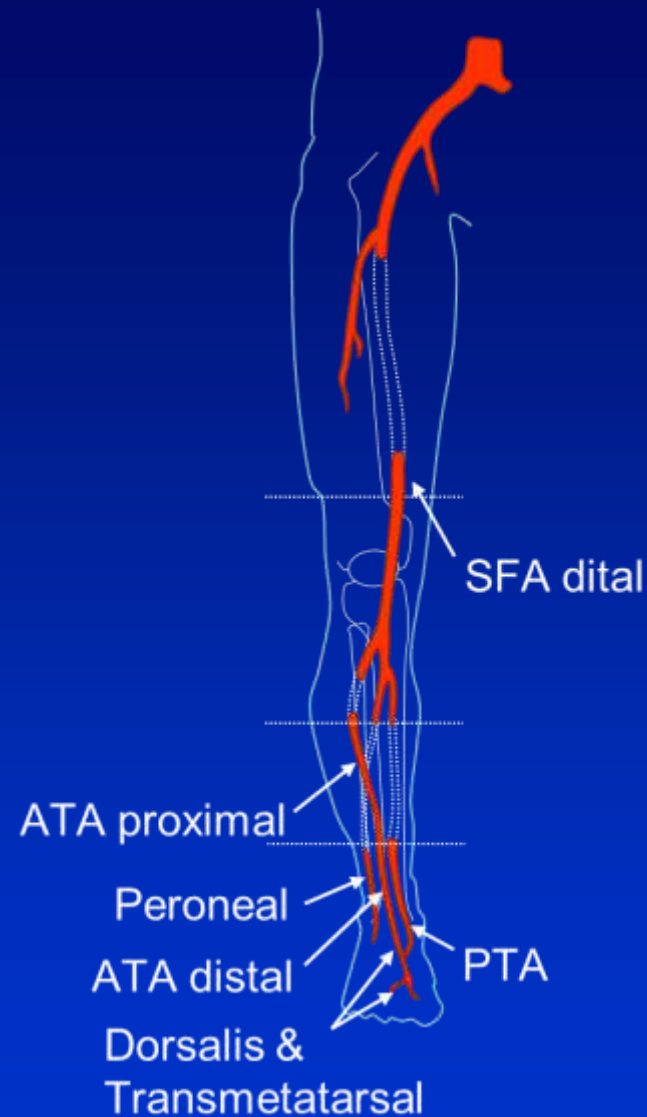


Iliac CTO Communication

Outback to aorta (flush occlusion)



Retrograde Puncture in Supine Patient Position



Retrograde Access Technique

- Sheathless approach
 - 0.014" or 0.018" GW
 - Coronary OTW balloon or Microcatheter
(2.6-2.8 Fr outer diameter < 1 mm)
 - I prefer Command GW + CXI microcatheter
- 4 Fr Terumo or 3 Fr Pedal sheath (Cook)



Retrograde Puncture Needle

- **Micropuncture set**

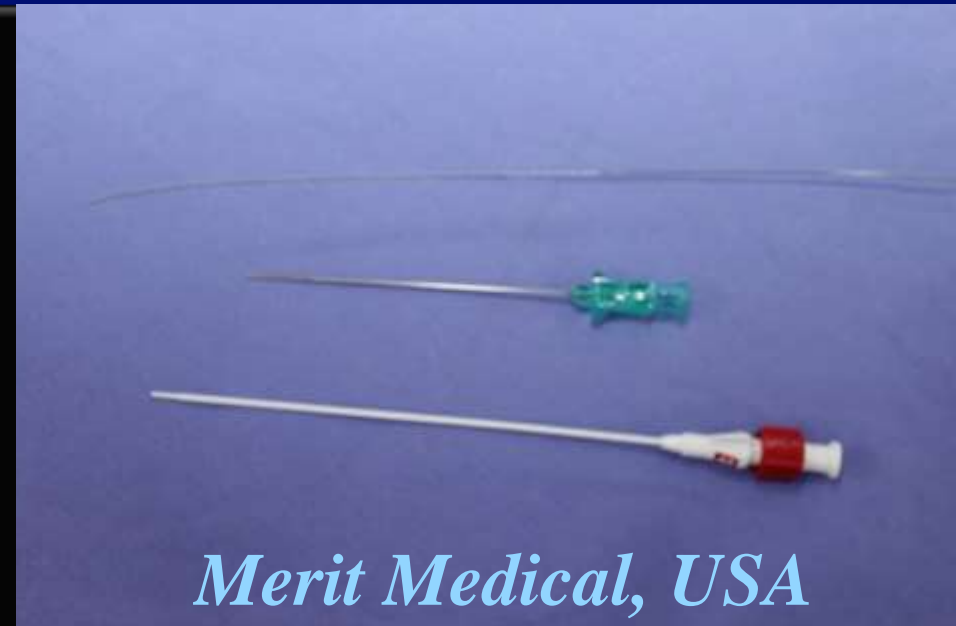
- 4-5 Fr sheath

- 21 G steel needle

- (4 cm vs. 7 cm)

- Inner dilator for sheathless approach (~.018")

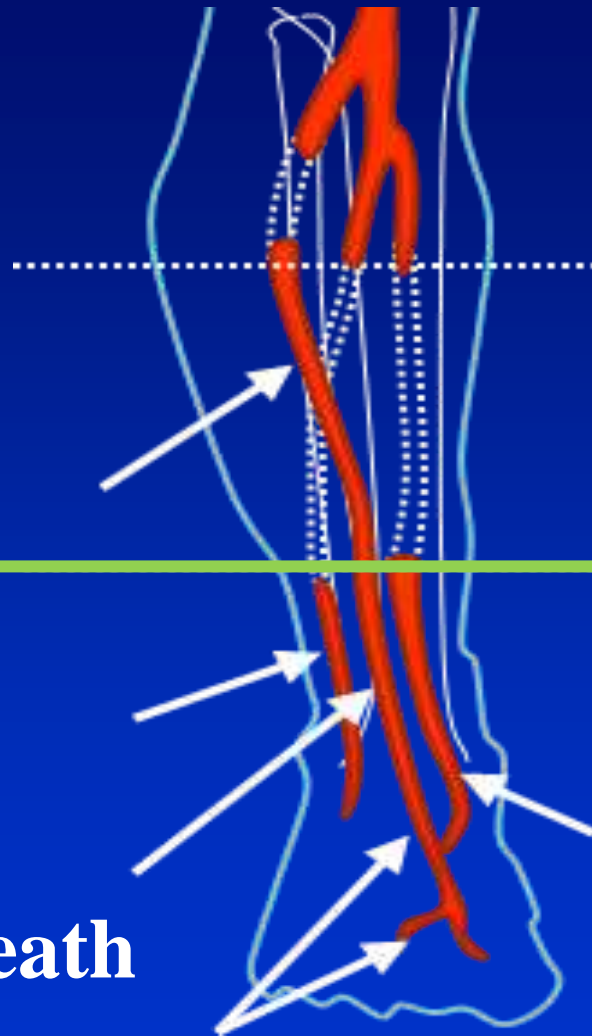
- Outer sheath for .035" Terumo



Sheath or Sheathless ?

Sheathless
3-4 Fr sheath

Sheathless
3 Fr pedal sheath



High ATA

- 7 cm 21G needle



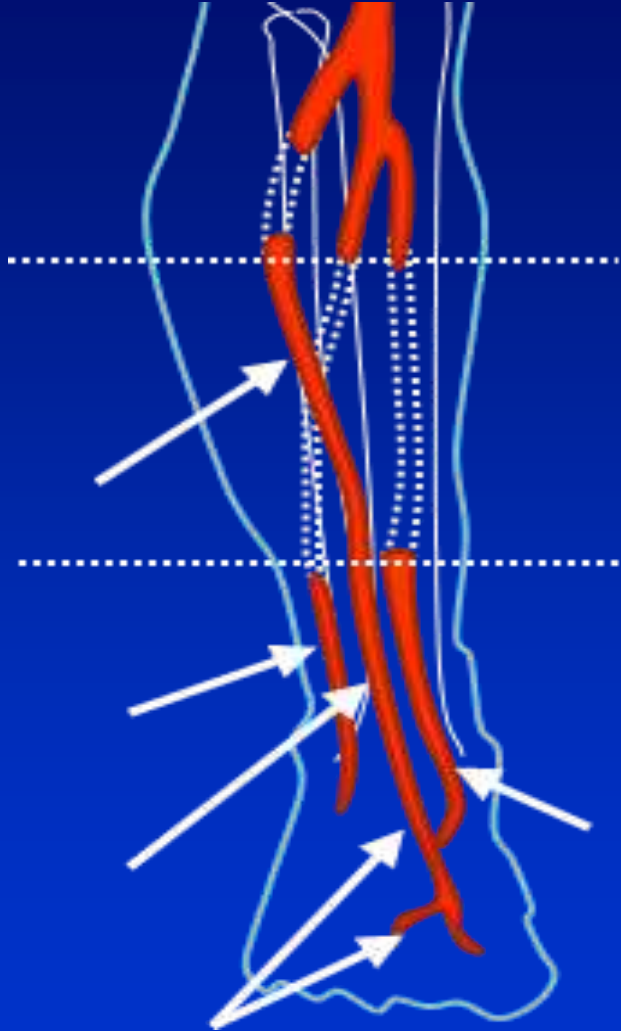
Low ATA & PTA

- 4 cm 21G needle

Low PA

- 7 cm 21G needle

Material for Pedal / Tibial puncture



- Nitroglycerin 200-300 ug
antegrade injection
- Mix Nitro + Lidocaine
(eg. 1 mg NTG + 9 cc lidocaine)
- Heparin 120 IU/kg

Guidance for Retrograde Puncture

- Road map or Smart select
 - can save contrast but,
 - movement d/t manipulation or patient
- Puncture for calcified arterial silhouette
 - intraluminally or subintimally
- **Ultrasound guidance**
- Contrast injection from
 - **guiding sheath or catheter**
 - occlusion balloon at SFA or popliteal
 - microcatheter or OTW balloon

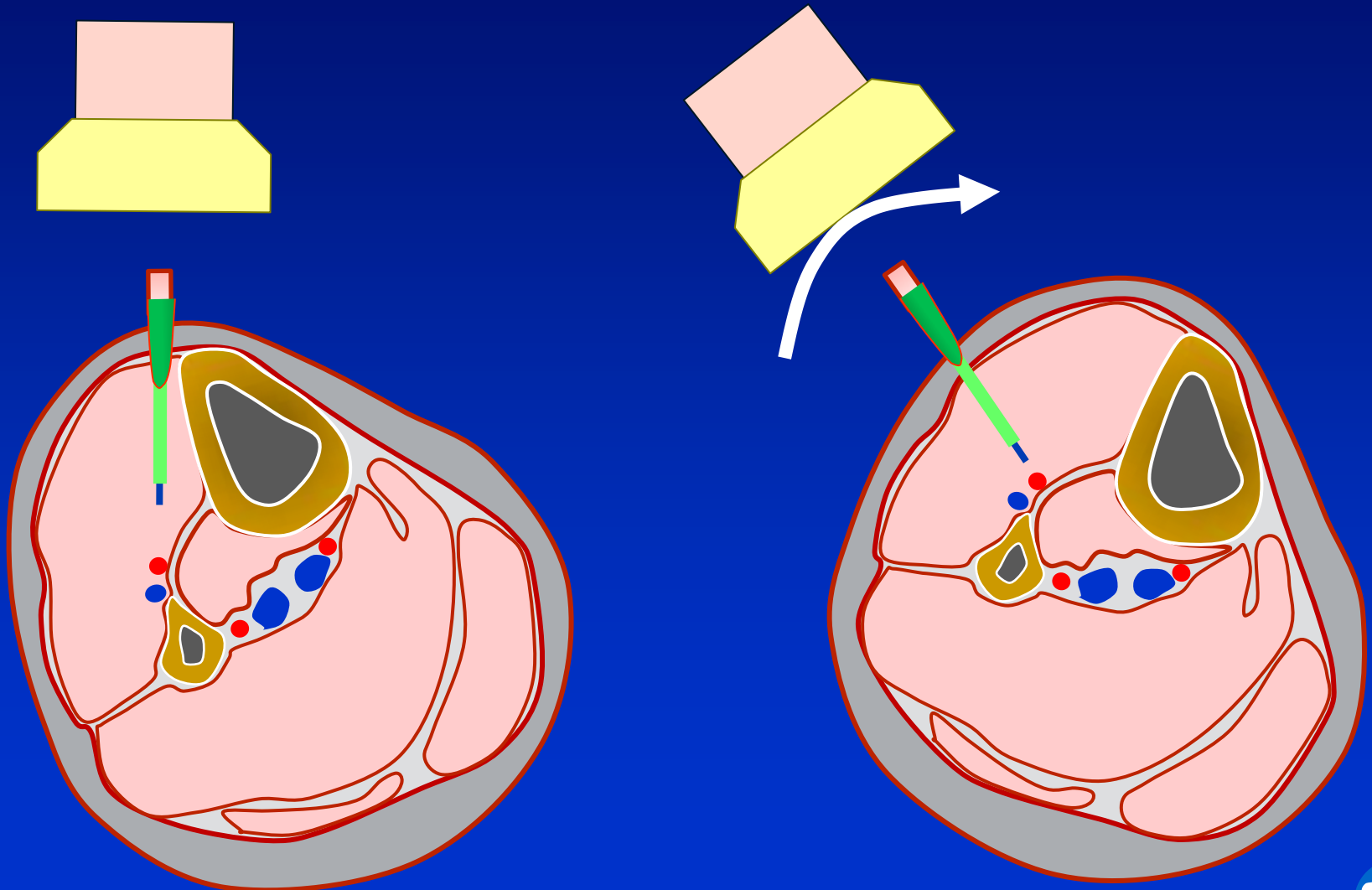
Needle-Expansion for Puncture



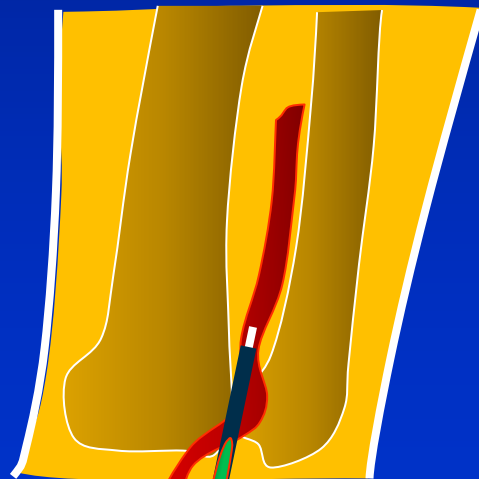
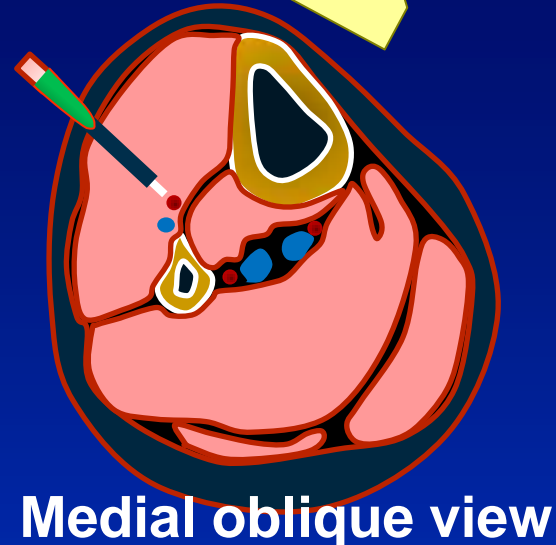
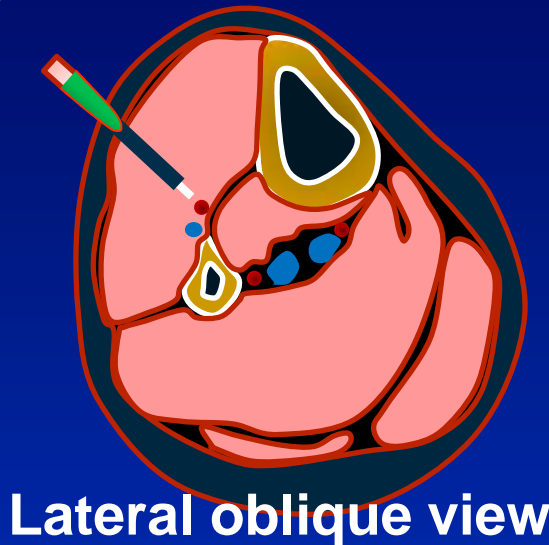
Quick-Access Needle Holder (Spectranetics)

Foot Position for ATA or PA puncture

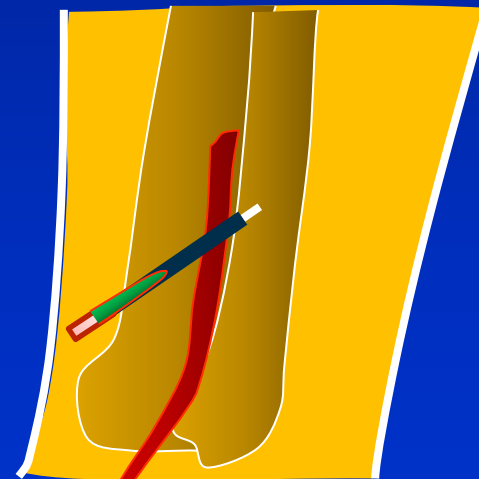
Tube – Needle – Artery in a single line



Left ATA puncture

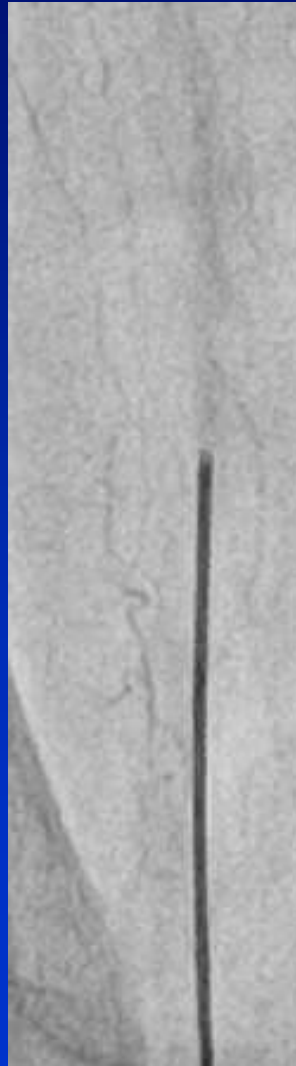


**Tube – Needle – Artery
in a single line**



**Measure artery depth at
60-90° opposite angle**

Penetration of artery



Foot Position for DPA, ATA, or PA puncture



Foot Position for PTA or distal SFA

Straight Position / Frog Leg Position



**Tube – Needle – Artery
in a single line**



**Measure artery depth at
60-90° opposite angle**

Retrograde access via proximal ATA



Foot position preparation is crucial
Tube – Needle – Artery in a single line

Retrograde access via proximal ATA

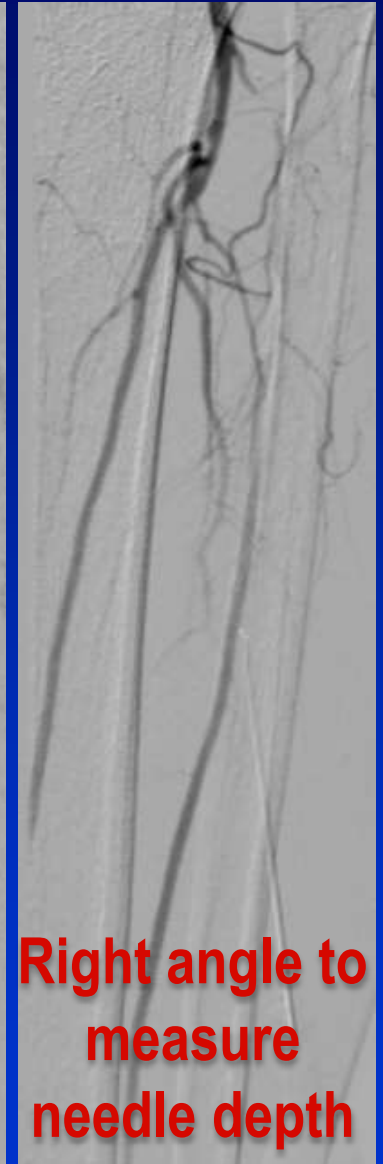
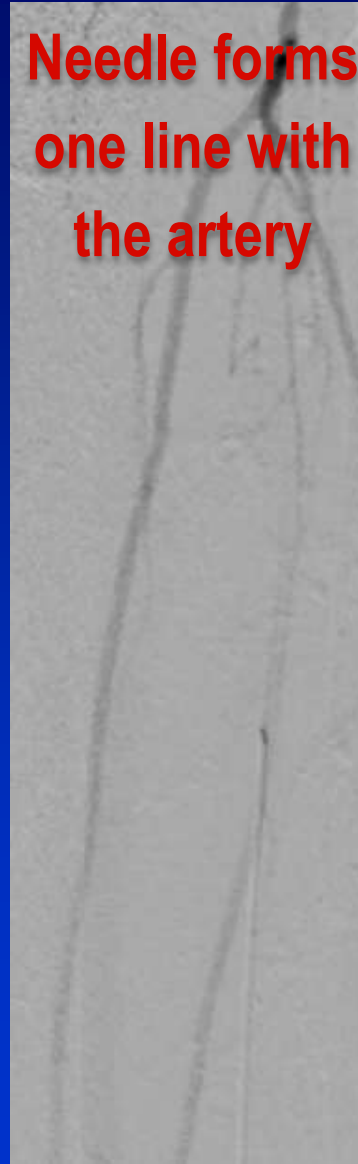


Measure needle depth at 60-90° opposite angle

Retrograde access via proximal ATA

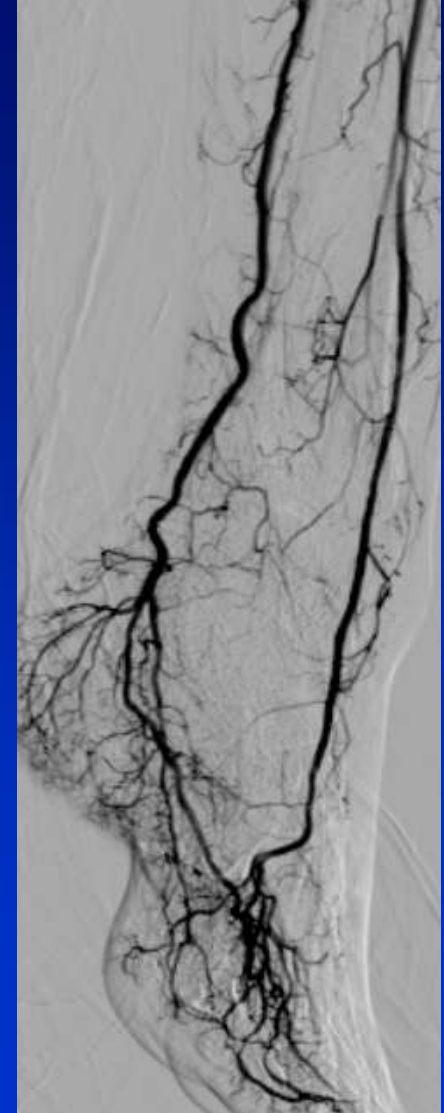
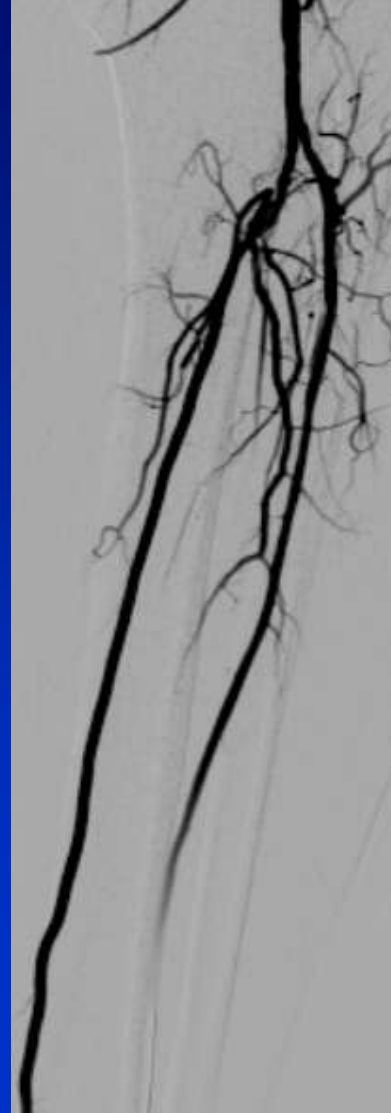


Needle forms
one line with
the artery

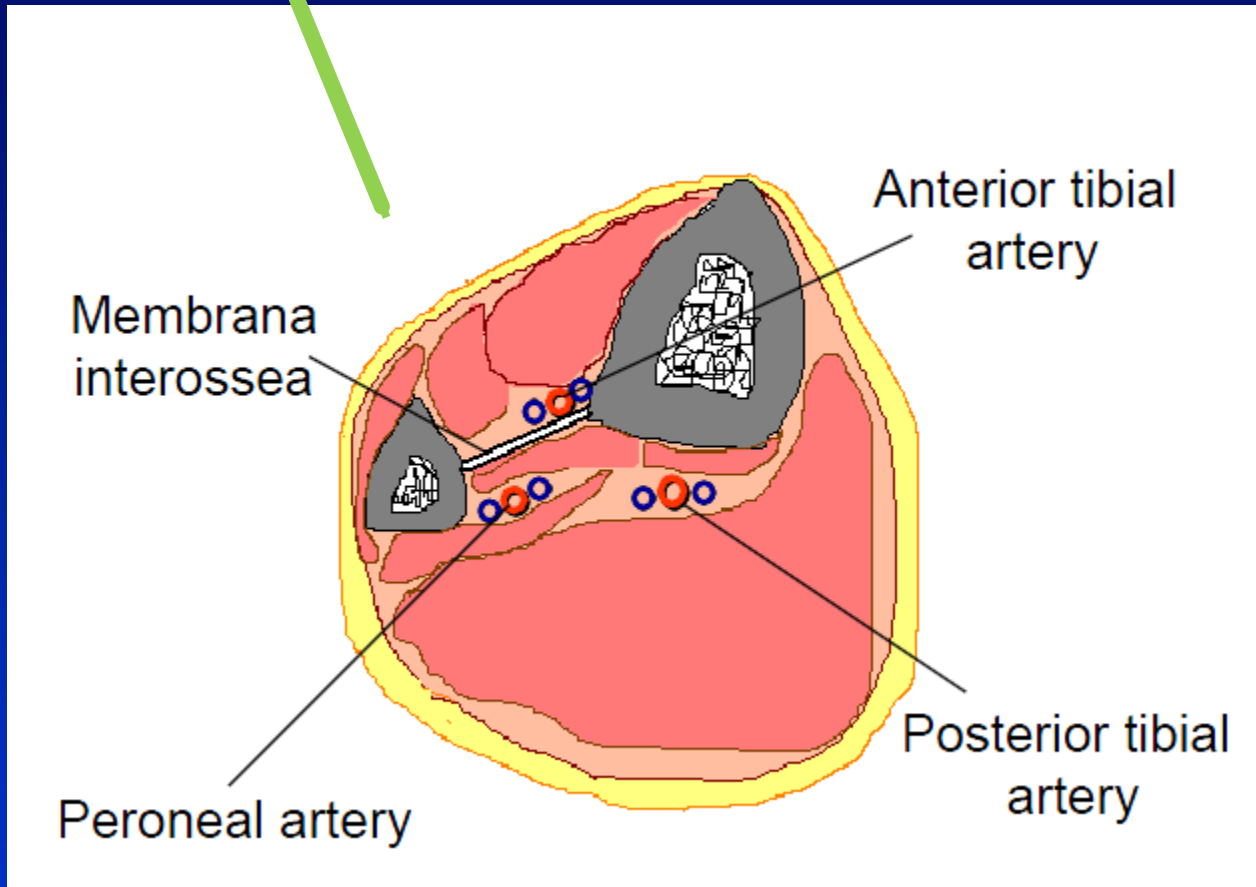


Right angle to
measure
needle depth

Retrograde access via proximal ATA



Peroneal Artery Puncture

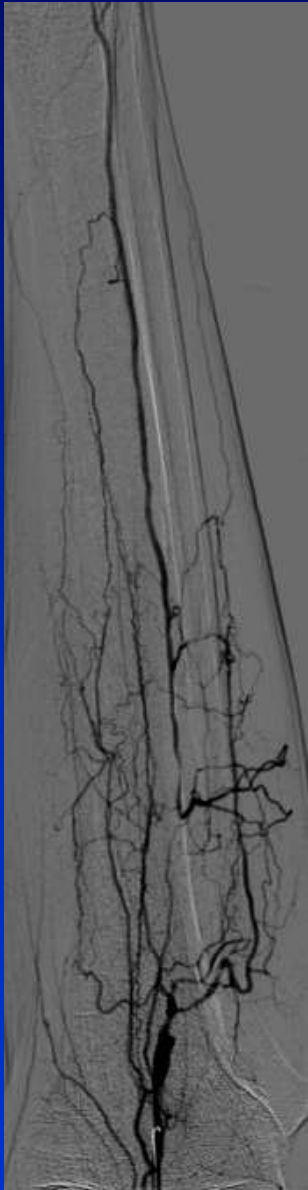


Lower 1/3 of lower leg
Through the membrana interosseus

Peroneal Artery Puncture



Peroneal Artery Puncture



**Difficult
antegrade
wiring**

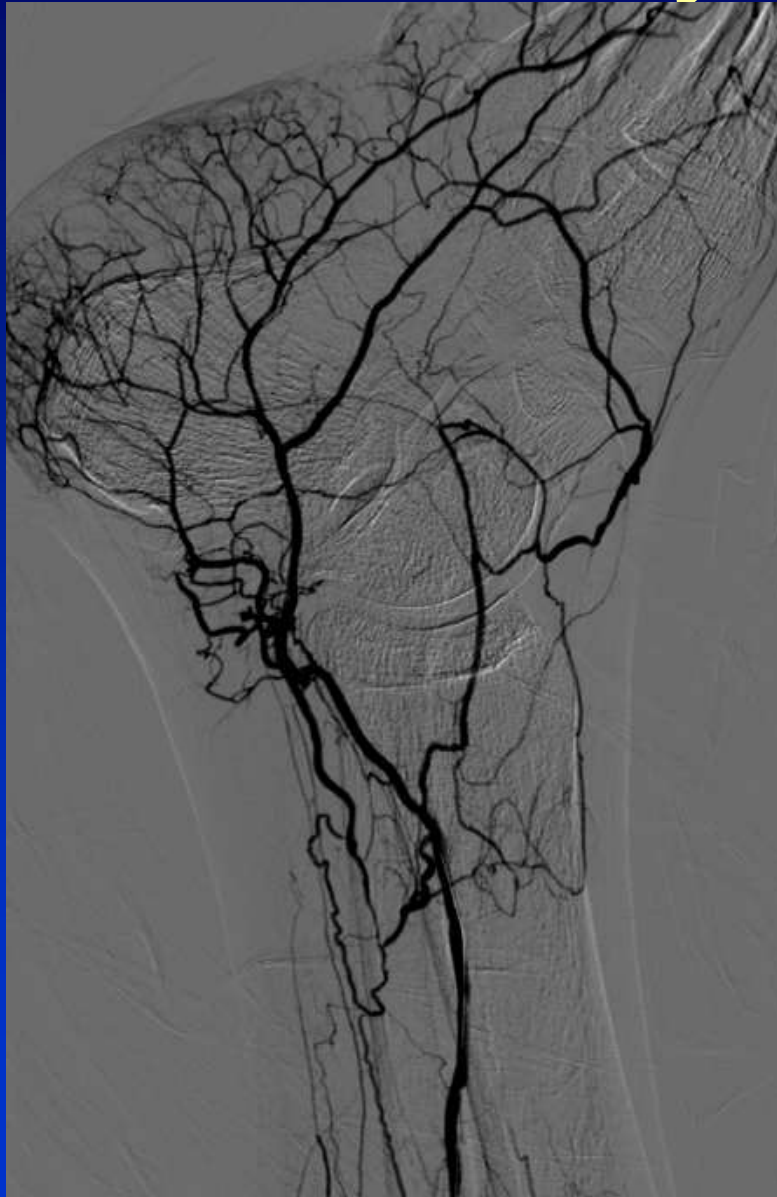
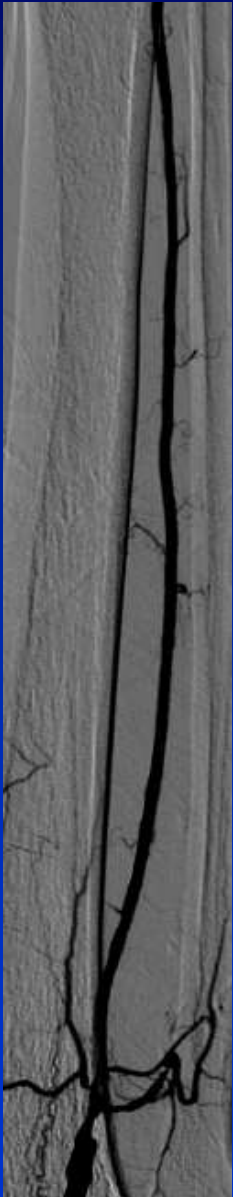


**Retrograde
peroneal
puncture**



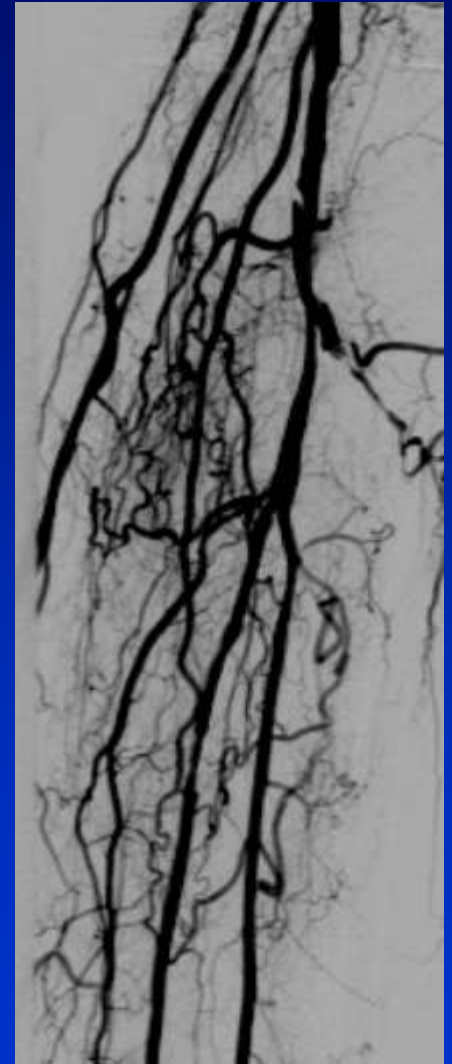
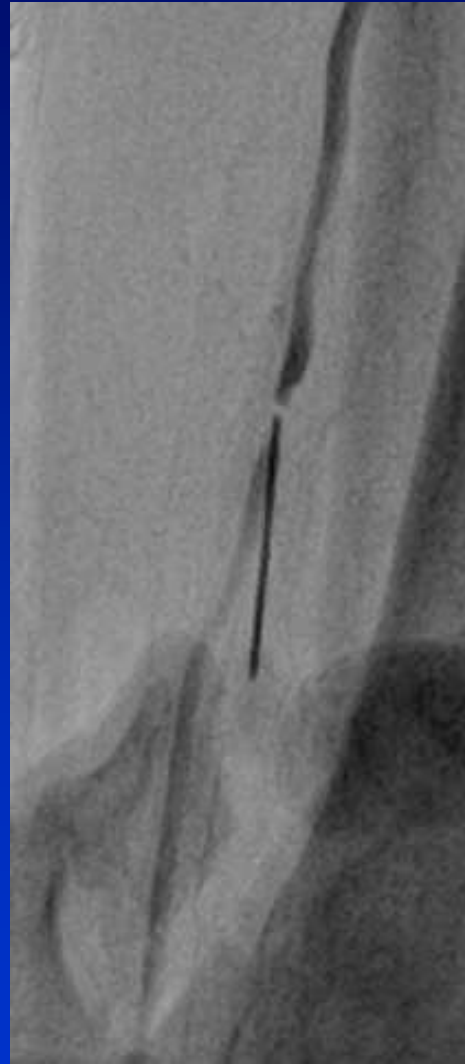
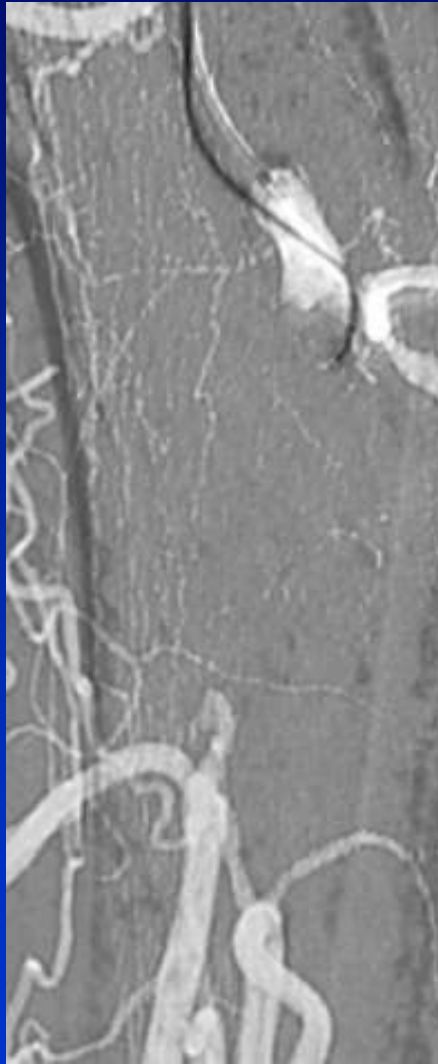
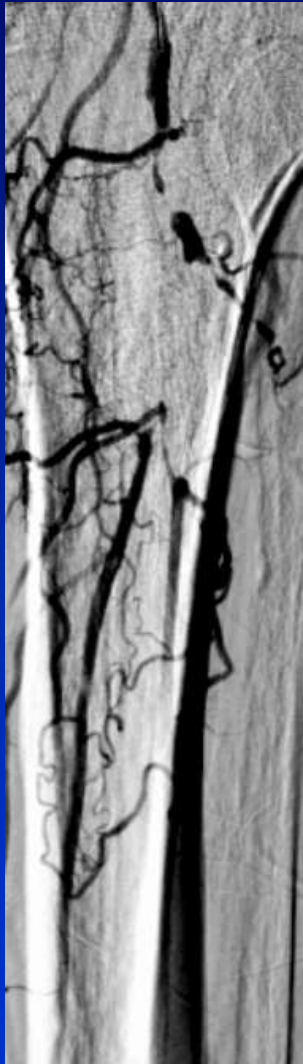
CART

Peroneal Artery Puncture

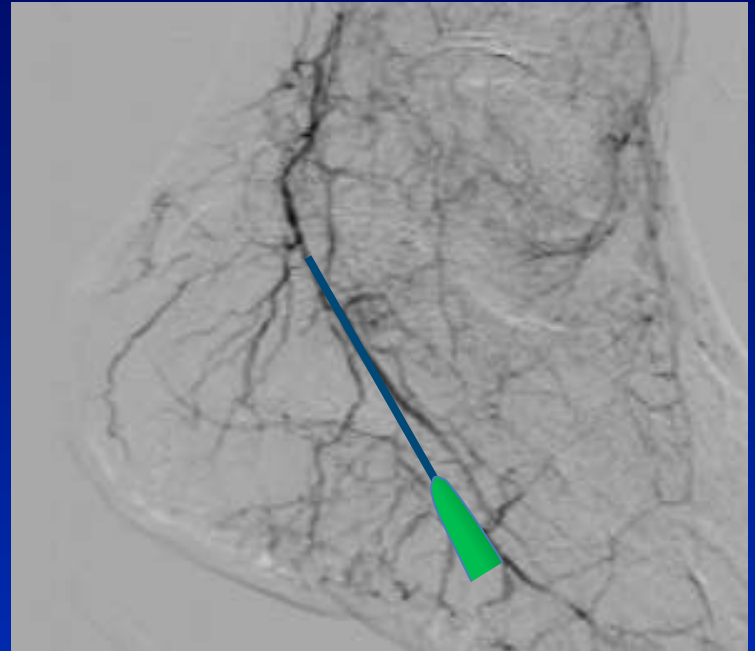
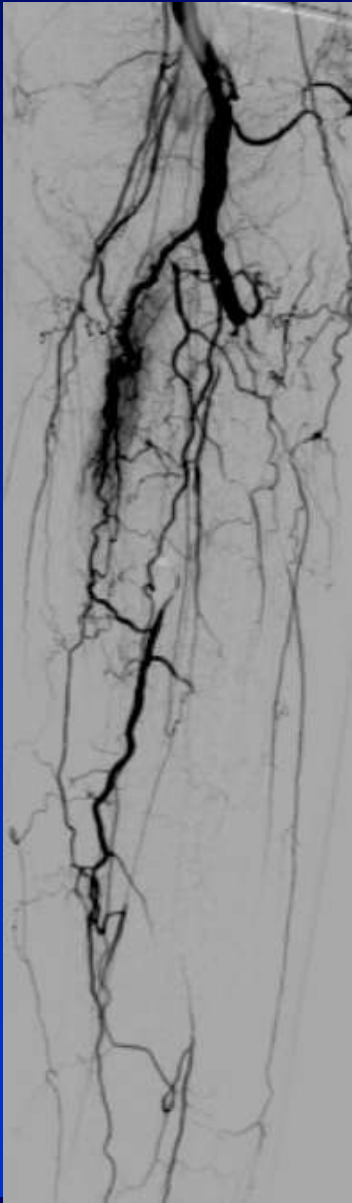


**Single straight
peroneal line
with good distal
connection**

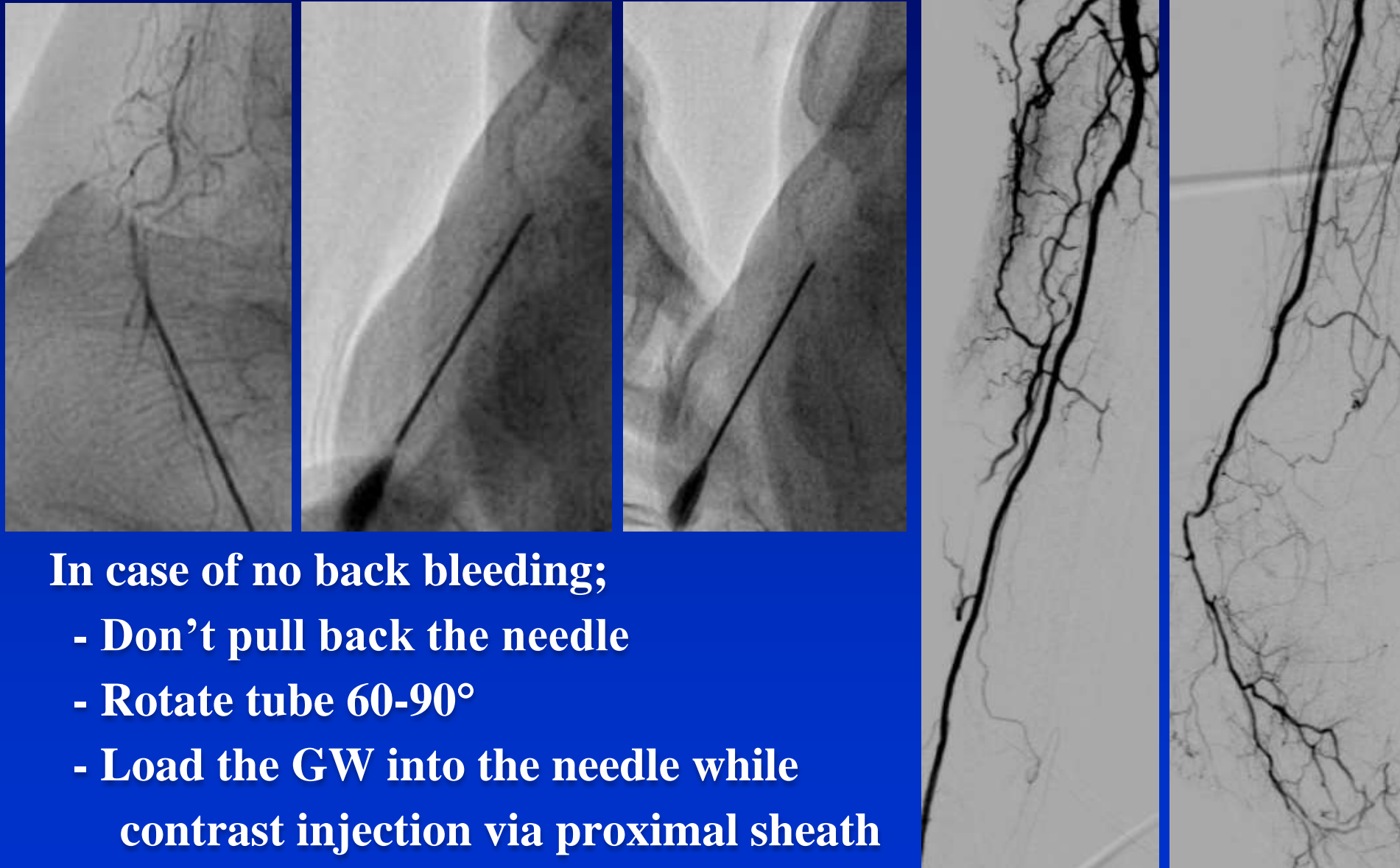
PTA Puncture – Contrast Pinching



Posterior Tibial Artery Puncture



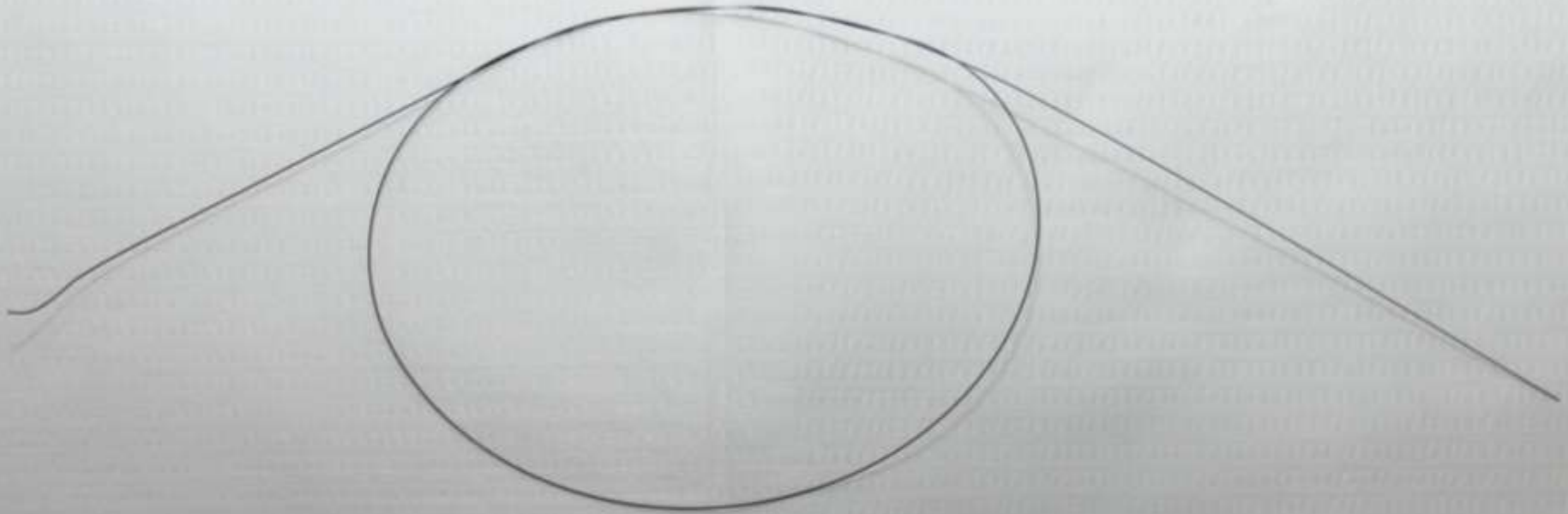
Posterior Tibial Artery Puncture



In case of no back bleeding;

- Don't pull back the needle**
- Rotate tube 60-90°**
- Load the GW into the needle while contrast injection via proximal sheath**

Prepare 50-60 cm Tip of 0.014" Hydrophilic GW



0.014" ChoicePT or Fielder FC

Puncture for Calcified Arterial Silhouette

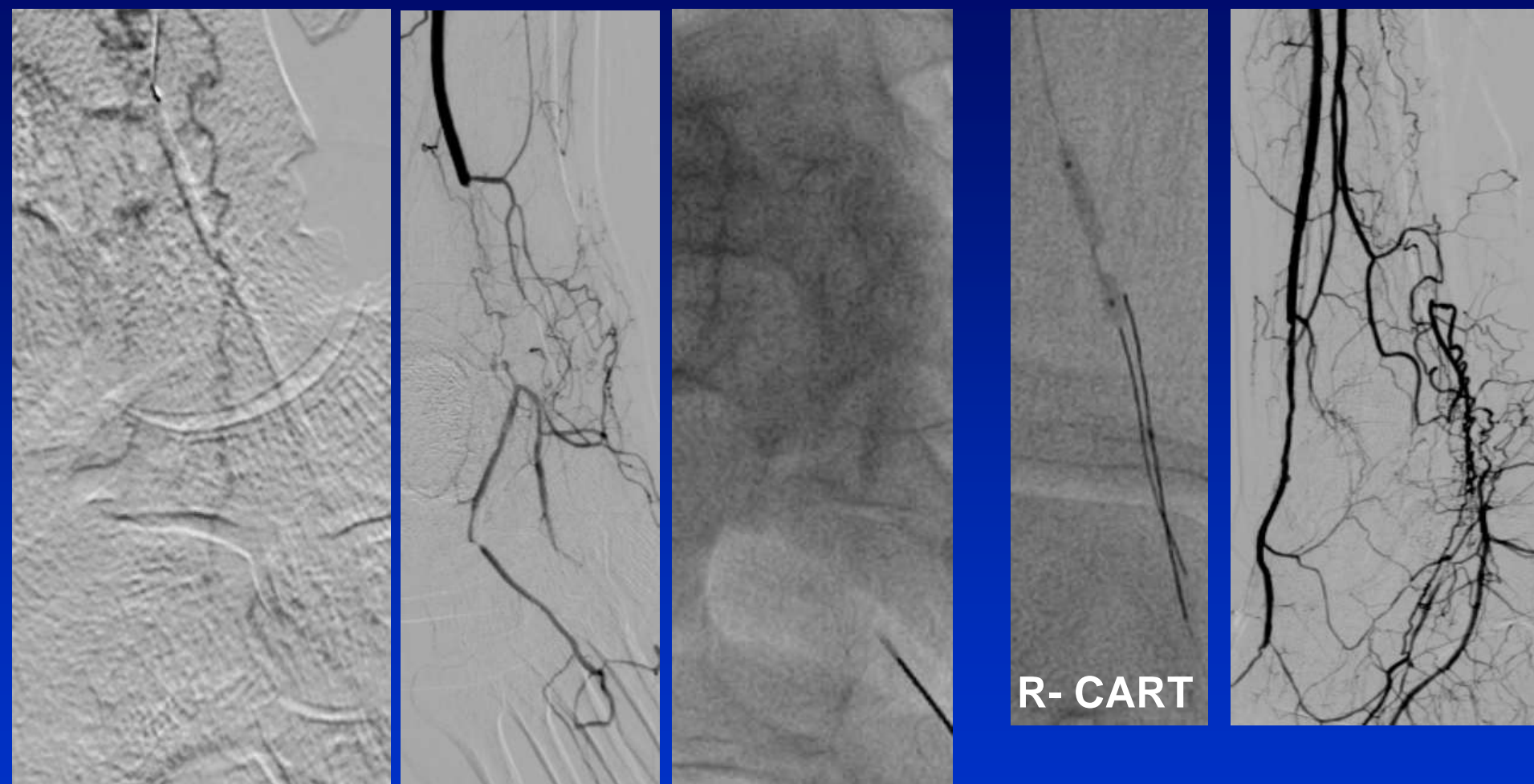


Distal PTA puncture without contrast injection

Occlusion Balloon at Distal SFA or Popliteal

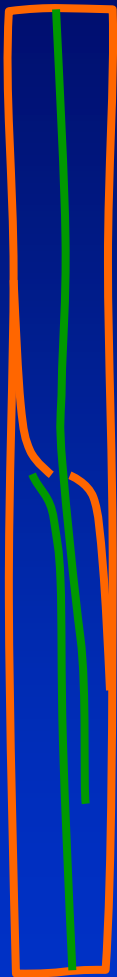
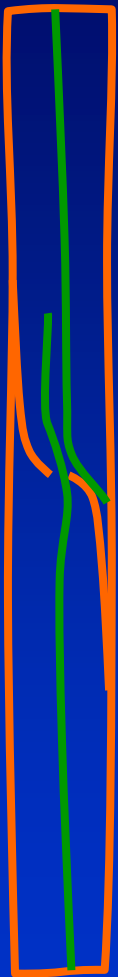


Injection from Microcatheter Tip

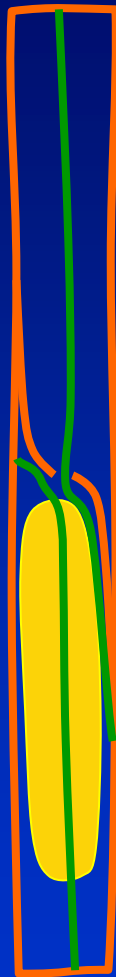


Continuous injection with < 2 cc contrast
Reduce noise from other collateral

Techniques for Retrograde GW Passage



**Contralateral GW
-assisted wiring**



**R-CART
& CART**

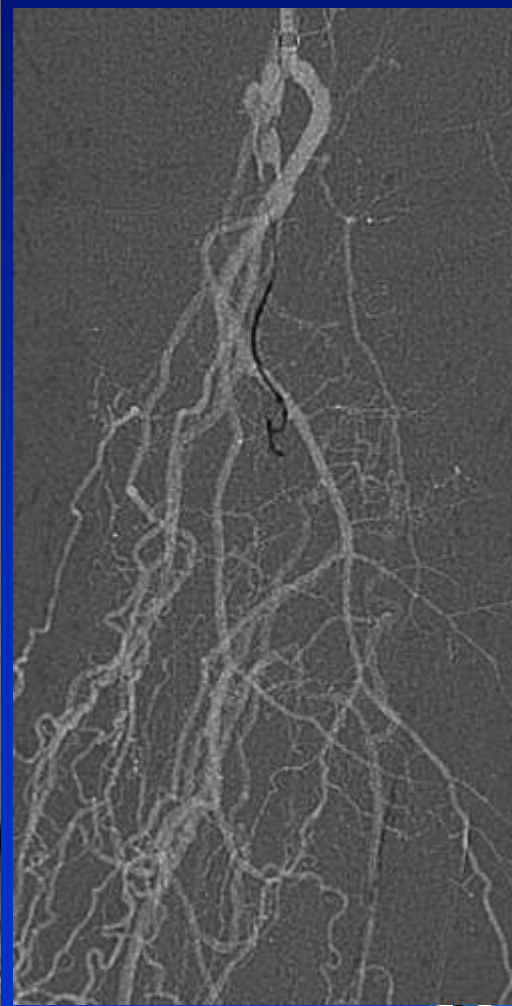
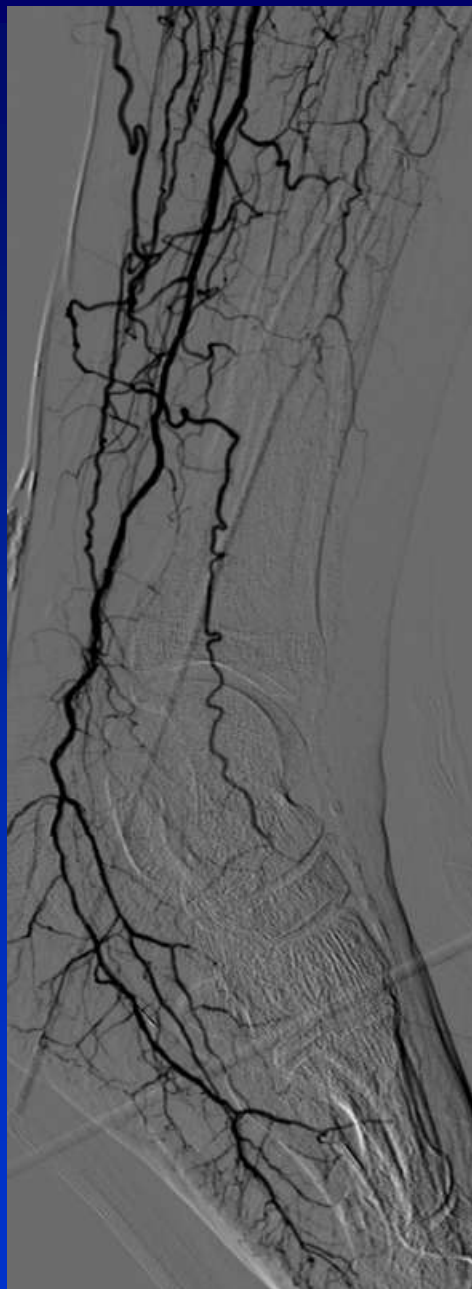
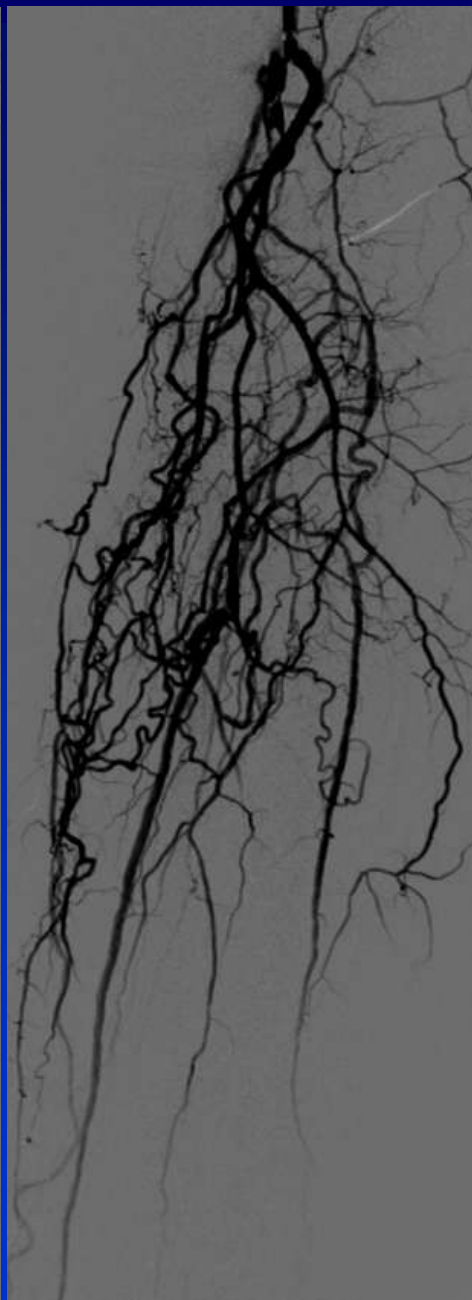
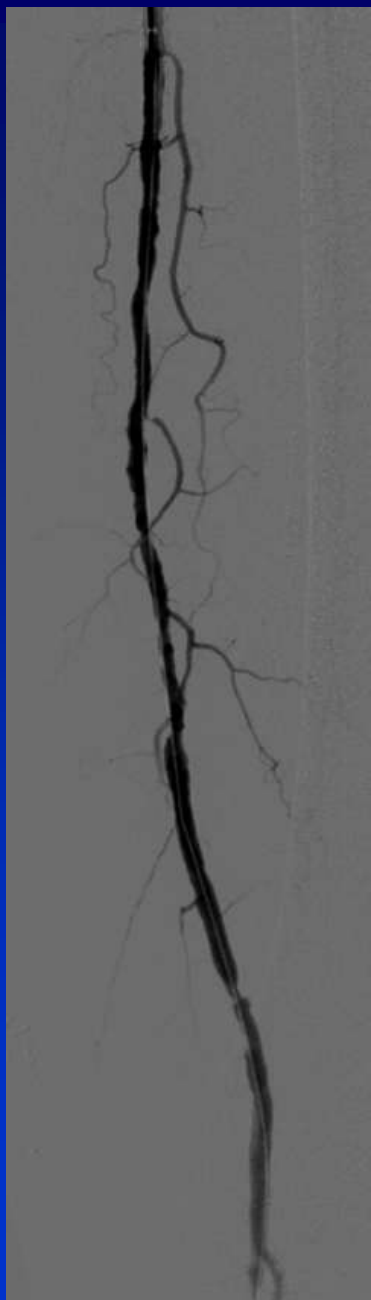


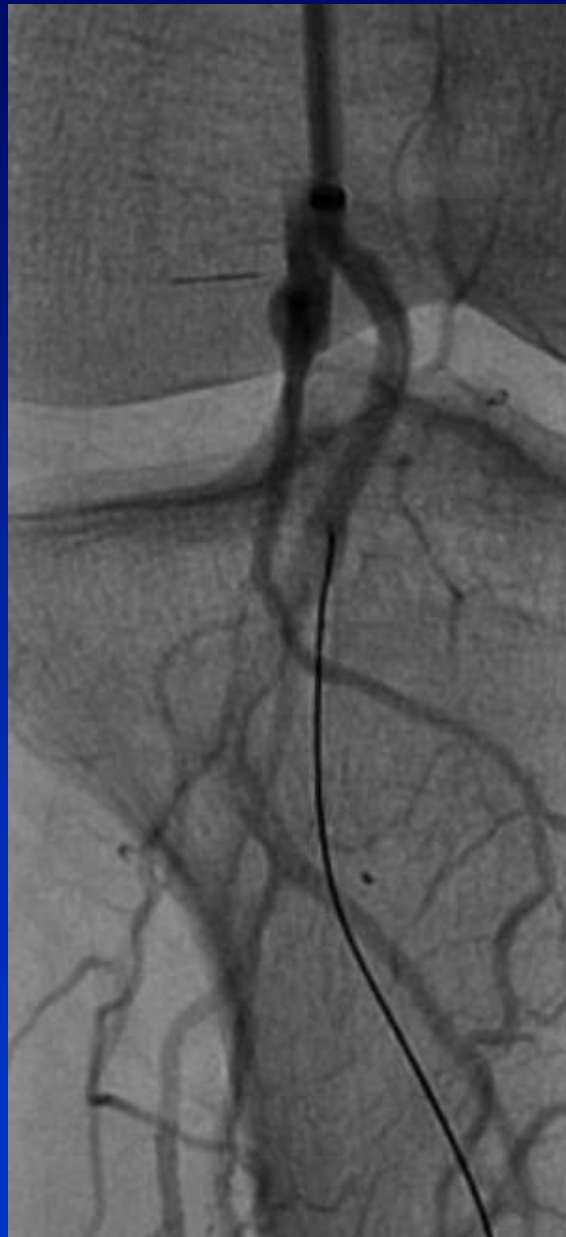
**Double
balloon**



**Reentry
device**

Unsuccessful antegrade wiring

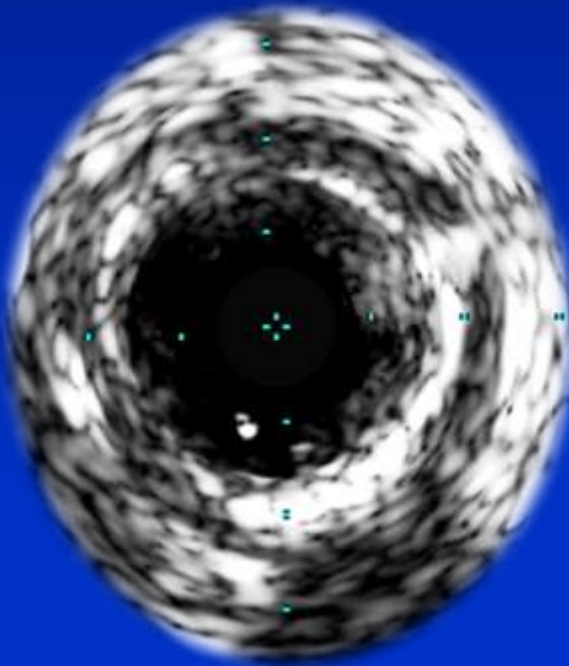




**Unsuccessful
retrograde
wiring**

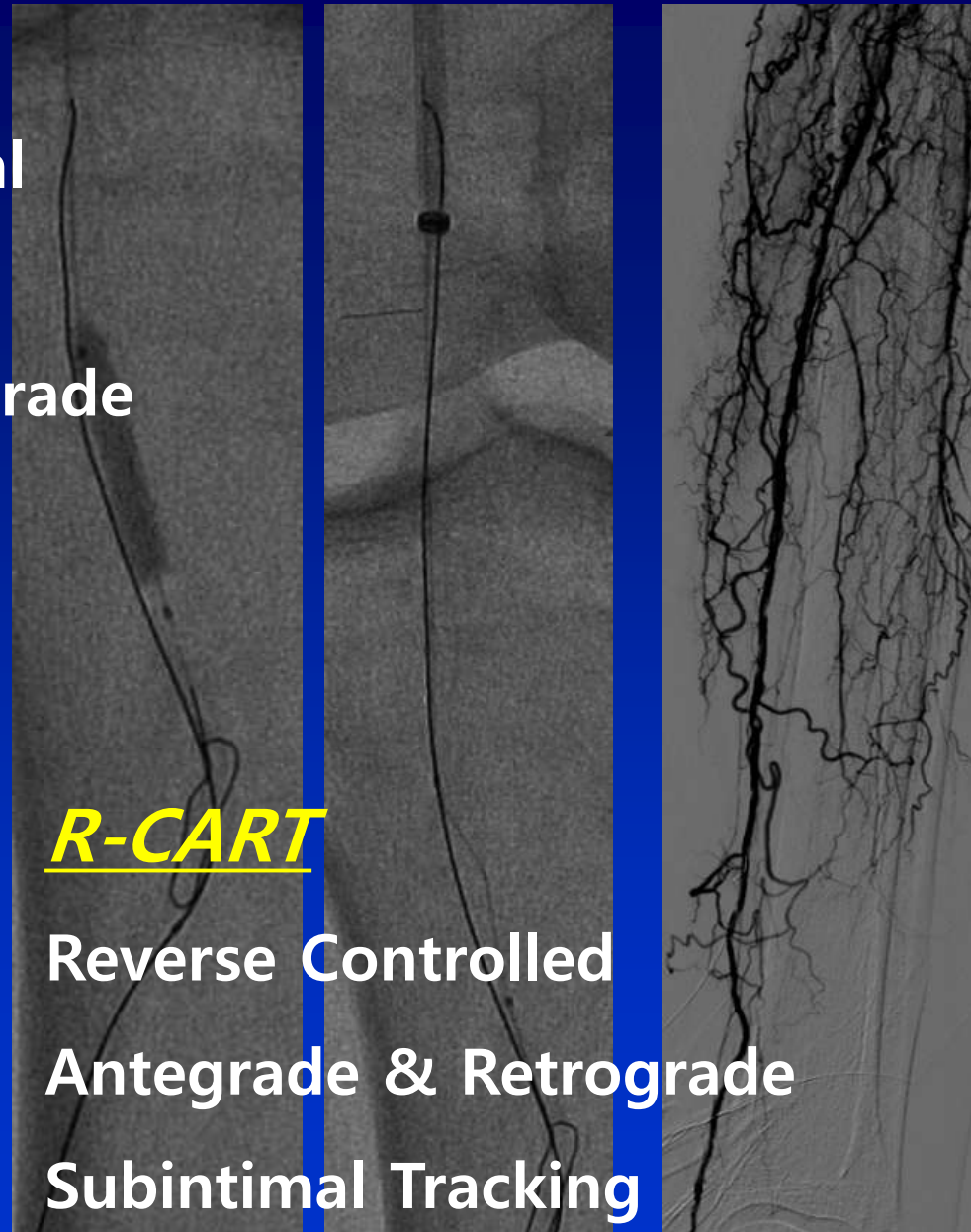
SAFARI

Subintimal Arterial
Flossing with
Antegrade-Retrograde
Intervention

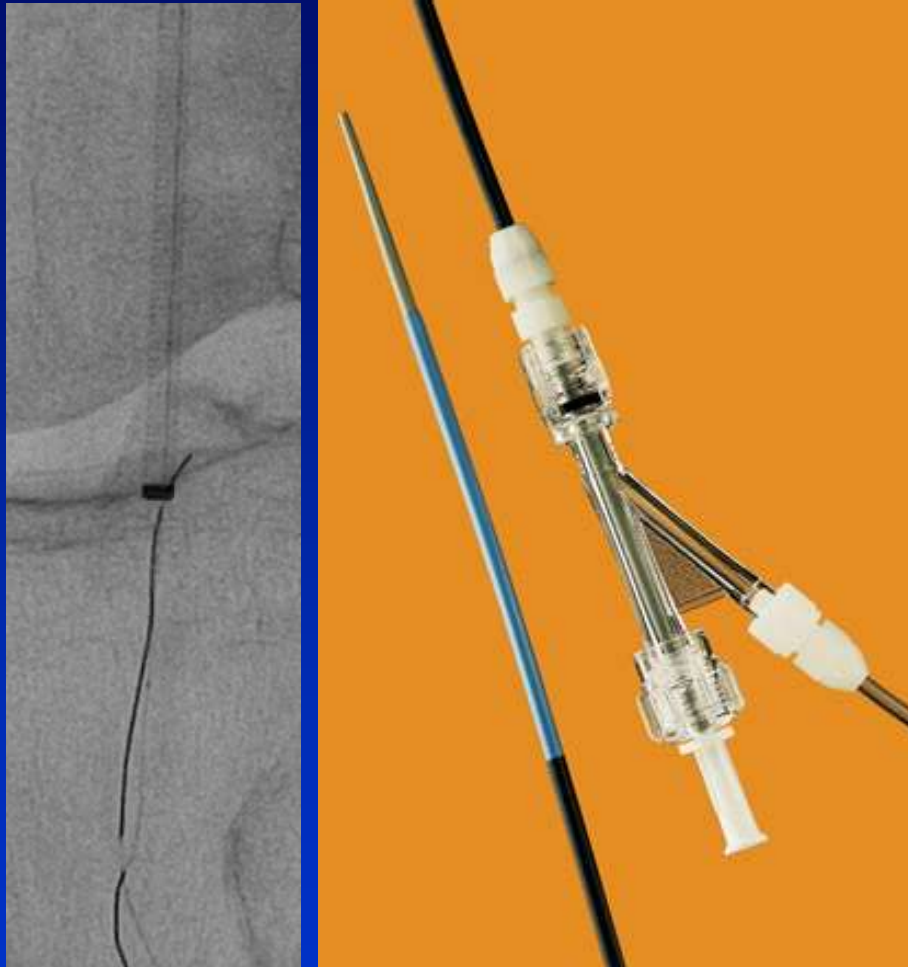


R-CART

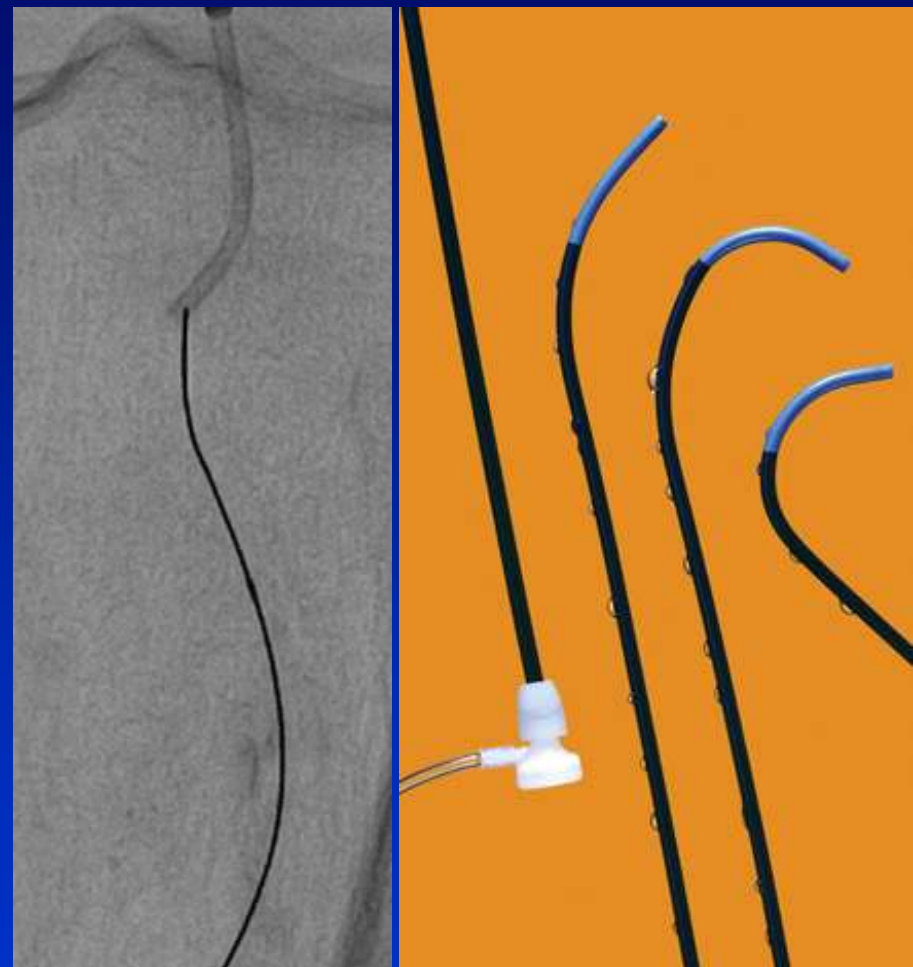
Reverse Controlled
Antegrade & Retrograde
Subintimal Tracking



Snaring of Retrograde Wire



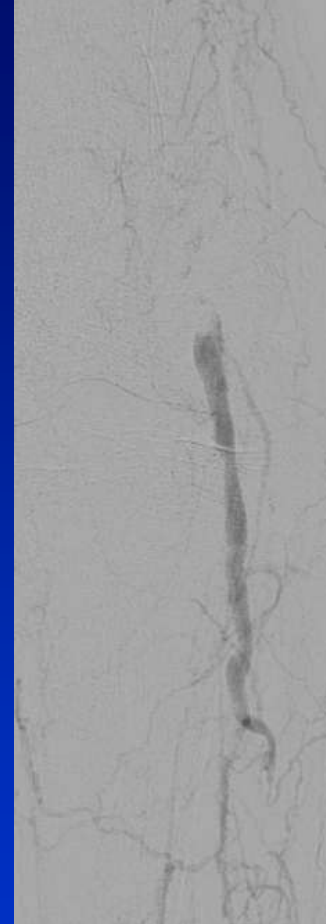
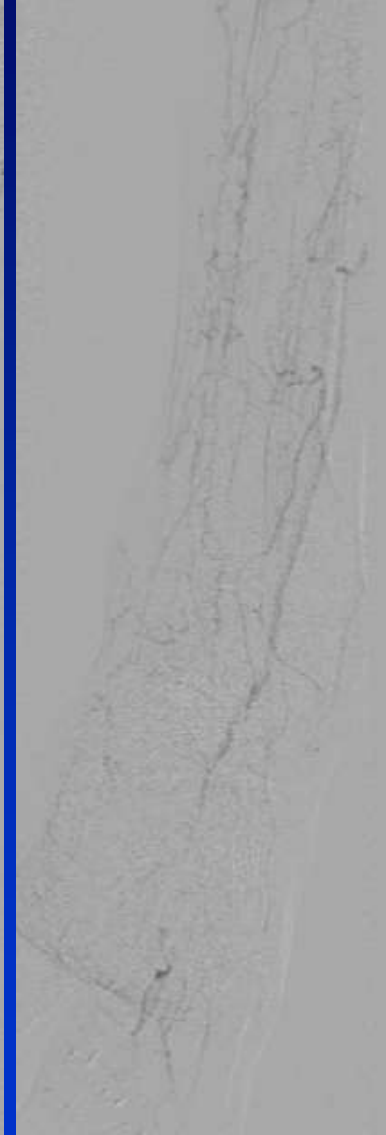
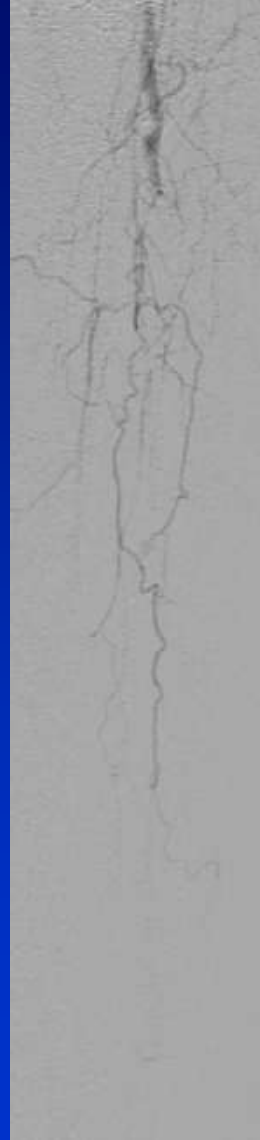
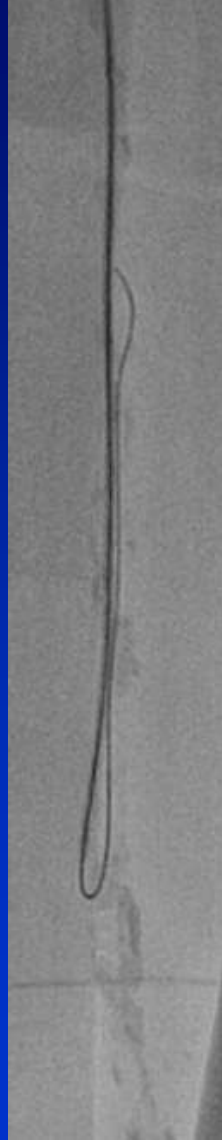
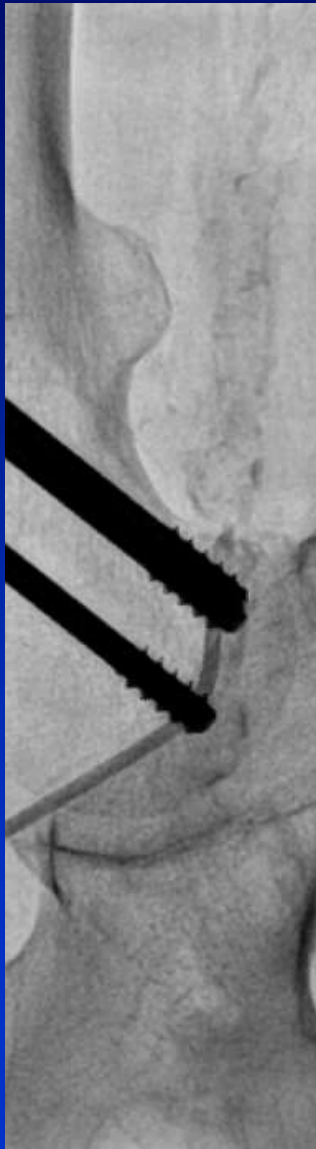
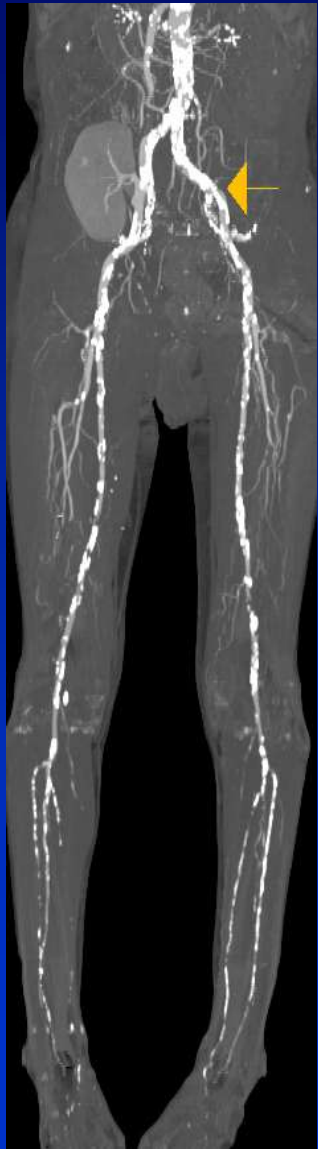
**Direct insertion
to the sheath**

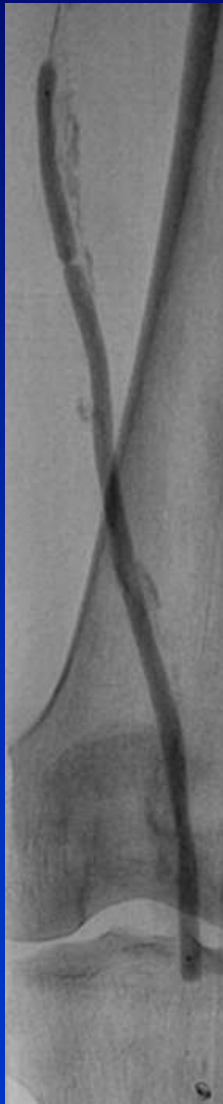
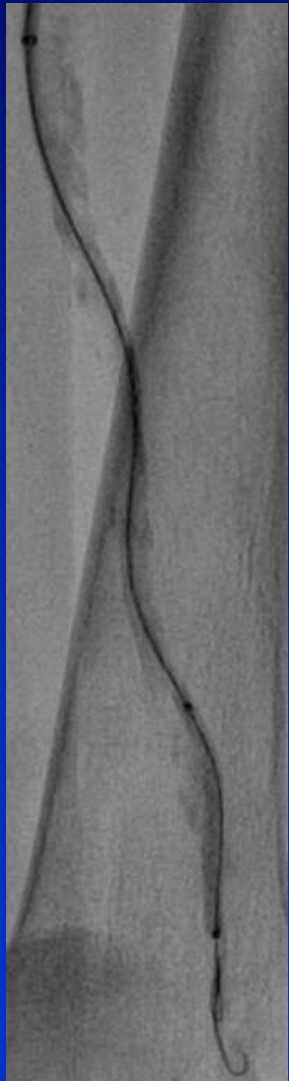


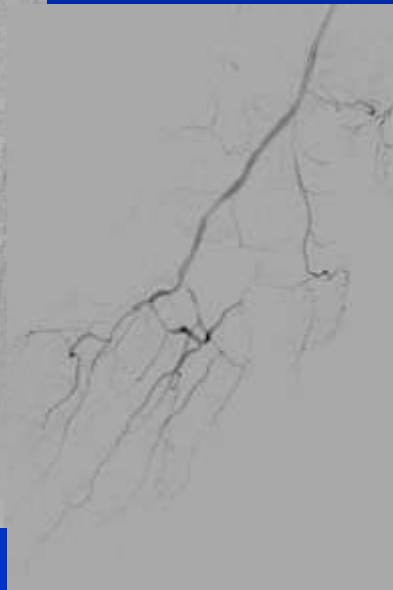
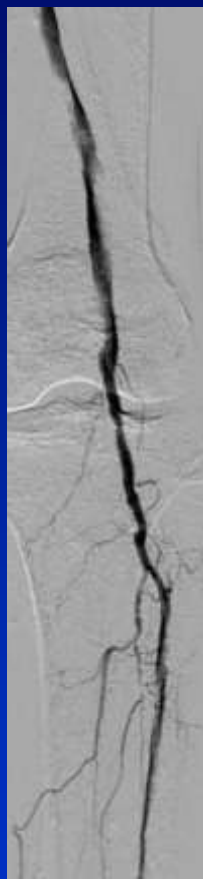
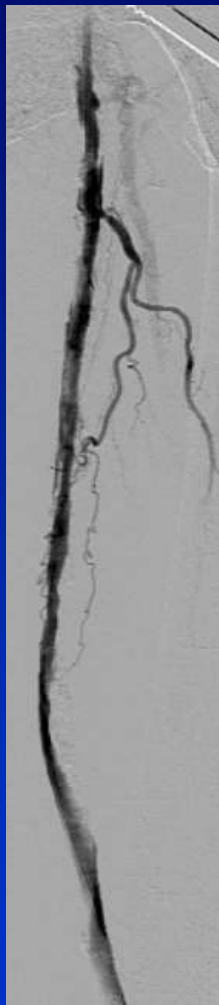
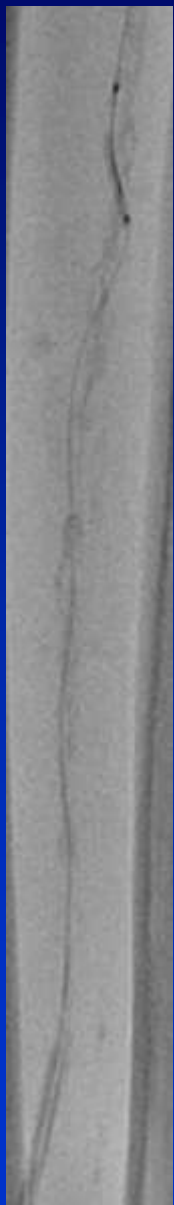
**Insertion into
JR 5-6 Fr**

Extreme Retrograde Cases

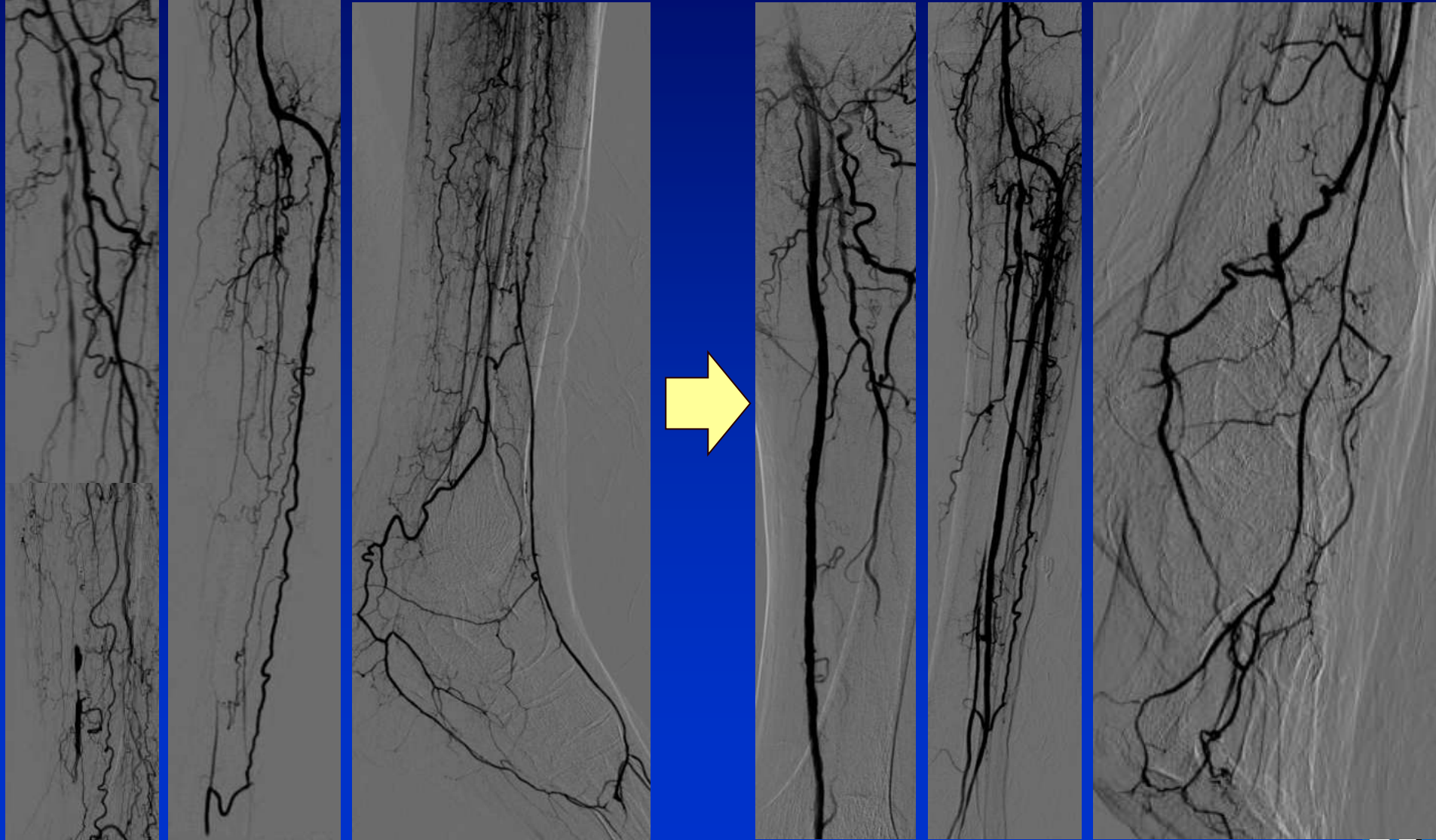
Failed Twice Previously





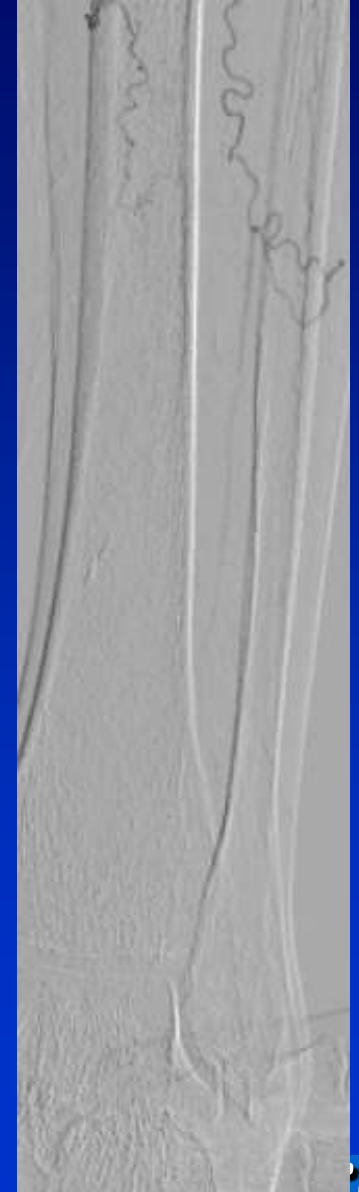
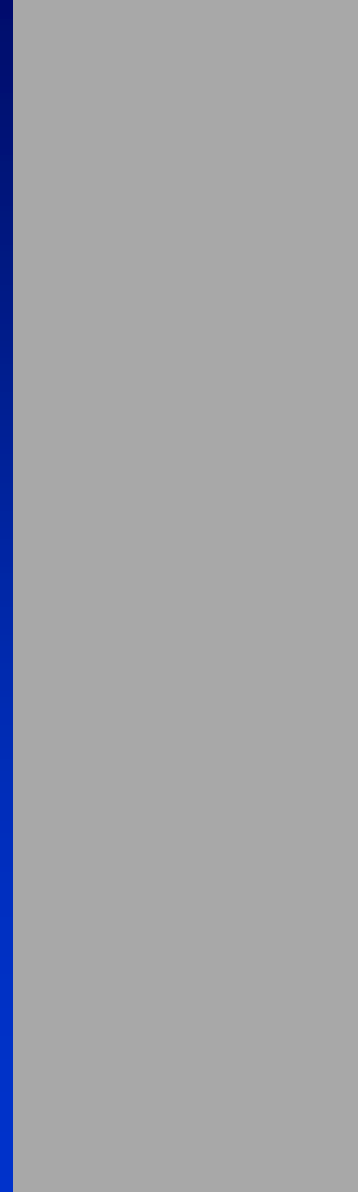


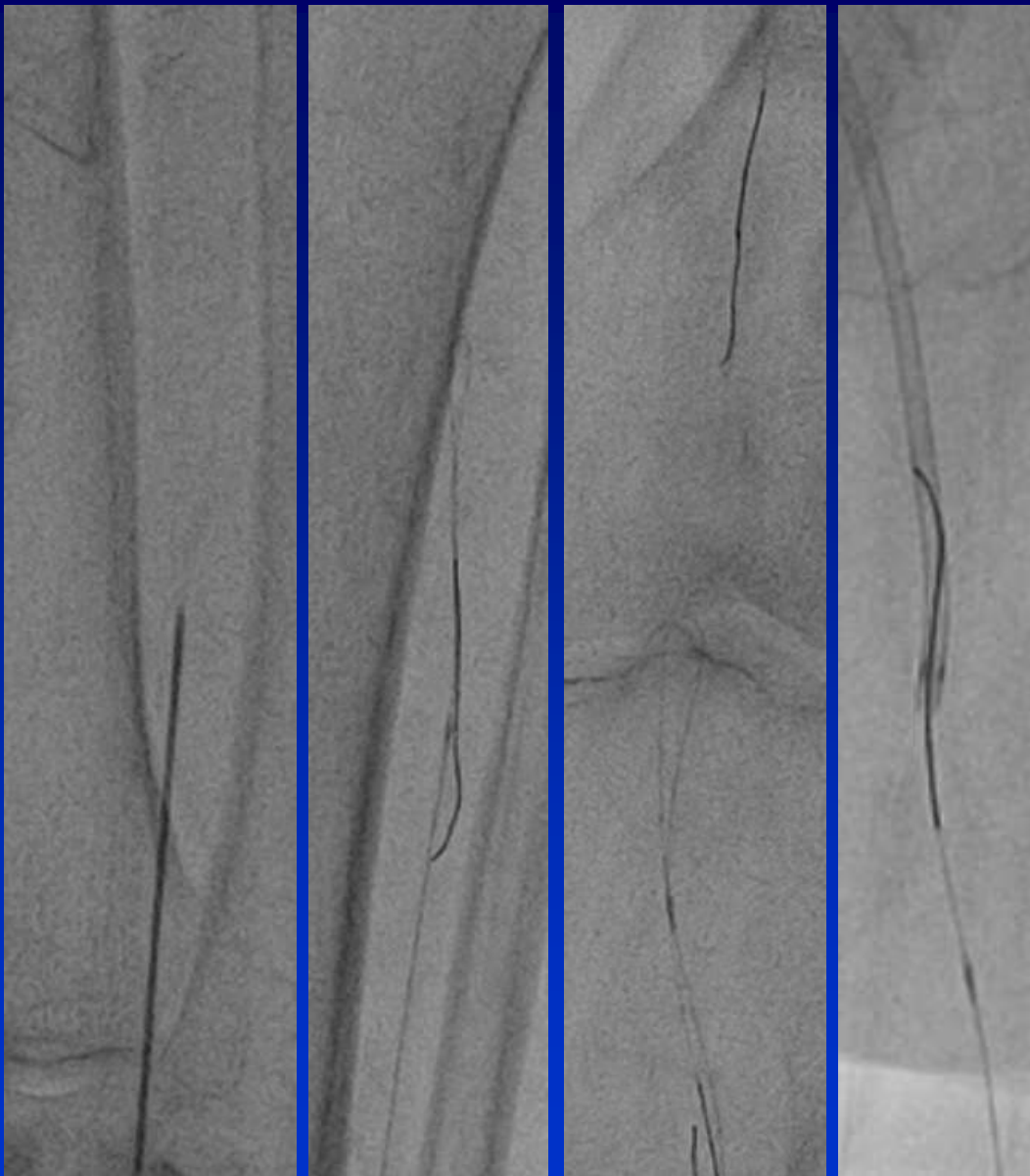
77 yo woman, Old CI, IHD
Left ischemic foot ulcer, 2YA



Recurrent left toes ulcer, unhealed for 3 mo

→ Antegrade access

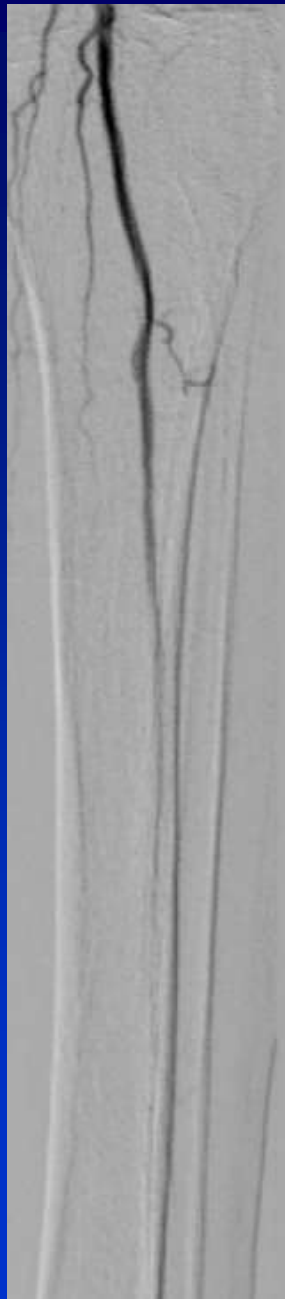
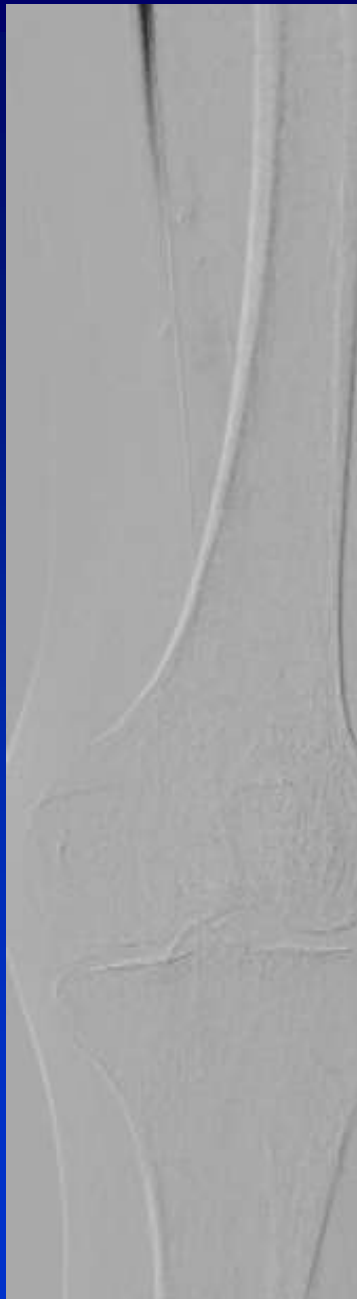




Retrograde peroneal access



Balloon angioplasty



86 yo man, S/P PCI 2 YA, Chr. Afib
Chronic Fontaine IIb claudication, both
→ Severe resting limb pain, several days



2YA

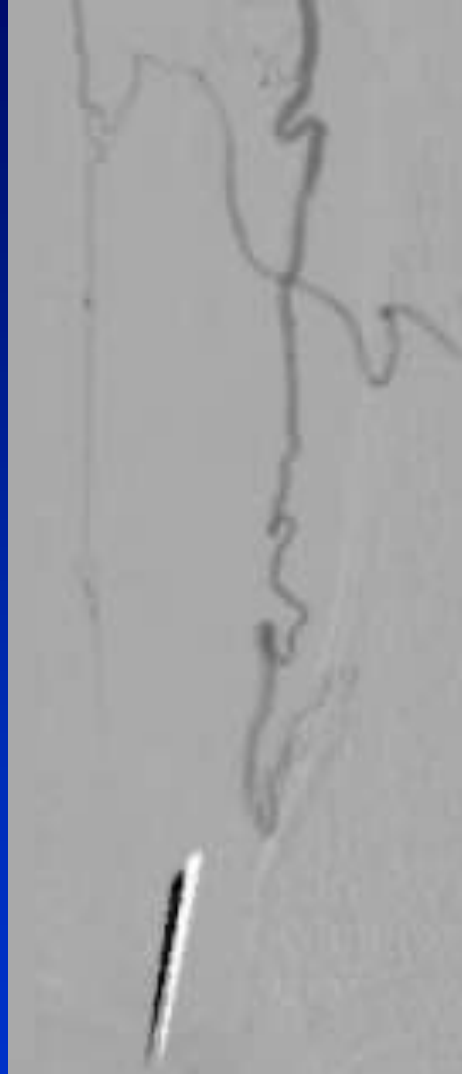


Resting limb pain



**Thrombi
aspiration**

After overnight UK infusion



PTA puncture

Stumpless

Reentry to popliteal



IVUS-assisted **Balloon angioplasty**
Astato GW

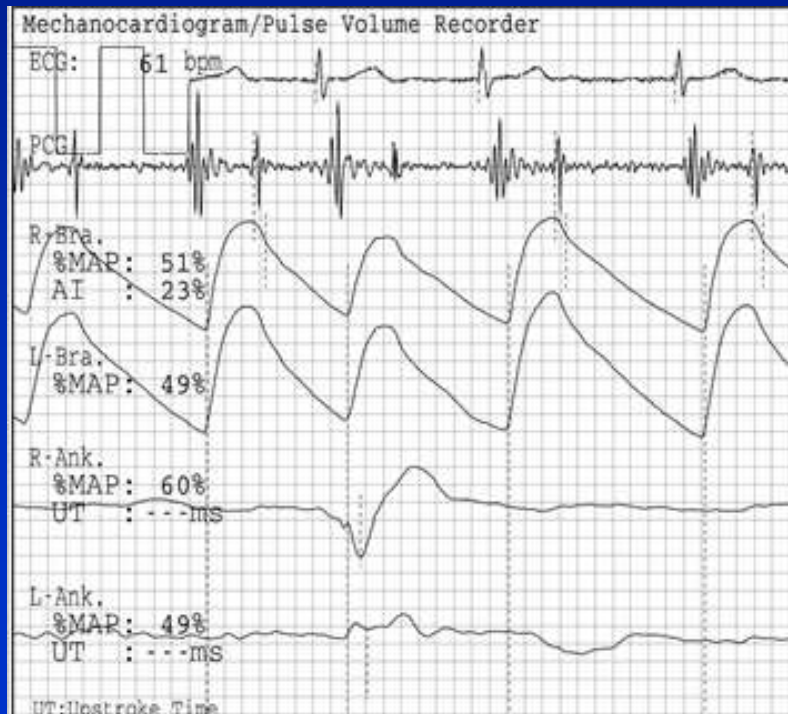
86 yo man,

Both leg claudication > 20 yrs, Fontaine lib

→ Right 2nd toe ulcer for 8 mo

DM, HTN

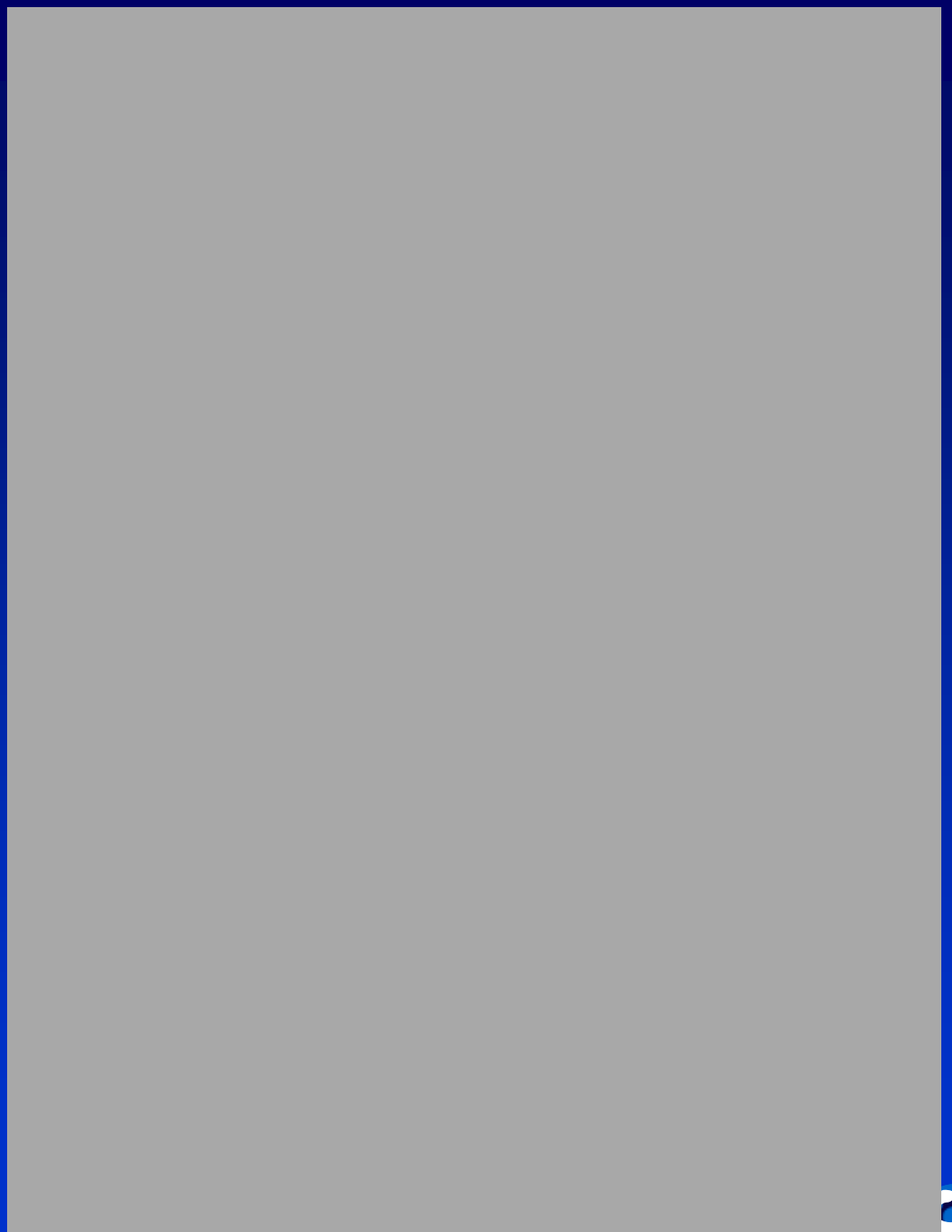
Cr 1.3 mg/dL



CT angiography



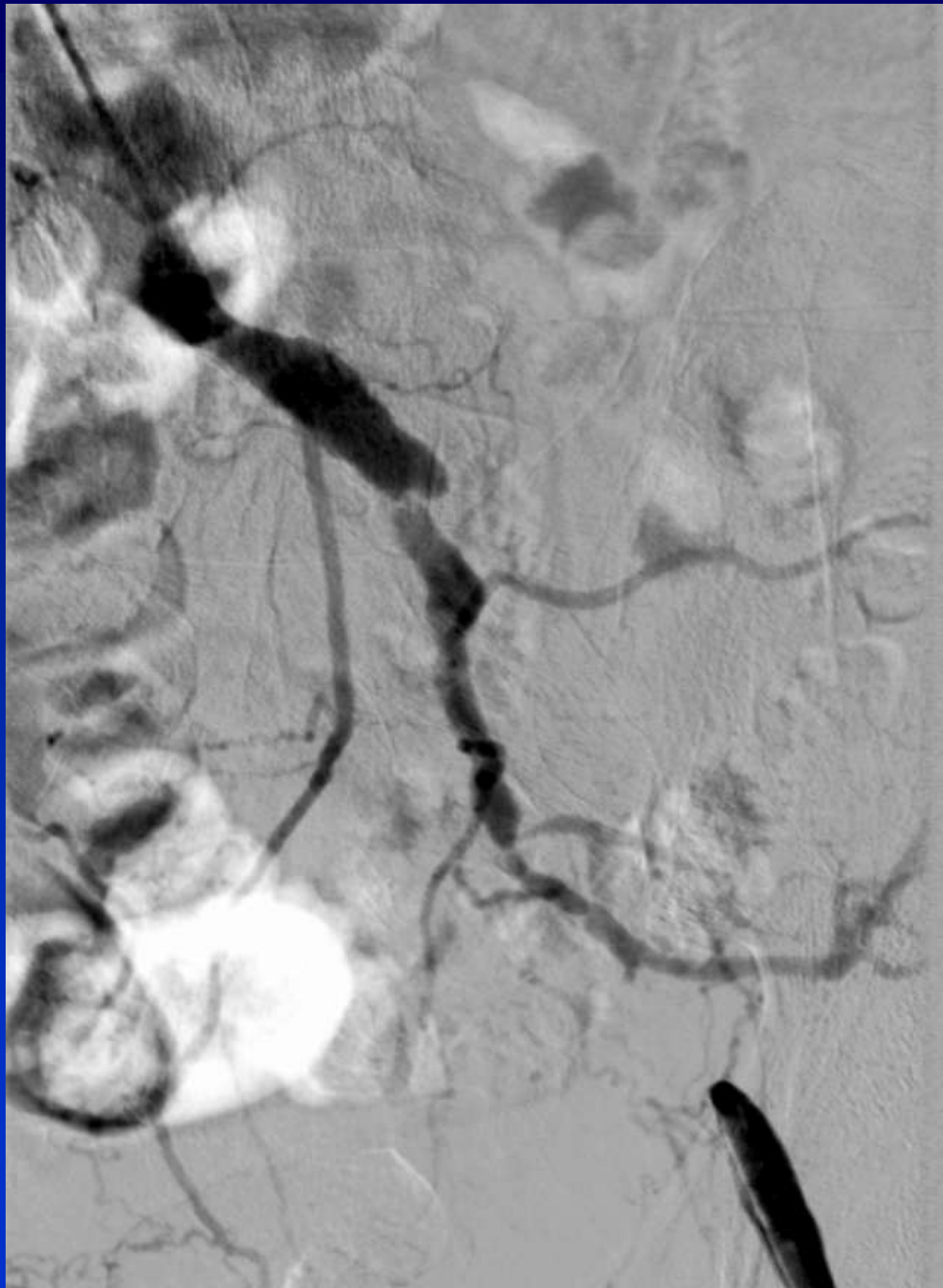
Angiogram via radial approach



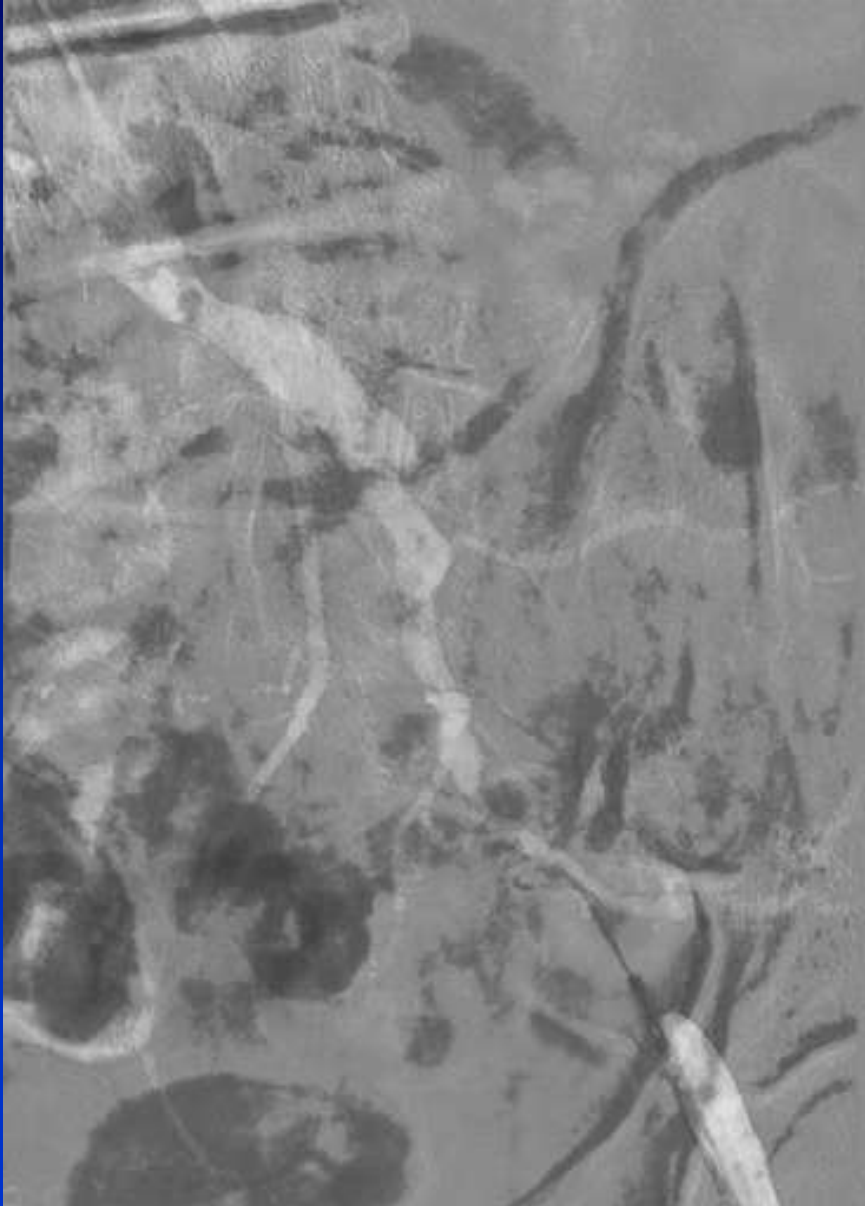
Both common femoral puncture



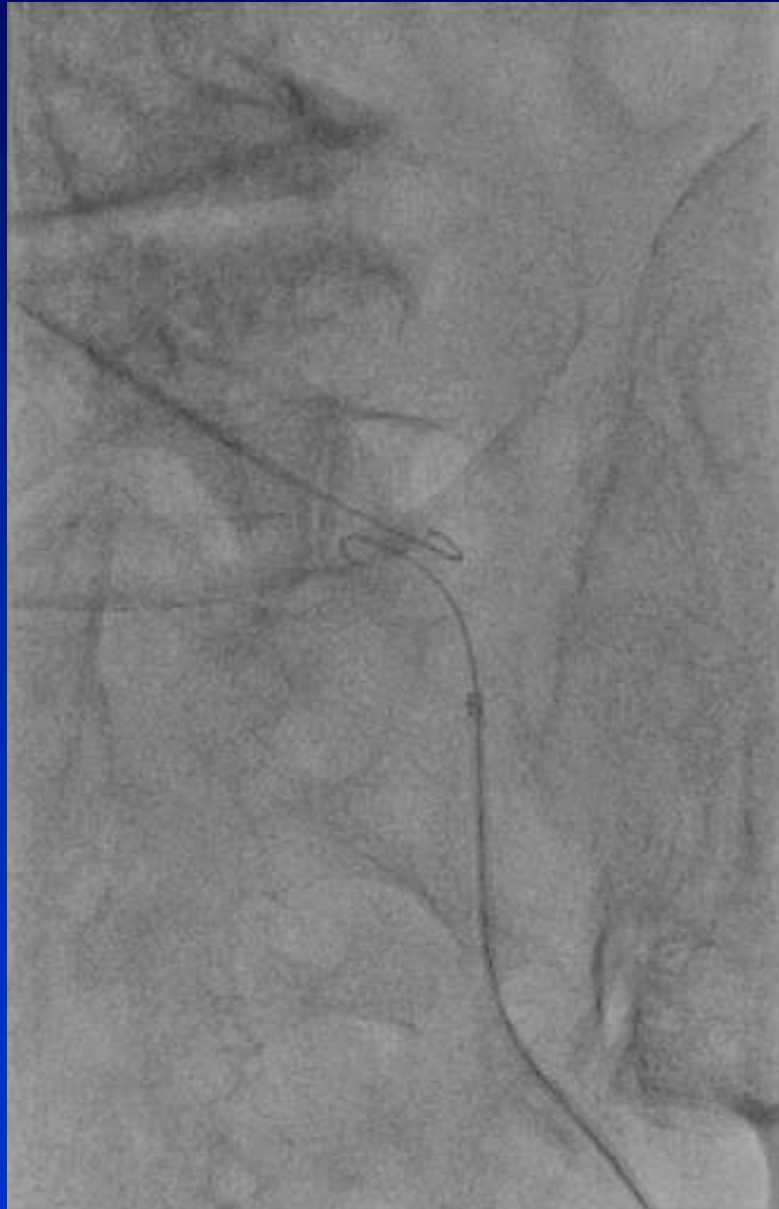
Lt iliac angiogram



Lt EIA – retrograde approach



Lt EIA – antegrade approach



Lt EIA – SAFARI technique (CART)



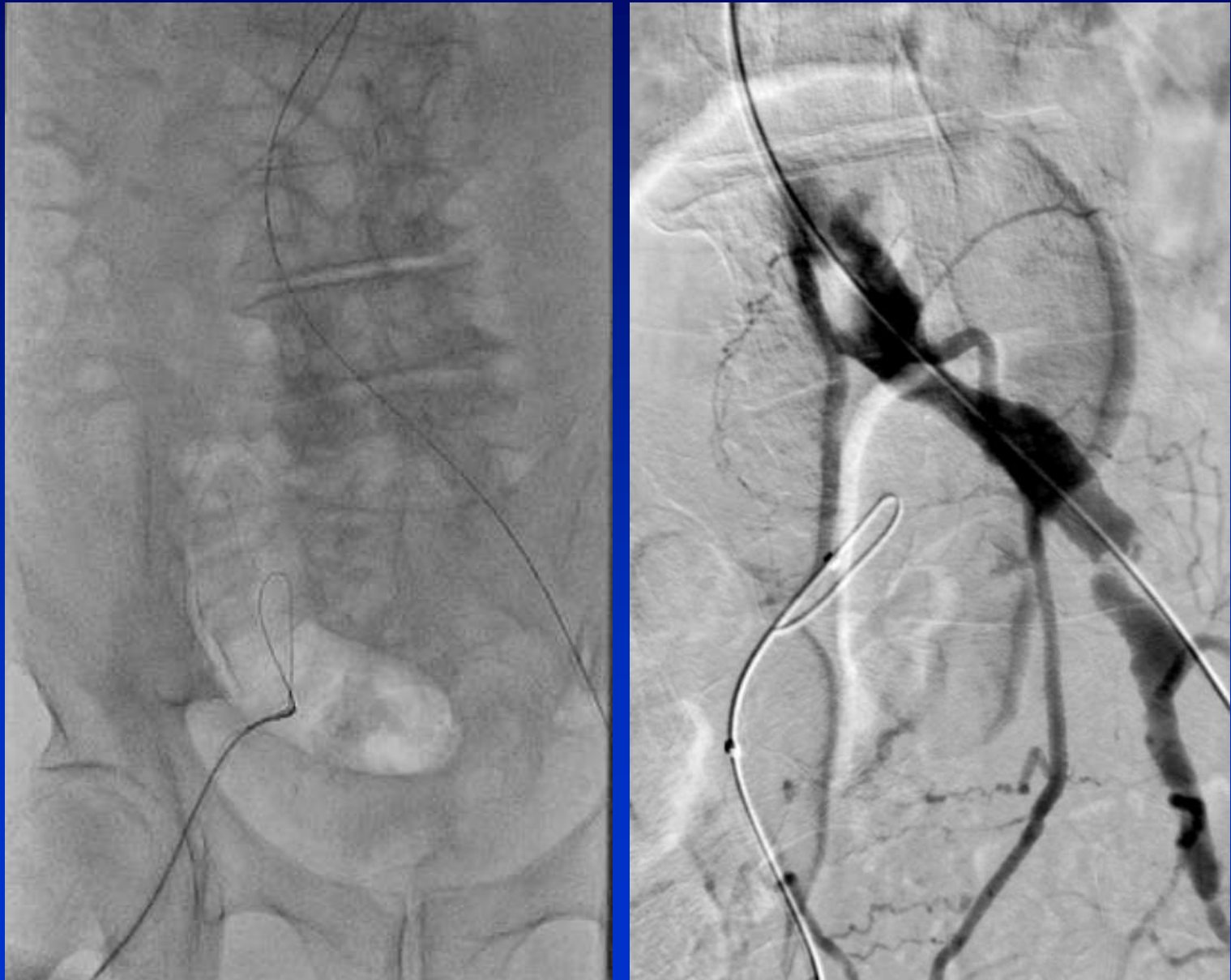
Antegrade wire was snared to 5 Fr JR



Lt EIA – Ballooning



Rt CIA – retrograde approach



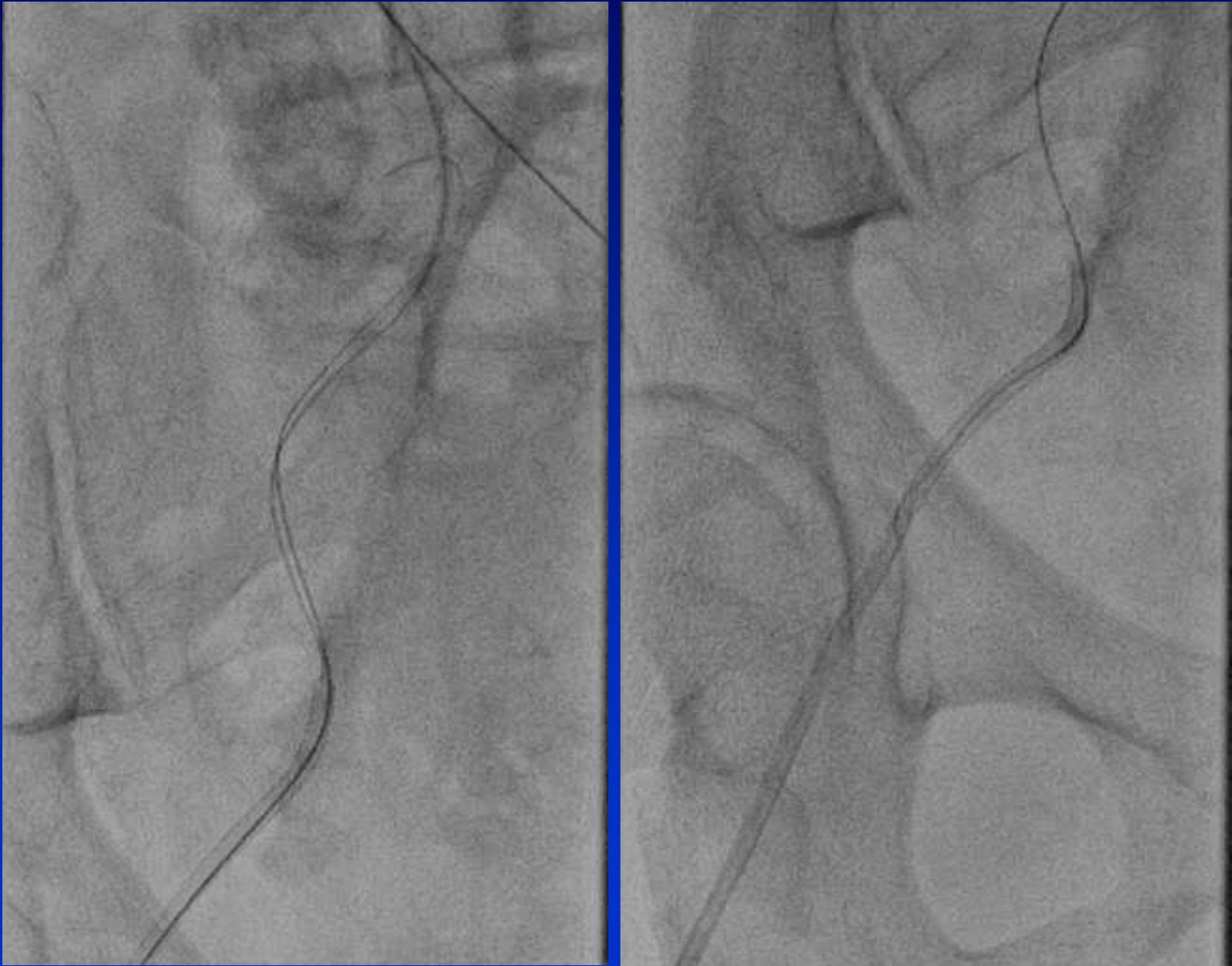
Rt CIA – antegrade approach



Rt CIA – SAFARI technique (CART)



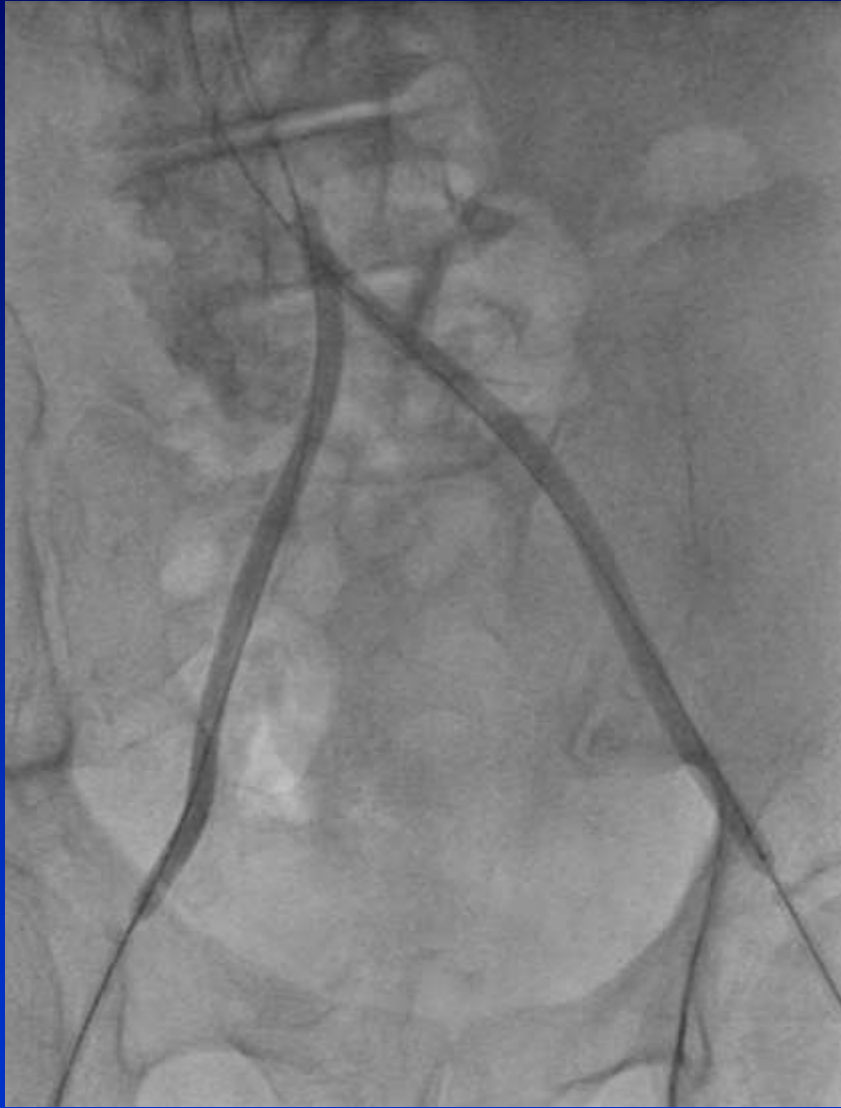
Antegrade wire was passed to femoral sheath



Rt CIA – Ballooning

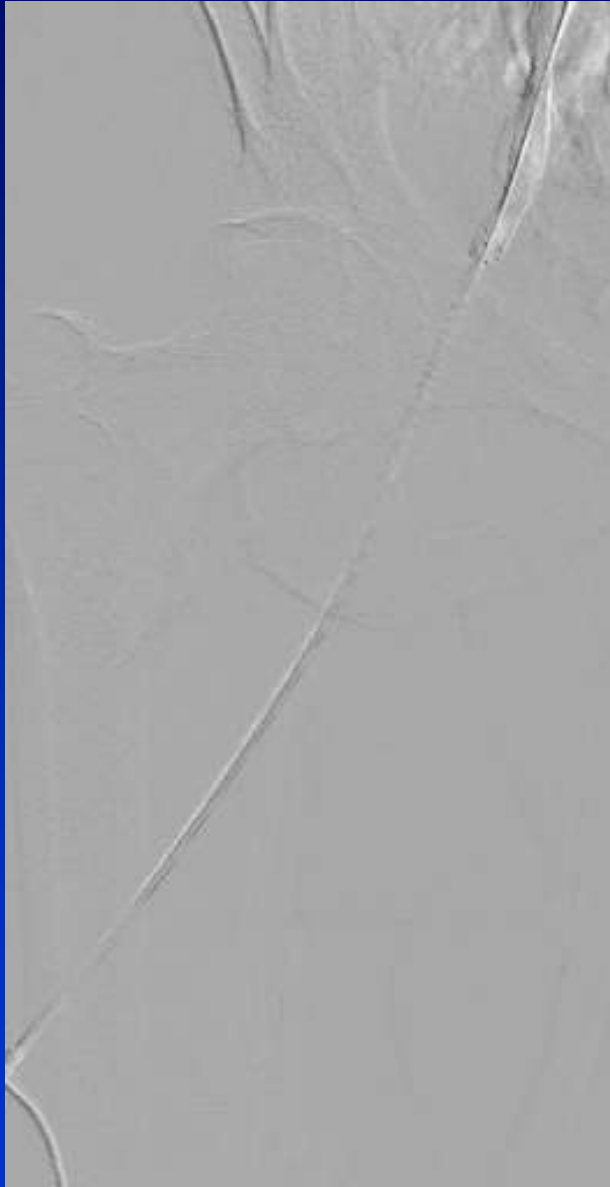


Kissing Balloon and stenting



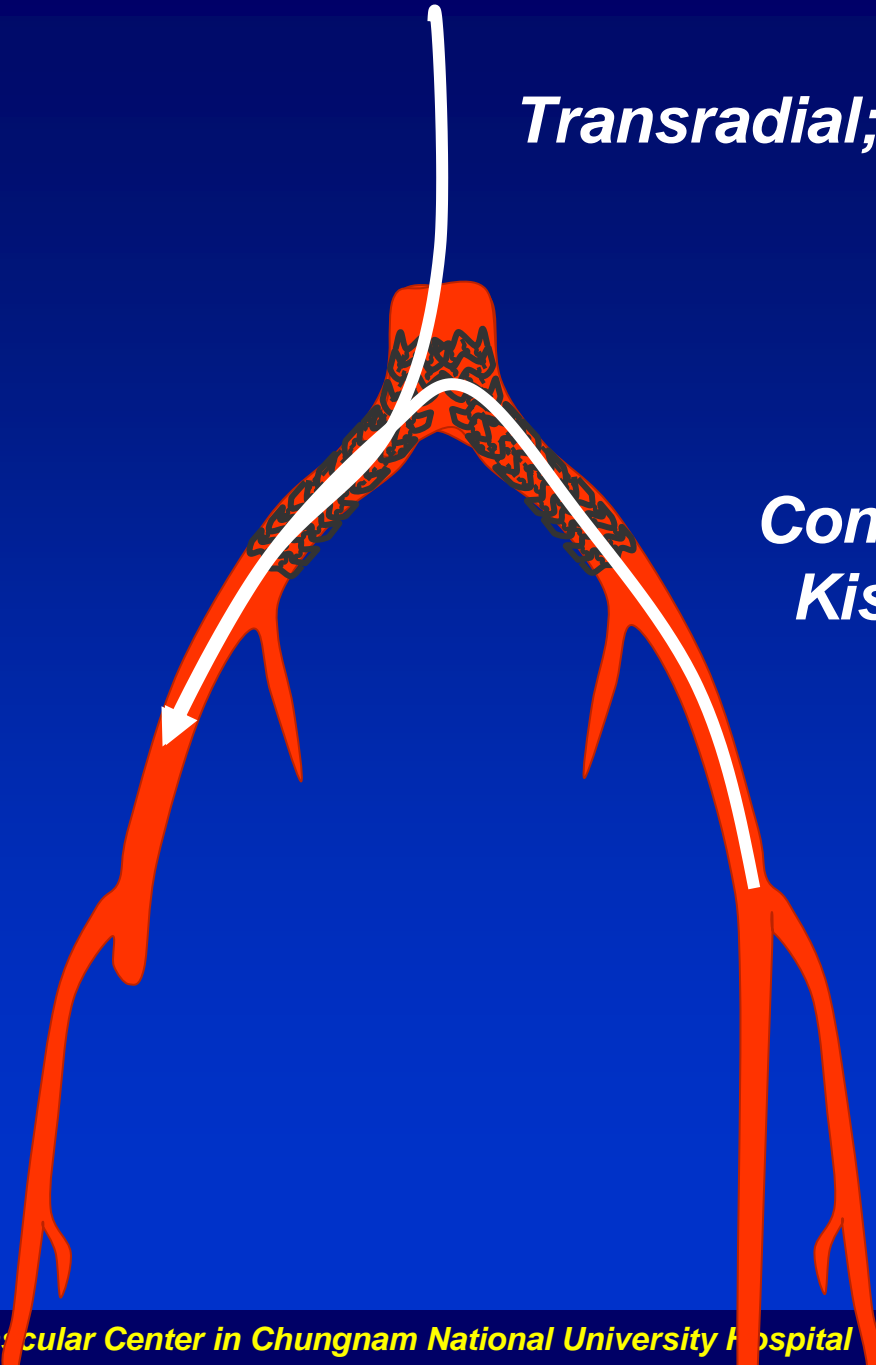
Kissing stenting with two 10.0x80 mm, self expandable

After both CIA stenting



Transradial; too long to reach

*Contralateral femoral;
Kissing stents prohibit access*



Distal SFA puncture



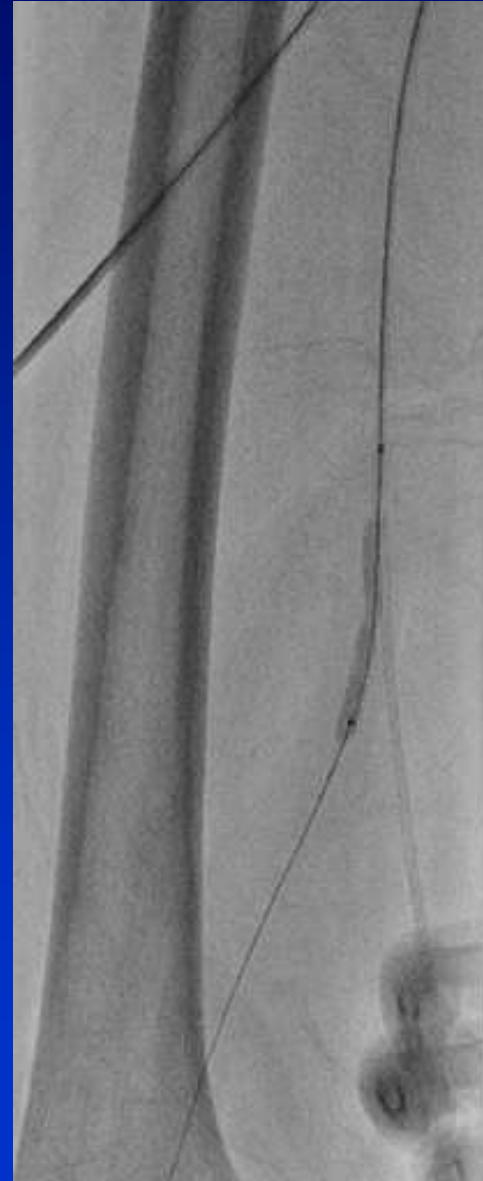
Rt CFA Ballooning



Rt dSFA-BTK angiogram



Rt pSFA puncture and dSFA Ballooning



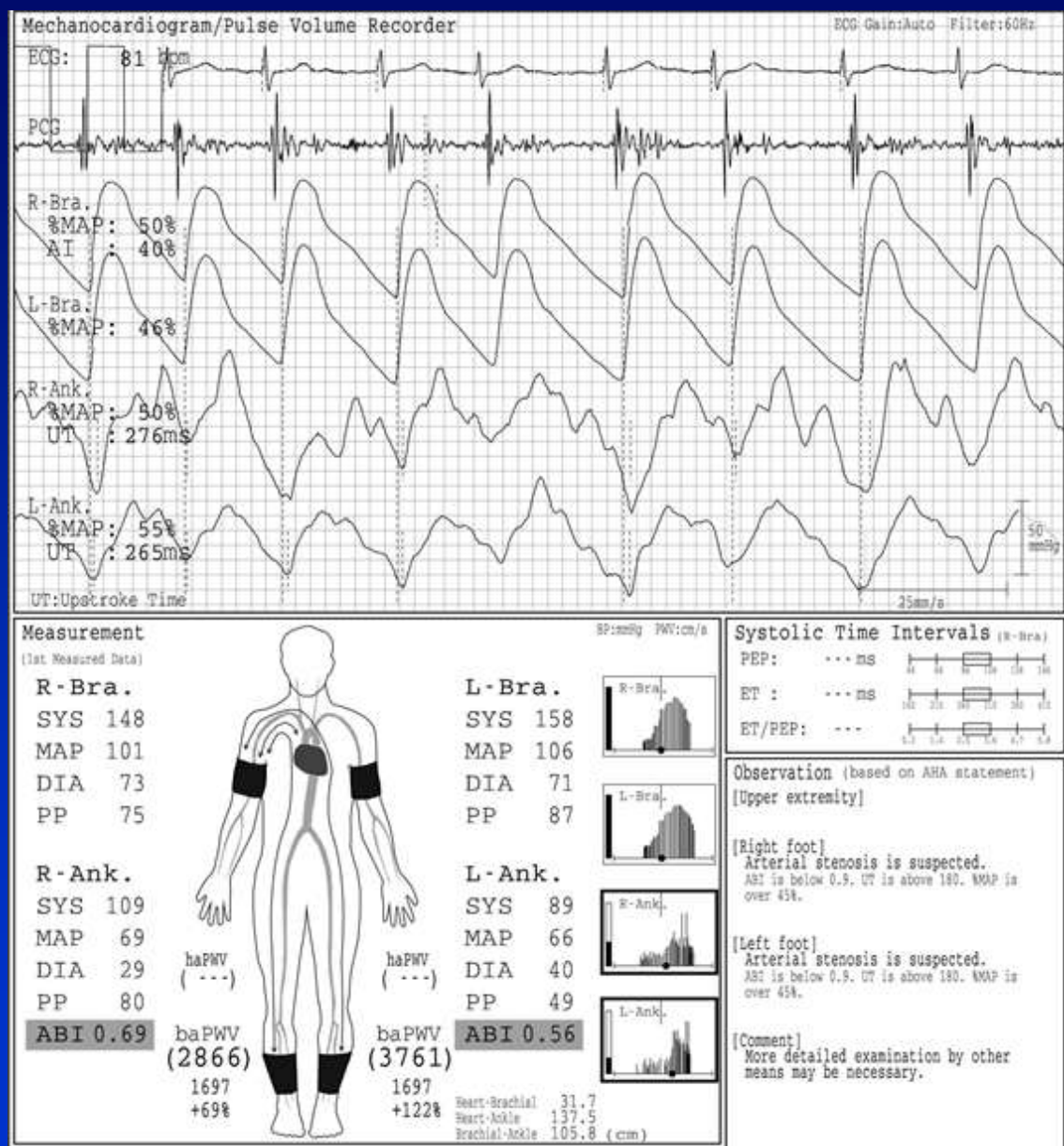
Rt BTK intervention



Rt BTK final angiogram



ABI after intervention



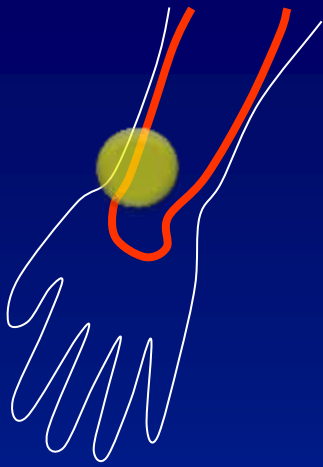
Foot photo after intervention



1 month



3 month



Five Different Sites Puncture

Rationale of Retrograde Approach

- **Effective and Safe**
 - **96% success (J Endovasc Ther 2012 19:23-9)**
 - **No serious complication**
- **Not easy but not difficult, need training**
- **Not a first choice, but always a bail out after antegrade failure**
- **Should consider not after too many antegrade attempts**
- **Less time consuming**
- **Cost effective**

Conclusion

- *To obtain good results for BTK intervention*
 - Knowledge of arterial anatomy
 - Good treatment strategy
 - Knowledge of new access and techniques
 - Retrograde approach is promising*
 - Knowledge of dedicated devices
 - Appropriate selection of device

Treating Critical Limb Ischemia

Primary Treatment
for CLI in 1800's



Treating Critical Limb Ischemia

In some places...

Primary Treatment
for CLI in 2014





For Making Good Footprints

Thanks for the Time