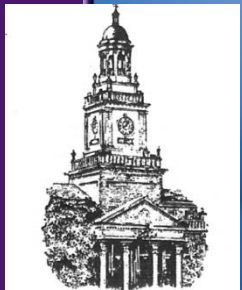
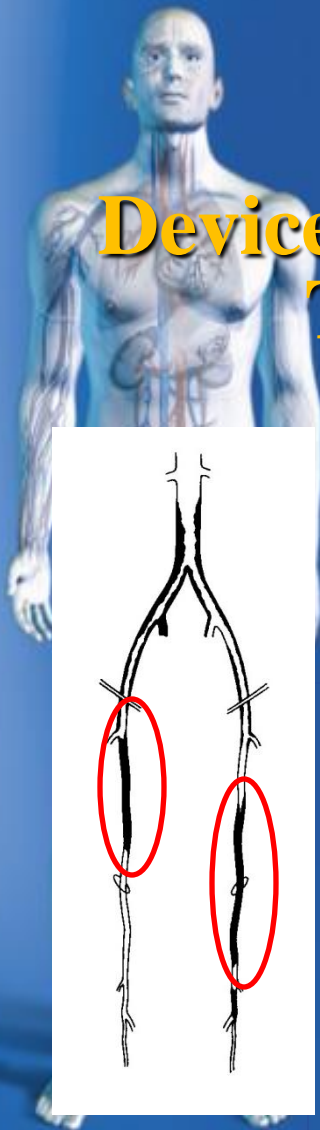


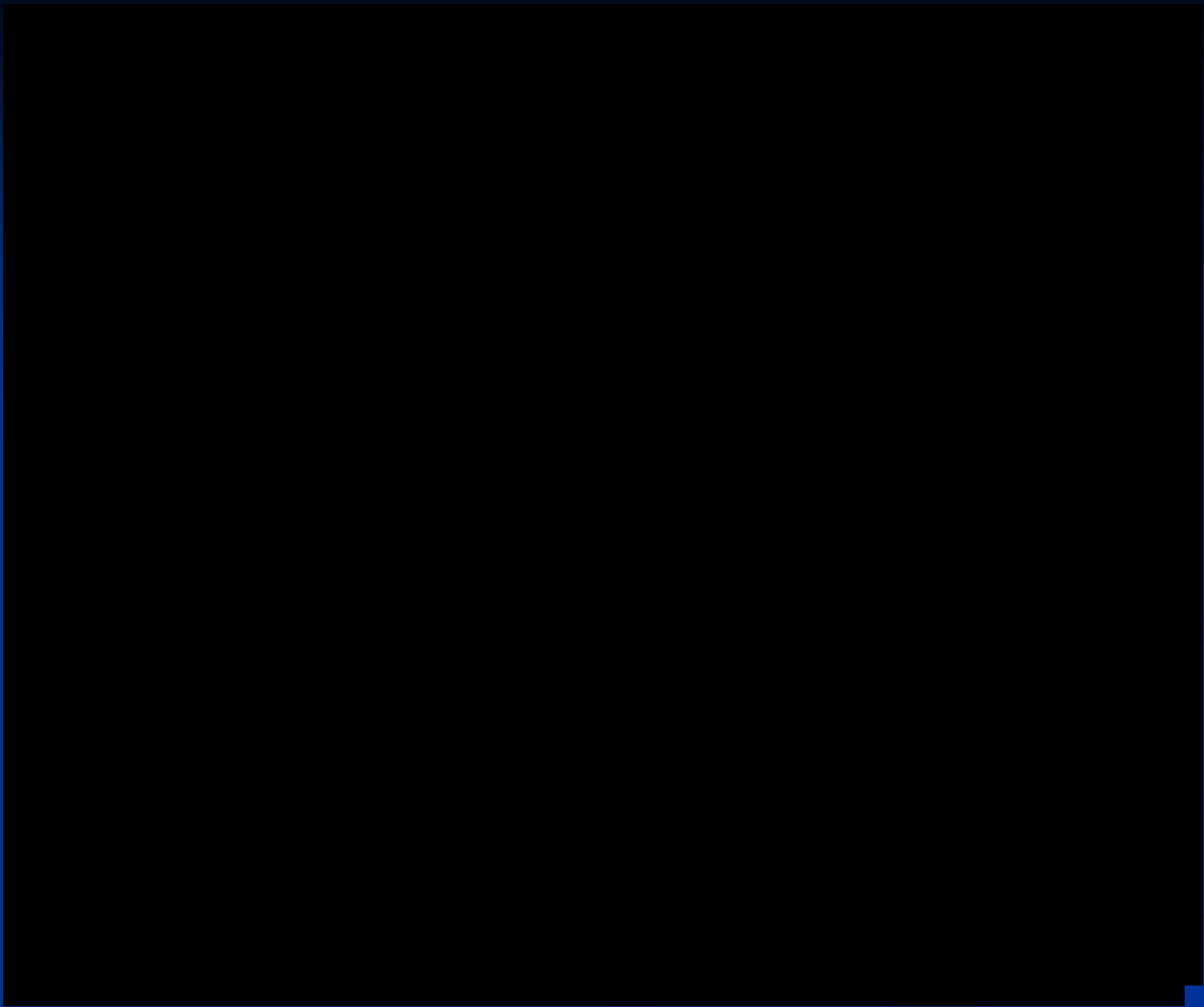
CACVS 2015

Devices and Techniques in Crossing Total Occlusion (CTOs)

ALI AMIN MD,FACS,FACC,RVT

CHIEF OF ENDOVASCULAR INTERVENTIONS
READING HEALTH SYSTEM





Endovascular Interventions Lower Extremity

- Endovascular techniques have gained much interest in the management of Chronic Total Occlusions (CTO):
 1. **Subintimal Angioplasty (SIA)**
 2. **Intraluminal PTA**

CTOs

- Percutaneous treatment of peripheral arterial Occlusion has evolved greatly:

1. Improvement in Techniques, Wires, Catheters, Balloons and stents **Lower Profile System.**

Atherectomy Devices

2. Devices to **Cross the Occlusion** and **Re-enter** the True Lumen

| Company Name | Product Name | Catheter Size (F) | Wire Size (inch) | Working Length (cm) | Minimum Guiding Catheter ID (inch) | Comments |
|-------------------------------|--|-------------------|---------------------------------|---------------------|------------------------------------|---|
| Avinger, Inc. | Ocelot | 6 | 0.014 | 110 | N/A | Peripheral over-the-wire CTO crossing catheter with onboard real-time OCT intravascular imaging for precise catheter navigation |
| Avinger, Inc. | Ocelot Pixl | 5 | 0.014 | 135, 150 | N/A | Peripheral over-the-wire CTO crossing catheter with onboard real-time OCT intravascular imaging for precise catheter navigation and extra length for distal lesion access |
| Avinger, Inc. | Kittycat | 5 | 0.014 | 140 | N/A | Peripheral over-the-wire CTO crossing catheter; rotating distal tip with spiral flutes for lesion access |
| Avinger, Inc. | Kittycat 2 | 5 | 0.014 | 150 | N/A | Peripheral over-the-wire CTO crossing catheter; catheter shaft is preshaped for better steerability in the most tortuous anatomy; Juicebox compatible |
| Avinger, Inc. | Wildcat | 6 | 0.035 | 110 | N/A | Peripheral over-the-wire CTO crossing catheter with six different modes of operation to cross any lesion; Juicebox compatible |
| Baylis Medical Company, Inc. | PowerWire Radiofrequency Guidewire | N/A | 0.035 | 250 | N/A | RF energy delivered through a nitinol core wire with a low-friction PTFE coating to a radiopaque tip; tapered distal profile and variable options for distal stiffness facilitate crossing of challenging occlusions in the peripheral vasculature; straight and angled models available |
| Boston Scientific Corporation | TruePath CTO Device | N/A | 0.018 | 165 | 0.018 | 0.018-inch guidewire with 0.017-inch diamond-coated, rotating distal tip; shaping tool allows for 15° angle; extension capability to 335 cm; compatible with any 0.018-inch compatible catheters ≤ 135 cm |
| Boston Scientific Corporation | OffRoad Re-entry Catheter System | 6 | 0.035 (catheter)/0.014 (lancet) | 70, 100 | 0.079 | Two-component system: over-the-wire catheter with a 5.4 mm, conical-shaped, balloon designed to preferentially inflate toward the true lumen, accommodates 0.035-inch guidewires and microcatheter lancet; |
| Cordis Corporation | Fronrunner XP CTO Catheter | 3.1 | N/A | 90, 140 | 0.039 | Actuating distal tip creates a channel through occlusions via blunt microdissection |
| Cordis Corporation | Micro Guide Catheter | 4.5 | N/A | 82, 132 | 0.078 | Support catheter for use with 90- or 140-cm Fronrunner XP CTO catheter |
| Cordis Corporation | Outback LTD Re-Entry Catheter | 5.9 | 0.014 | 120 | 0.079 | Enables reentry of a guidewire from the subintimal space back into the true lumen via re-entry cannula and highly visible L and T markers |
| Covidien | Viance Crossing Catheter | 2.9 | 0.014 | 150 | 0.066 | Low-profile peripheral CTO crossing catheter with atraumatic distal tip; device operates via physician-controlled torque handle for fast manual spinning; the spinning motion created by the torque device allows the catheter tip to find its way through the lesion; available in Flexible and Standard stiffness |
| Covidien | Enteer Re-entry System, Catheter | 4.8 | 0.018 | 135, 150 | 0.066 | Re-entry catheter designed with a unique flat balloon to self-orient in the subintimal space and easily target the true lumen using the Enteer Guidewire; catheter available in two sizes for above- and below-the-knee use |
| Covidien | Enteer Re-entry System, Guidewire | N/A | 0.014 | 300 | N/A | Specialized guidewire designed to target Enteer catheter exit ports and engage and penetrate tissue for re-entry into the true lumen from a subintimal position; available in three levels of stiffness (flexible, standard, stiff) for use across a range of peripheral vessels |
| Volcano Corporation | Pioneer Plus Intravascular Ultrasound Guided Re-Entry Catheter | 6 | 0.014 | 120 | 0.087 | Uses IVUS to facilitate ease of orientation of the re-entry cannula toward the true lumen |

ATHERECTOMY DEVICES

DOWNLOAD

| Company Name | Product Name | Minimum Vessel Diameter (mm) | Sheath Compatibility (F) | Crossing Profile (inch) | Working Length (cm) | Tip Length (cm) |
|--------------------------------|-----------------------------|------------------------------|--------------------------|-------------------------|---------------------|-----------------|
| Bard Peripheral Vascular, Inc. | Crosser 14S | 1.1 | 5 | 0.044 (1.1 mm) | 146, 106 | N/A |
| Bard Peripheral Vascular, Inc. | Crosser 14P | 1.1 | 5 | 0.044 (1.1 mm) | 146, 106 | N/A |
| Bard Peripheral Vascular, Inc. | Crosser S6 | 0.6 | 5 | 0.025 (0.6 mm) | 154, 106 | N/A |

Arterial Occlusion (CTOs)

```
graph TD; A[Arterial Occlusion (CTOs)] --> B[Cross the Lesion]; B --> C[Enter the True Lumen]; C --> D[Endovascular Intervention];
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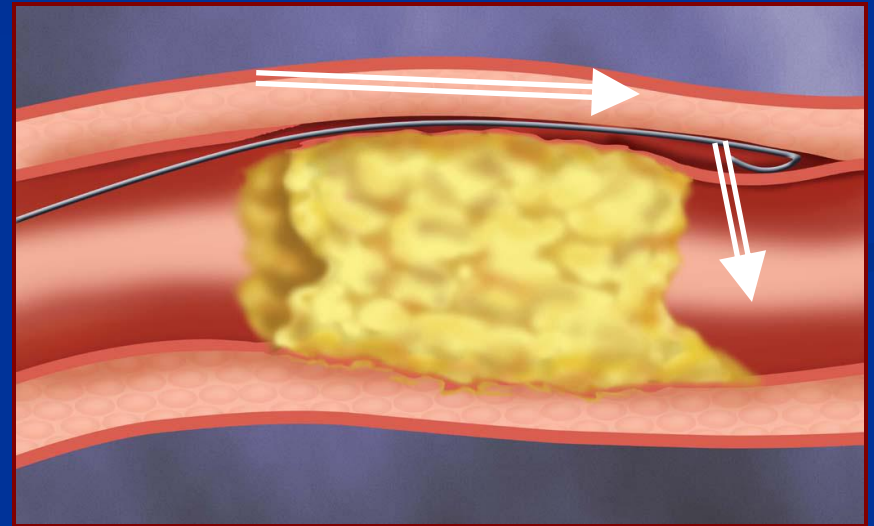
Cross the Lesion

Enter the True Lumen

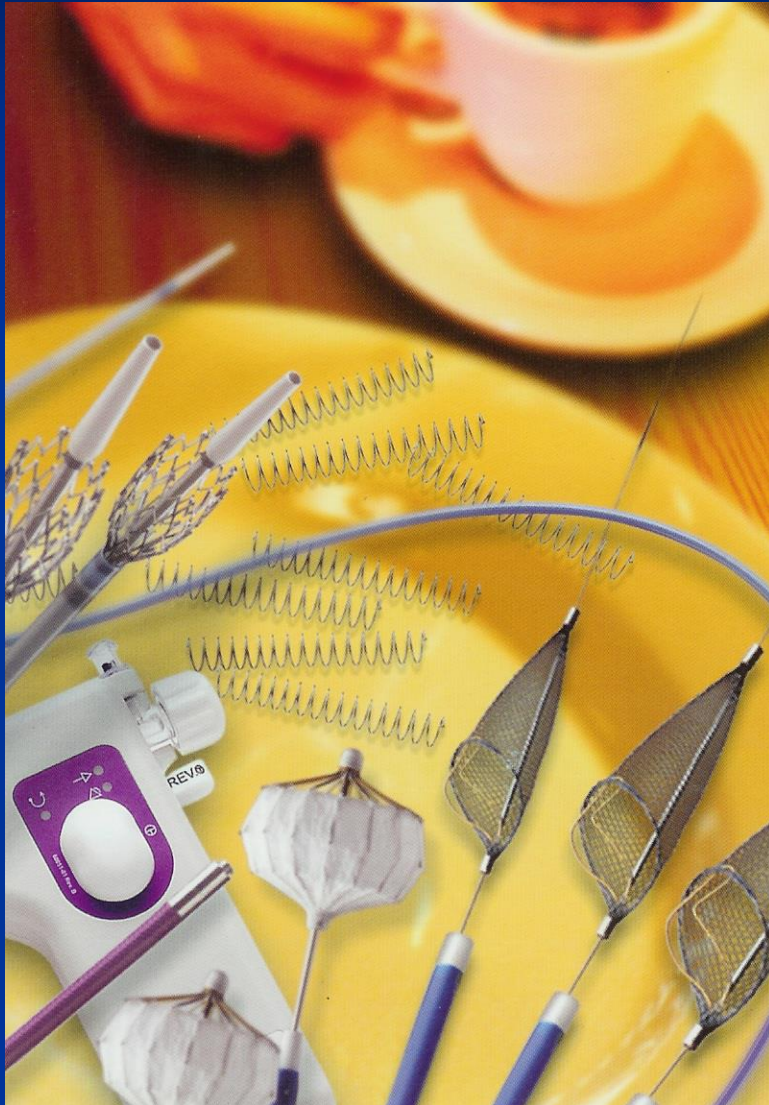
Endovascular Intervention

Subintimal Angioplasty/CTO

- Permits creation of Dissection plane + Re-entry without reducing future bypass options
- Successful Case without complications

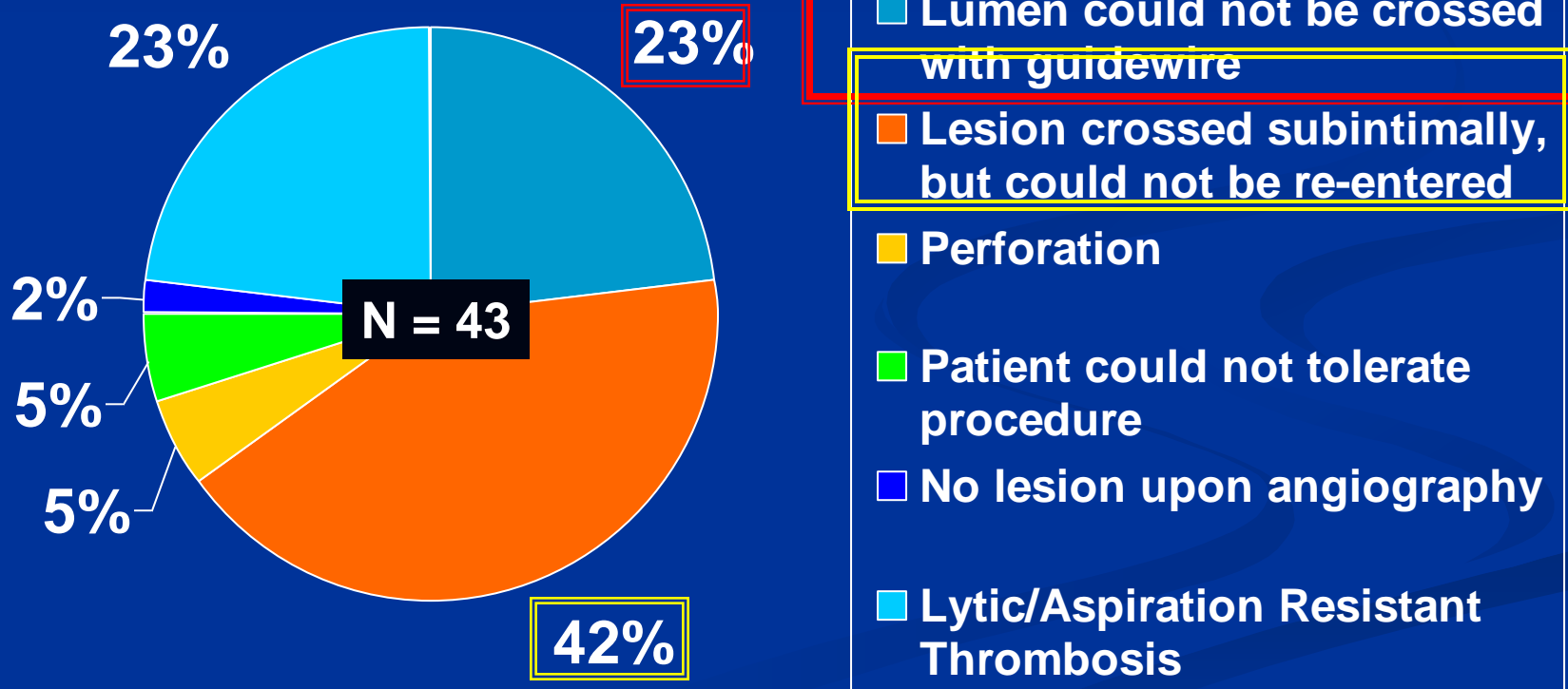


“Set” of TOOLS FOR Tx of CTOs and SIA



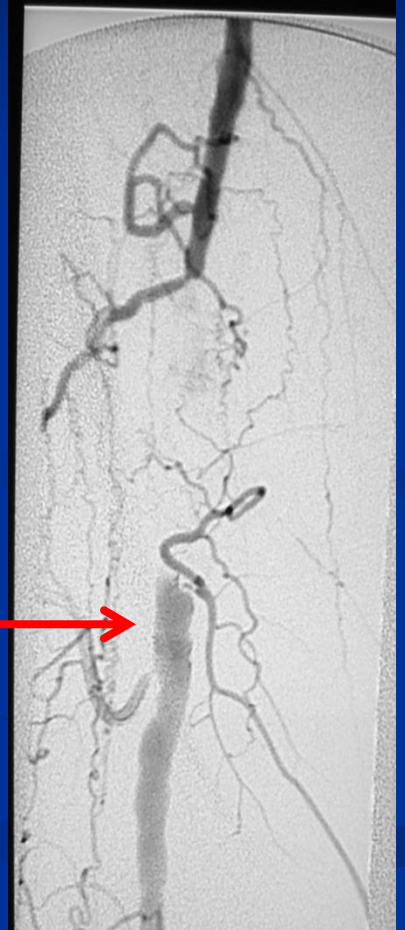
Angioplasty Attempts/Immediate Failures

- Of the 224 patients allocated to angioplasty, 216 underwent attempted angioplasty
- Of these, **43 (20%)** were considered **immediate failures**:



CTO and Subintimal Angioplasty (SIA)

Must Re-enter the **TRUE Lumen**



INTRALUMINAL RECANALIZATION

SUBINTIMAL RECANALIZATION

Longitudinal section

Longitudinal section

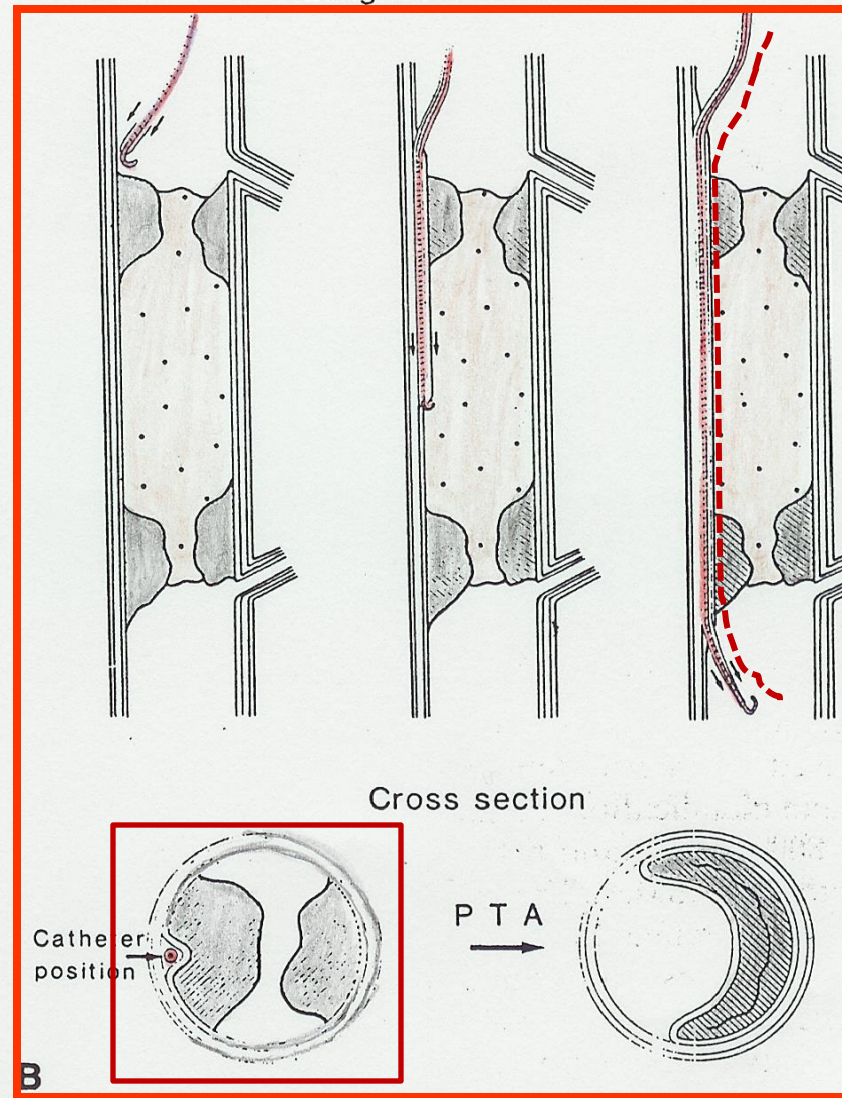
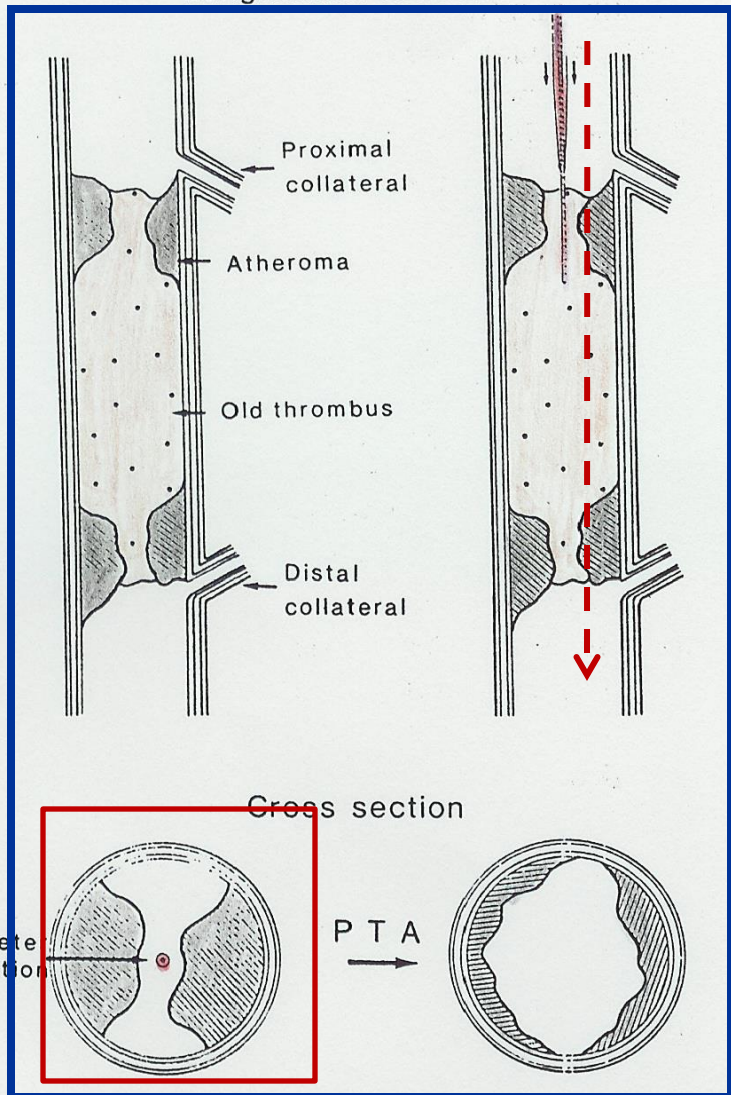


Fig. 3. Site of balloon inflation in **A** standard intraluminal technique and **B** subintimal recanalization technique.

Arterial Occlusion

Wires & Catheters

Cross Lesion

DEVICE

Wires & Catheters

Enter True Lumen

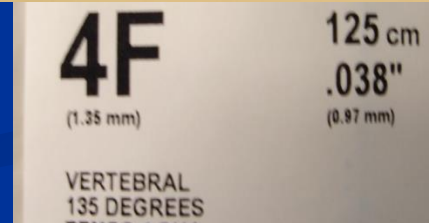
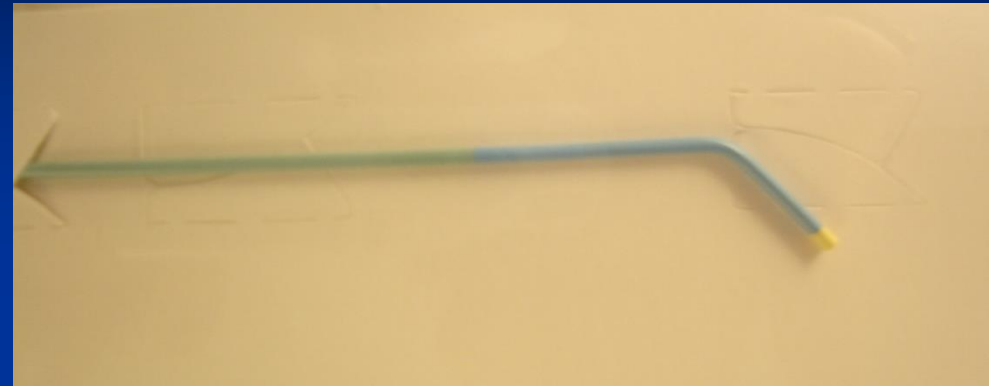
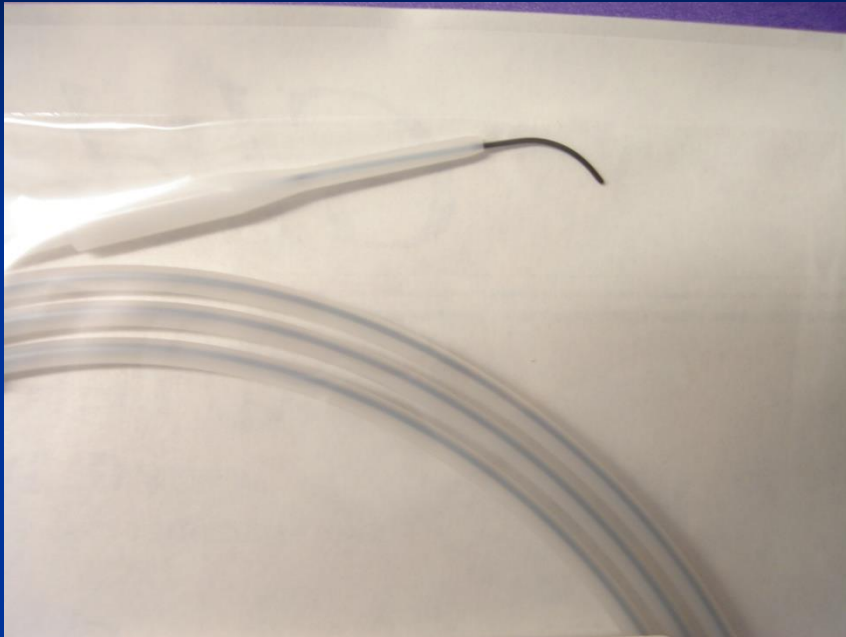
DEVICE

Endovascular Intervention

Crossing and Re-Entry Devices

- Have increased the success of CTO and having a successful outcome
- Decreased need for retrograde approach esp popliteal
- Decreased need for Bypass Surgery
- Decreased stenting of “NO STENT” zone
- Decreased length of stented segment
- Decreased amount of Radiation and Contrast

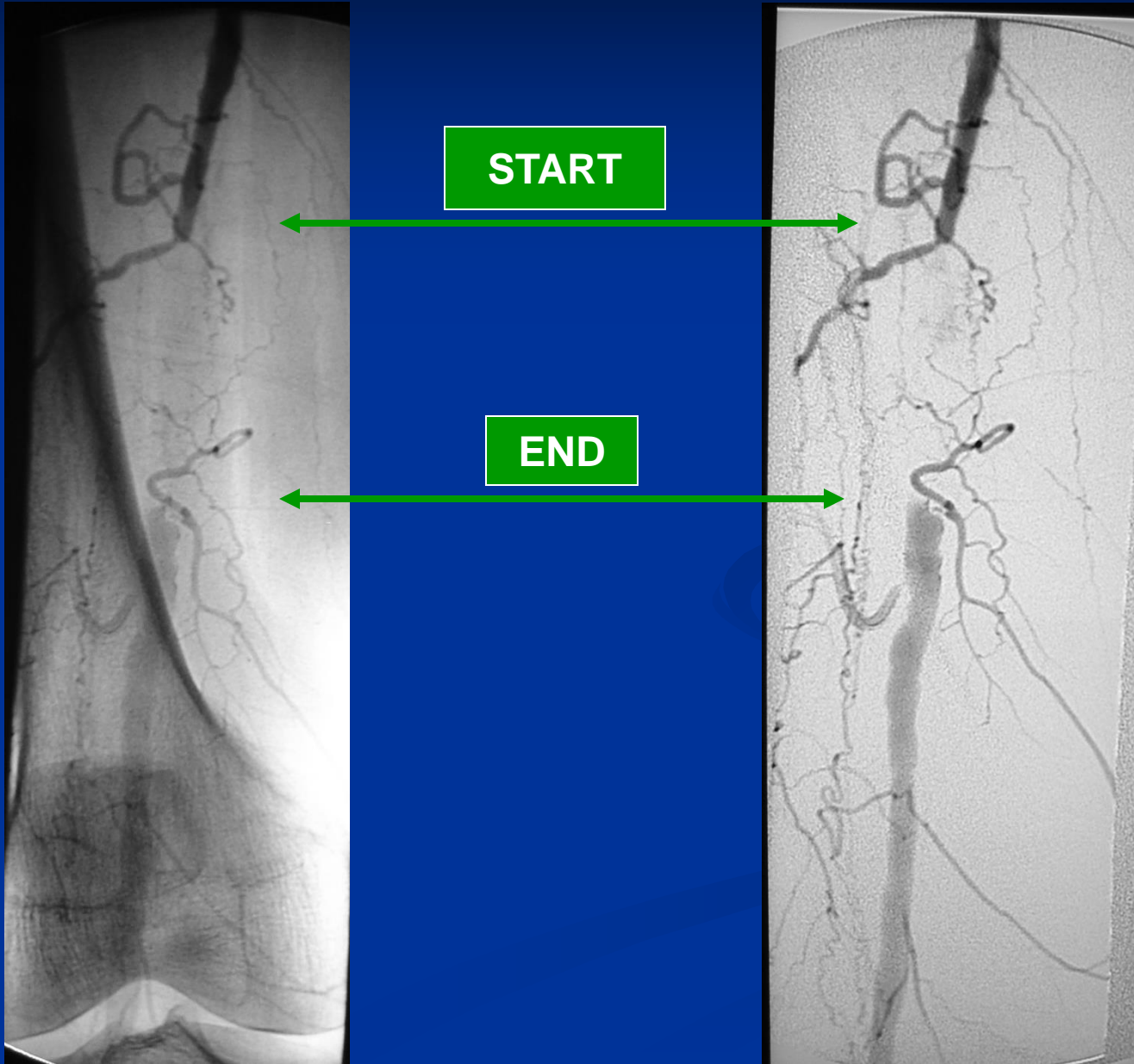
Catheter and Wire



**.035 Angle hydrophilic
Wire**

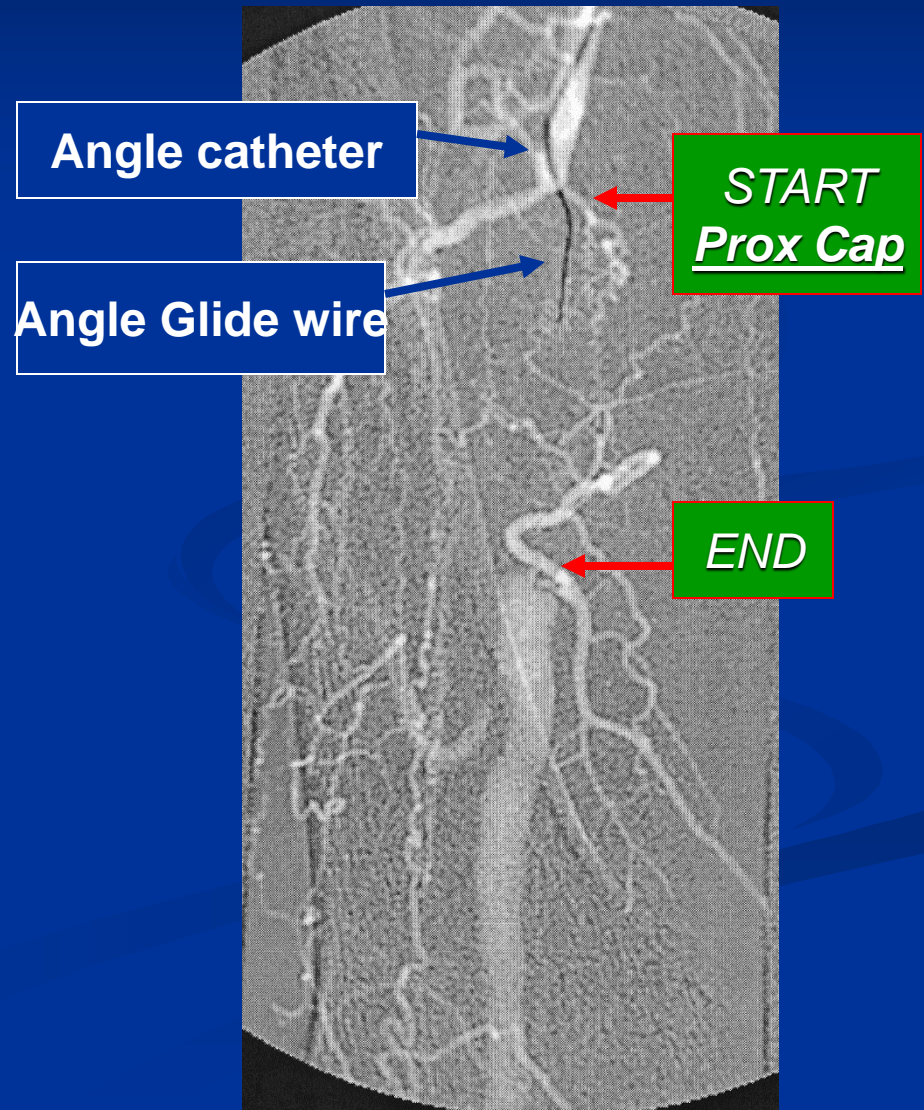
CTO of Iliac, SFA, Pop

Distal SFA Occlusion



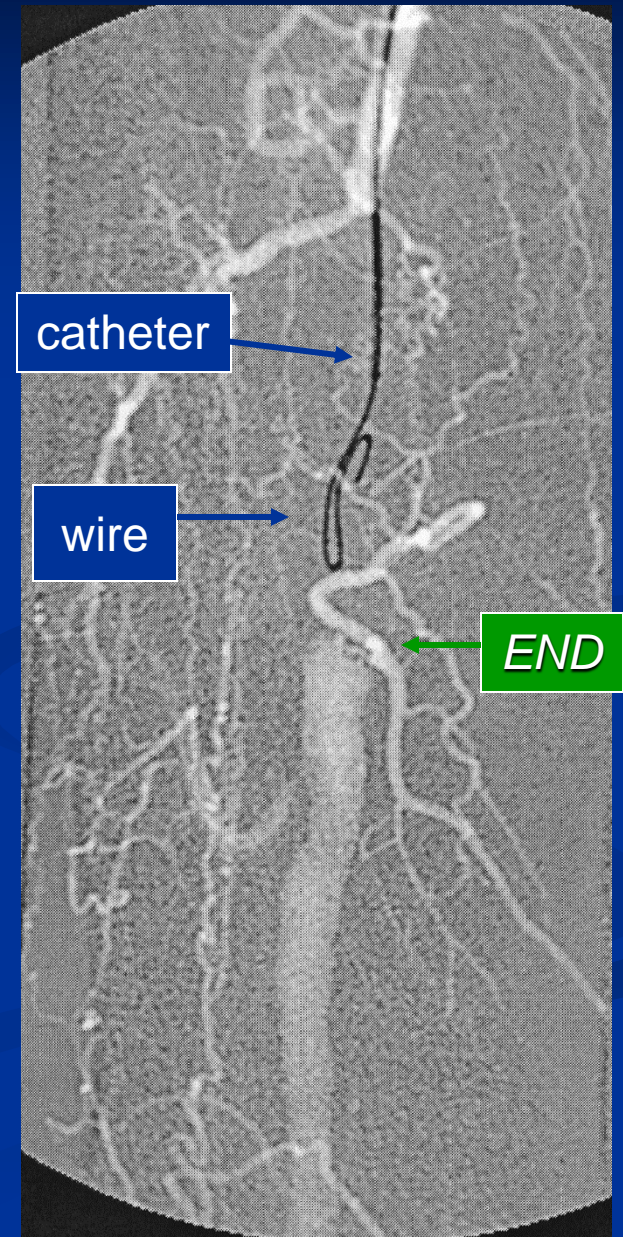
Advance Catheter & Wire under Roadmap

- Advance angle 4 Fr. catheter over a .035 angle Hydrophilic wire toward “Start” point
- Force the wire into the Occlusion
- For Long occlusion form a loop by passing wire back and forth.



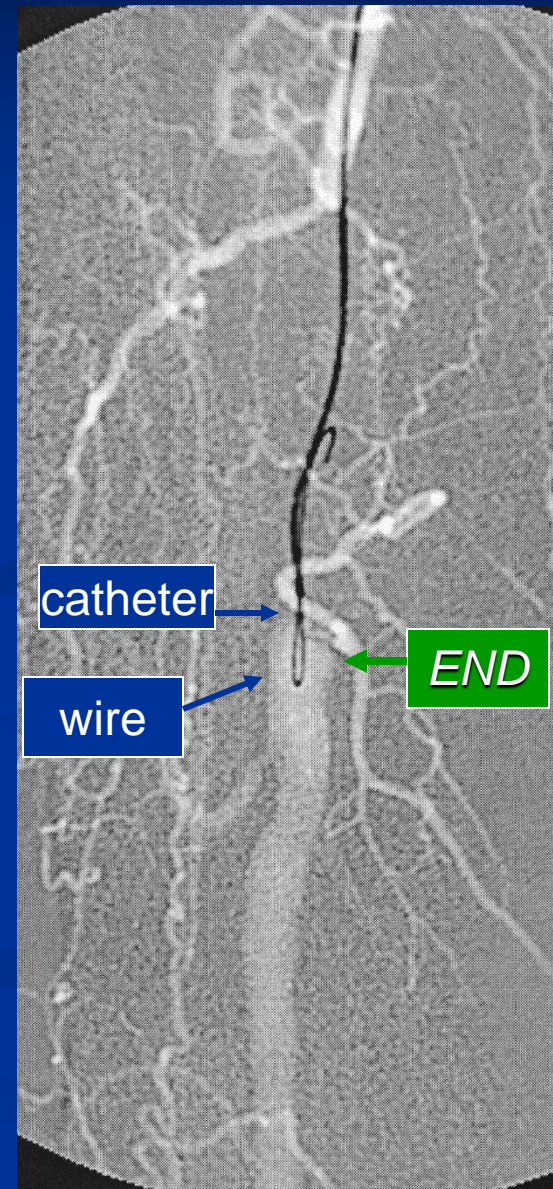
Advance Catheter & Wire under Roadmap

- Advance the Wire followed by the Catheter until the “End” point is reached
- At this point “End” point and distal native vessel should be visualized on the Roadmap



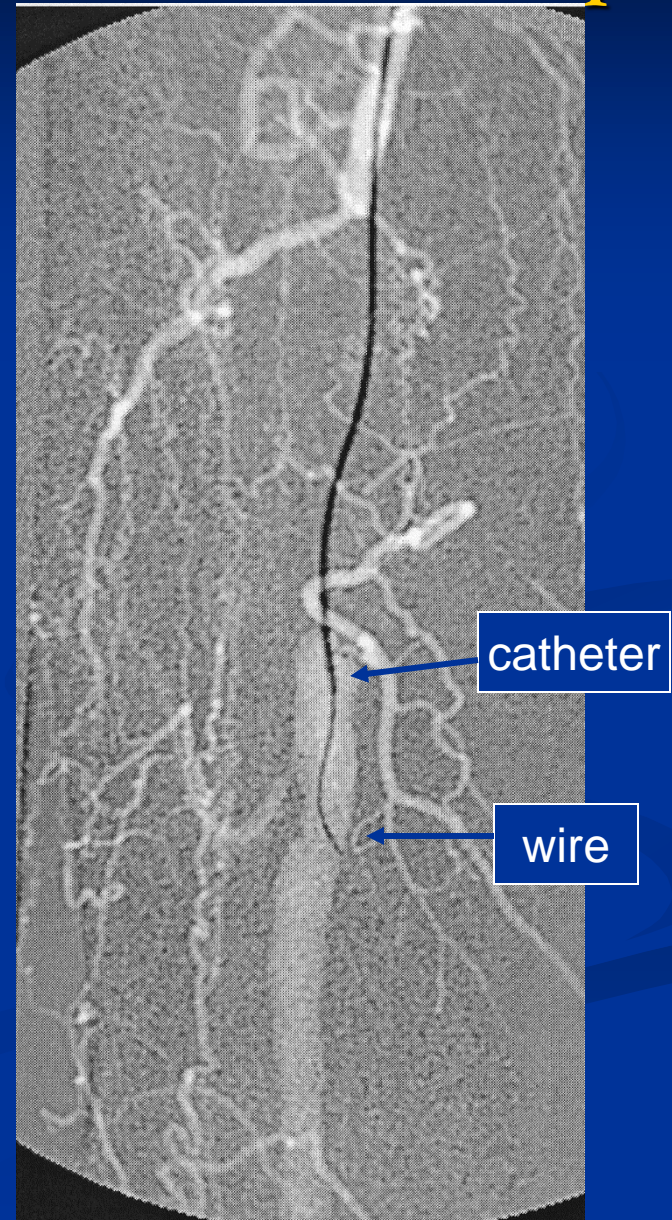
Advance Catheter & Wire under Roadmap

- Pass the loop 1.0 cm into the patent distal native vessel followed by the catheter



Advance Catheter & Wire under Roadmap

- by this point the wire and catheter has entered the **True Lumen** (feel the resistance). Wire easily pass distally
- Pull out the wire and back bleeding from catheter (+) for true lumen access



True Lumen

- Gently hand inject contrast to confirm (True Lumen)
- DO NOT inject if No back bleeding (stain the area)

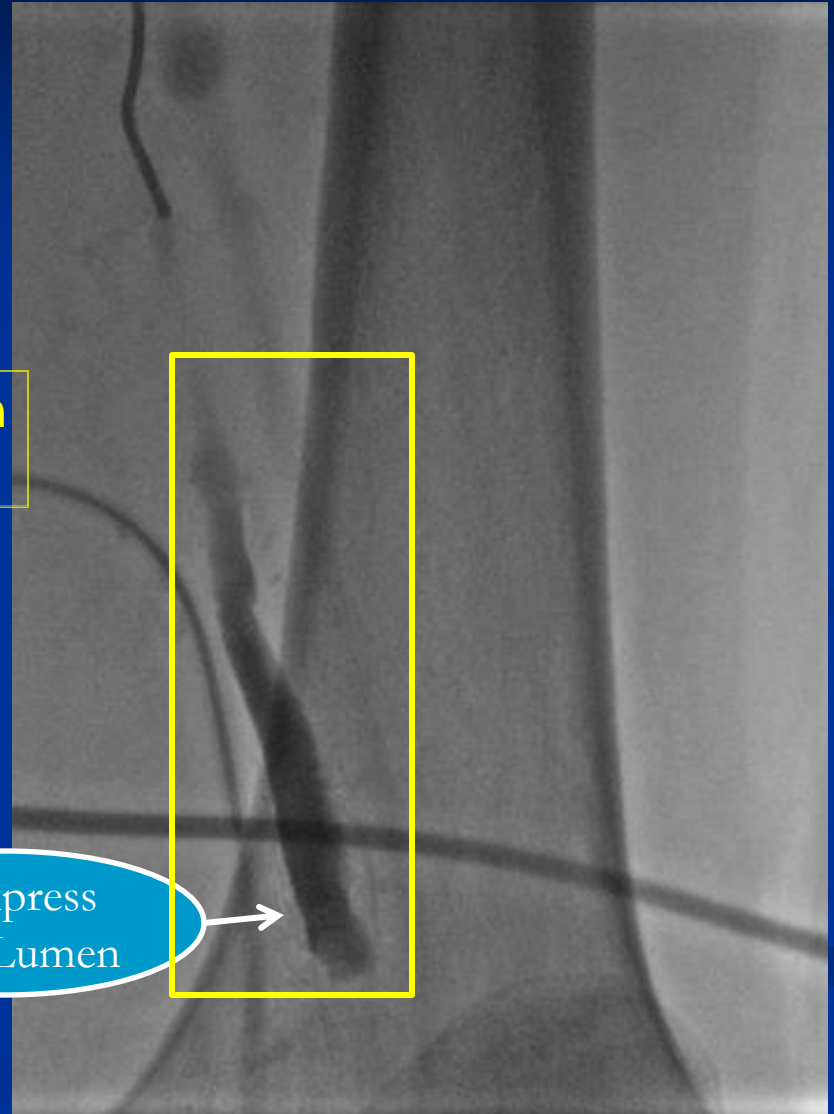


Distal patent
True Lumen



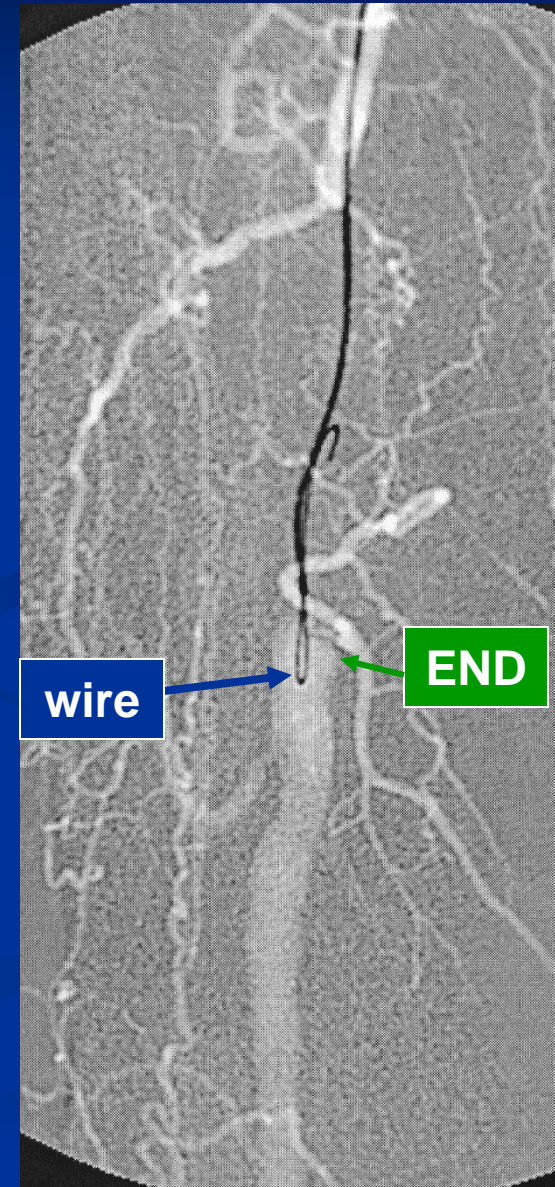
DO NOT inject if No back bleeding (stain the area)

Compress
True Lumen



Critical Point

- Must Enter Wire into the **True Lumen** at the “**END**” Point



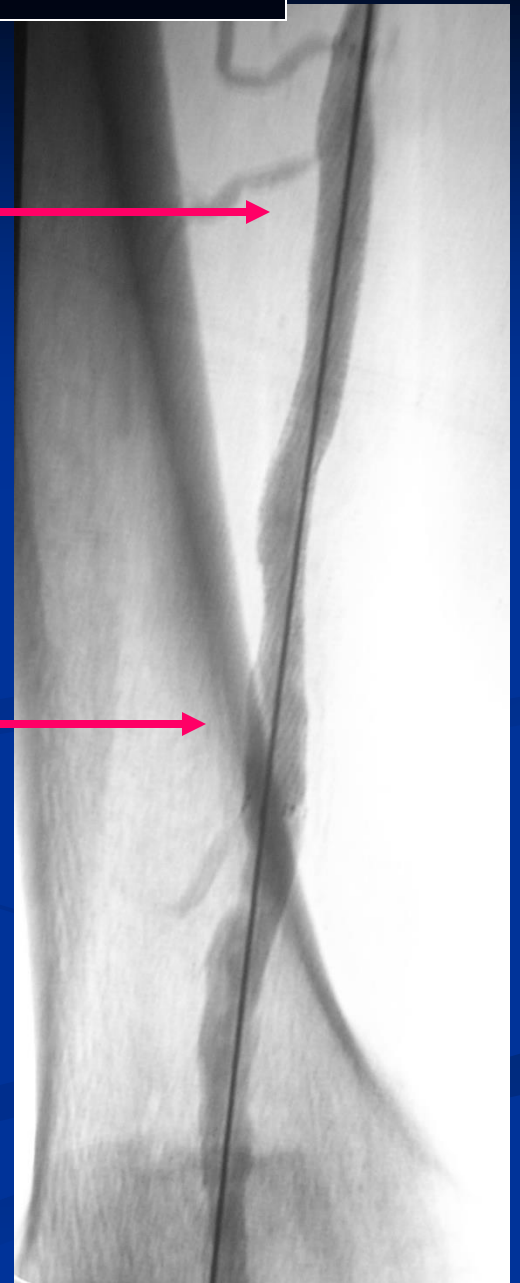
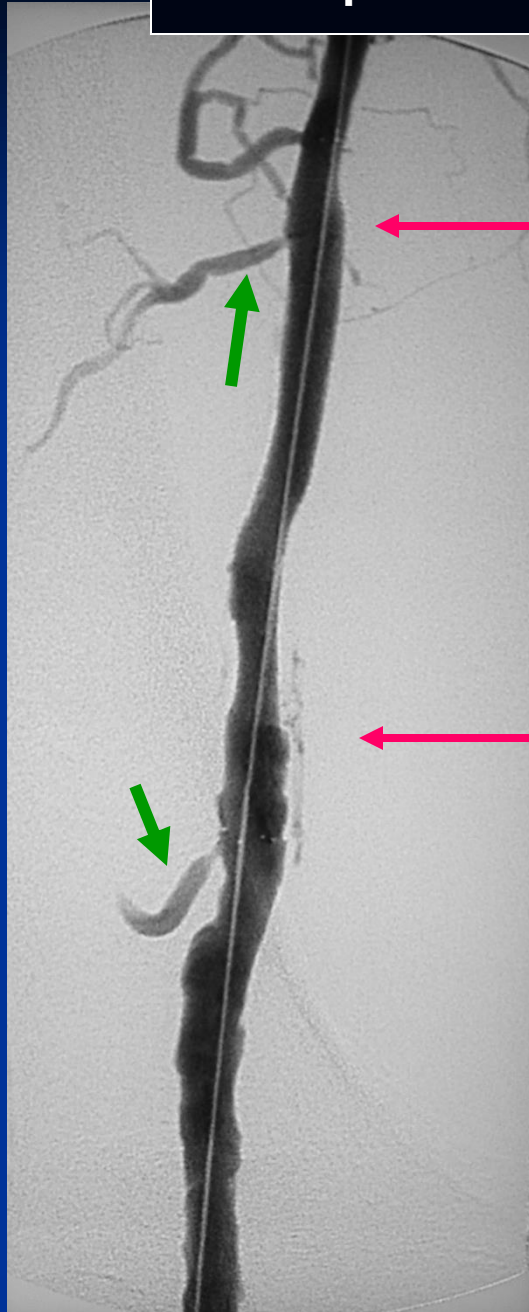
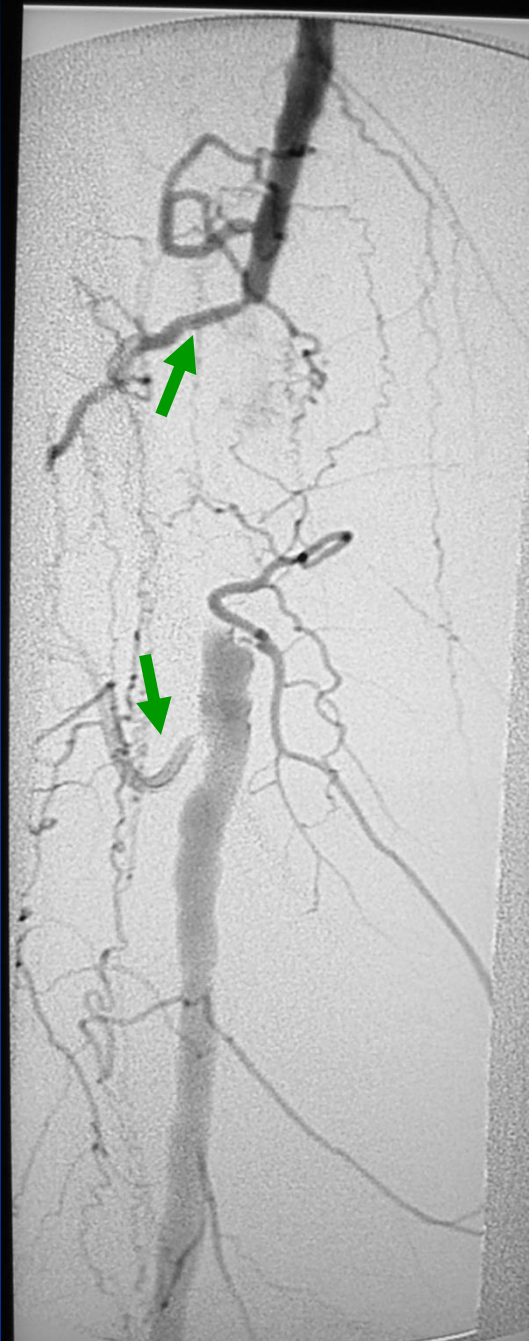
**Do Not Pass the wire too far beyond
the “END” point**



**Extend the dissection distally
‘Convert AK to BK bypass’**

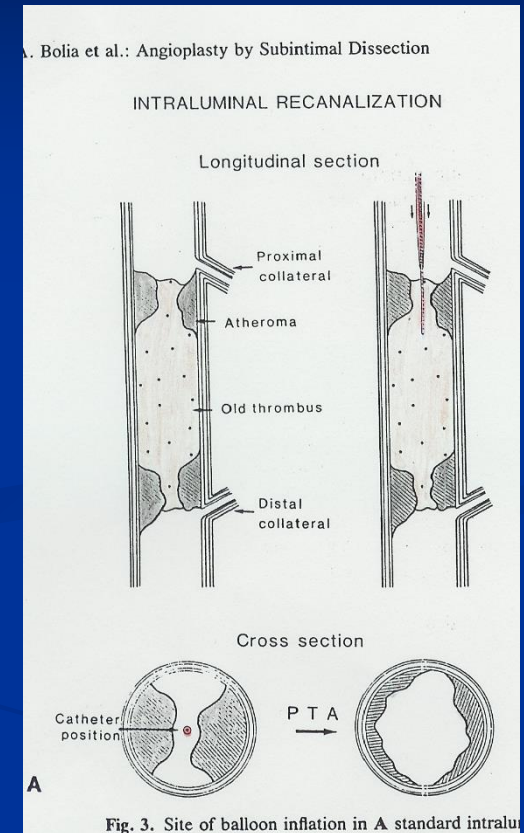
Compromise important collaterals

Completion Arteriogram

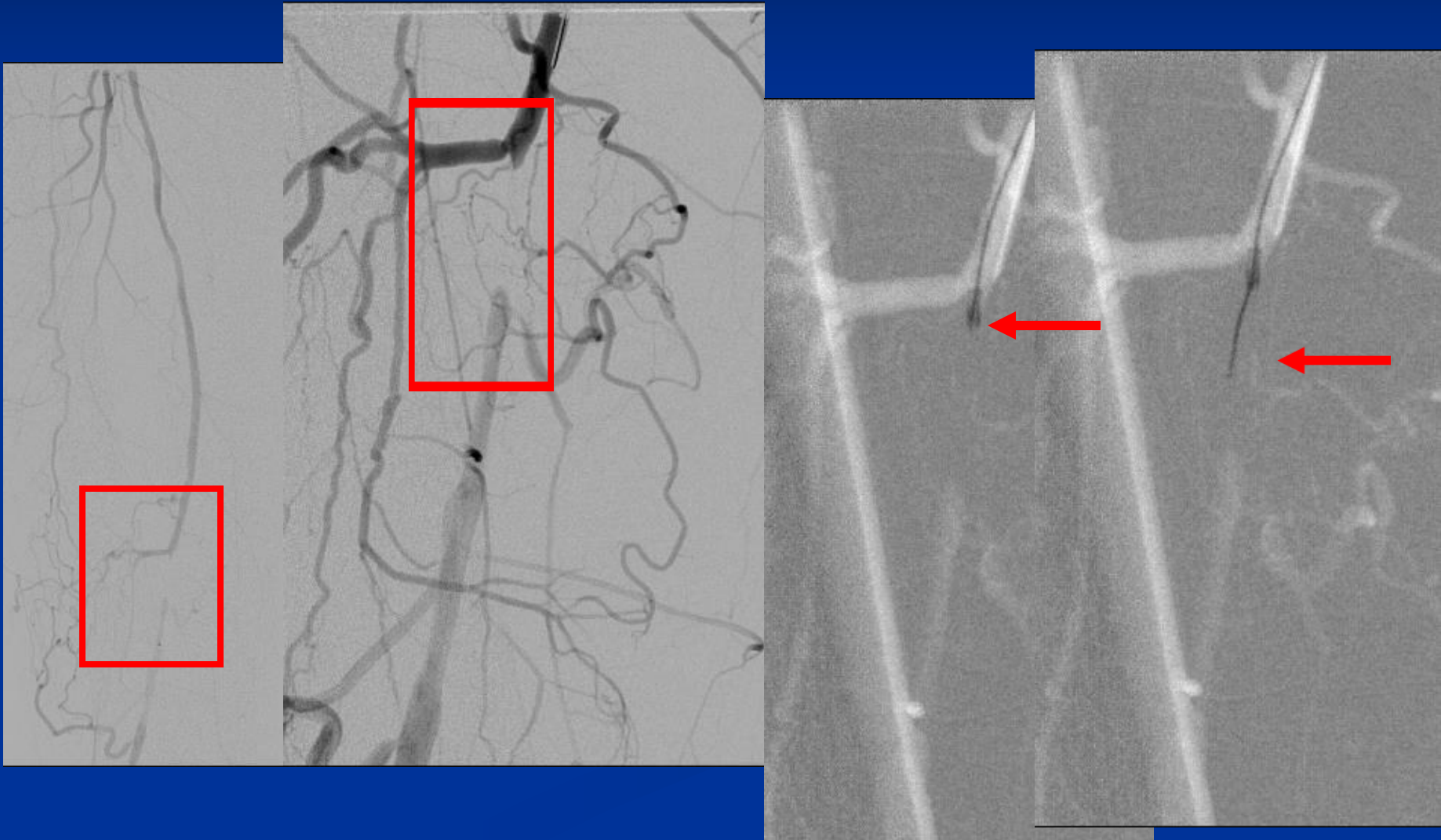


Intraluminal CTO

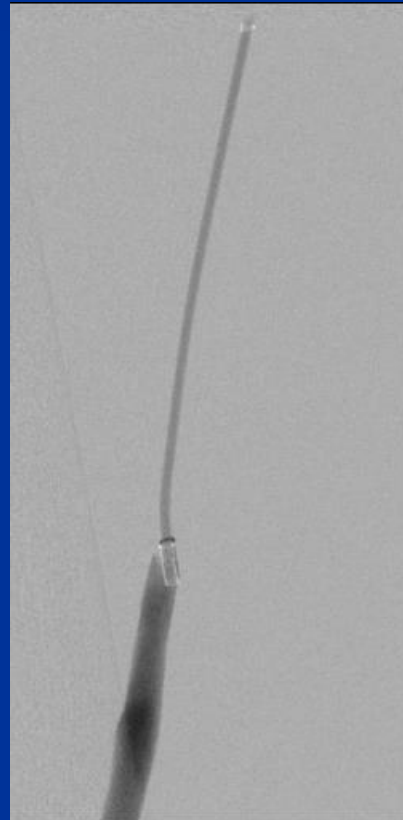
- Straight tip Wire and Catheter
- 4F catheter and .018 wire



Intraluminal CTO



Intraluminal CTO



Arterial Occlusion

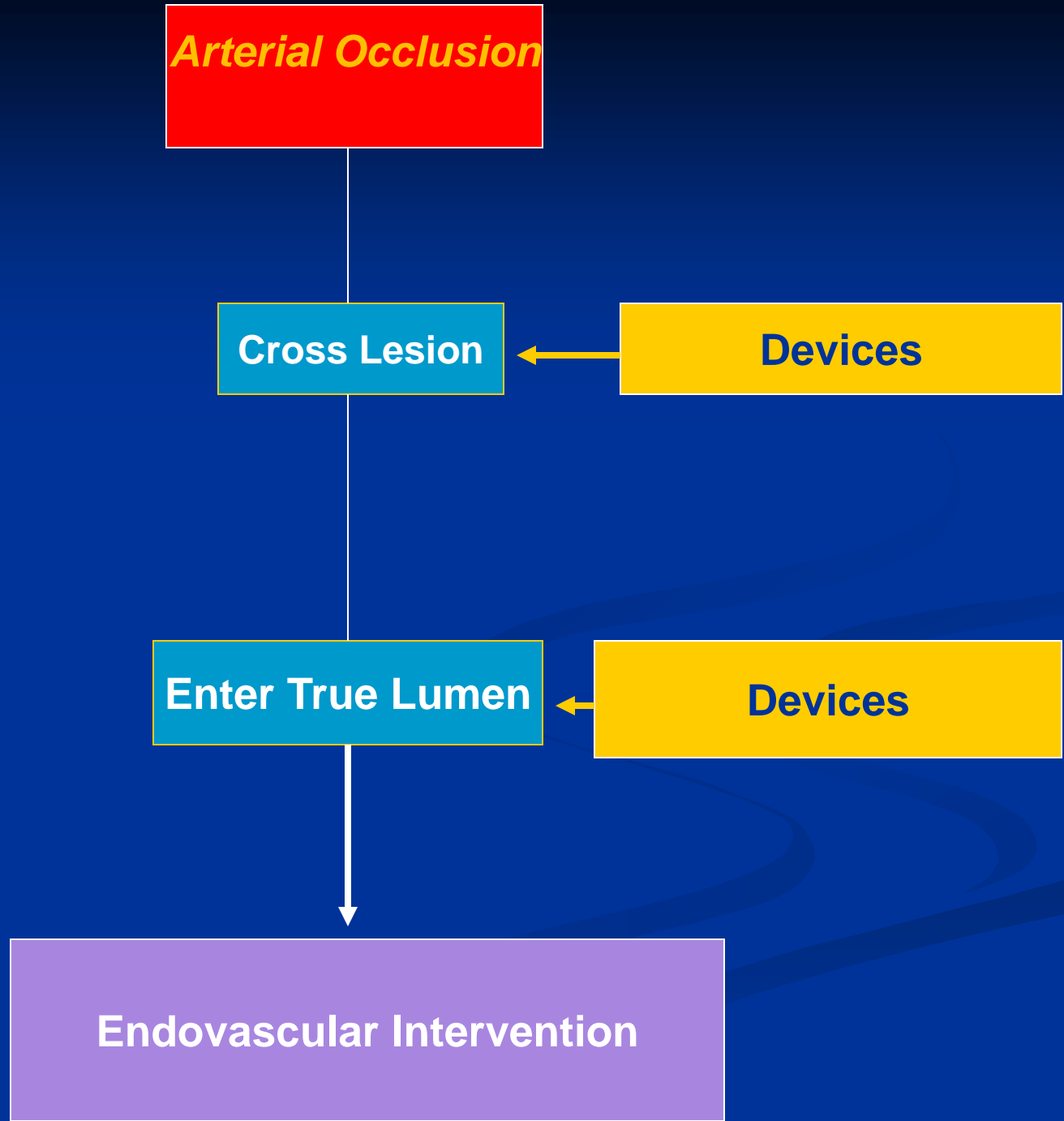
Cross Lesion

Devices

Enter True Lumen

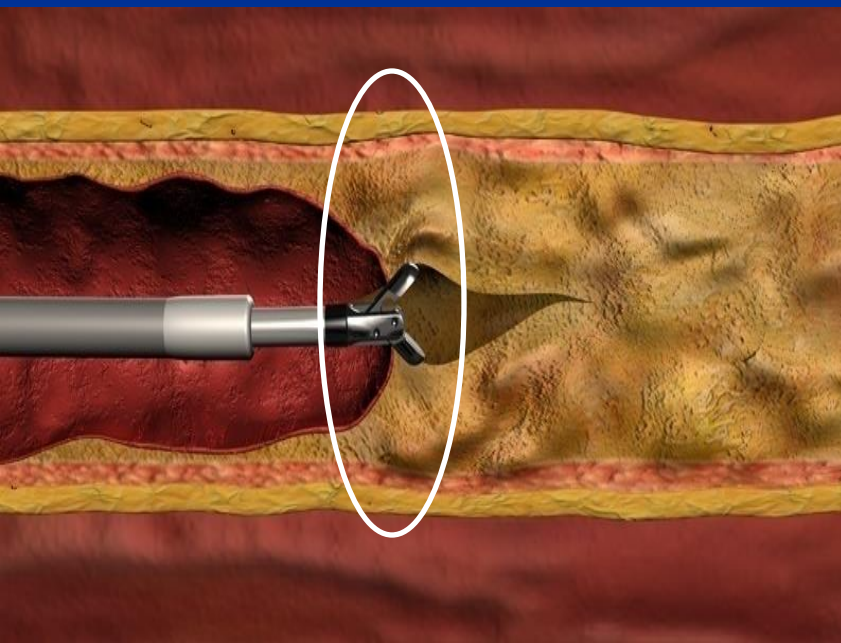
Devices

Endovascular Intervention



Crossing Device

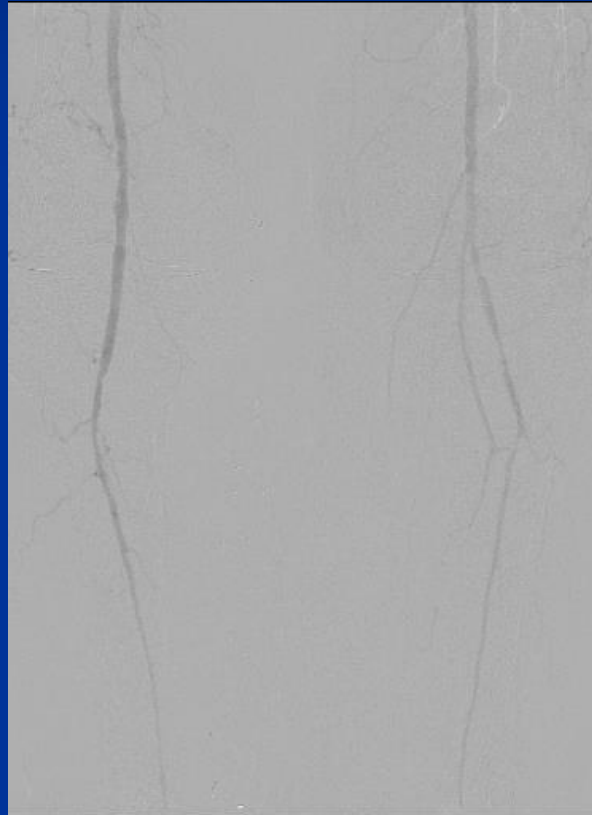
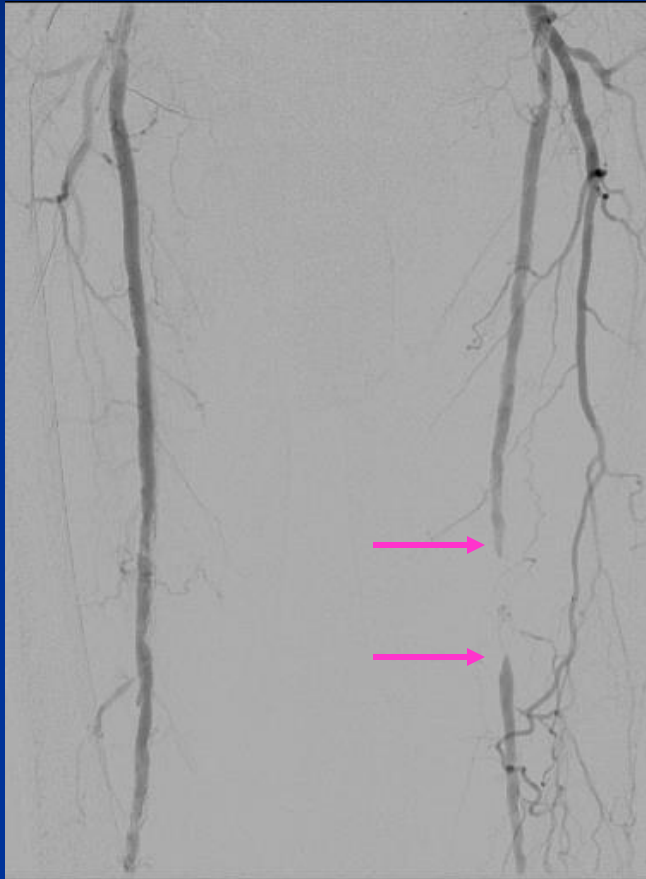
Frontrunner XP Peripheral CTO



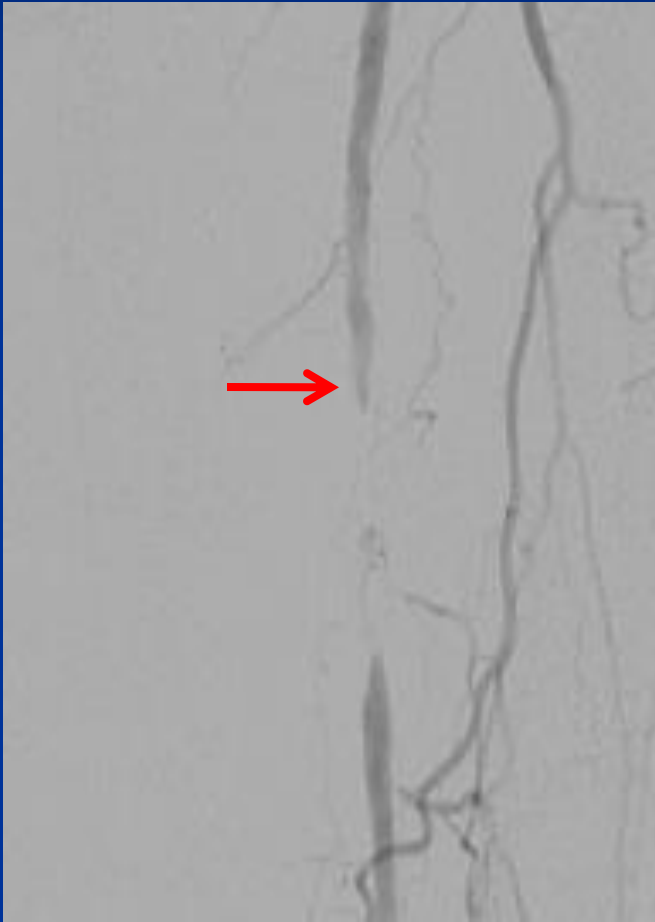
Crossing device

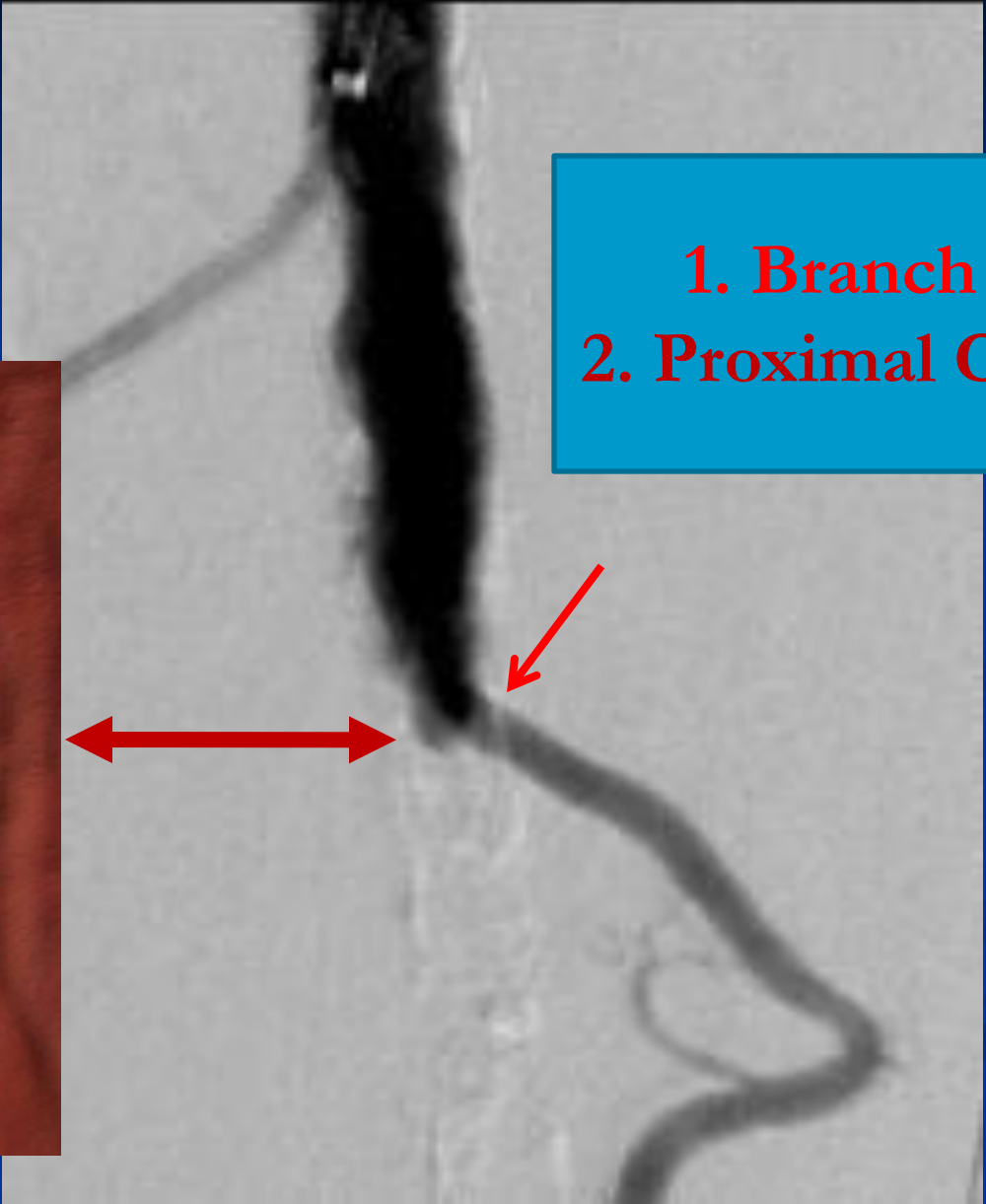
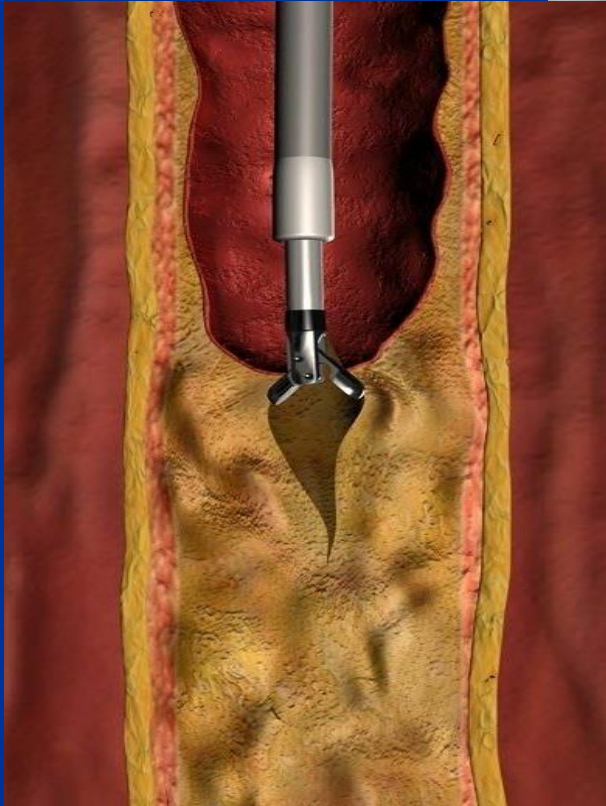


Crossing Device (Frontrunner XP)



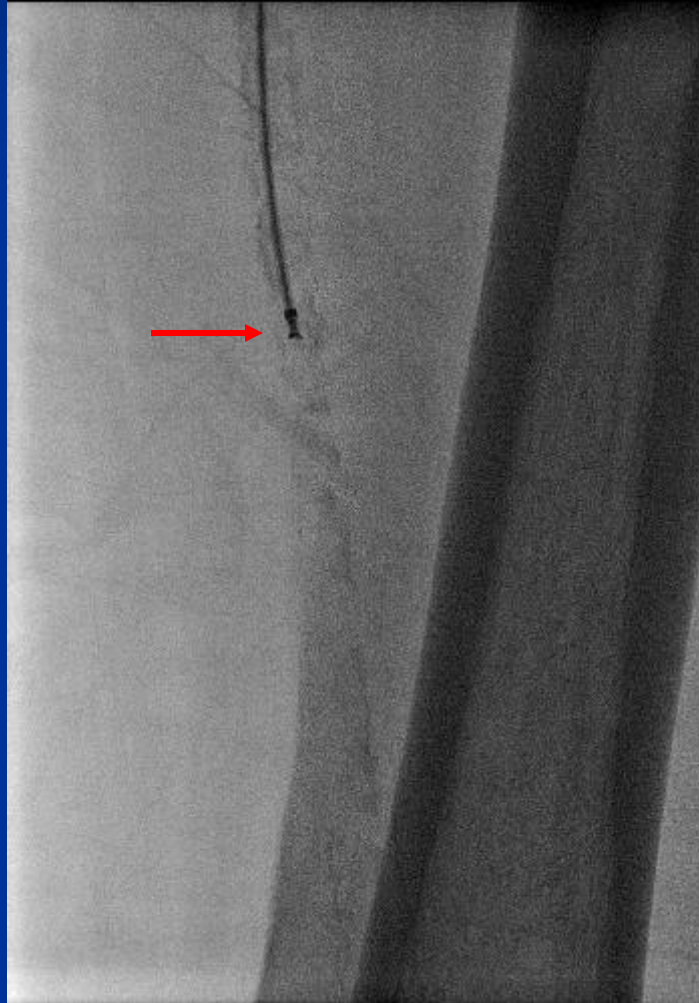
Proximal Cap (Magnify)





1. Branch
2. Proximal Cap

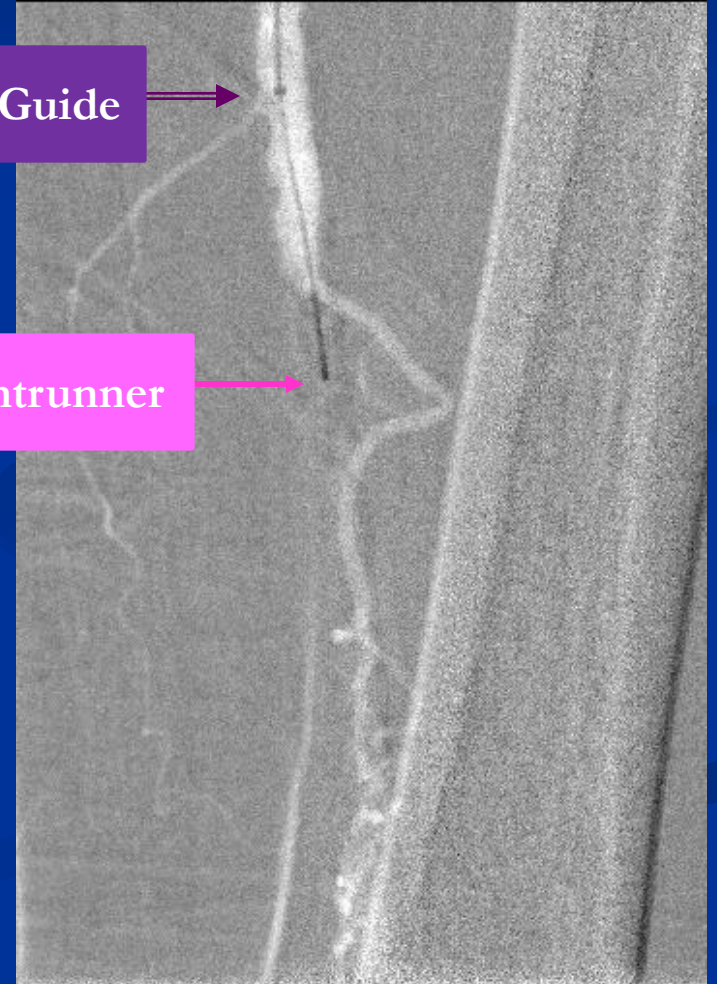
Penetrate Cap with Jaws Open



Advance FR with Jaws Closed

Micro Guide

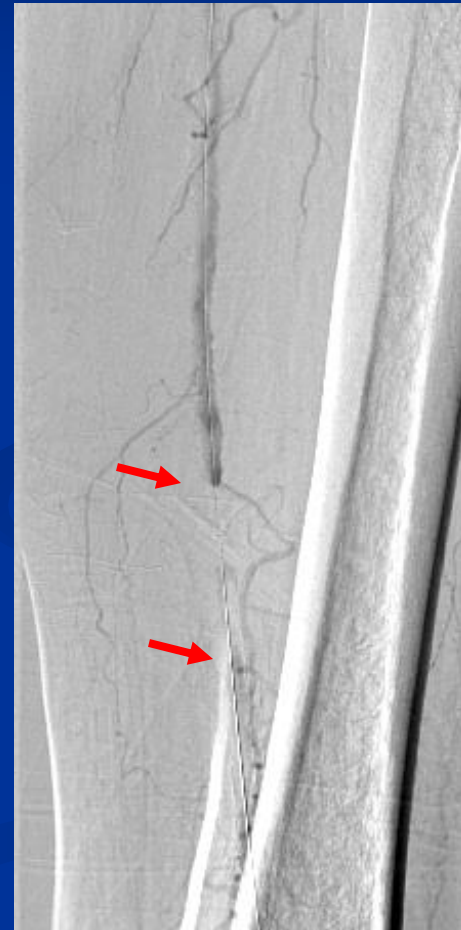
Frontrunner



**May enter True Lumen by FR
Blood return, inject 3 cc thru Micro Guide**

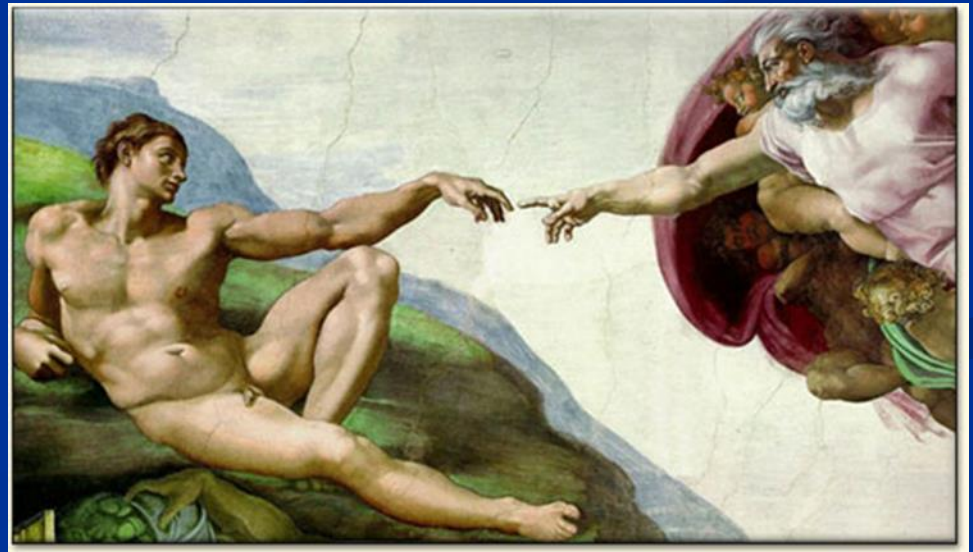


Pass Wire thru MGC



Re-entry Devices: Have Crossed the Occlusion but can NOT Re-enter

- Not a Crossing tool, but a Re-entry tool (RD)
- Must pass through the Occlusion first before using (RD)
- Must get to the “Point of Reconstitution”



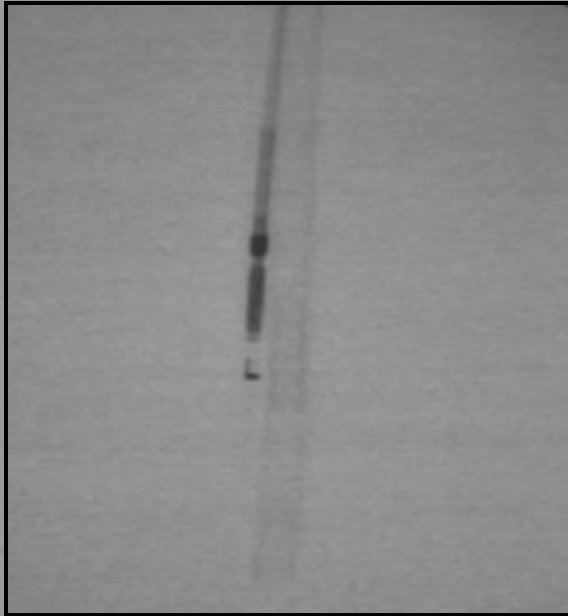
**Crossed but can NOT
get back in “True Lumen”**

**Wire/Catheter remains in the
Subintimal Space**

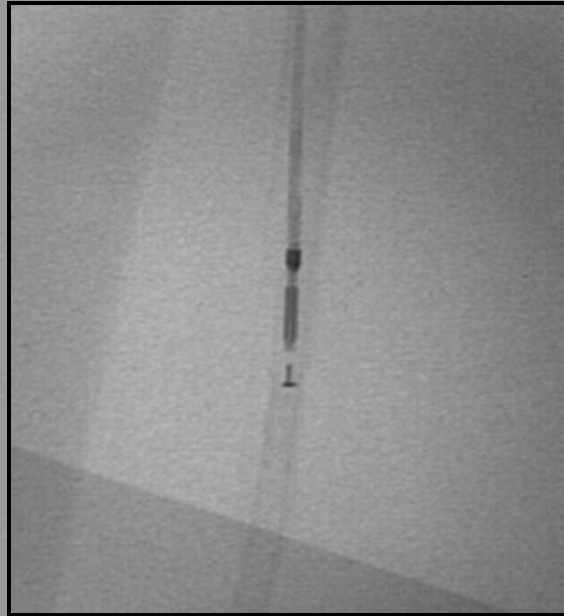


Outback[®] LTD[™] Orientation Markers

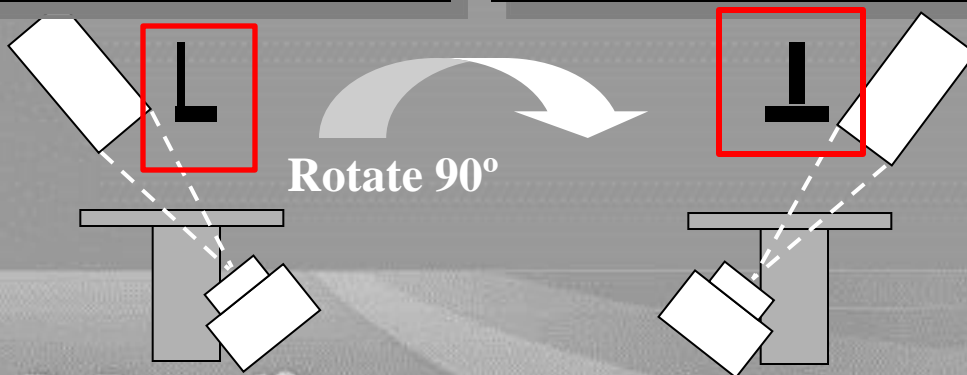
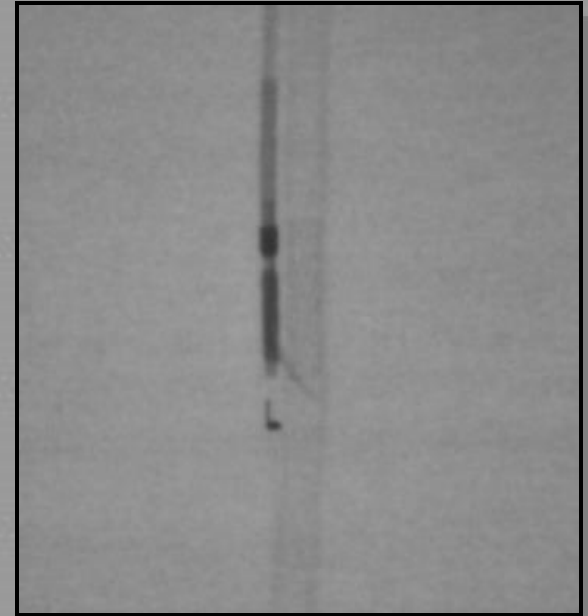
Locate



Tune

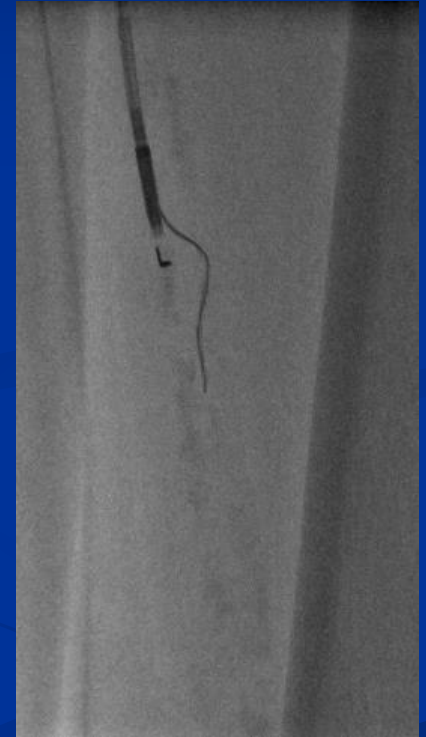
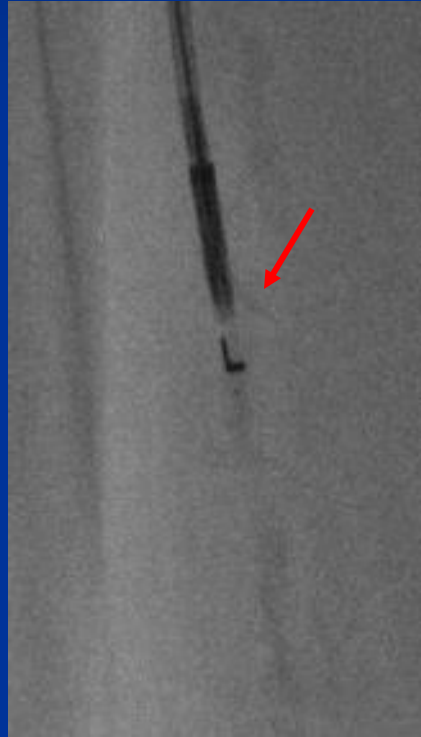


Deploy



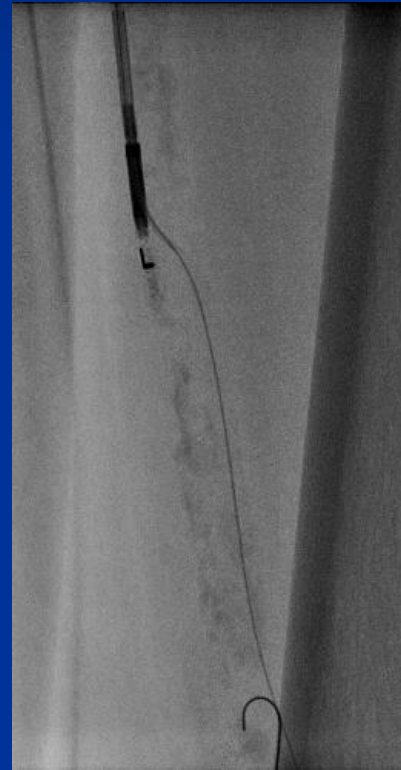
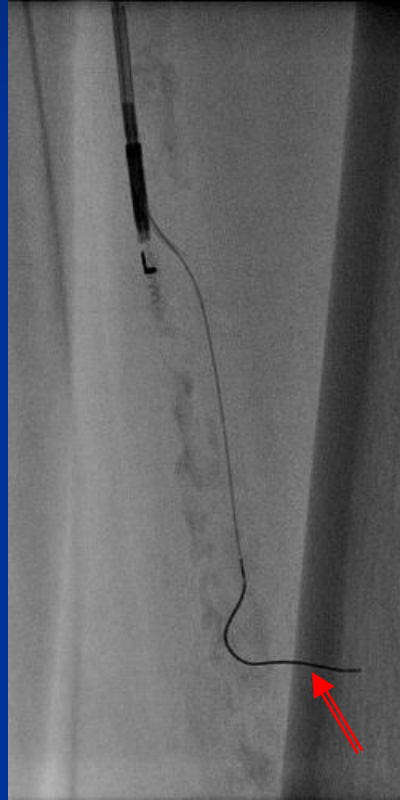
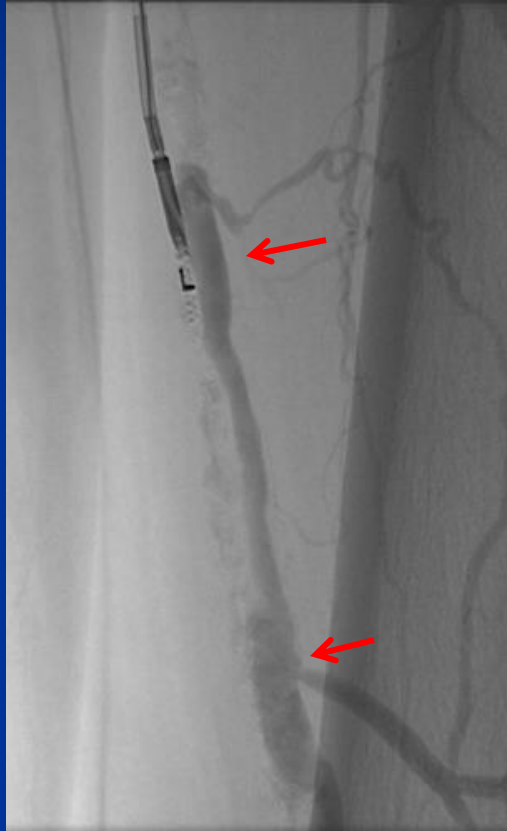
Hold On to the Handle while "L" and "T"

Deploy Needle



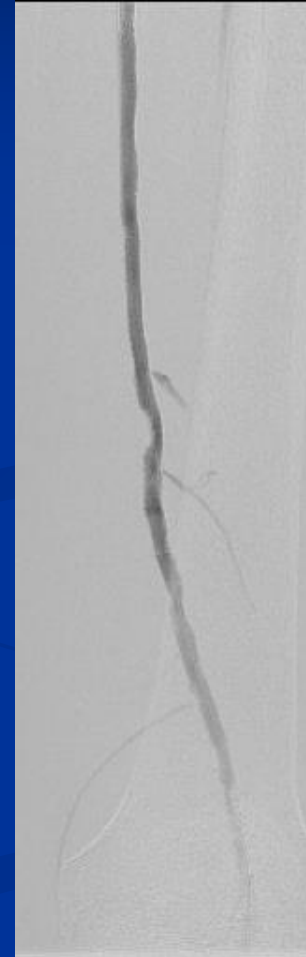
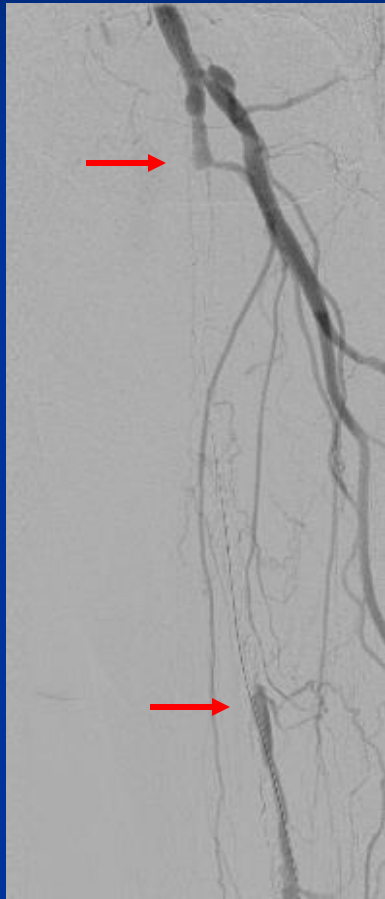
.014 Non Hydrophilic Wire

Gently Pass .014 wire while Needle is deployed



Remove OB, only after
Needle is pulled back

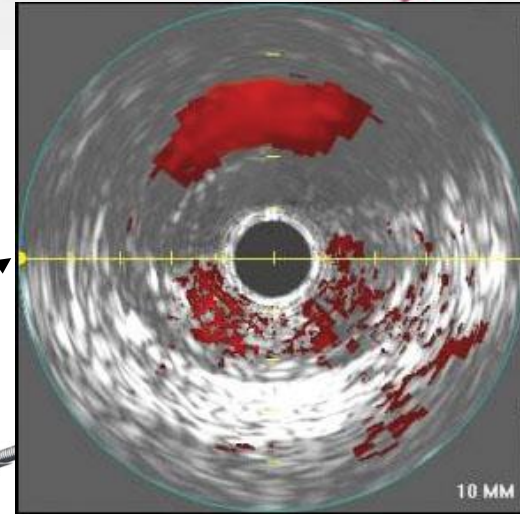
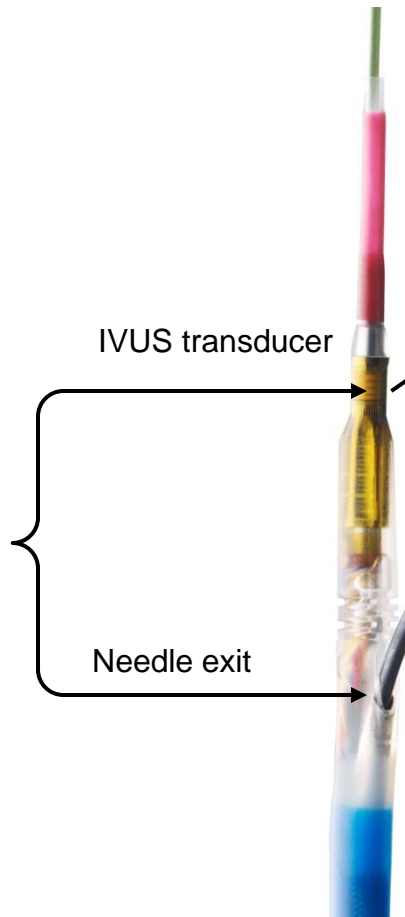
Completion Arteriogram after EVI



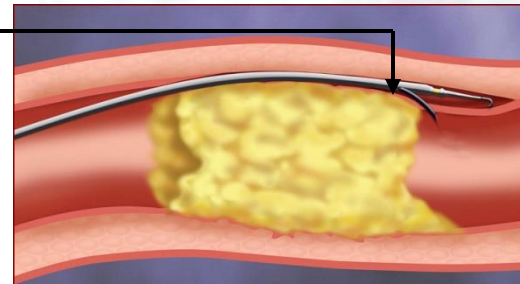
Pioneer Plus Catheter

Needle and IVUS Transducer

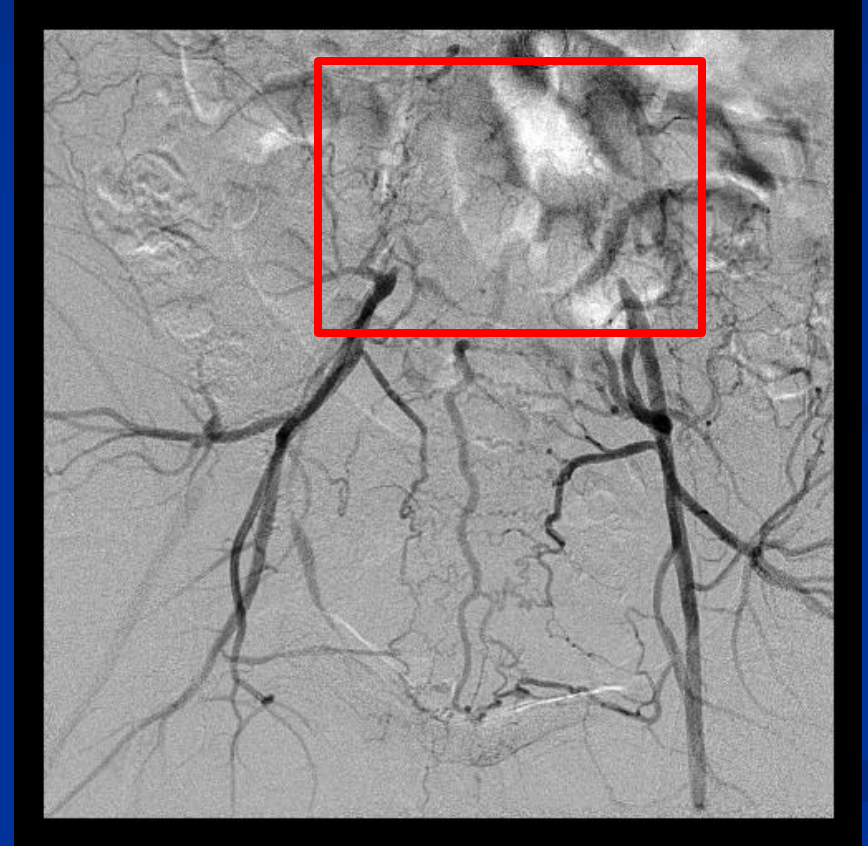
Needle exits
catheter ~7mm
below IVUS
transducer 7 mm



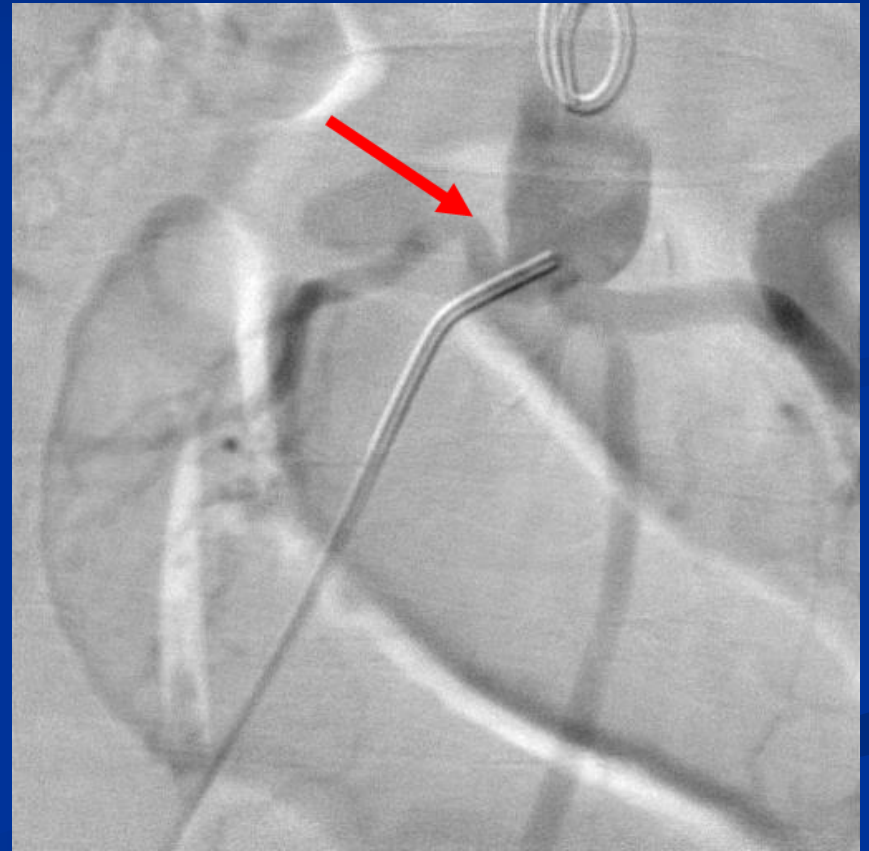
Visualize
Success



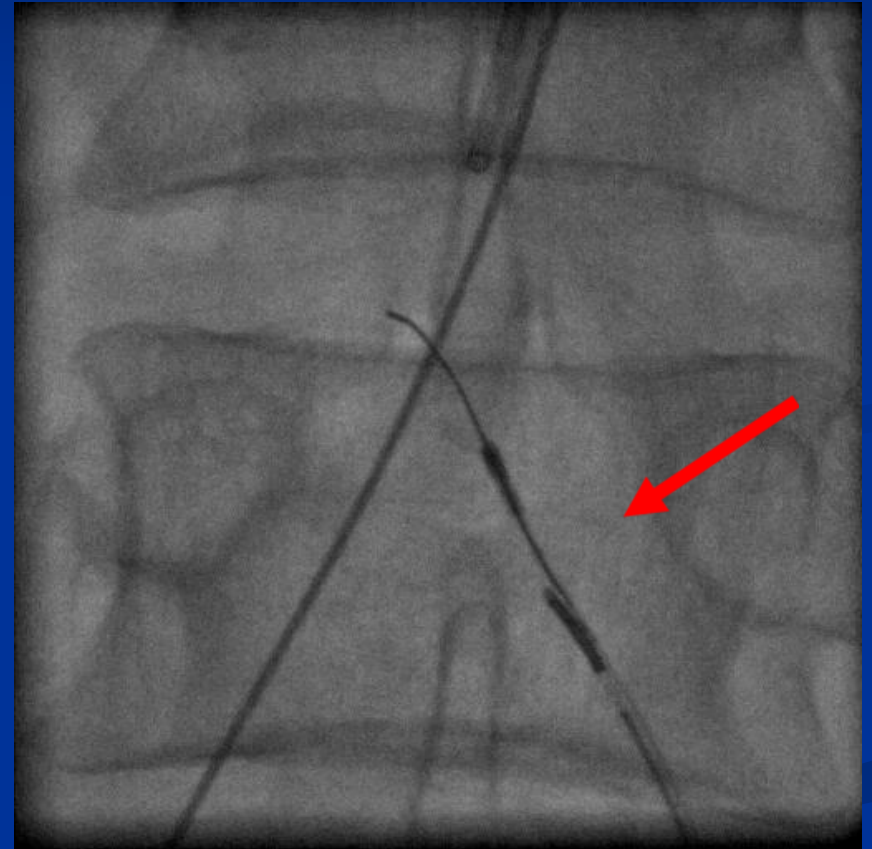
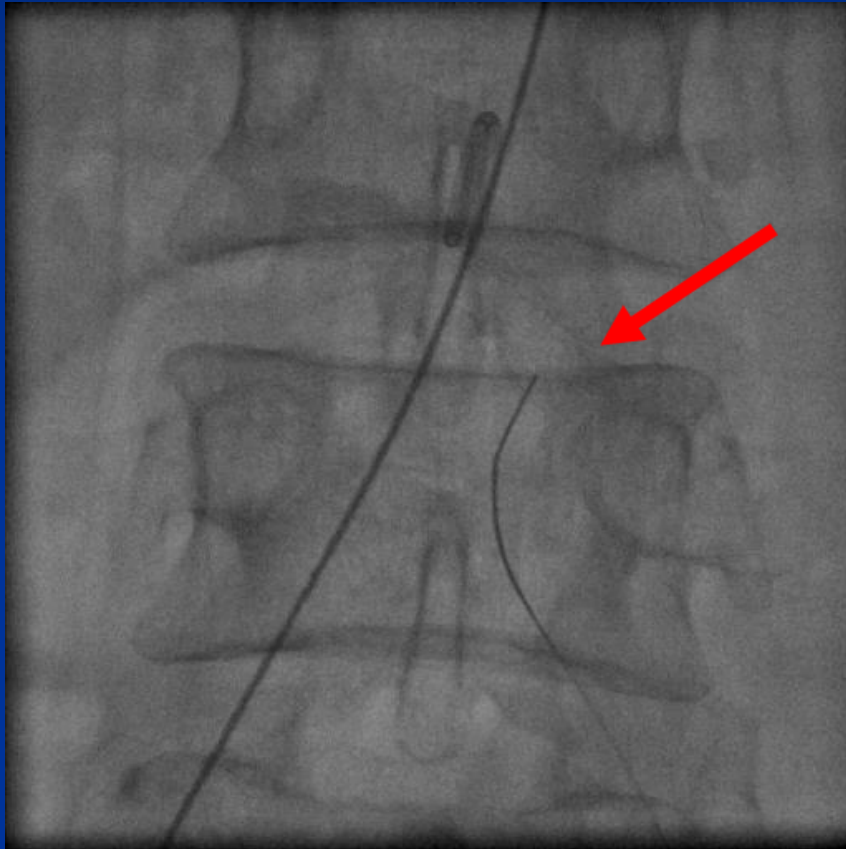
Distal Aorta and B/L C. Iliac Occlusion



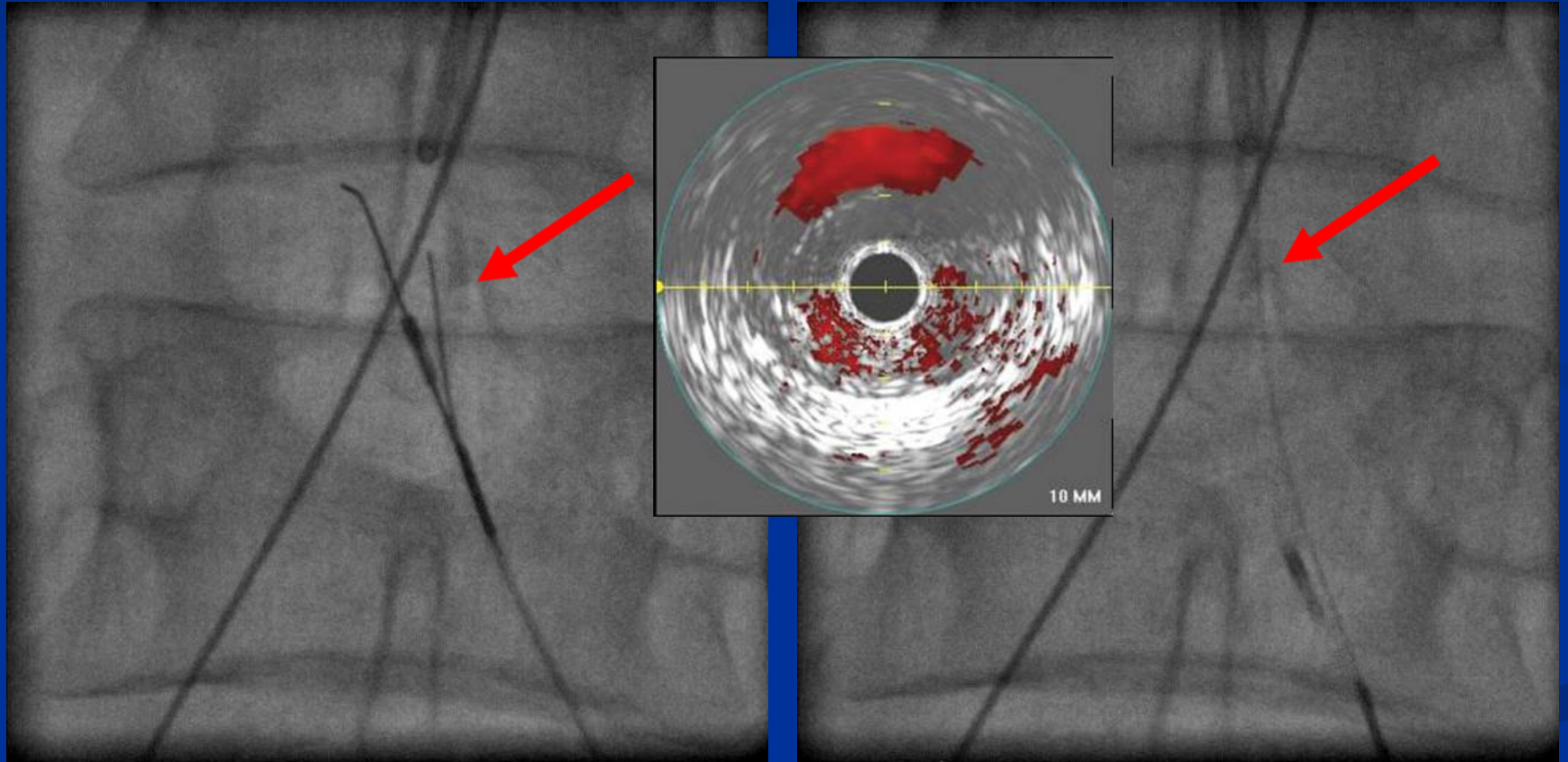
R Iliac CTO: wire & catheter



Left Iliac Occlusion: use Pioneer for Re-entry



Pioneer- IVUS



B/L Iliac PTA & STENTING





Summary: AVIOD SURGERY!



- Successful CTO can be accomplished using meticulous techniques, and attention to details
- Either wire&catheter technique and/or Crossing--- Re-entry Device

ASSAULT ON FREEDOM OF EXPRESSION. 2B

TERROR ATTACK IN PARIS

CARTOONISTS REACT. 8A



USA TODAY™
01.08.15

“I’d rather die standing than live on my knees.”

Stéphane Charbonnier, editorial director of Charlie Hebdo, killed in Wednesday’s assault



A GATHERING IN PARIS, BY THEAULT CASUS, 4P

‘JE SUIS CHARLIE’

The Western world stood up against Islamic terrorism Wednesday after 12 people, including four cartoonists, were assassinated in the

Charlie Hebdo had repeatedly parodied Islamic radicals and at times showed images of the prophet Mohammed, which is forbidden under Islamic law.

yesterday



today



tomorrow

