

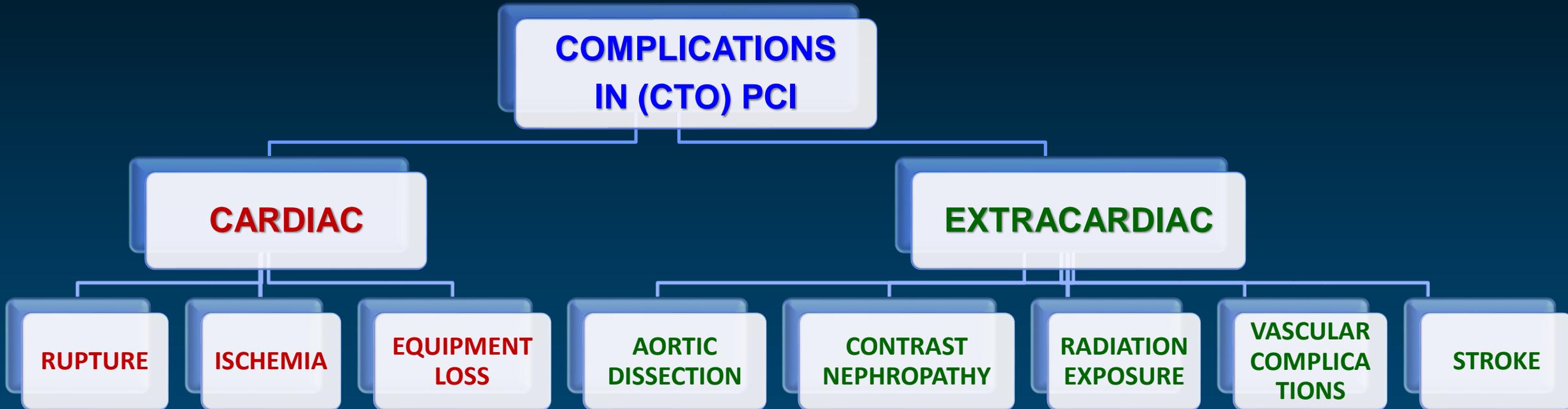
# CTO PCI

## - *Complication & Management* -

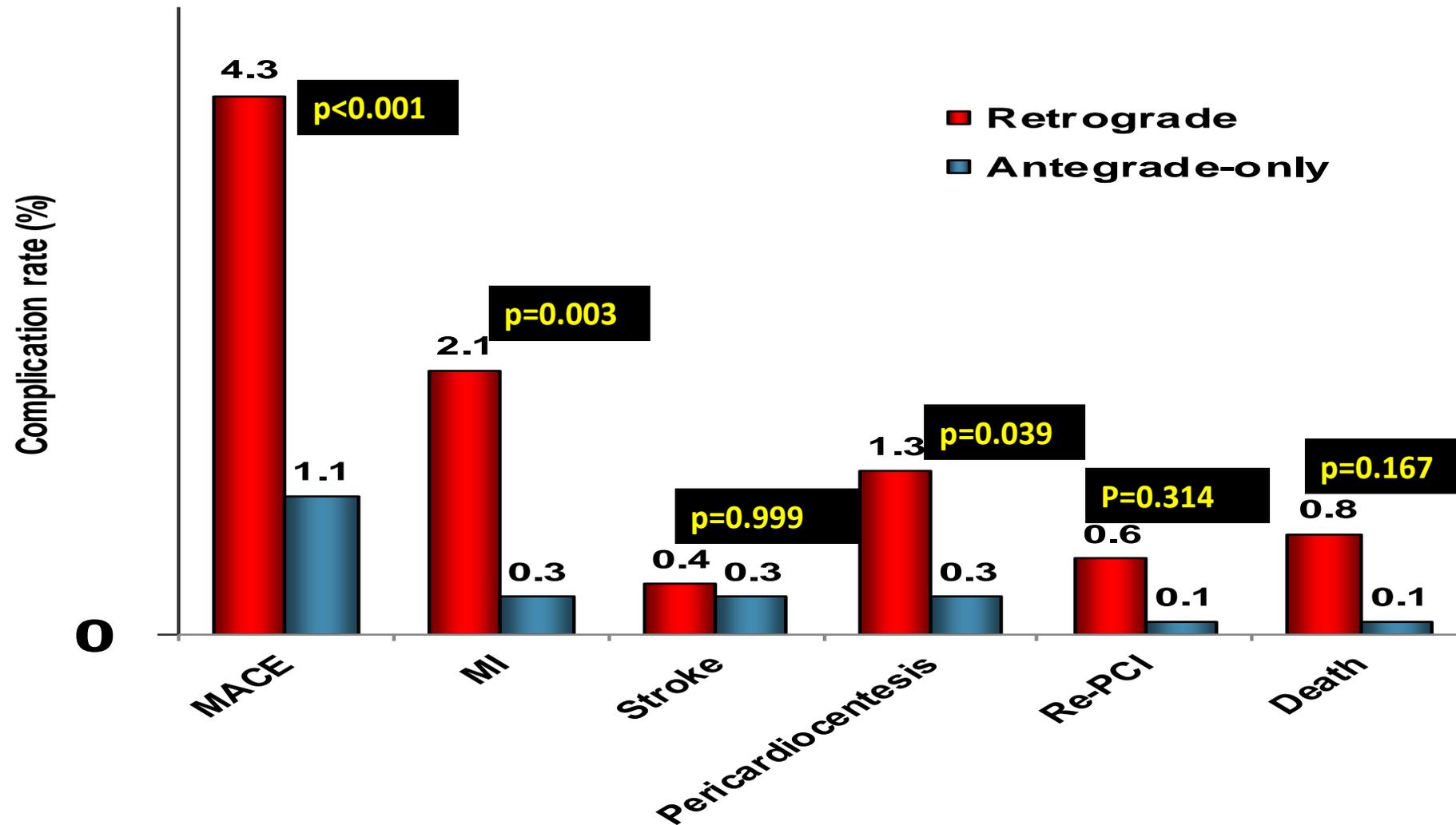
**Jae-Hwan Lee, MD, PhD**

**Cardiovascular Center in  
Chungnam National University Hospital**

# CTO-PCI complication and Mx



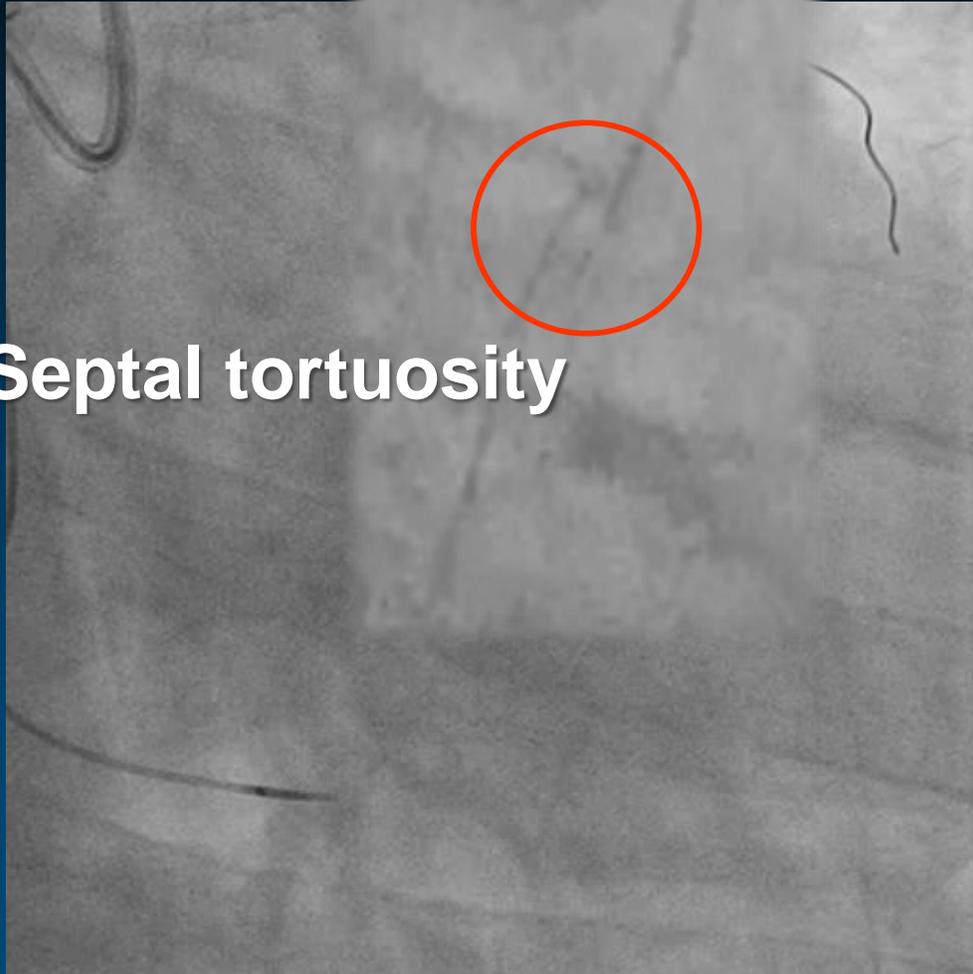
# Retrograde vs. antegrade-only: in-hospital MACE



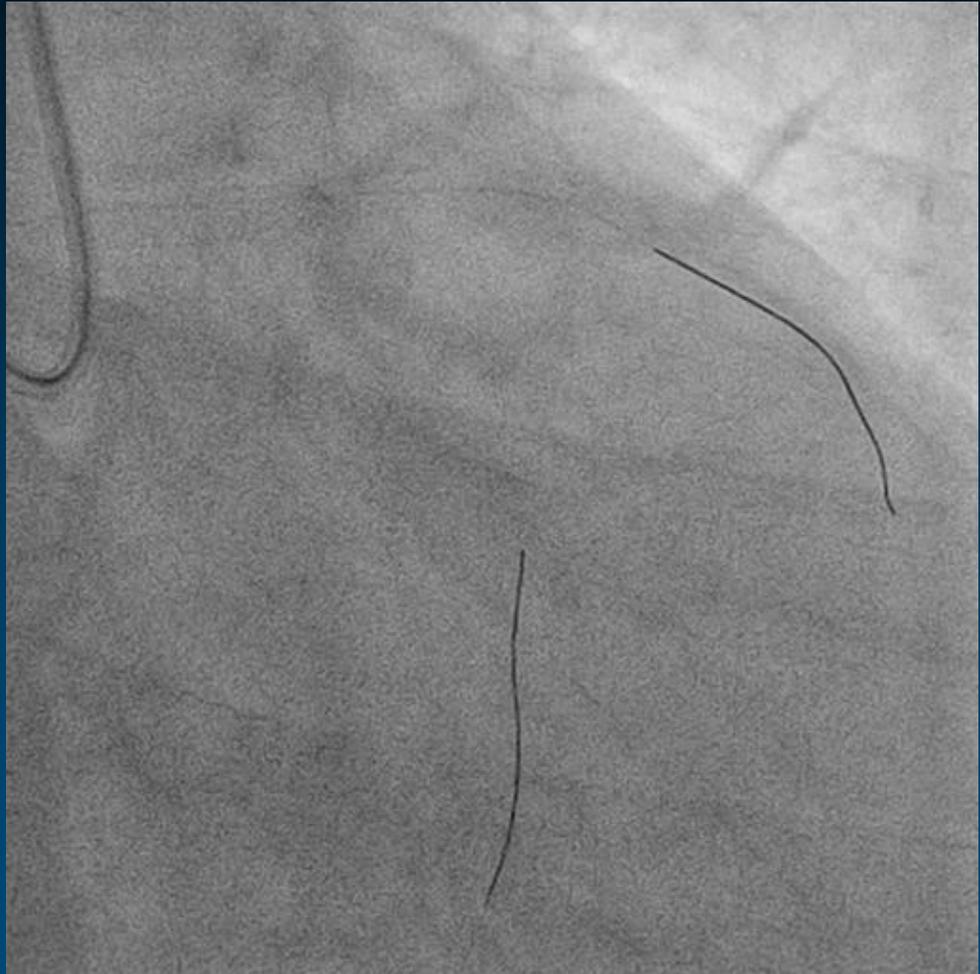
Karpaliotis D, Karatasakis A, Alaswad K, Jaffer FA, Yeh RW, Wyman RM, Lombardi W, Grantham JA, Kandzari DE, Lembo NJ, Doing A, Patel M, Bahadorani J, Moses JW, Kirtane AJ, Parikh M, Ali Z, Kalra S, Nguyen-Trong PJ, Danek BA, Karacsonyi J, Rangan BV, Roesle M, Thompson CA, Banerjee S, Brilakis ES. *Circ Cardiovasc Interv* 2016 Jun;9(6)

# Channel Injury

# Channel Injury

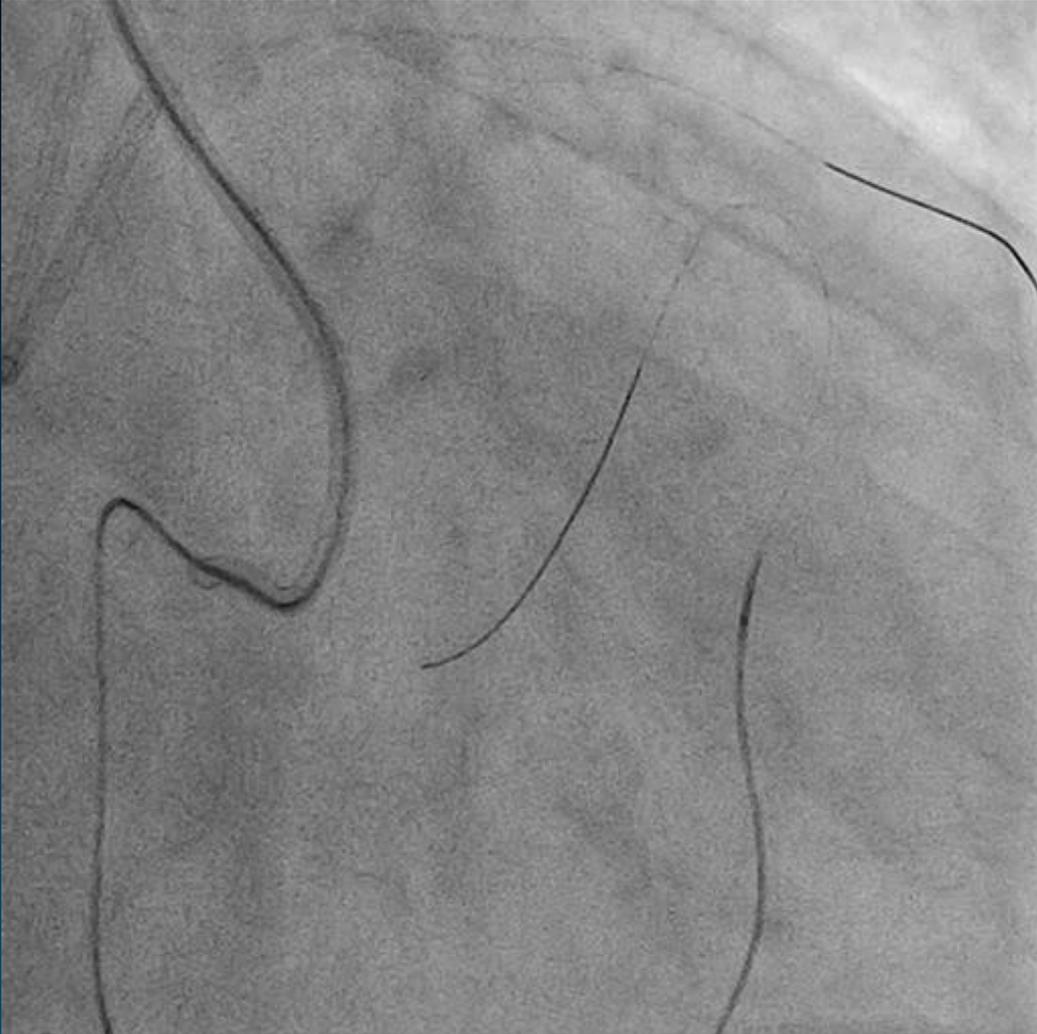


Septal tortuosity

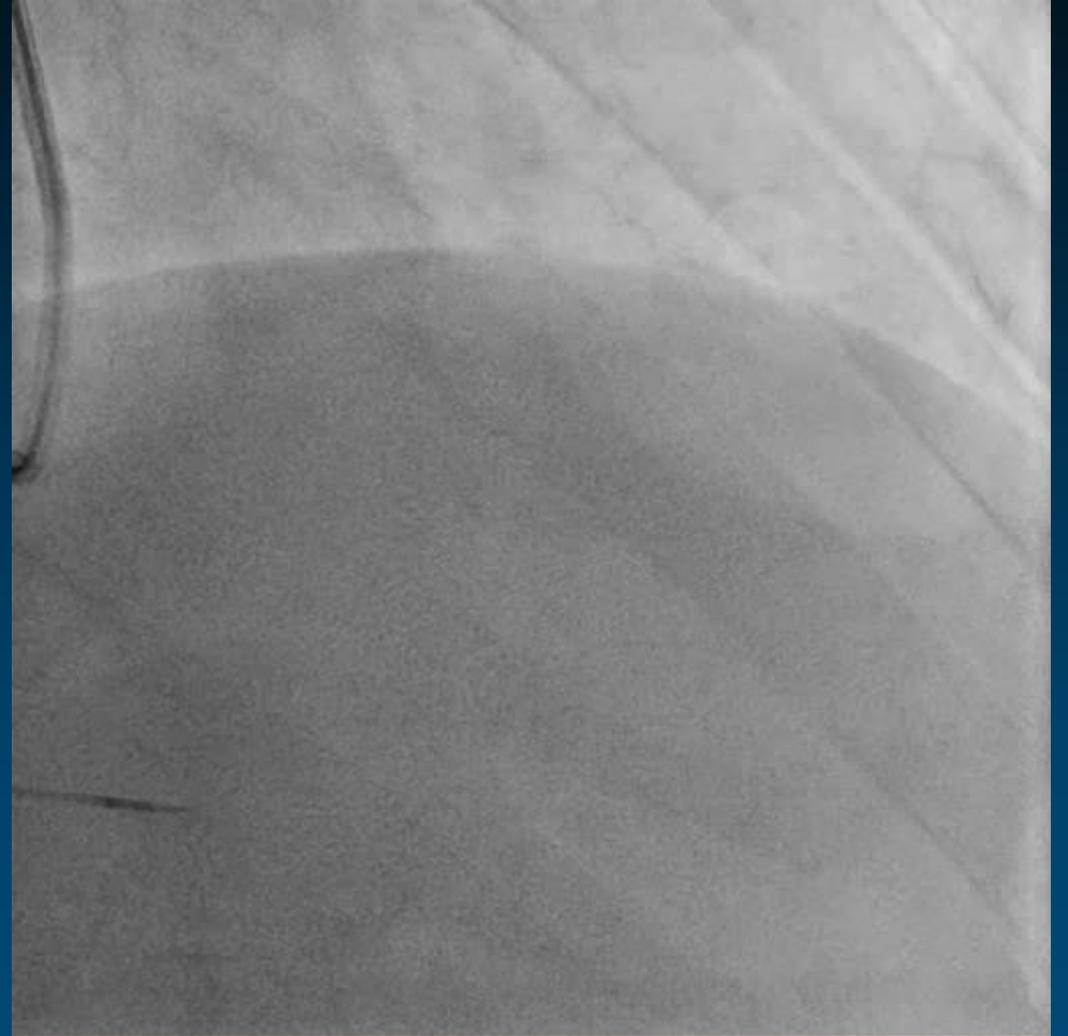


Corsair & Sion wire

# Channel Injury

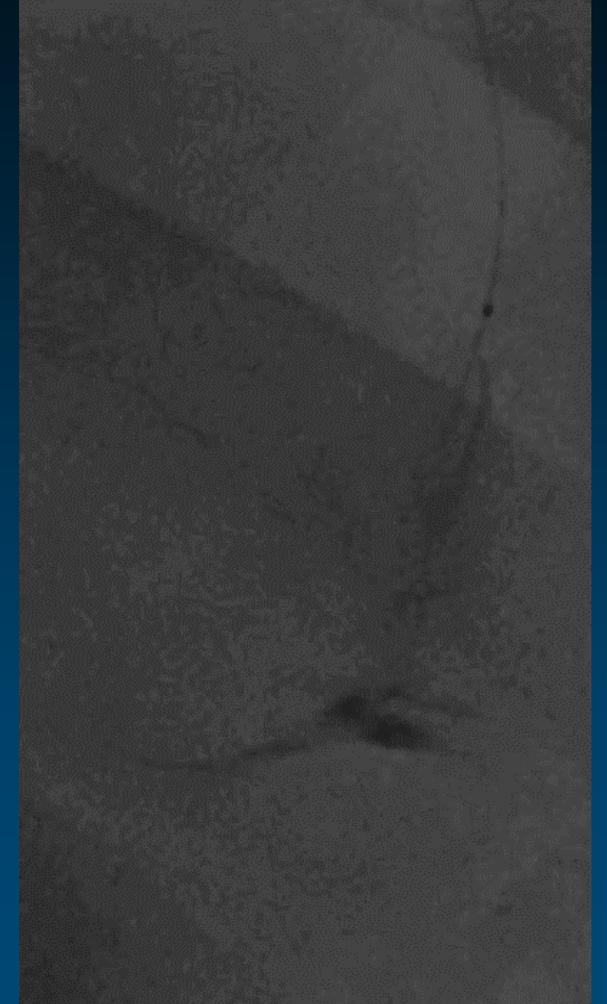


**Cosair prolapse d/t septal tortuosity**



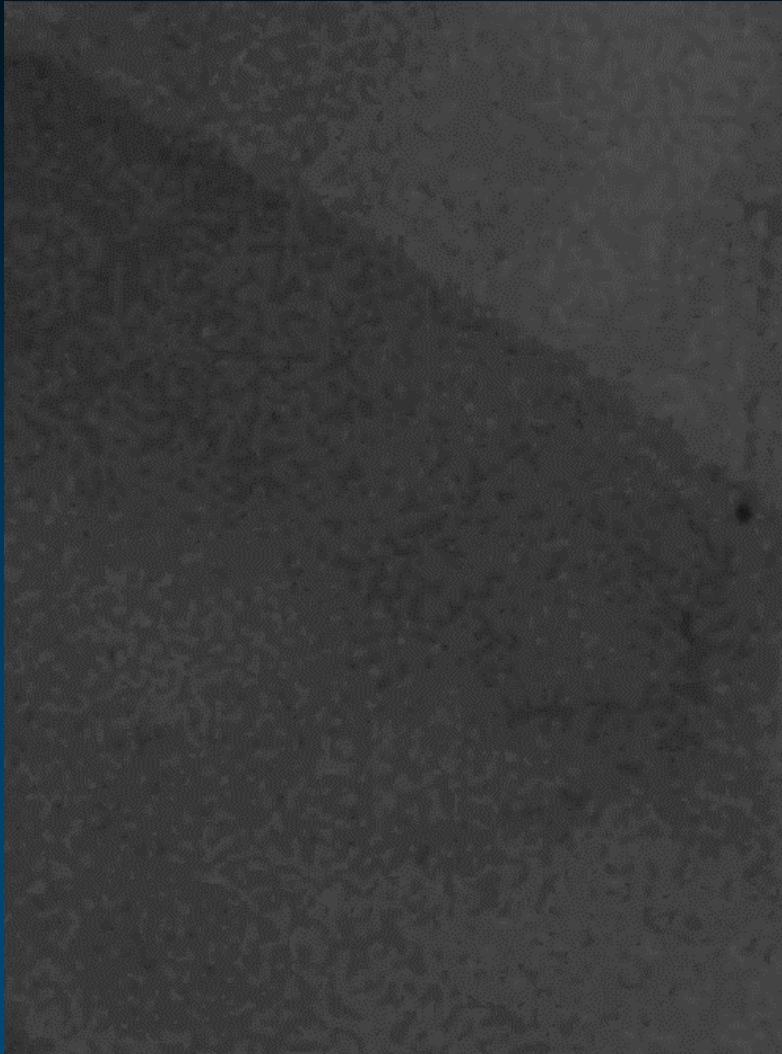
**Septal perforation to LV cavity**

# 61/M, Stable Angina, Long RCA CTO

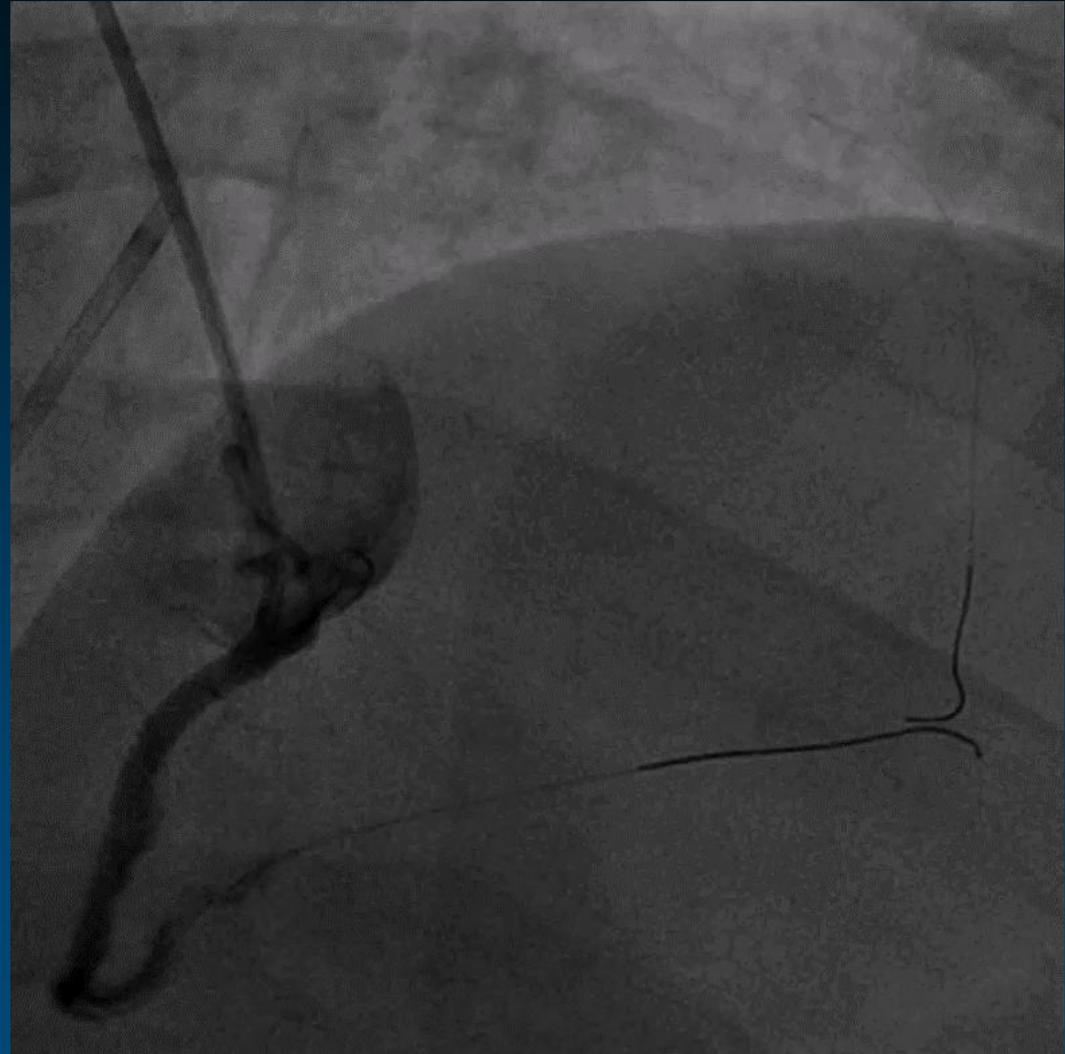


Wrong passage → Extravasation

# Continue Retrograde CTO PCI

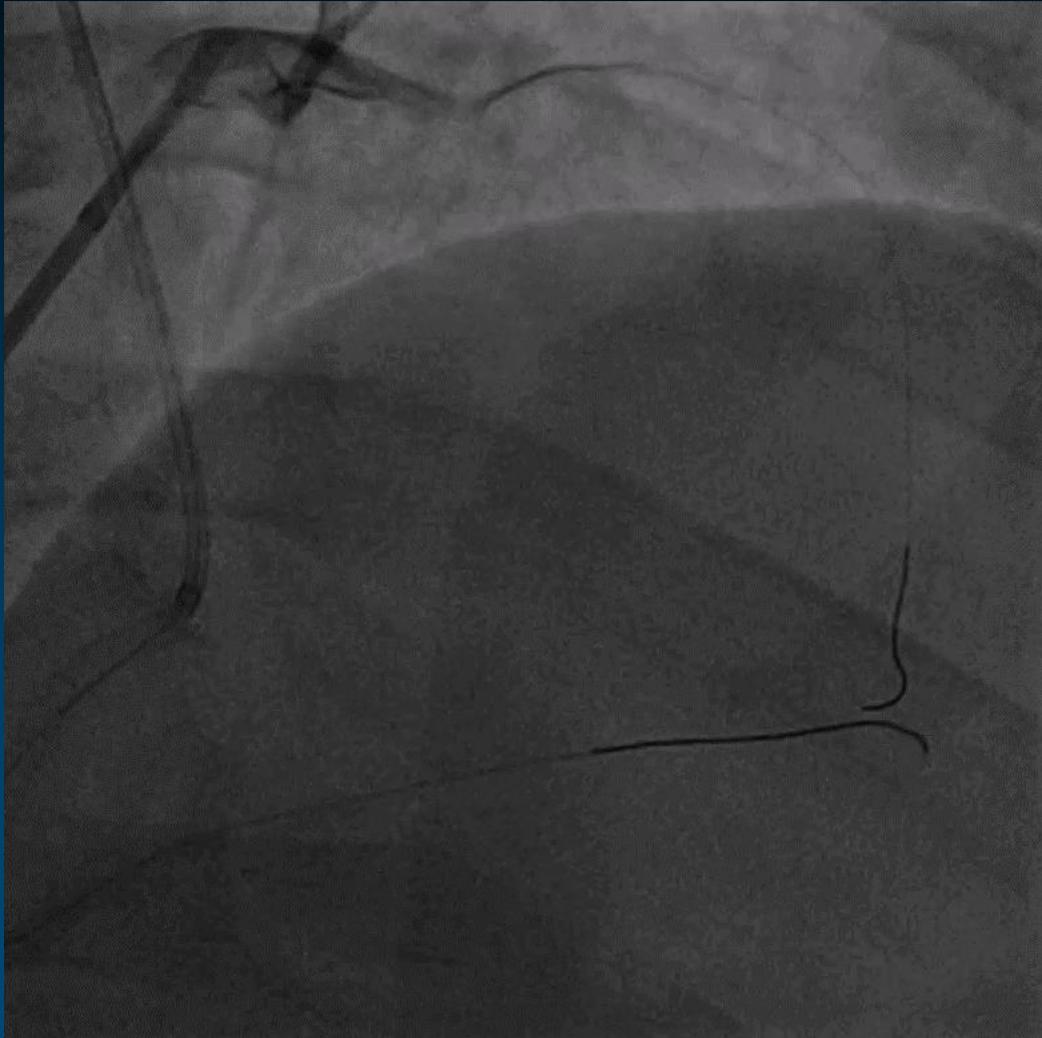


Appropriate channel selected

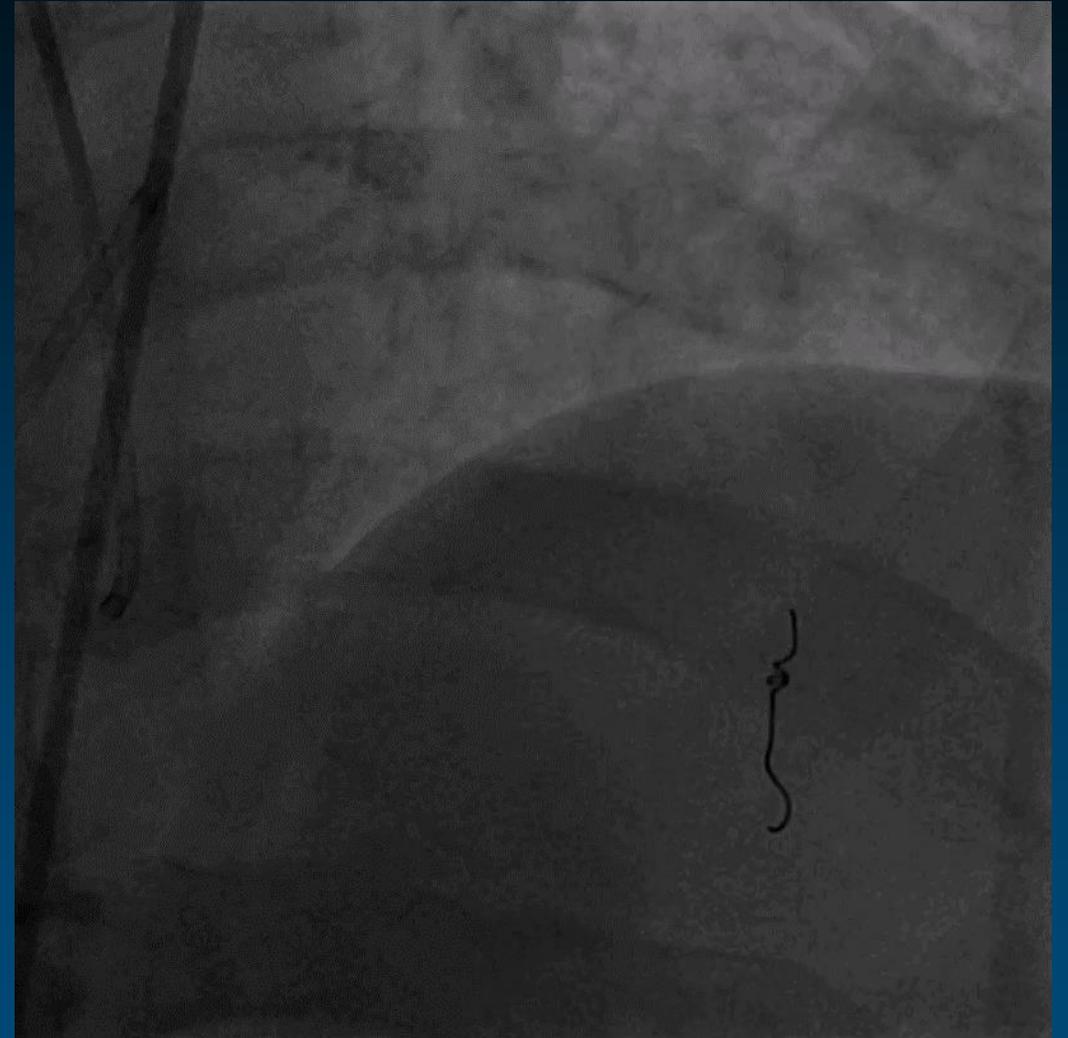


Successful Retro PCI

# Septal Perforation → Coil Embolization



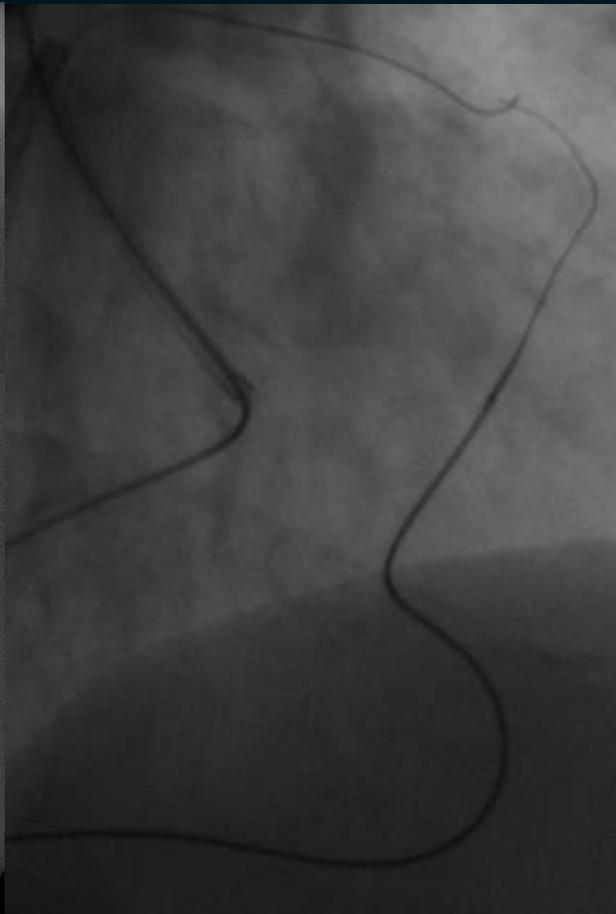
**Persistent septal leakage**



**Coil embolization from LAD**

# Perforation

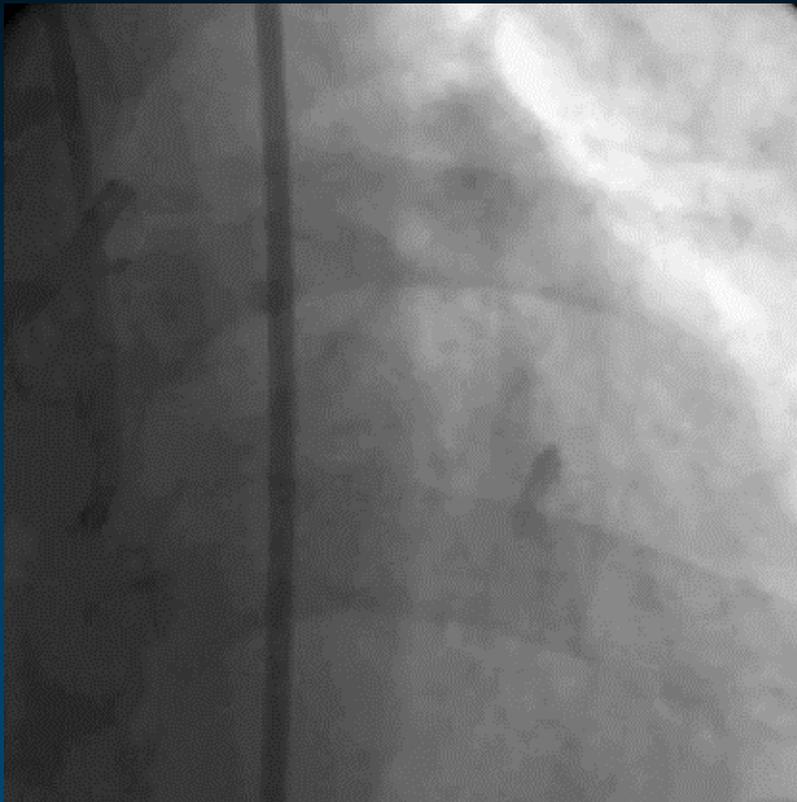
# 55/F, Unstable angina, mLAD CTO



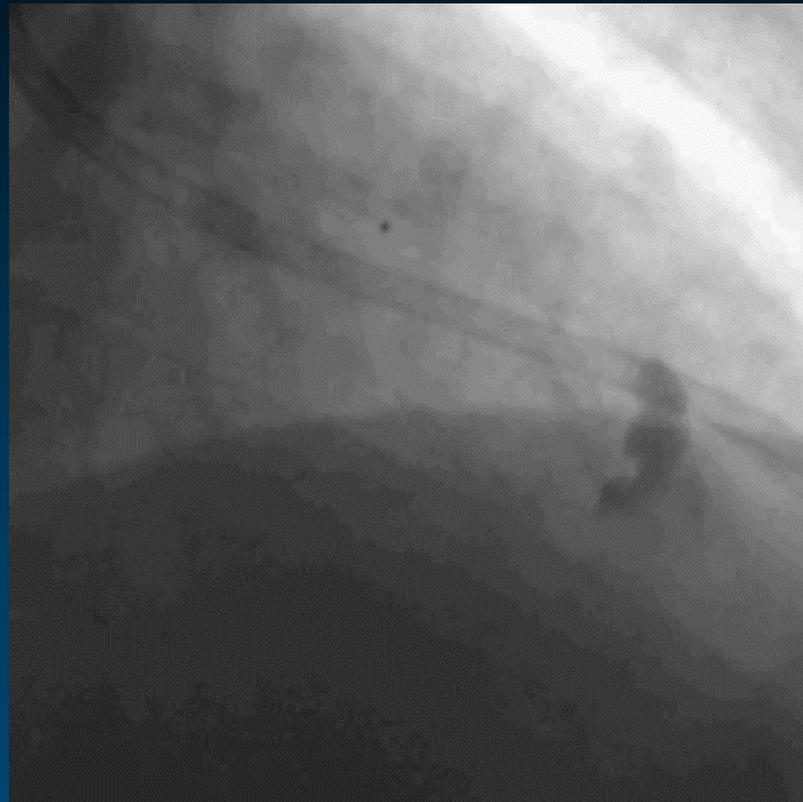
Dye staining  
No septal damage

sBP dropped to 60 mmHg during retrograde CTO PCI

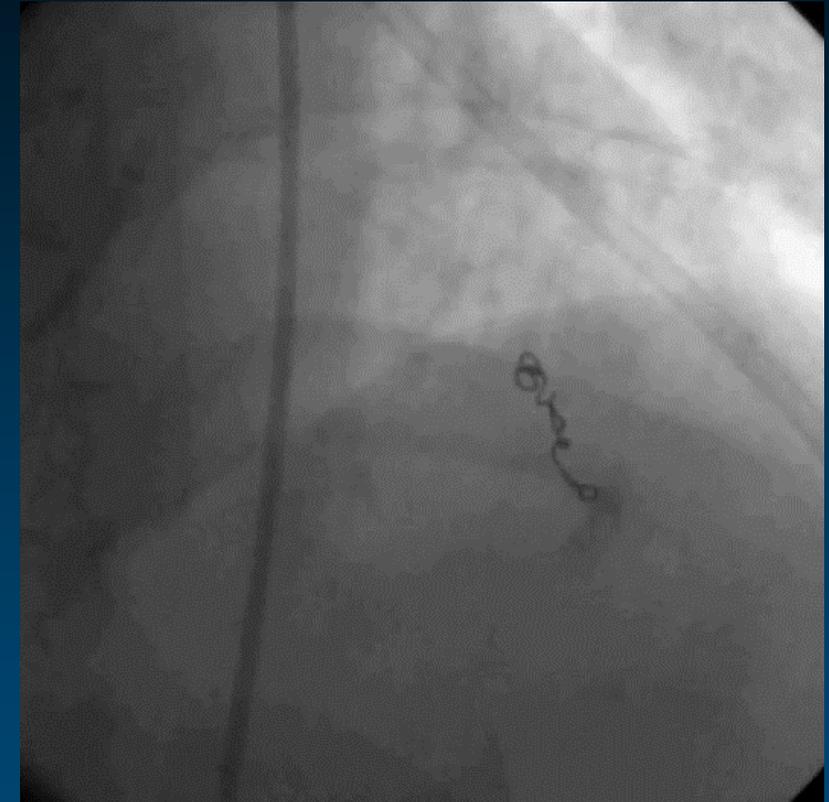
# 55/F, Unstable angina, mLAD CTO



**Antegrade perforation**

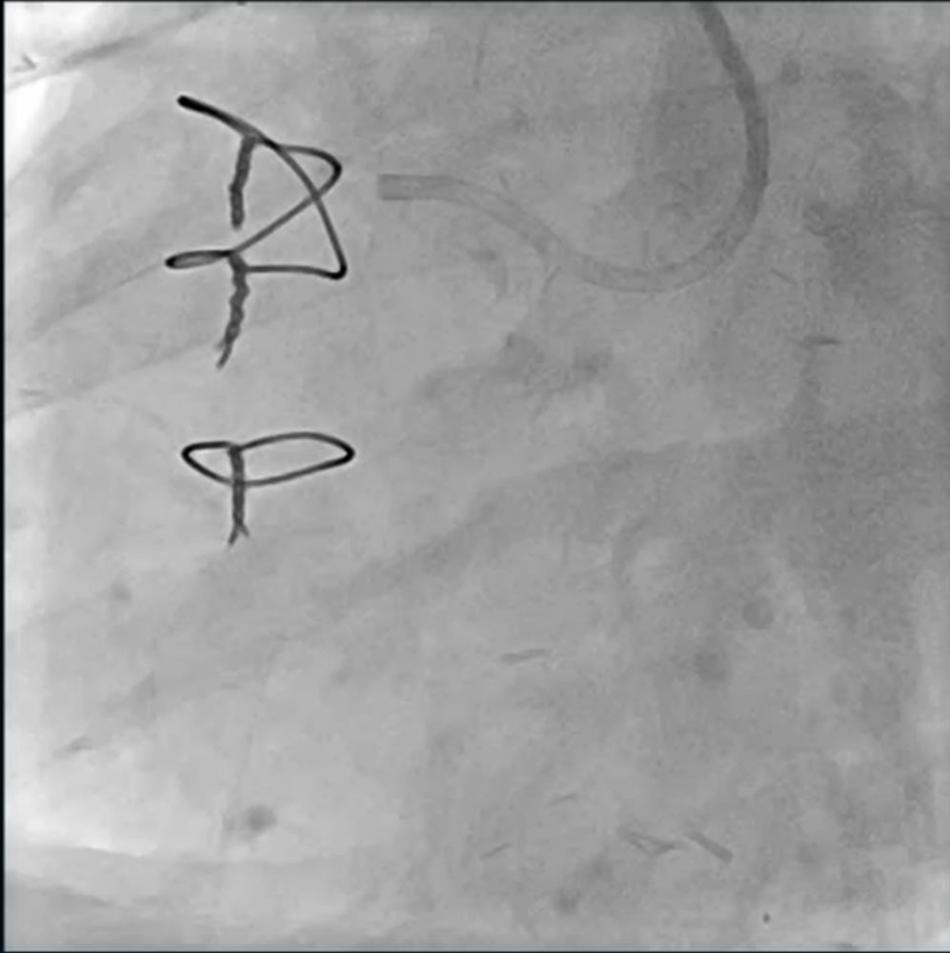


**Pericardiocentesis  
Microcatheter delivery**



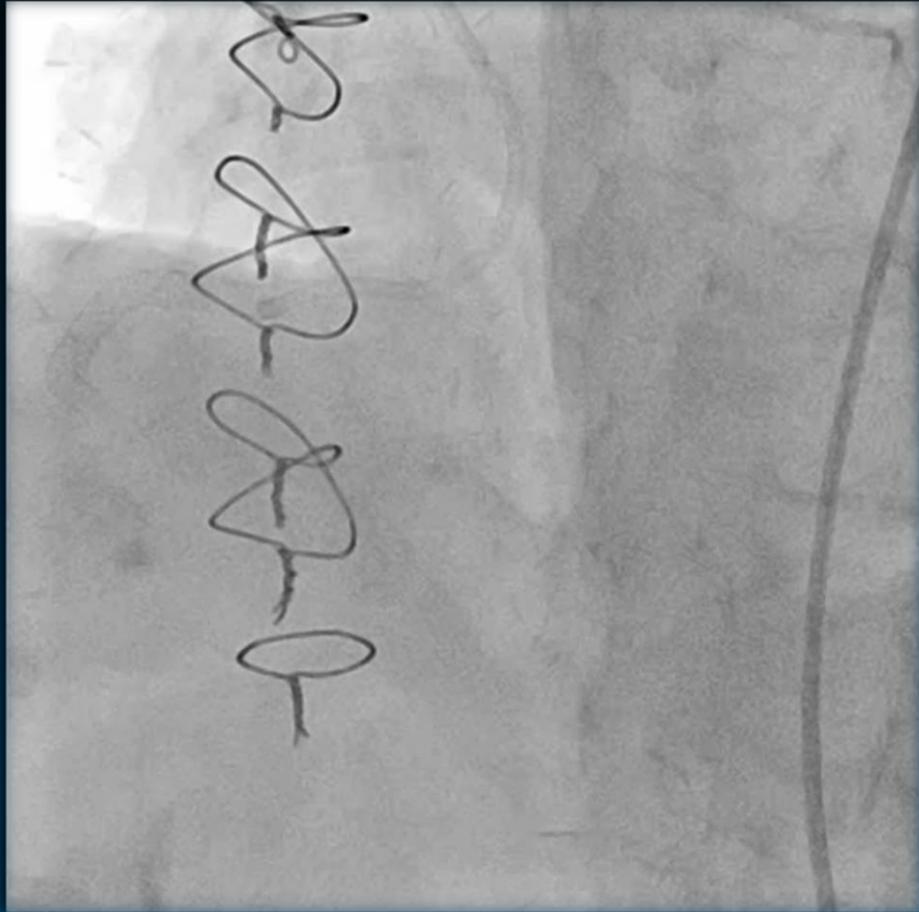
**Coil embolization  
→ CABG**

# Perforation: Pericardiocentesis and Operation

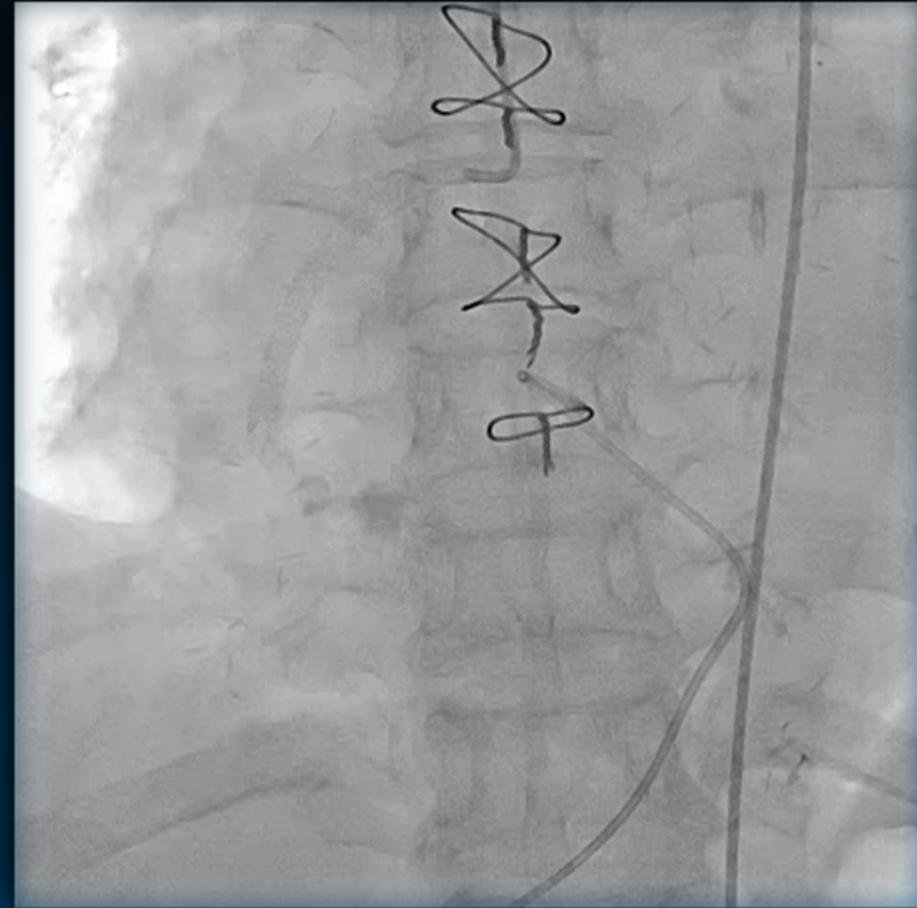


AWE with Gaia 2 → exchanged with soft wire → Stenting

# Perforation: Pericardiocentesis and Operation

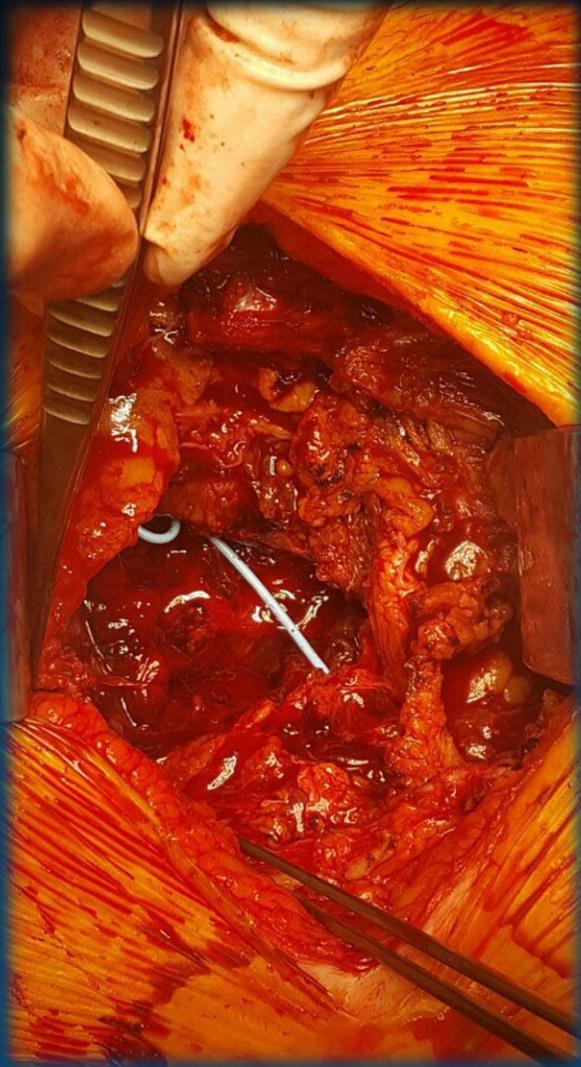


Persistent contrast extravasation



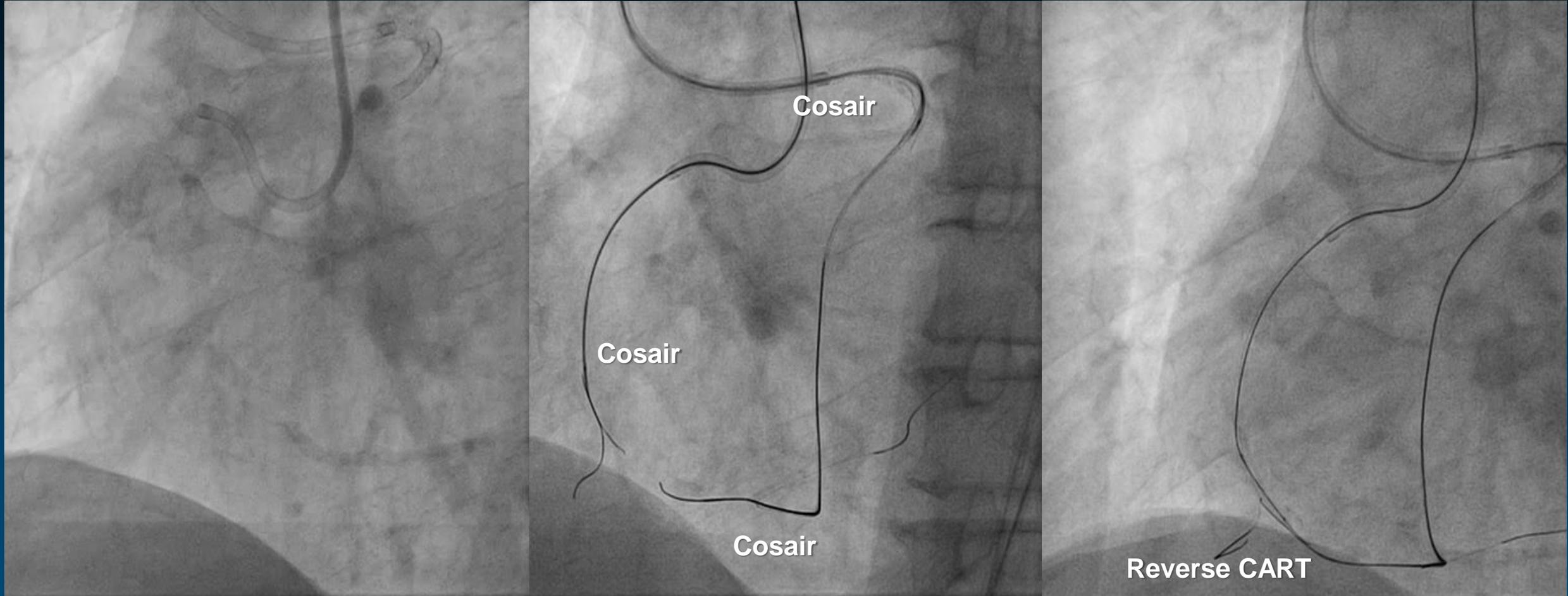
After pericardiocentesis,  
persistent tamponade

# Perforation: Pericardiocentesis and Operation

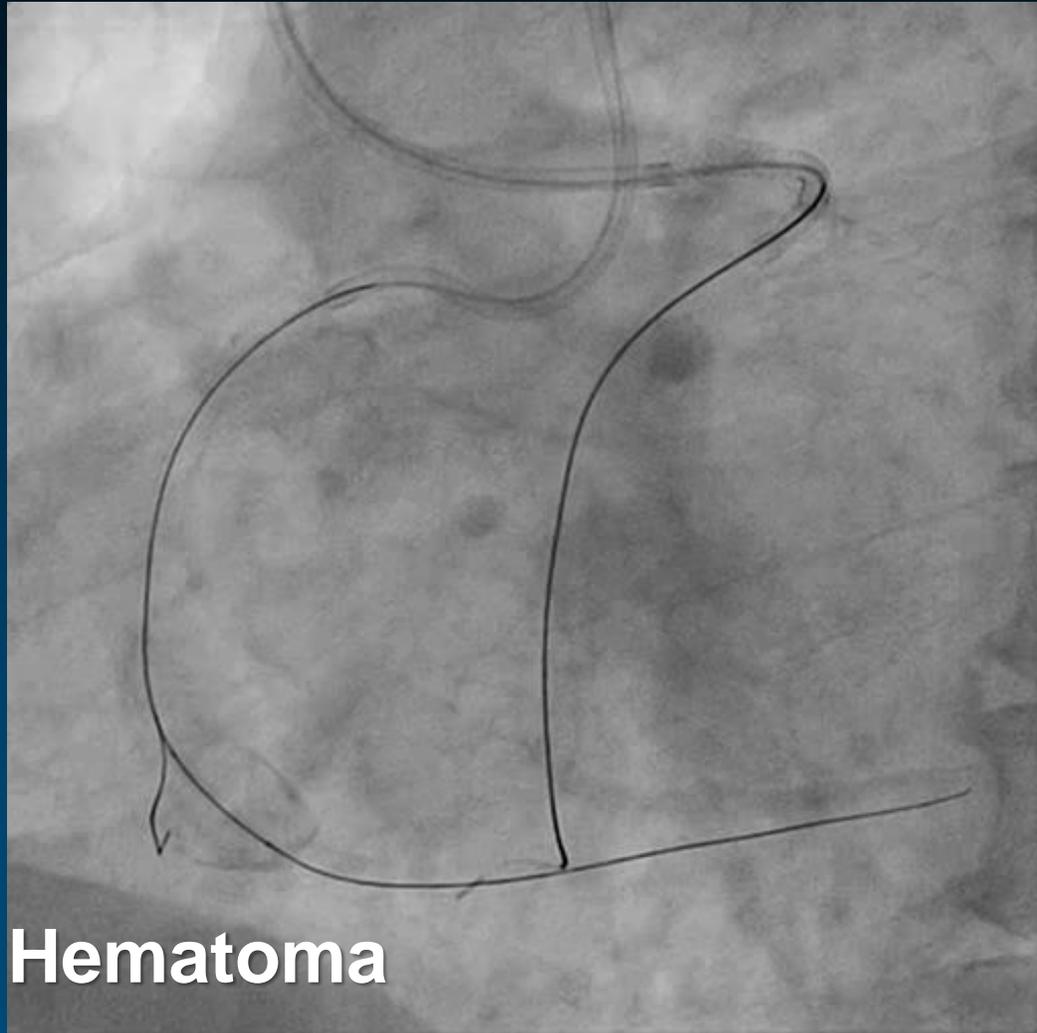


**RV wall rupture because of RV wall hematoma**

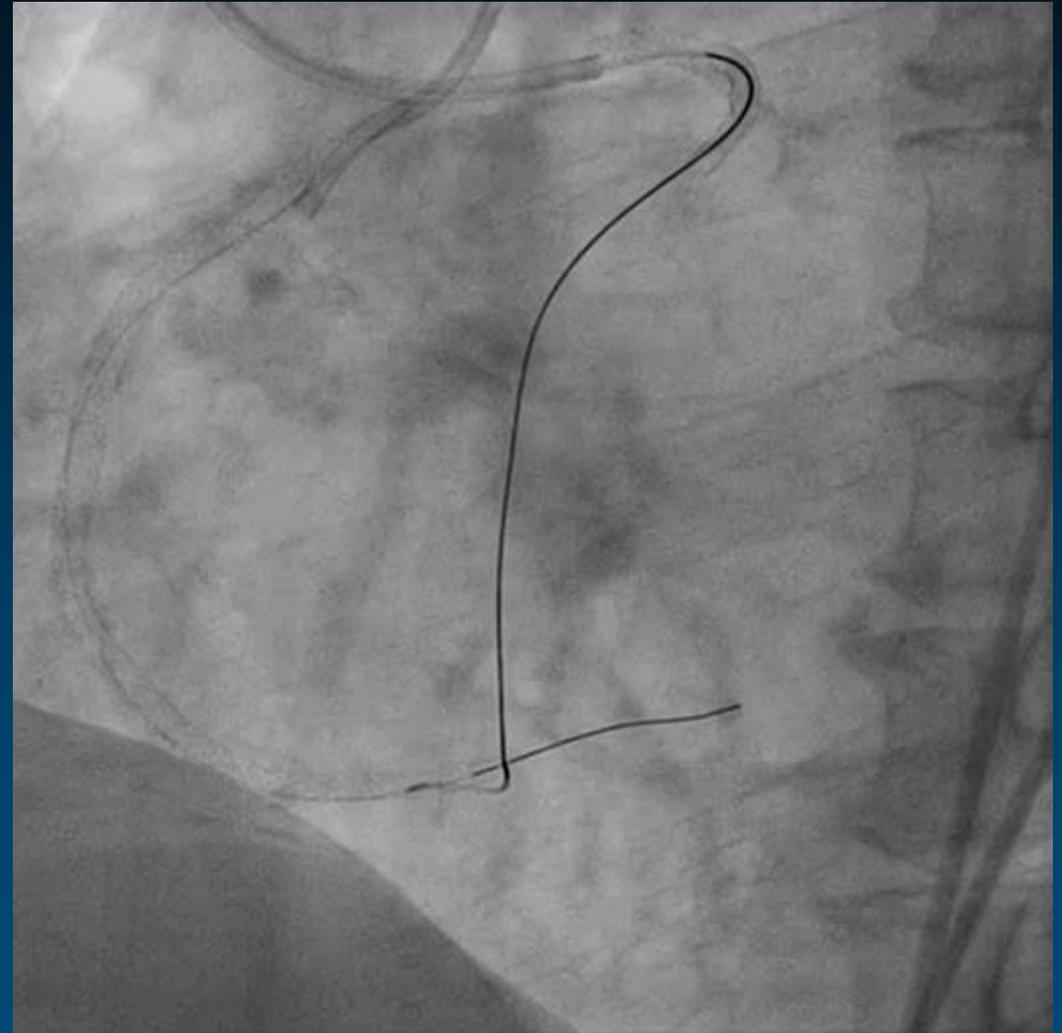
# Perforation: Concealed Hematoma



# Perforation: Concealed Hematoma



**Hematoma**

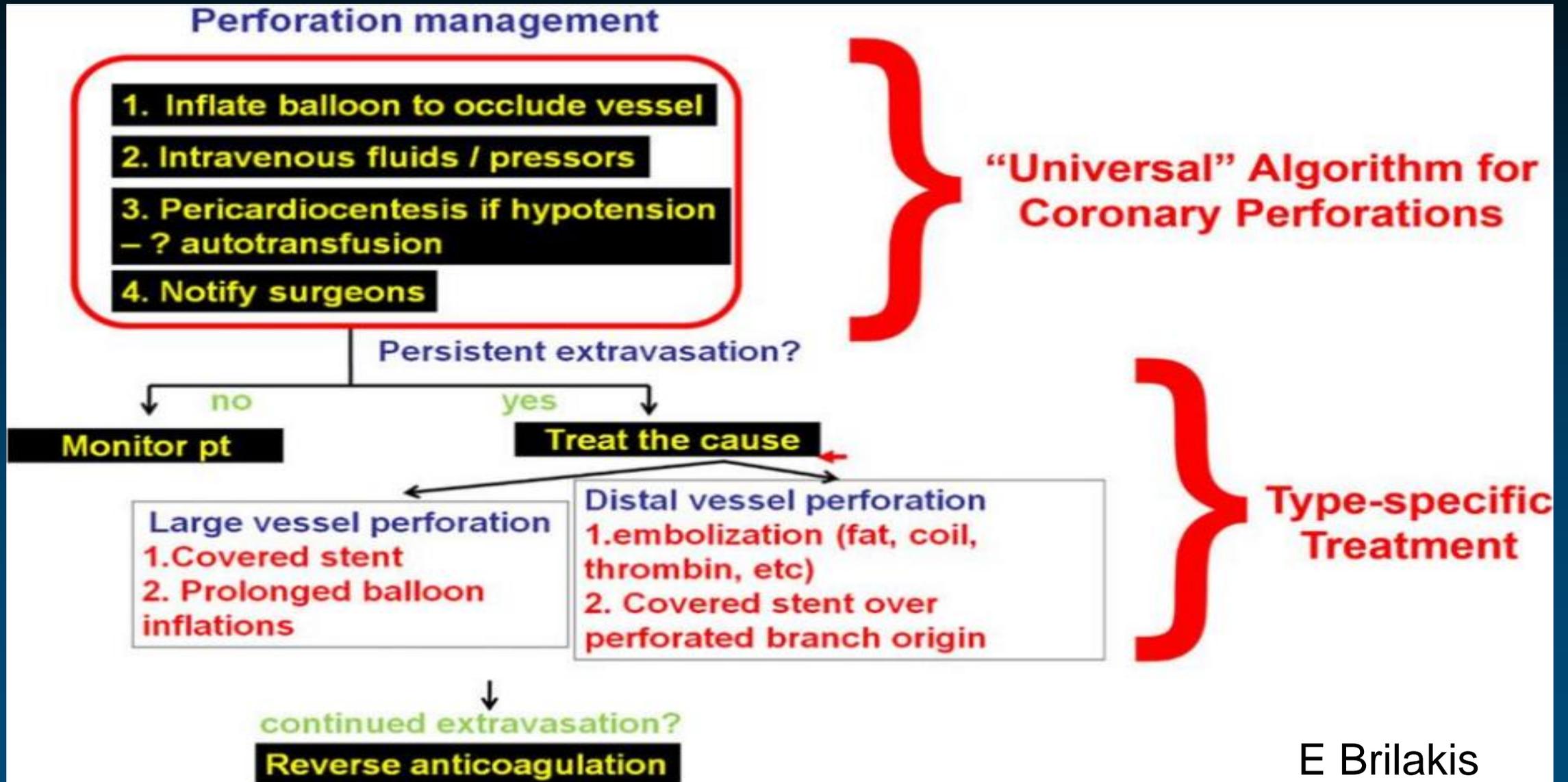


**After stenting**

# **Coronary Perforation - Prevention**

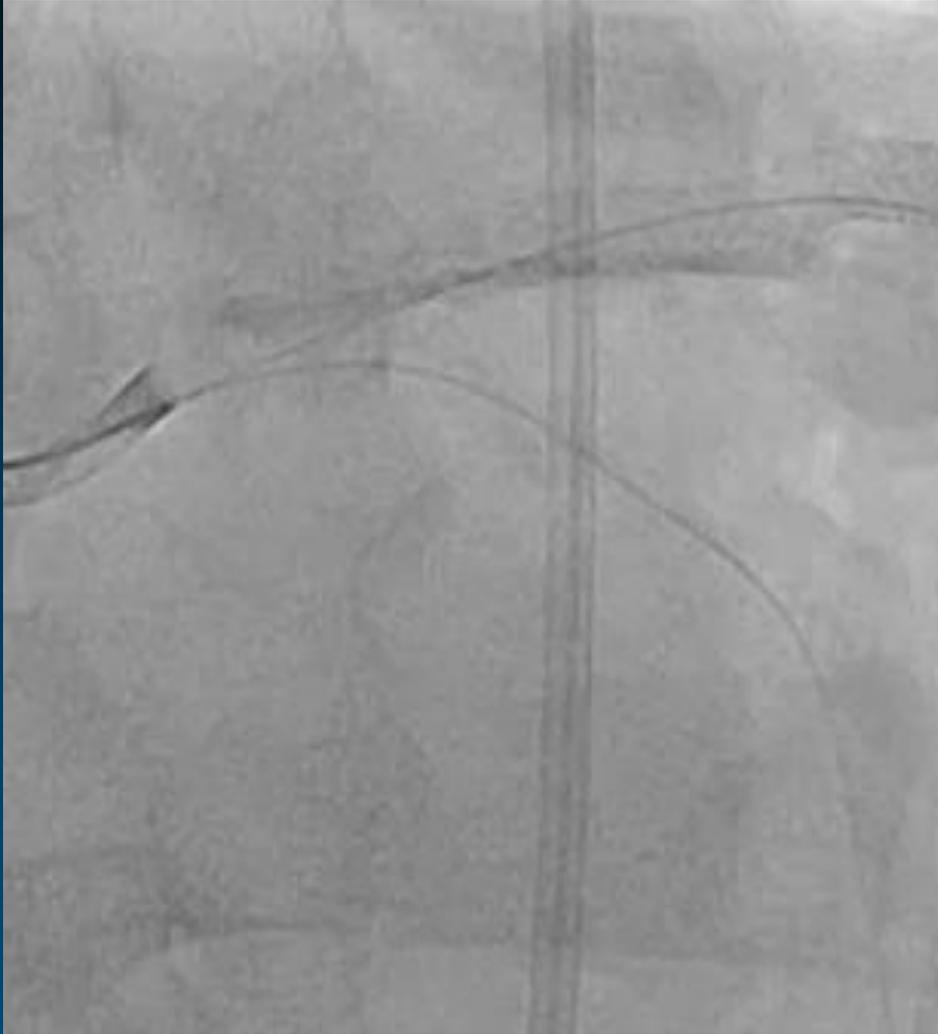
- **Septal channel is preferred.**
- **Know where your wire is.**
- **Do not push wire beyond where you know it is in vessel.**
- **Verify wire position before microcatheter advancement and balloon inflation with contralateral injection or angiography.**
- **Do not leave stains**

# Coronary Perforation - Management

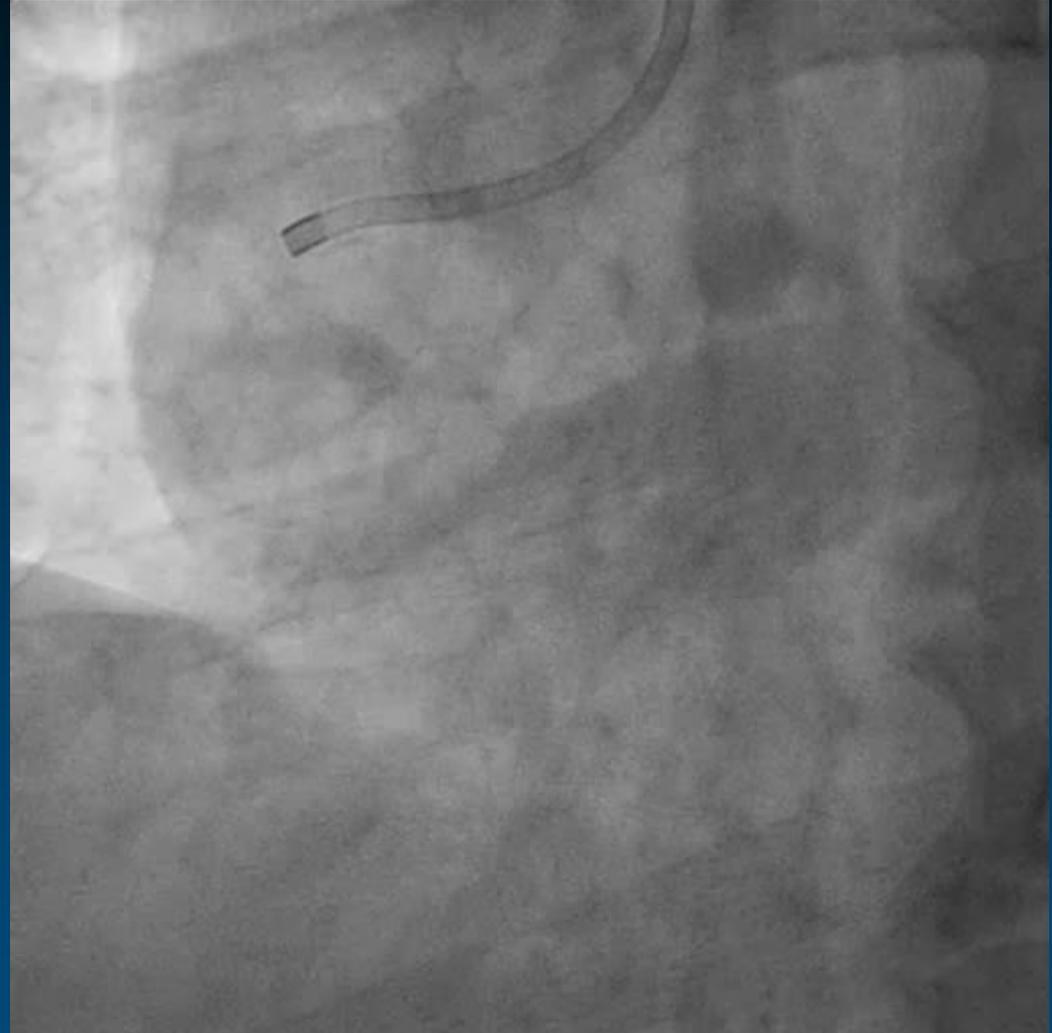


# **Donor Artery Injury / Thrombosis**

# Donor Artery Injury



**pLAD+LCx stenting**

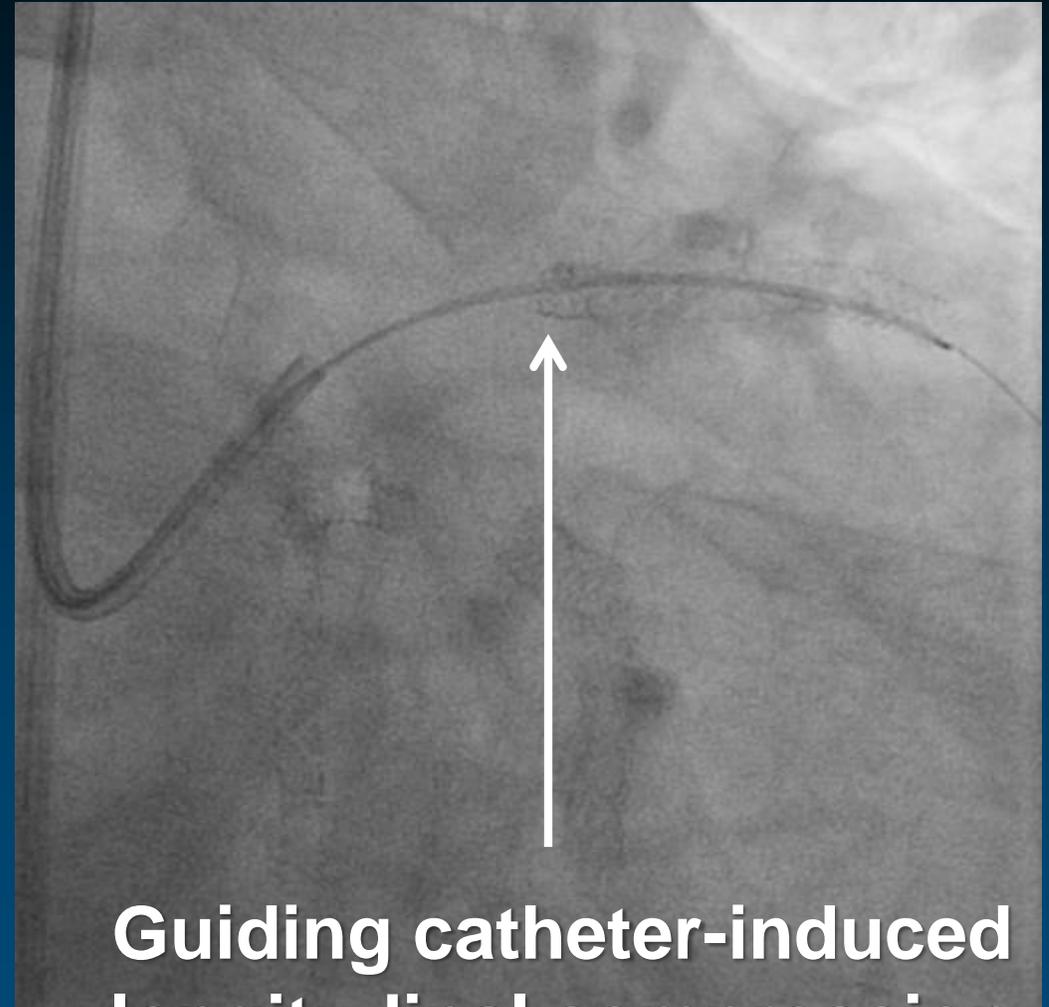


**RCA CTO intervention**

# Donor Artery Injury

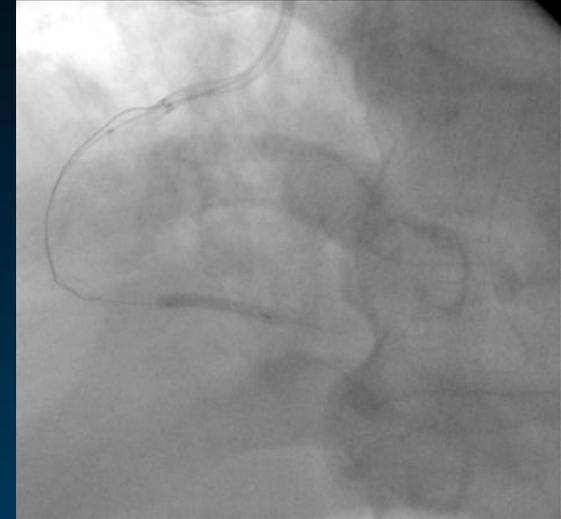
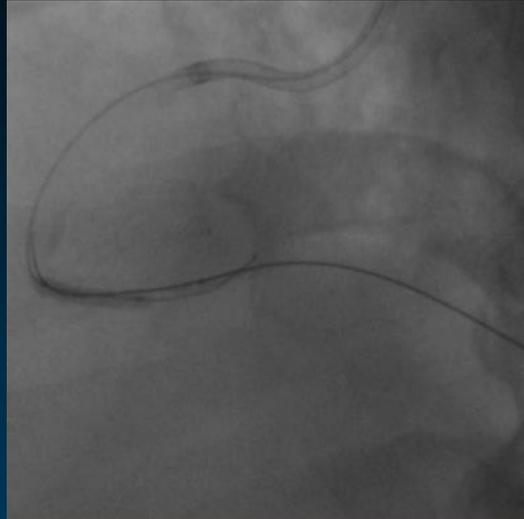
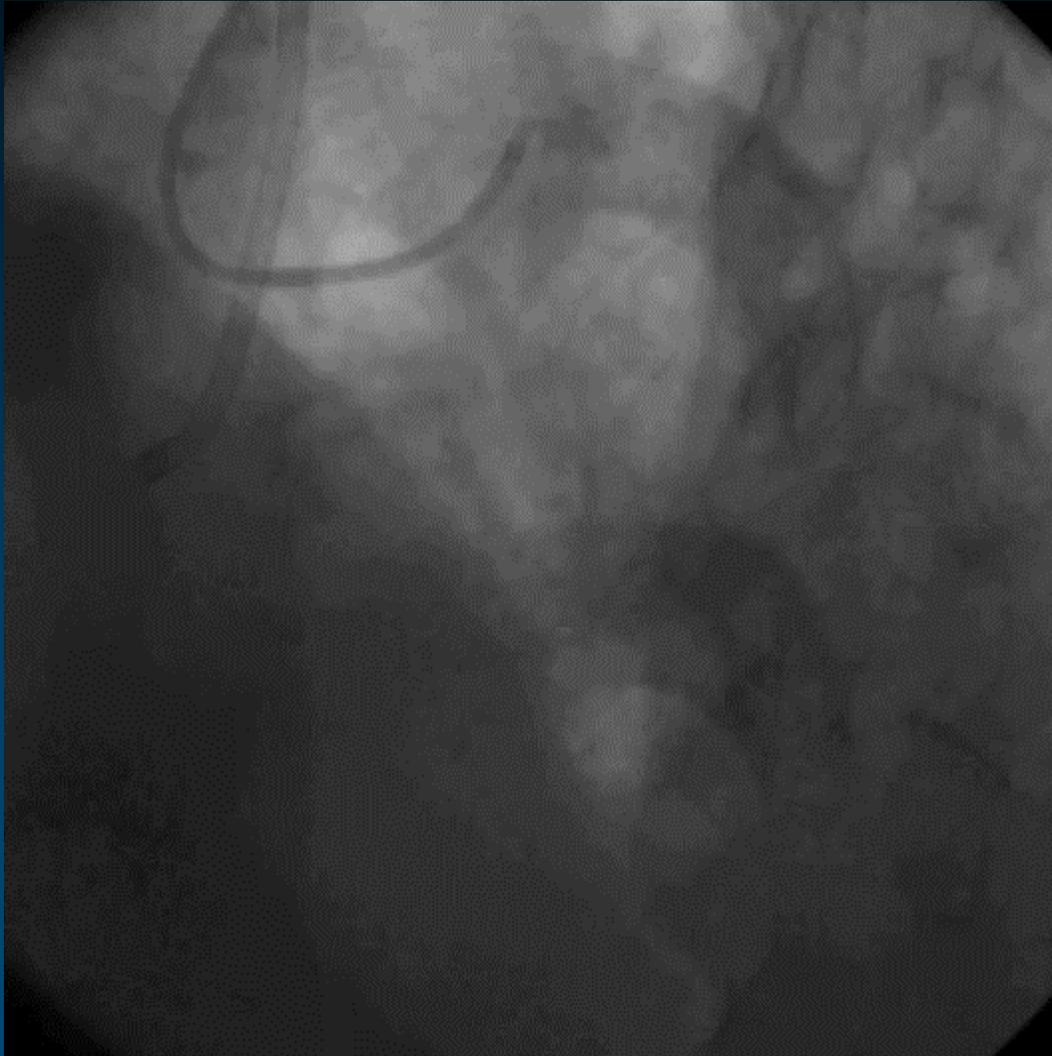


**Retrograde RCA CTO stenting**



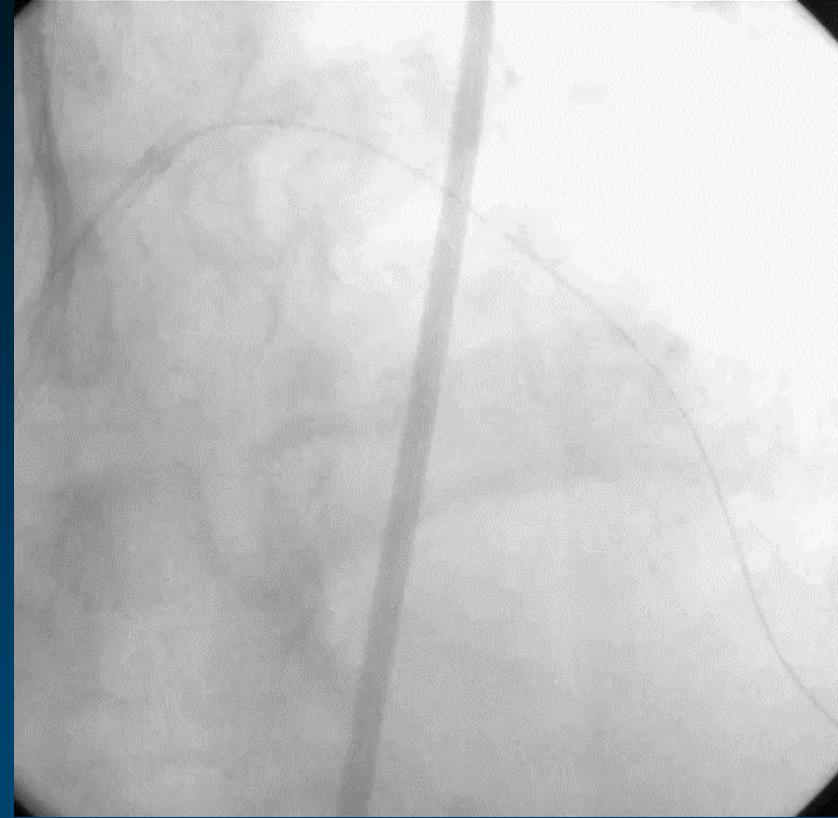
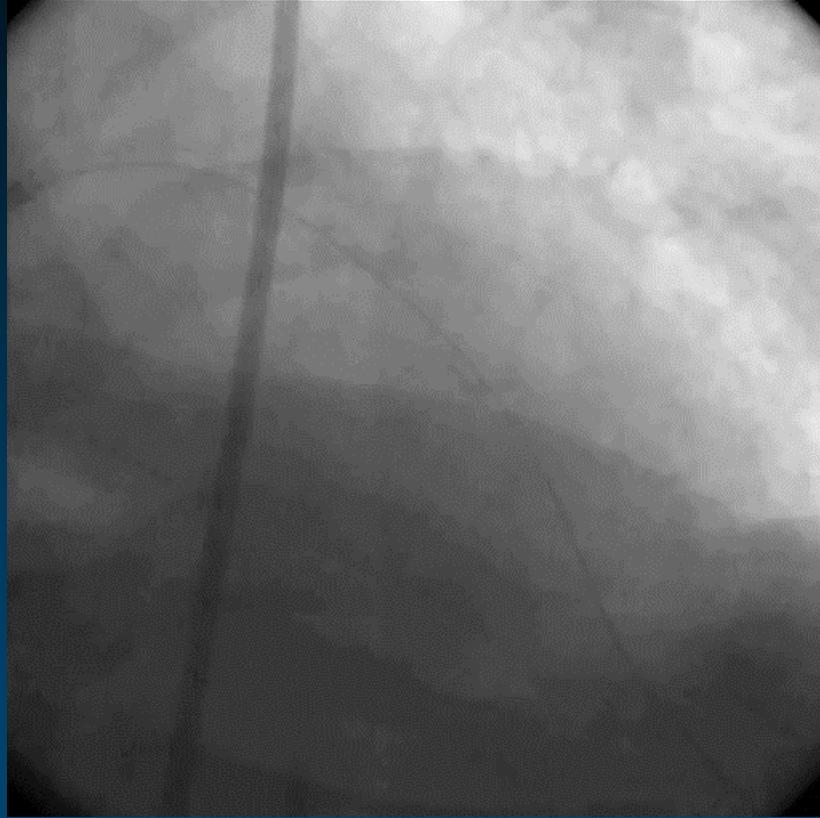
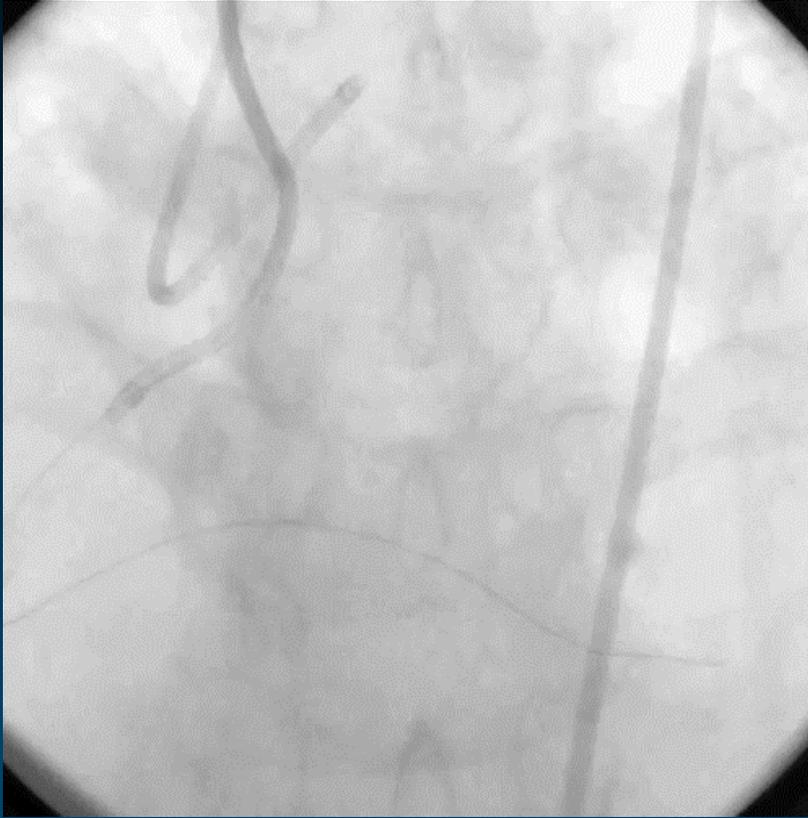
**Guiding catheter-induced longitudinal compression of pLAD ostial stent**

# 69/M, Stable angina, dRCA CTO, Retrograde PCI



**Successful R-CART in 90 min**  
**→ Everyone was satisfied**

# Catheter-Driven Thrombi During Retrograde CTO PCI



- LCA injection after retrograde GW removal**
- Thrombus in mLAD with transient cardiac arrest**
- Aspiration thrombectomy and stabilized**

# Donor Artery Injury / Thrombosis:

## Prevention

- Monitor position and waveform of retrograde guiding
- Lift guide catheters high up into the aorta
- Monitor ACT > 350 sec for retro. CTO q 30 min
- Timed flushing every 10 min
- Flush anytime if you feel blood in the guiding

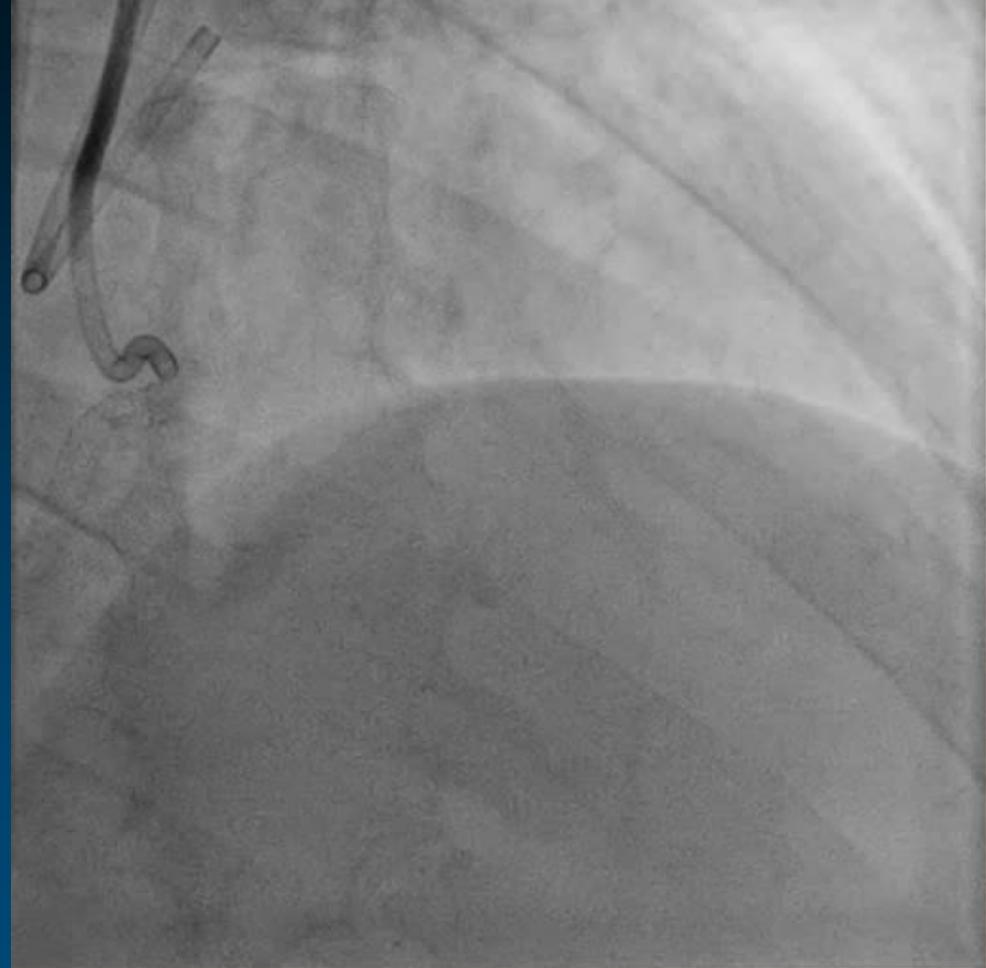
## Management

- Preventive stenting for DS > 50%
- Stenting for dissection
- Hemodynamic support
- Thrombus aspiration or GPIIb/IIIa



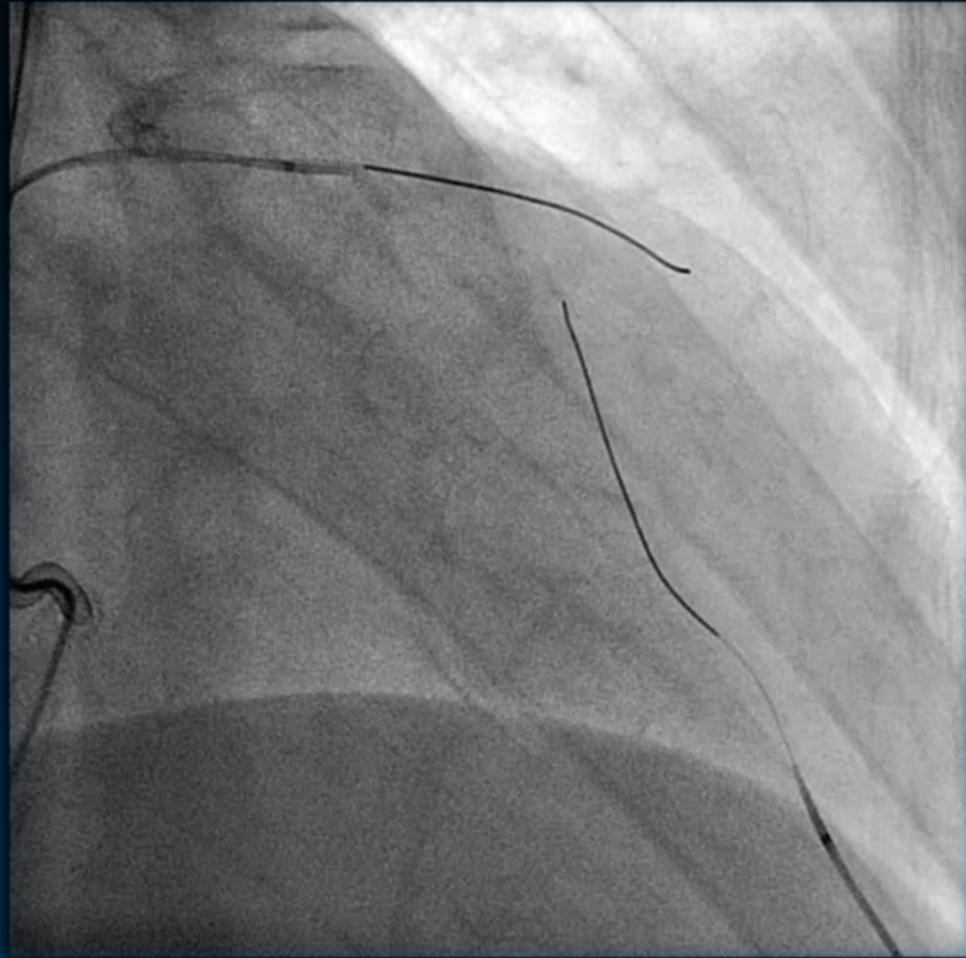
# **Ischemia During Retrograde Approach**

# Ischemia During Retrograde Epicardial Approach

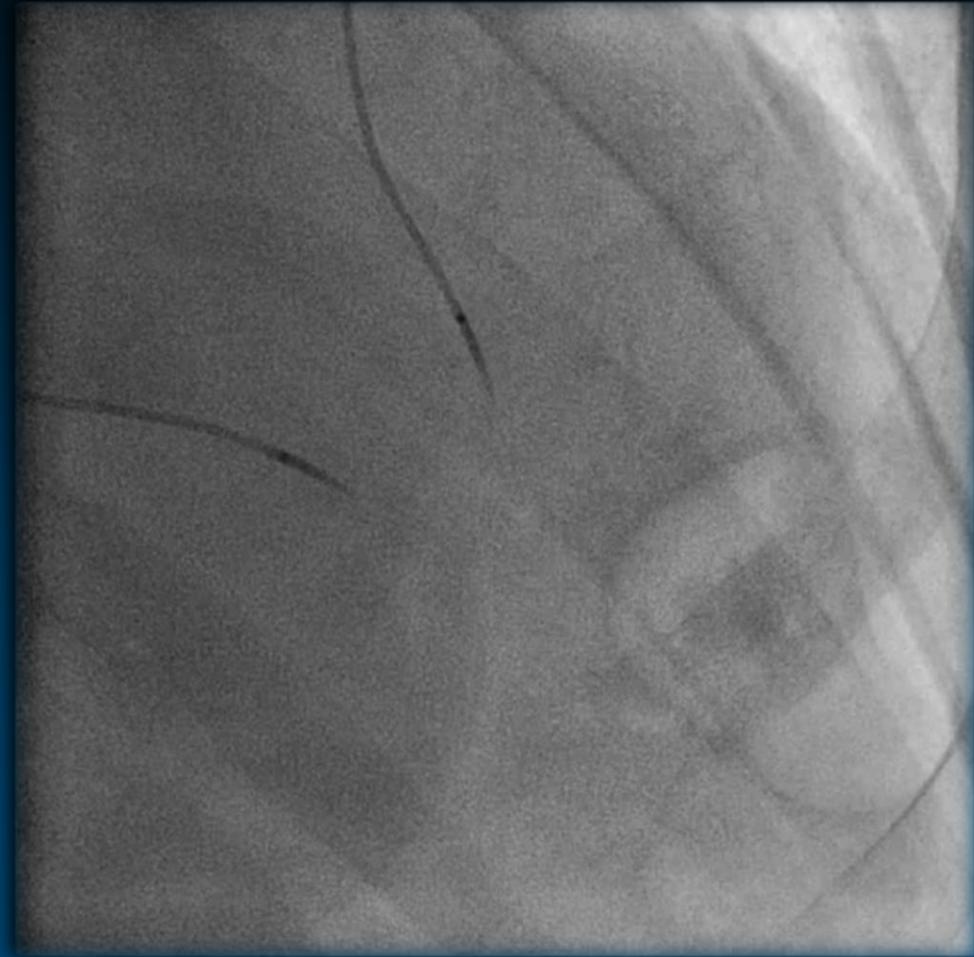


**Single dominant epicardial channel**

# Ischemia During Retrograde Epicardial Approach

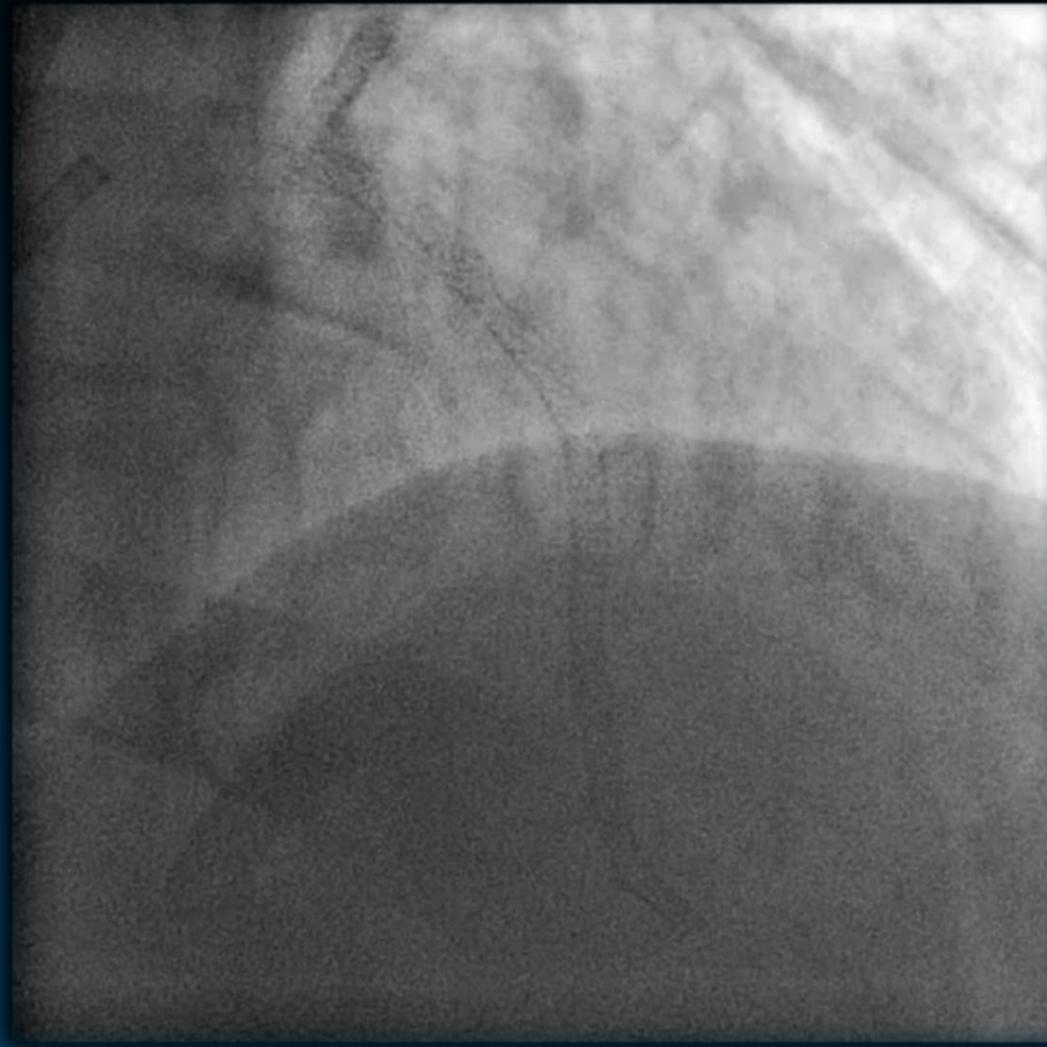


Severe pain, ST elevation & hypotension  
→ Stopped retrograde approach



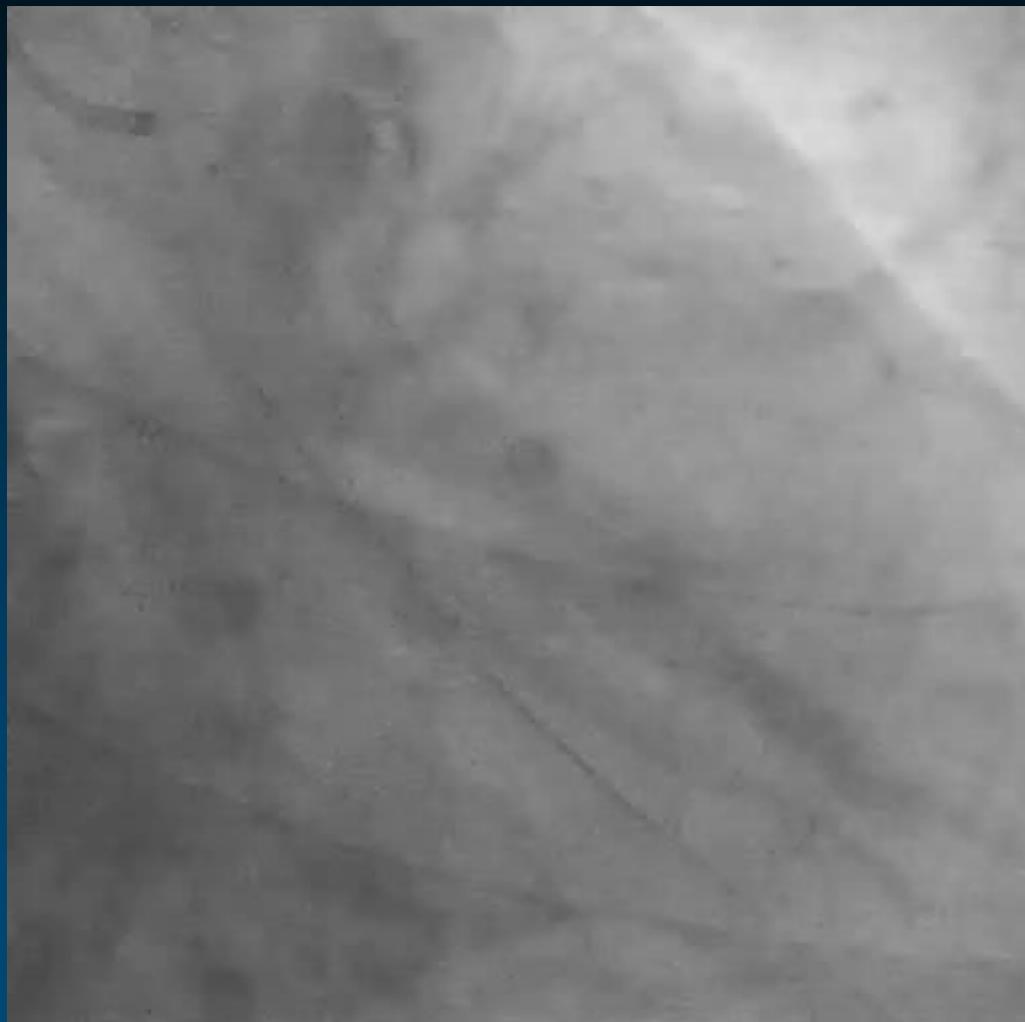
Finally antegrade wiring

# Ischemia During Retrograde Epicardial Approach



Final results

# Donor Artery Spasm During Retrograde Approach

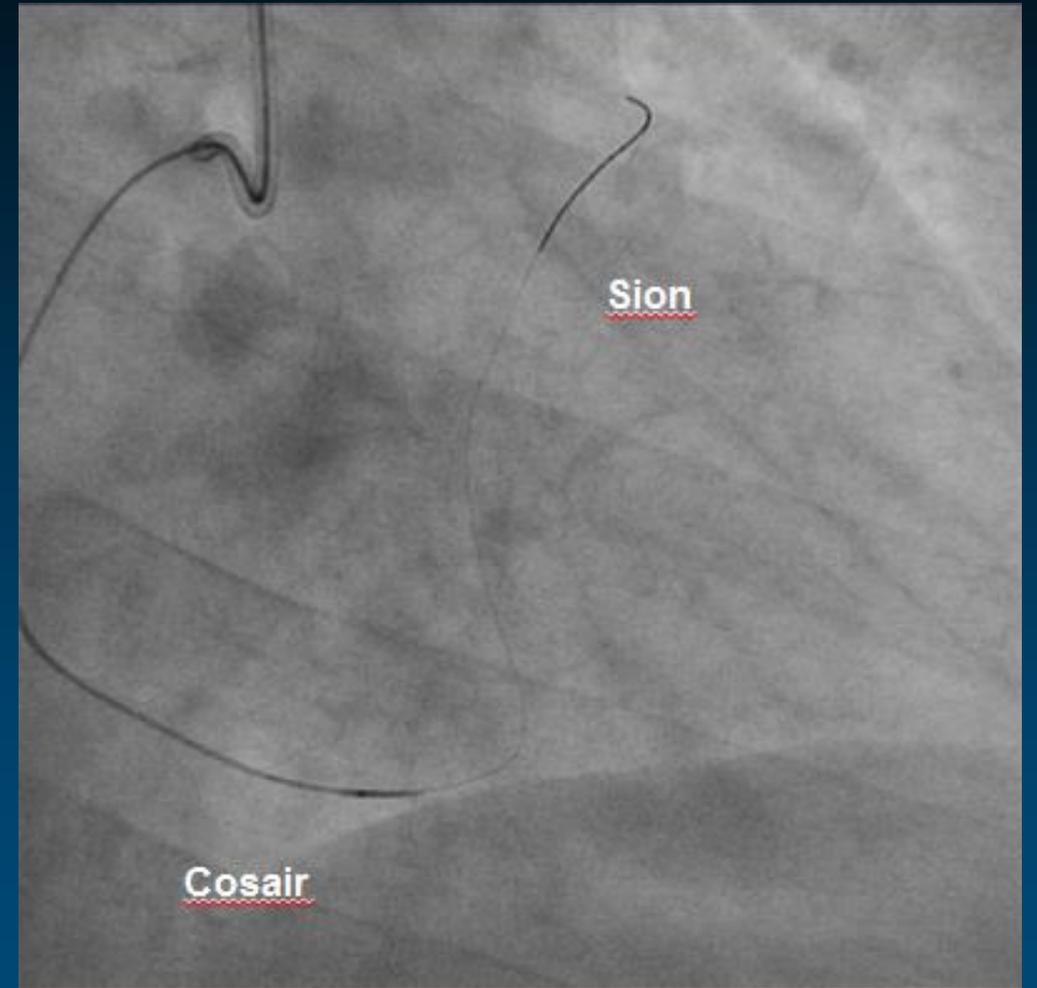


**LAD ostial CTO**



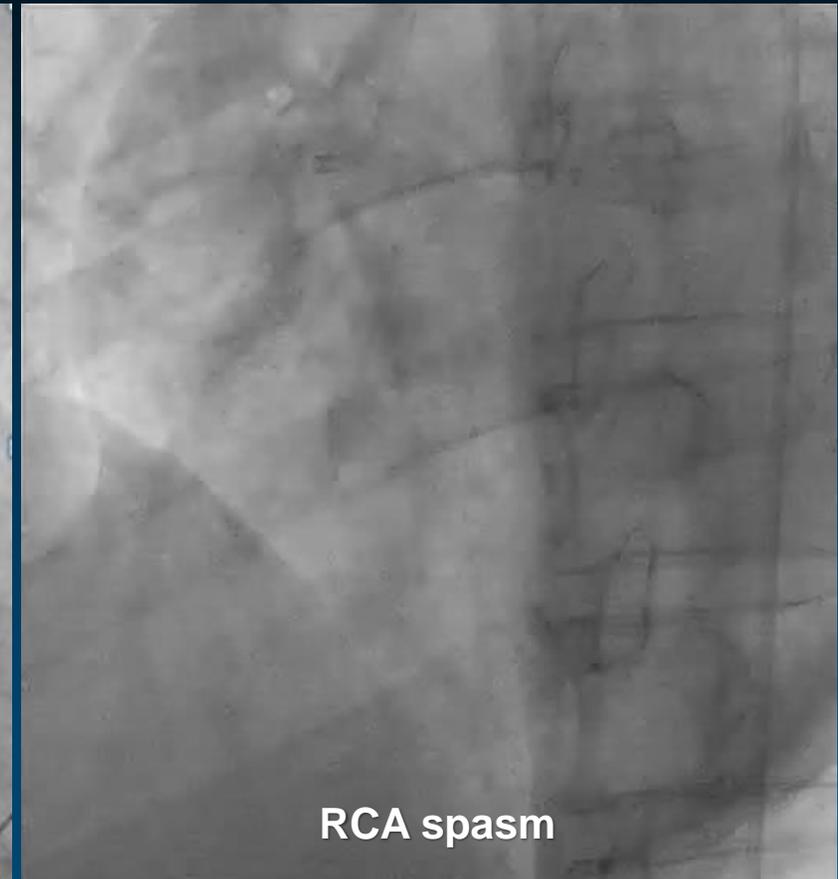
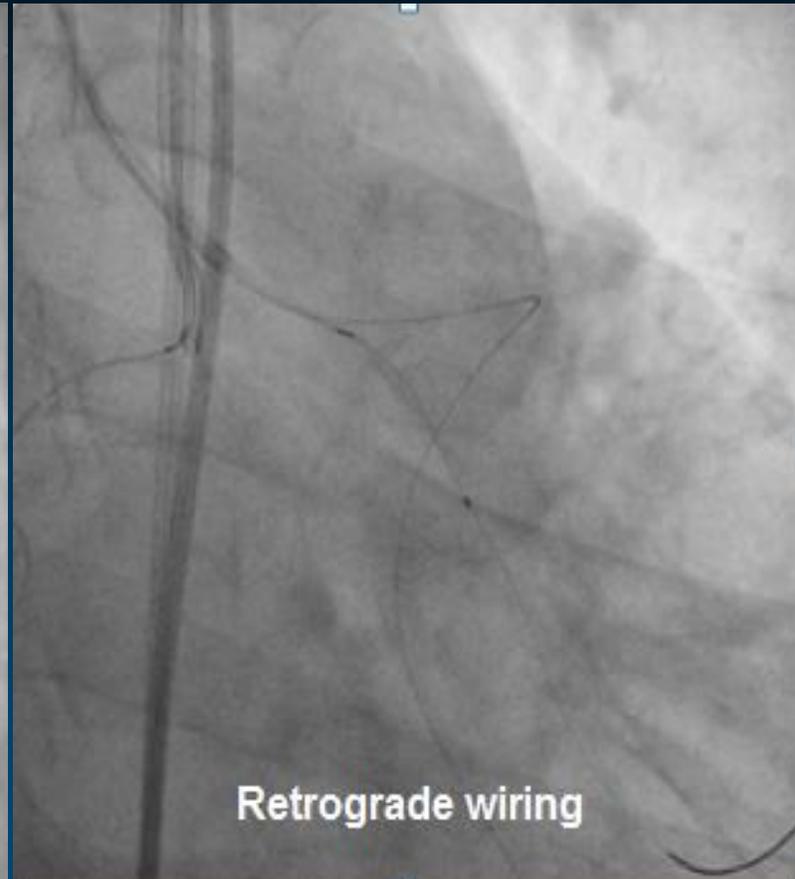
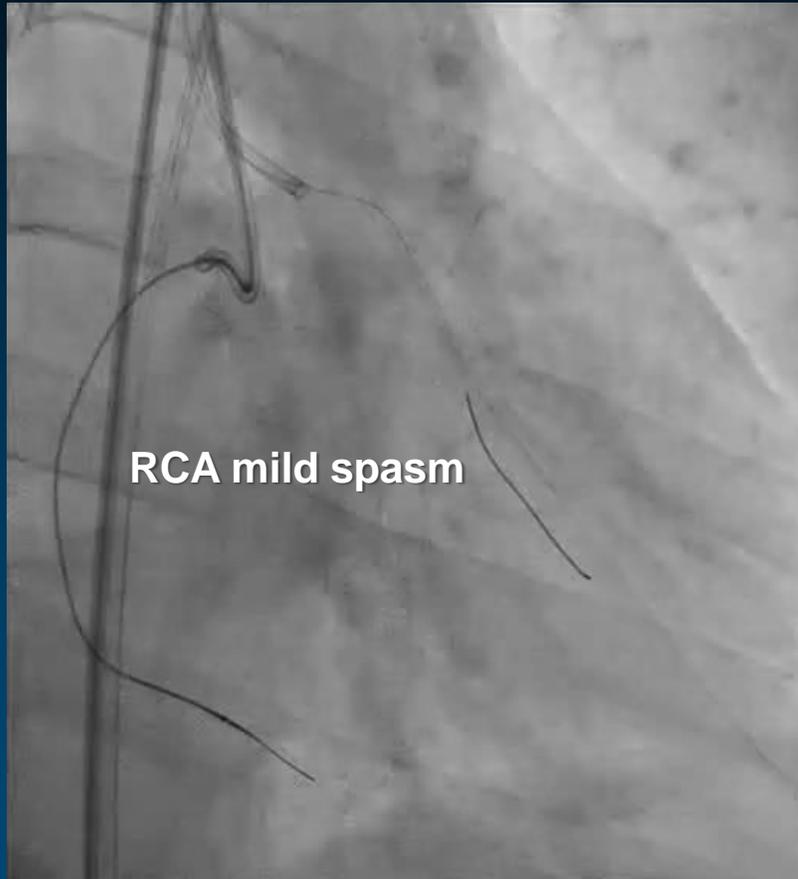
**Multifocal RCA stenosis**

# Donor Artery Spasm During Retrograde Approach



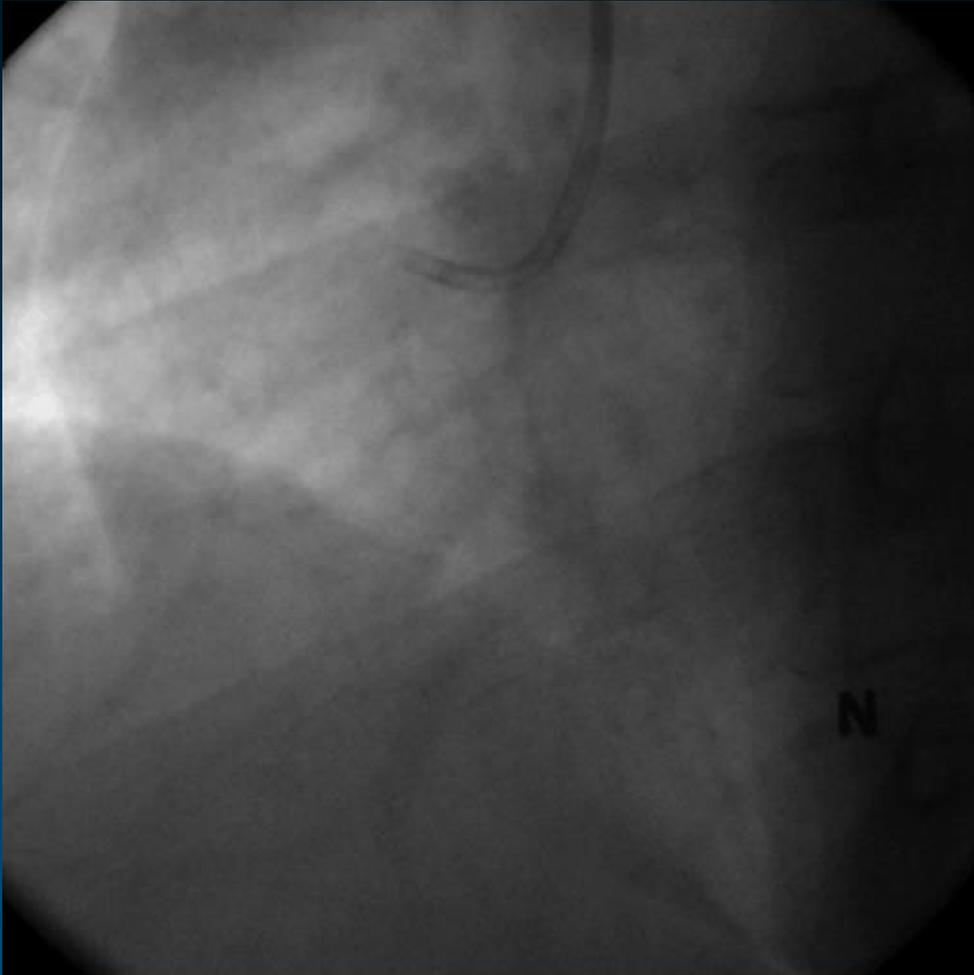
**Corsair + Sion**

# Donor Artery Spasm During Retrograde Approach

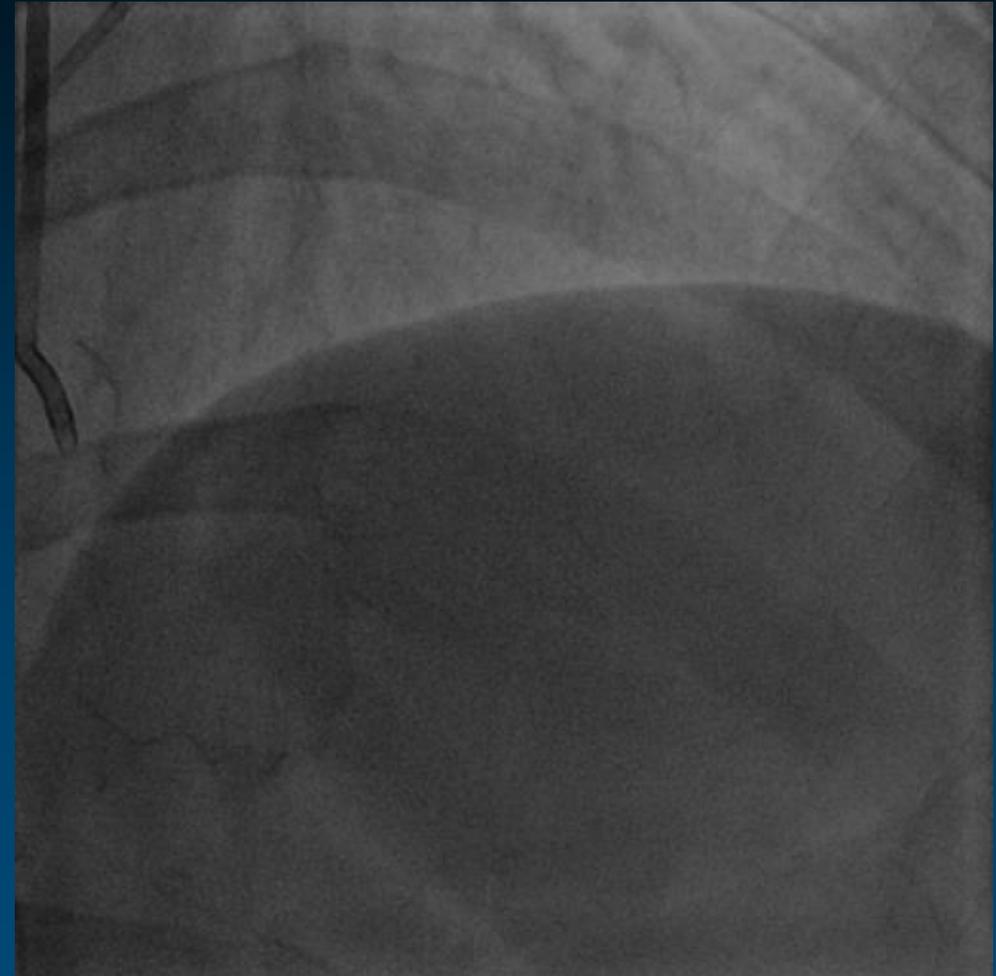


**Bradycardia/Shock/ST elevation in inferior leads**

# Diffusely Narrowed Donor Artery Separating Septal

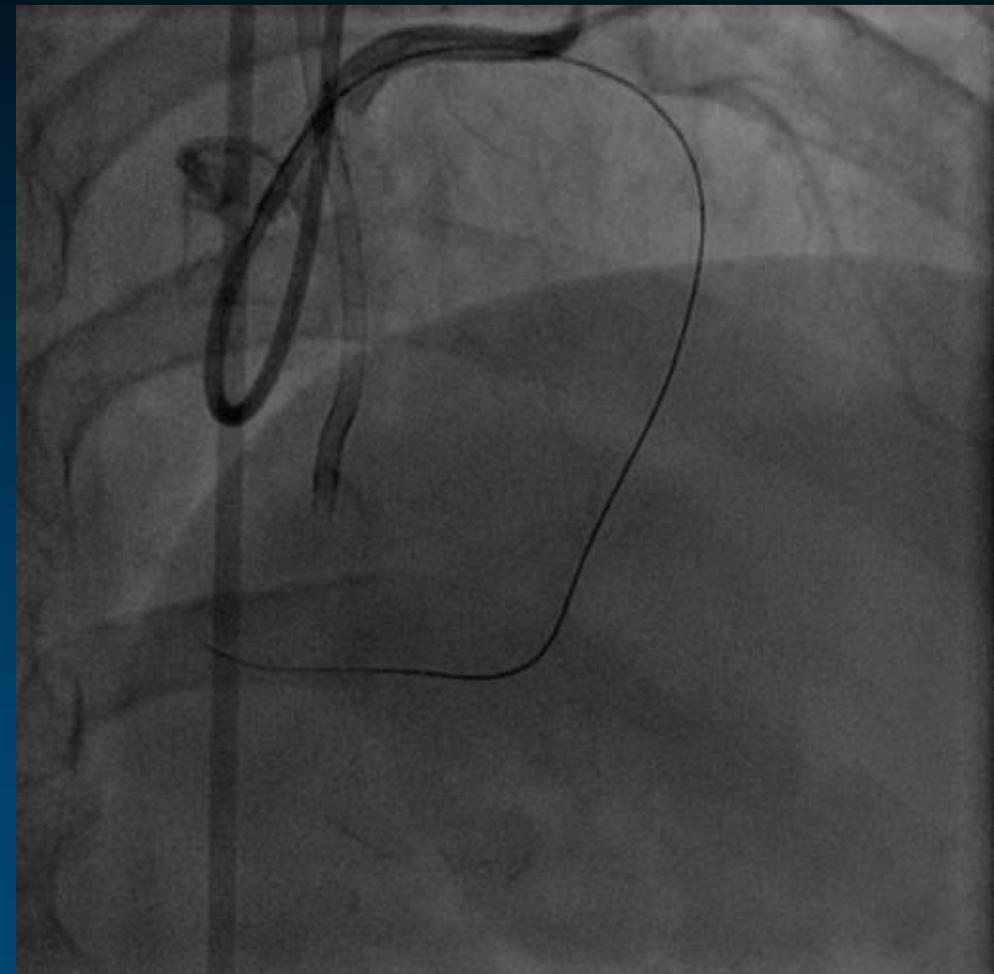
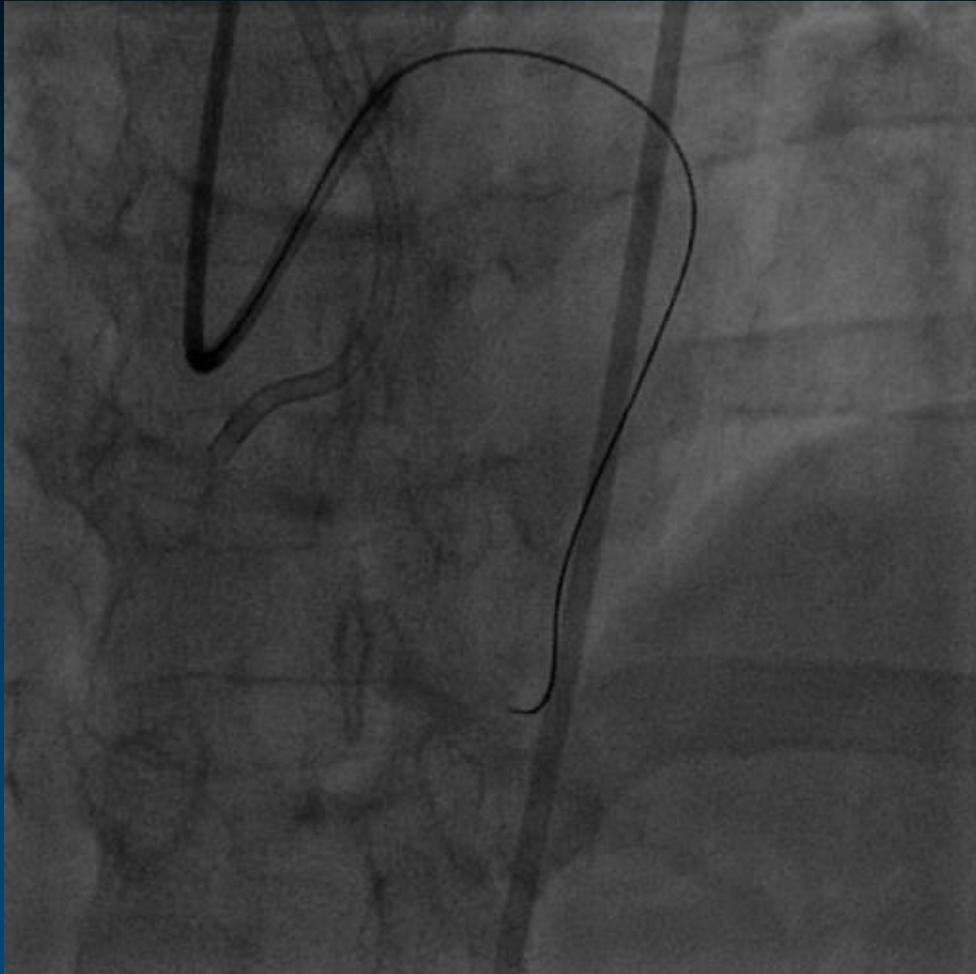


RCA CTO



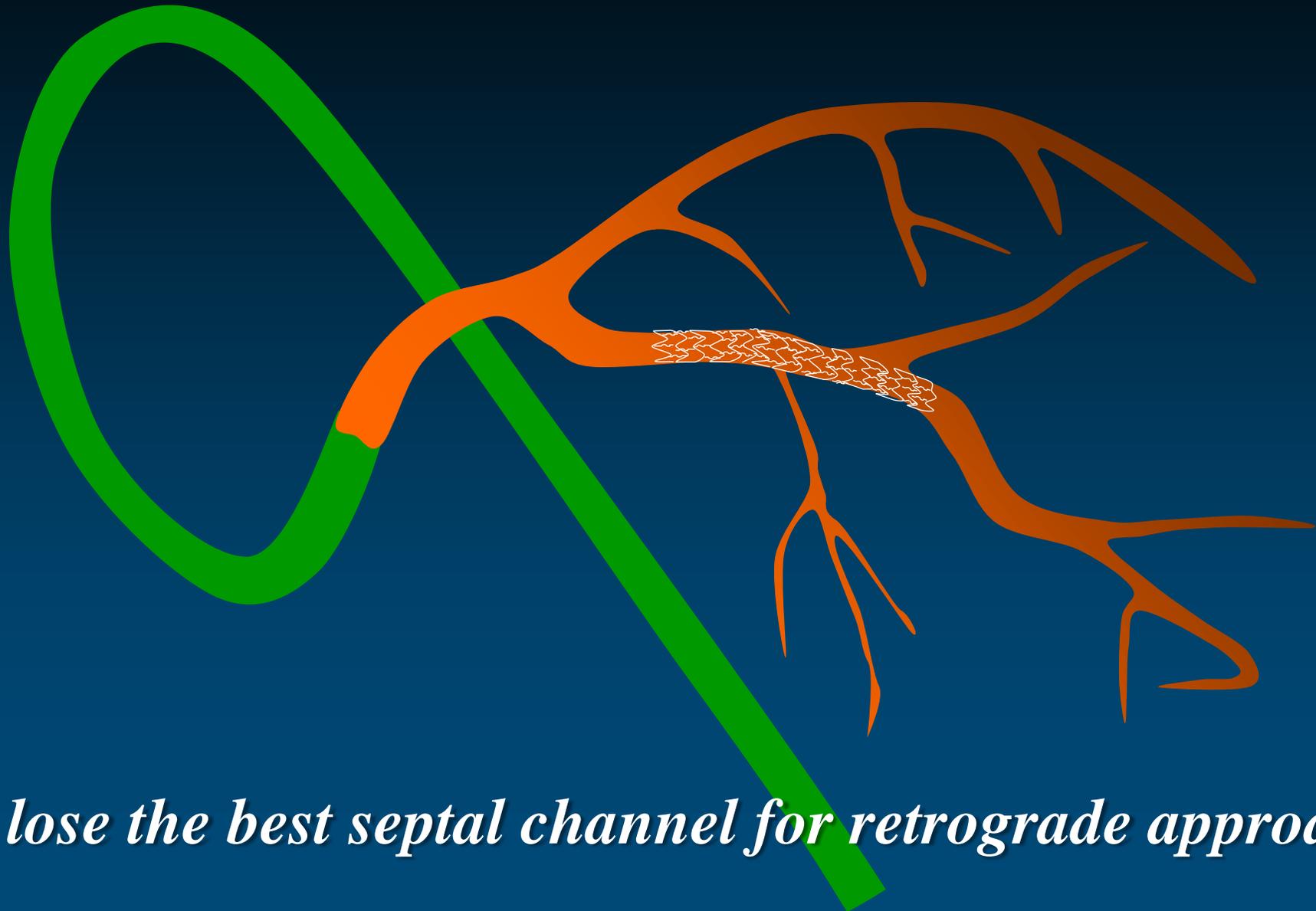
Diseased LAD sending septal channel

# Severe Pain During Microcatheter Advancement



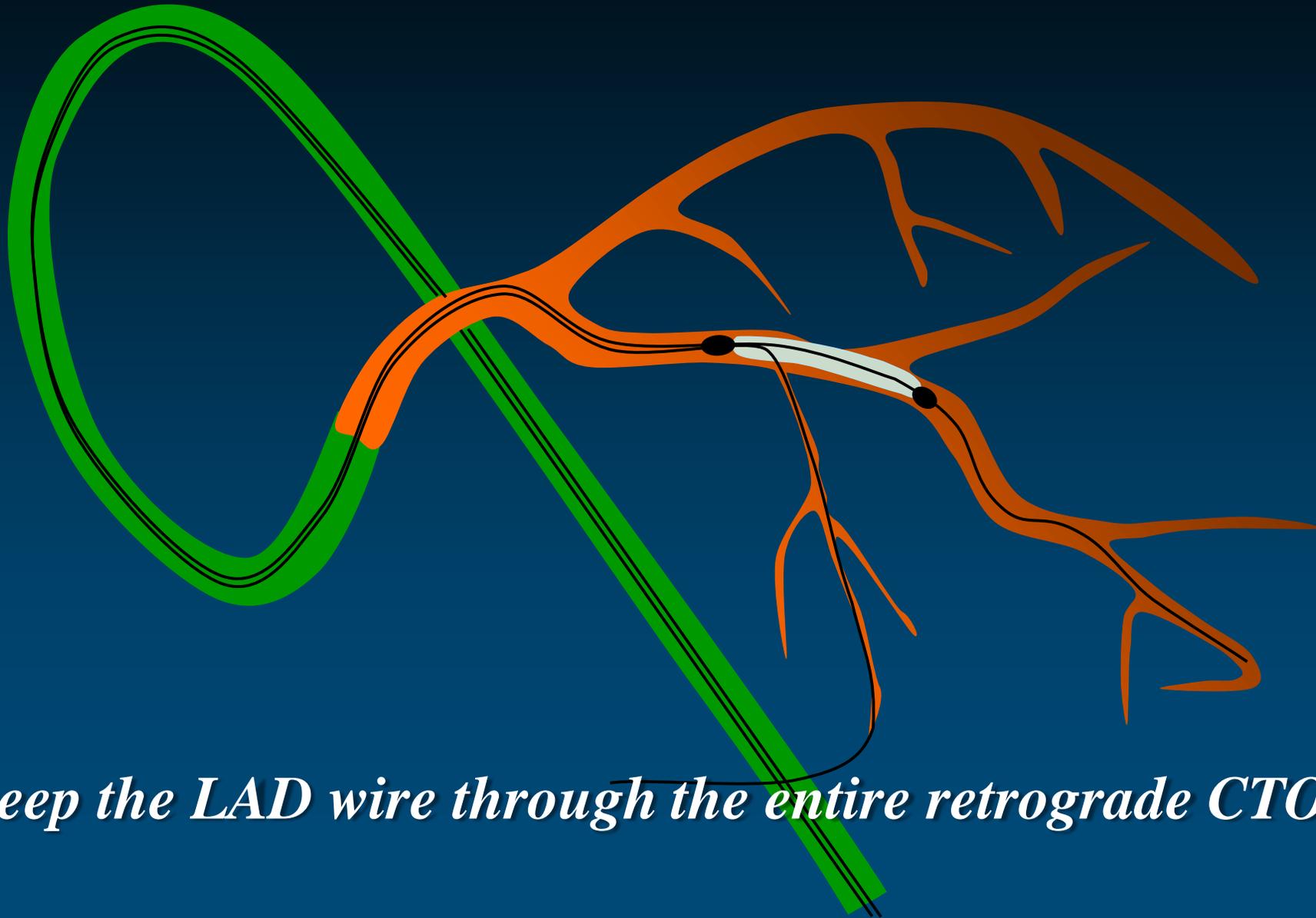
TIMI 1 LAD flow with Finecross → TIMI 3 after Finecross removal

# LAD stenting followed by septal kissing dilatation



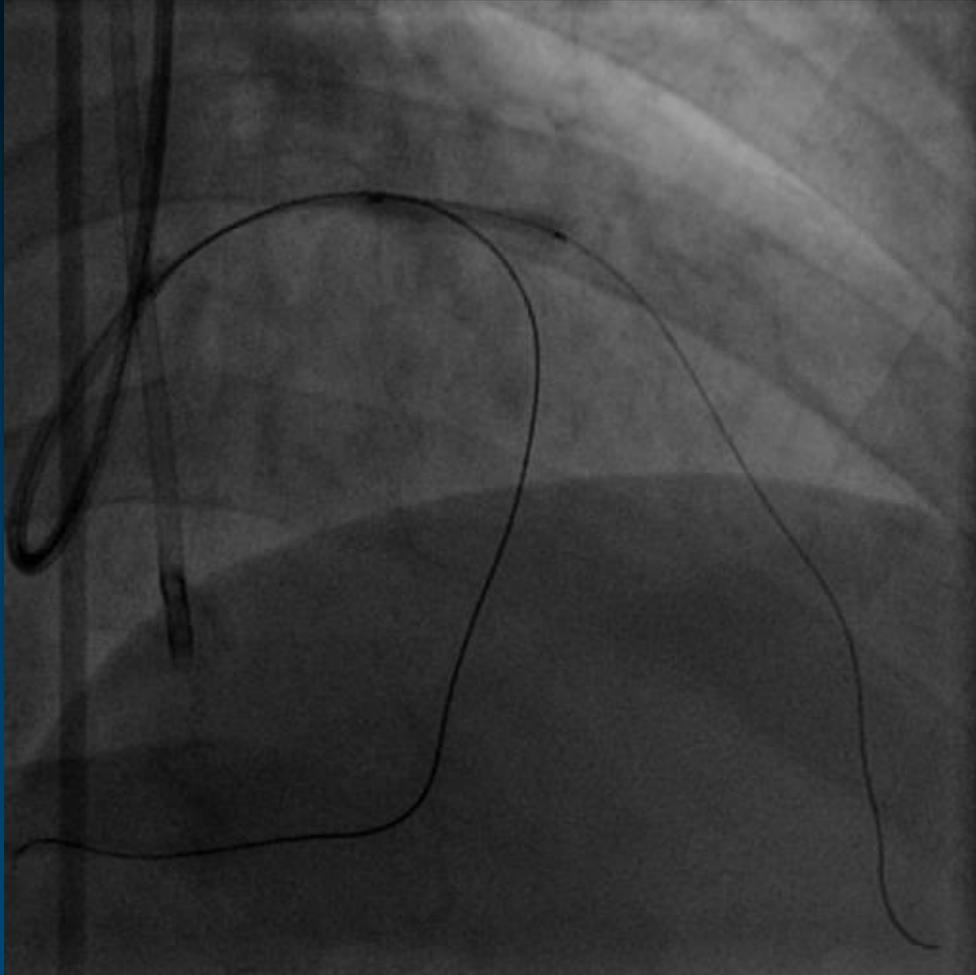
*may lose the best septal channel for retrograde approach*

# Dilate LAD lesion while keeping septal wire

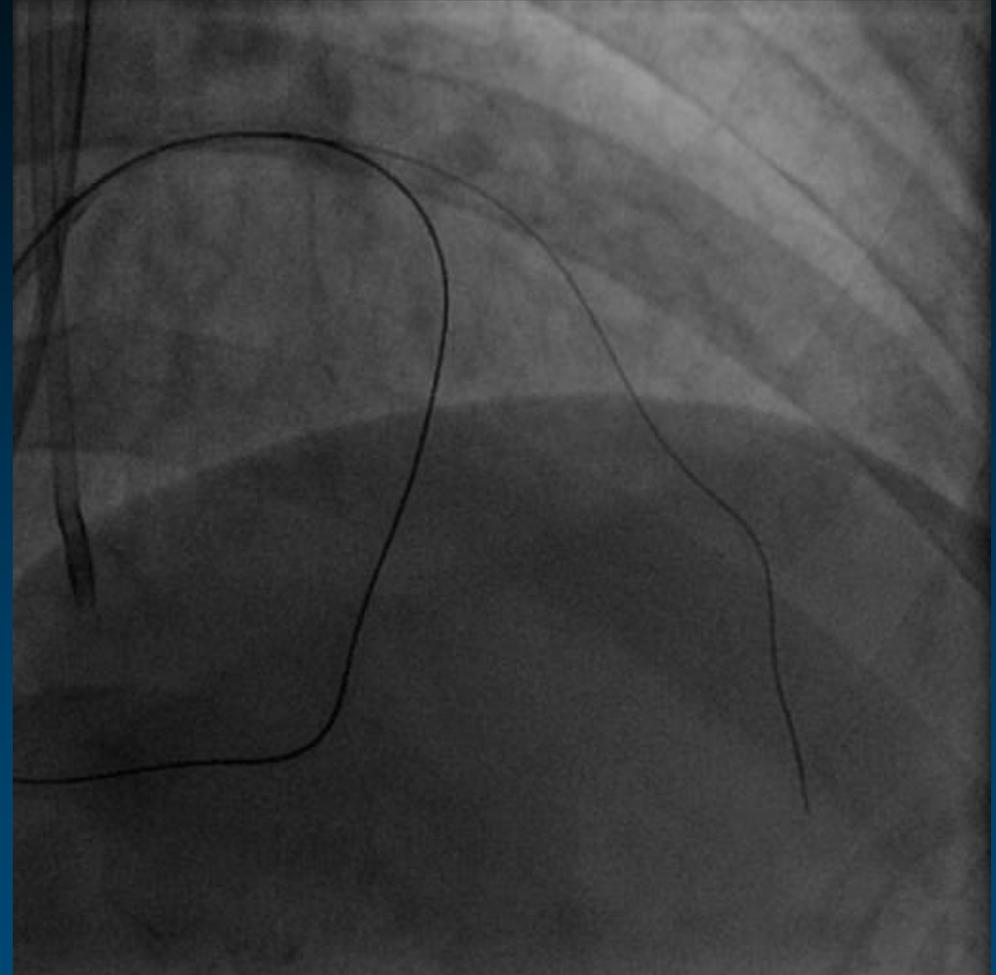


*have to keep the LAD wire through the entire retrograde CTO procedure*

# After LAD Dilatation → Keep Going Retrograde

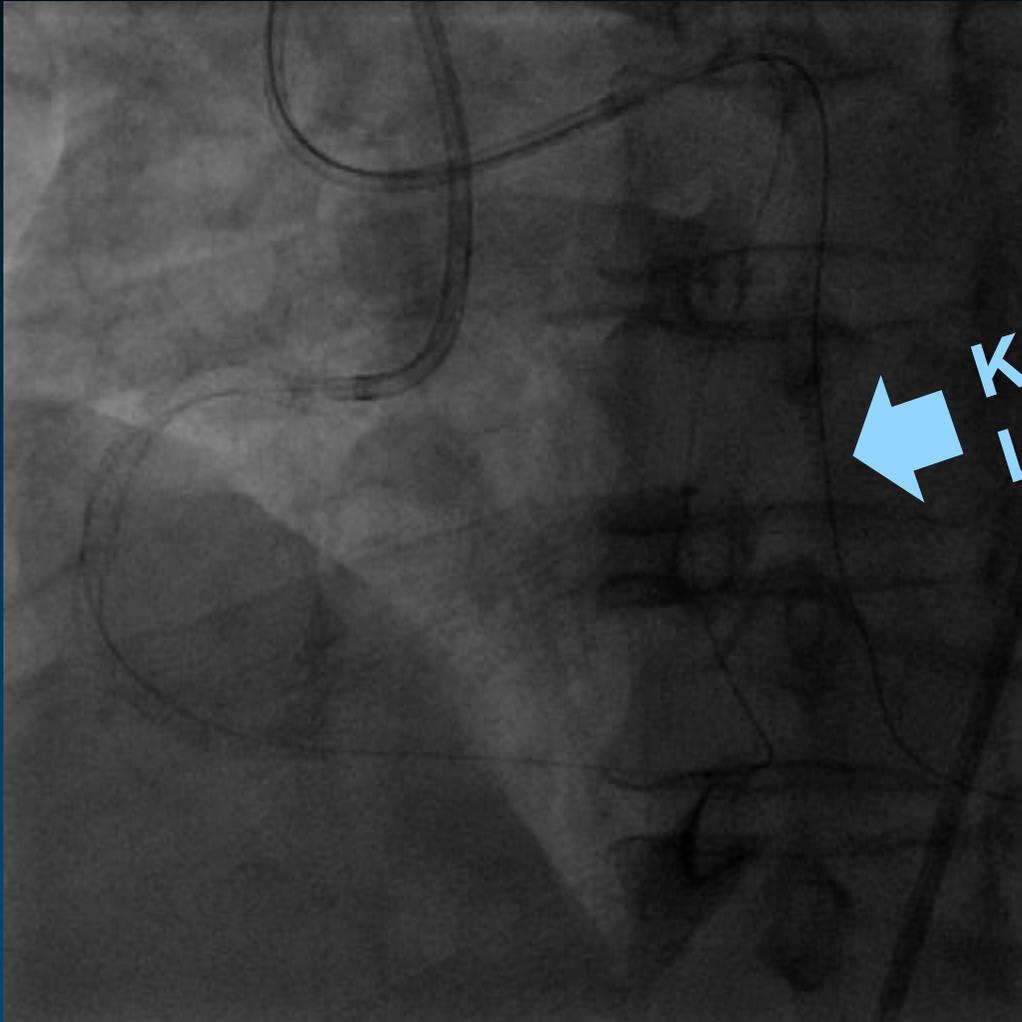


LAD balloon dilatation

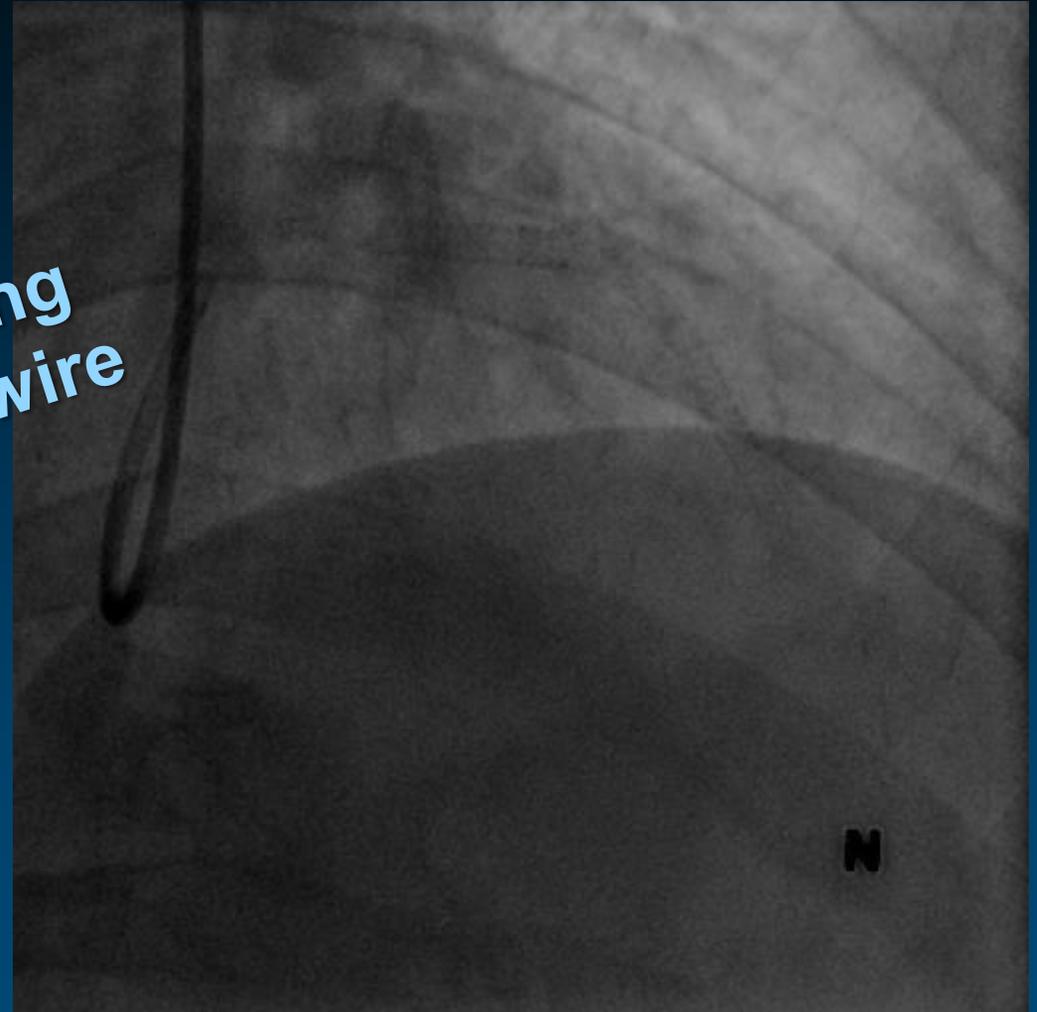


TIMI 3 during microcatheter advancement  
No chest pain

# Diffusely Narrowed Donor Artery Separating Septal



Retrograde RCA stenting



Finally LAD stenting

← Keeping  
LAD wire

# **Corsair fracture**

# Calcified Balloon Uncrossable CTO



dLCx calcified focal CTO



Difficulty of Corsair crossing

# Fracture of Corsair Tip



**Fracture of Corsair tip**



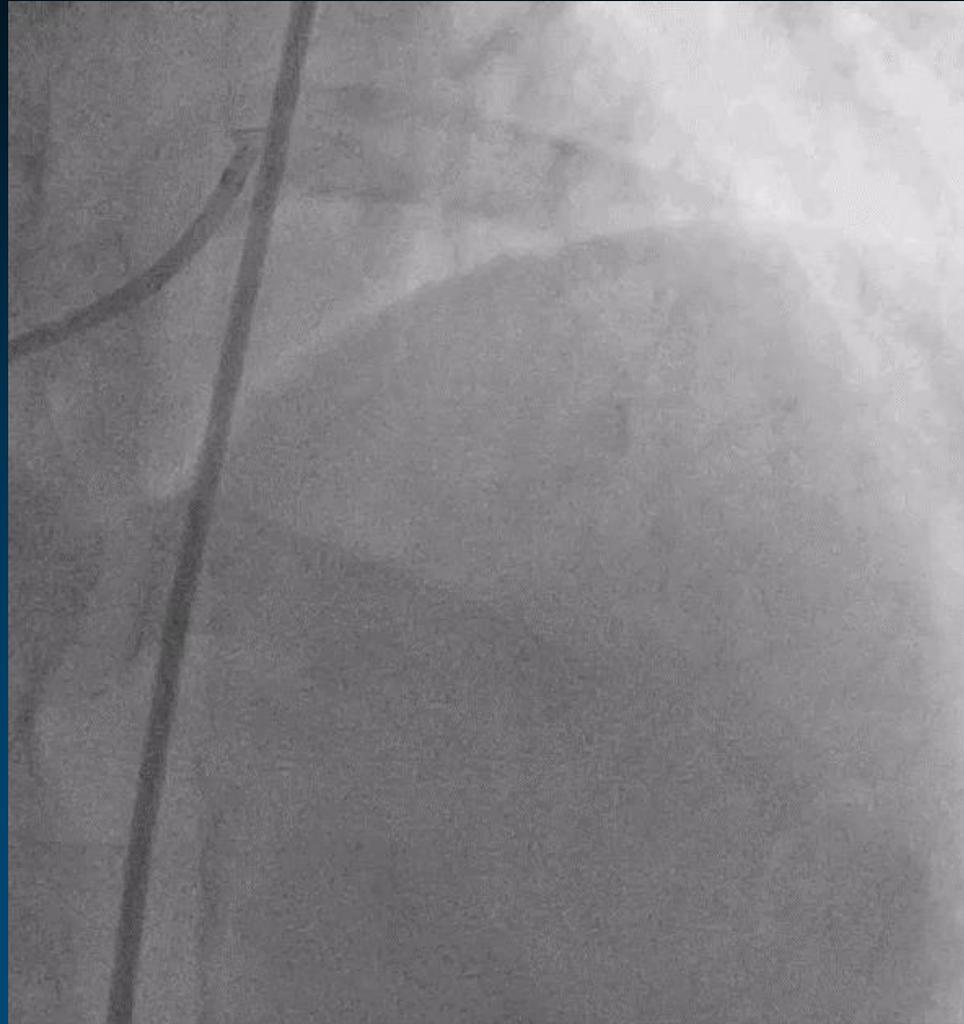
**pLCx dissection**



**Final**

# **Guidewire fracture**

# M/56, 2 YA at Other Hospital – Anterior STEMI



**mLAD TIMI 0**

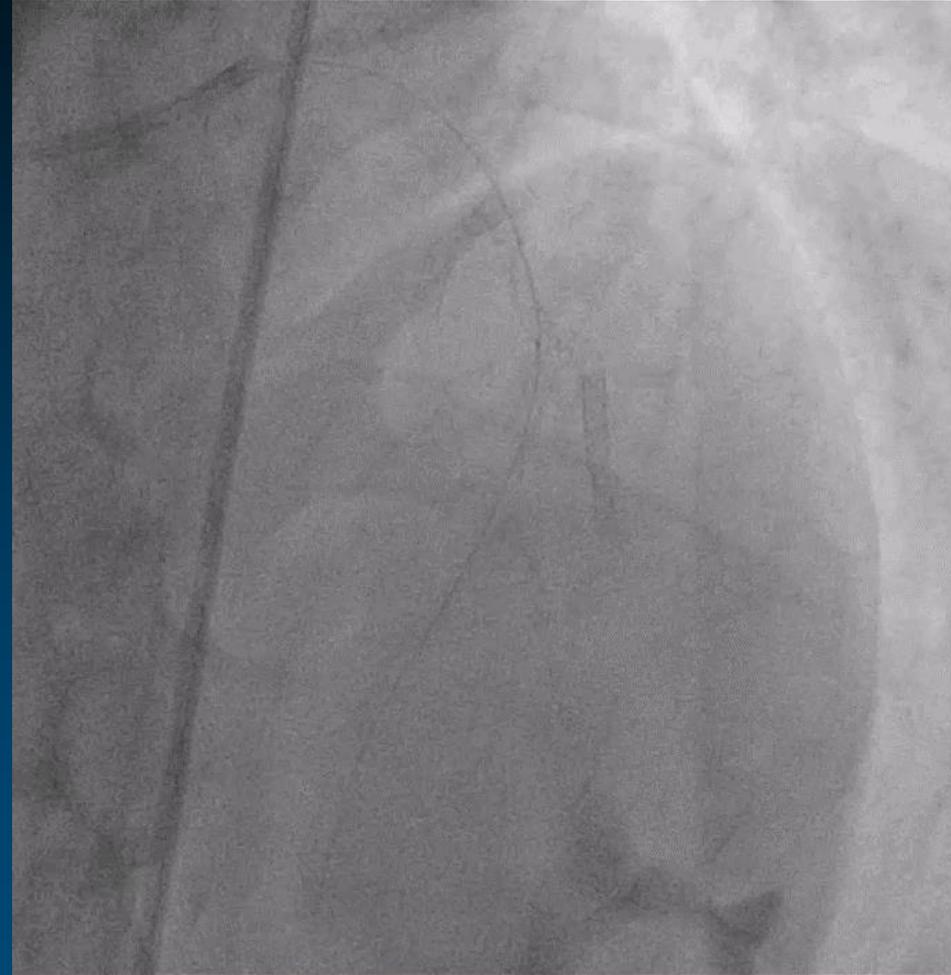


**LAD-Dx stent cross-over?**

# M/56, 2 YA at Other Hospital – Anterior STEMI



TAP?? Culotte??



No final kissing T.T.

# Recurred angina, 2 years later

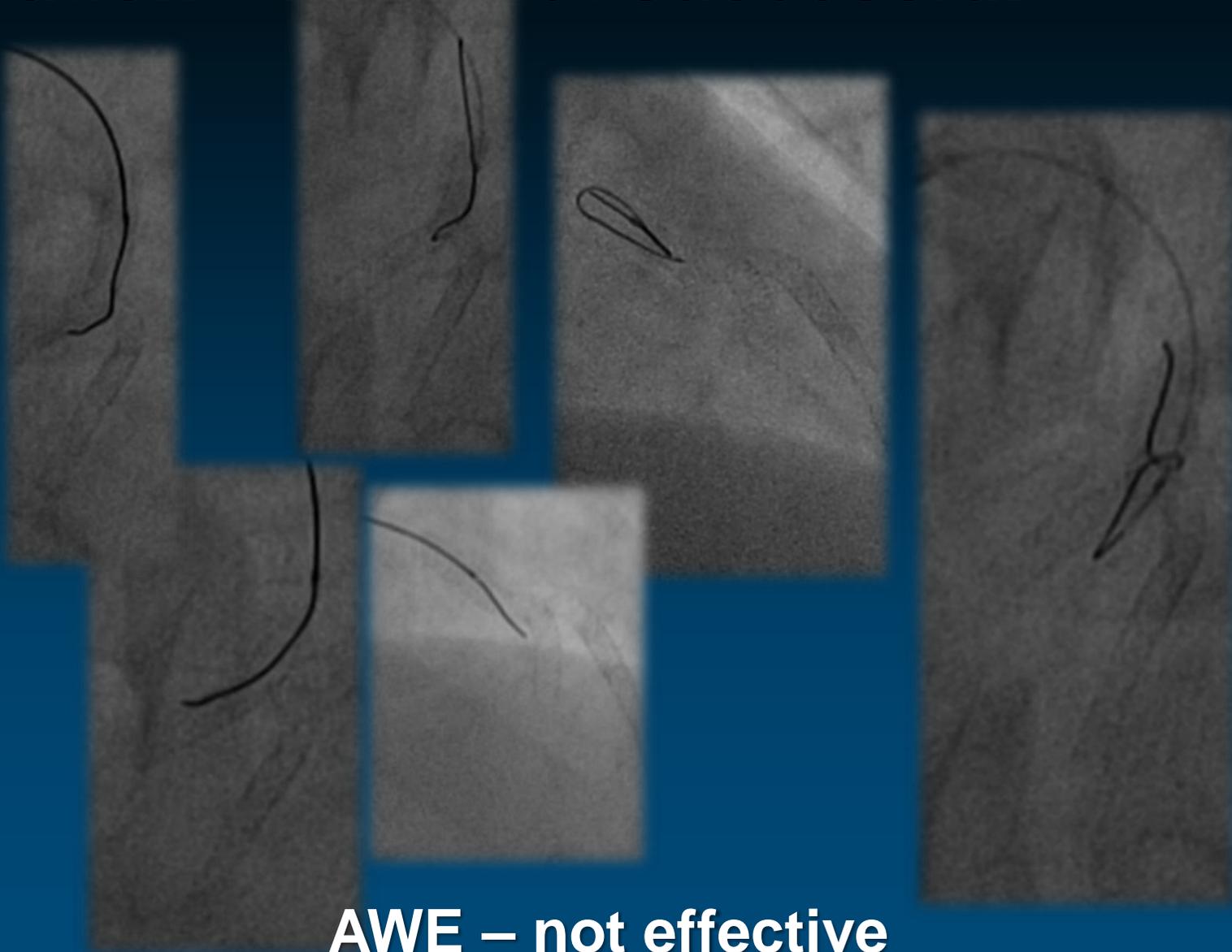


**ISR CTO**



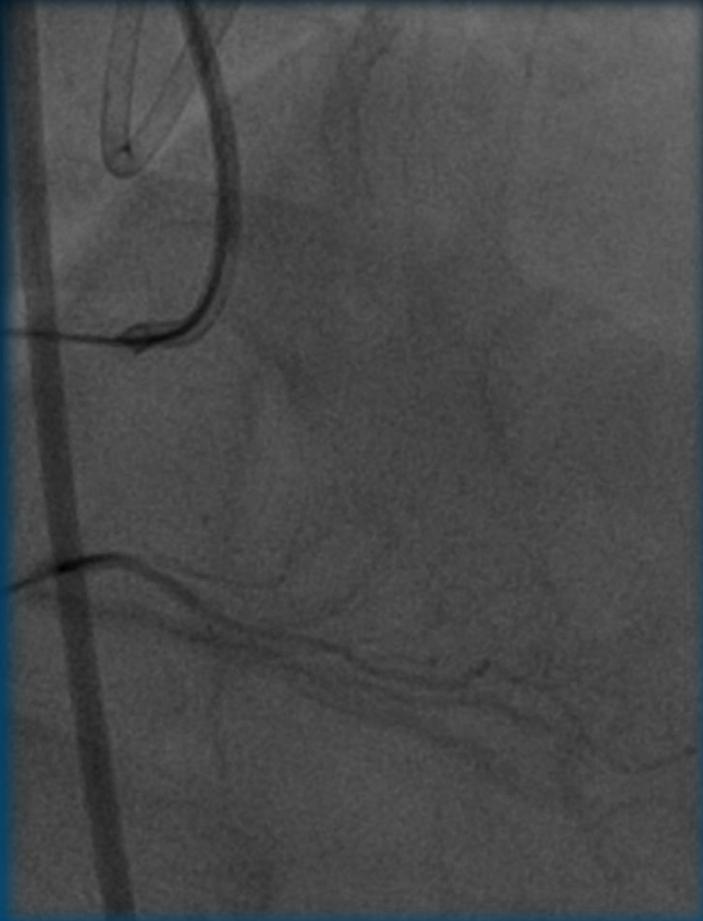
**Microchannel visible?**

# Damaged bifurcation – AWE not successful

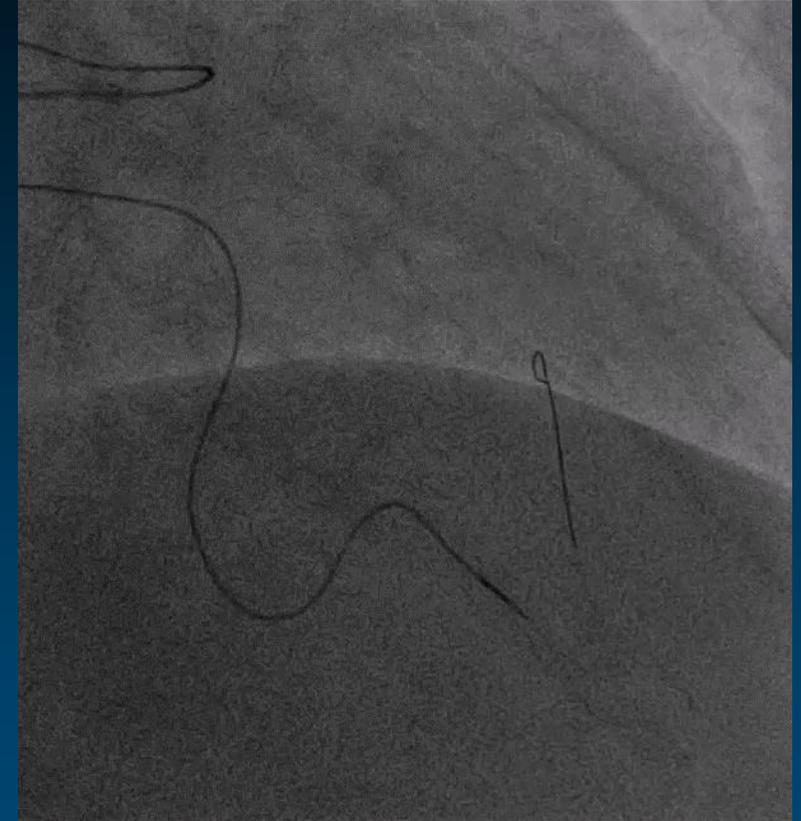
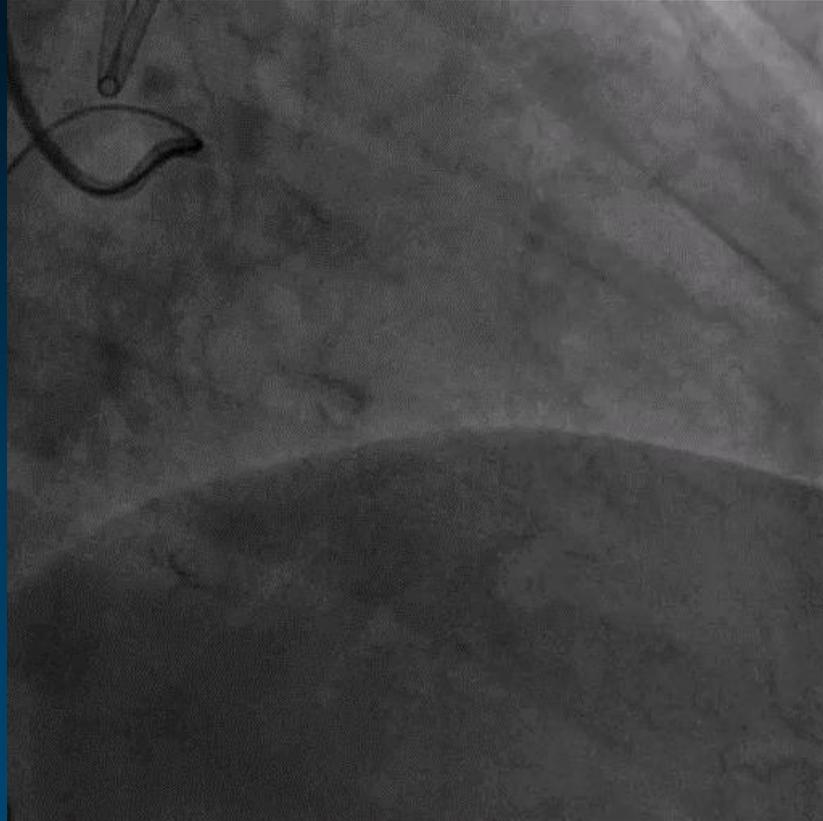


TAP?? Culotte??

# Retrograde Channel Tracking

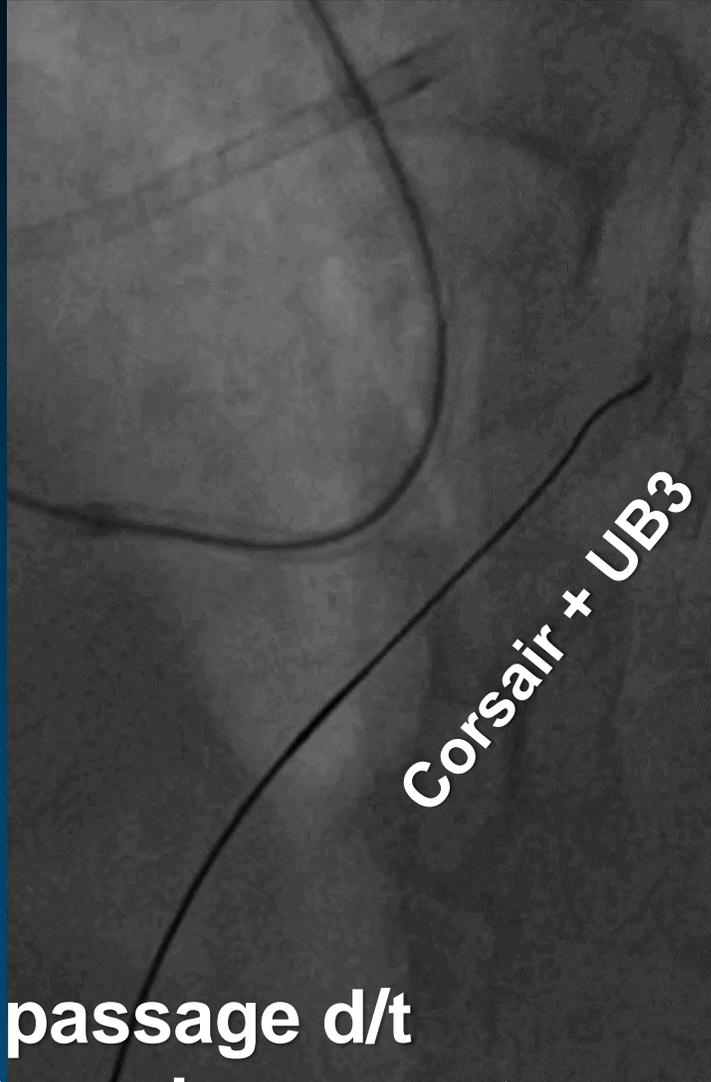
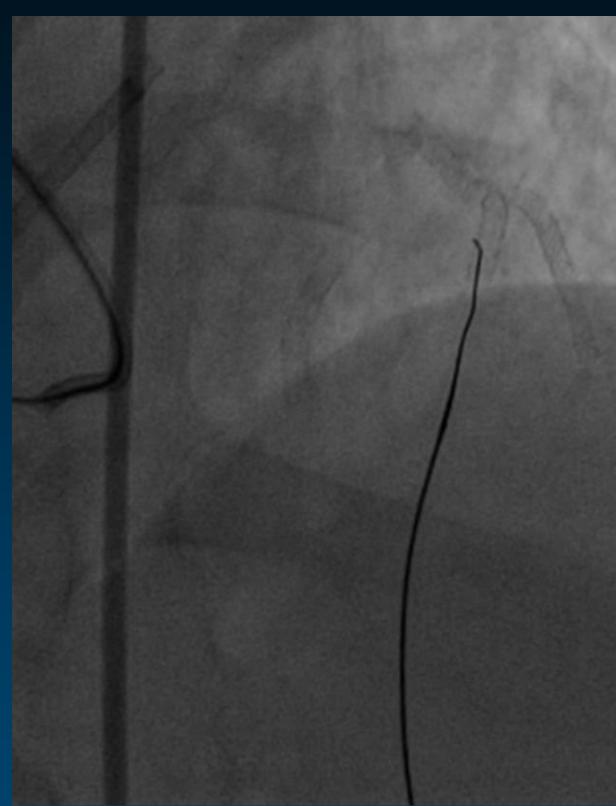


No septal collateral

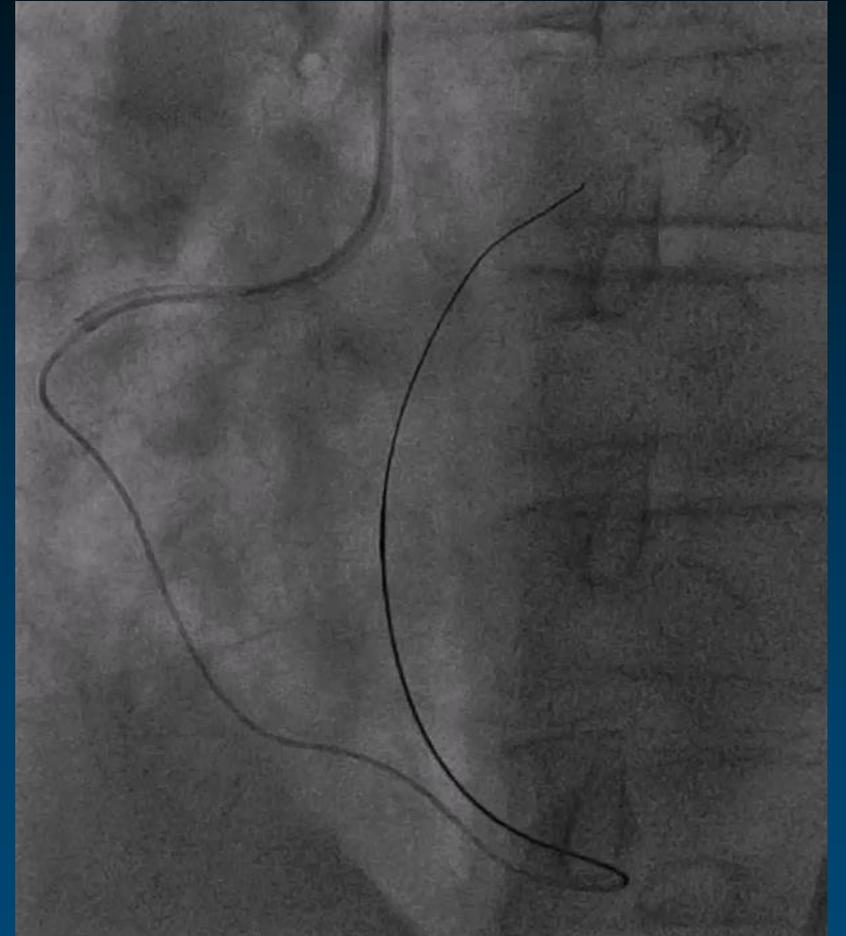


Epicardial channel, RV br. – dLAD  
Corsair + Sion

# Retrograde Passage Tried



**Difficulty of GW passage d/t friction & poor Corsair support**

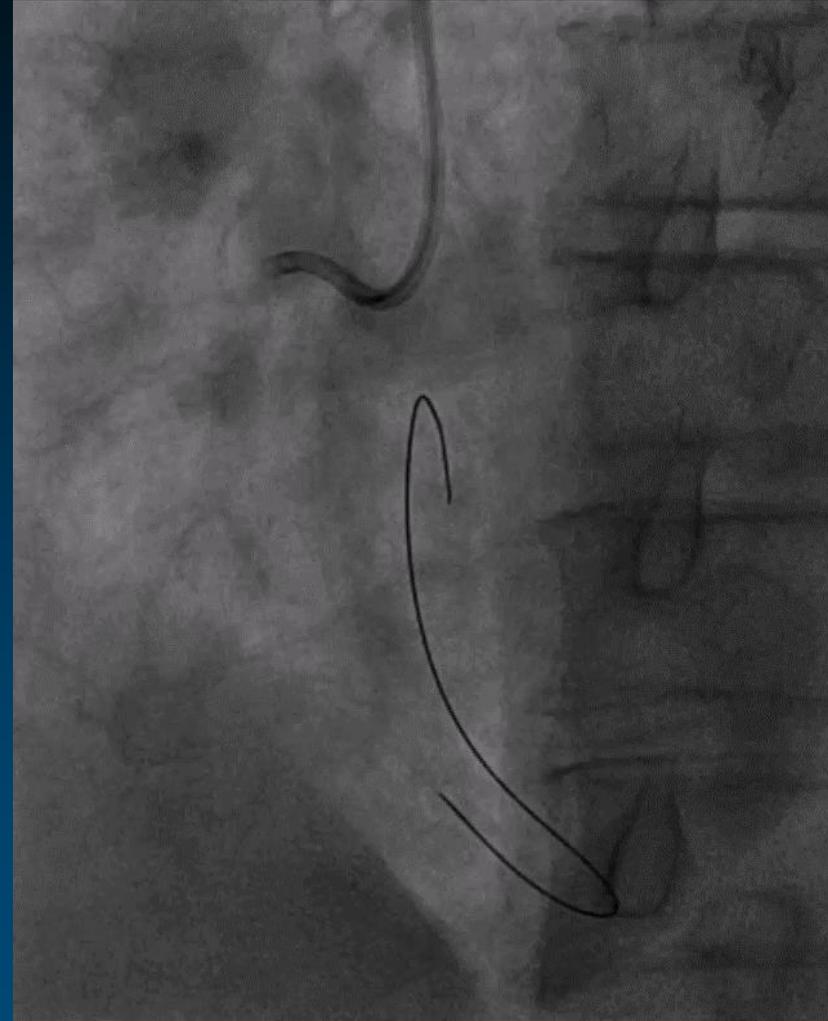


**Sudden release of GW friction  
→ felt that GW was cut**

# Broken Tip of Ultimate BROS3



Prayed for getting out but...



→ Sent CABG

# Conclusions

- Prevention is better.
- Know where your wire is.
- Do not push wire beyond where you know it is in vessel.
- Do not leave stains.
- Do not be lazy with ACT, heparin and flushing.
- Do not allow guiding to be sucked into the coronary.

***PLANNING FOR CTO MEANS ALSO PLANNING FOR TREATING COMPLICATIONS, SHOULD THEY OCCUR***