VSD closure in 2016: An overview

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Device closure of VSD

Device closure for VSD, there is ……

- No data
- No clinical trial
- No consensus
- No evidence
- No protection

Device closure of VSD

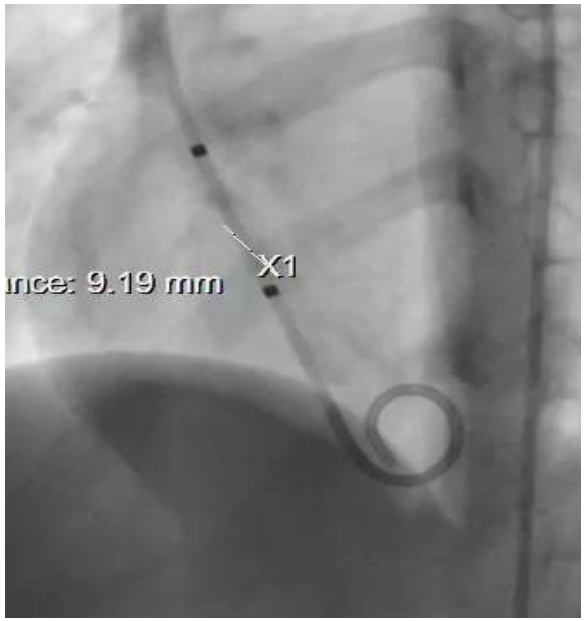
But……

- It’s true
- Some experience from centers
- Some case series reports
- Really necessary
- Need: evidence from publication

How?

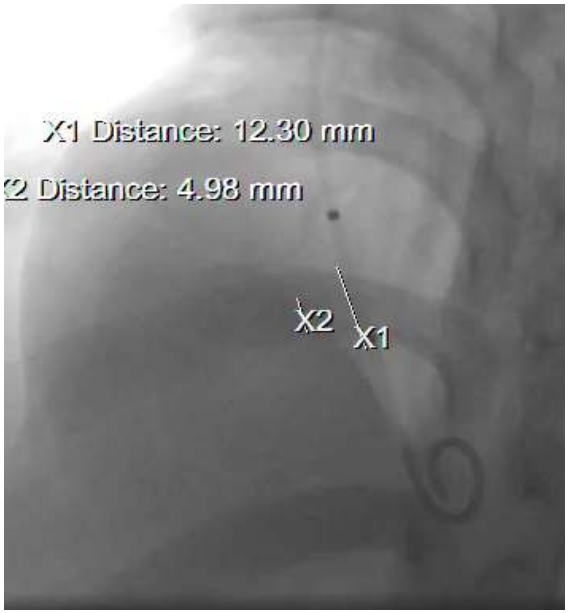
LV angiography for VSD

Pm VSD



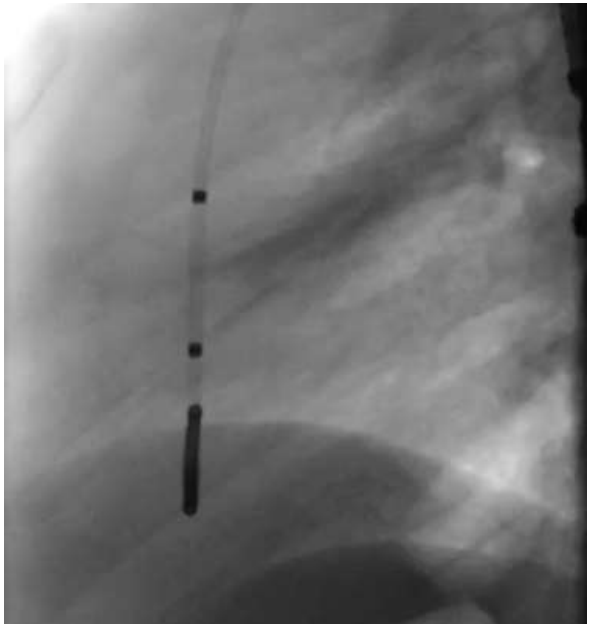
LAO 30°/ CRA 30°

Subaortic VSD



LAO 60°/ CRA 20°

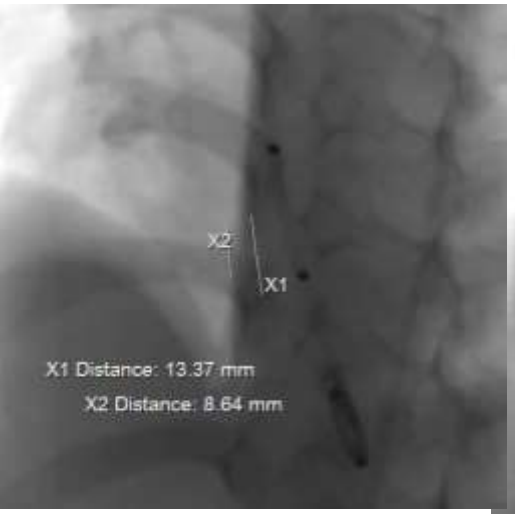
DC VSD

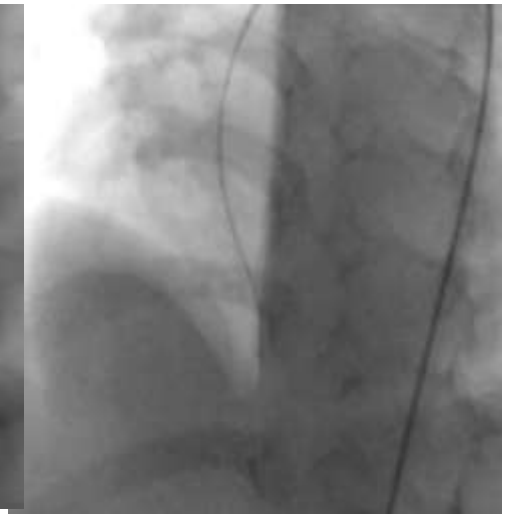


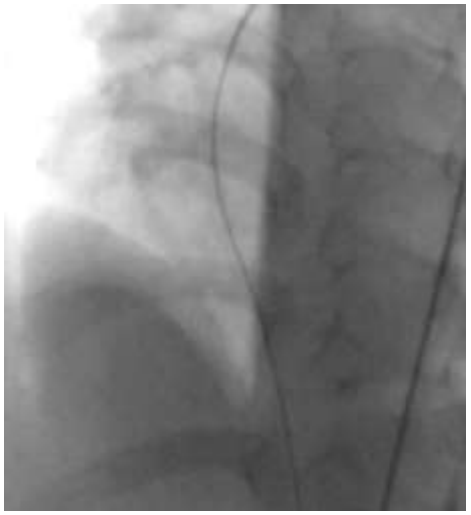
LAO 90°/ 0°

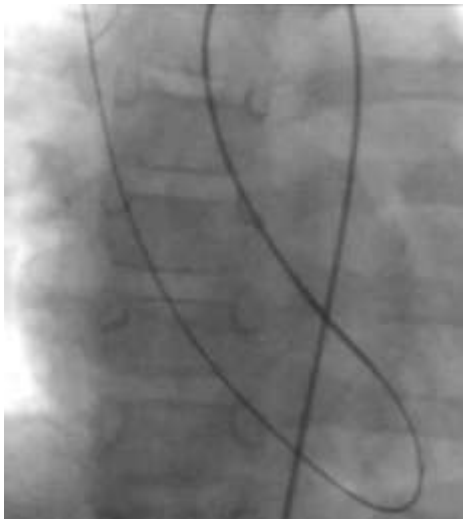
Crossing the defect

Avoiding TV entangling: Control the wire to SVC or PA



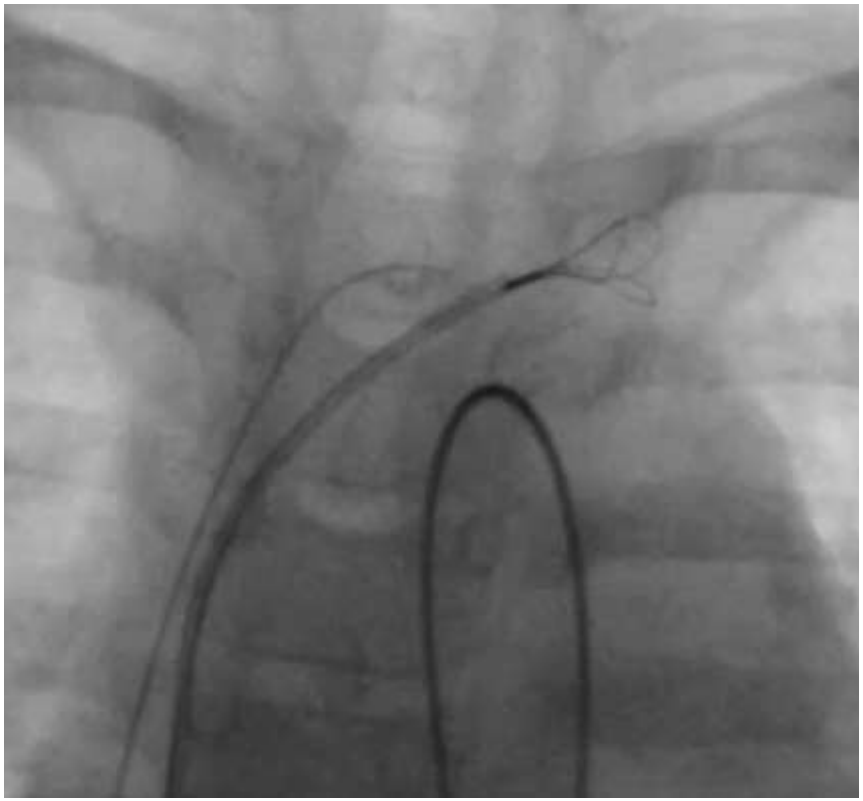


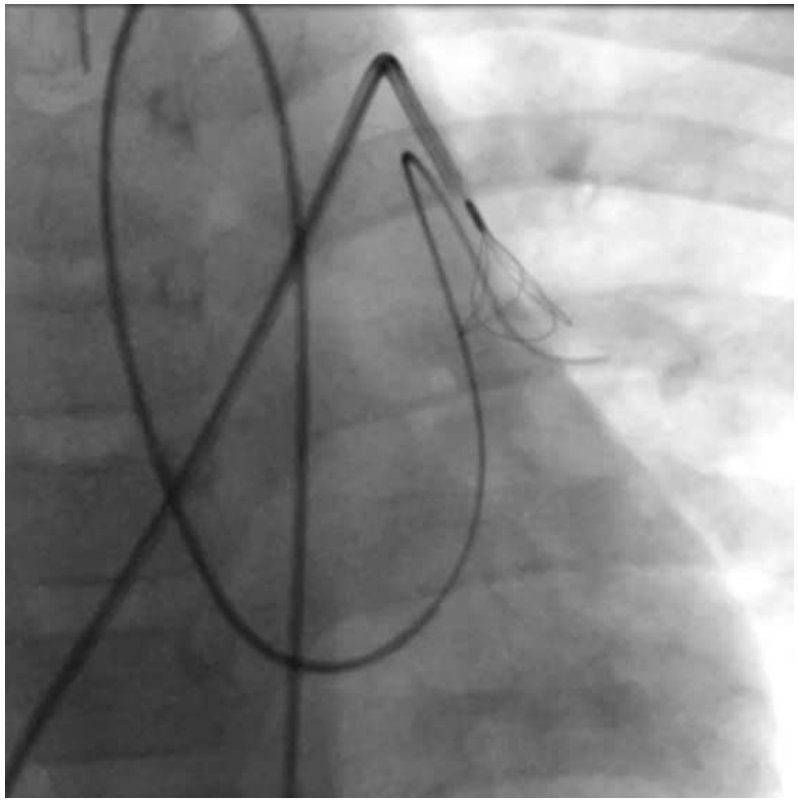




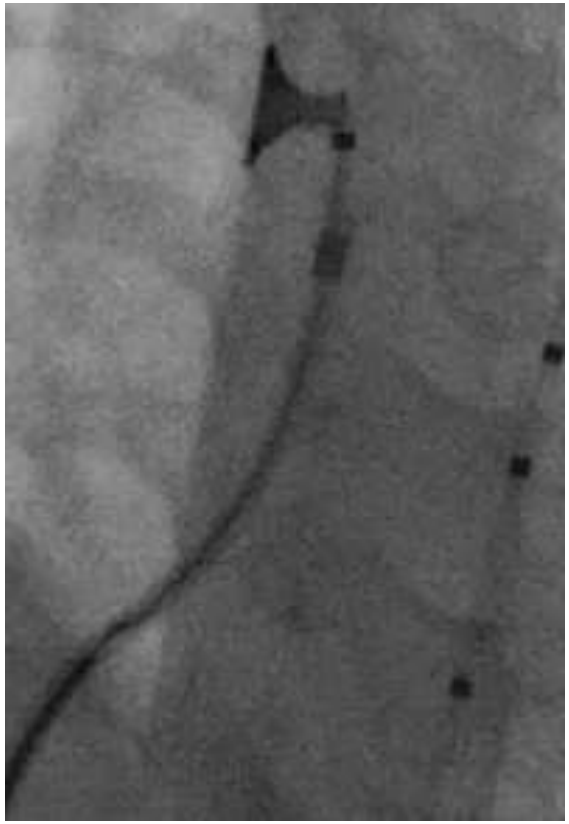
VSD closure: step by step

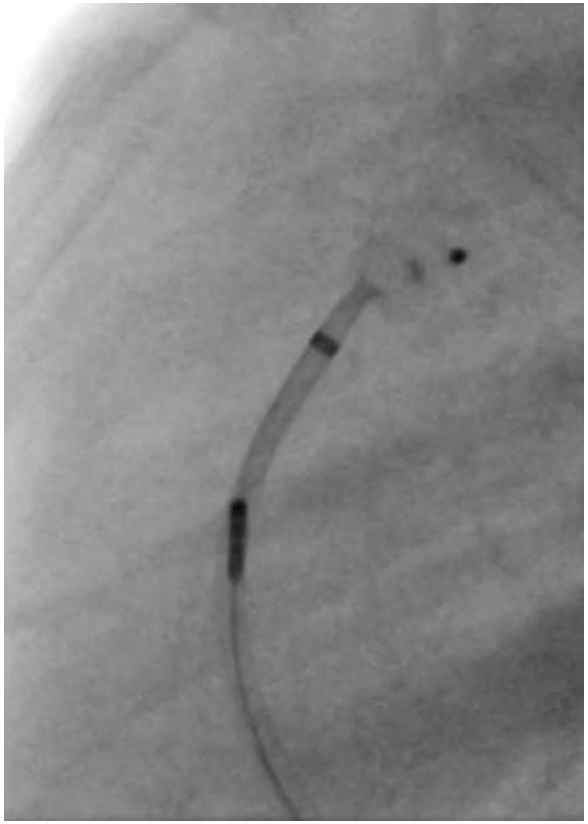
Avoiding TV entangling

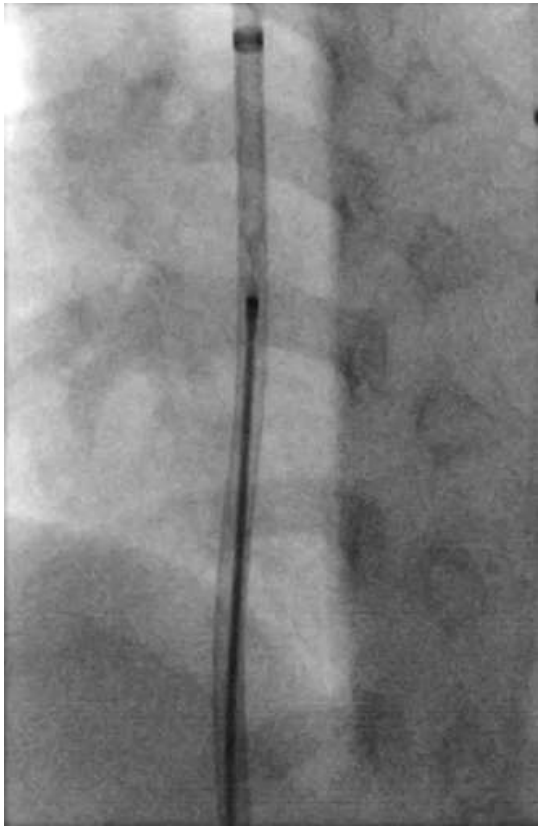




VSD closure: step by step



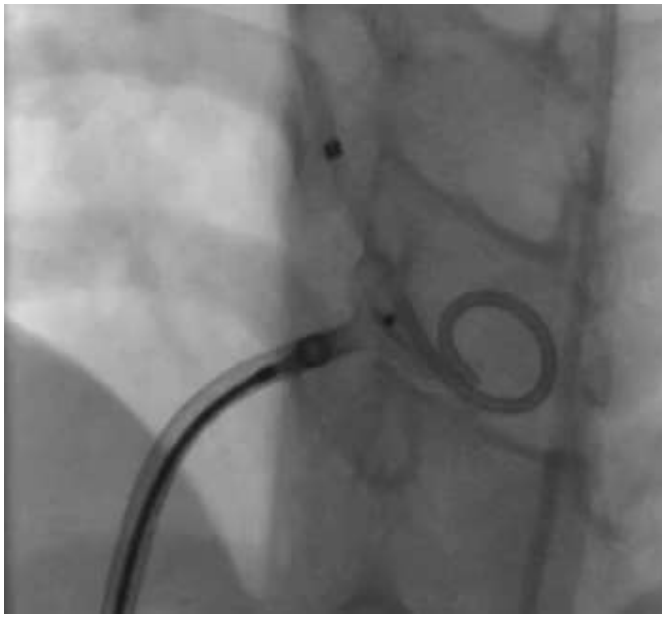




Crossing aortic valve

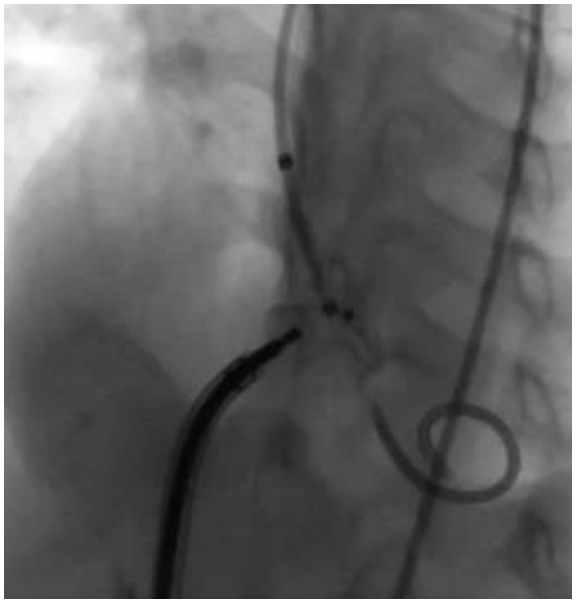
VSD closure: step by step

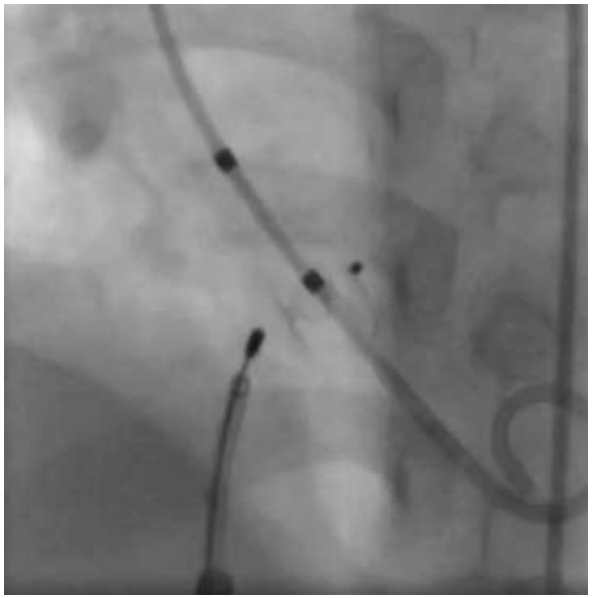
Device in LV side



VSD closure: step by step

Release or not?





Checking stability of the device

Who?

INDICATIONS OF VSD CLOSURE

Hemodynamic issues

- **LV dilatation**
- **Qp/Qs > 1.5**

INDICATIONS OF VSD CLOSURE

MORPHOLOGY ISSUES

- **Can not be closed spontanously: subpulmonic, muscular, VSD without MSA, residual VSD**
- **DC VSD with the risk of AVP and AR**

INDICATIONS OF VSD CLOSURE

Endocarditis

- **High risk in developing countries**
- **High morbidity and mortality**

INDICATIONS OF VSD CLOSURE

Other special reasons

- **Family's requirement**
- **Patient's requirement**
- **Social issues: study, insurance, working**

PERIMEMBRANOUS VSD

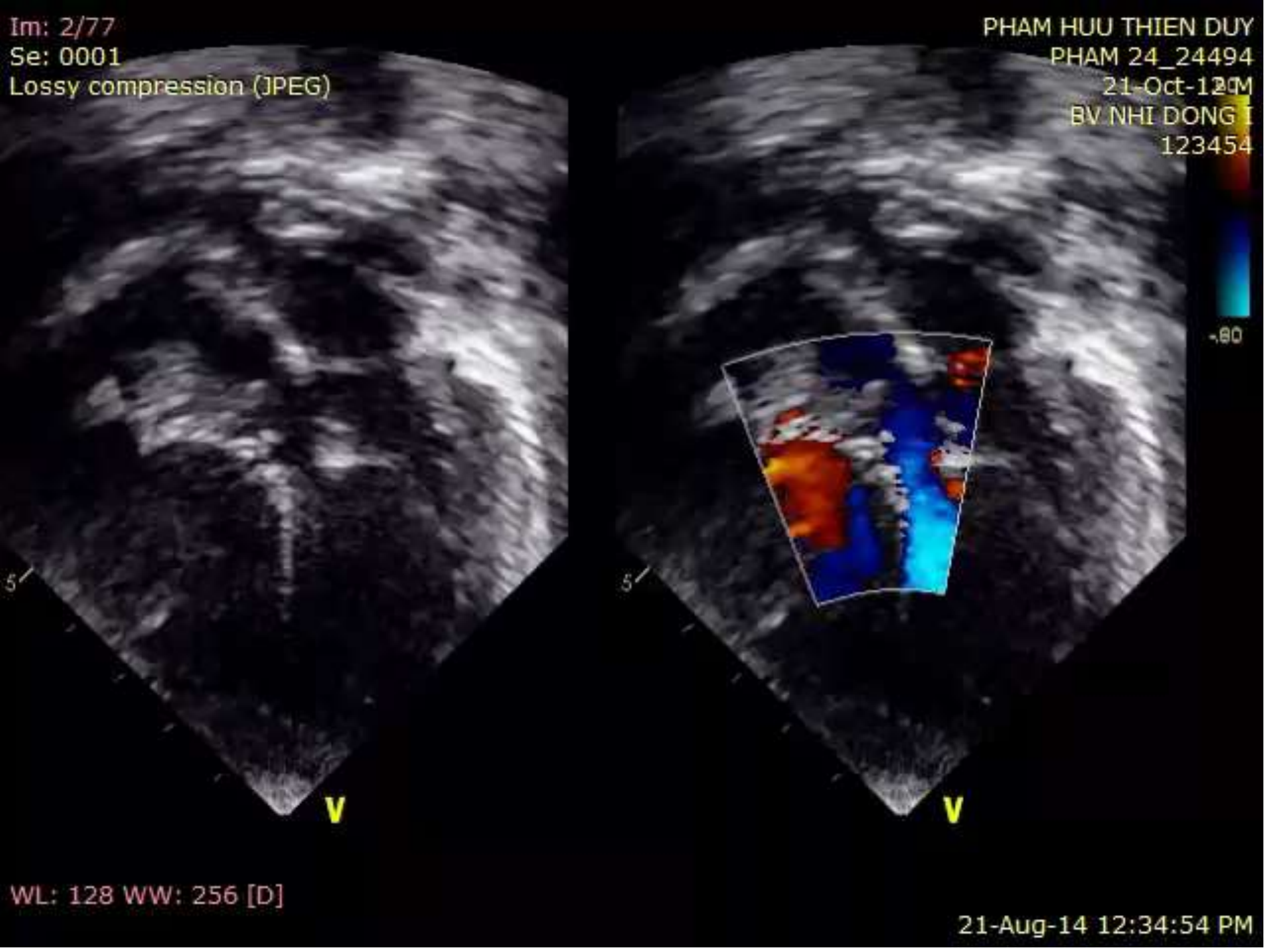
3 main points

- Membranous septal aneurysm
- Distance to aortic valve
- Size of defect

PRESENCE OF ANEURYSM

Without aneurysm:

- Single opening exit in to RV
- ADO I, ADO II, Pfm coil, symmetric or asymetric VSDO
- **Easy to cross the defect by guide wire or catheter**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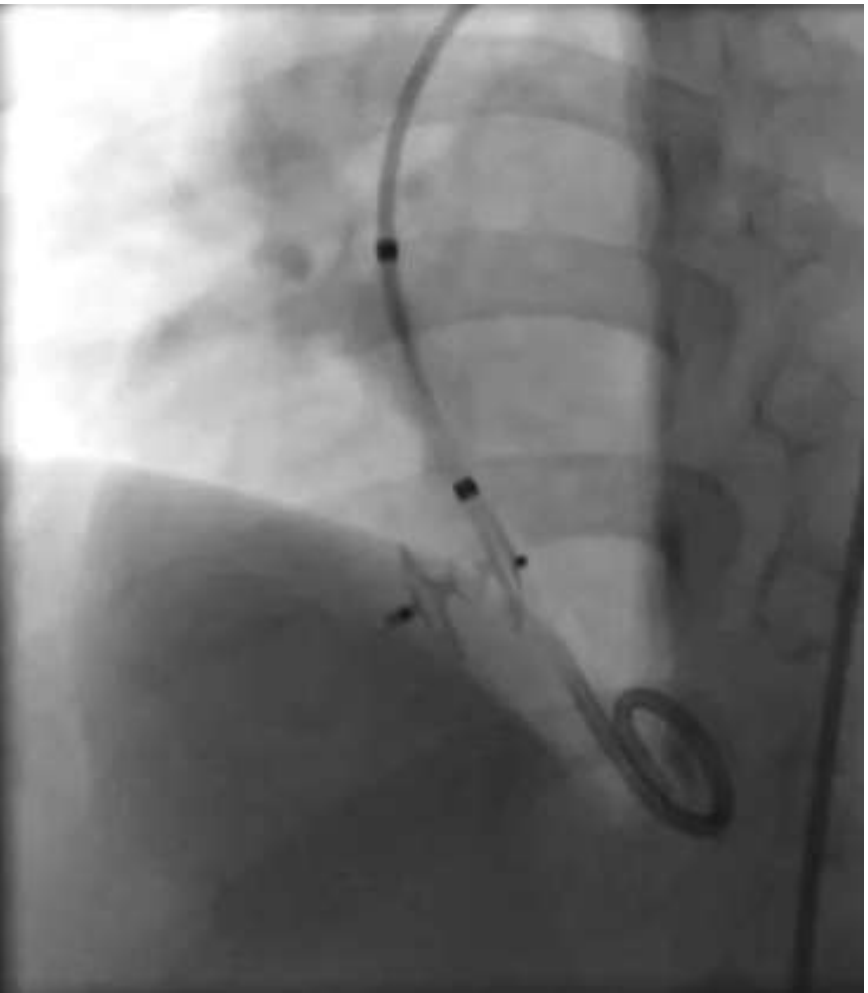
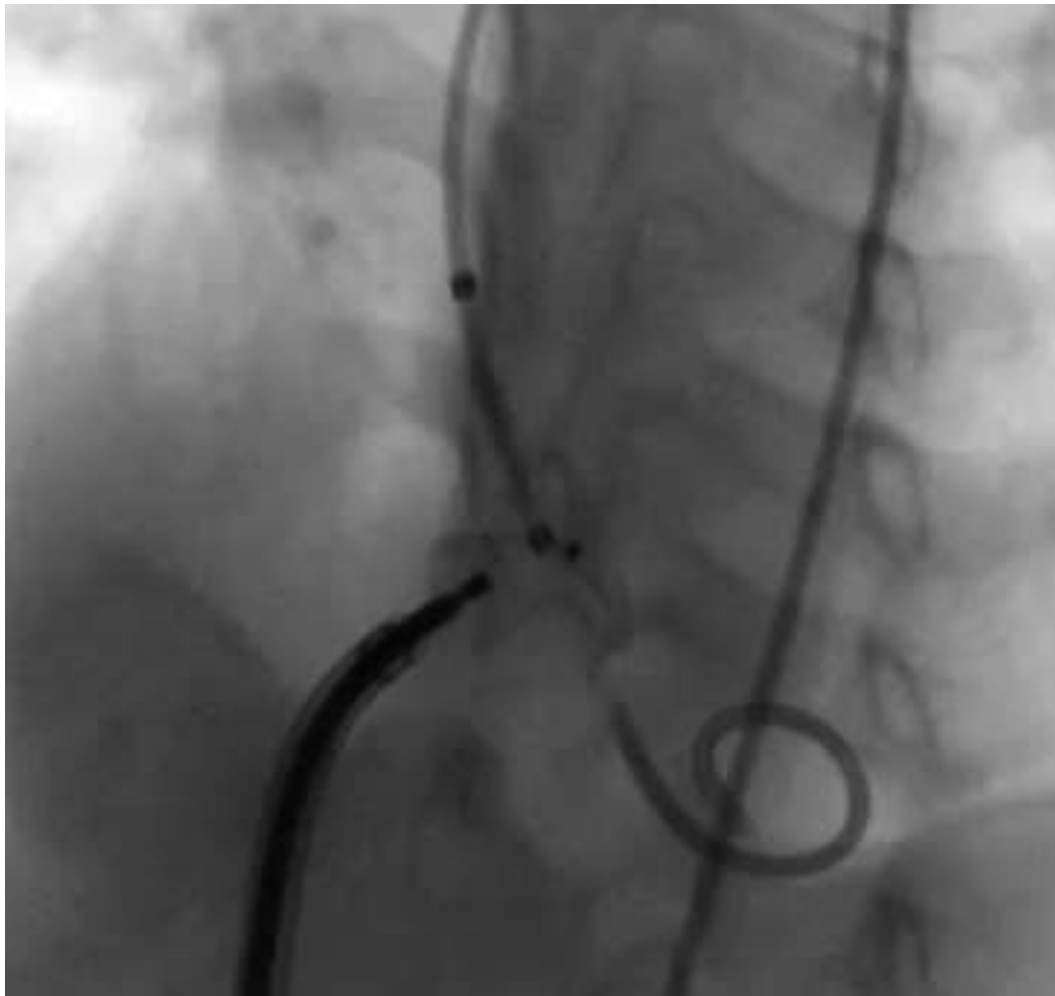
WITHOUT MSA + SINGLE OPENING EXIT

ADO I, ADO II, PFM coil

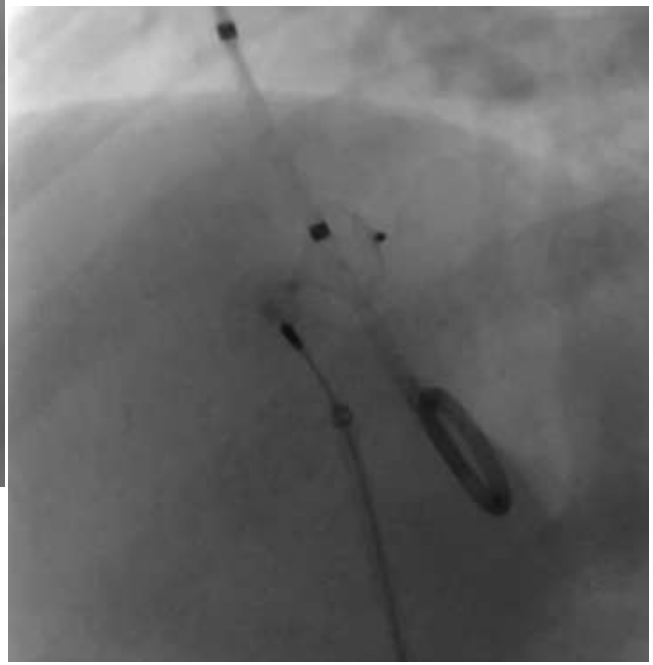


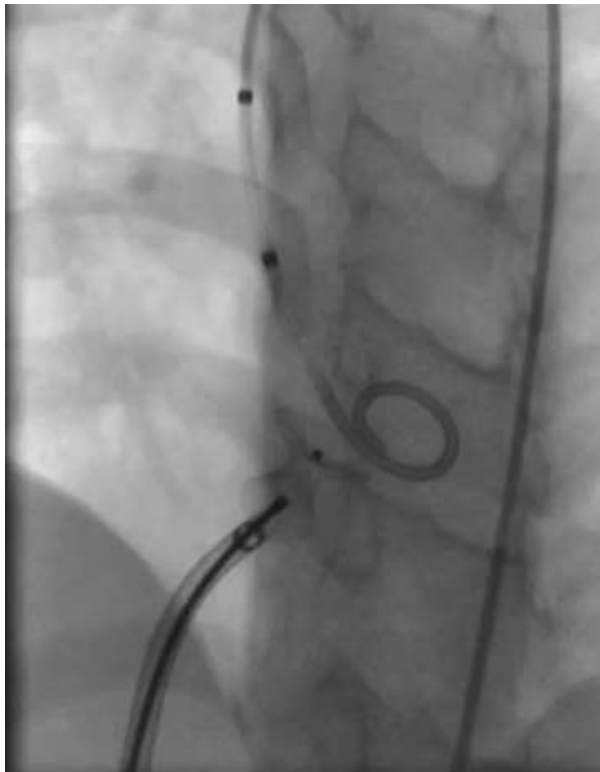


PRESENCE OF ANEURYSM

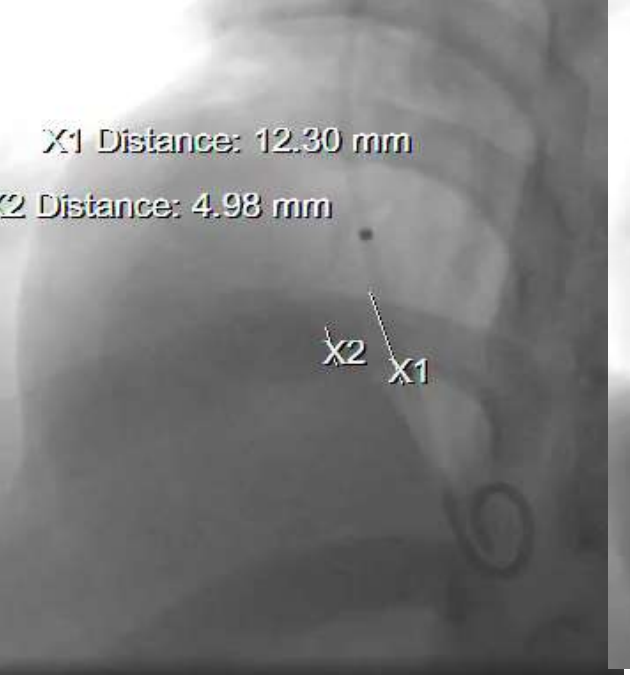
- Some space for the device
- Separating from aortic valve
- Tricuspid valve involvement in to MSA
- Triangle shape: PDA- like: ADO I, ADO II, coil, symmetric, asymmetric...
- Simple or complicated opening exits

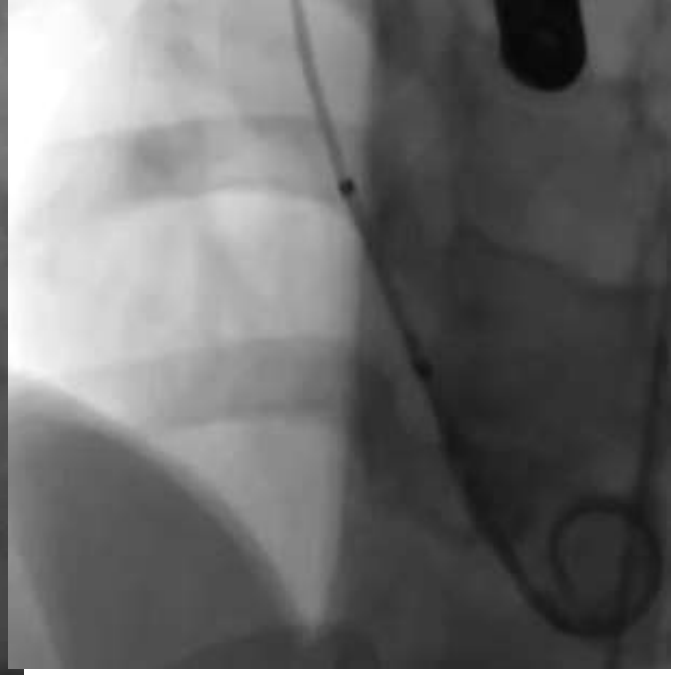
WITH ANEURYSM

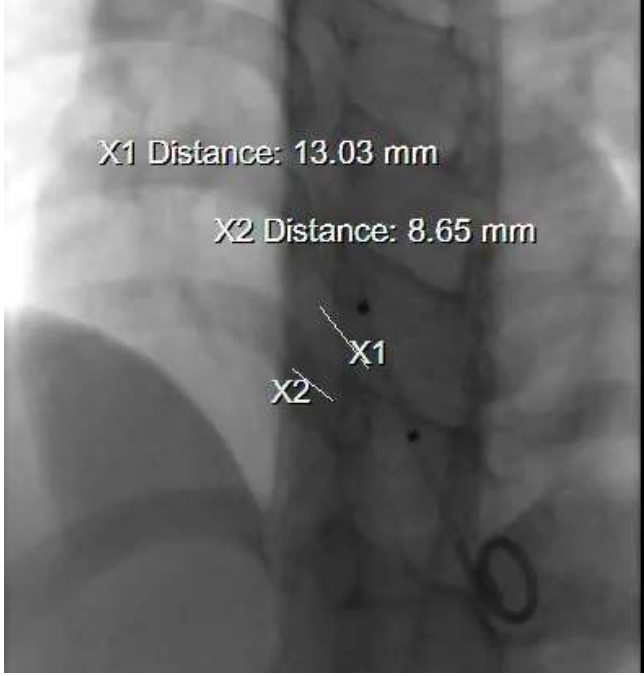


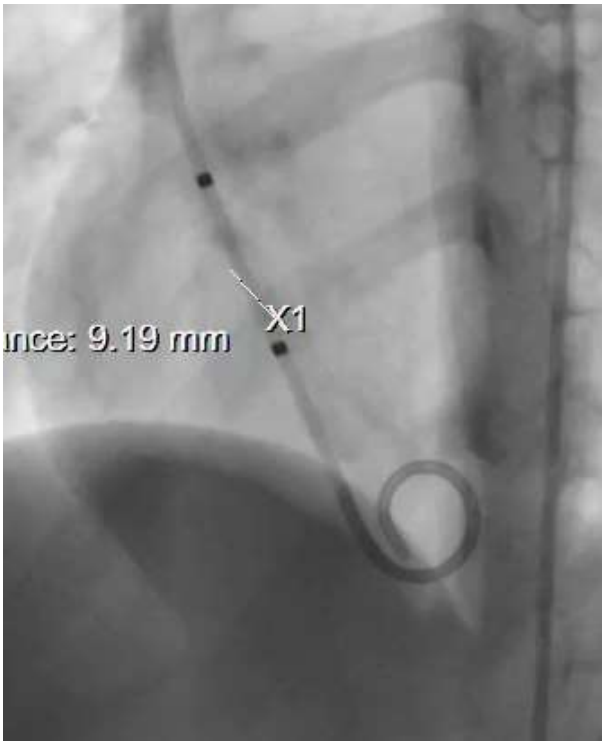


Some space for the device

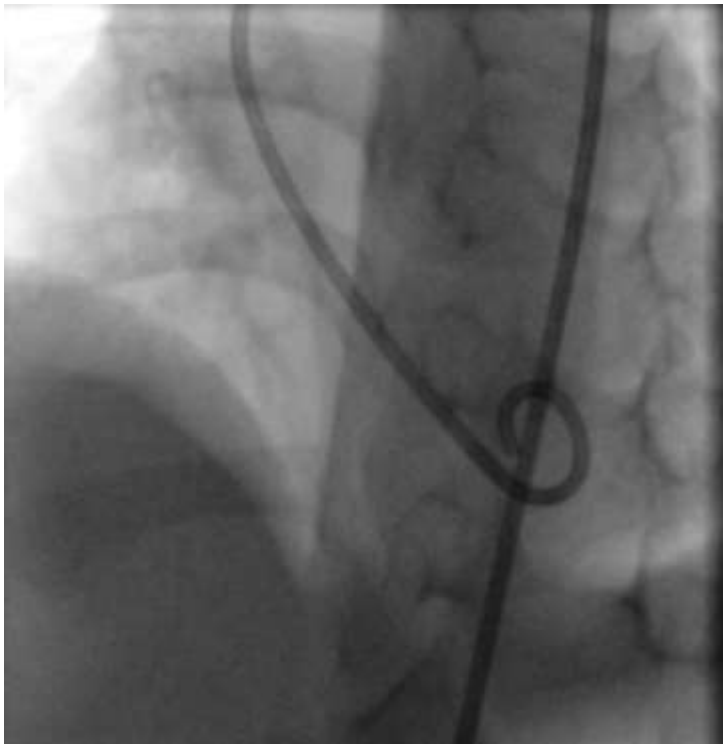

X1 Distance: 12.30 mm
2 Distance: 4.98 mm
X2
X1

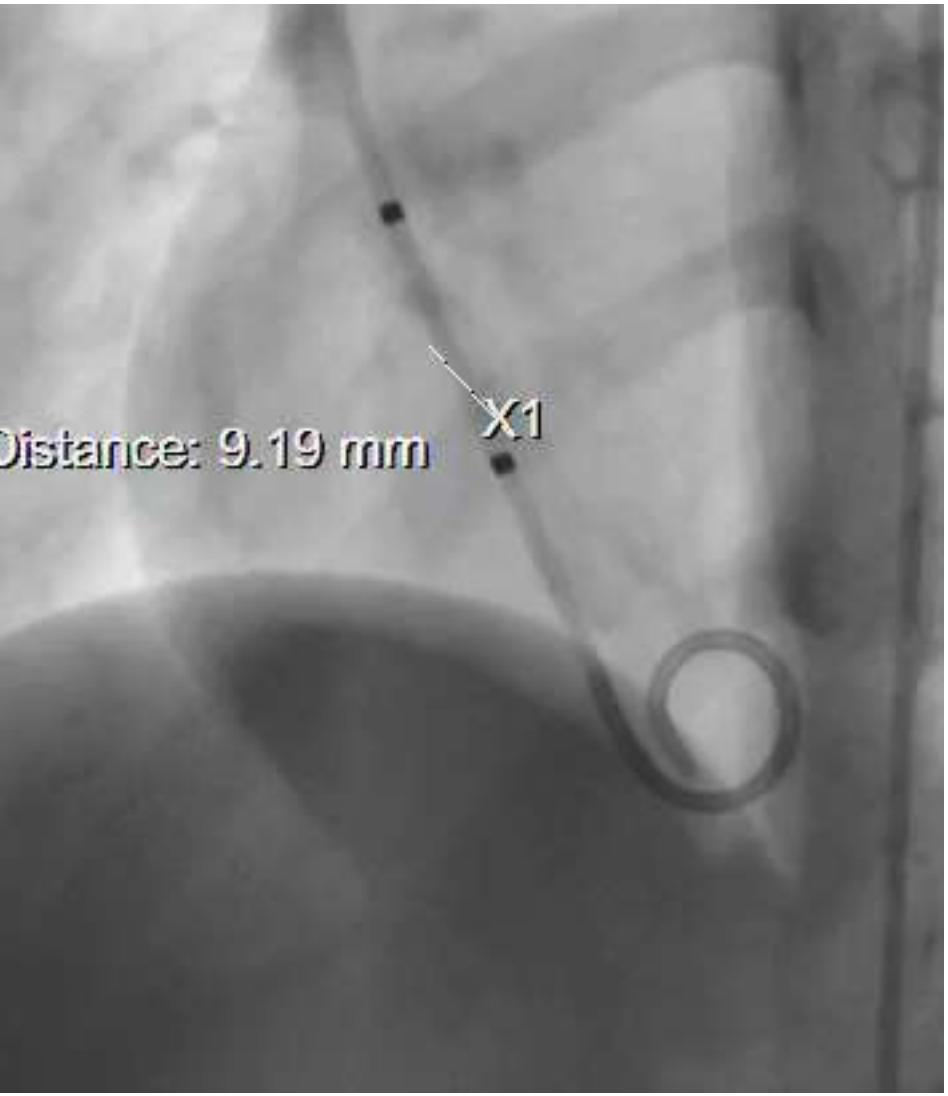



X1 Distance: 13.03 mm
X2 Distance: 8.65 mm
X1
X2


nce: 9.19 mm
X1

ANEURYSM

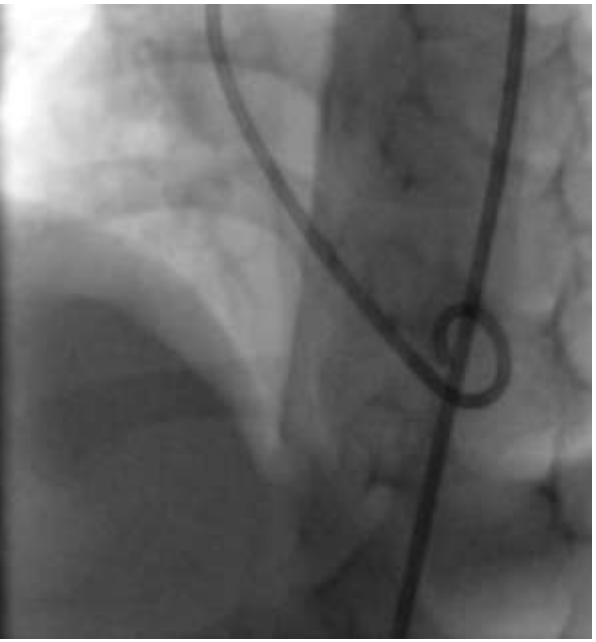


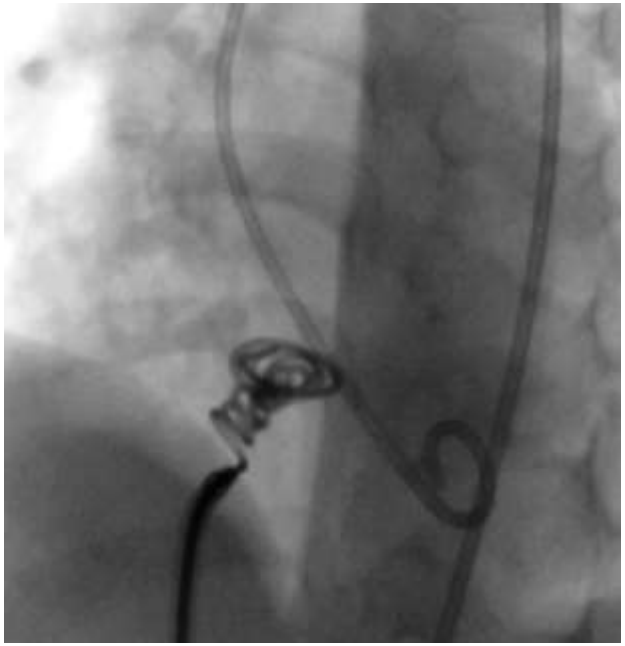


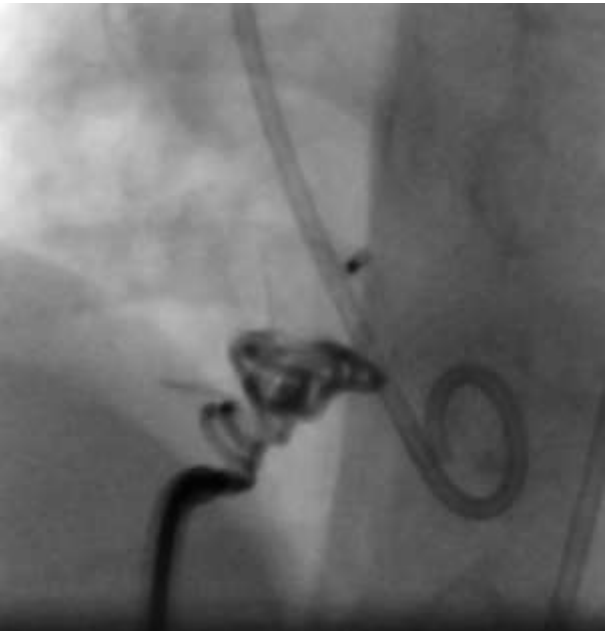
For complicated aneurysm:

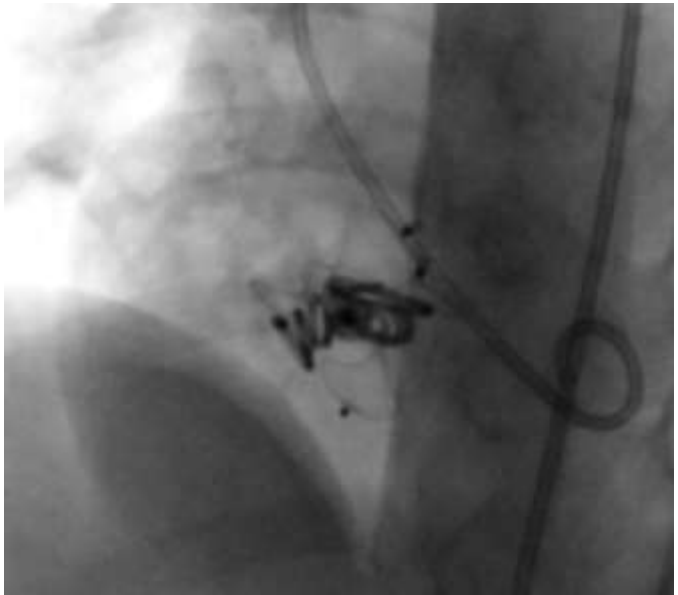
close all in the left side

MULTIPLE OPENING EXITS



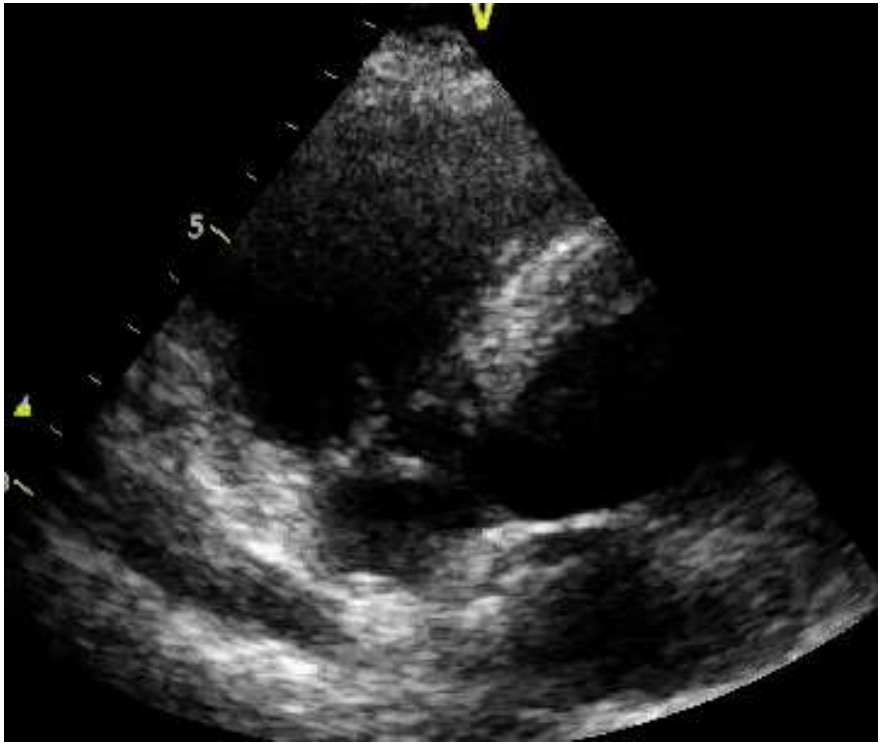


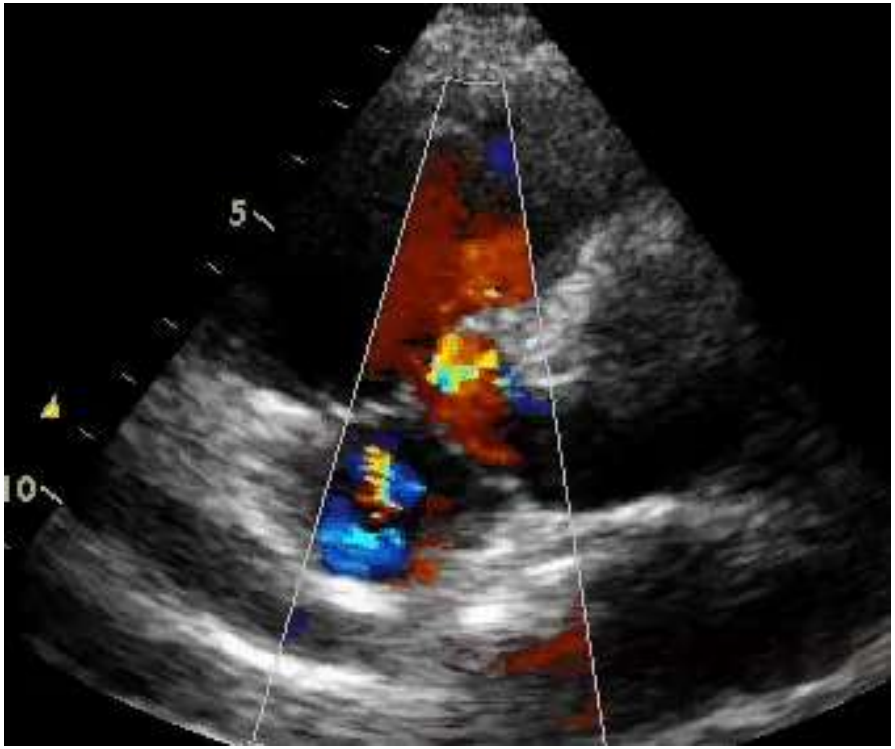




Perimembranous VSD- inlet extension type

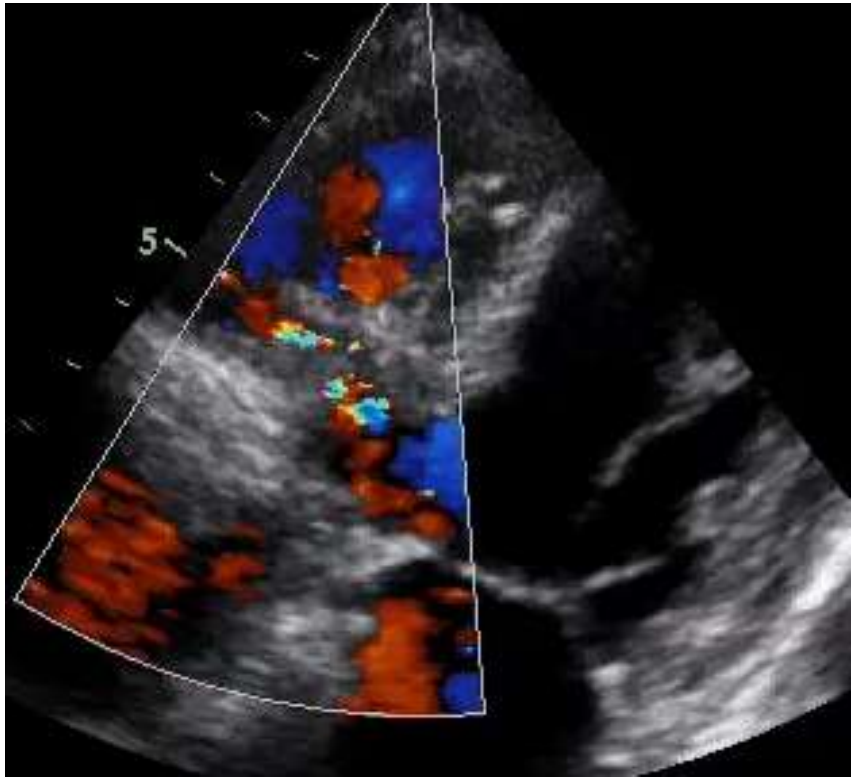
- TR due to LV to RA shunting
- Septal leaflet of TR is the roof of the defect.





Perimembranous VSD- inlet extension type

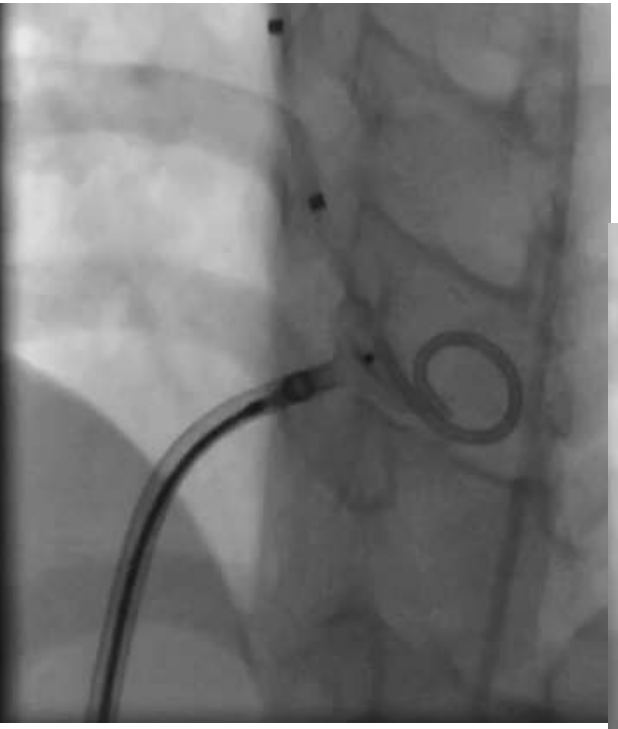
- Aneurysm is complicated
- Stability of the aneurysm is unpredictable

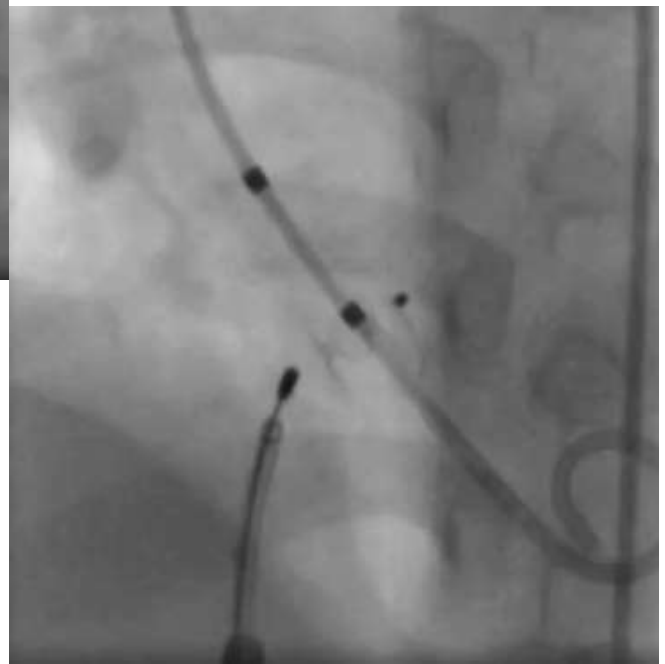


Distance from the aortic valve

- > 3 mm : many devices can be used: ADO I, PFM COIL, ADO II, AMVSDO, Symmetric

ENOUGH AORTIC RIM

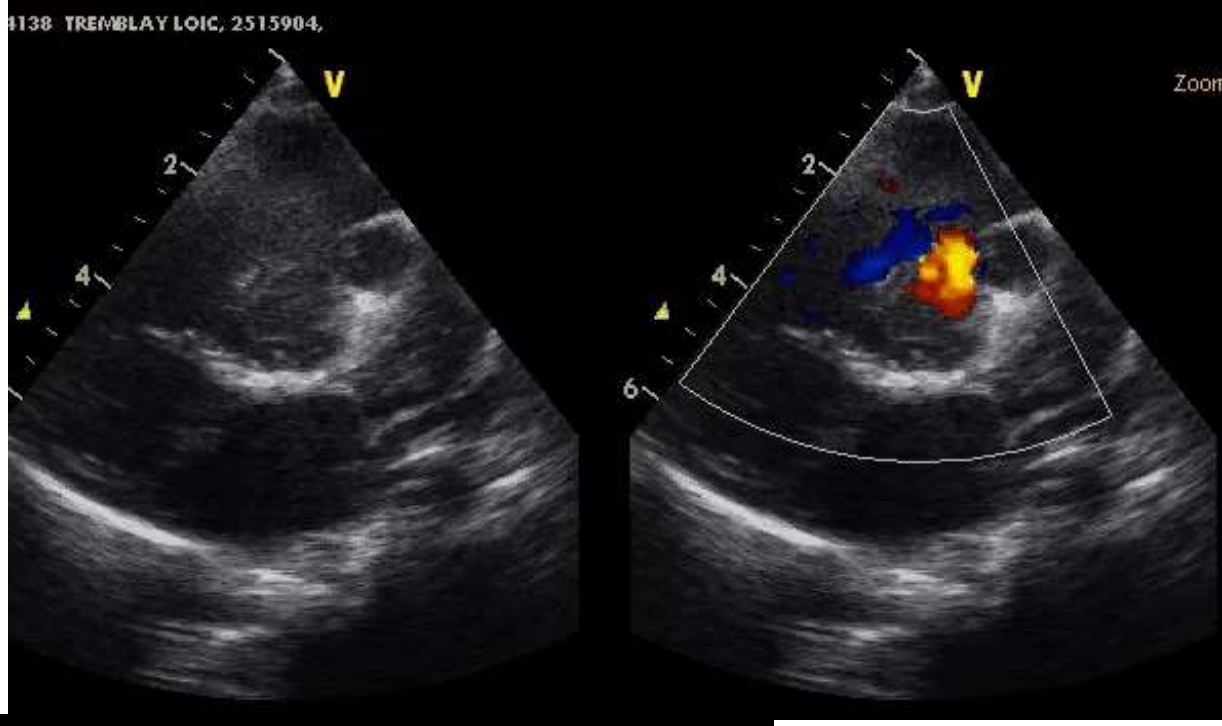




DEFICIENT AORTIC RIM
SUB-AORTIC and DOUBLY COMMITTED VSD

- No MSA: no supportive mechanism
- Limitted or no aortic rim: should use soft and flexible device: ADO II, Coil
- The severity of aortic valve prolapse and AR

EG)
8
6
4
2
V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V
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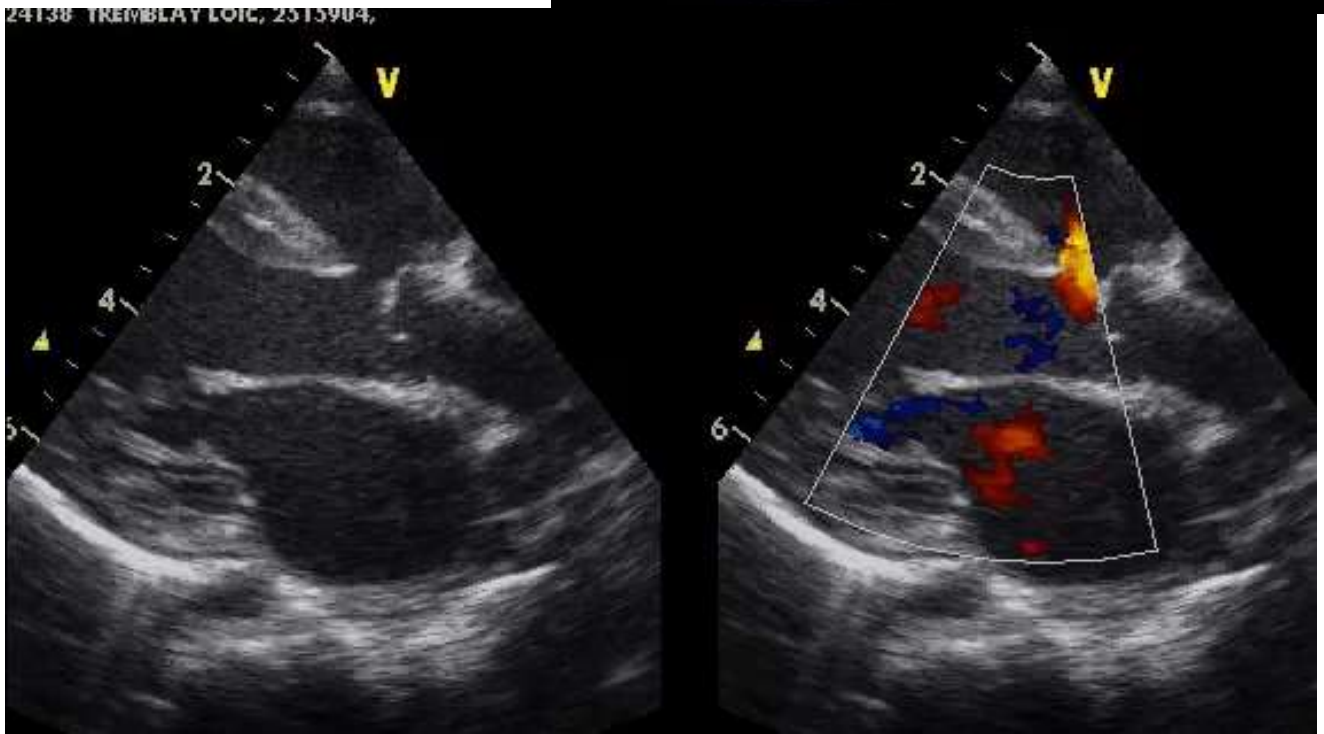
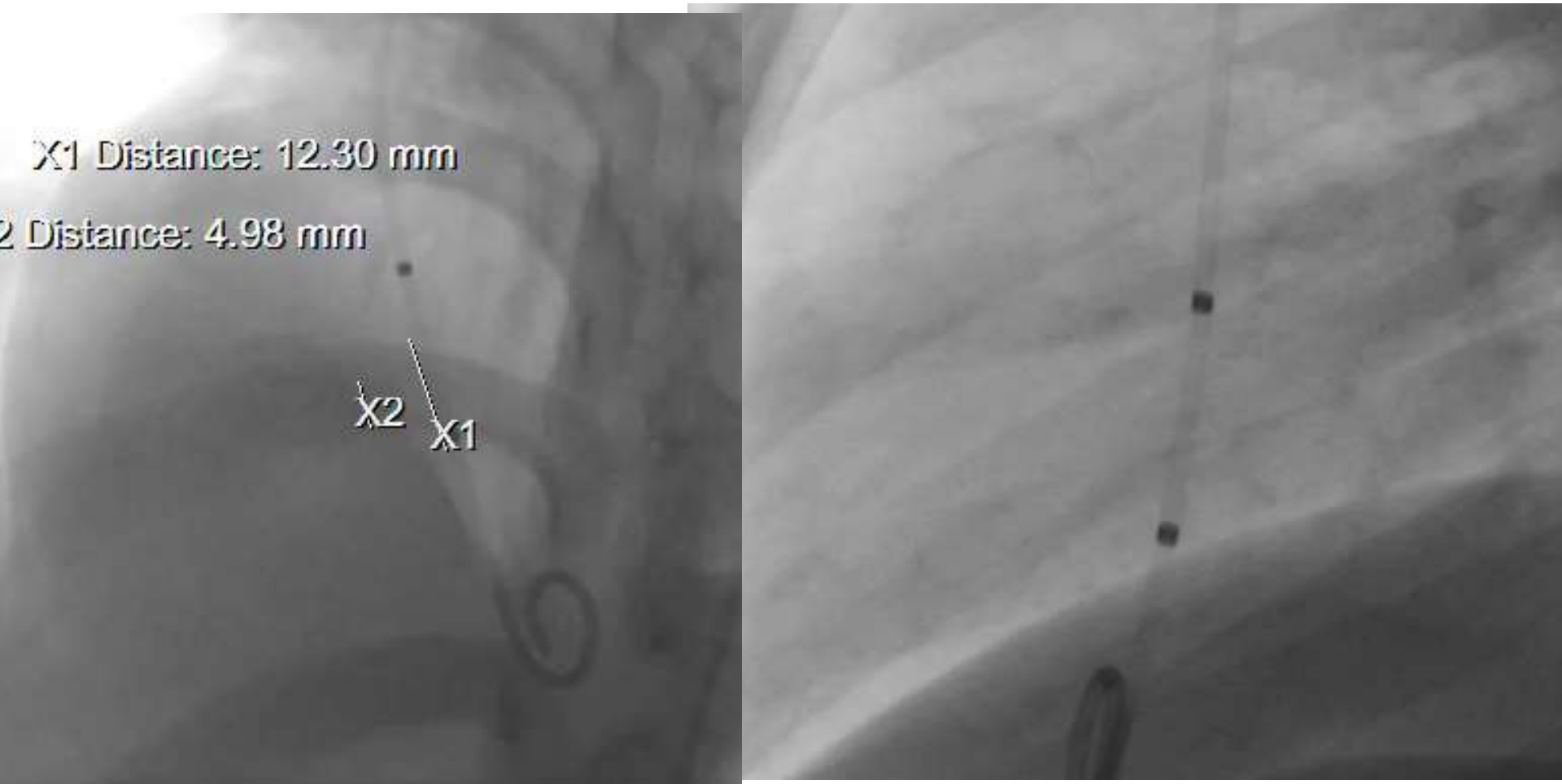
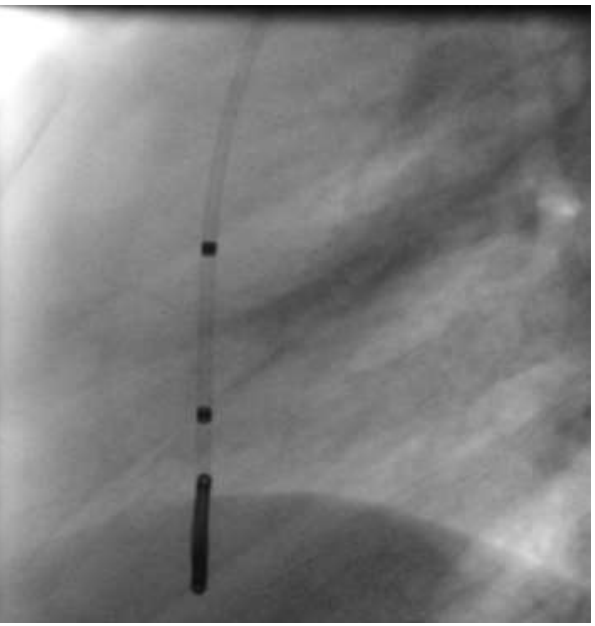
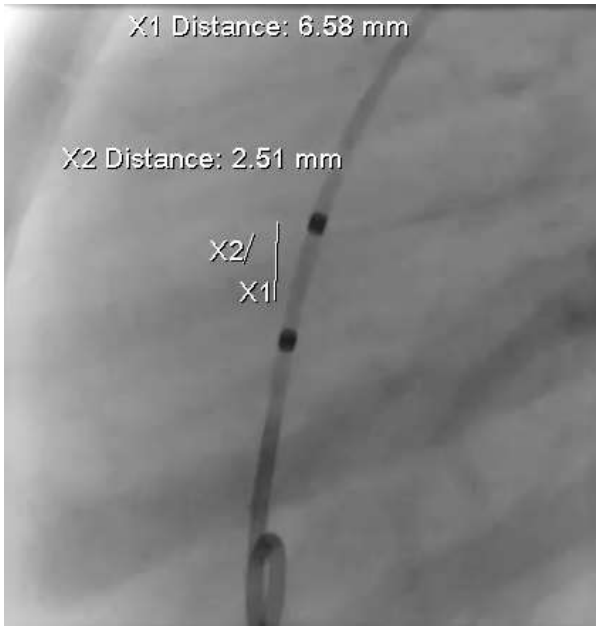

V
2
4
V
2
4
6

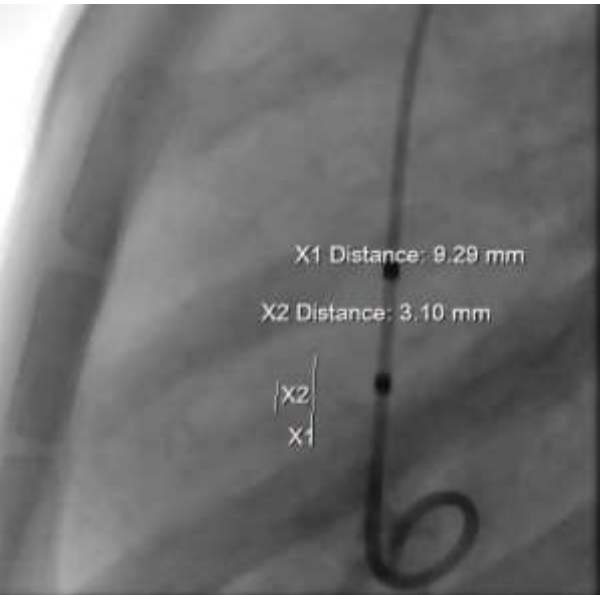
DEFICIENT AORTIC RIM
SUB-AORTIC and DOUBLY COMMITTED VSD

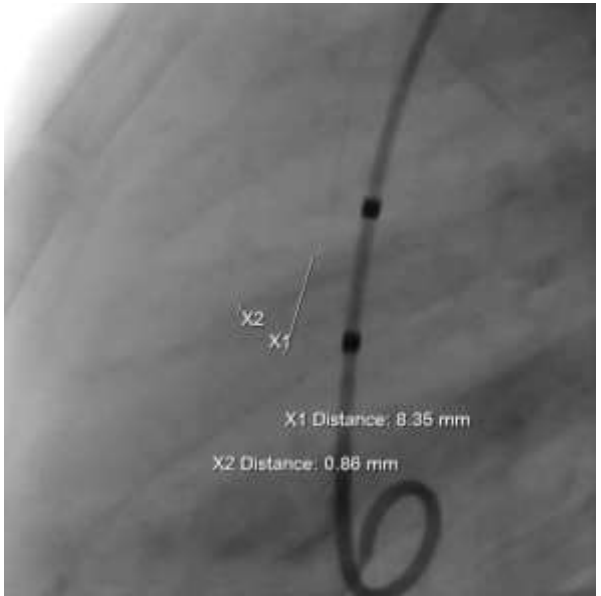


MORPHOLOGY OF DOUBLY COMMITED



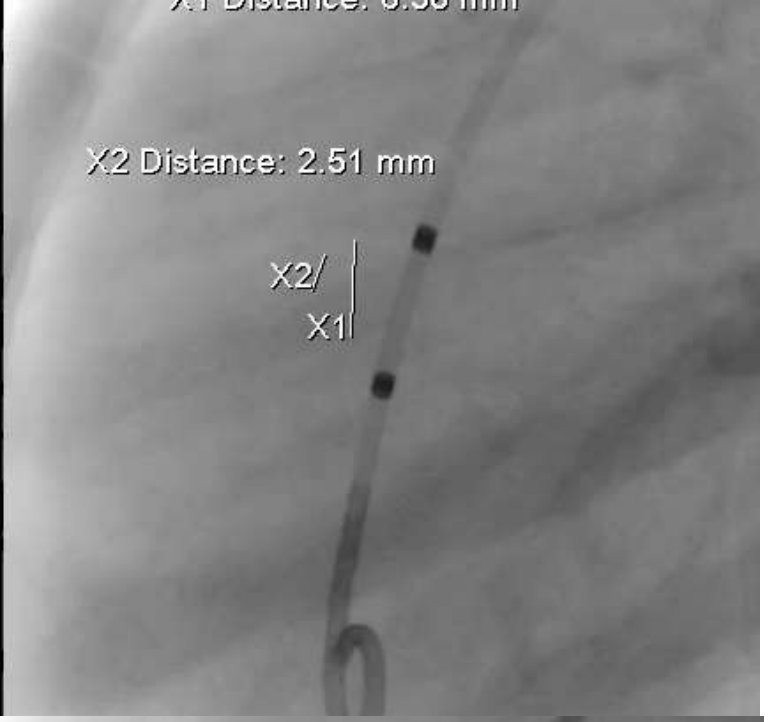






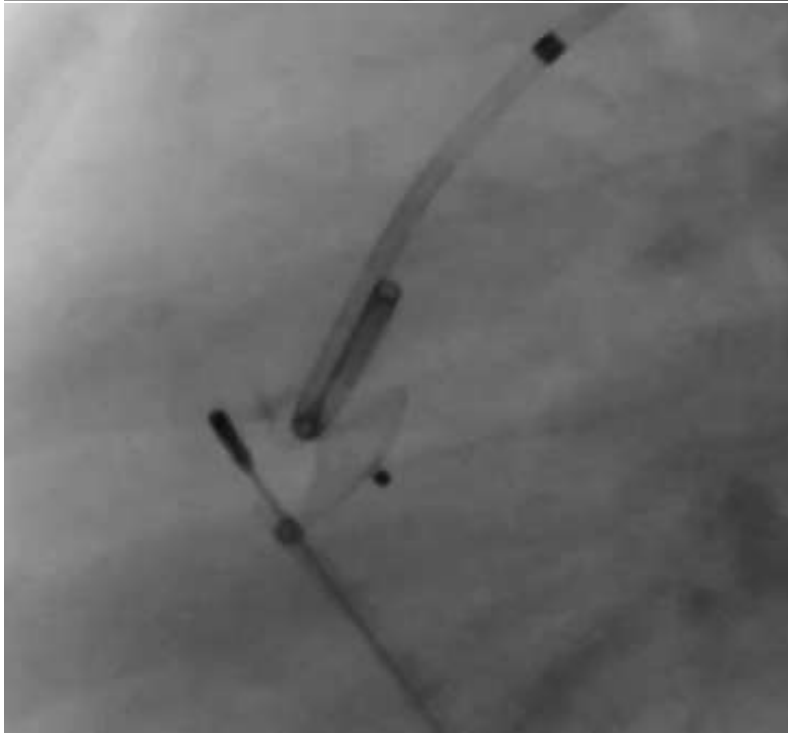
OUTLET VSD

WITH COIL

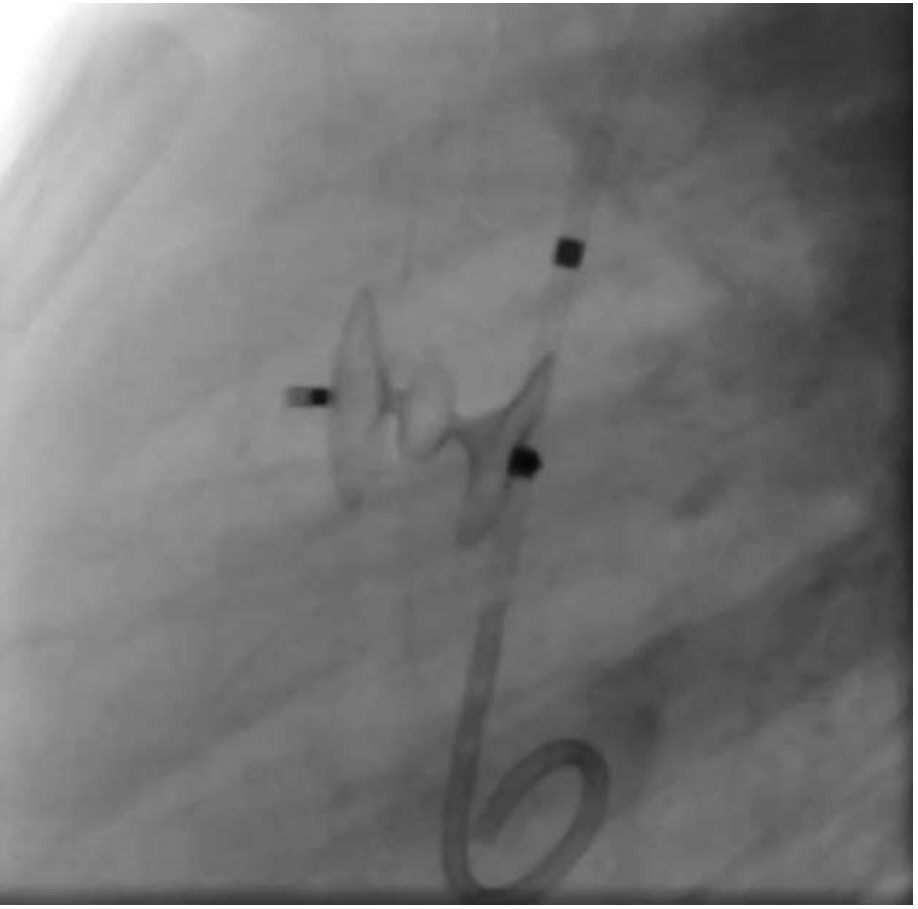


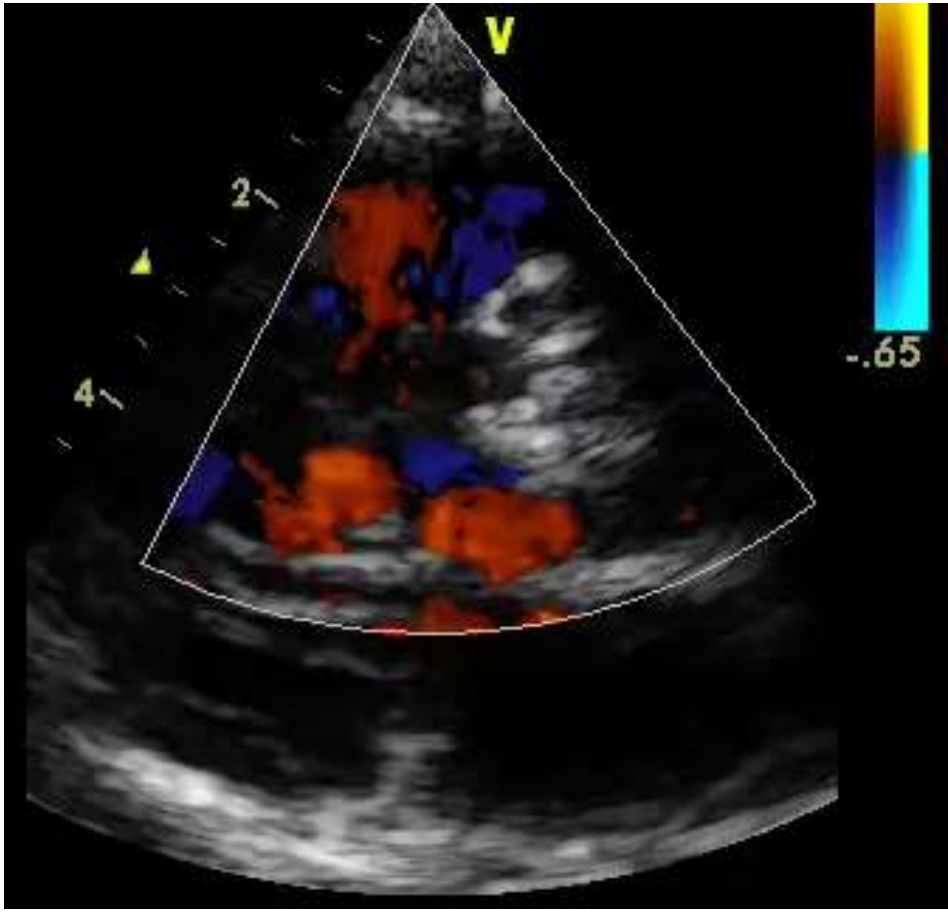
OUTLET

VSD



DEFICIENT AORTIC RIM
SUB-AORTIC and DOUBLY COMMITTED VSD

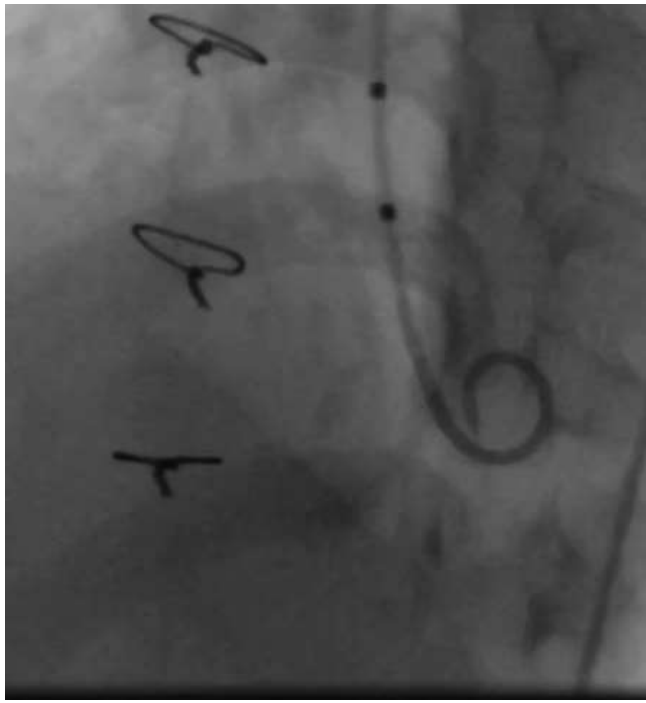


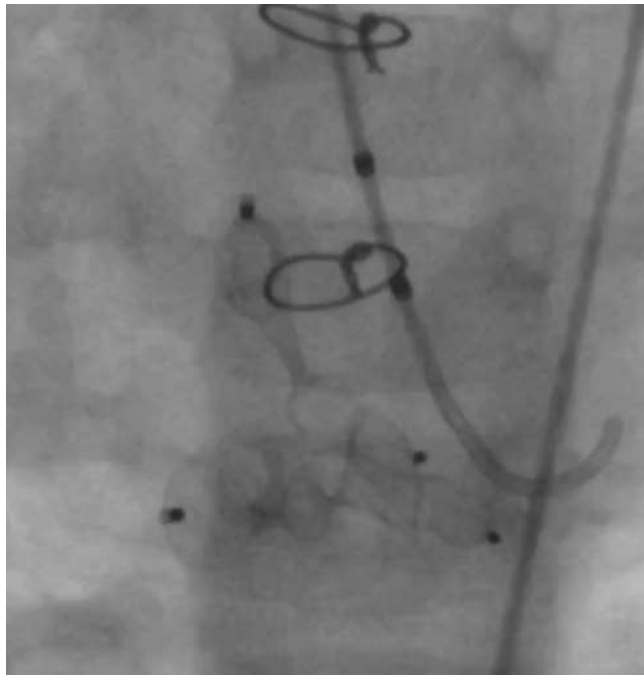


MUSCULAR VSD

- Different morphology
- Difficult morphology
- More flexible device for tortous defects
- More stable for large defects

MUSCULAR VSD





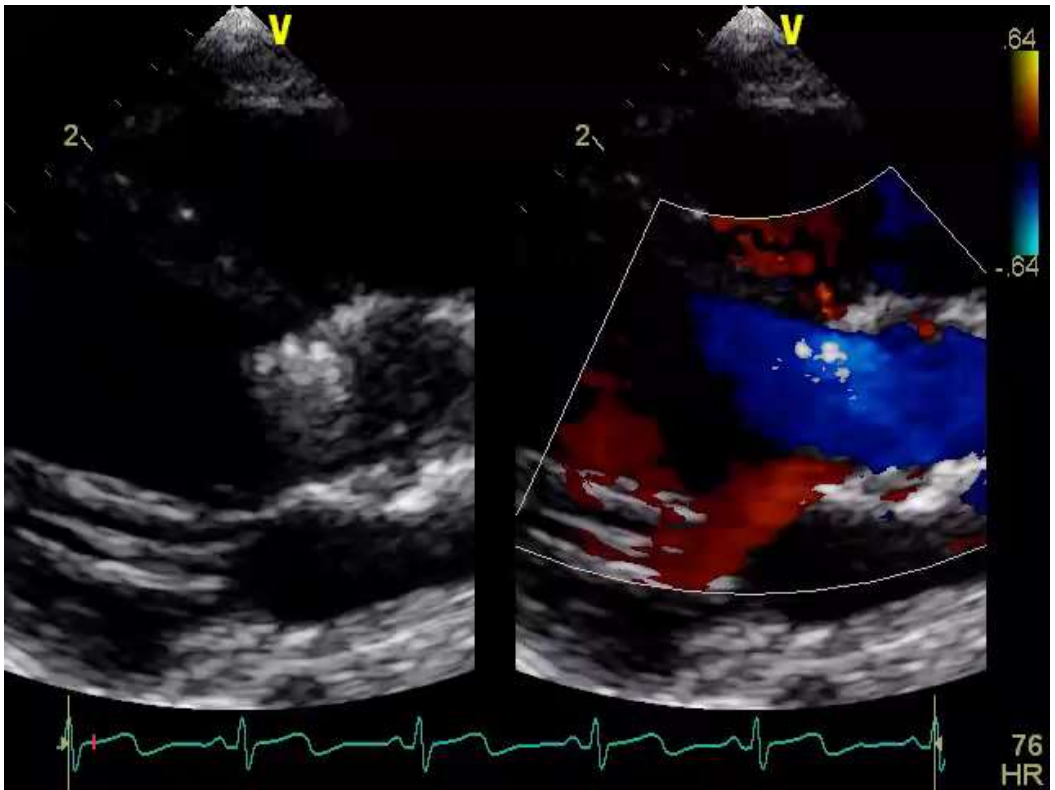
Outcome?

Main issues in outcomes

- Heart block: AV block
- Aortic valve
- Tricuspid valve
- Residual shunt and hemolysis
- RVOT, LVOT obstruction

Aortic regurgitation in VSD closure

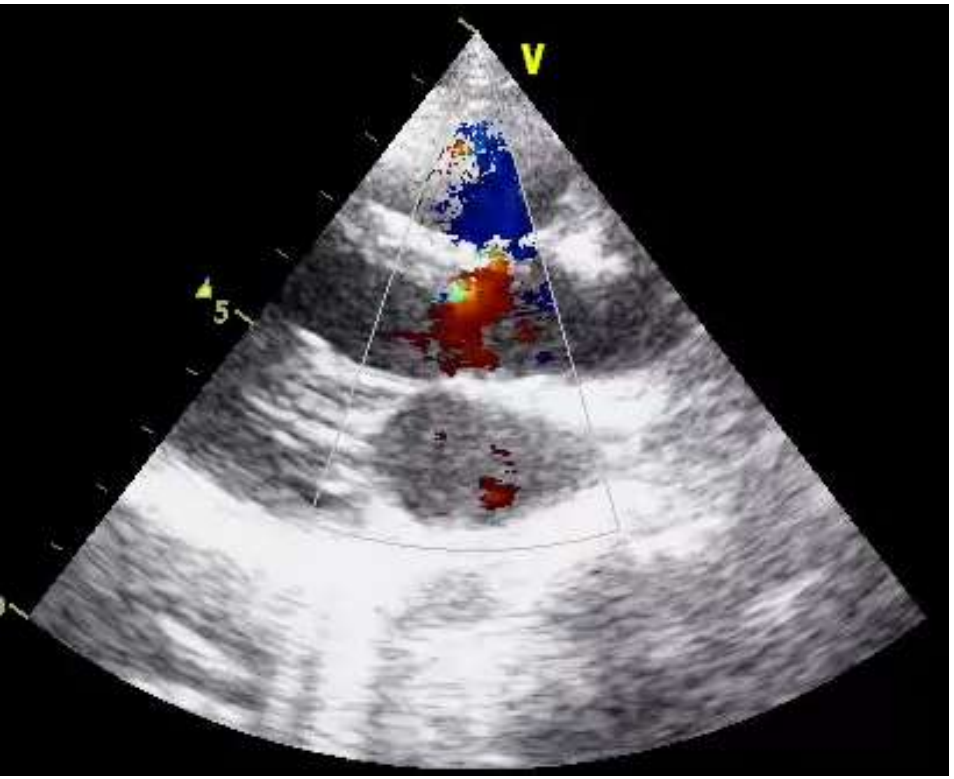
How, when, why?

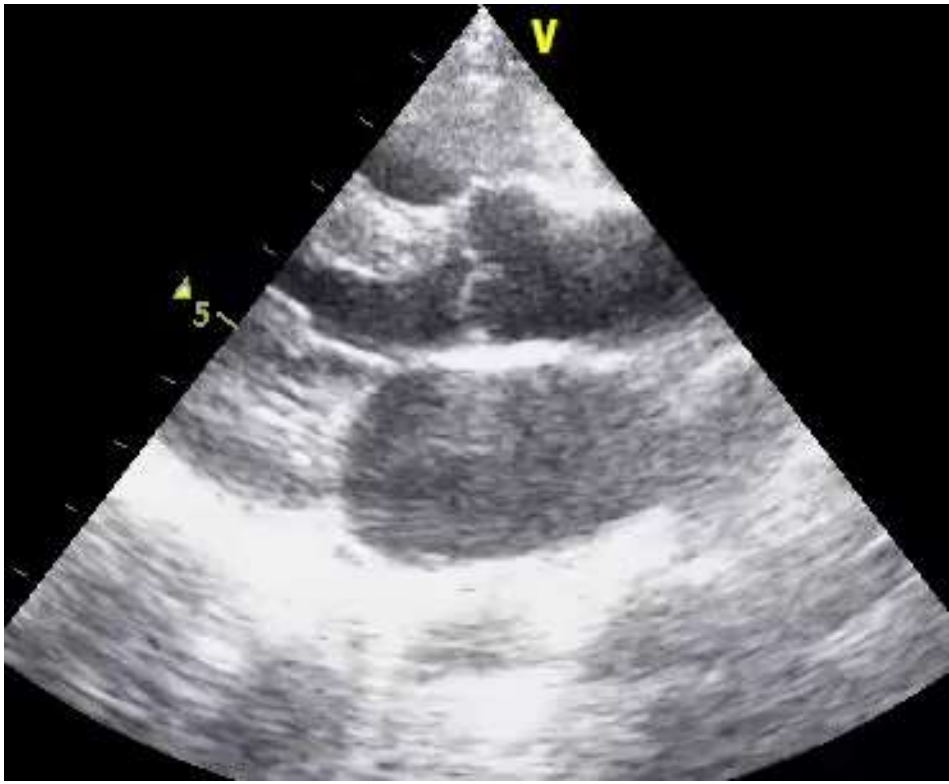


Aortic regurgitation

- Before procedure: prolapse of RCC
- During procedure: crossing aortic valve
- After procedure: device involvement

Aortic regurgitation





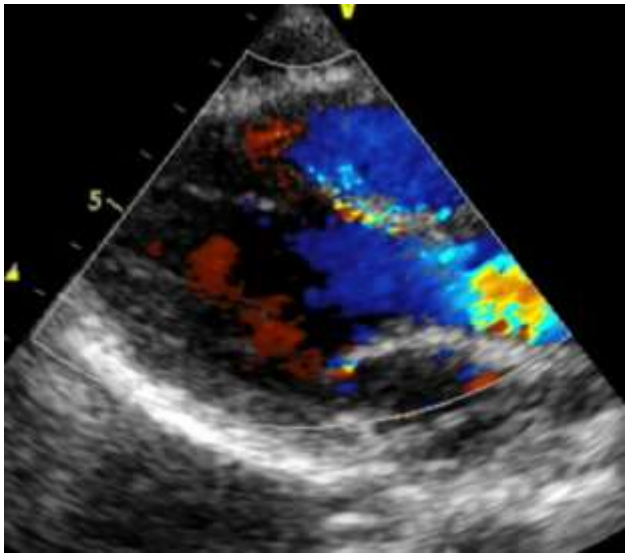
AR before procedure due to prolapse of RCC

Aortic regurgitation

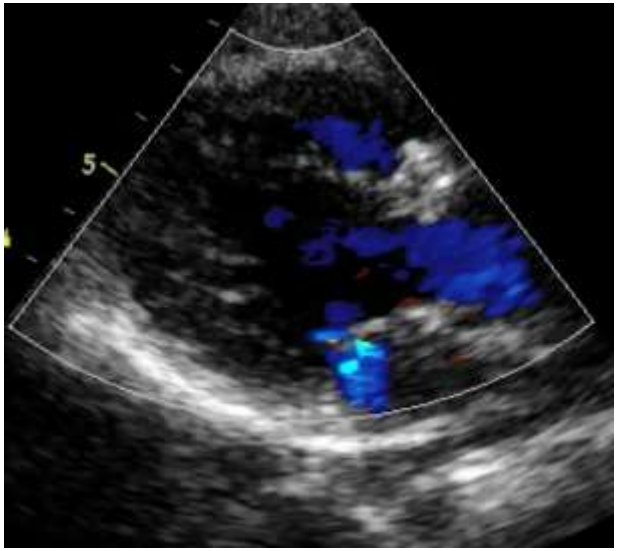
Doubly committed with prolapse of RCC and AR

Acceptable?

Before procedure



Right after procedure

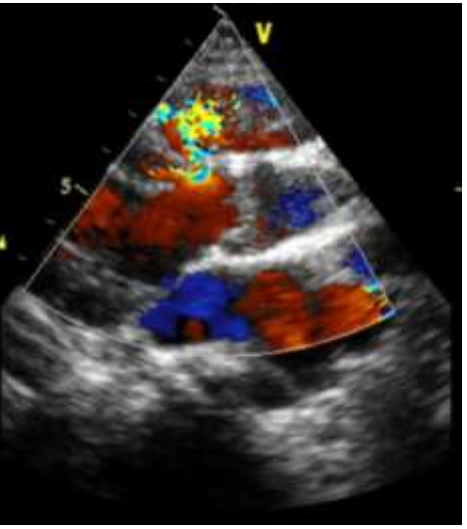


2ys after procedure

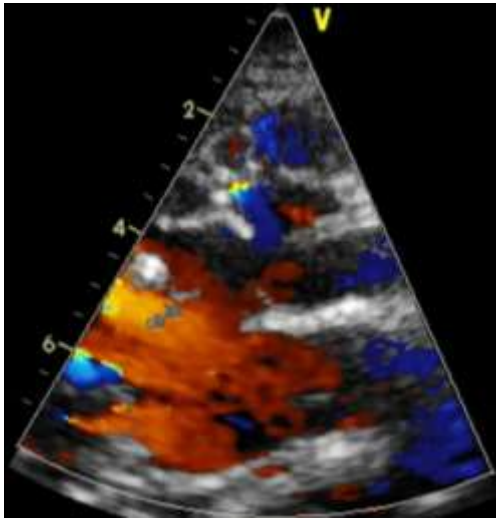
Aortic regurgitation

Doubly committed with prolapse of RCC and AR

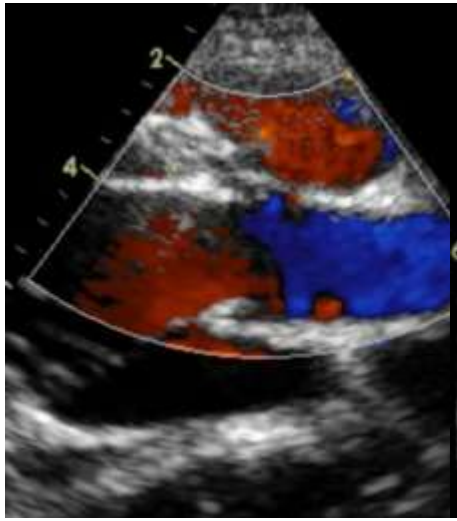
Acceptable?



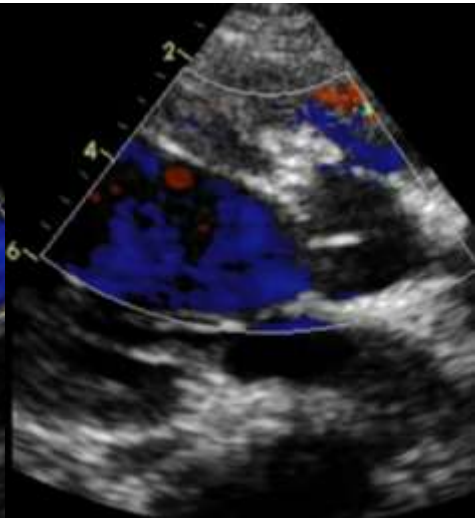
Before procedure



Right after procedure



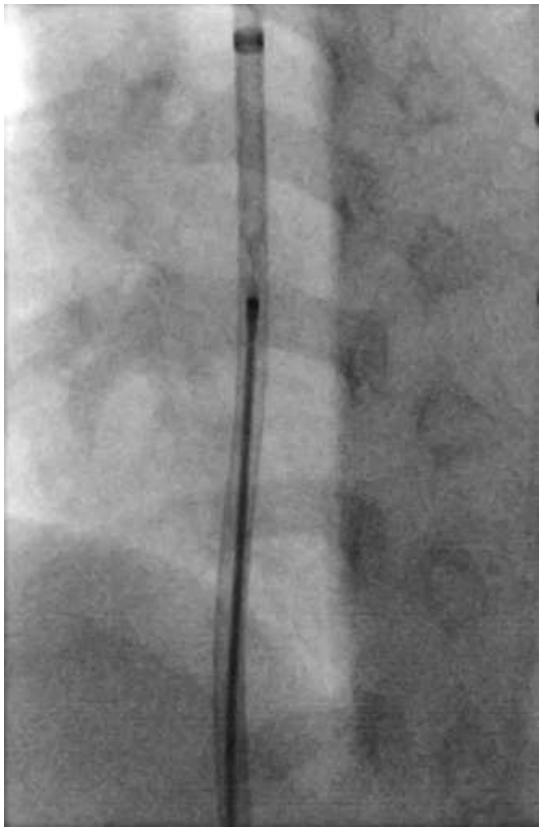
6ms after procedure



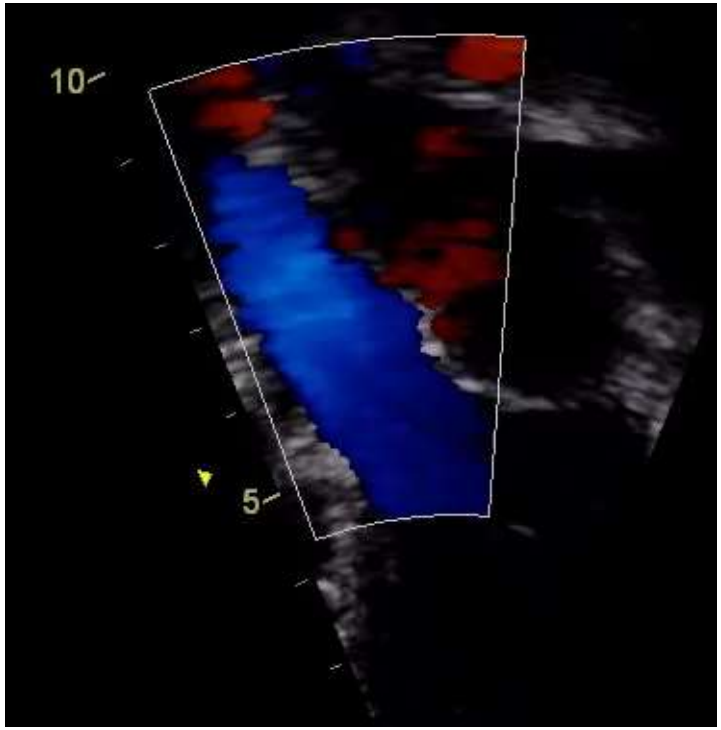
2ys after procedure

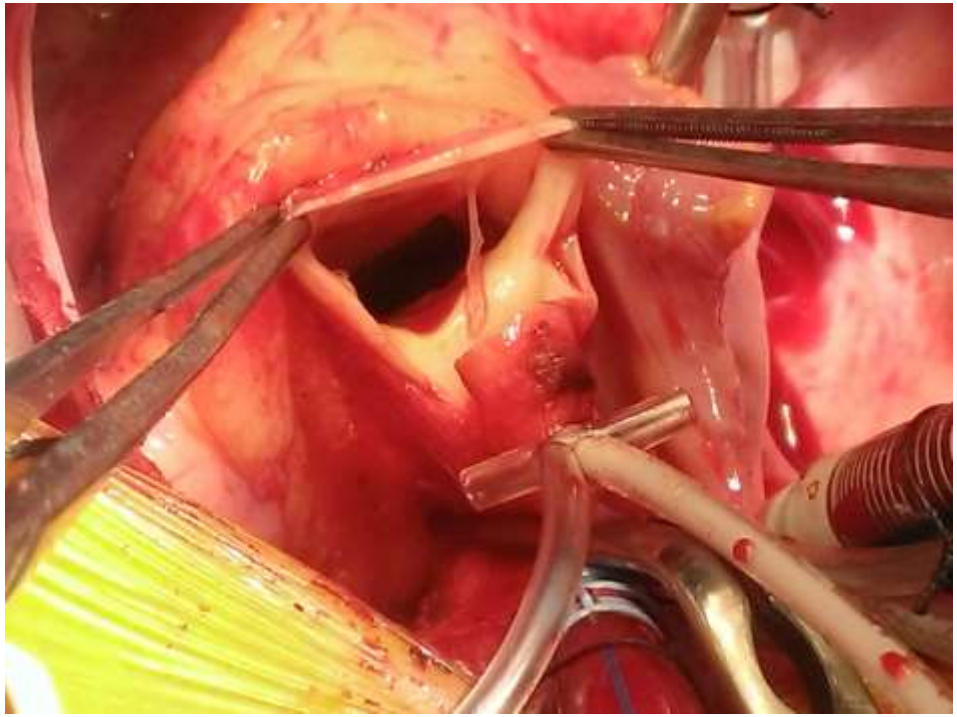
Aortic regurgitation

During the procedure: Crossing aortic valve



Aortic regurgitation

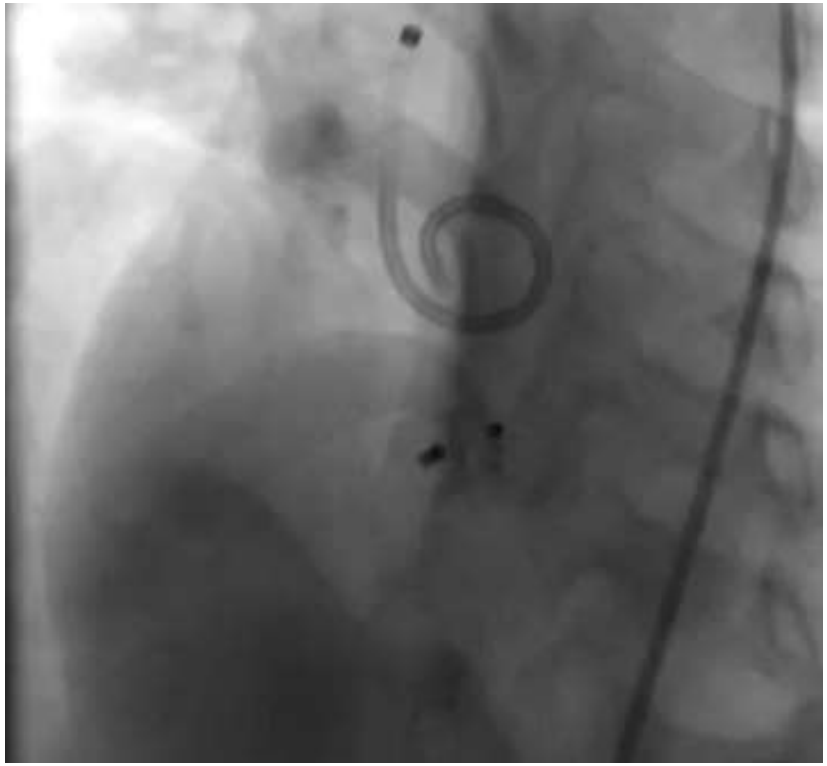


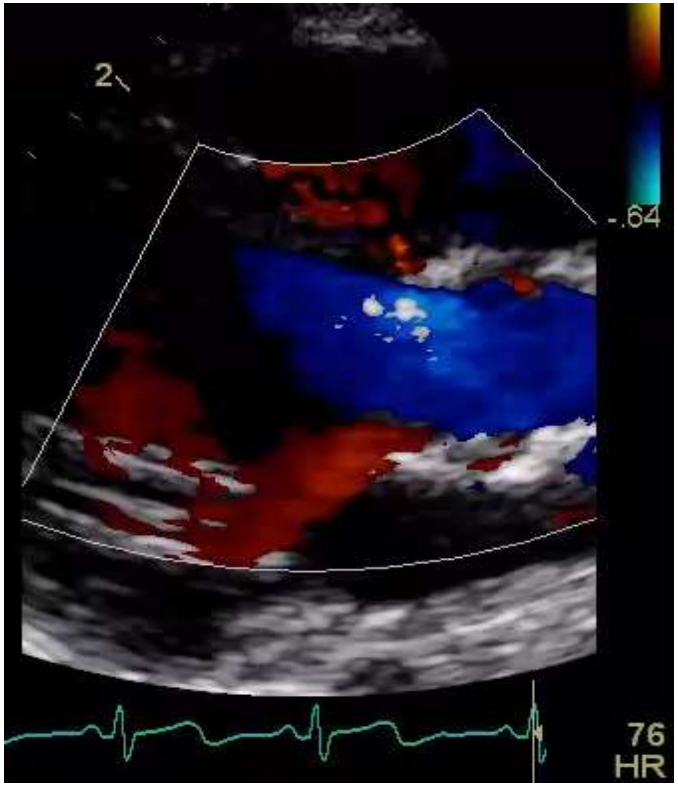


Damage of aortic valve

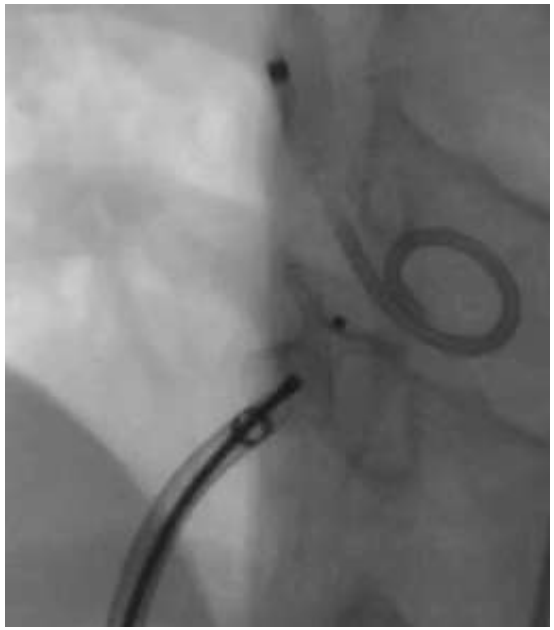
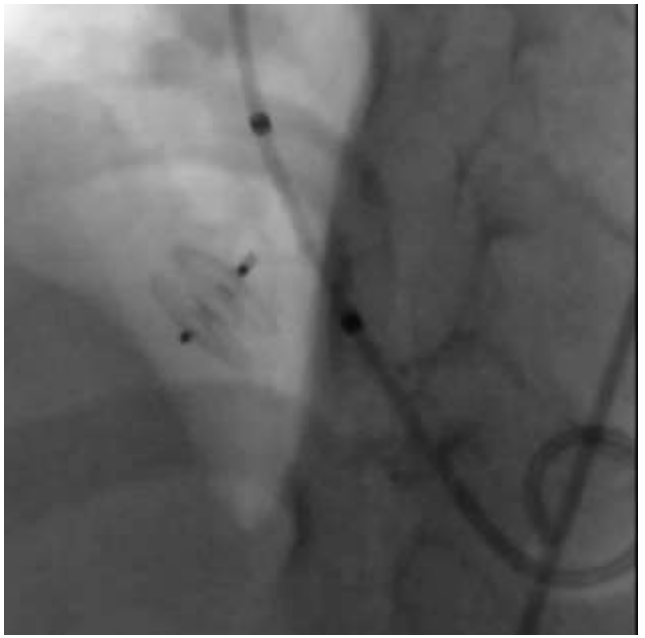
Aortic regurgitation

Device-induced AR





Aortic regurgitation

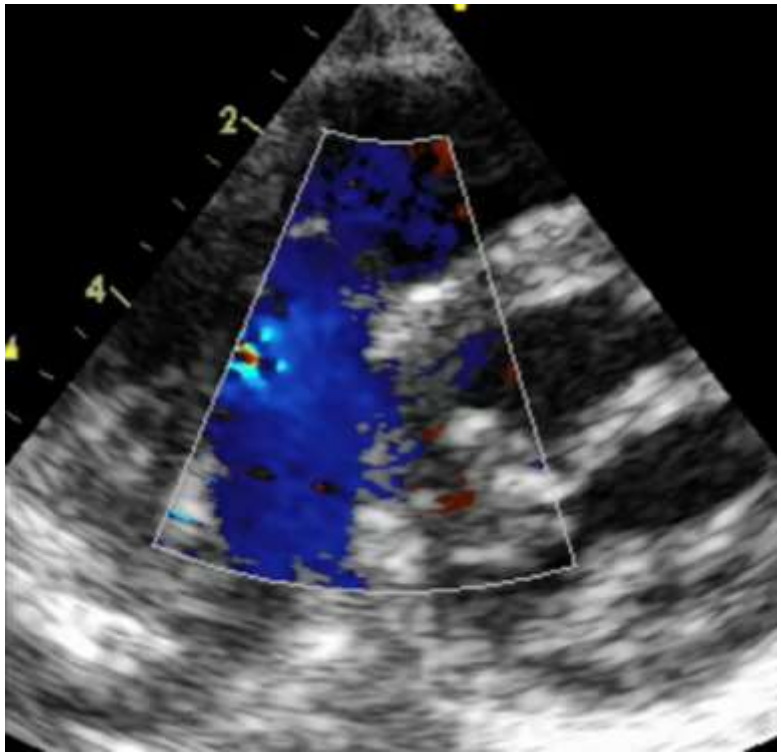



- Aneurysmal formation: an advantage

  The device will lie inside the aneurysm, separate from aortic valve

Tricuspid regurgitation in VSD closure

How, when and why?



Tricuspid regurgitation

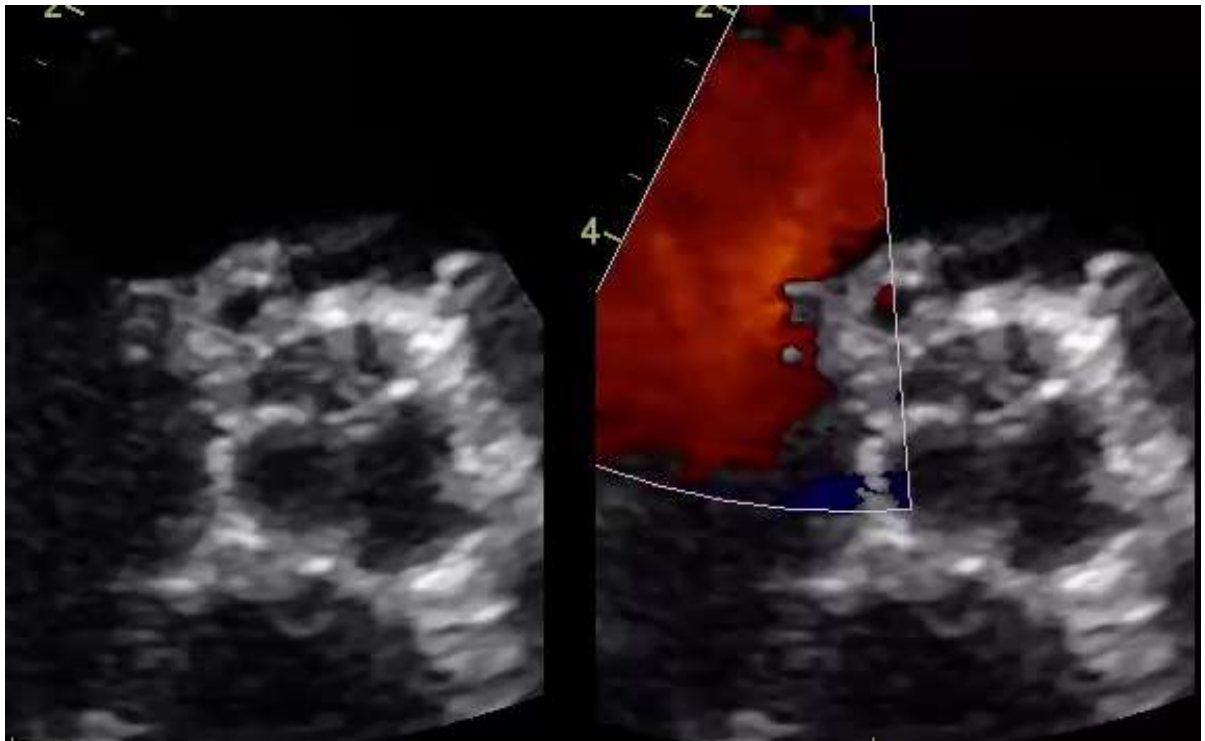
- Before procedure: tricuspid valve involvement into aneurysm
- During procedure: entangling
- After procedure: device-induced TR

Tricuspid regurgitation

Before procedure

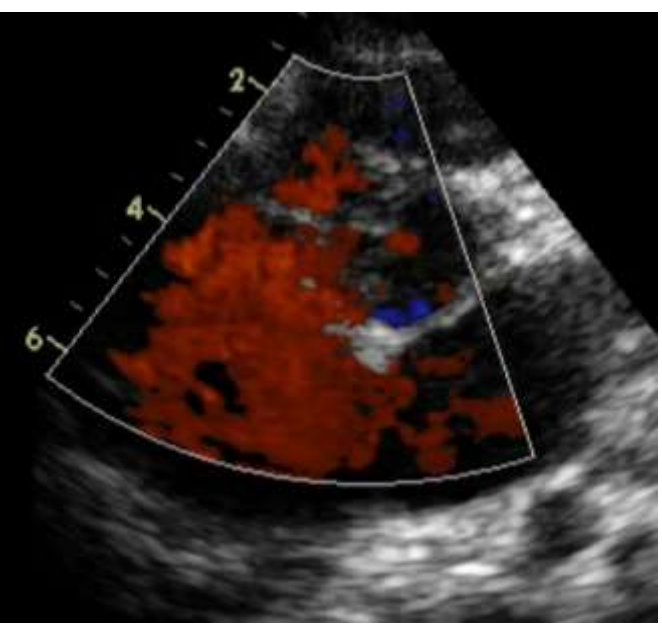
•Tricuspid valve involvement in aneurysm

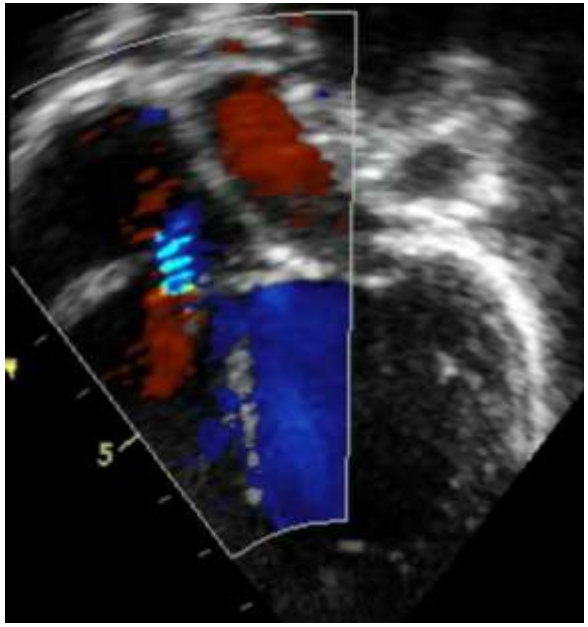
• LV – RA shunting

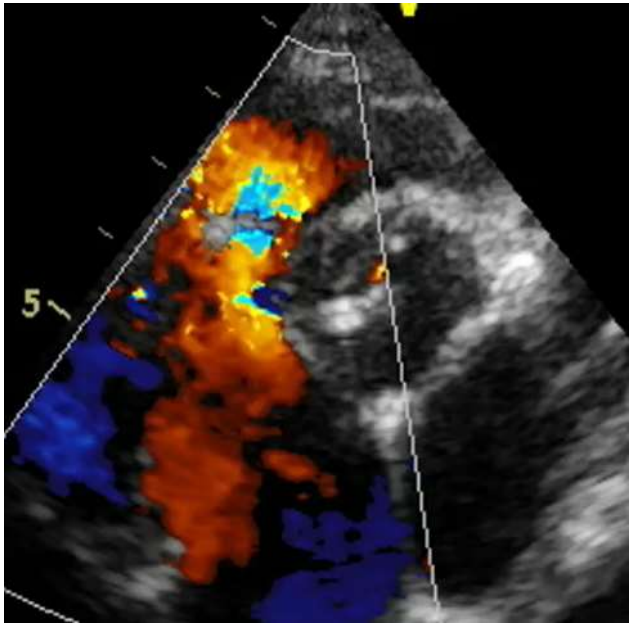


Tricuspid regurgitation

- LV – RA shunting reduced after VSD closure







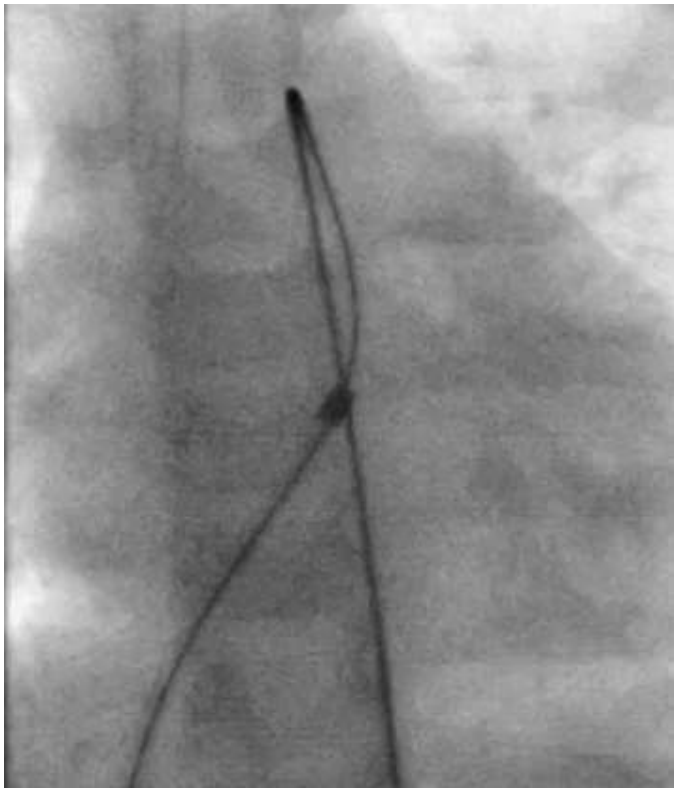
Before procedure

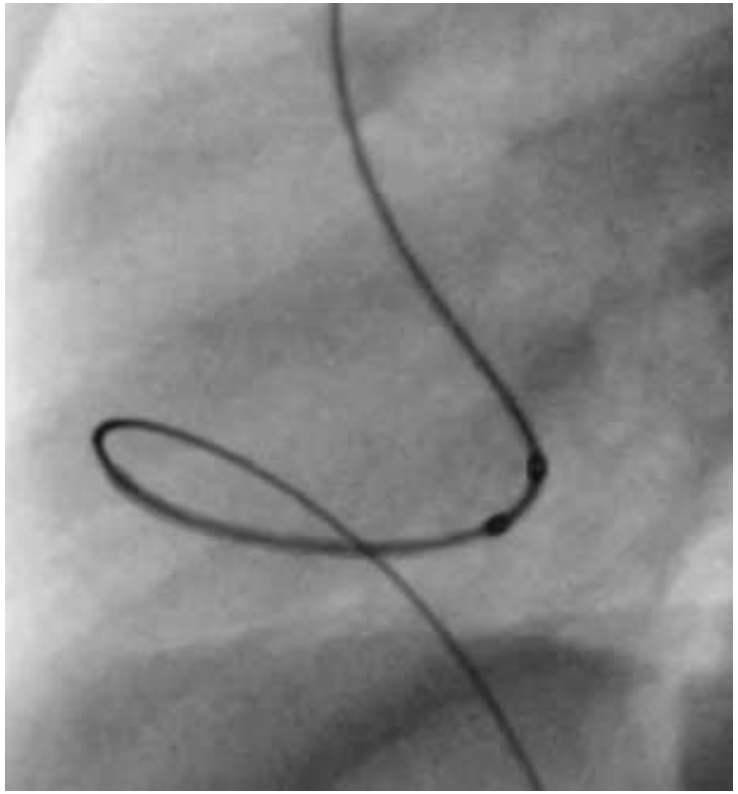
After procedure

Tricuspid regurgitation

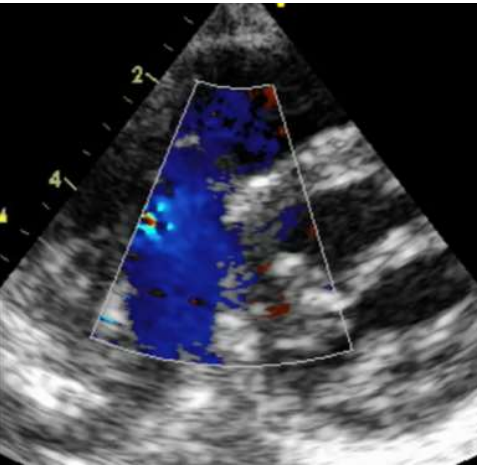
During procedure

- Tricuspid valve entangling

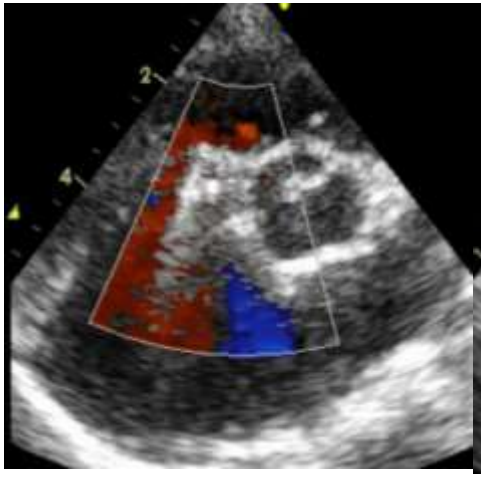




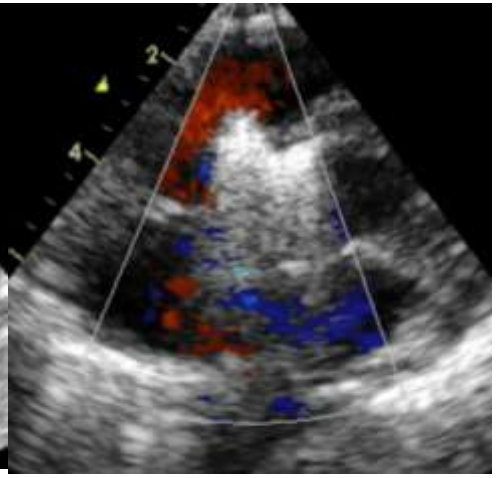
Tricuspid regurgitation



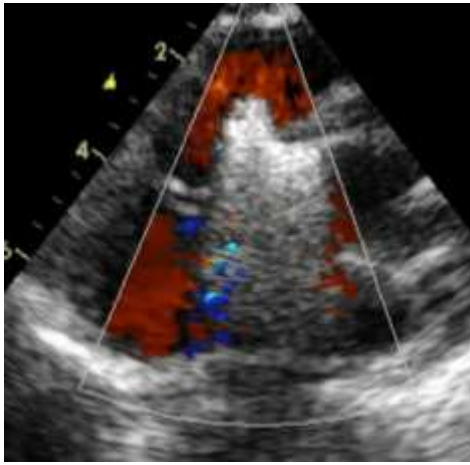
ADO I



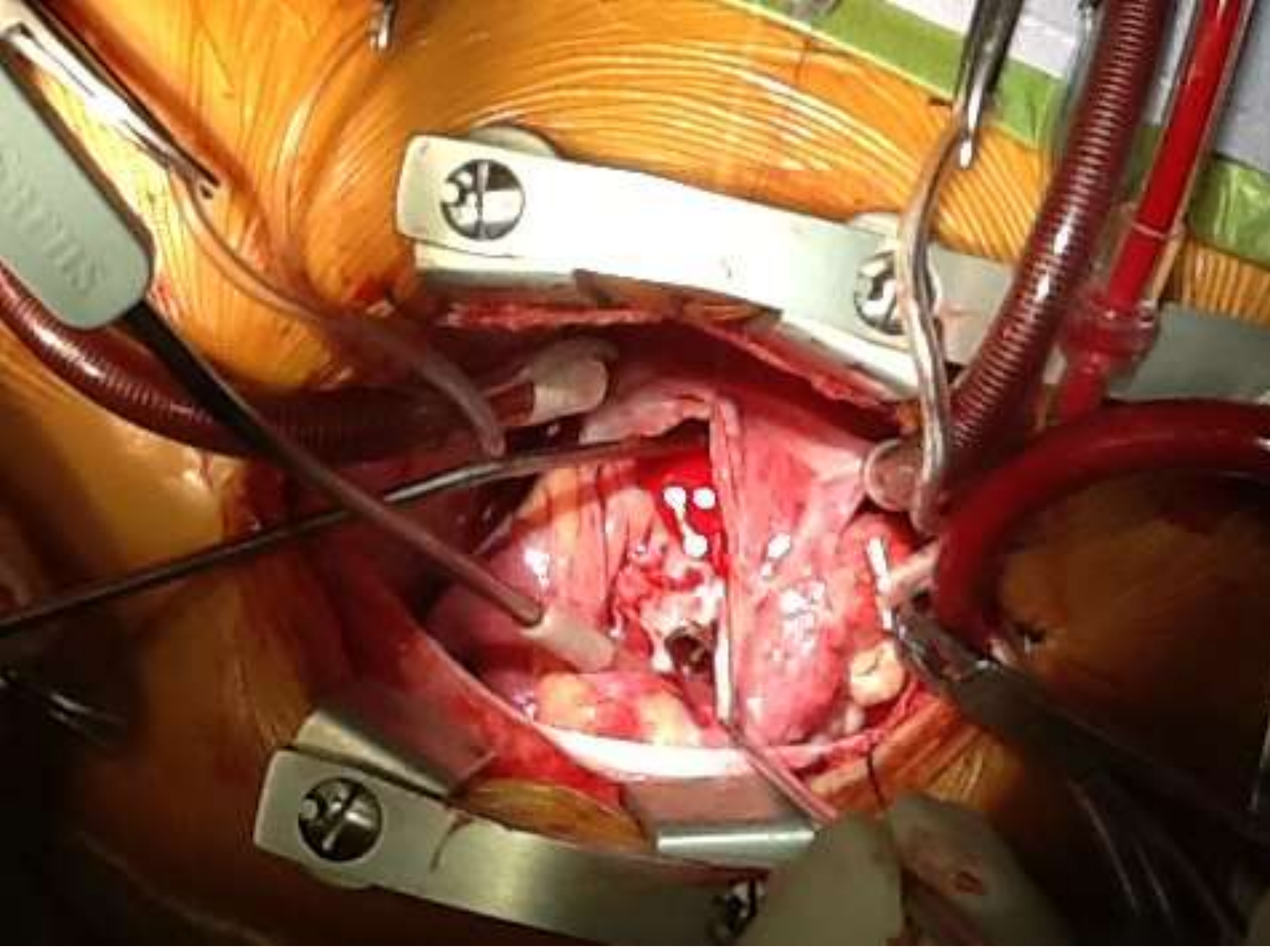
Adjusted



After releasing

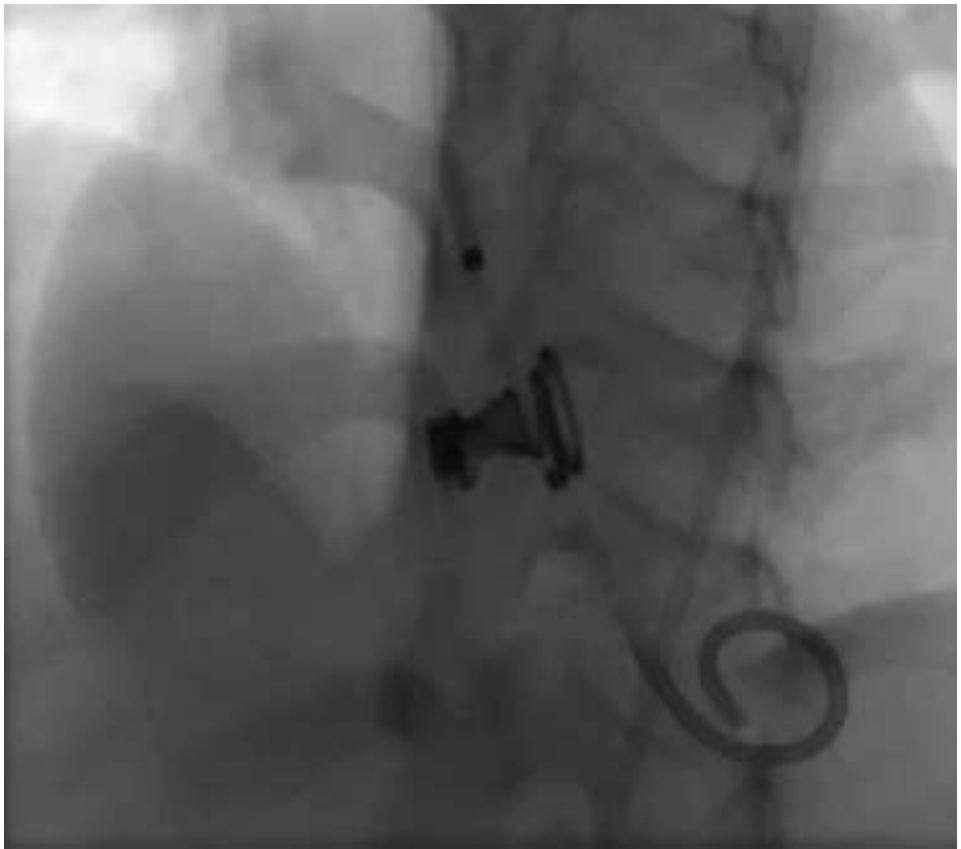


1 month later

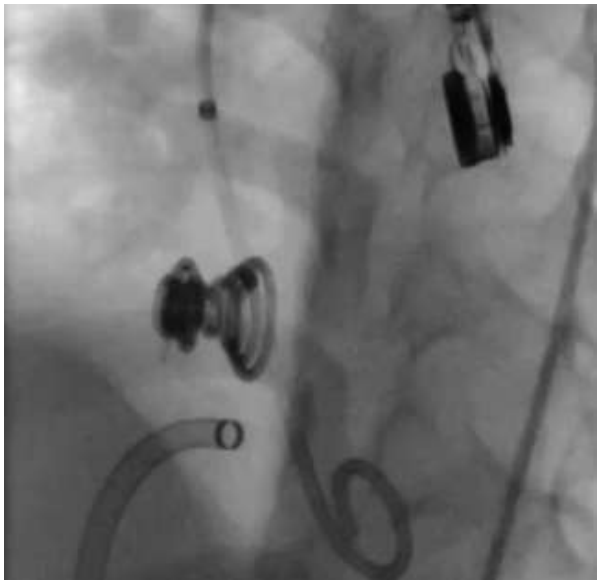


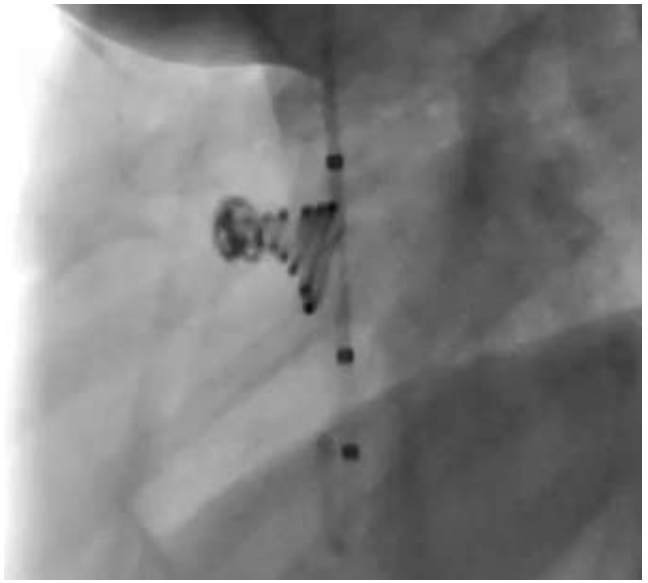
Residual shunt and hemolysis

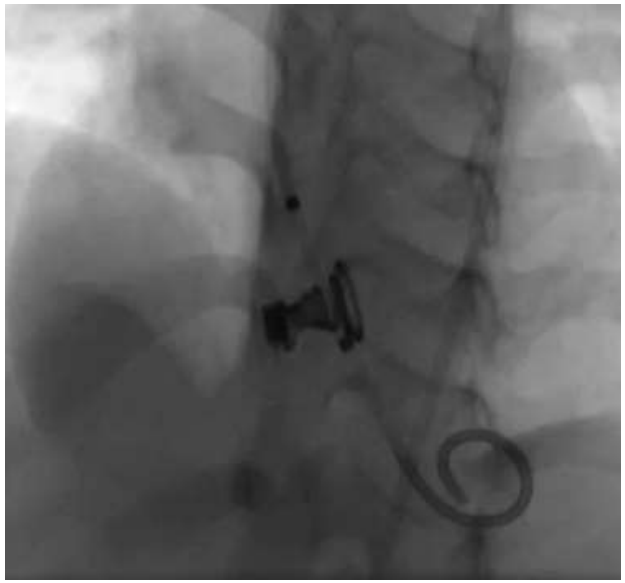
How, when and why?



Residual shunt and hemolysis

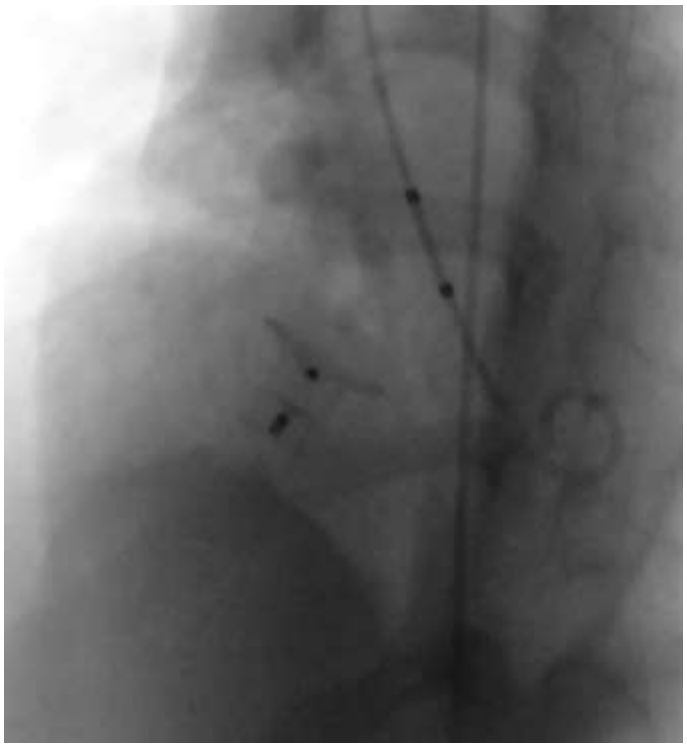


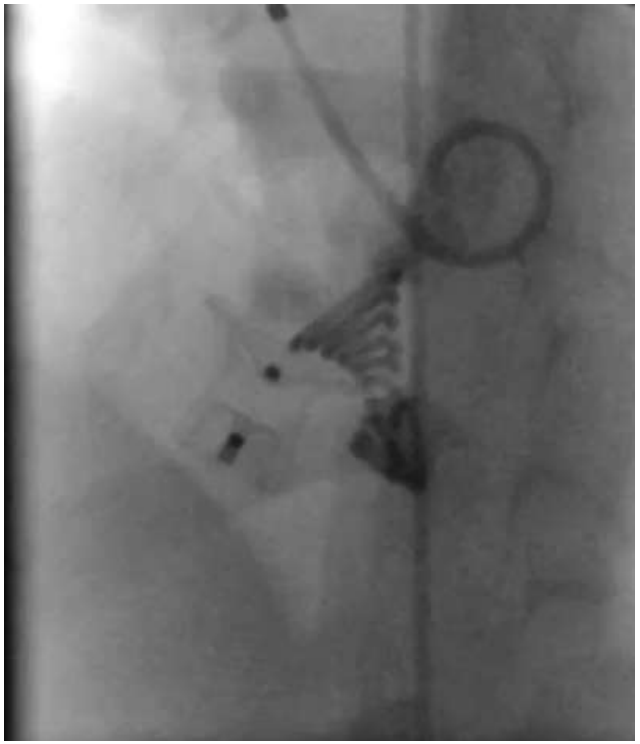




- Residual shunt through the device: high risk of hemolysis
- Residual shunt in Pfm coil: high risk of hemolysis

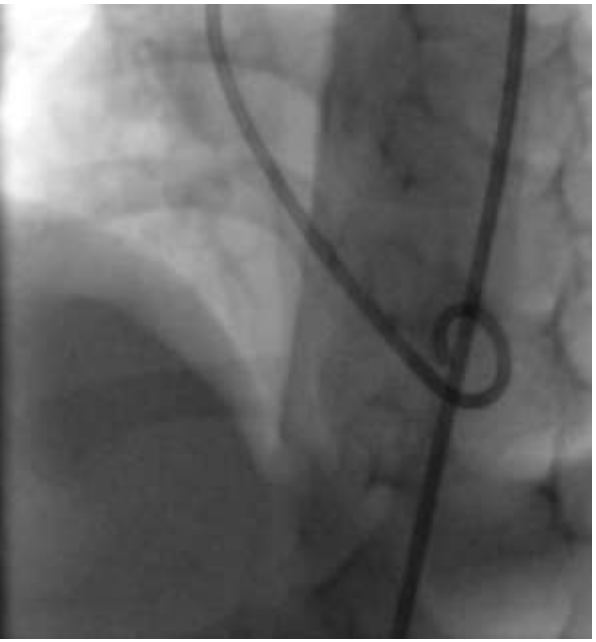
Residual shunt and hemolysis

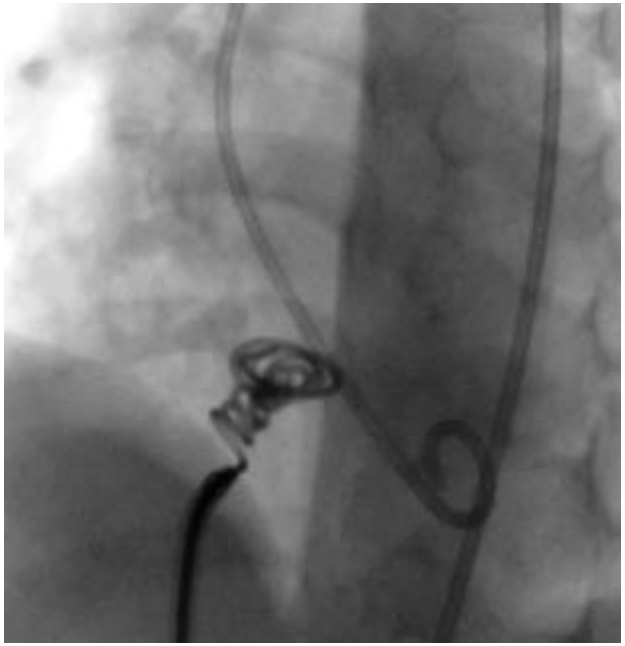


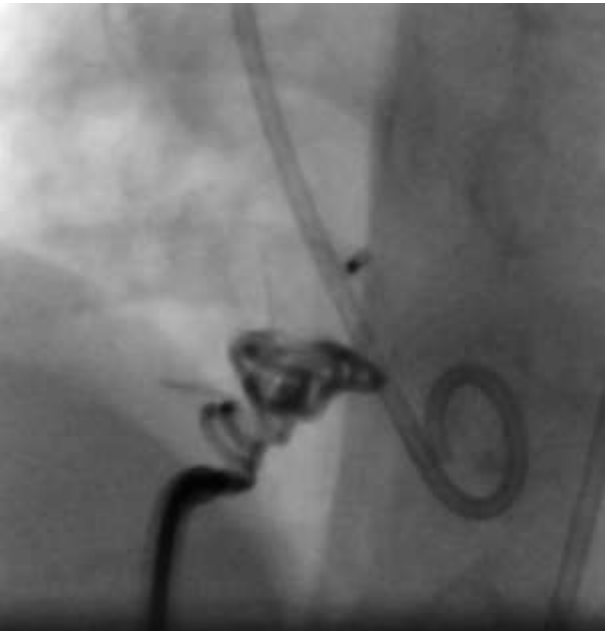


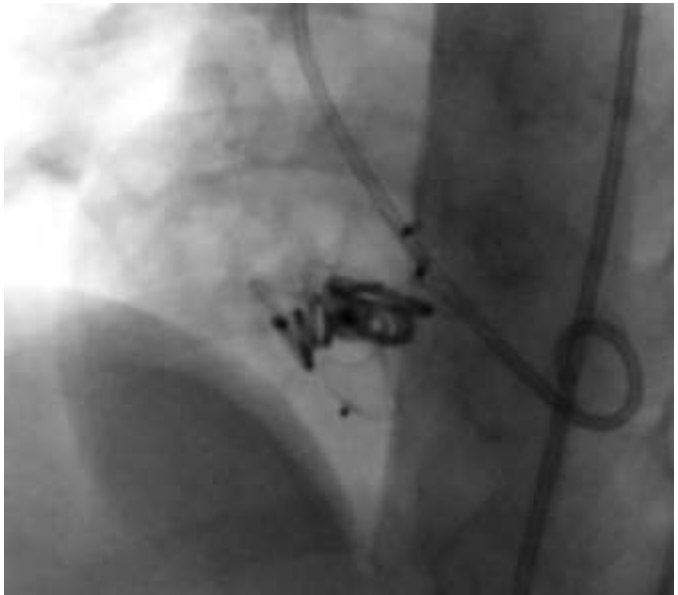
Multiple opening exits: no hemolysis

MULTIPLE OPENING EXITS





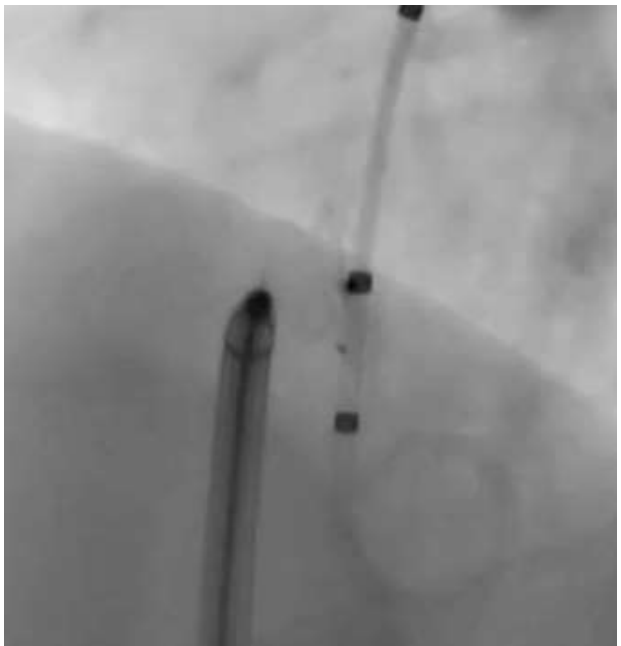




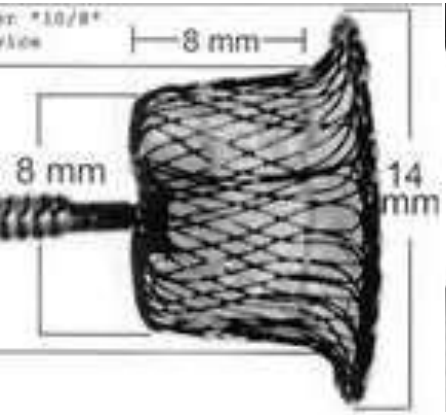
Heart block in VSD closure

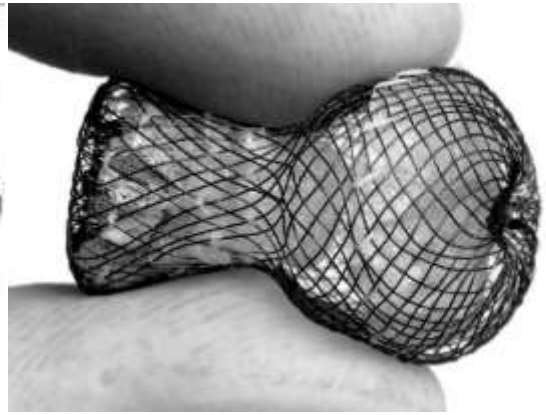
Heart block

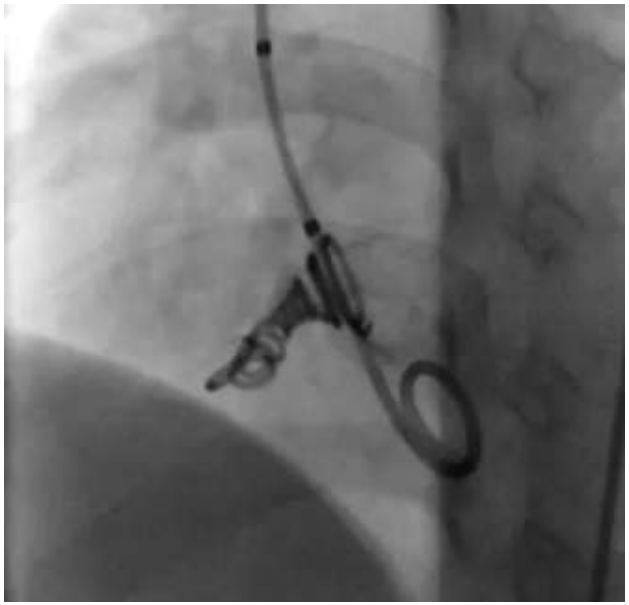
- 1 heart block in our cases with AGA
- No heart block with ADO I, ADO II, coil
- Just say NO

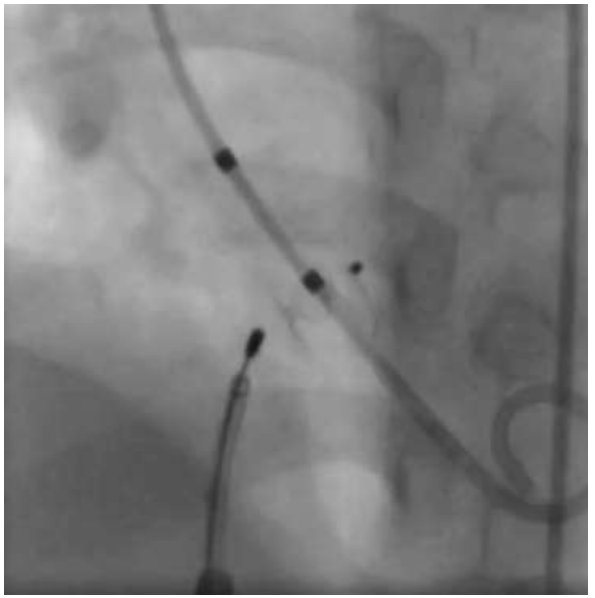


Heart block









Softer and more flexible devices: Pfm coil, ADO II, ADO I

Heart block

•With aneurysmal morphology: device will go inside the aneurysm separating from conduction system

Heart block

- Outlet or muscular VSD: far from conduction system

CONCLUSION

- No ideal device, no ideal patient
- Different morphologies can bring different results
- Different devices can bring different results
- Different techniques can bring different results
- If you can prove that the procedure is not really difficult and safe, the indication will be opened