How to achieve maximum success : CTO PCI

Complication and management

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TCT AP 2019

In hospital MACCE (CTO PCI) retrograde summit

	2012 (1553)	2013 (1676)	2014 (1045)	P
MACCE	**6 (0.4%)**	**9 (0.5%)**	**9 (0.9%)**	**0.2791**
- Cardiac death	1 (0.1%)	3 (0.2%)	3 (0.3%)	0.3803
- Non cardiac death	1 (0.1%)	1 (0.1%)	-	0.7220
- MI	2 (0.1%)	-	2 (0.2%)	0.2411
- Non QMI	1 (0.1%)	1 (0.1%)	2 (0.2%)	0.4924
- Stroke	1 (0.1%)	2 (0.1%)	2 (0.2%)	0.6494
- Emergent CABG	-	2 (0.1%)	-	0.2121

Procedural complications

	2012 (1553)	2013 (1676)	2014 (1045)	P
1. Coronary perforation	2.8% (44)	3.3% (55)	1.5% (17)	0.0333
Cardiac tamponade	0.5% (7)	0.2% (4)	0.7% (8)	0.1327
- Stent thrombosis	0.2% (3)	0.2% (4)	0.1% (1)	0.7016
- Thrombosis formation	0.1% (2)	0.1% (1)	0.1% (1)	0.8136
- Contrast induced nephropathy	0.1% (2)	0.1% (2)	0.1% (1)	0.9705
- Radiation dermatitis	-	0.1% (2)	0.3% (3)	0.1104
- Access route complication	0.4% (6)	0.4% (7)	0.5% (6)	0.7623
- Donor vessel trouble	0.1% (1)	0.1% (1)	0.1% (1)	0.9367

Complications related to the retrograde approach

	2012 (490)	2013 (538)	2014 (281)	P
Retrograde approach relevant	11.4% (56)	8.9% (48)	7.8% (22)	0.2040
Channel injury	10.6% (52)	8.4% (45)	7.5% (21)	0.2703
Additional treatment required	4.1% (20)	3.0% (16)	2.5% (7)	0.4274
Cardiac tamponade	0.4% (2)	0.2% (1)	1.4% (4)	0.0623
Donor artery trouble	0.2% (1)	0.2% (1)	0.4% (1)	0.8803

Including minor events

Major Complication of CTO-PCI

1. collateral channel injury

2. coronary perforation

1 Channel injury

1) Septal channel

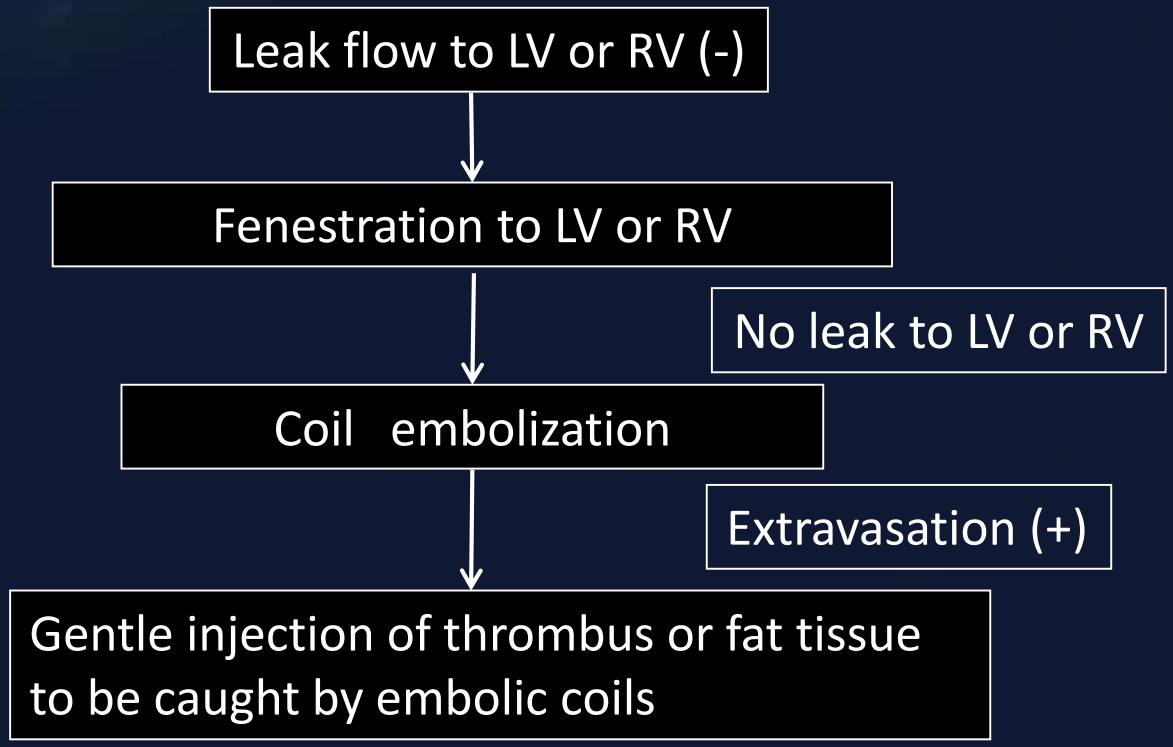
Additional treatment don't need in many cases

2) Epicardial channel

Additional treatment is sometimes necessary

A management of coronary collateral channel perforation (septal channel)

Septal channel : additional treatment don't need if there is a leak to LV or RV
Big hematoma is required additional treatment



A management of coronary collateral channel perforation (epicardial channel)

Epicardial channel : perform additional treatment all patients if there is active bleeding

Balloon dilatation with heparin neutralization

Extravasation (+)

Coil embolization

Extravasation (+)

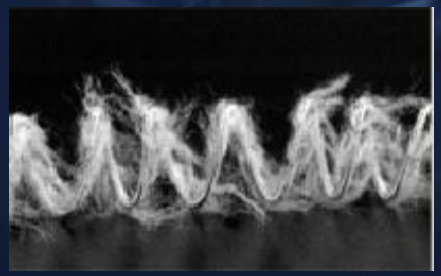
Gentle injection of thrombus or fat tissue to be caught by embolic coils

Extravasation (+)

Injection of fibrin glue around the perforation site

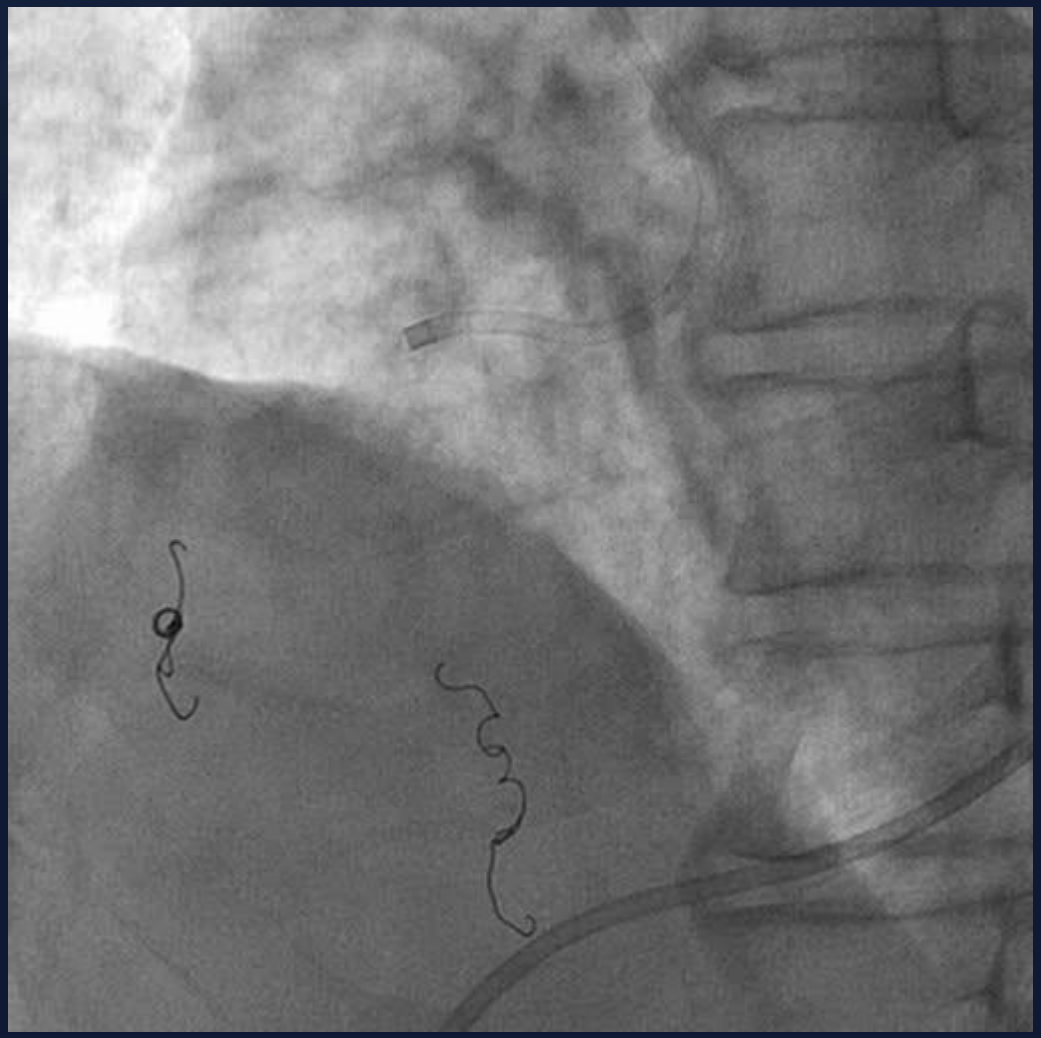
Bilateral coil embolization is sometimes necessary if a collateral channel is injured during the retrograde approach.

Cook Emboli/Micro Coil

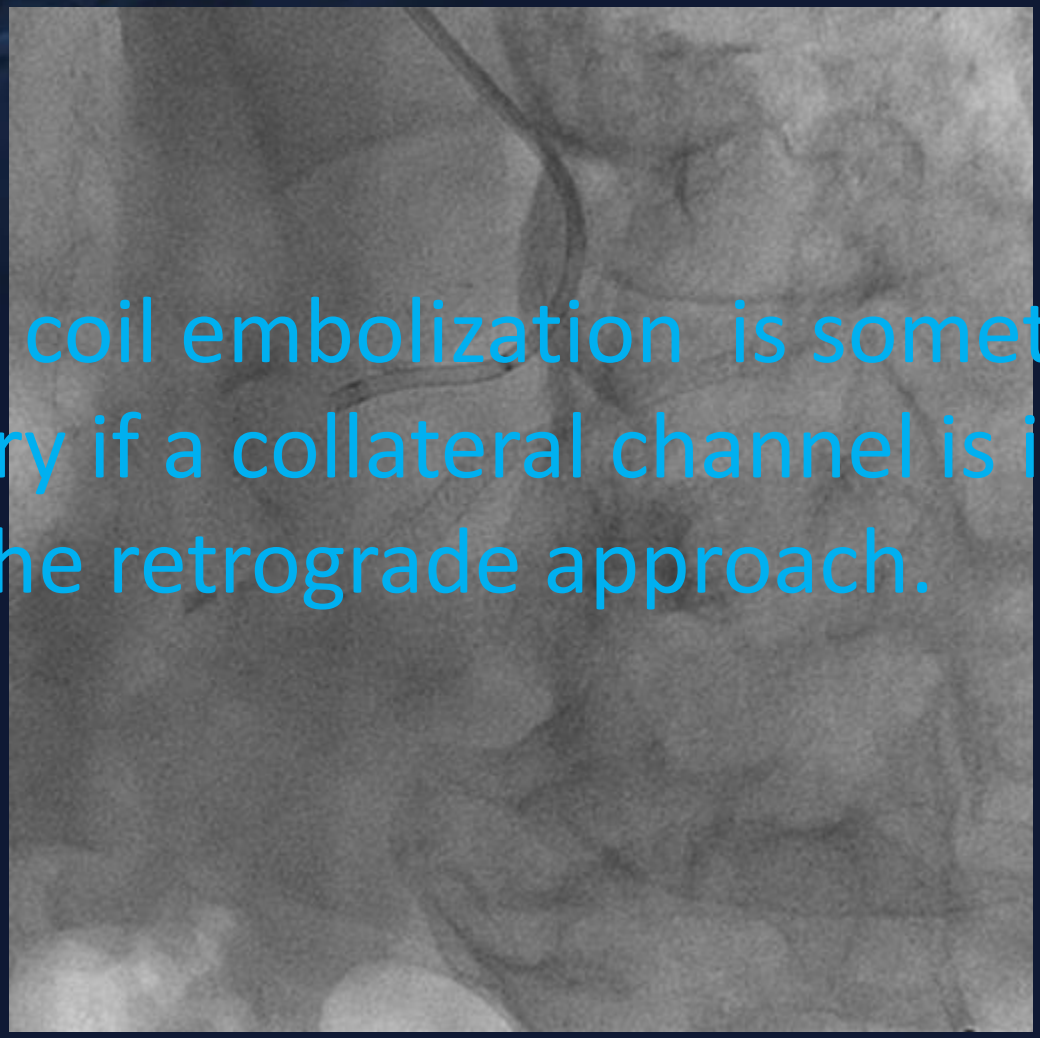


HILAL Coil (Cook)
Diameter: 2 mm
Length: 20mm

It can pass through into Finecross micro catheter.



Cook Emboli/Micro Coil

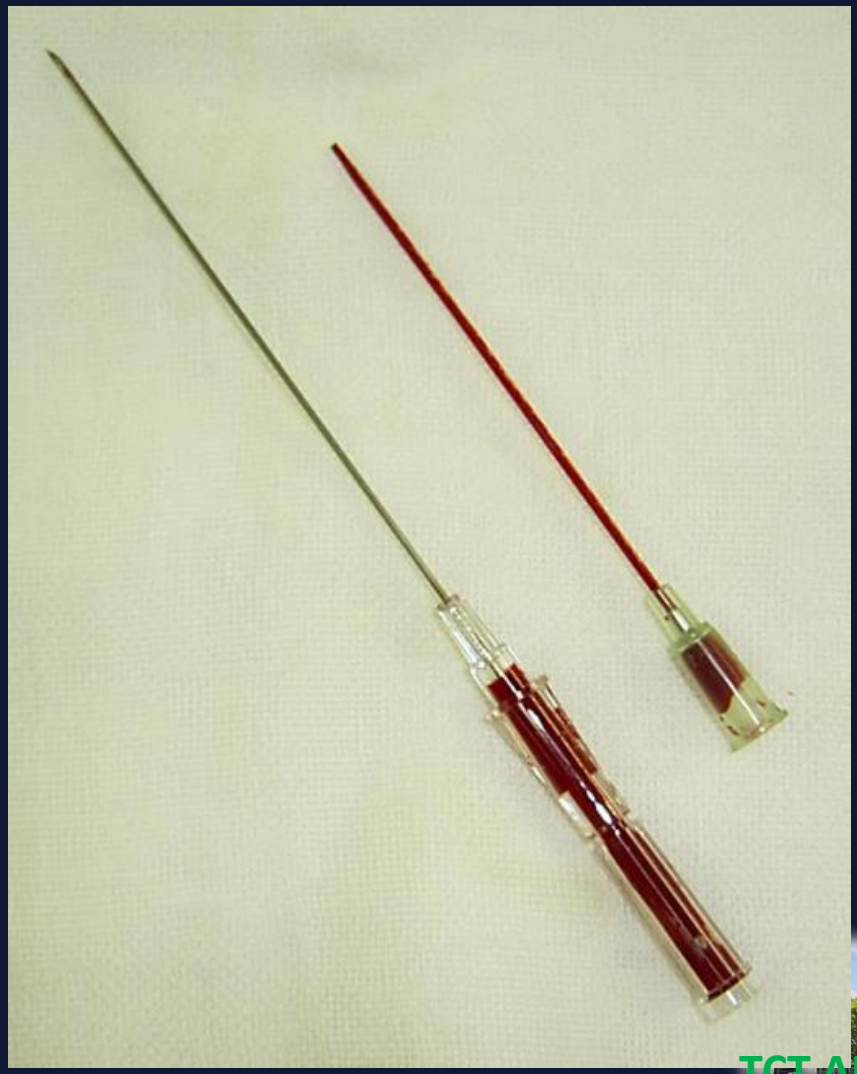


Bilateral coil embolization is sometimes necessary if a collateral channel is injured during the retrograde approach.

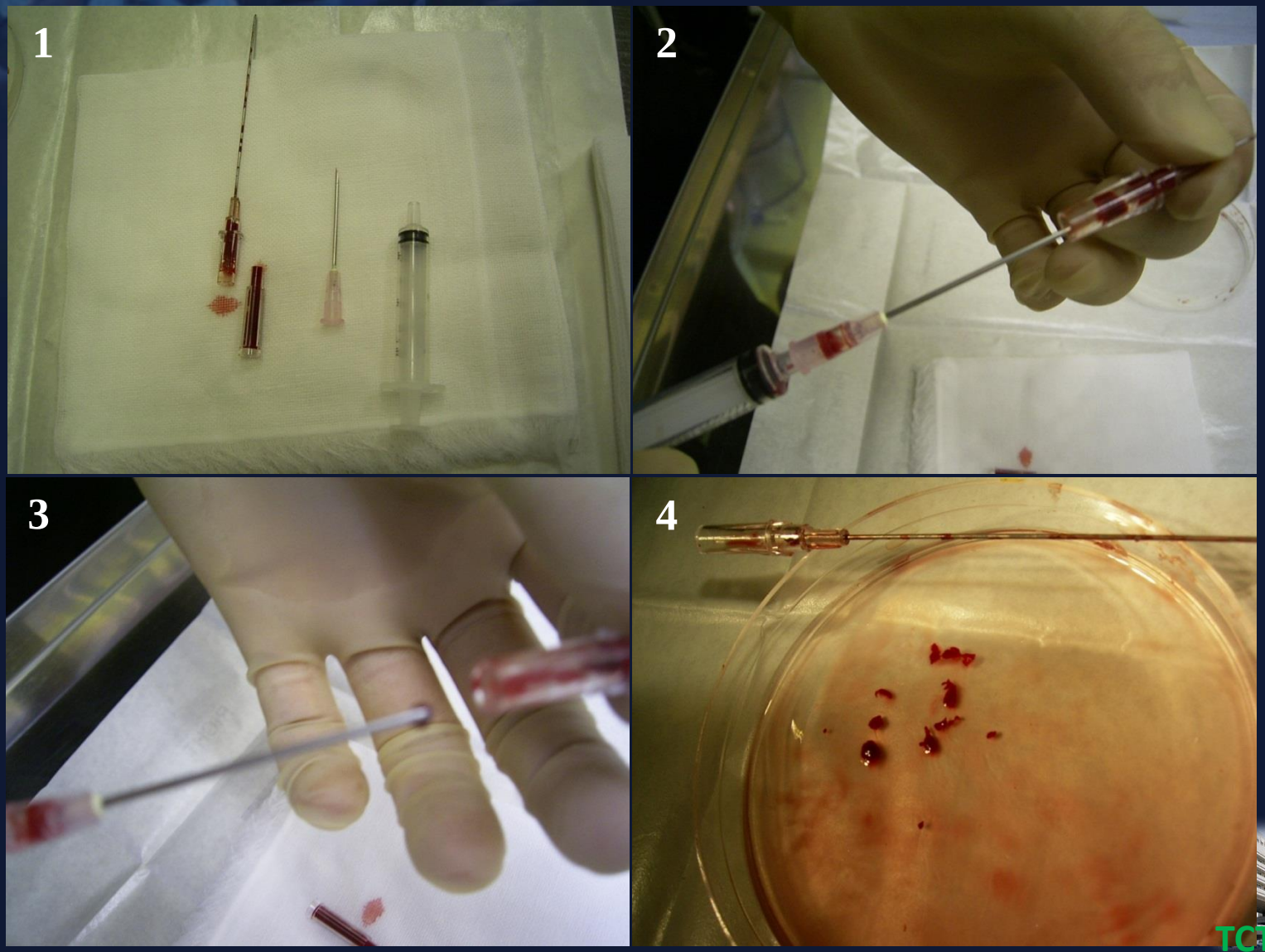
Fat tissue / Thrombus emboli

Thrombus in an elaster

Keep the puncture needle until procedure is over



There is thrombus in an elaster or inner sheath
Thrombus recovery process in an elaster



Hub of Finecross

Thrombus are floating

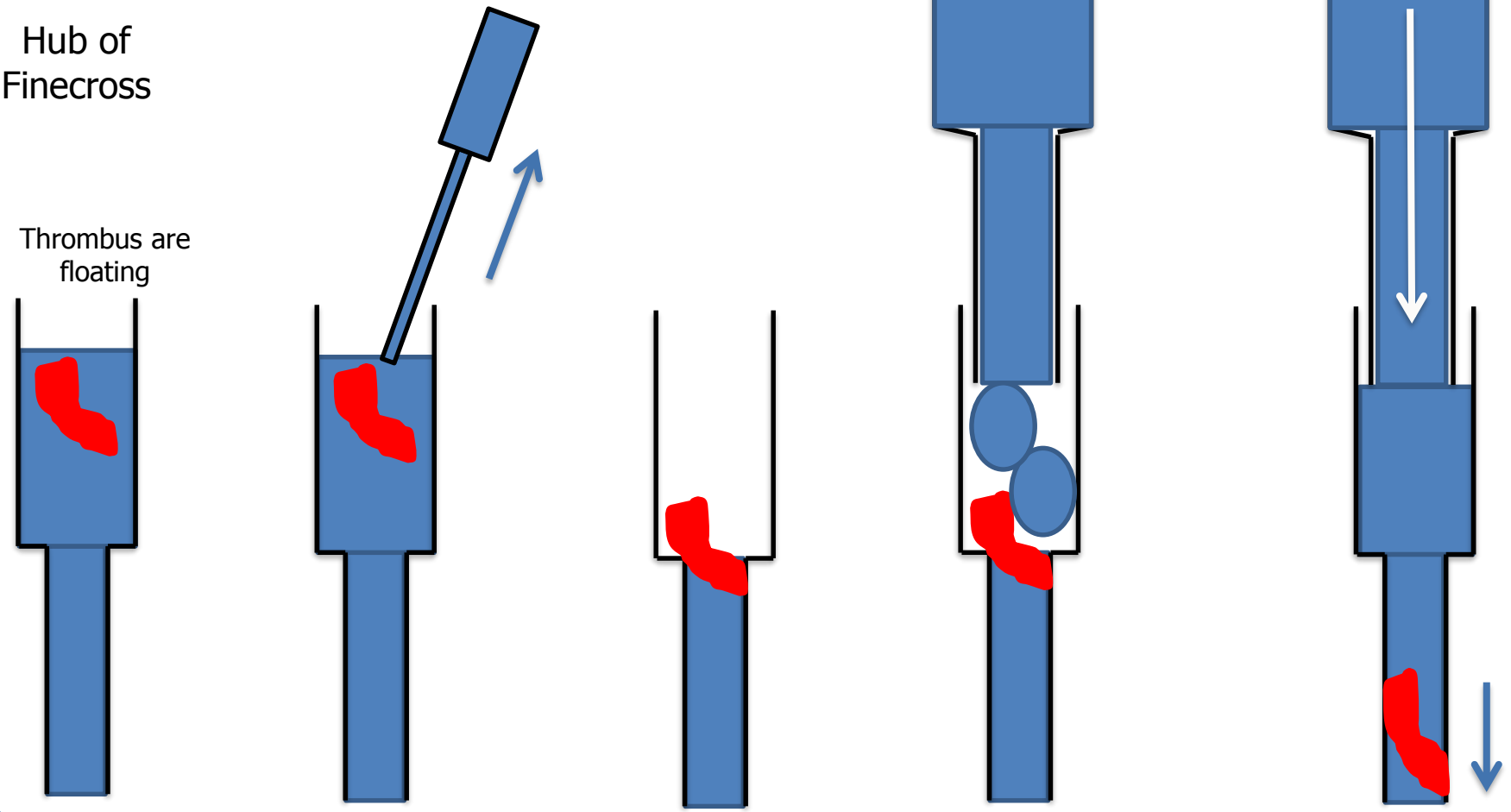
Pull out the blood of hub portion using syringe

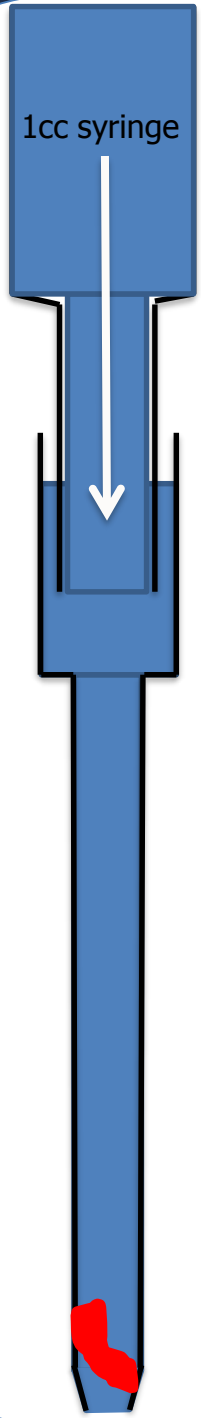
filled in the hub with saline from 1cc syringe

1cc syringe

Thrombus exits from Finecross in about 0.4cc

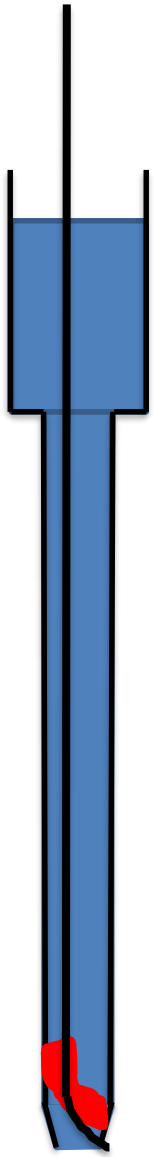
1cc syringe



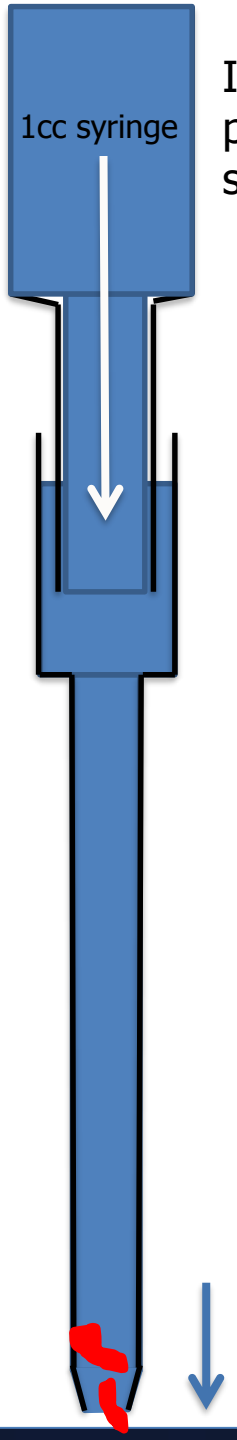


In the case of the resistance is strong, If you push strongly There is a possibility to expand the perforation.

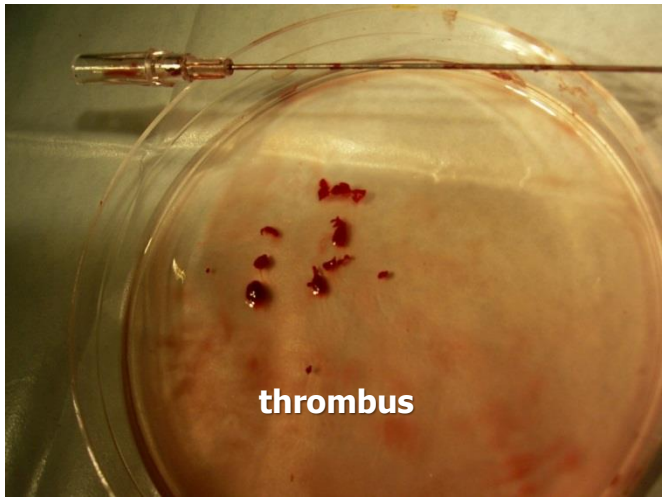
Thrombus is caught at the exit

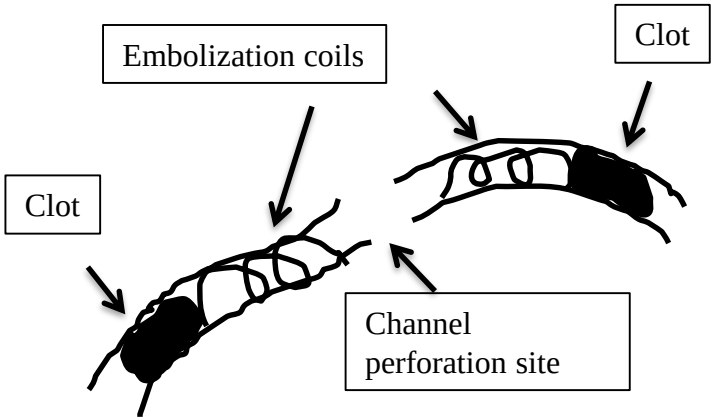


Press with soft wire Don't use the back of wire because of invisible



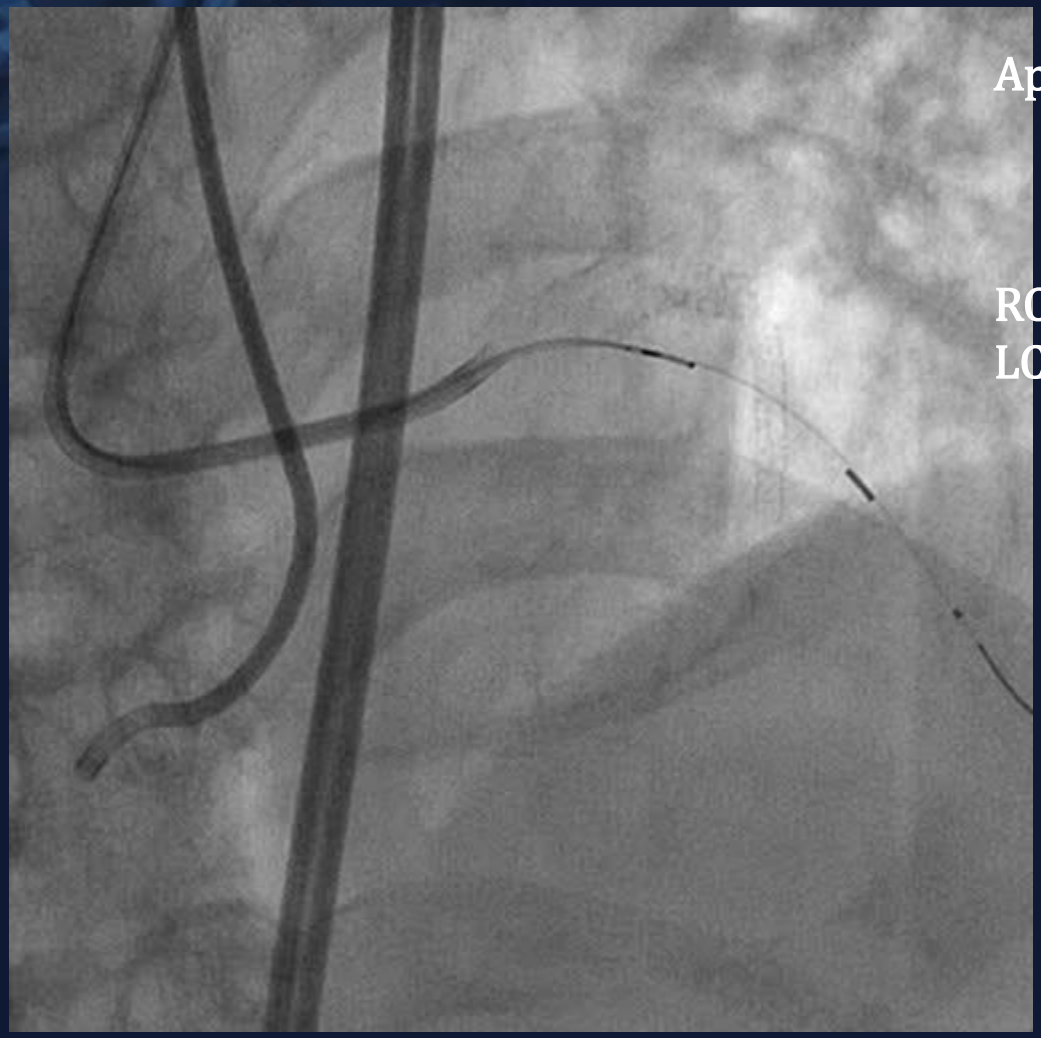
It's easy to press with syringe again





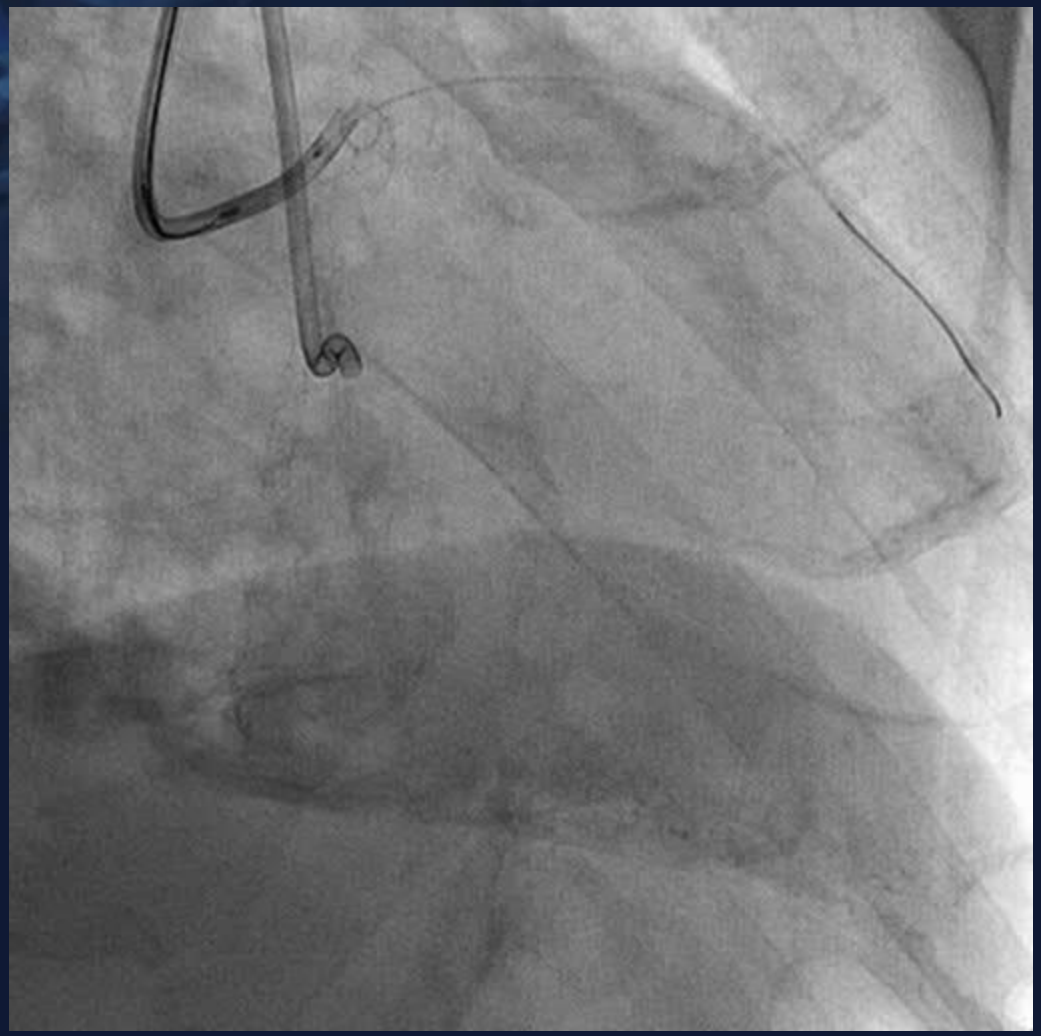
Using Thrombin if no clot

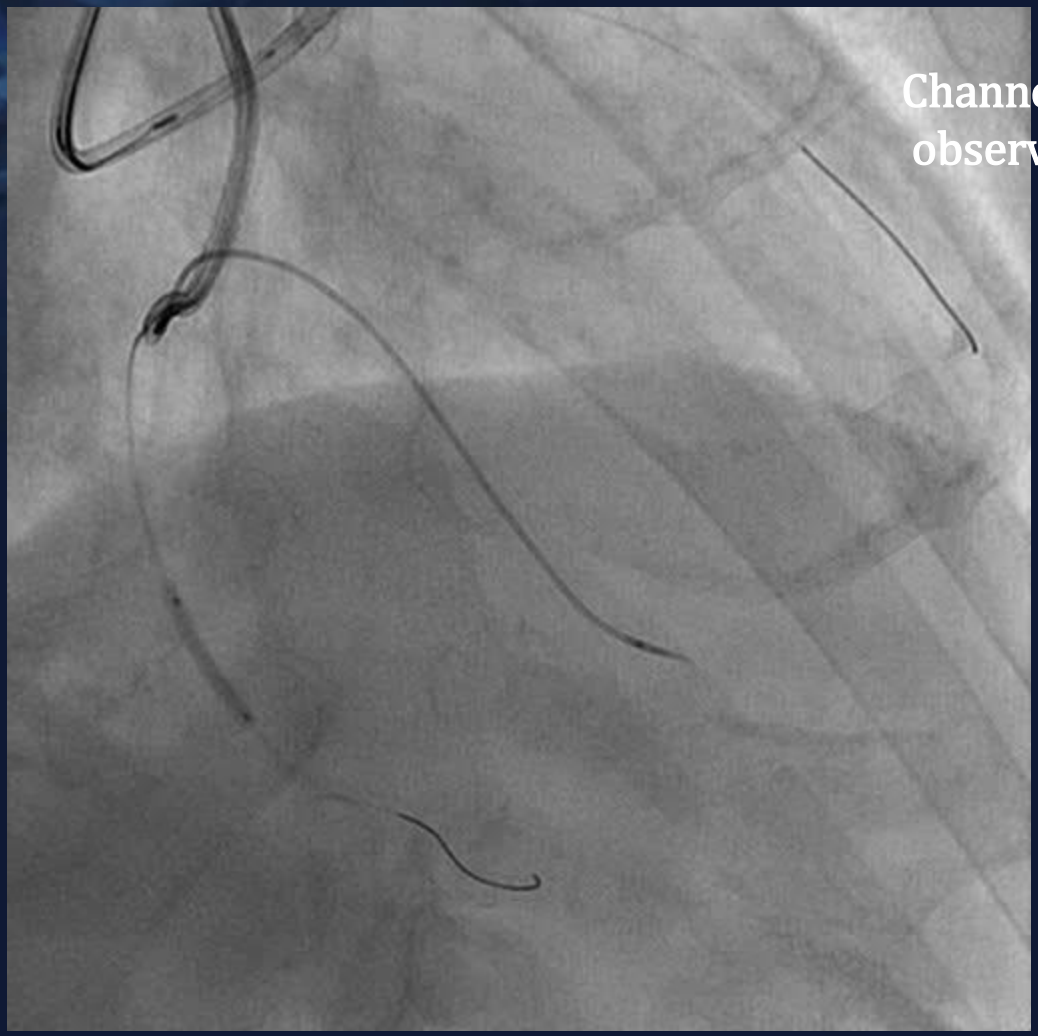
Case 1 (epicardial channel perforation)



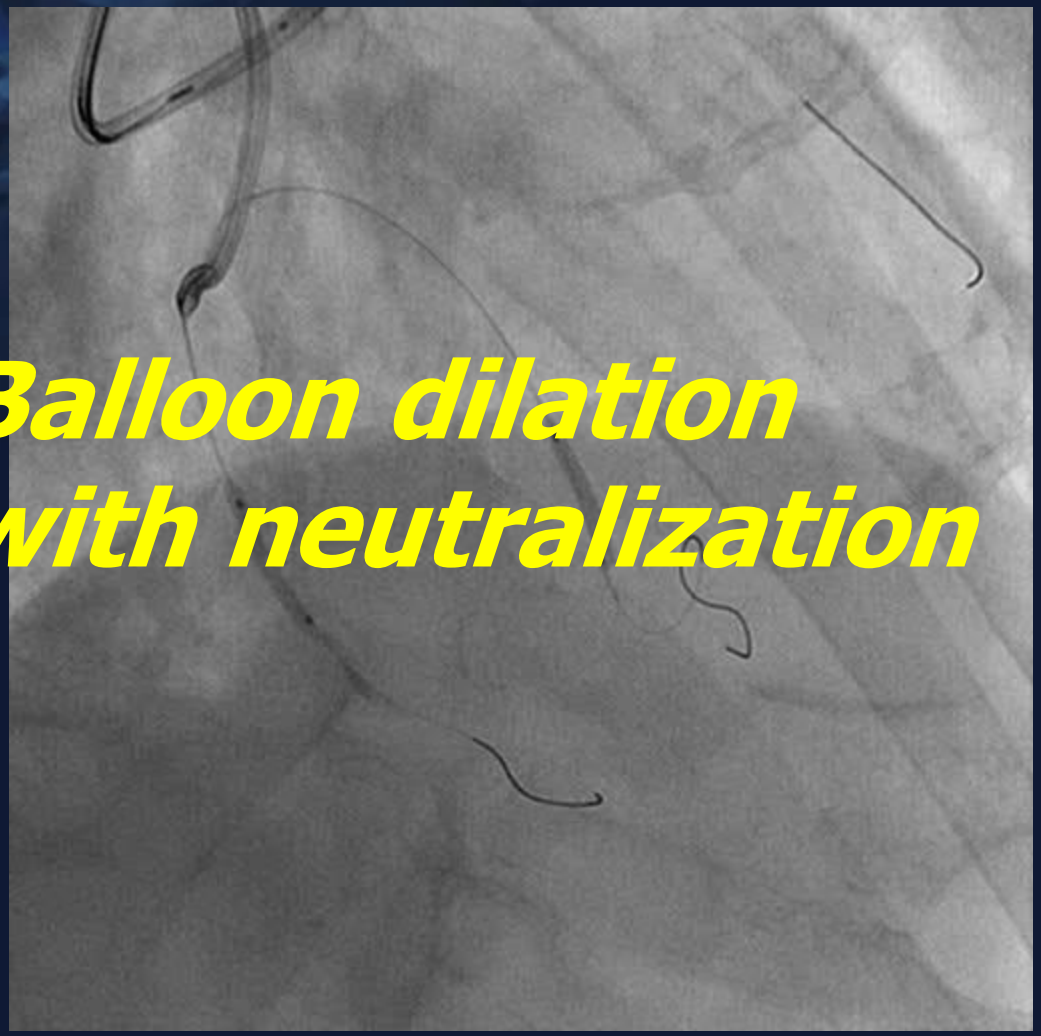
Approach : rt FA-8Fr
rt FA-7Fr

RCA : AL 1 SH 7Fr
LCA : SL 4 SH 8Fr



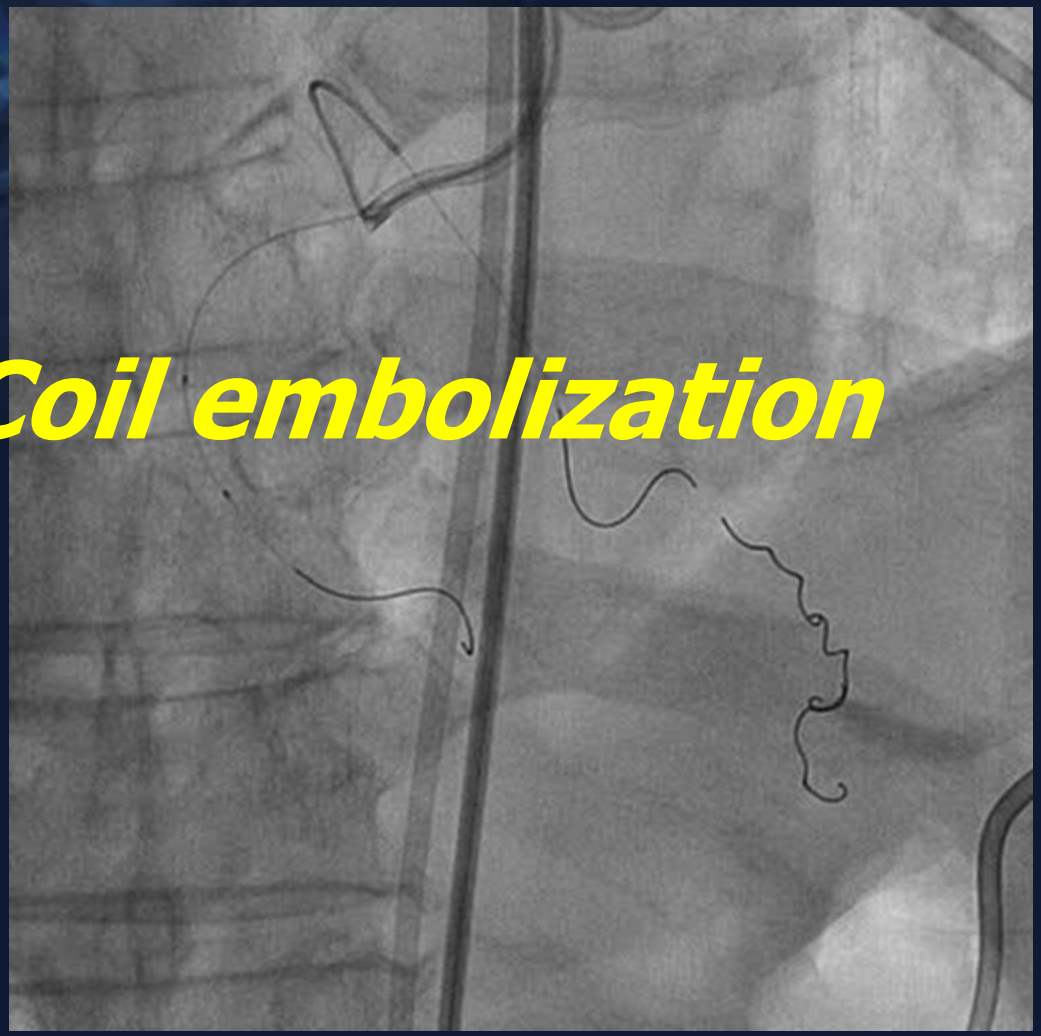


Channel perforation was observed from two places



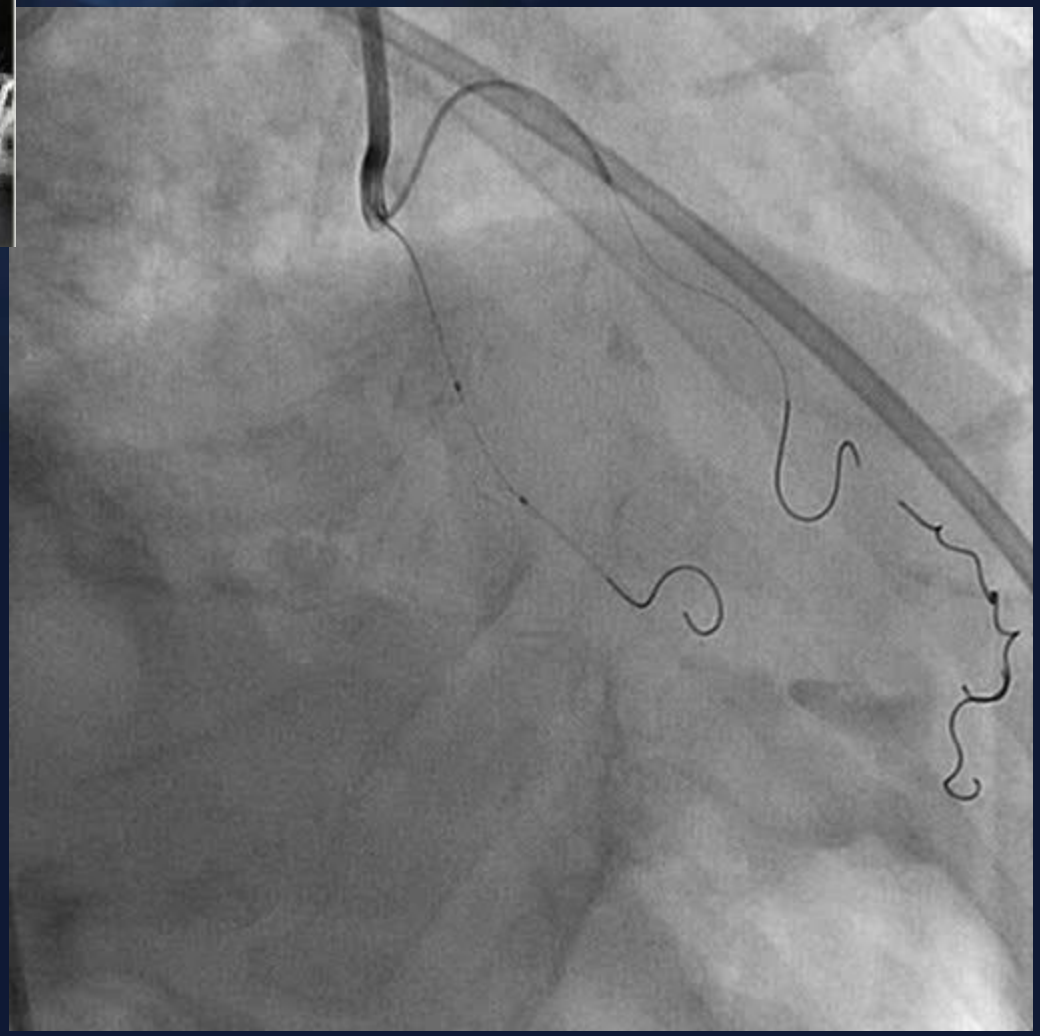
Balloon dilation with neutralization

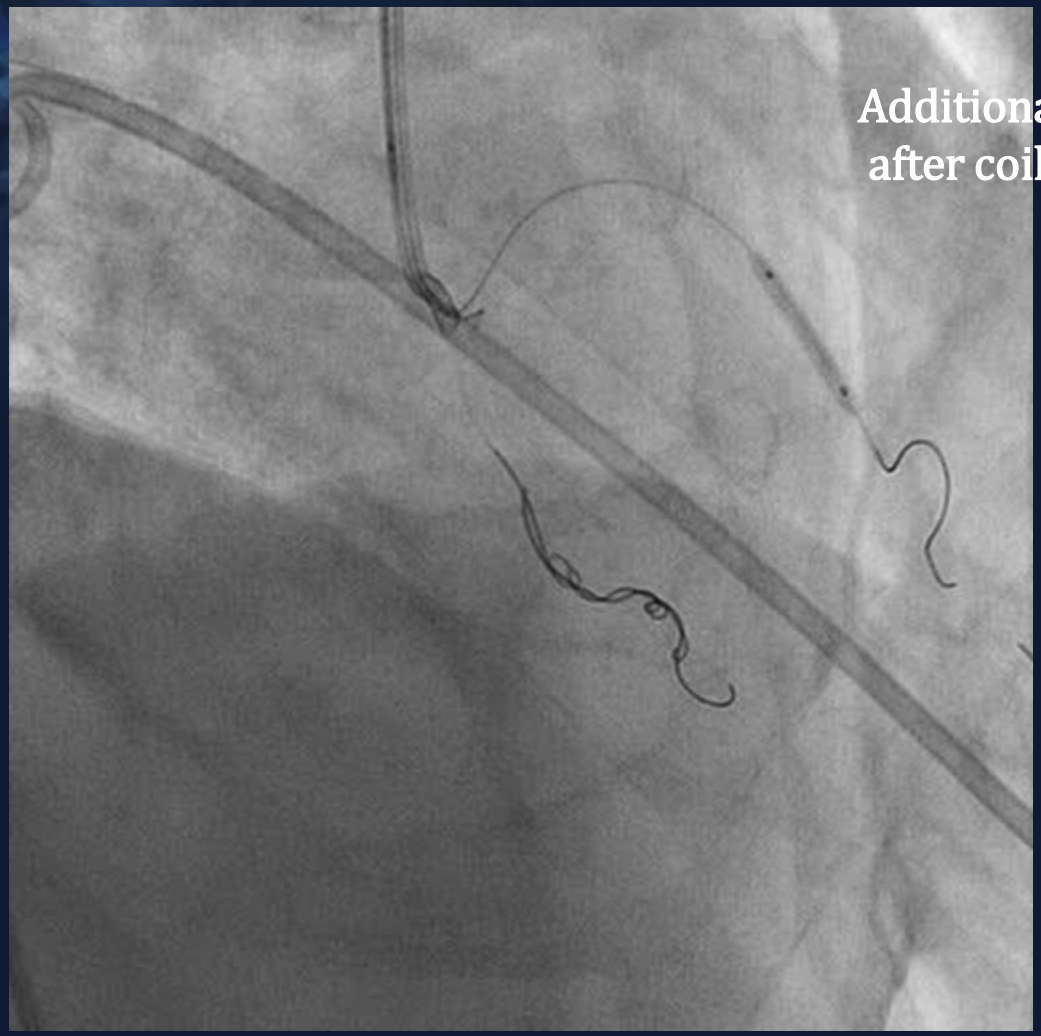
Coil embolization



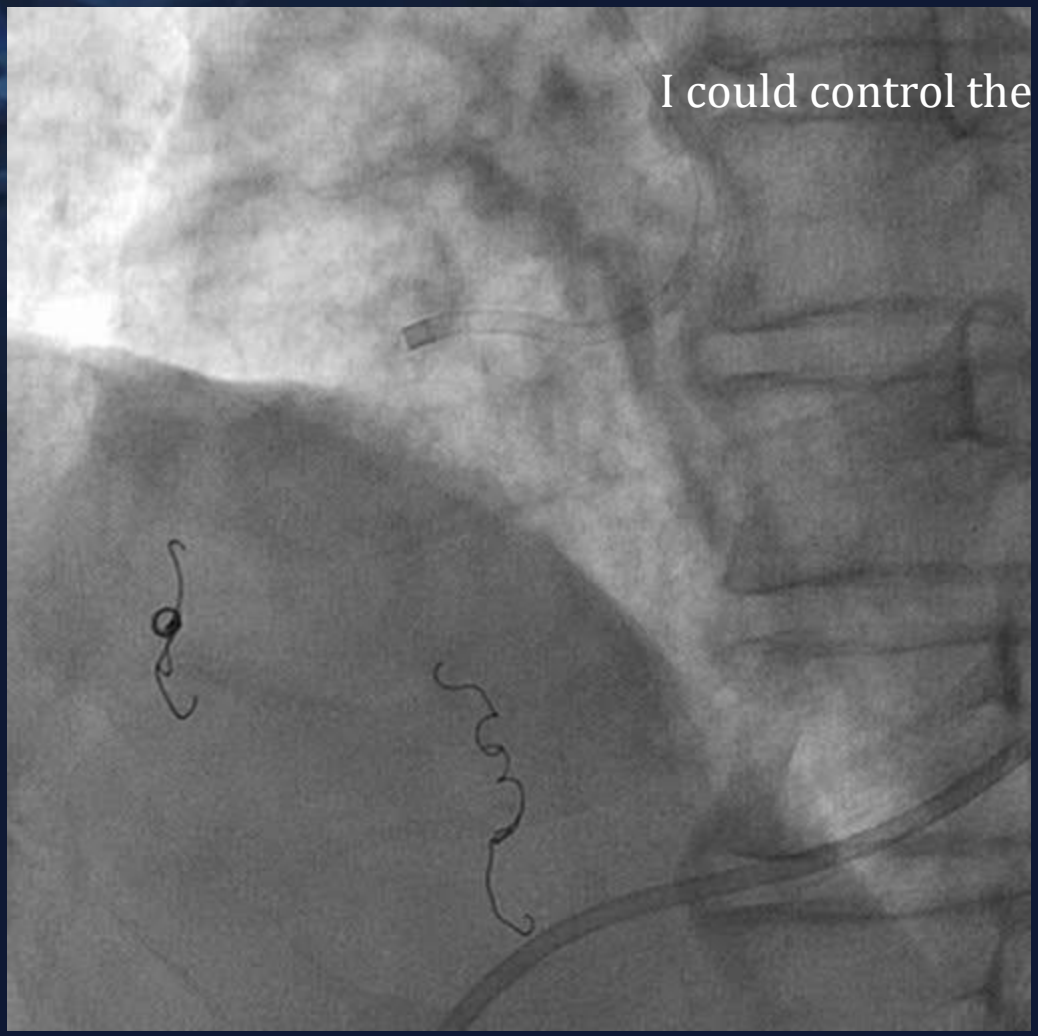
Cook Emboli/Micro Coil

HILAL Coil
Diameter: 2 mm
Length: 20mm



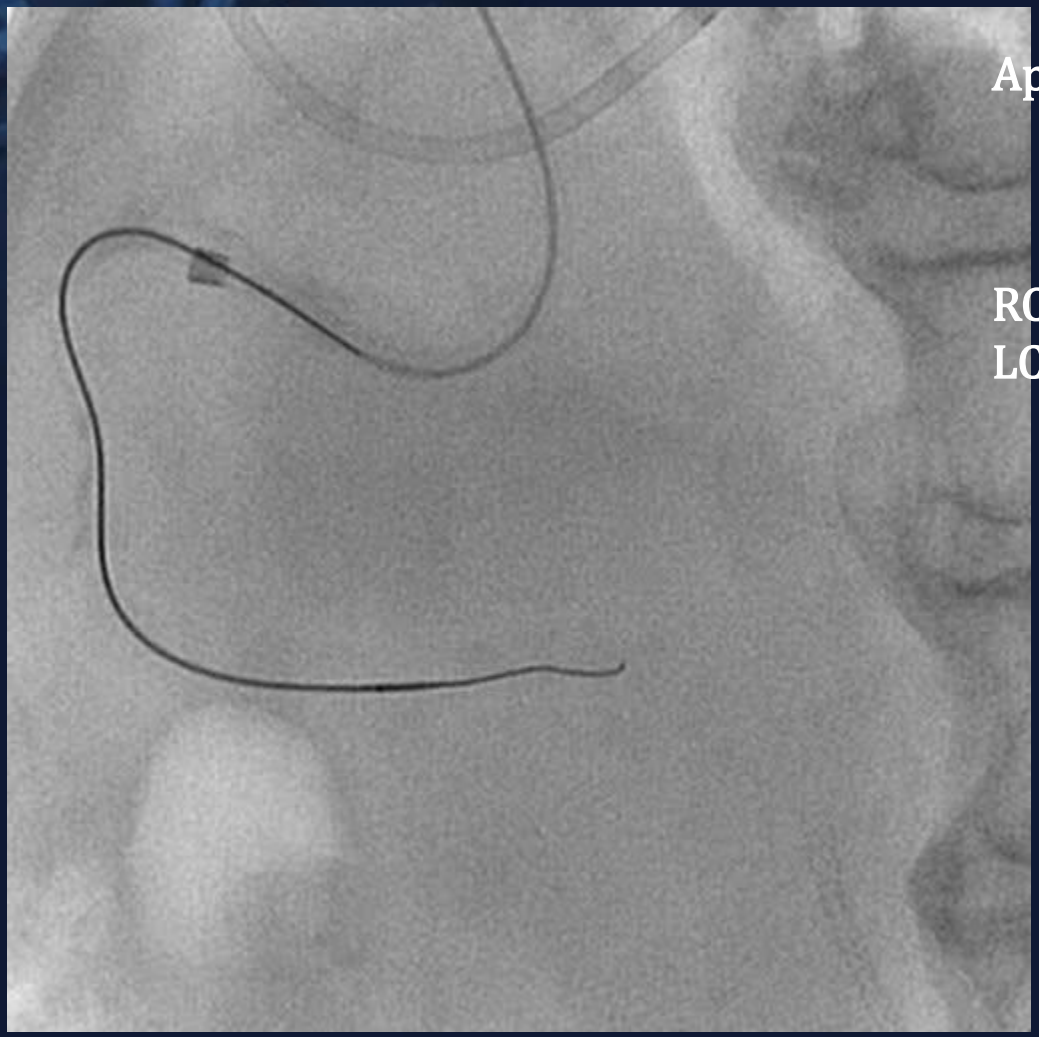


Additional balloon dilatation after coiling



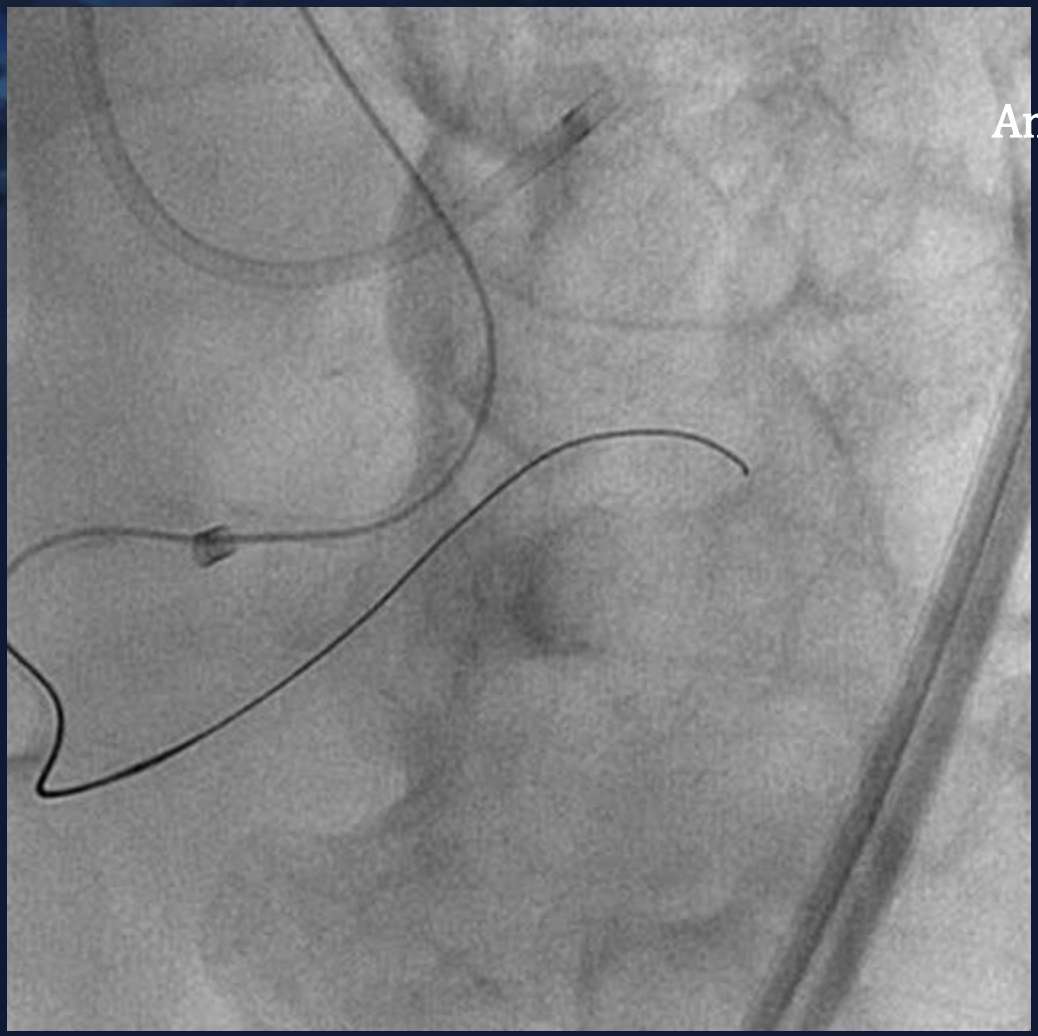
I could control the bleeding using Coils.

Case 2 (epicardial channel perforation)

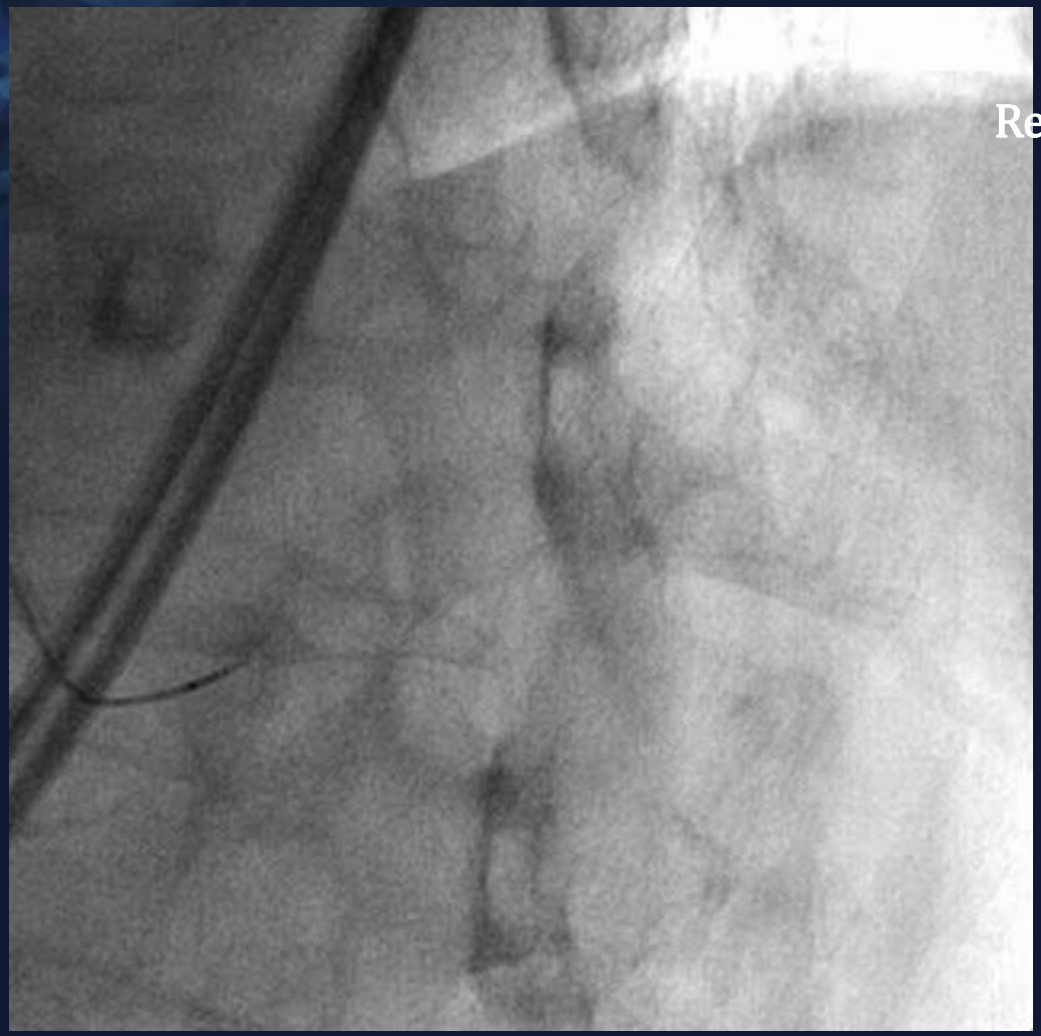


Approach : rt FA-8Fr
rt FA-7Fr

RCA : AL 1 SH 8Fr
LCA : EBU 3.5 SH 7Fr

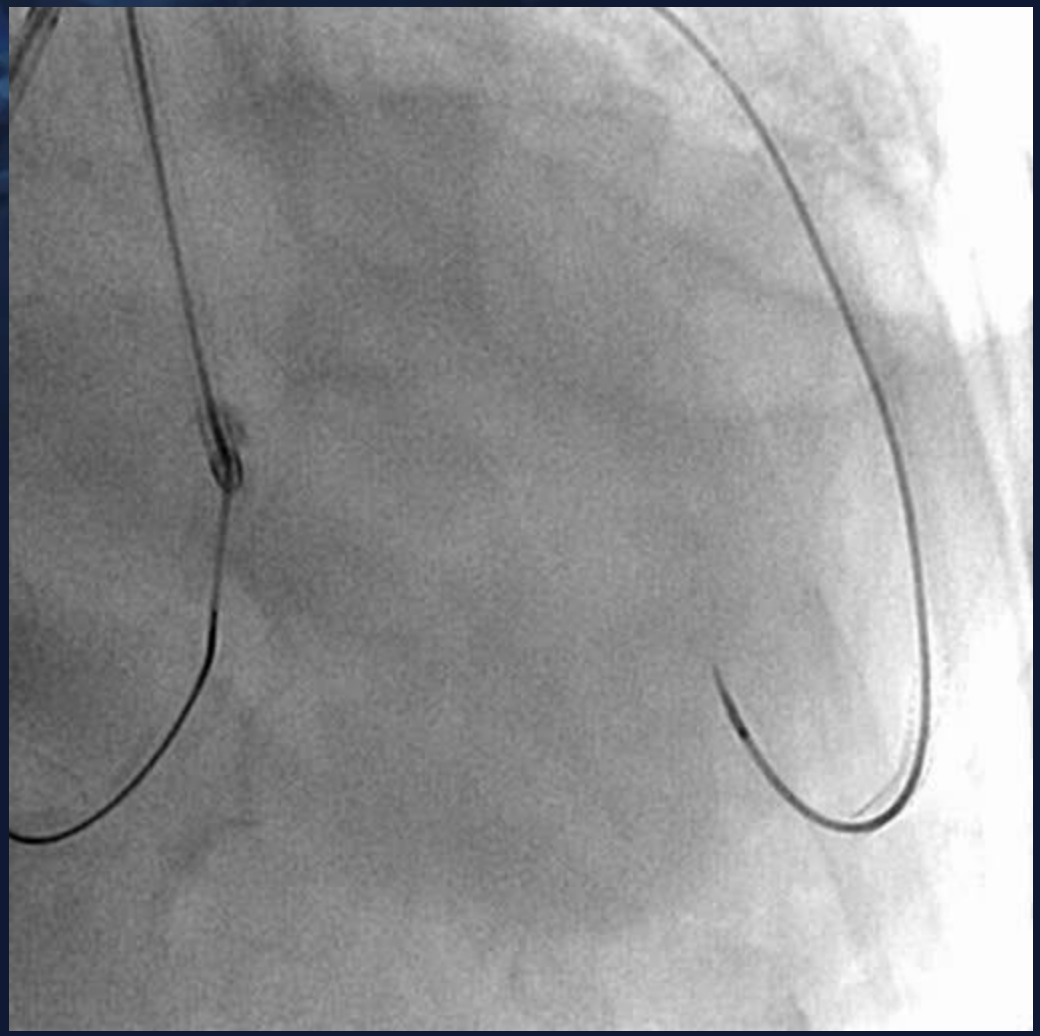


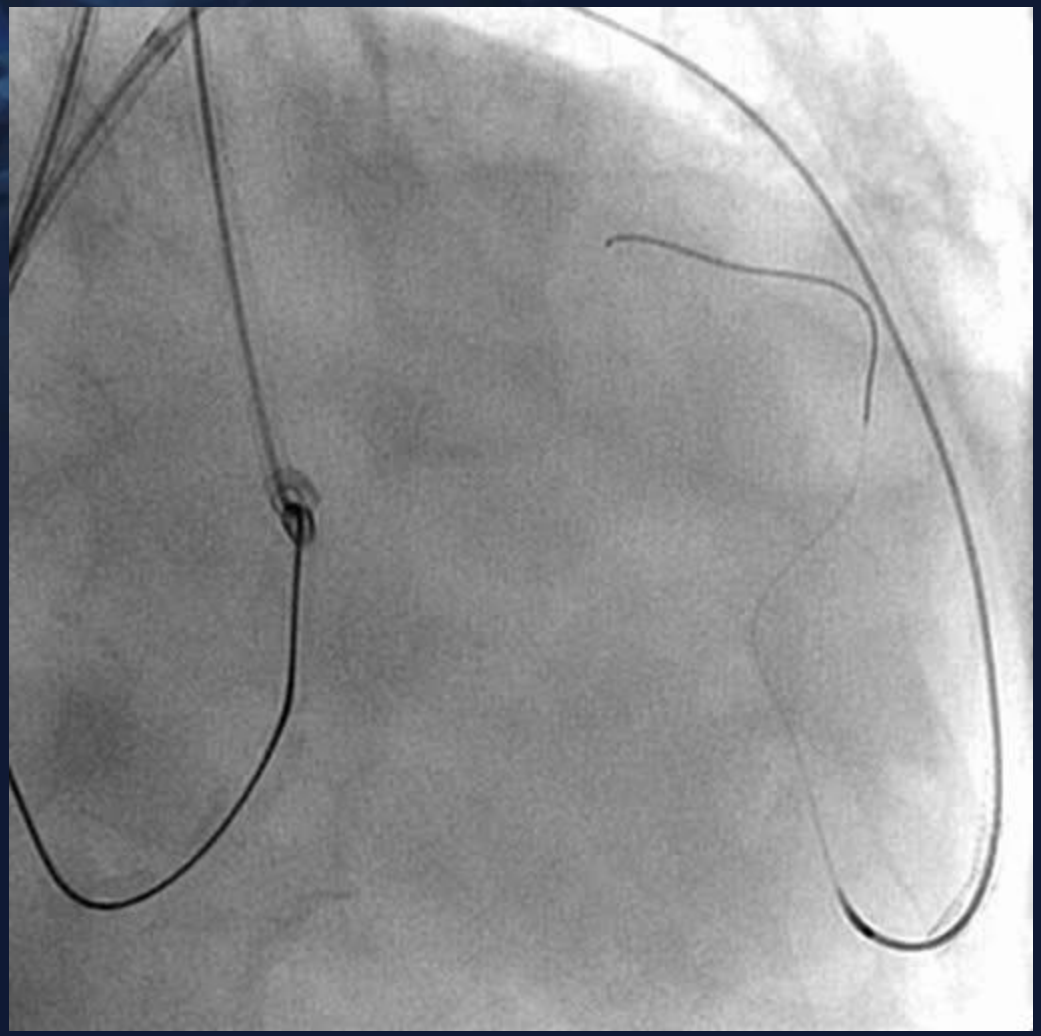
Antegrade wiring failed



Retrograde approach

Tip injection
from retrograde Corsair

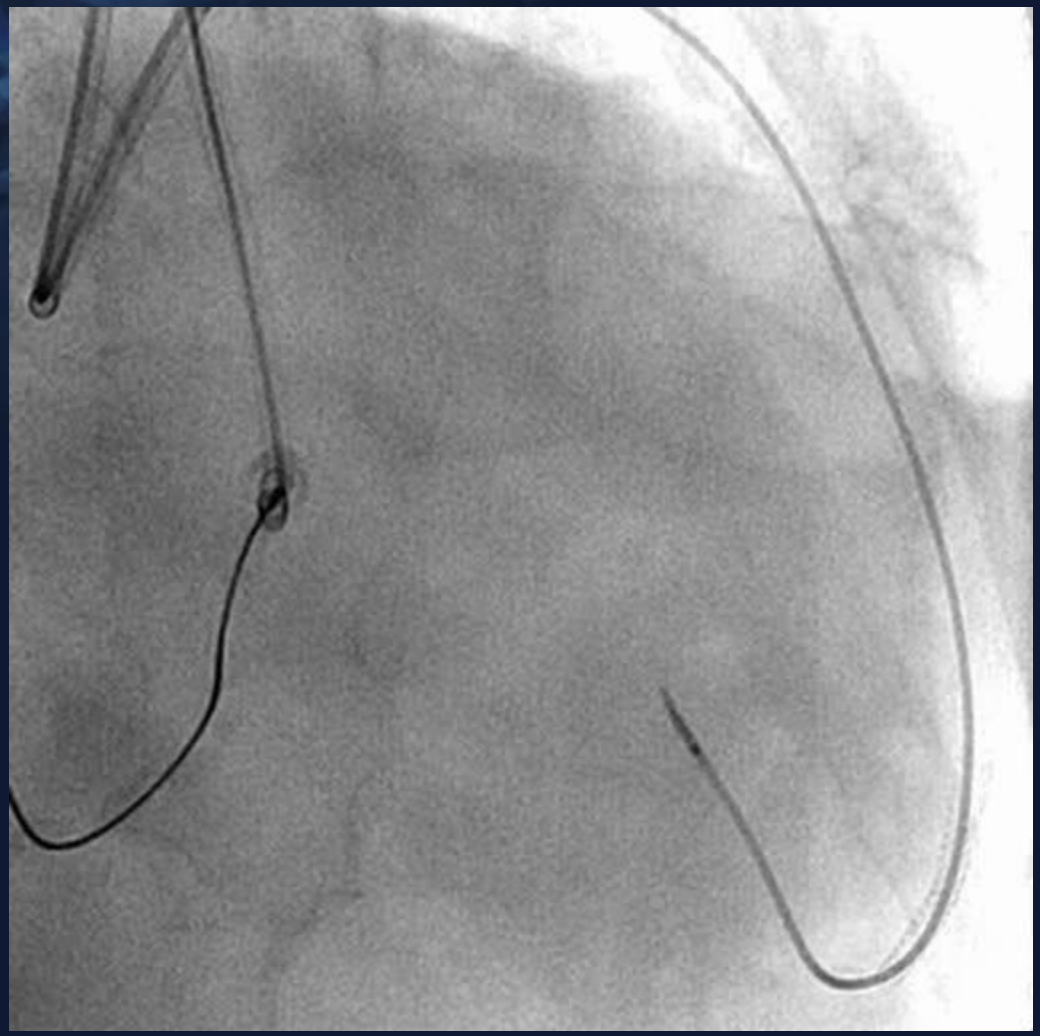


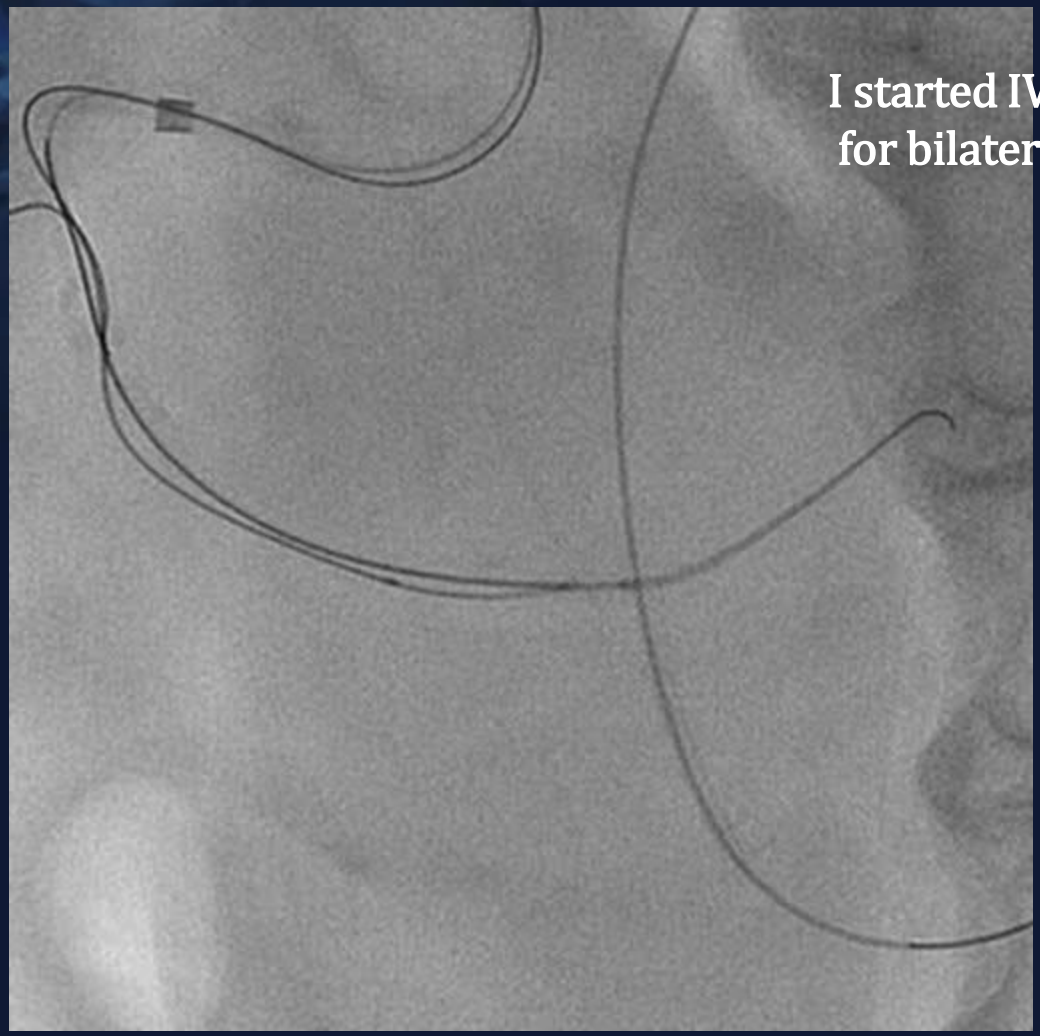


Wire: SUOH03

I confirmed the channel perforation after wiring and advancing Corsair.

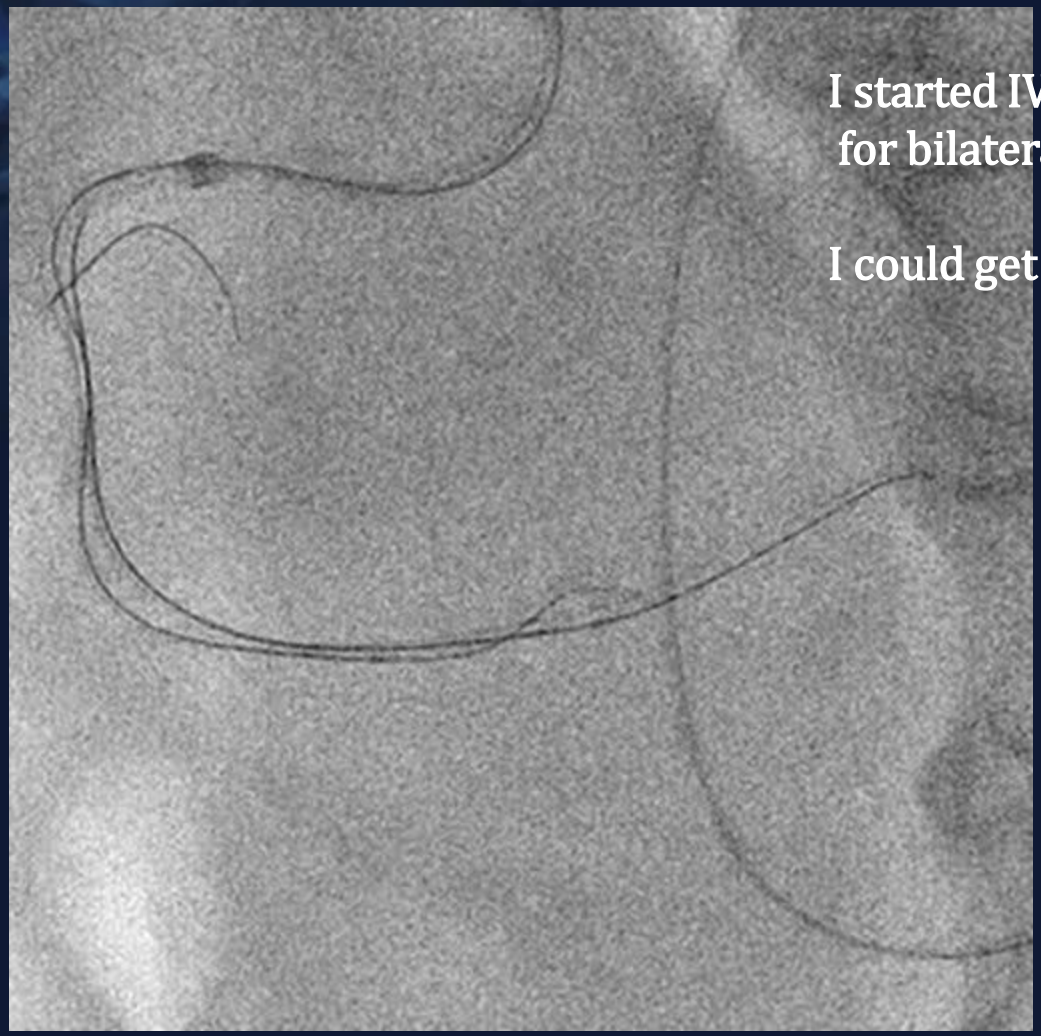
Channel perforation





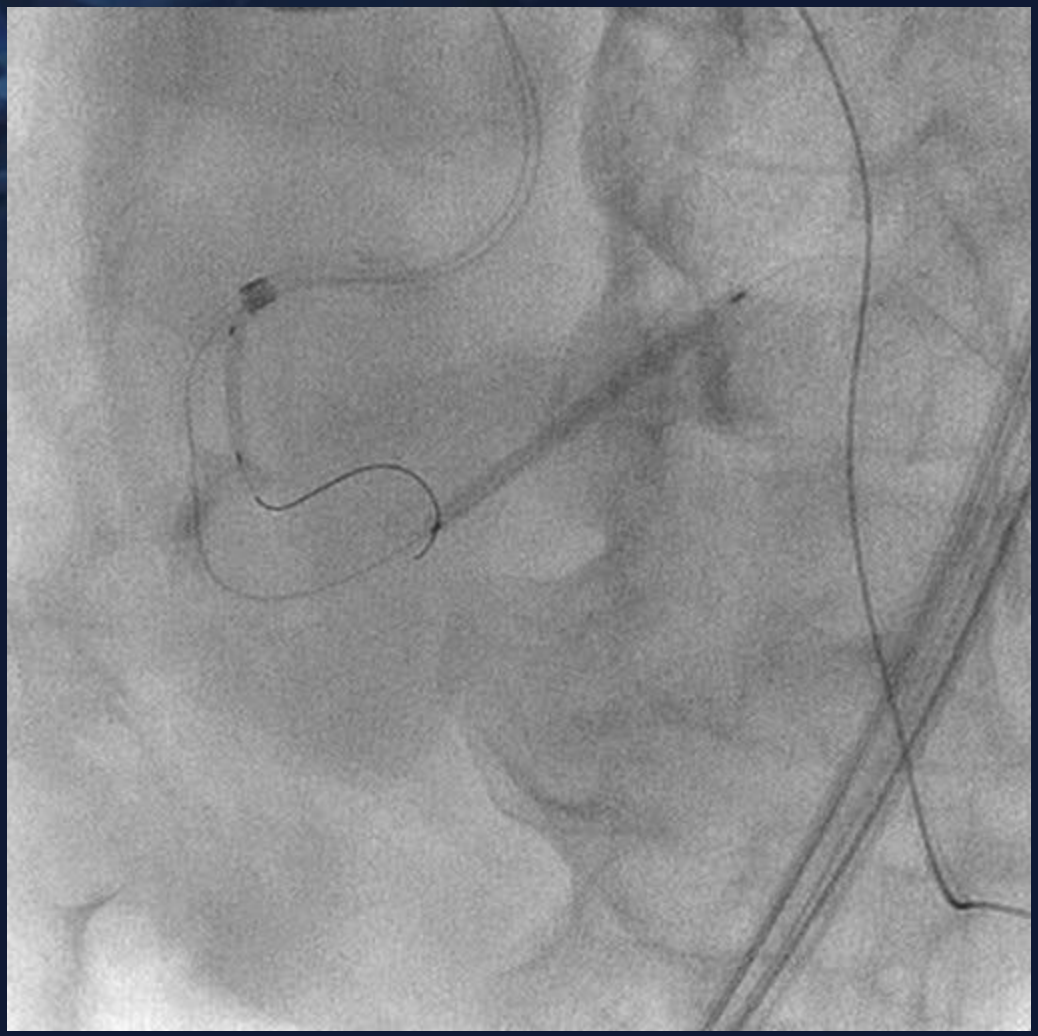
I started IVUS guided wiring
for bilateral coil embolization

It’s difficult to control bleeding, because antegrade flow.

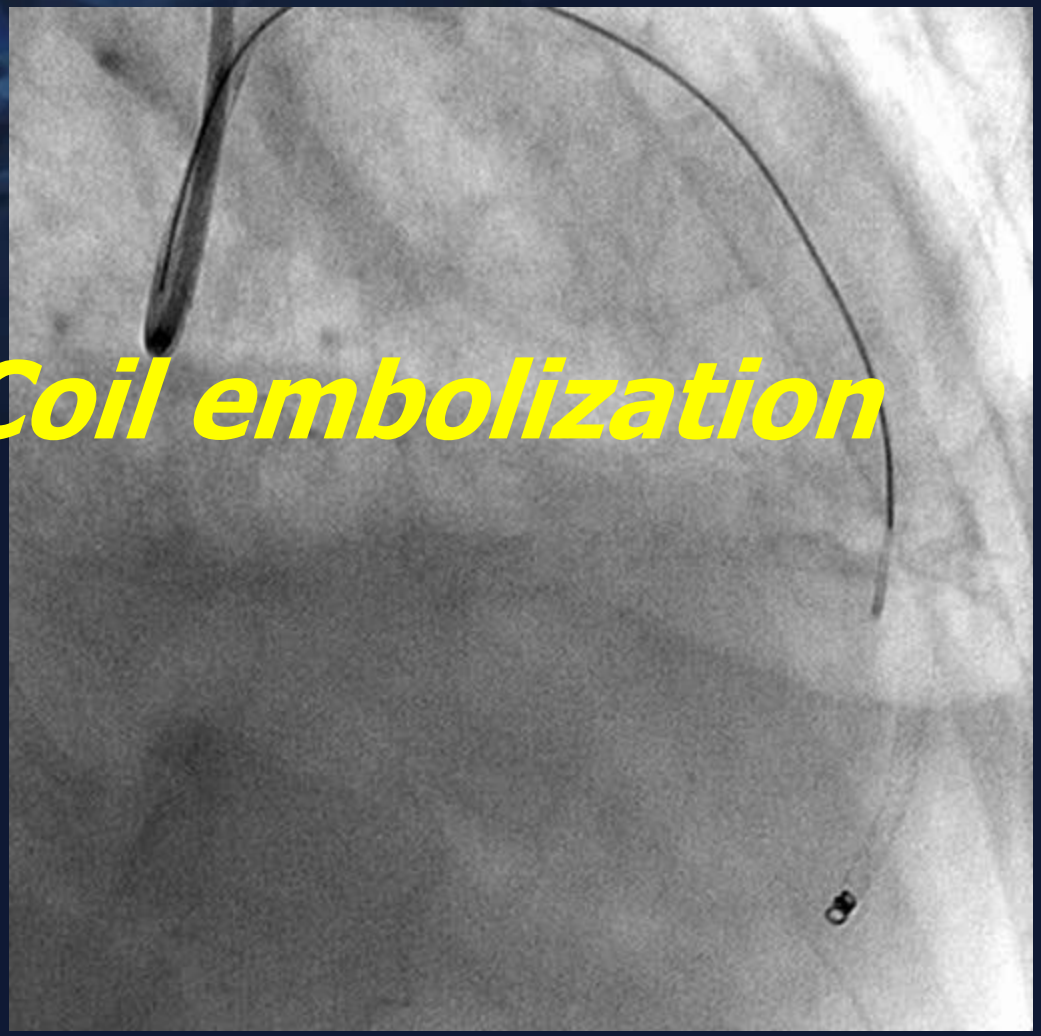


I started IVUS guided wiring
for bilateral coil embolization

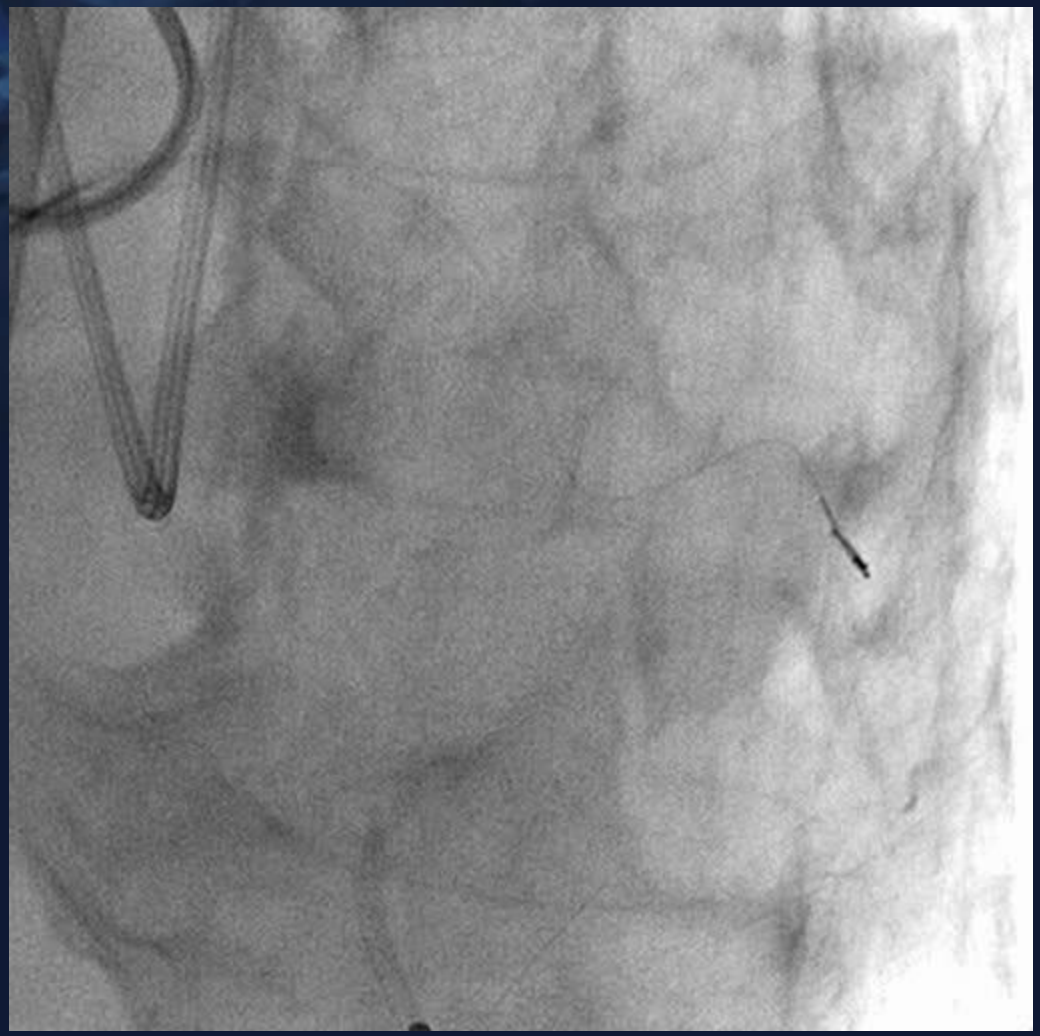
I could get the distal true lumen



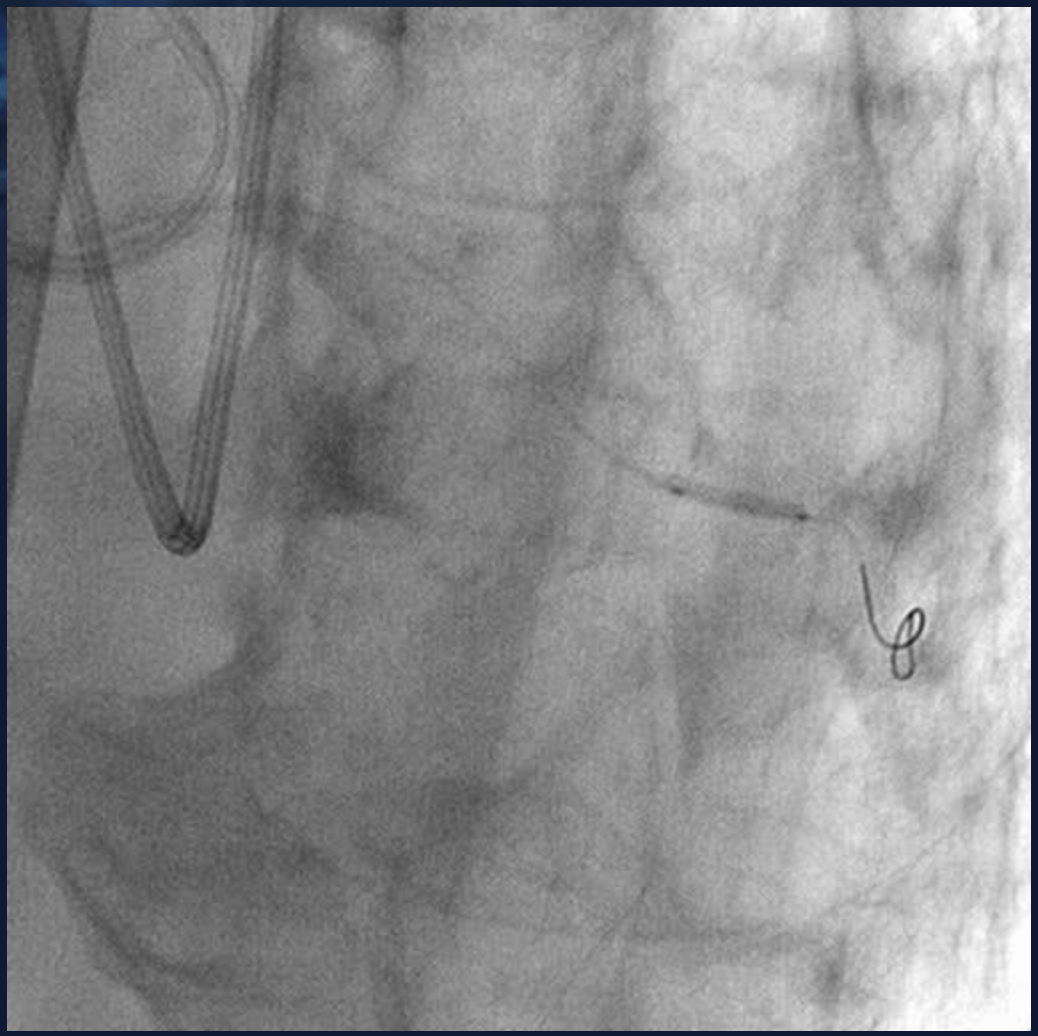
put DES in CTO



I used many coils for stopping the bleeding

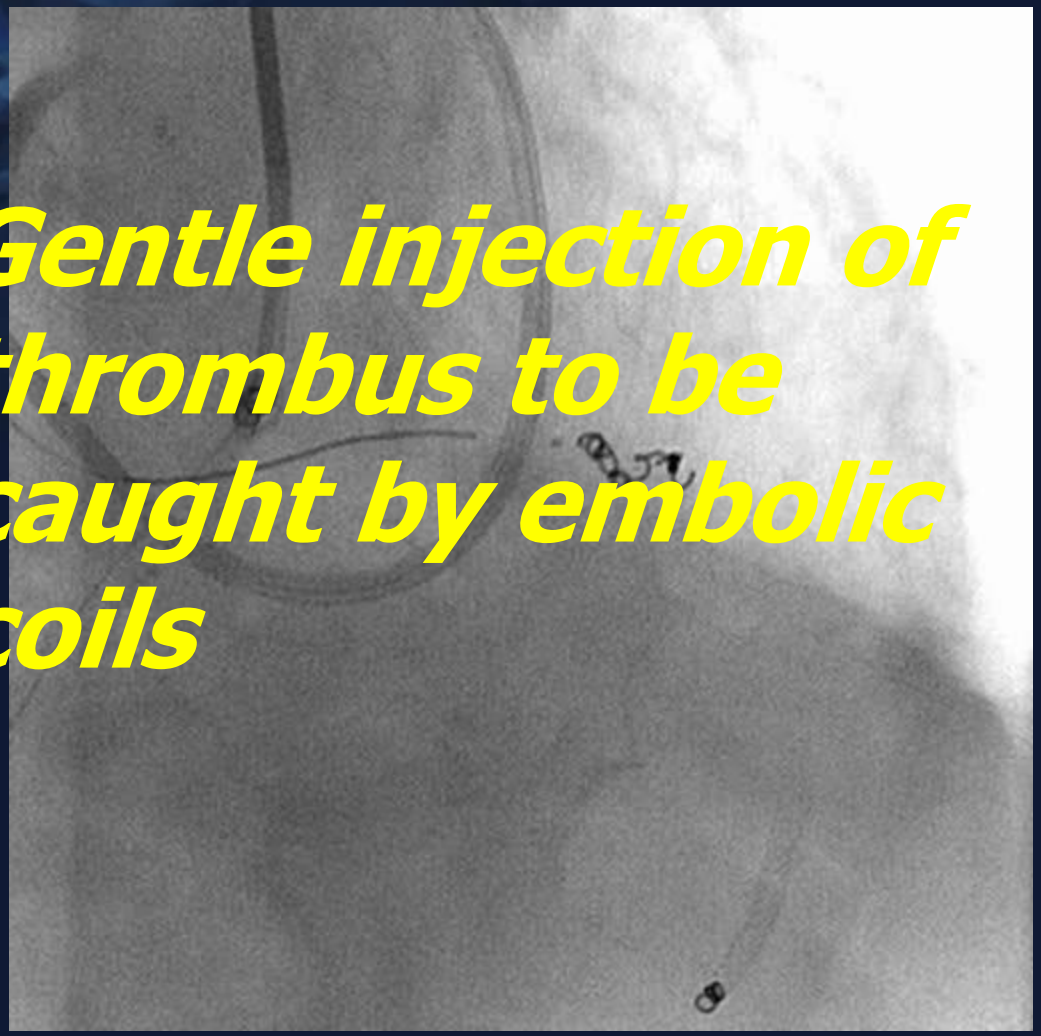


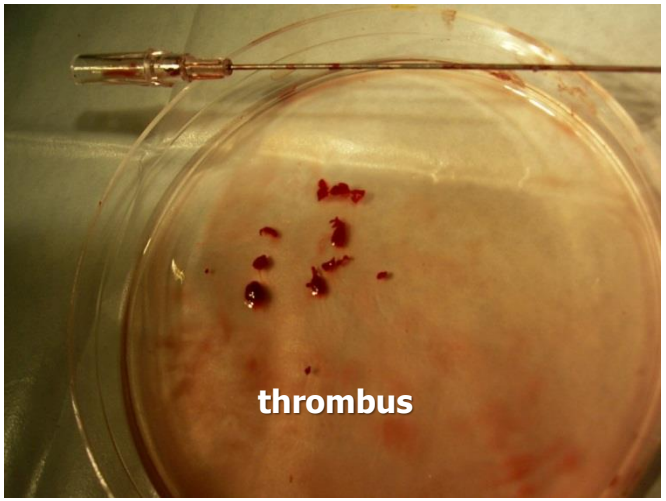
I confirmed the bleeding after coil embolization retrogradely.

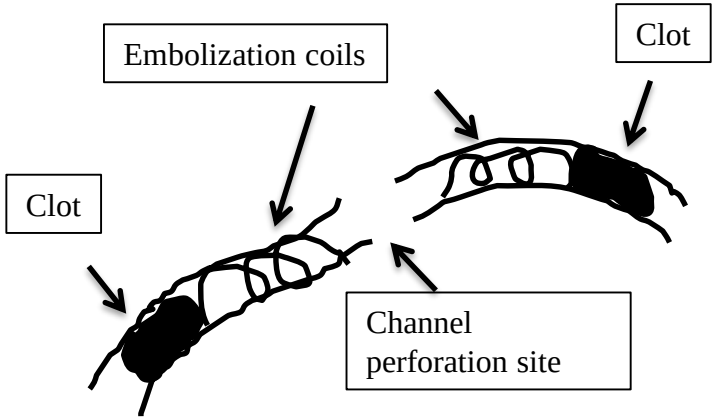


I started PCPS and IABP because hemodynamics couldn't be maintained.

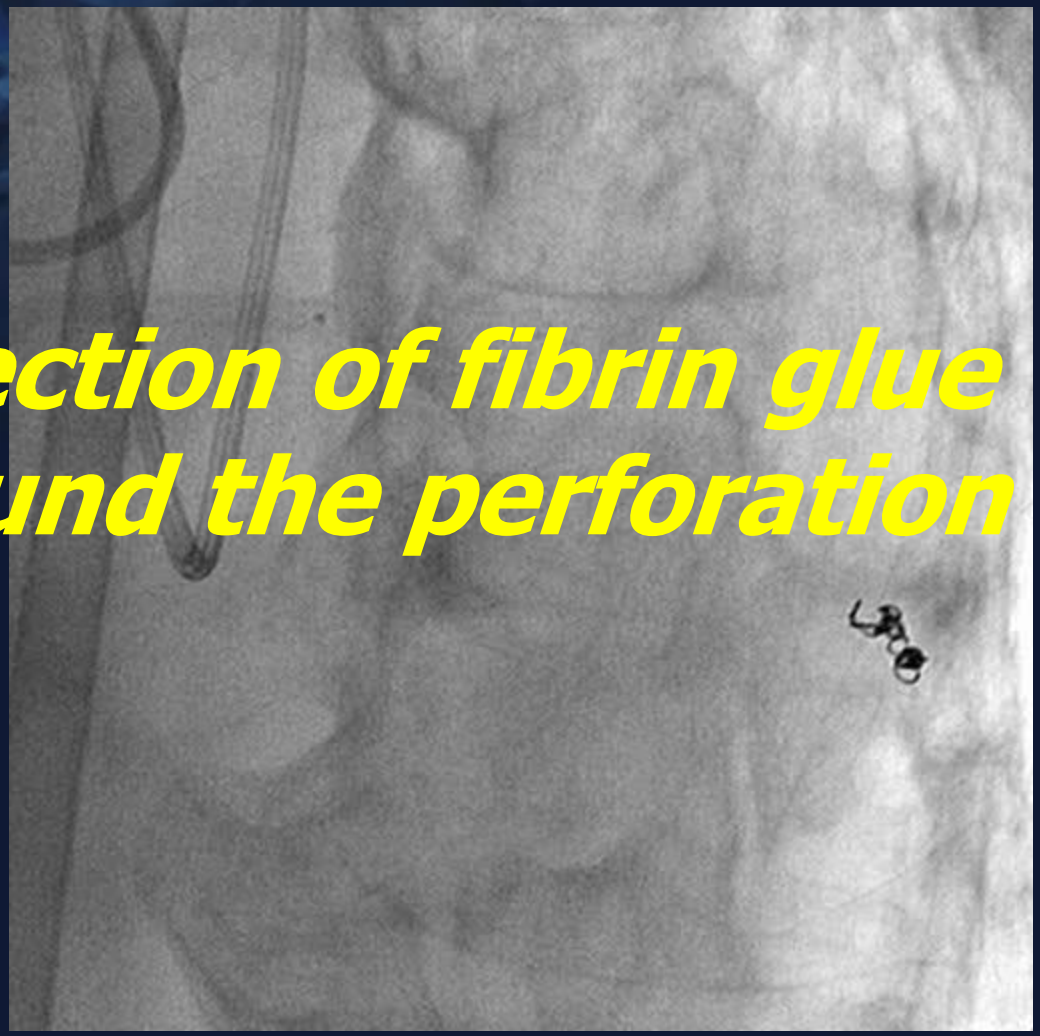
Gentle injection of thrombus to be caught by embolic coils




thrombus


Embolization coils
Clot
Clot
Channel perforation site

Injection of fibrin glue around the perforation site



Still we couldn't control it , I tried injection of Fibrin glue around the perforation site.

Fibrin glue (BeriprastR, CLS Behring)

Injection into Finecross Using 4 syringes

1) A solution of 0.2-0.3cc

2) 0.5cc saline (flash in the micro catheter)

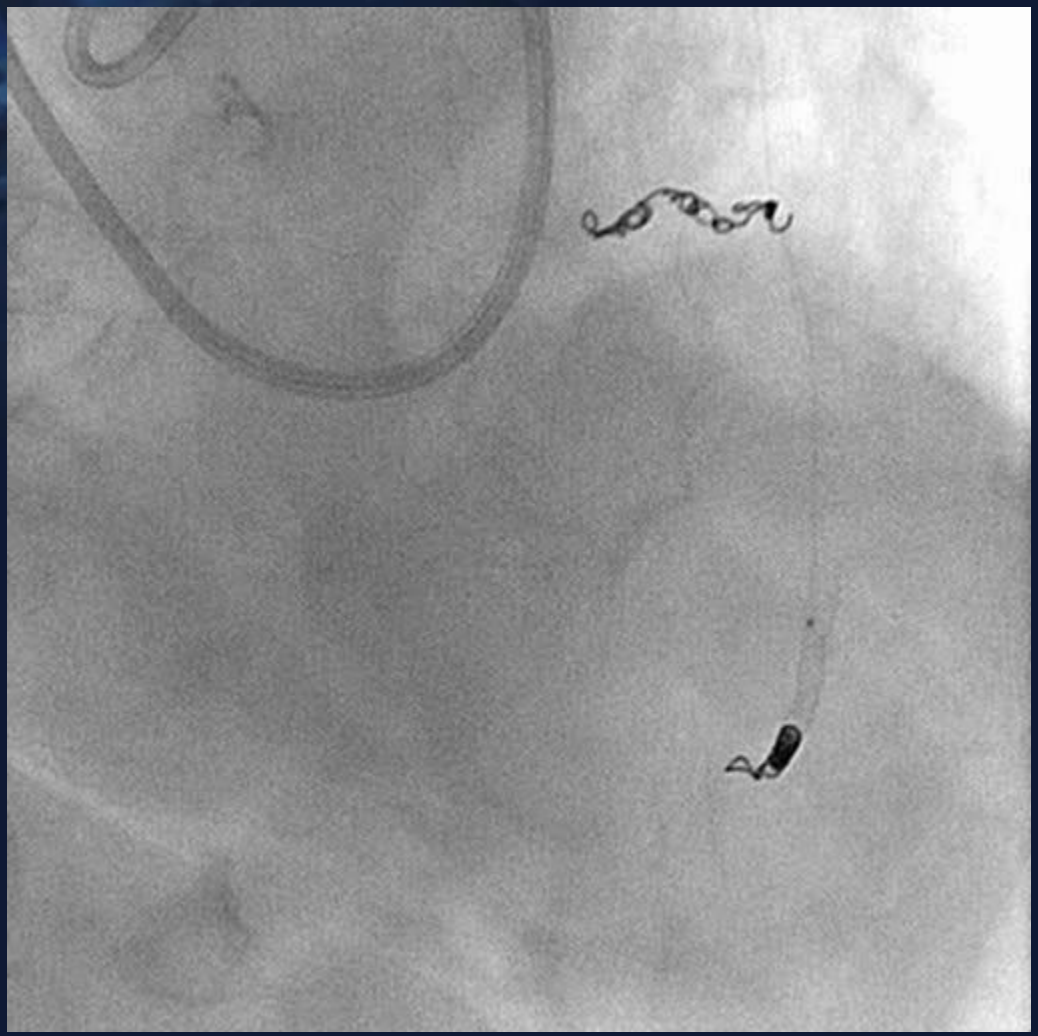
3) B solution of 0,2-0,3cc

4) 0.5cc saline (flash in the micro catheter)

Problems:

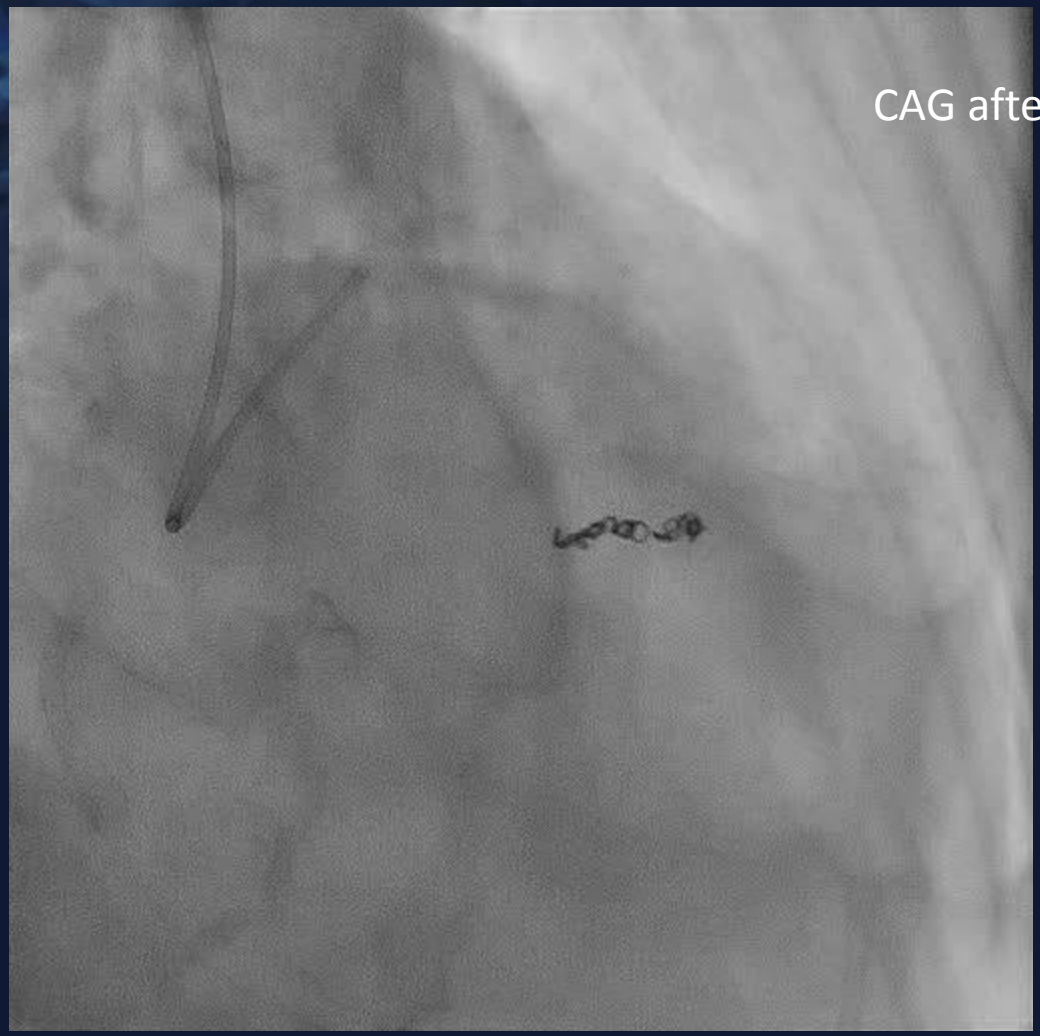
Intravascular administration is not Insurance adaptation

Blood products

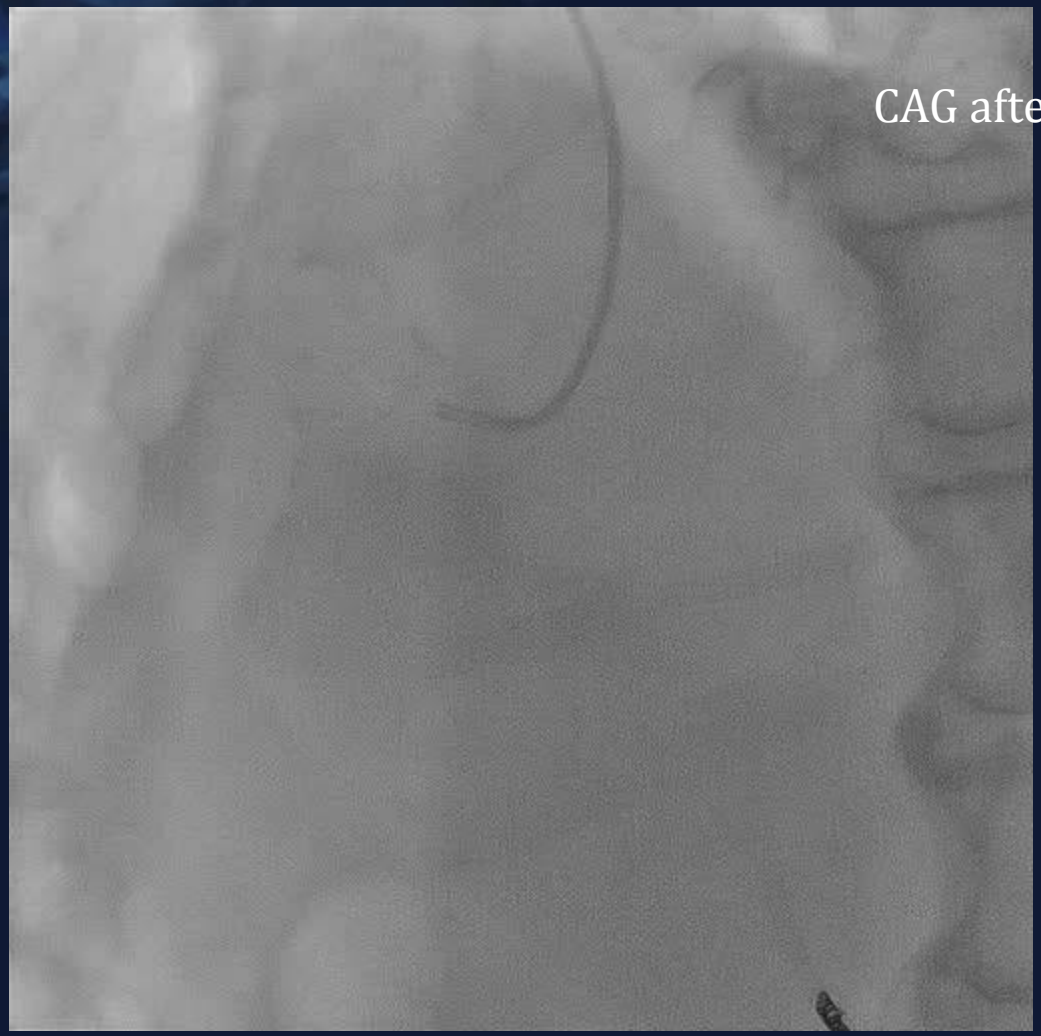


I managed to stop bleeding.

CAG after 3 weeks of PCI



CAG after 3 weeks of PCI



2 Coronary perforation

↓

cardiac tamponade

Pericardial drainage

A management of coronary perforation

Balloon dilatation with heparin neutralization

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Extravasation (+)

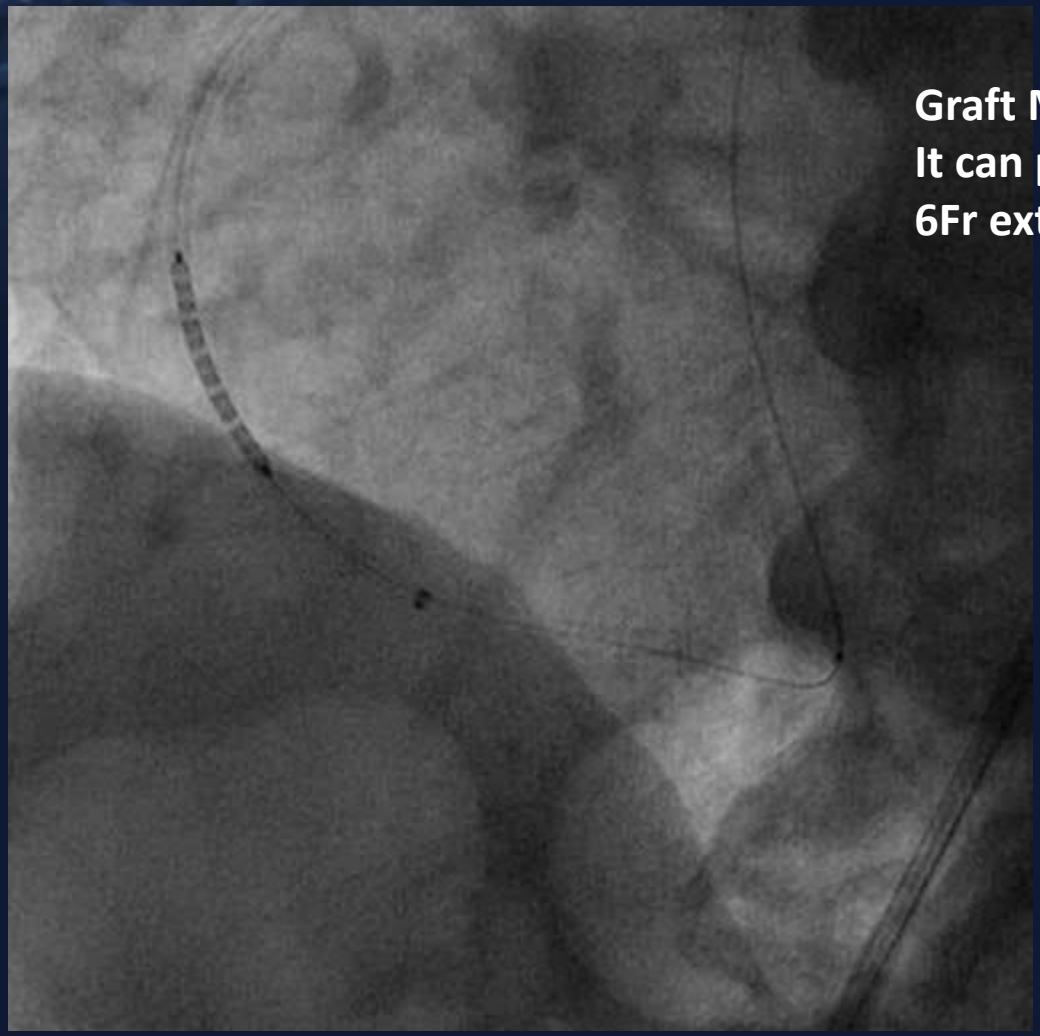
Long inflation with perfusion Balloon or crossing GuideLiner (6Fr)

↓

Extravasation (+)

GraftMaster implantation

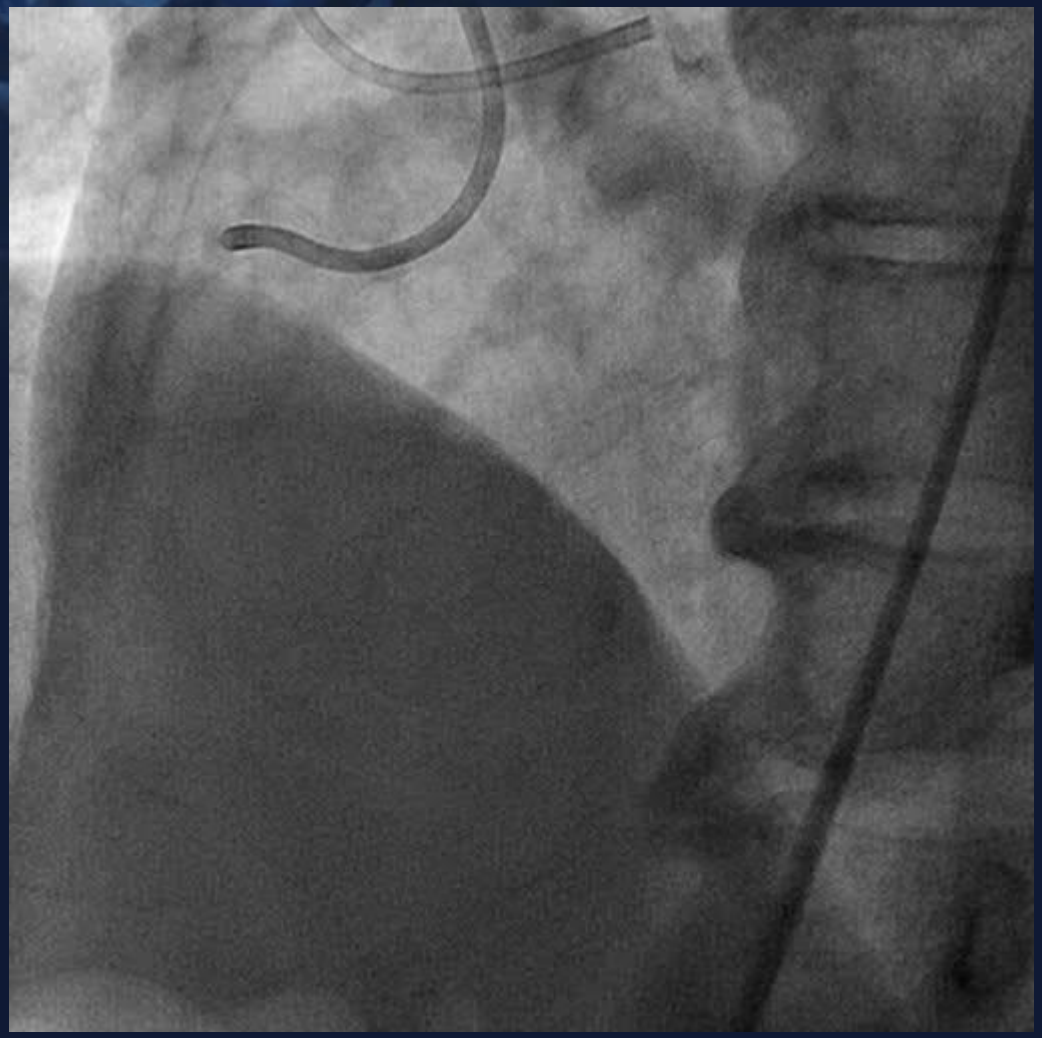
Graft Master



Graft Master 2.8×19mm
It can pass through into
6Fr extension Guide

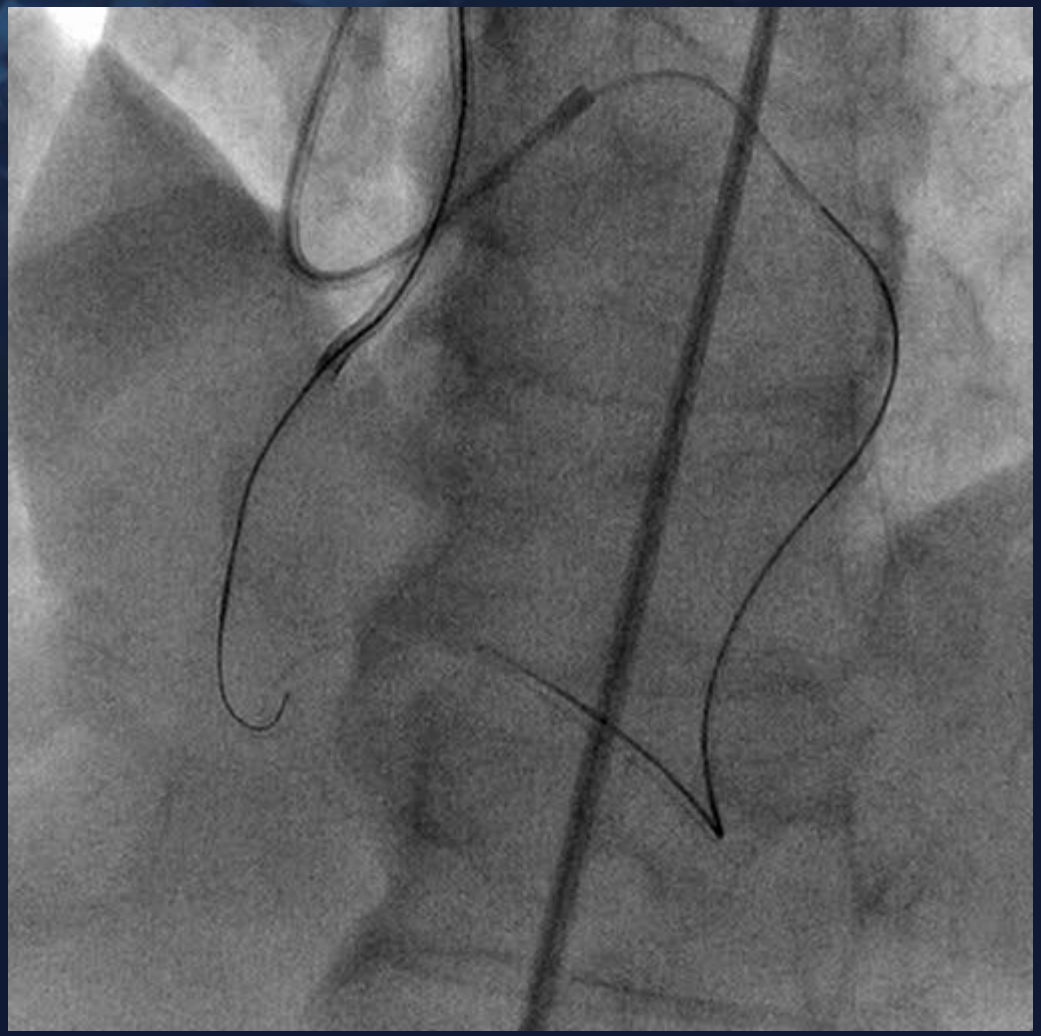
Case 3 (Coronary perforation)

LAO 50



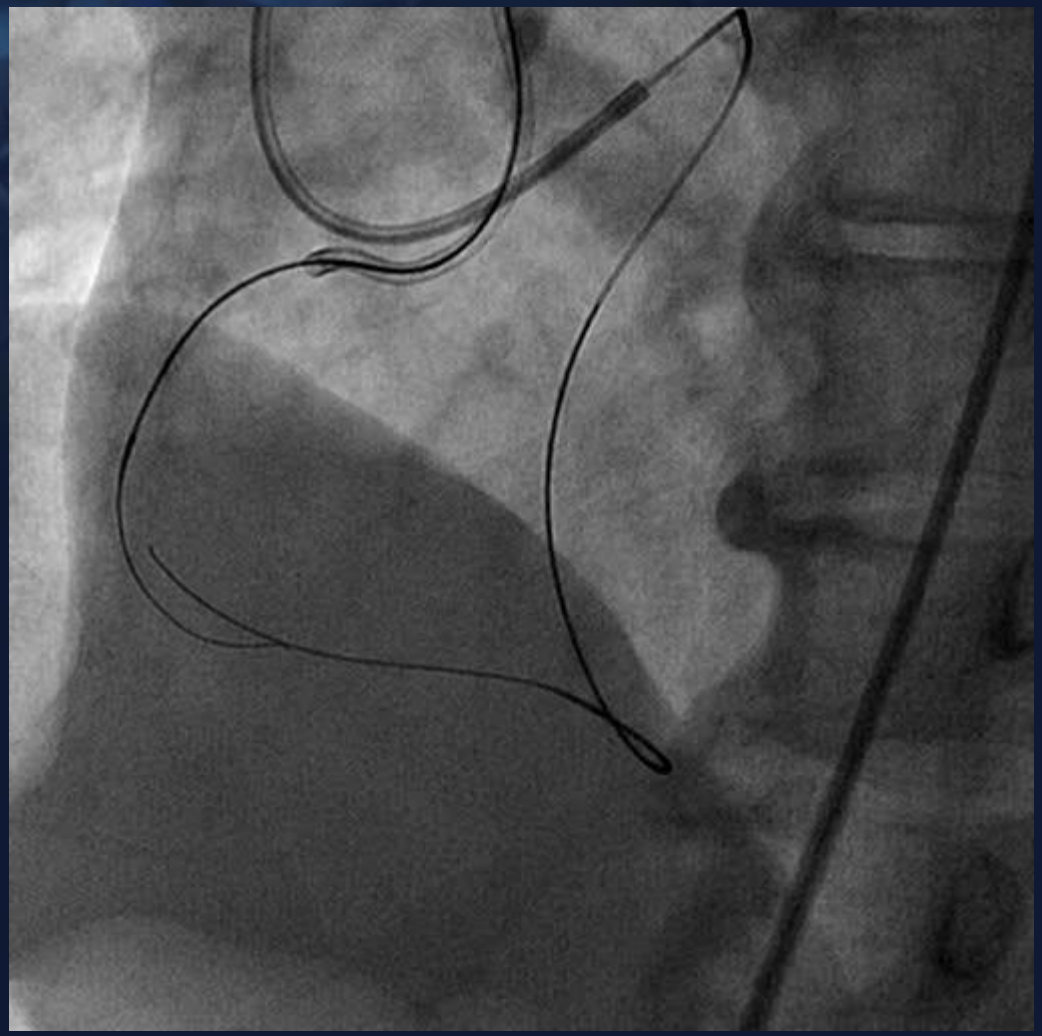
Approach : rt FA-7Fr
rt RA-6Fr

RCA : SAL 1 SH 7Fr
LCA : SPB 3.5 6Fr

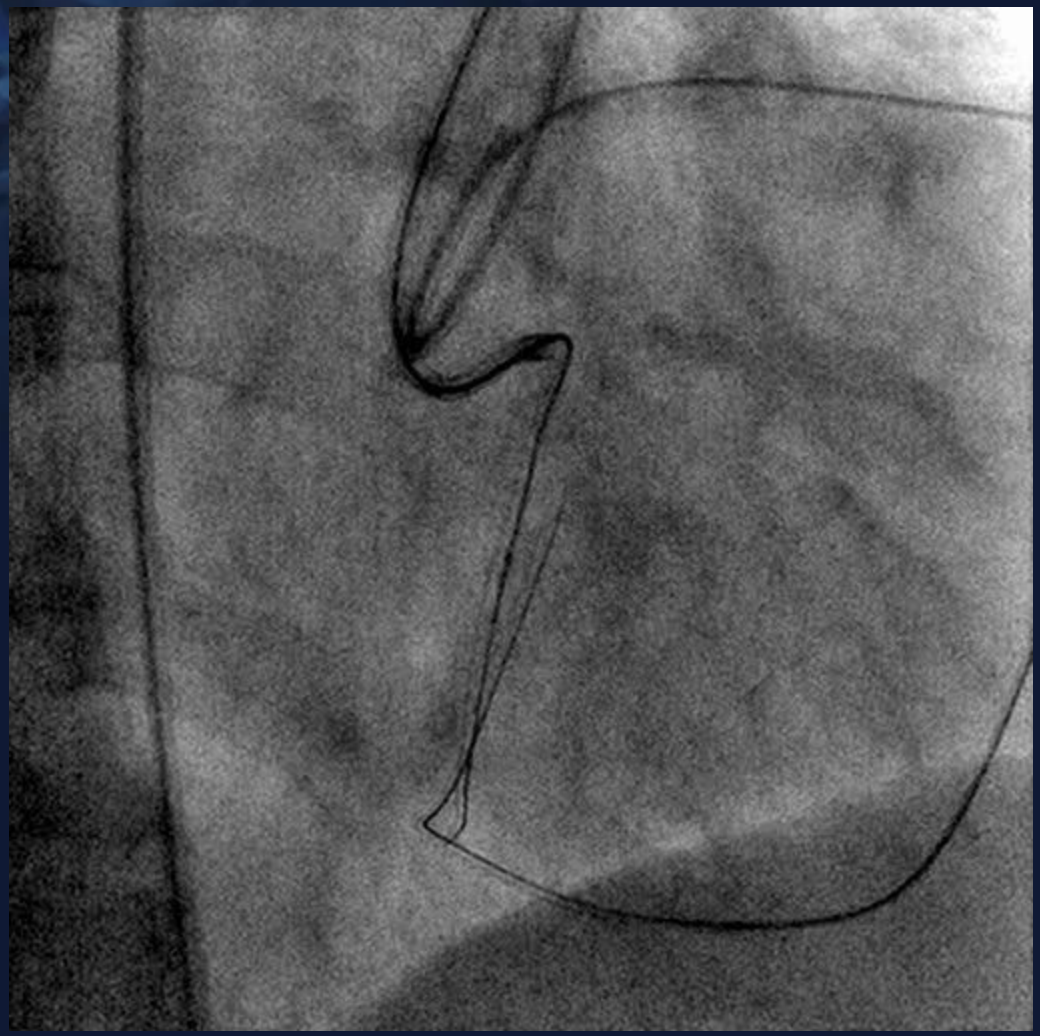


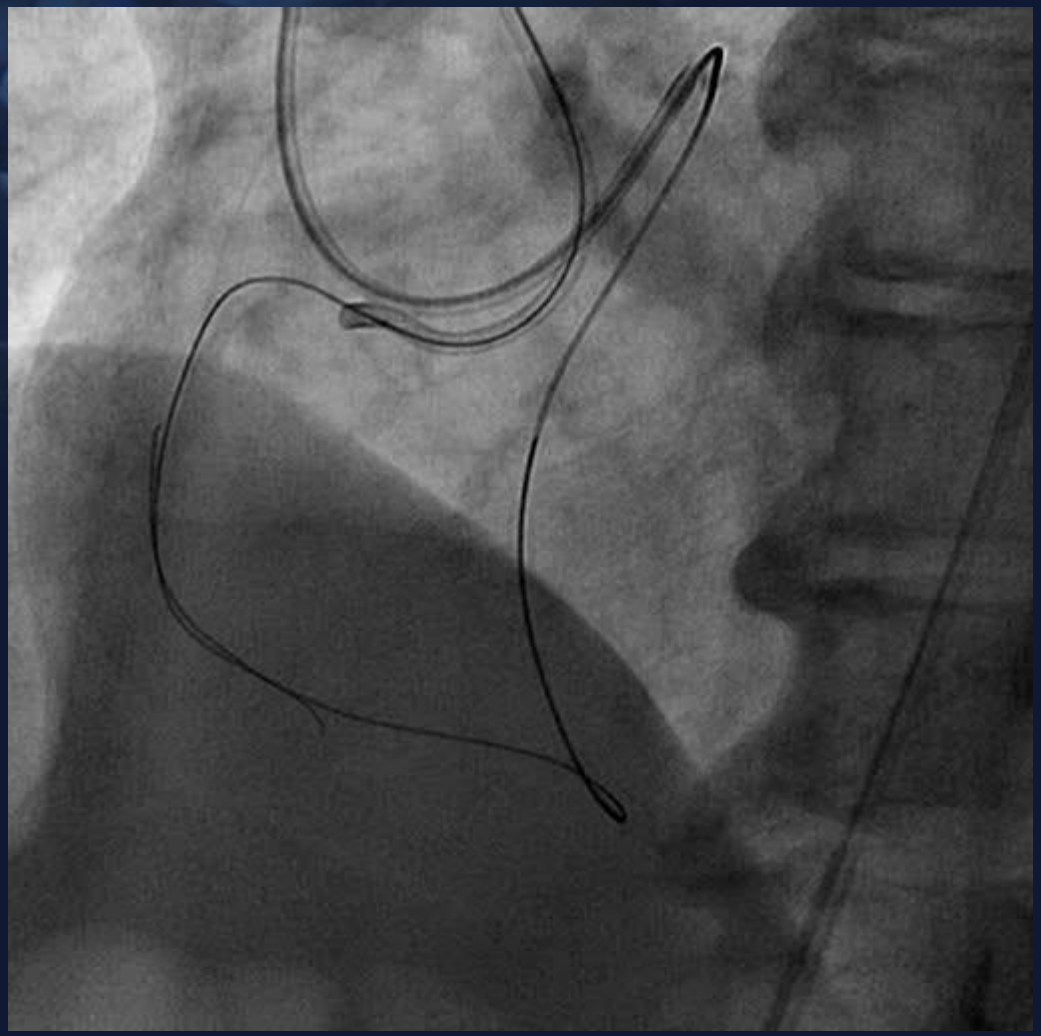
Retrograde wire :
XT-R ,Ultimate bros ,
Gaia 2ndCould not enter.

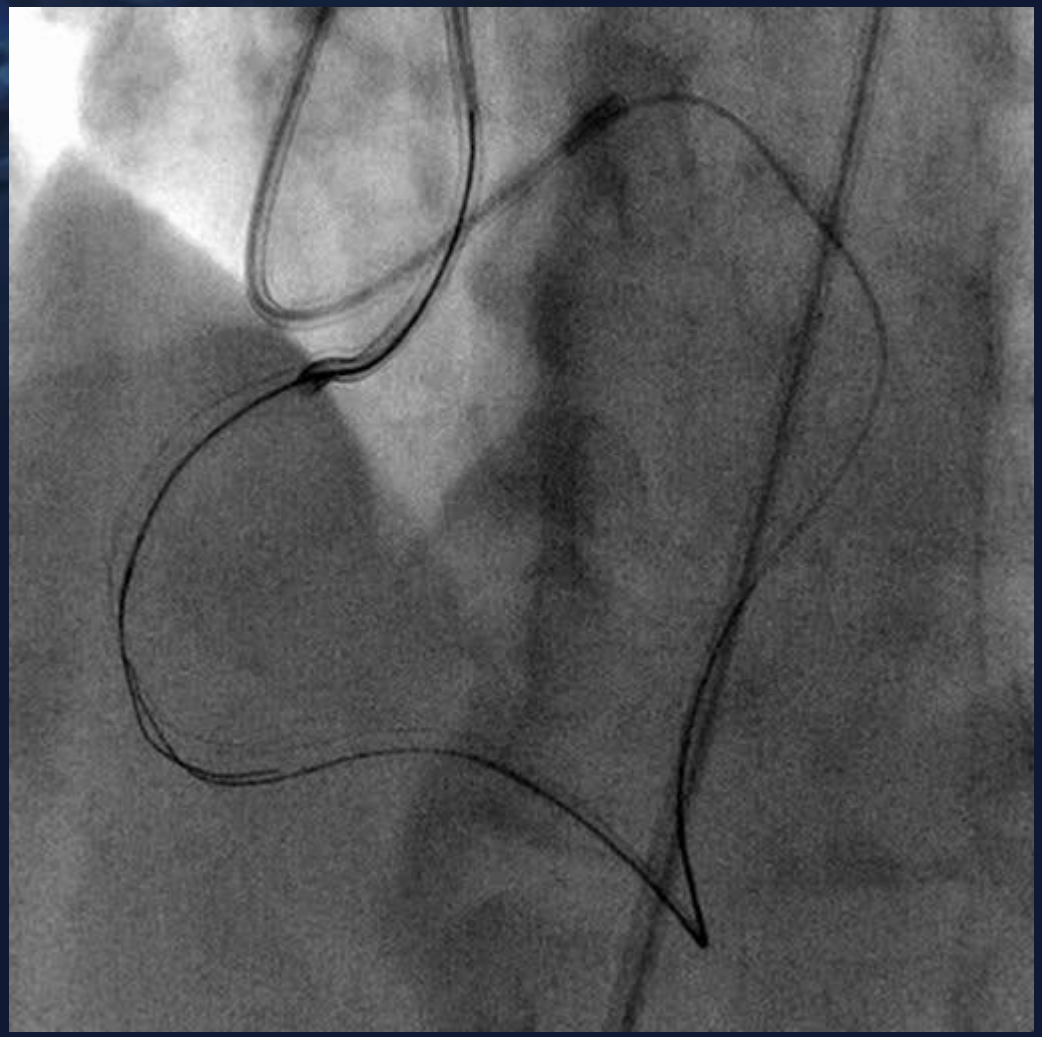
Gaia 3rd was able to advance
To the distal of CTO

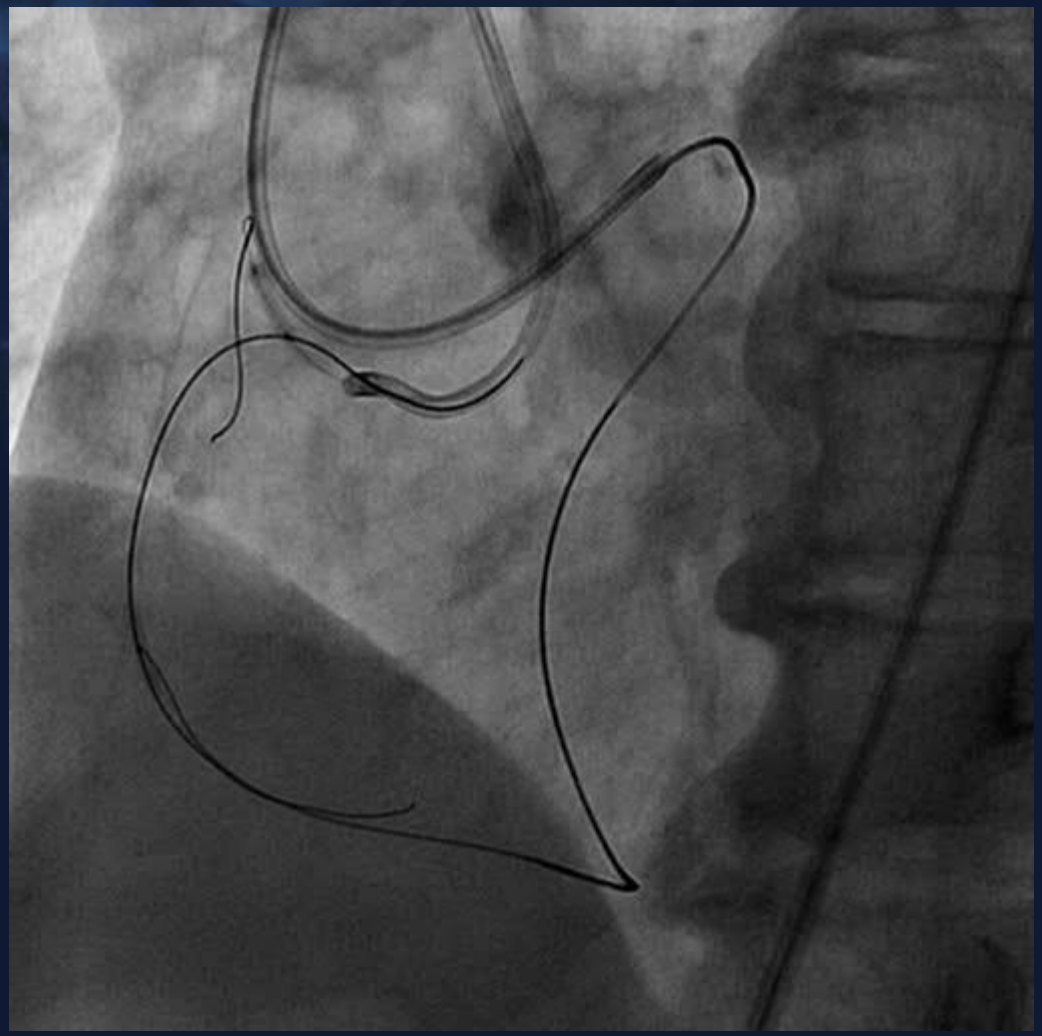


Both of wires have gone to the direction that seems to the extravascular many times.

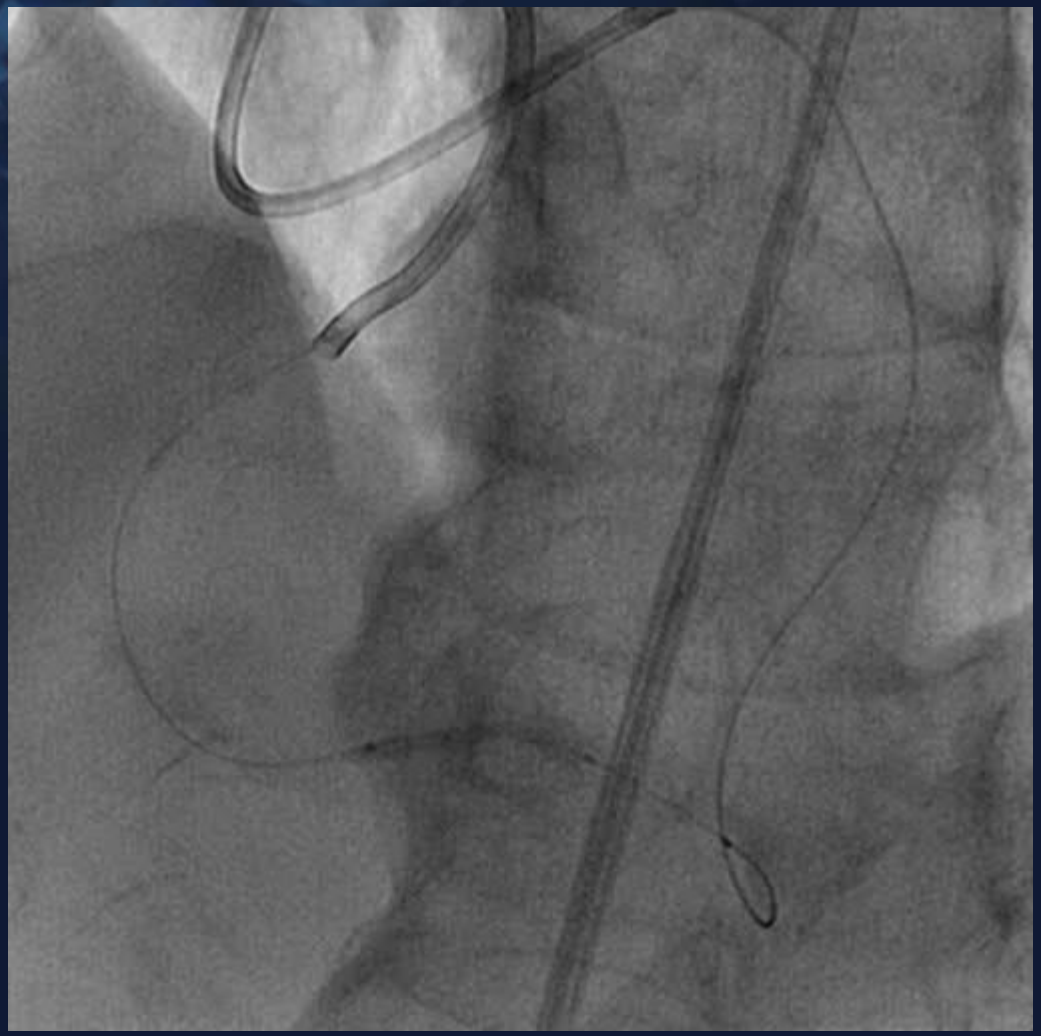






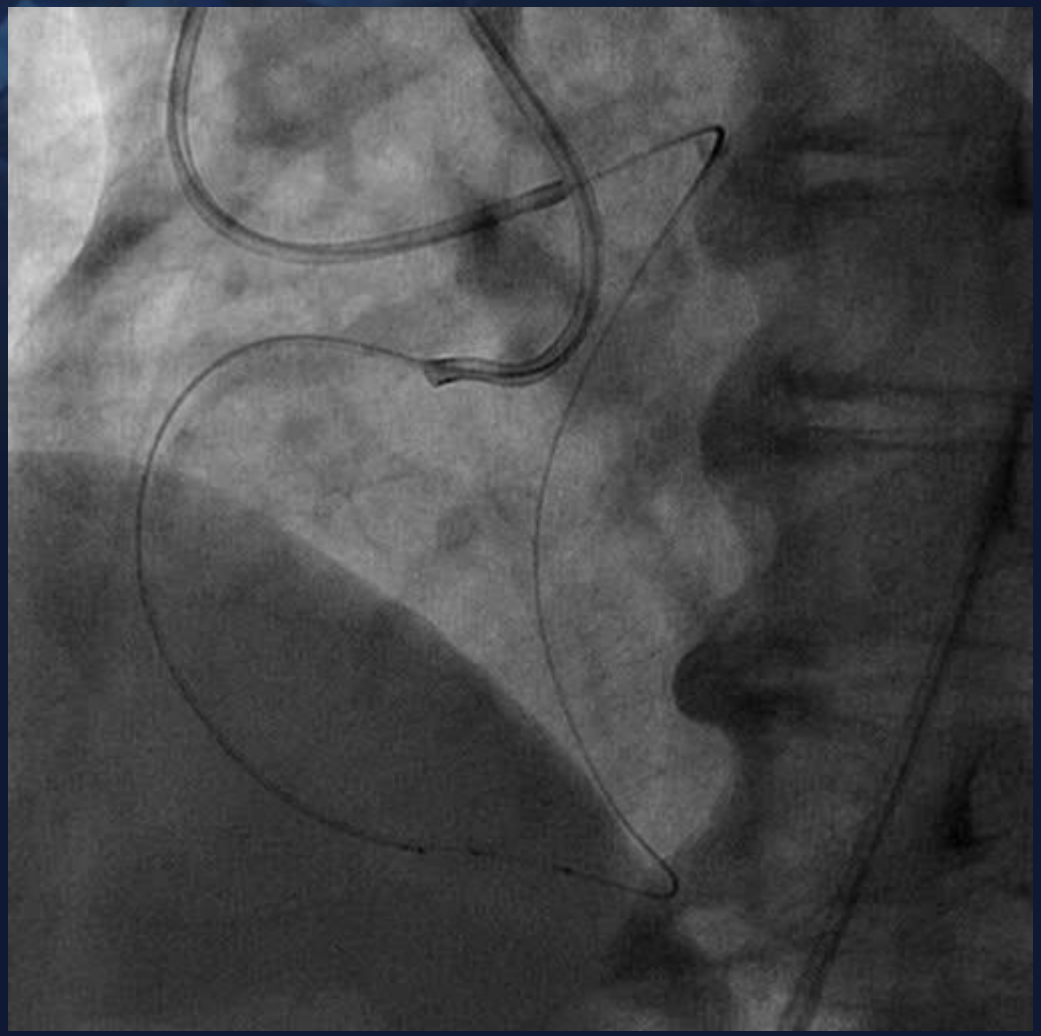


I have dilated the CTO lesion with 1.5mm balloon for the IVUS
using balloon anchor.

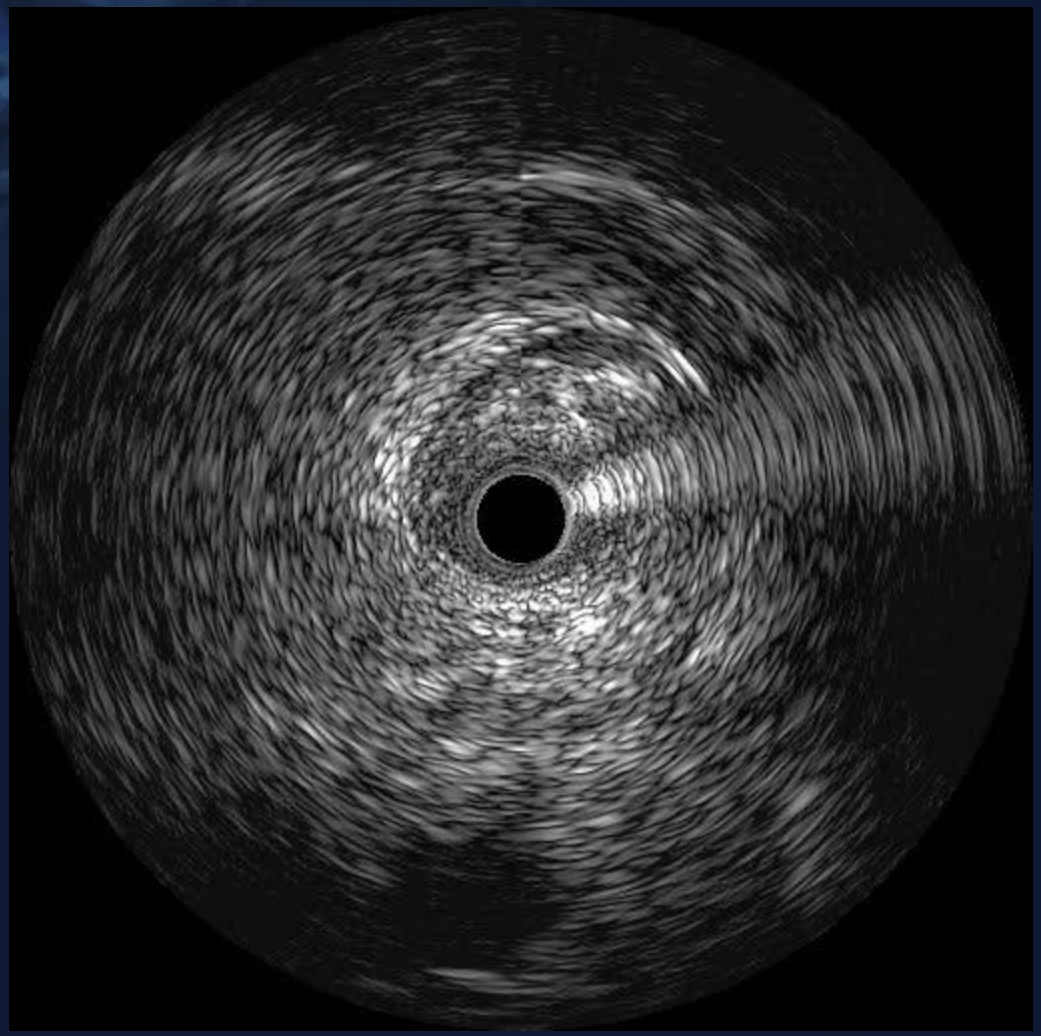


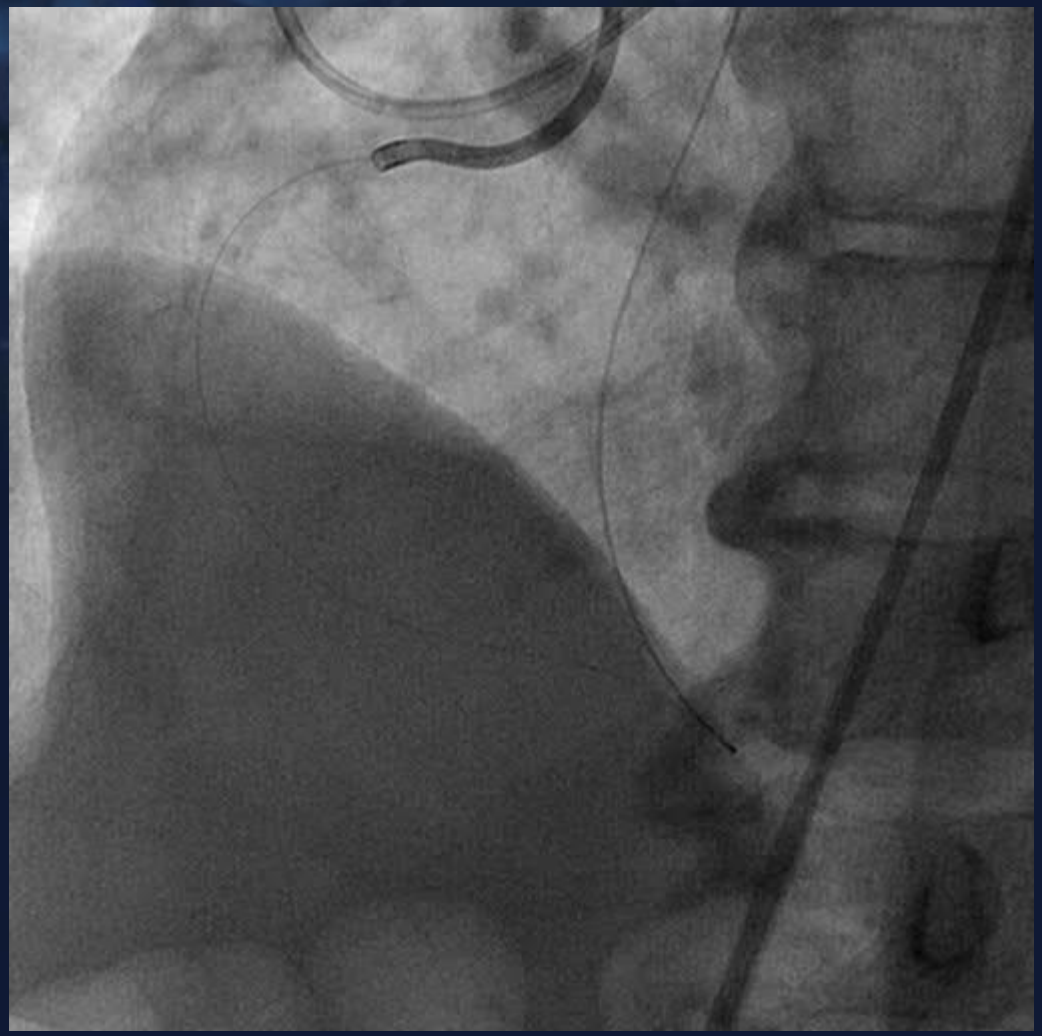
Externalization

I dilated with 2.0mm balloon
Because
IVUS catheter could not
Cross to the lesion

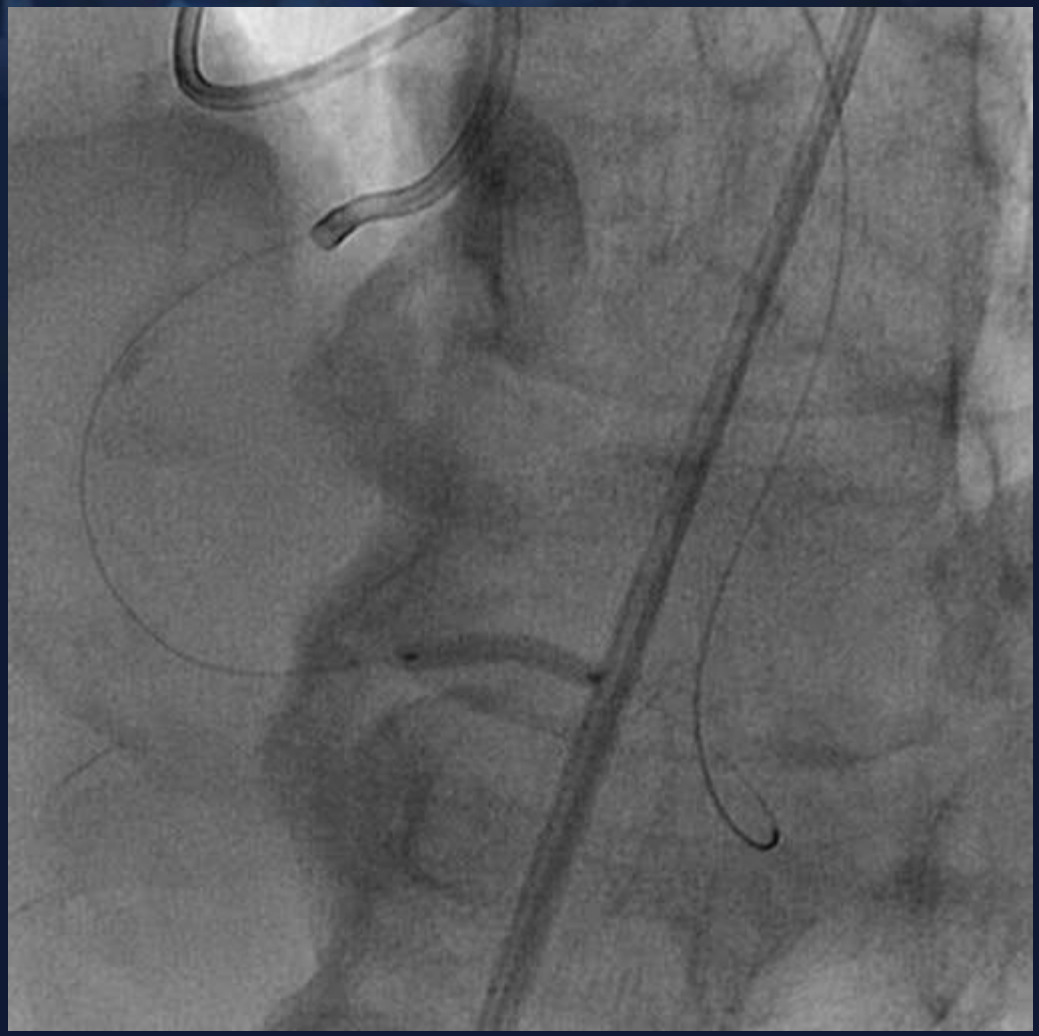


IVUS

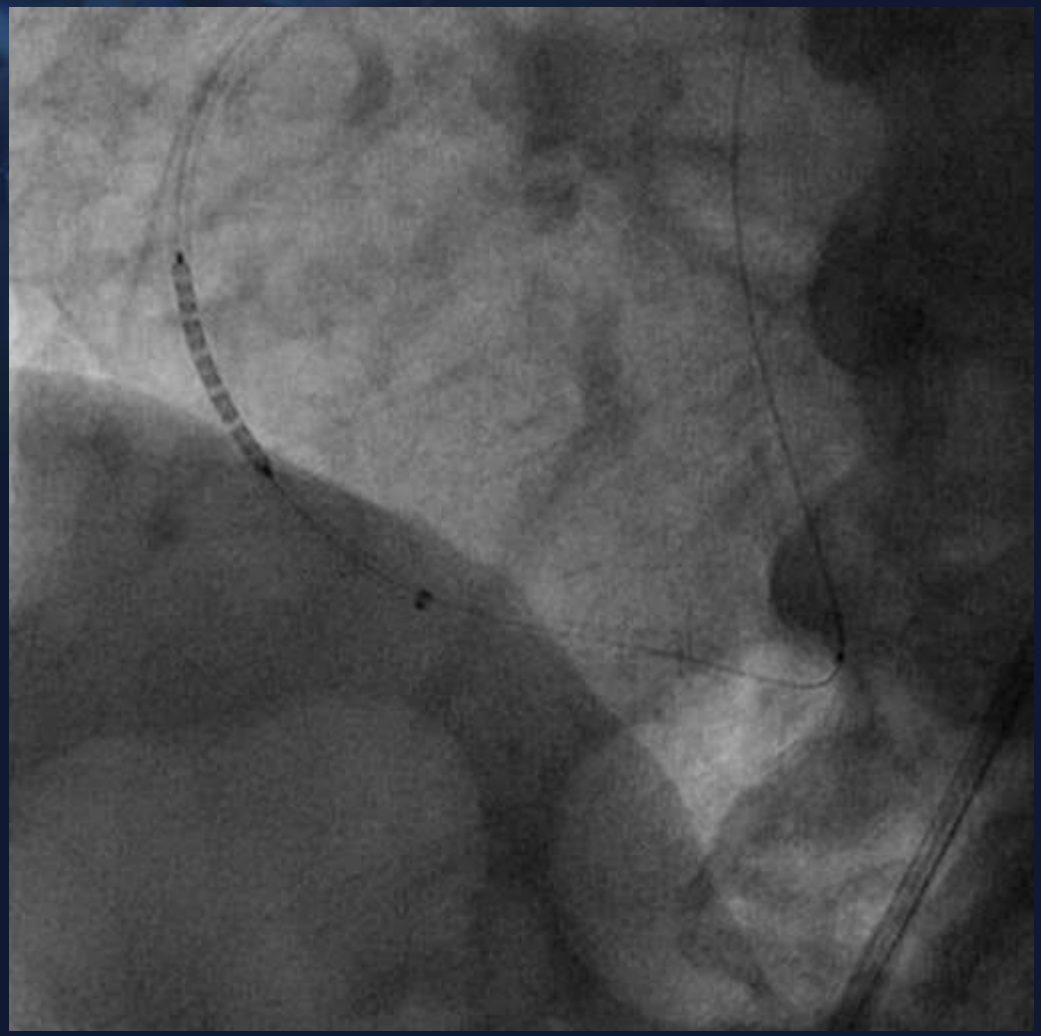




I confirmed the bleeding.

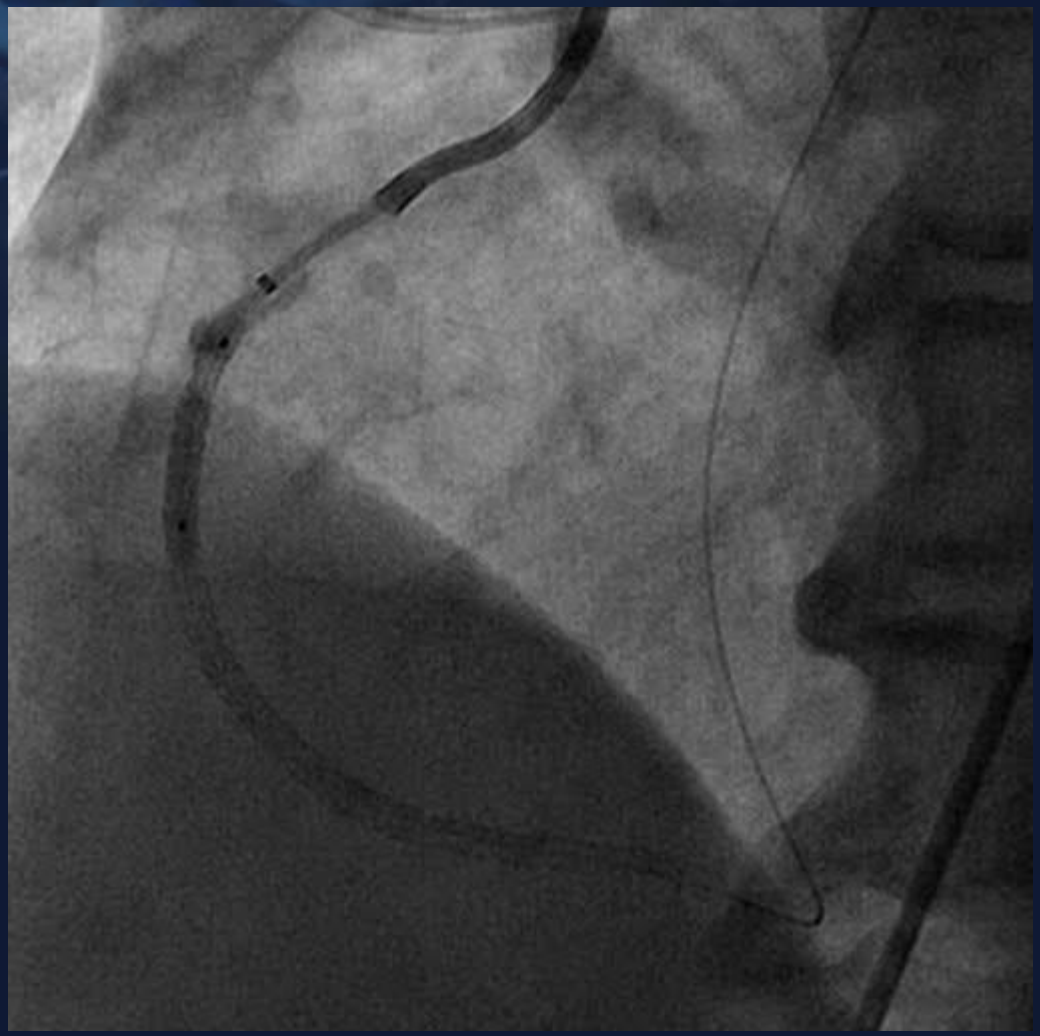


I have put the STENT(2.5×18mm EES)
in the bifurcation and long inflation
for stopping the bleeding
from retrograde.

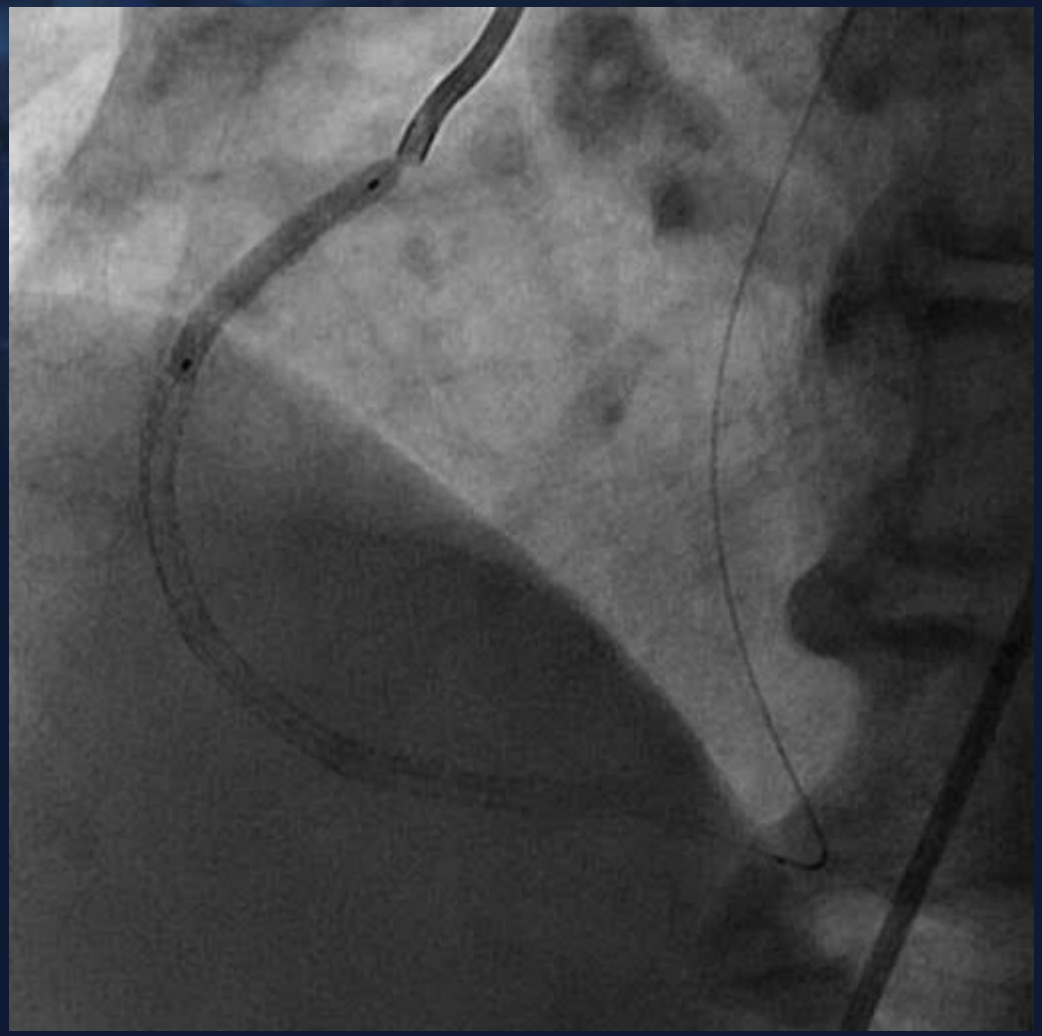


Graft Master 2.8×19mm

After putting
DES in the bifurcation

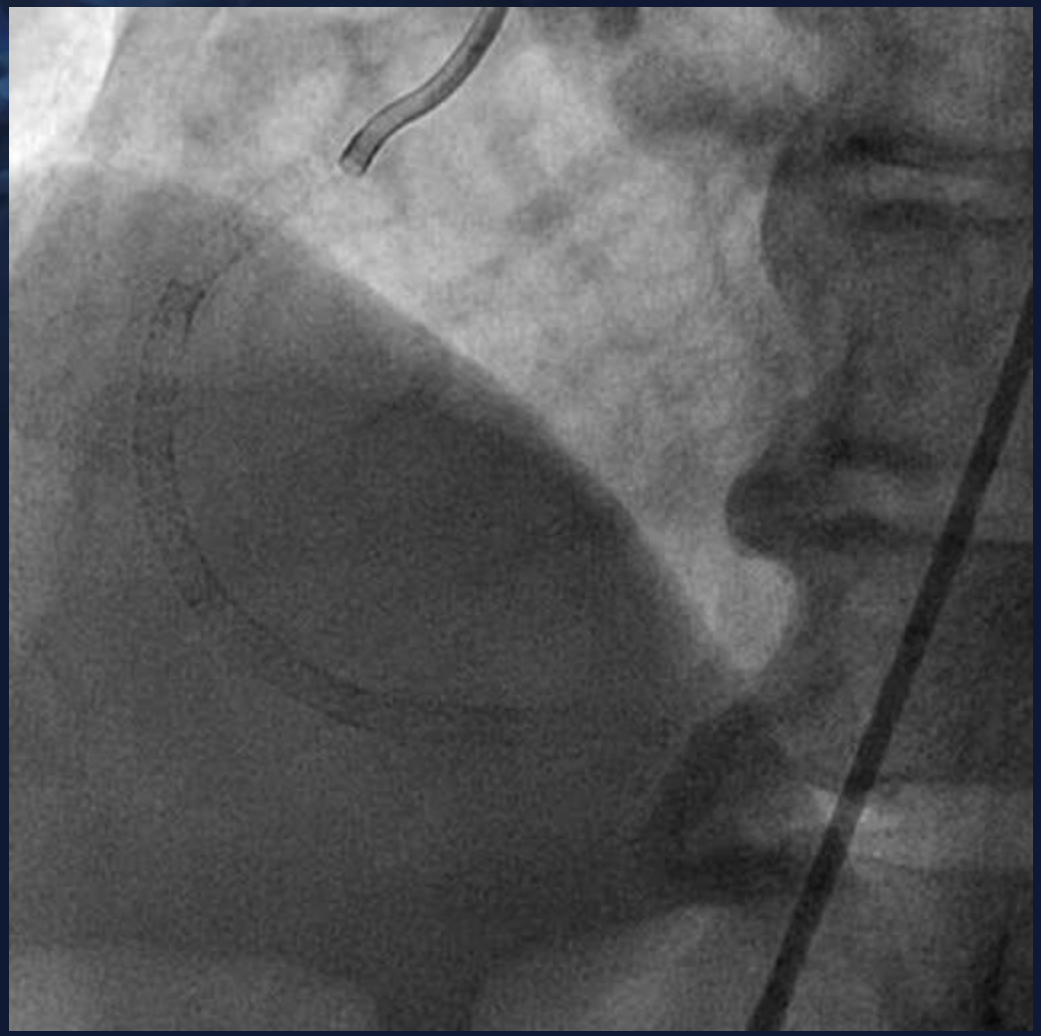


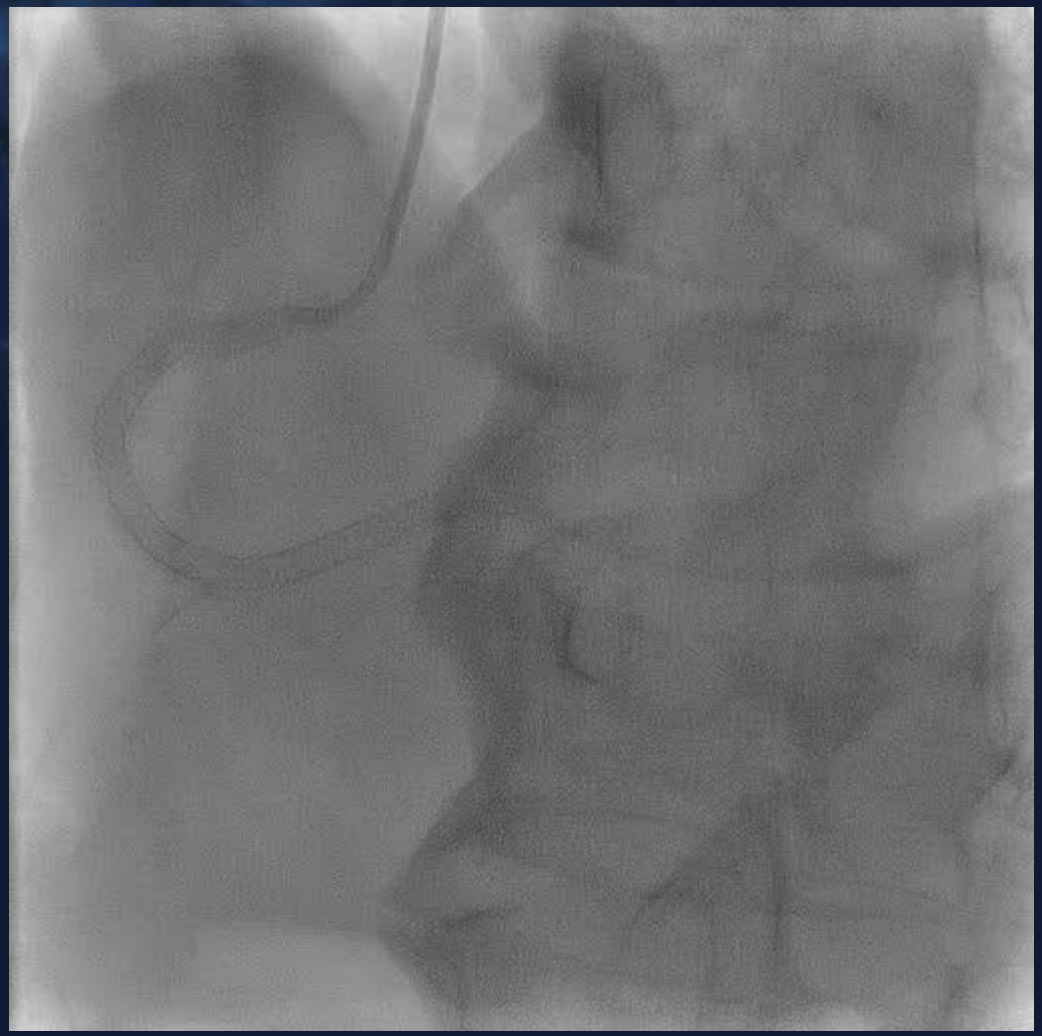
I confirmed to control
the bleeding
after 4 Graftmasters.



DES 3.0×23mm

Final angio





f/u angio after 3 years

GRAFTMASTER
Compatibility with Child-Catheter

	GuideLiner 5.5F V3	GuideLiner 6F V3	Guidezilla 6F	ST- 01 4F KIWAMI	ST- 01 5F
2.8mm	×	○	○	×	○
3.5mm	×	○	○	×	○
4.8mm	×	×	×	×	△

○ 抵抗なし　△ Guide部に入る時、出る時に抵抗有り　× 使用不可

参考データ	内腔径
ST-01 KIWAMI 4F	0.050inch (1.27mm)
ST-01 5F	0.059inch (1.50mm)
GuideLiner V3 5.5F	0.051inch (1.30mm)
GuideLiner V3 6F	0.056inch (1.42mm)
Guidezilla 6F	0.057inch (1.45mm)

＊社内体外実験　n=1

Summary

- Collateral channel injury is the most common complication in the retrograde approach, however two-thirds of them don`t require additional treatment.
- Bilateral coil embolization is sometimes necessary if a collateral channel is injured during the retrograde approach.
- Coronary perforation is a serious complication of CTO-PCI, and appropriate and prompt treatment is required to prevent the development of serious situations in patients.