Complications of MitraClip

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10 min

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Jung-Sun Kim, MD, PhD

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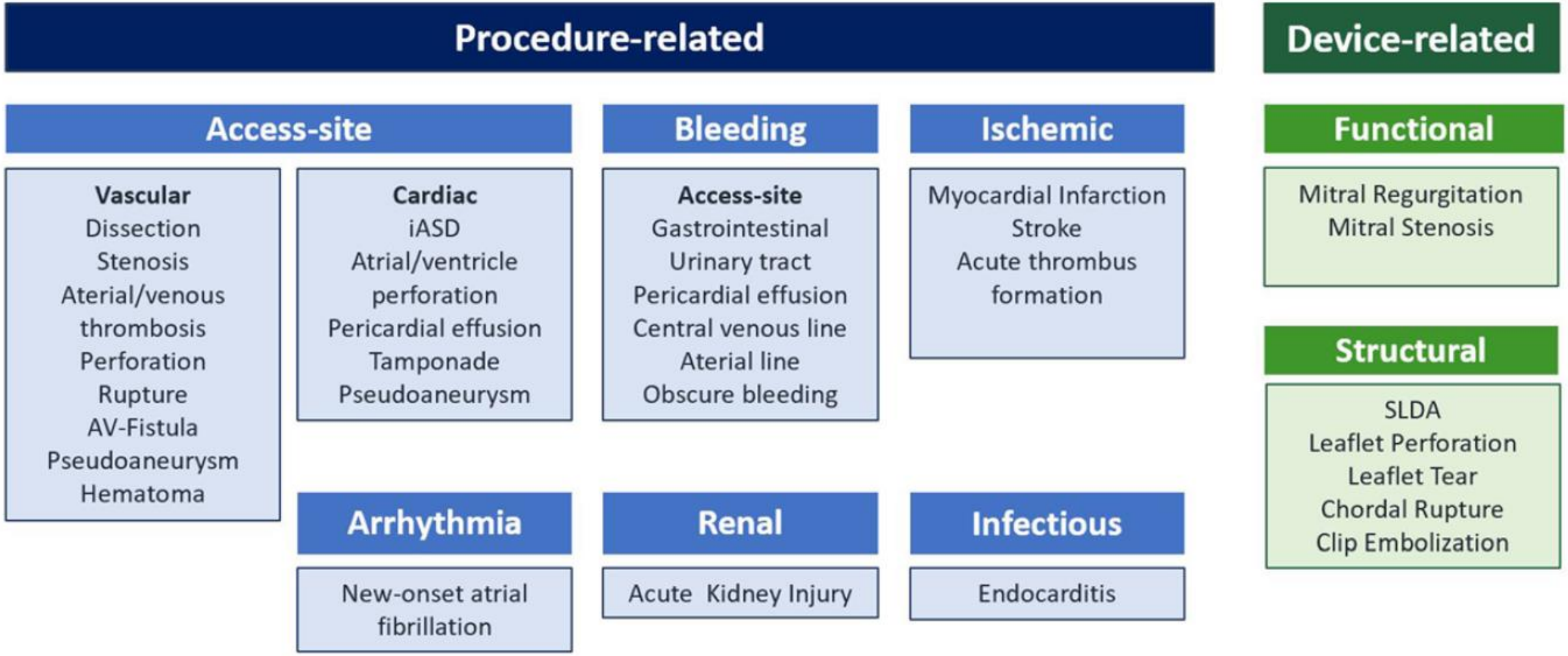
- **Speaker's Bureau:** Abbott Vascular



Schnitzler K, et al. Curr Cardiol Rep 2021;23:131

Relatively Safe Procedure !!!

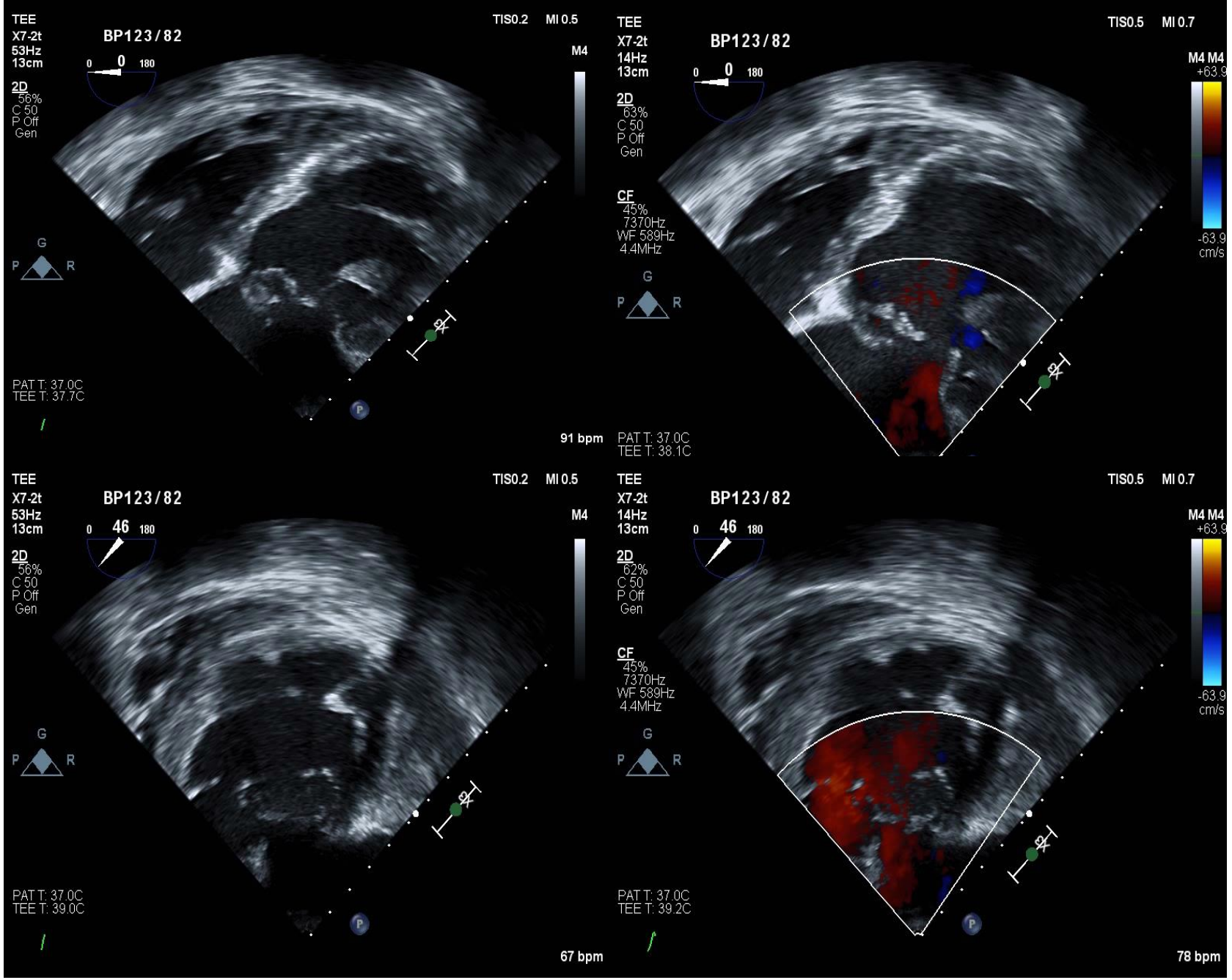
Real-world data **show a very low intraprocedural (TRAMI registery 0.1%, Praz et al. 0%, Chakravarty et al. 0%) and in-hospital mortality (TRAMI 2.4%, TCVT 2.9%, German nationwide sample 3.6%, TVT 2.7%, NIS database 2.0%).**

The latest studies **with the XTR/NTR and "G4" reported an even lower in-hospital mortality (XTR/NTR 0.9%, G4 0%)**

Schnitzler K, et al. Curr Cardiol Rep 2021;23:131

Cardiac Tamponade

Incidence : 0-0.5 %



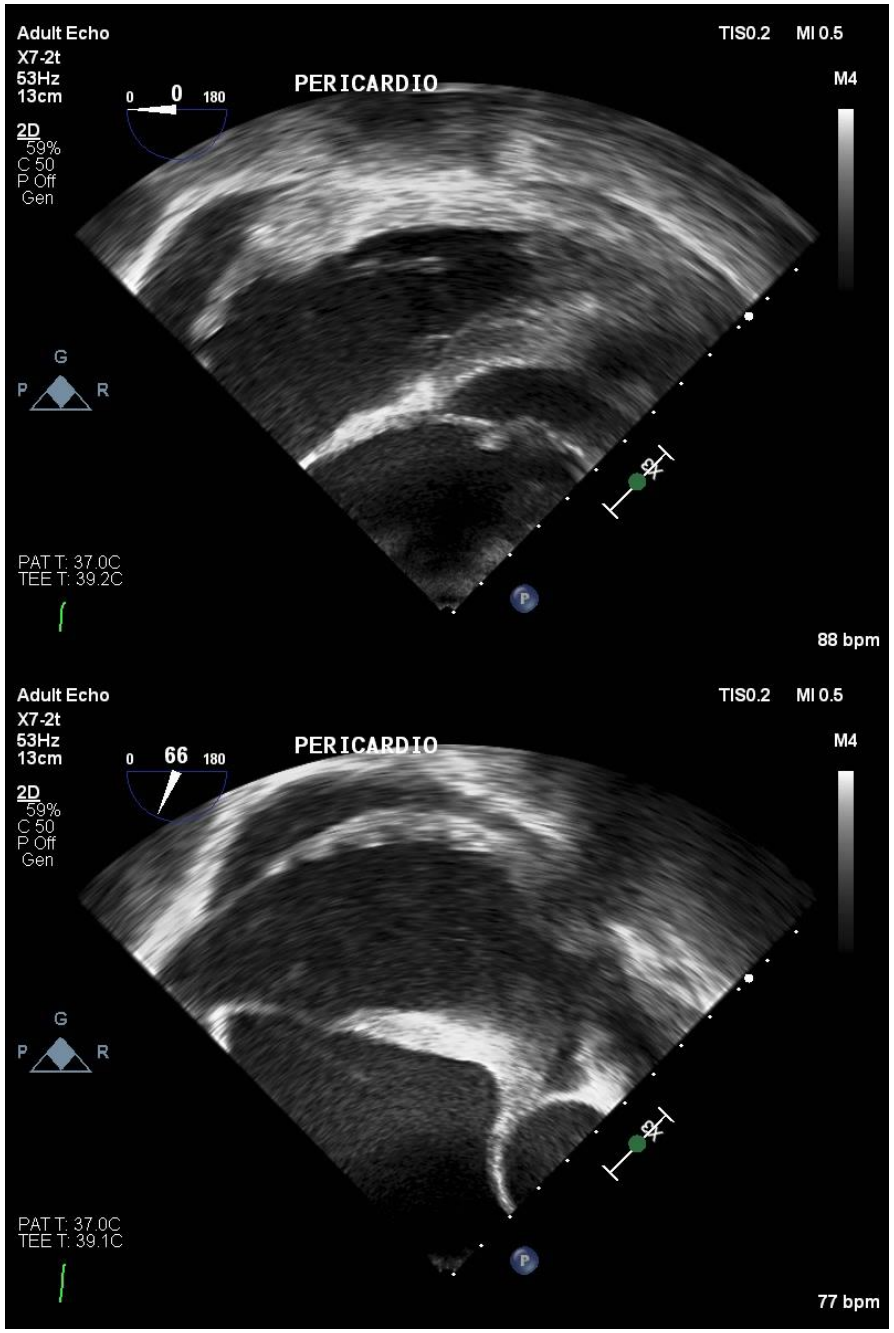
F/82

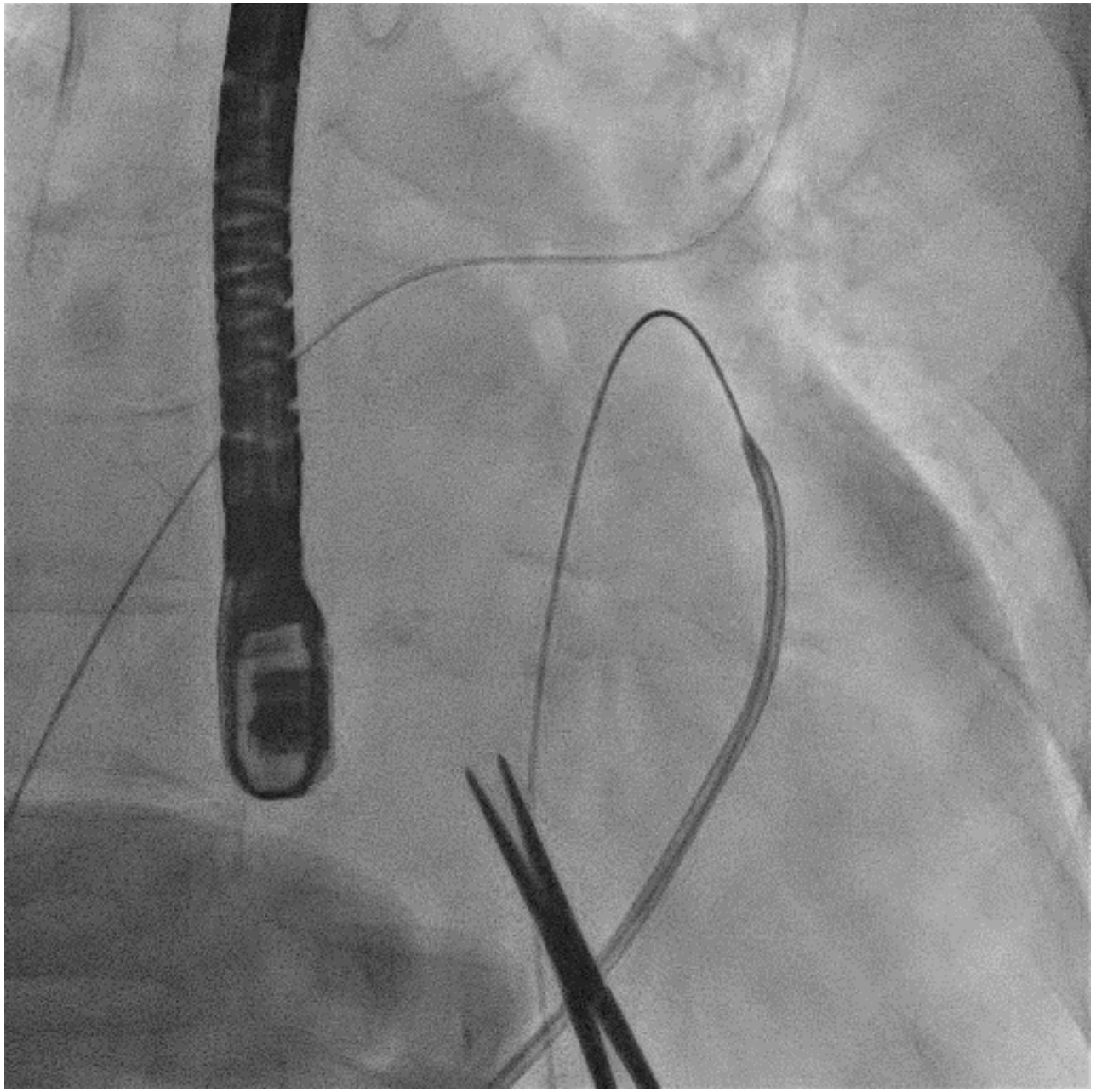
Aggravated dyspnea with GDMT

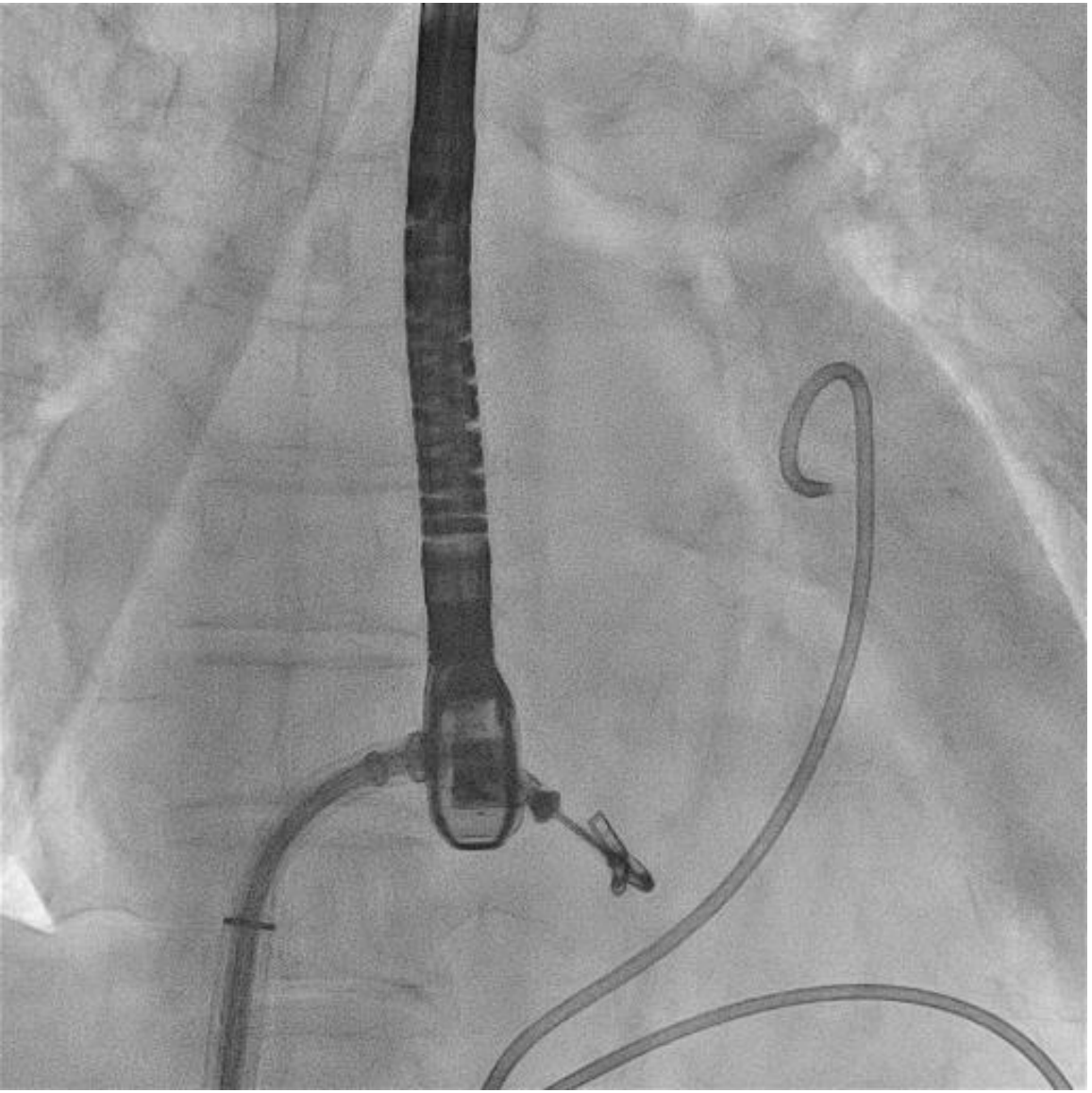
Atrial fibrillation

Severe Pul. HTN

Very severe MR due to flail AML (A3 and P3, commissural) due to ruptured chordae

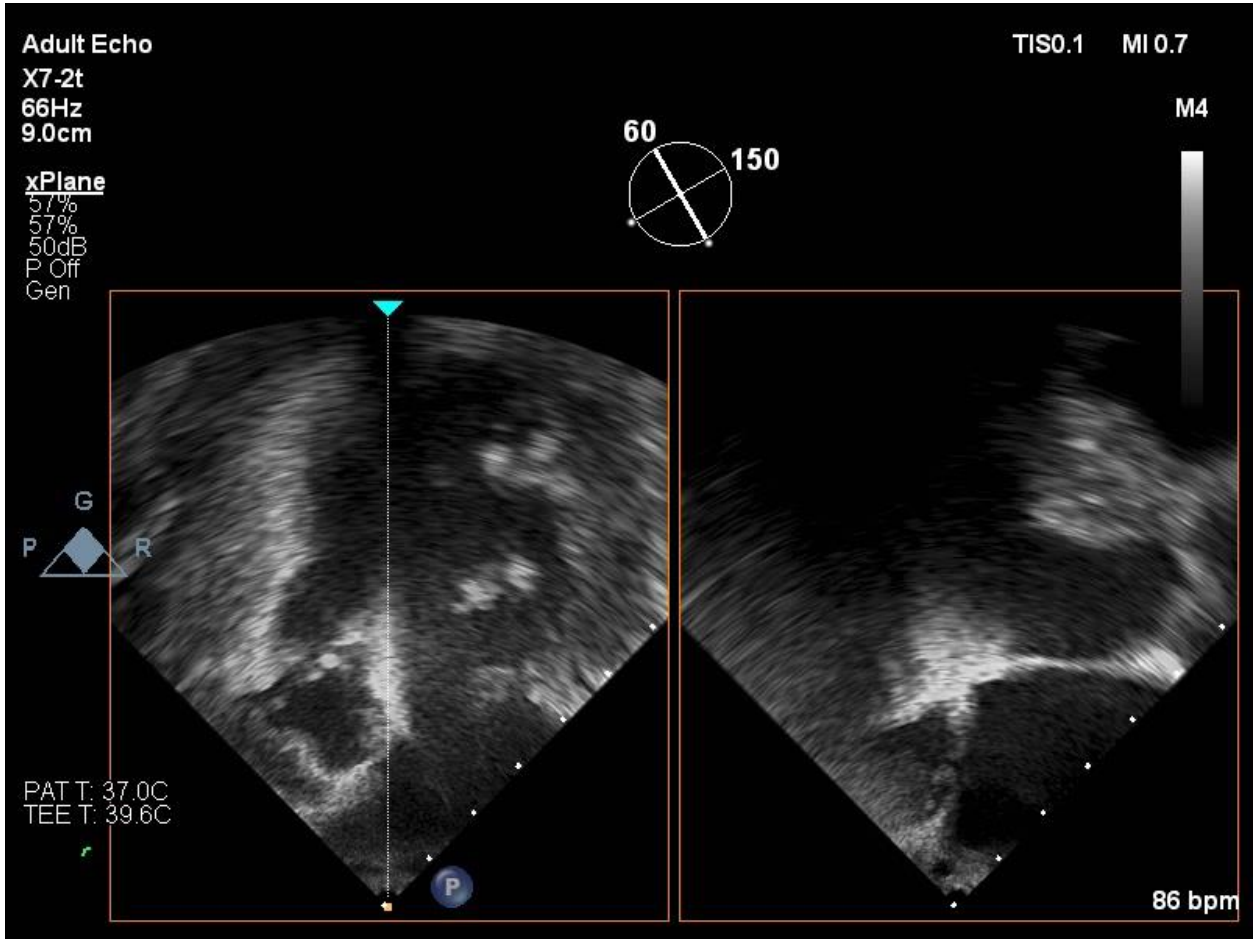

Adult Echo
X7-2t
53Hz
13cm
2D
59%
C 50
P Off
Gen
TIS0.2 MI 0.5
M4
PERICARDIO
0
180
G
P
R
PAT T: 37.0C
TEE T: 39.2C
88 bpm
Adult Echo
X7-2t
53Hz
13cm
2D
59%
C 50
P Off
Gen
TIS0.2 MI 0.5
M4
PERICARDIO
66
0
180
G
P
R
PAT T: 37.0C
TEE T: 39.1C
77 bpm



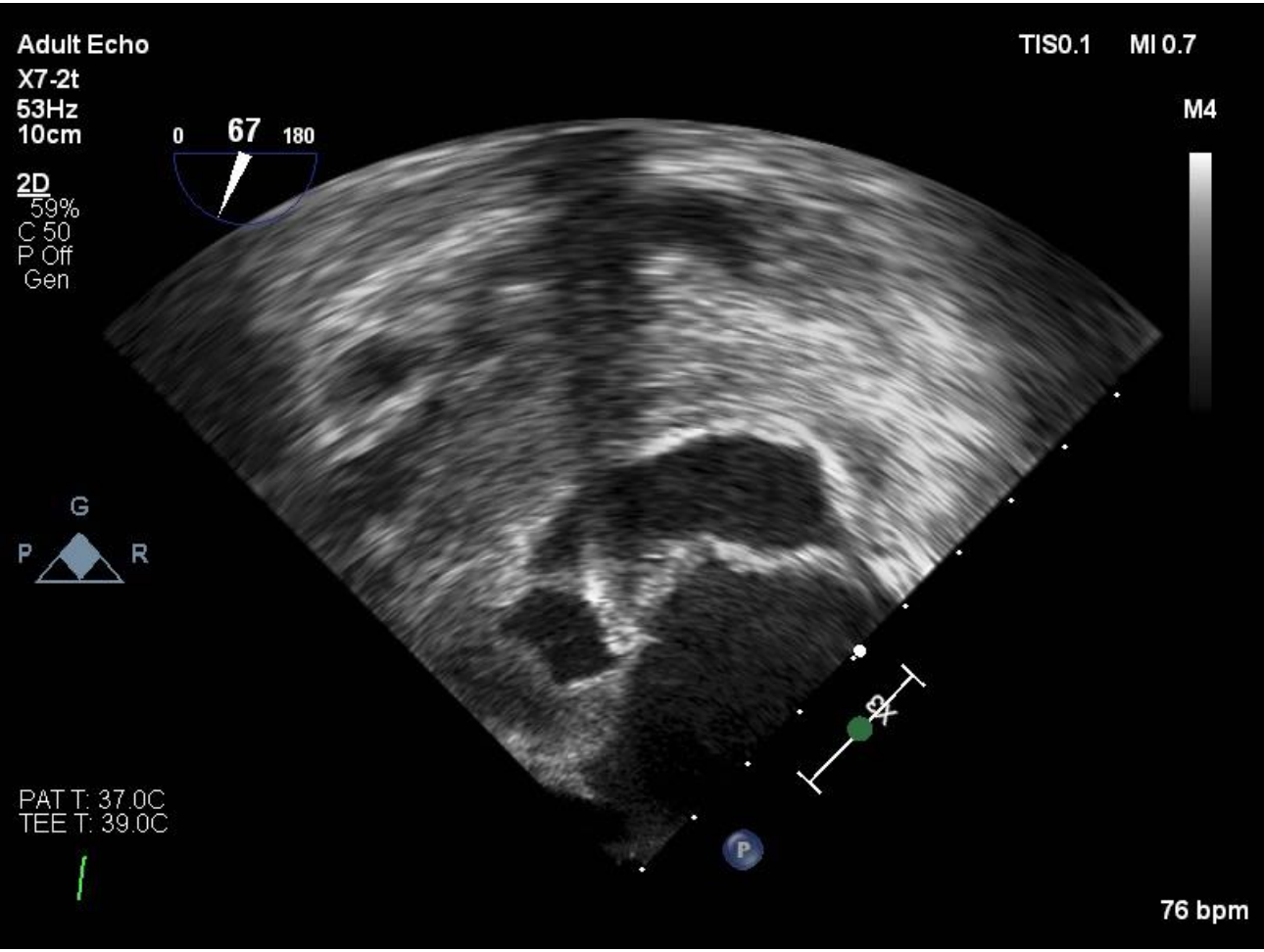


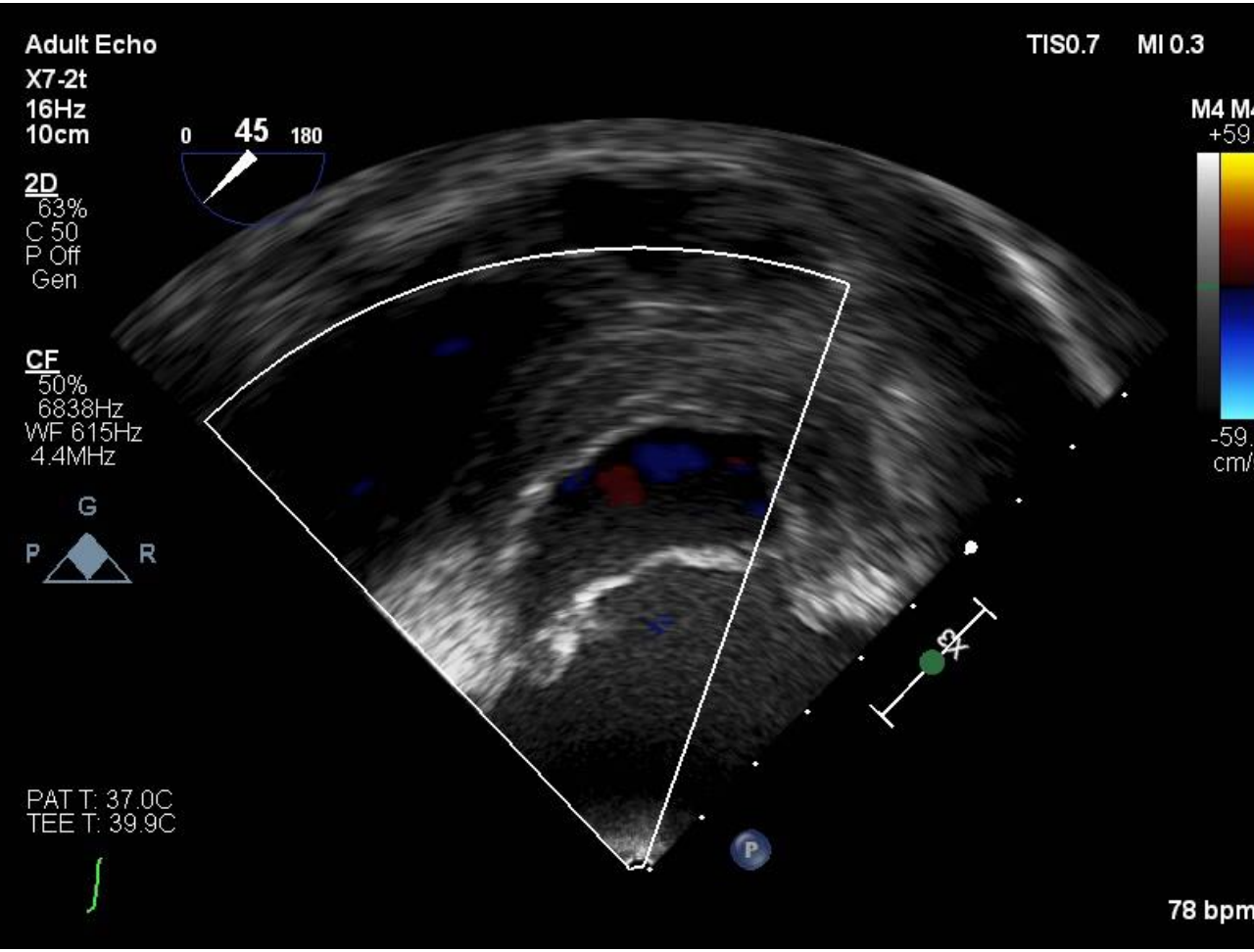
Intercomissural

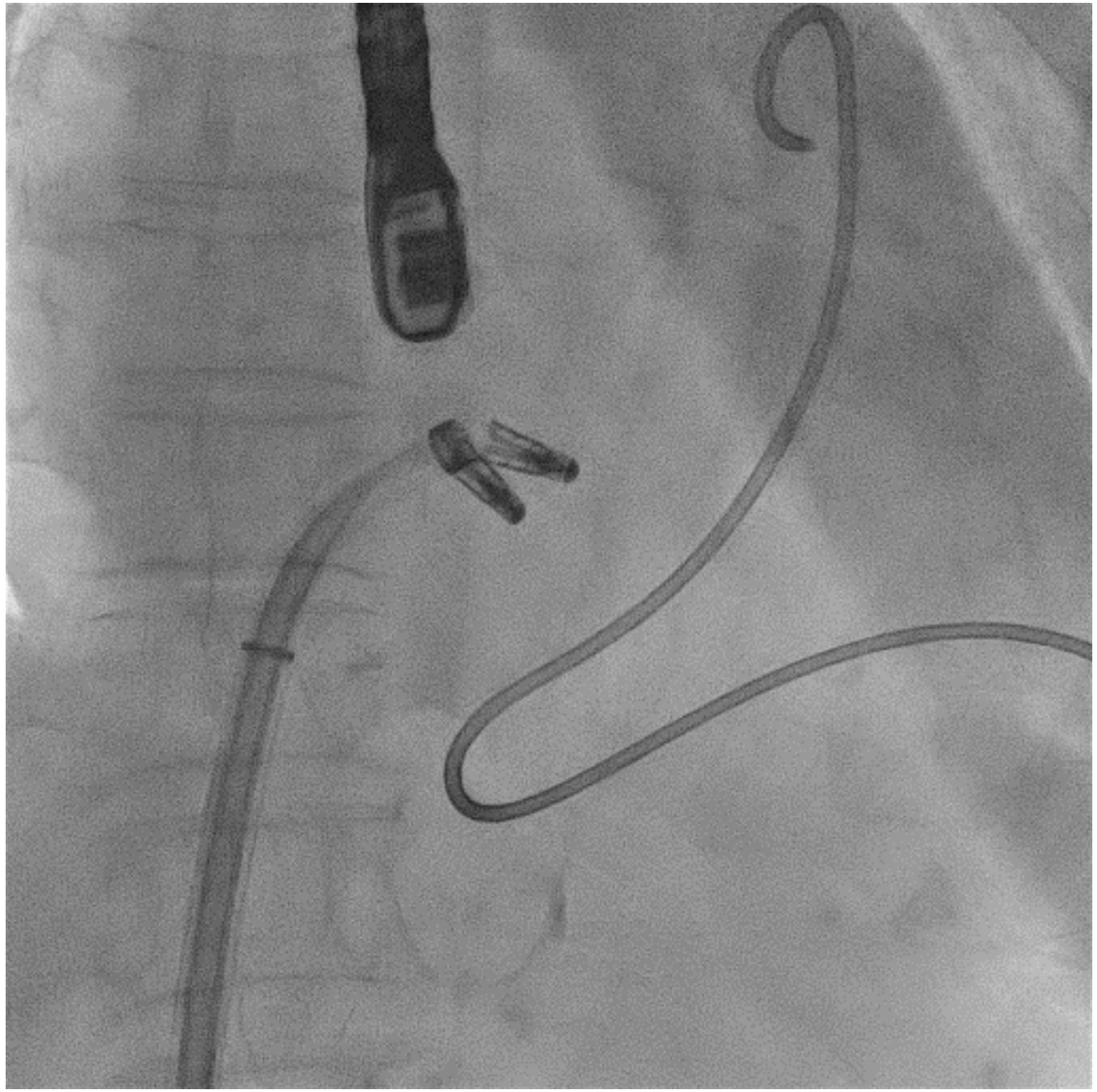
LVOT

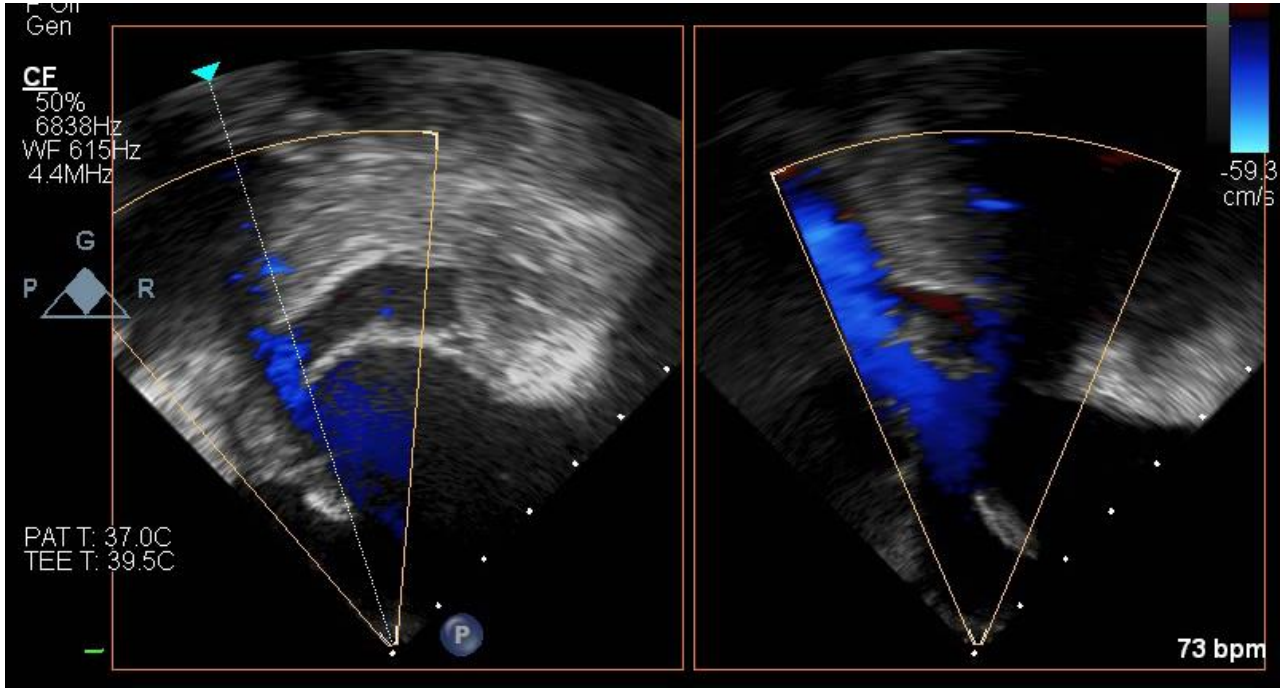


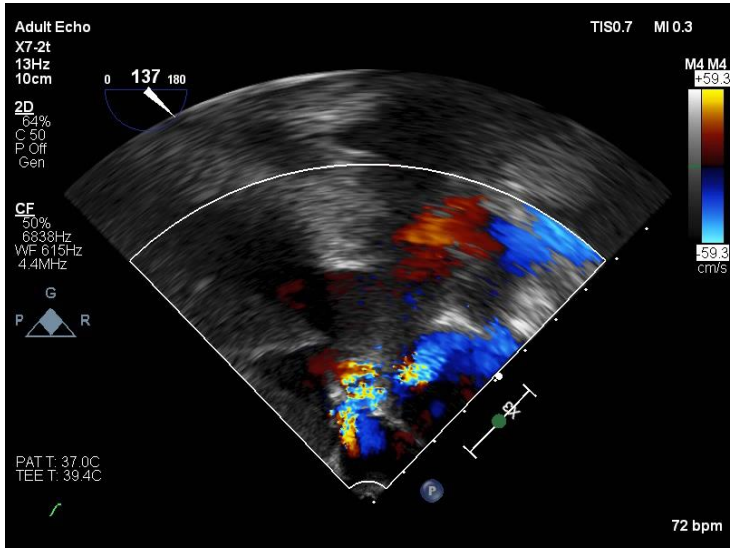
M L P A


Adult Echo
X7-2t
53Hz
10cm
2D
59%
C 50
P Off
Gen
TIS0.1
MI 0.7
M4
0
67
180
G
P
R
PAT T: 37.0C
TEE T: 39.0C
76 bpm

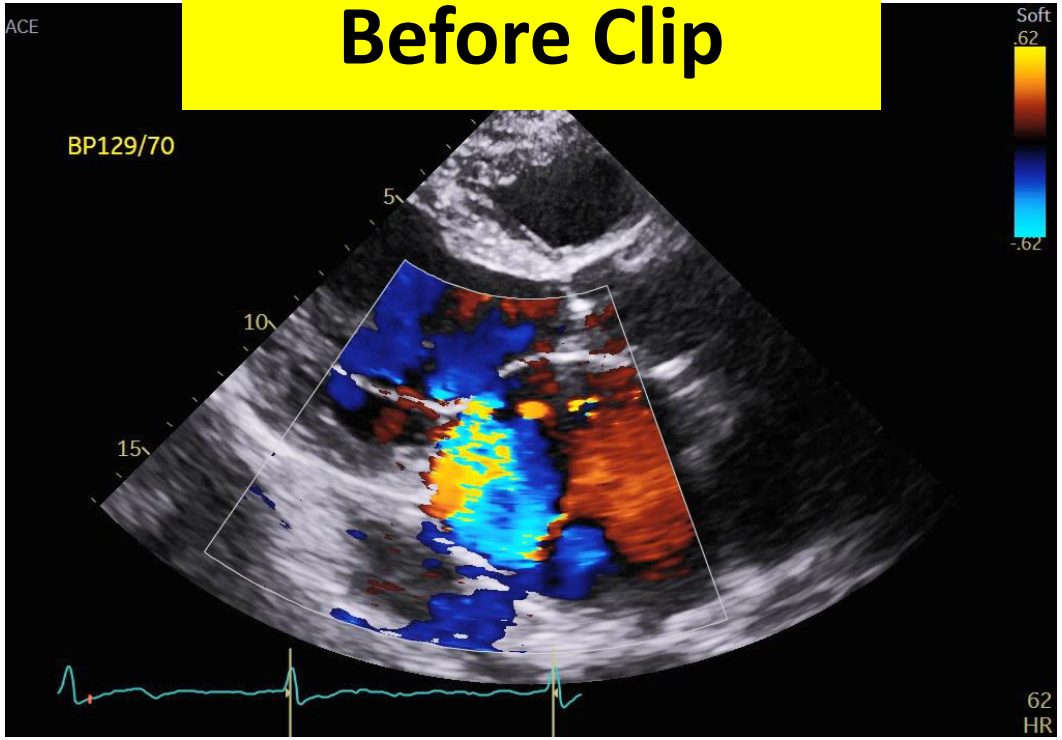

Adult Echo
X7-2t
16Hz
10cm
2D
63%
C 50
P Off
Gen
CF
50%
6838Hz
WF 615Hz
4.4MHz
TIS0.7
MI 0.3
M4 M
+59
-59
cm/
0
45
180
G
P
R
PAT T: 37.0C
TEE T: 39.9C
78 bpm



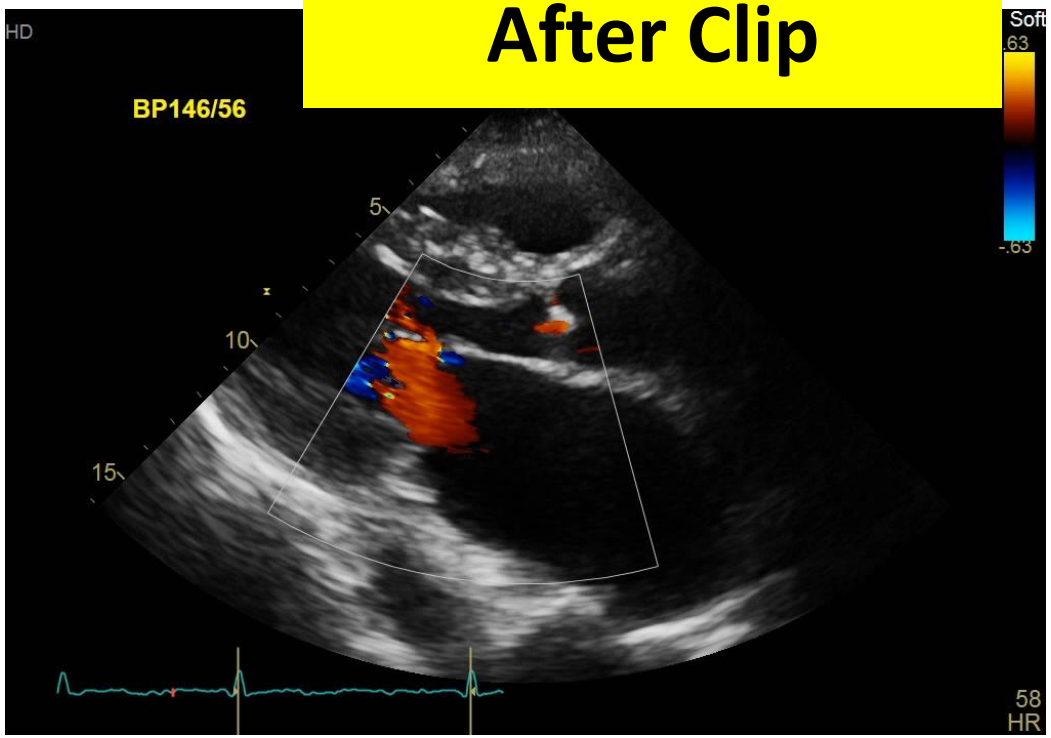

Gen
CF
50%
6838Hz
WF 615Hz
4.4MHz
G
P
R
PAT T: 37.0C
TEE T: 39.5C
-59.3
cm/s
73 bpm

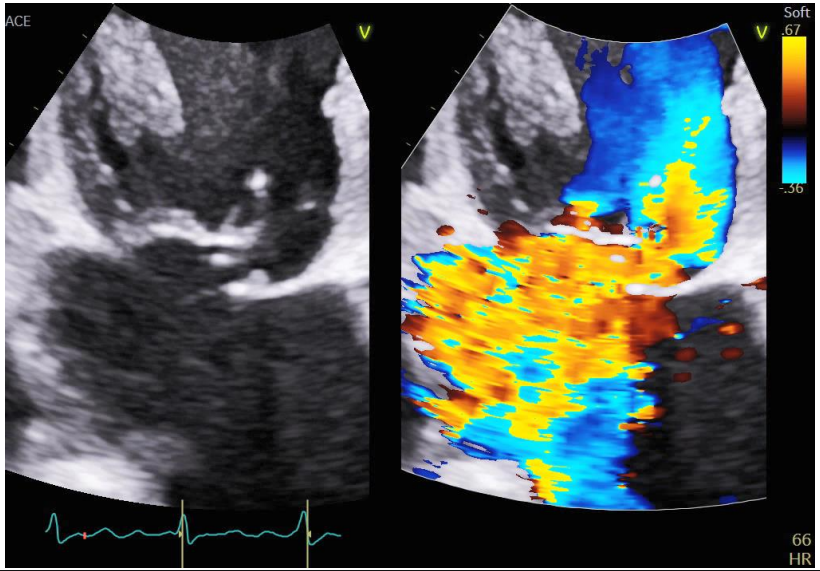

Adult Echo
X7-2t
13Hz
10cm
TIS0.7
MI 0.3
M4 M4
0
137
180
2D
64%
C 50
P Off
Gen
CF
50%
6838Hz
WF 615Hz
4.4MHz
G
P
R
+59.3
-59.3
cm/s
PAT T: 37.0C
TEE T: 39.4C
72 bpm

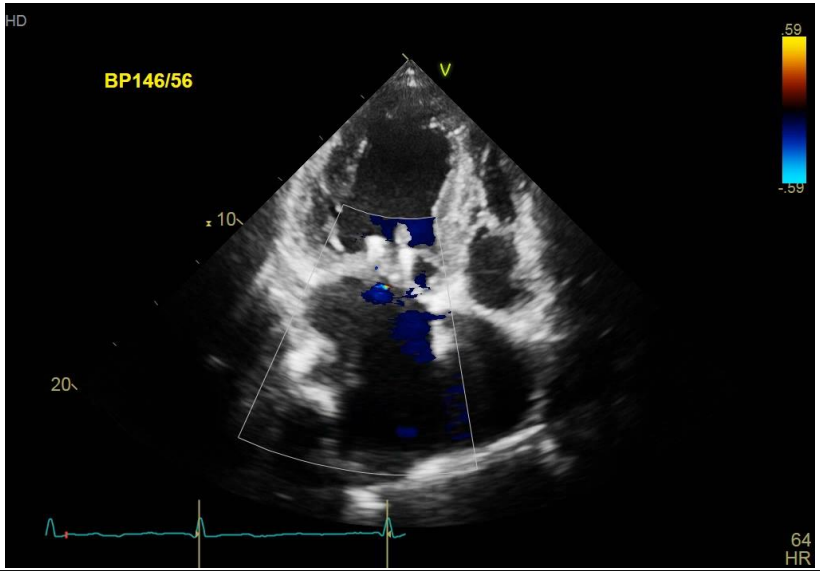
Before Clip



After Clip







Management of Cardiac Tamponade

- Immediate emergency pericardiocentesis if necessary.
- In case with puncture with ***only needle***, immediate reversal of therapeutic anticoagulation and removal of the needle may be adequate.
- If the ***guide catheter or other equipment*** has been advanced over the needle and out into the pericardial space, it is important to not immediately remove them once the problem is recognized. Consideration should be made for surgical removal of the larger bore catheters at this point and in select clinical and anatomic cases closure devices can be considered.

SCAI Textbook Transcatheter Edge-to-Edge Repair

Air or Thrombombolic Events

Incidence : 3-7 % (cardiac and cerebrovascular events)

Management of Air Embolism

- Manifest as stroke, coronary ischemia (*esp, RCA territory*), and cardiac arrest.
- Extra care with aspiration and flushing of the transseptal equipment, the MitraClip guide and delivery system.
- Adequate oxygenation, hemodynamic support with intravenous fluids and pressors when necessary, mechanical aspiration.

Management of Acute thrombus formation

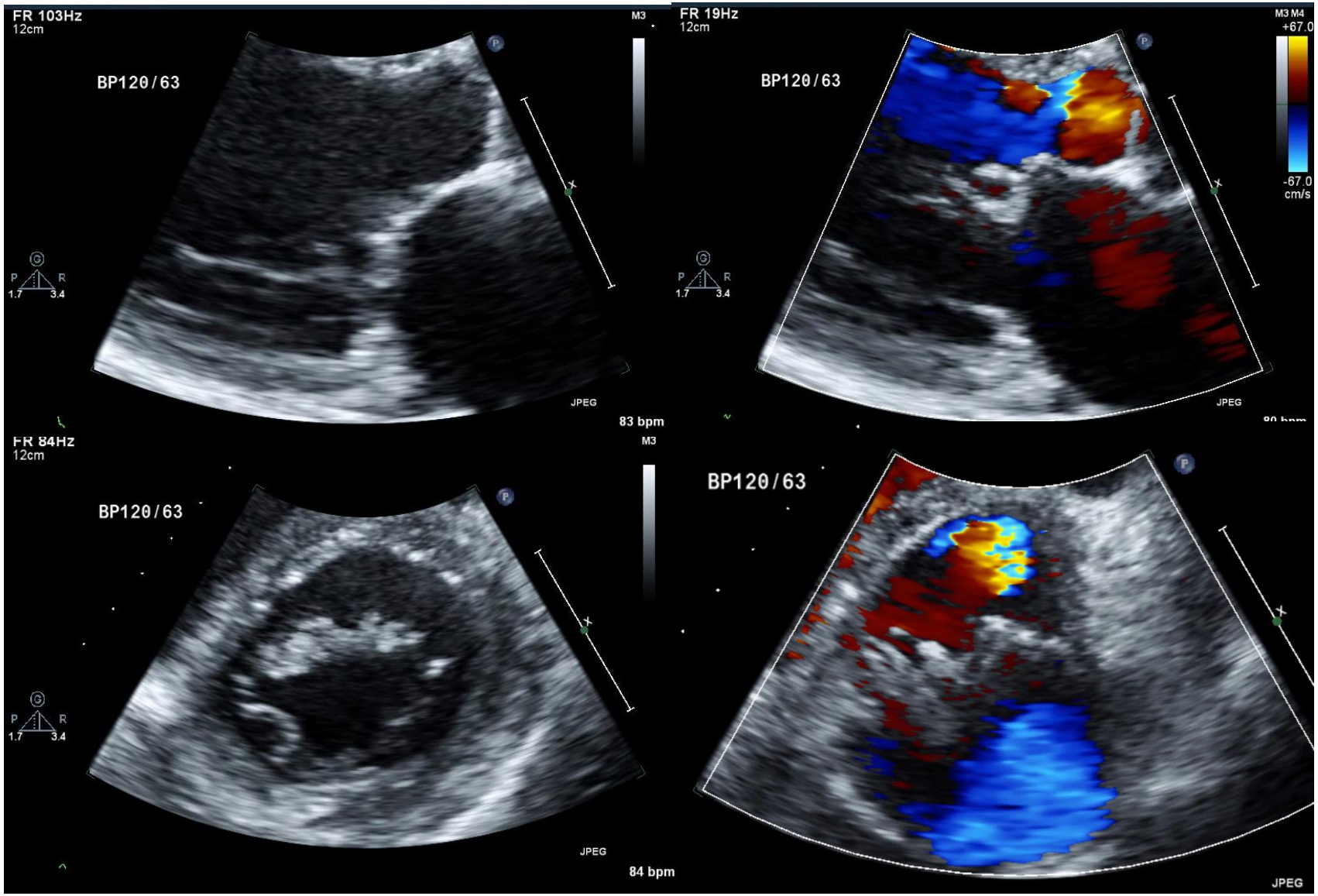
- "Wait and see" strategy with readministration of heparin, thrombus aspiration, or low-dose thrombolysis considering of bleeding risk.

SCAI Textbook Transcatheter Edge-to-Edge Repair
Schnitzler K, et al. Curr Cardiol Rep 2021;23:131

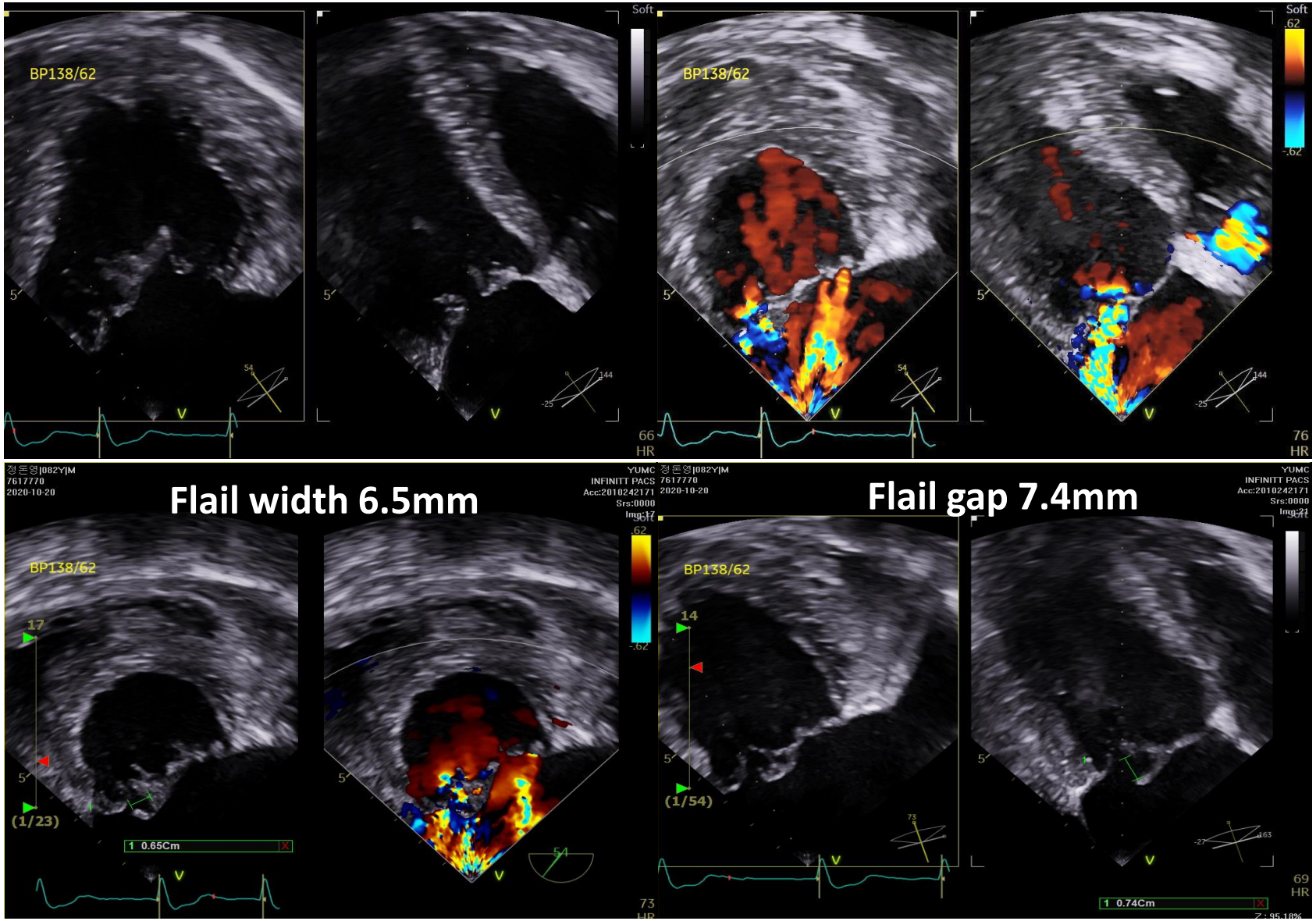
Leaflet Injury/Chordal Entanglement

Incidence : 0-2 %

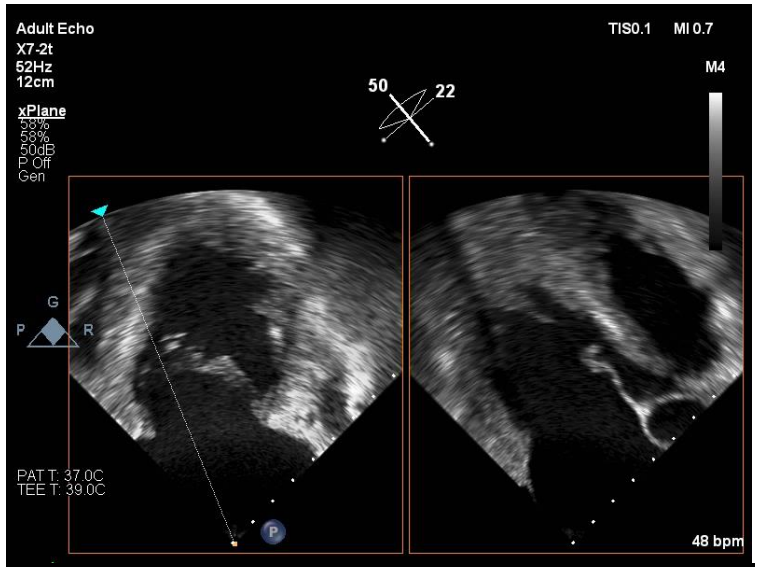
M/82 AMI with stenting, PeAF



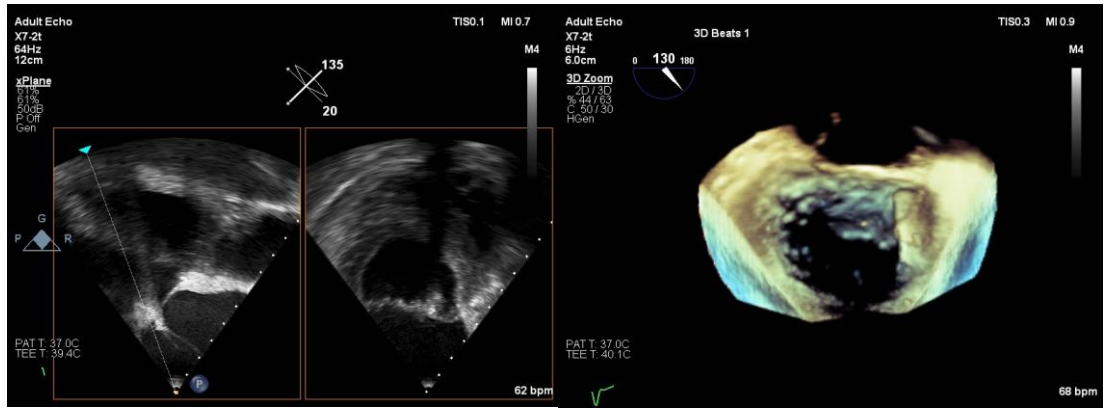
LVEDD/ESD: 60/46mm, LAVI: 62ml/m2, EF: 51%, E/e':15, RVSP :41mmHg


BP138/62
BP138/62
Flail width 6.5mm
Flail gap 7.4mm
BP138/62
BP138/62
1 0.65Cm
1 0.74Cm

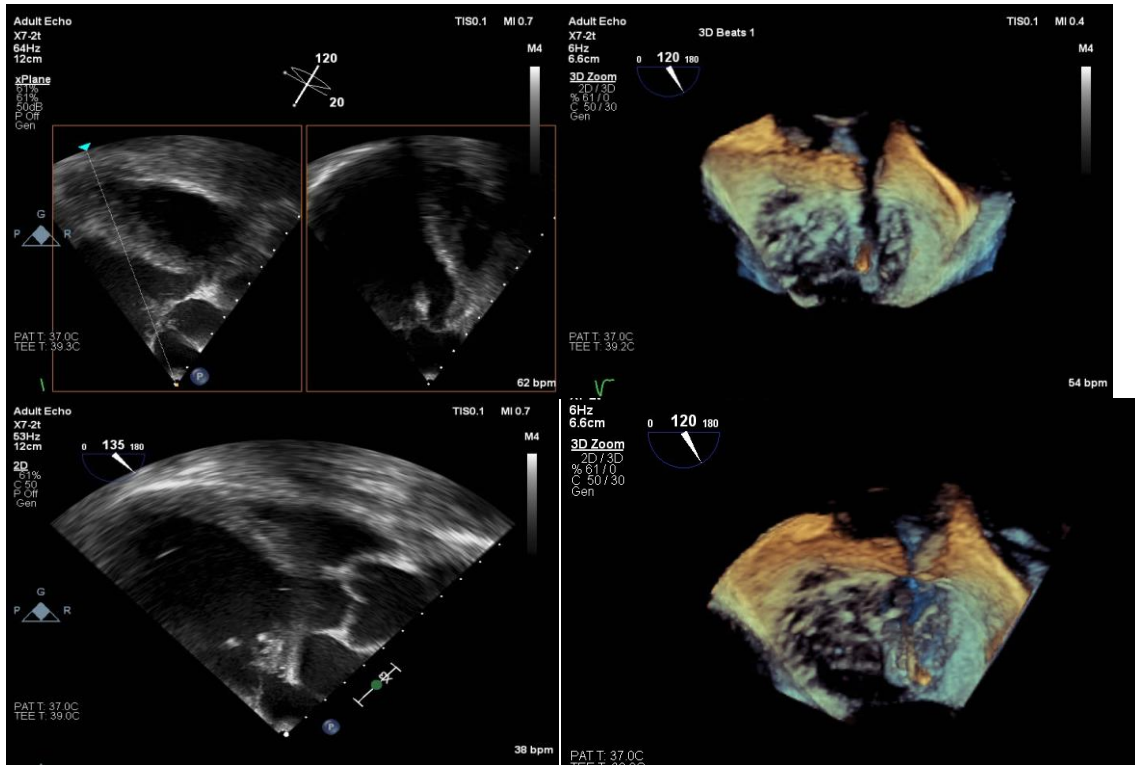
Intraprocedural TEE



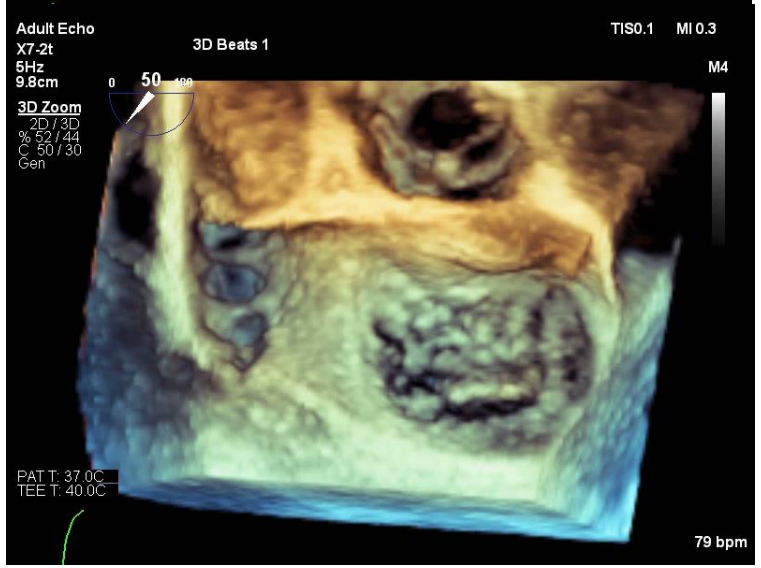
1st attempt – Too medial



2nd attempt – medial

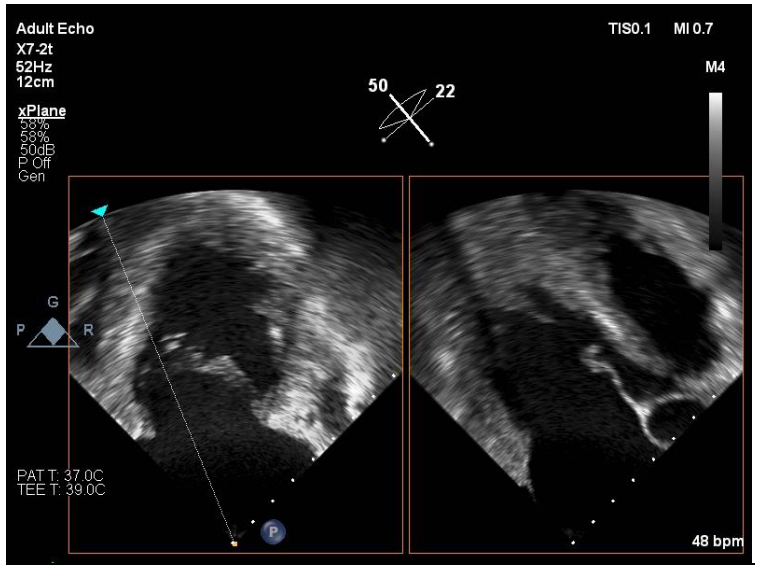


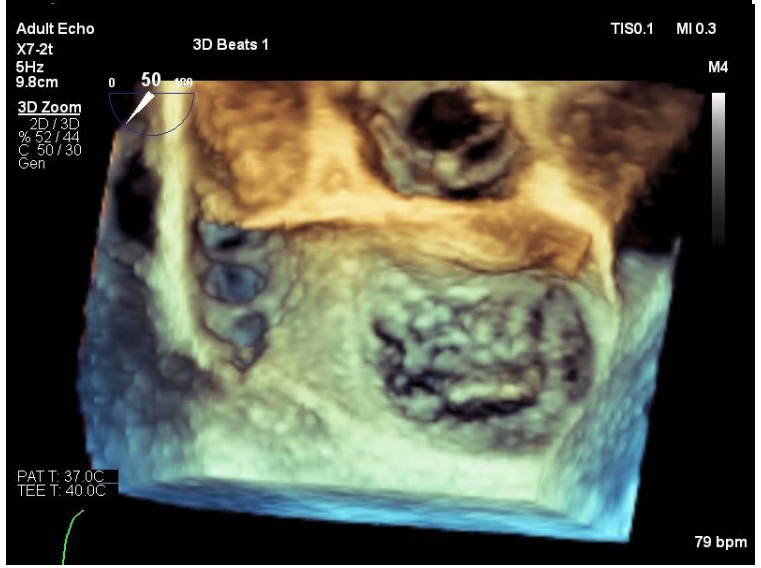
3rd attempt – central



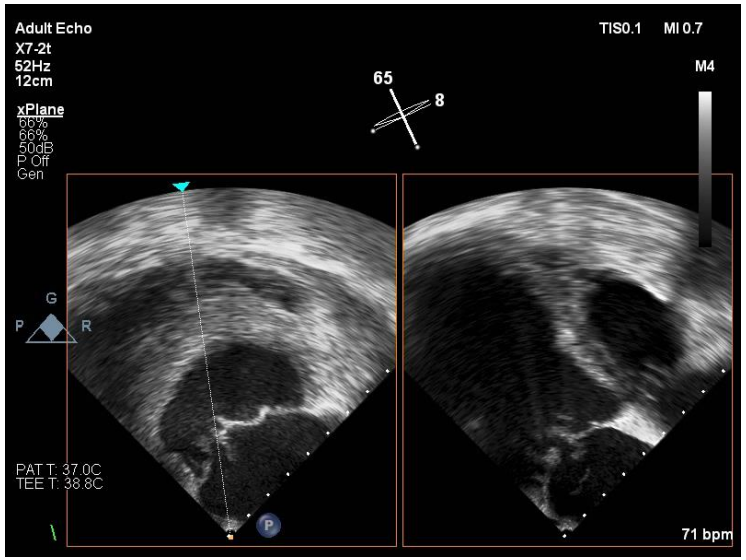
Pre Grasping

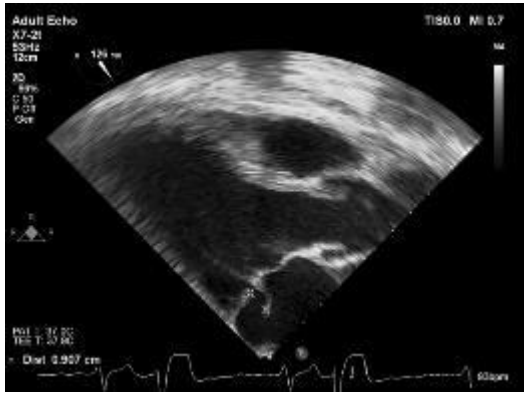
Intraprocedural TEE

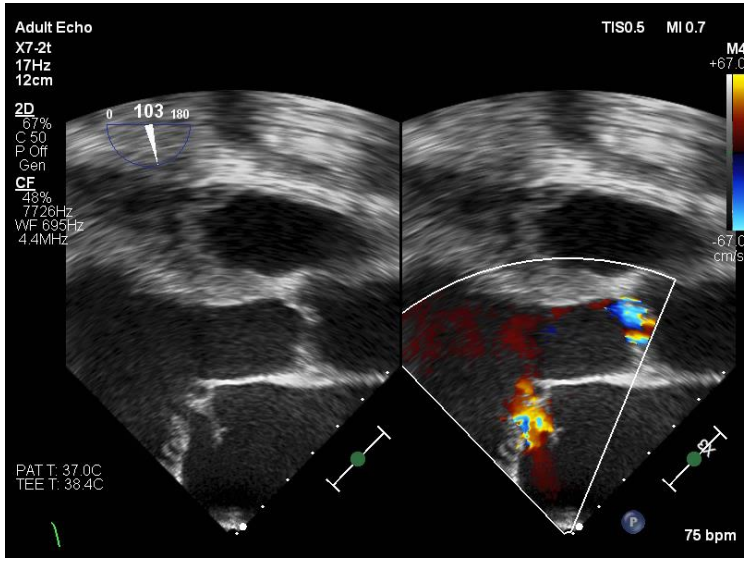




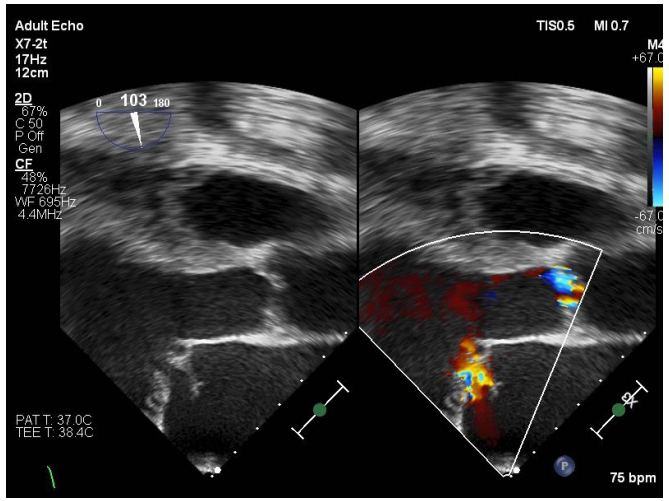
Pre Grasping



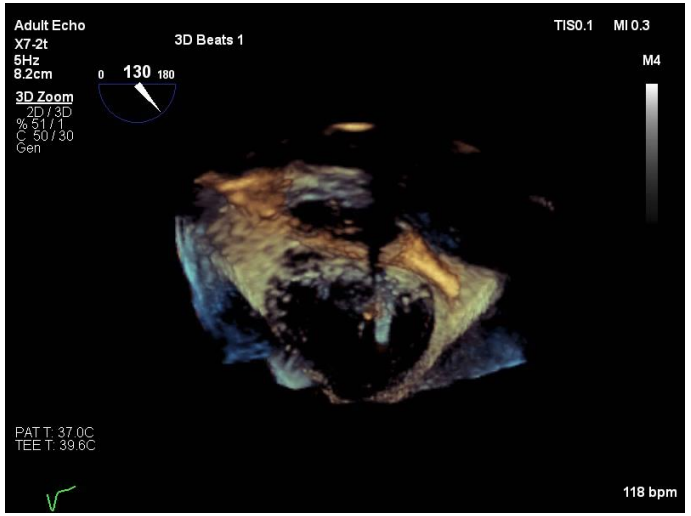


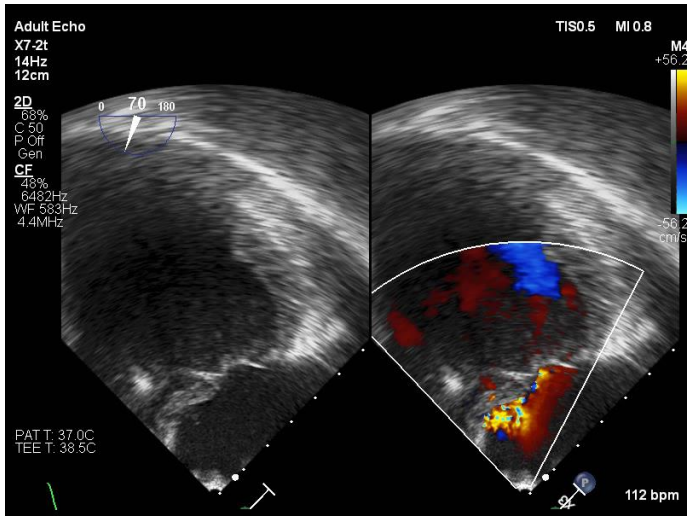


Intraprocedural TEE

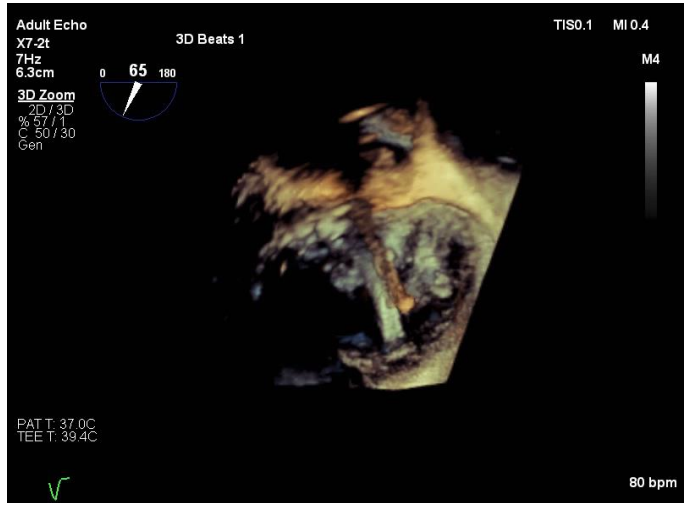


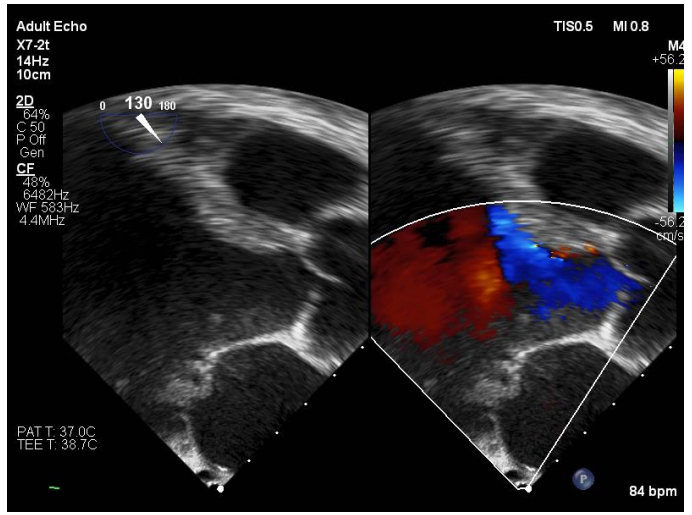
Failed to grasp a central portion of MV (A2-P2 due to chordae rupture)





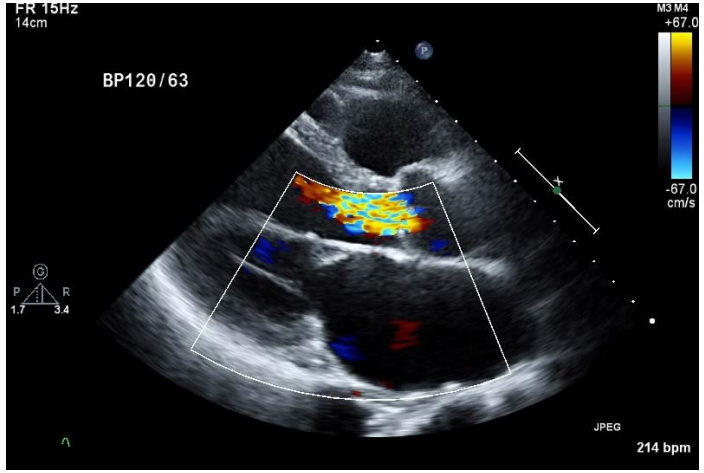
Firstly, grasping medial part with 1st Clip

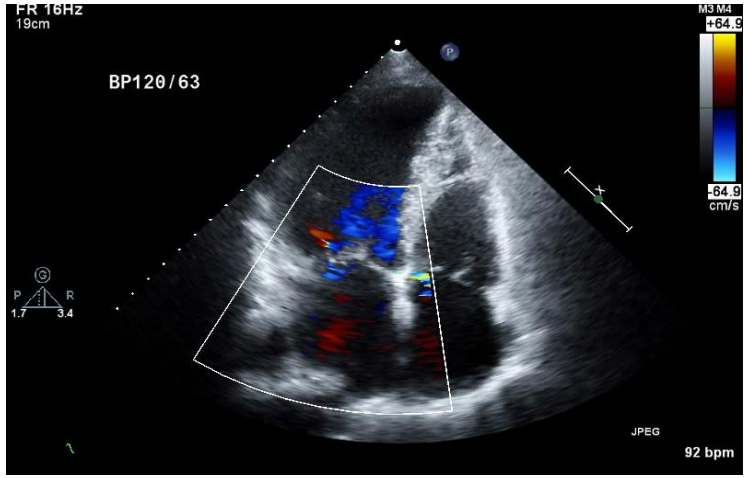


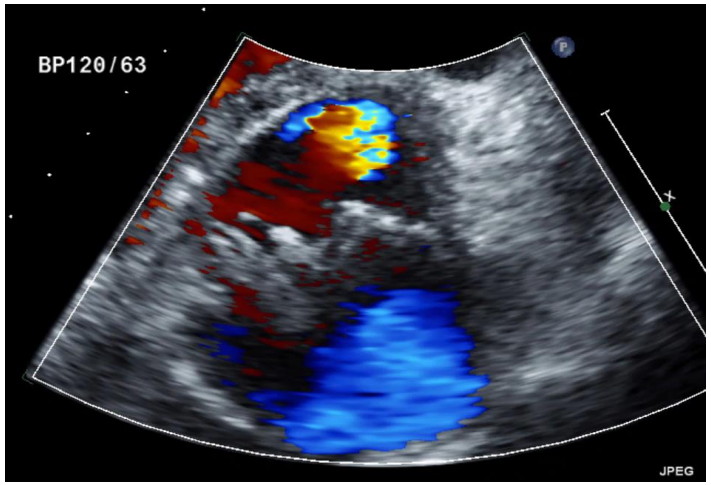


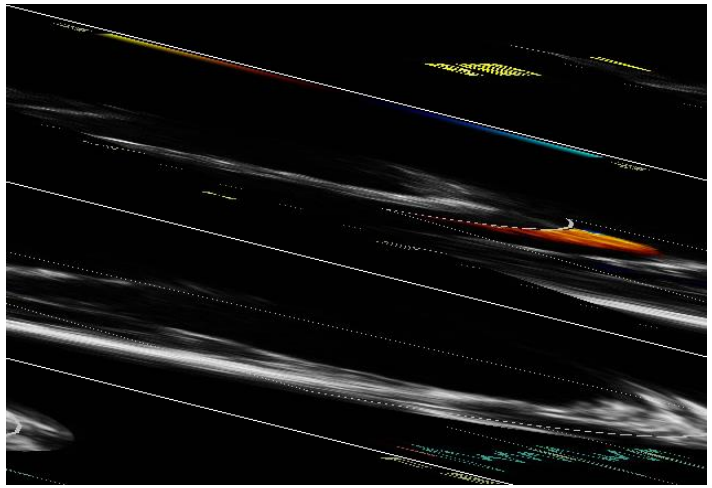
Then, grasping central part with 2nd Clip

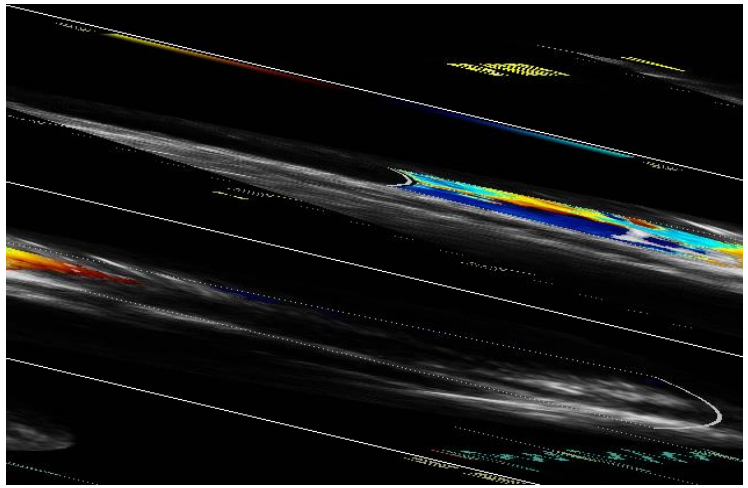
Before and After MitraClip

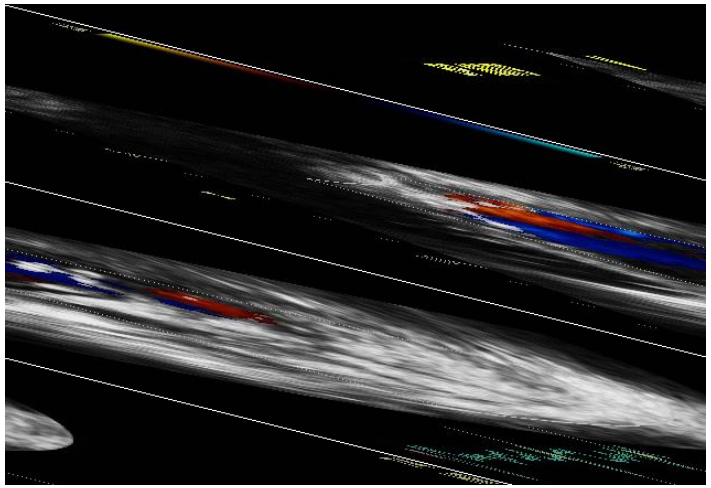












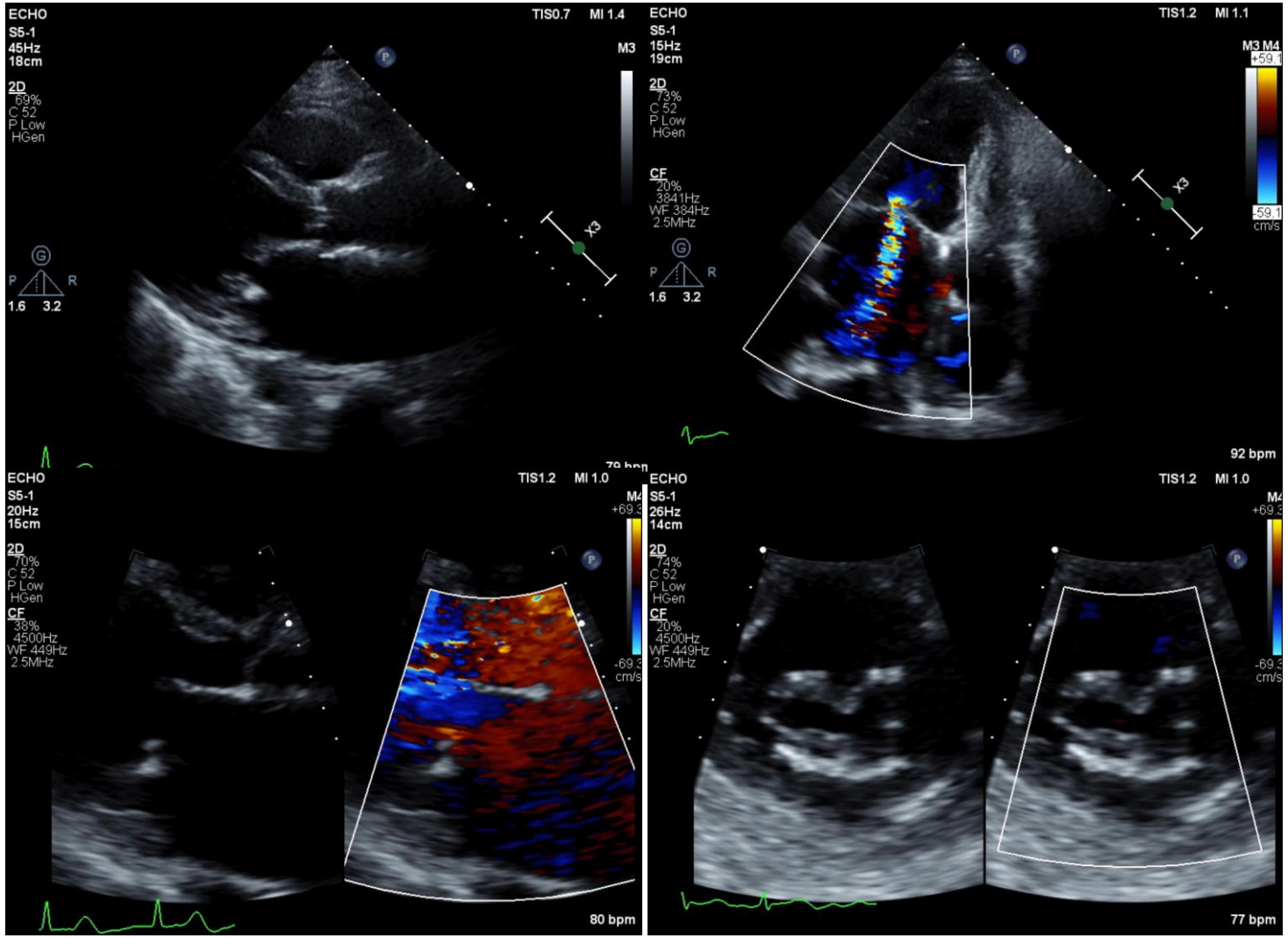
Management of Chordal Entanglement

1. Assessing the device trajectory considering chordae structure and direction
2. Adjusting device orientation before valve crossing – Don’t rotate >15 degree within the ventricle.
3. Avoiding excessive opening or premature deployment of device apparatus
4. Disentangle device – reverse the set of movements
5. Eversion with 270 degree angle and retraction into the atrium

SCAI Textbook Transcatheter Edge-to-Edge Repair

F/79, PeAF, s/p PTCA c stent

TTE



Severe MR

(GIV, ERO: 33 mm^2, RV: 61 ml)

Poor leaflet coaptation with annular flattening

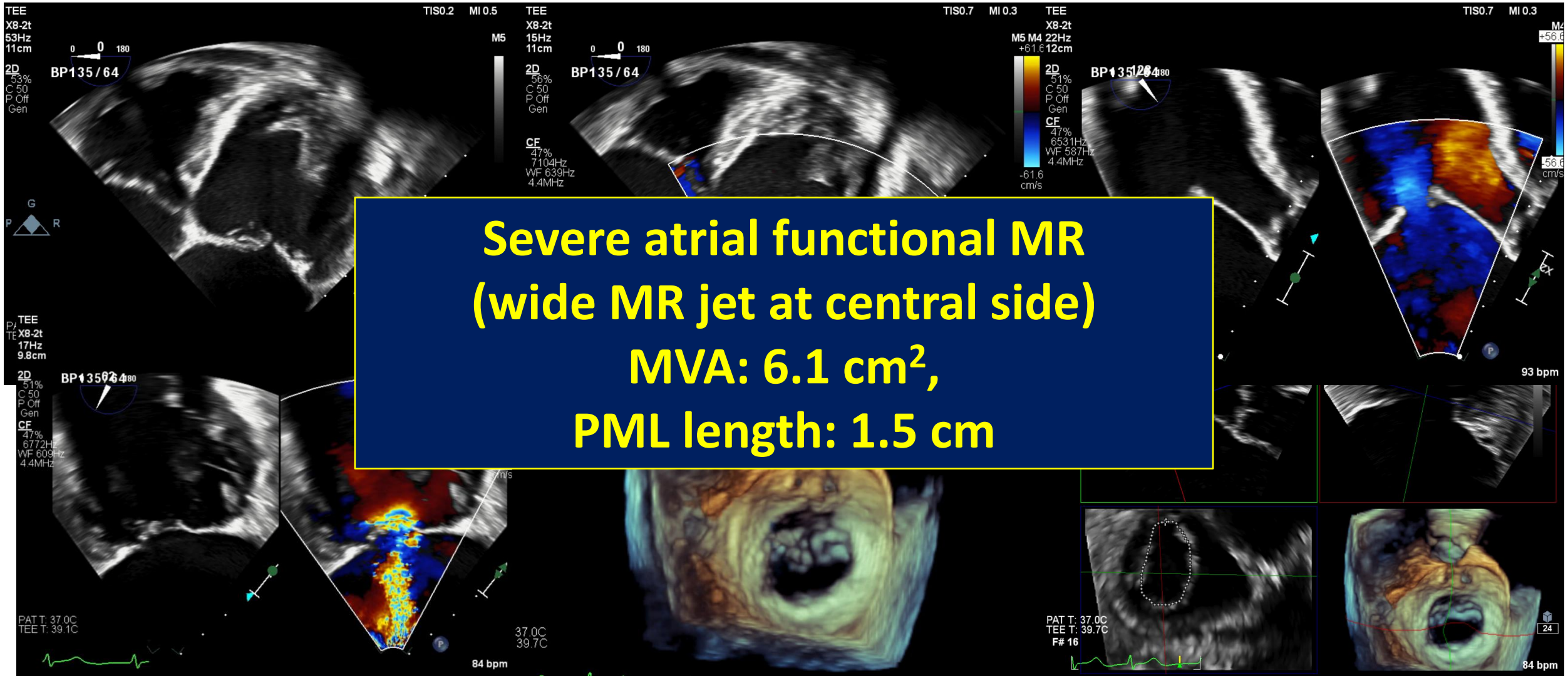
Moderate TR

EF: 63%, LVEDD/ESD: 56/40 mm,

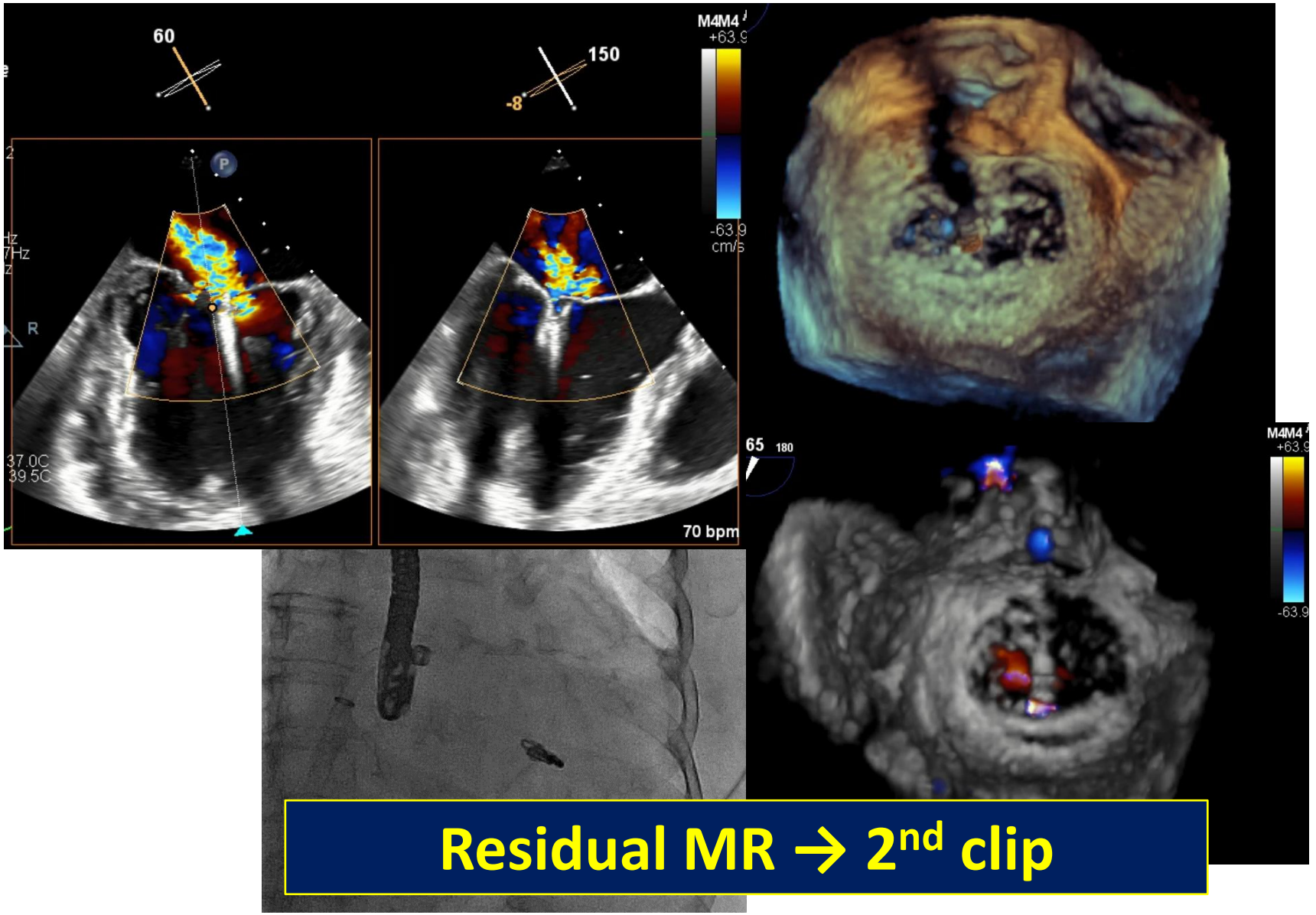
LAVi: 86 ml/m^2,

RVSP: 61 mmHg

TEE


Severe atrial functional MR
(wide MR jet at central side)
MVA: 6.1 cm²,
PML length: 1.5 cm

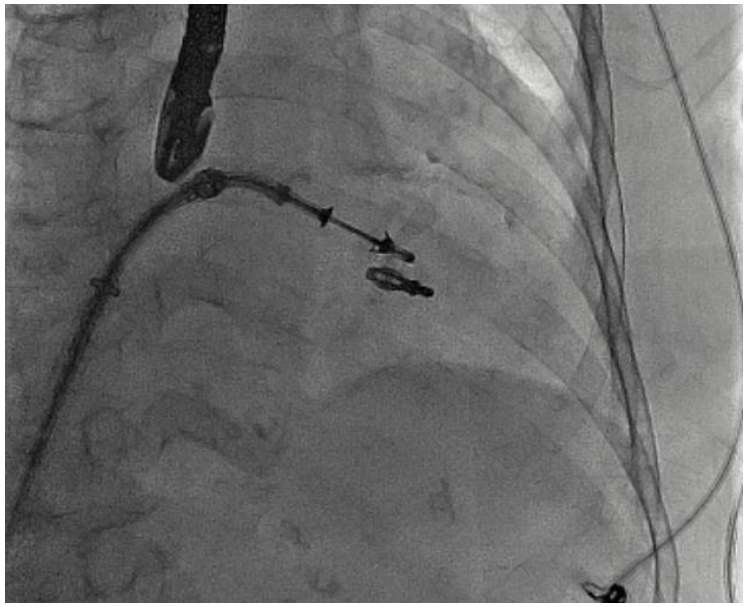
TEER – After deployment of the 1st clip with several attempts

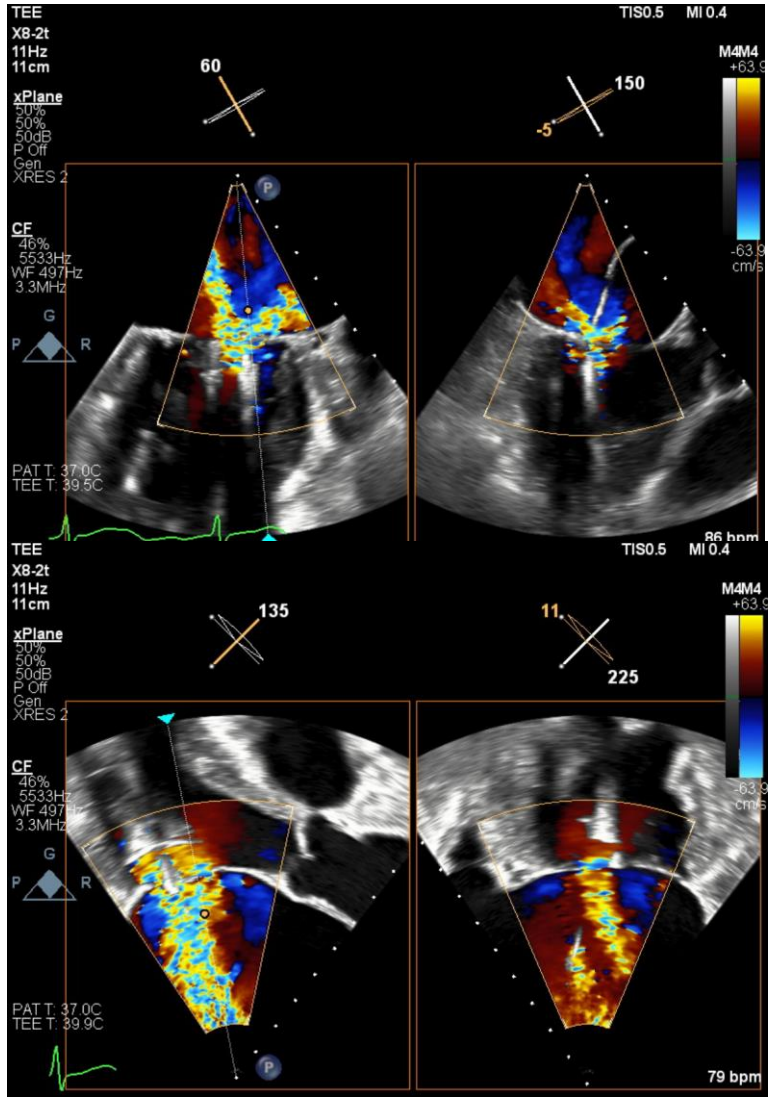


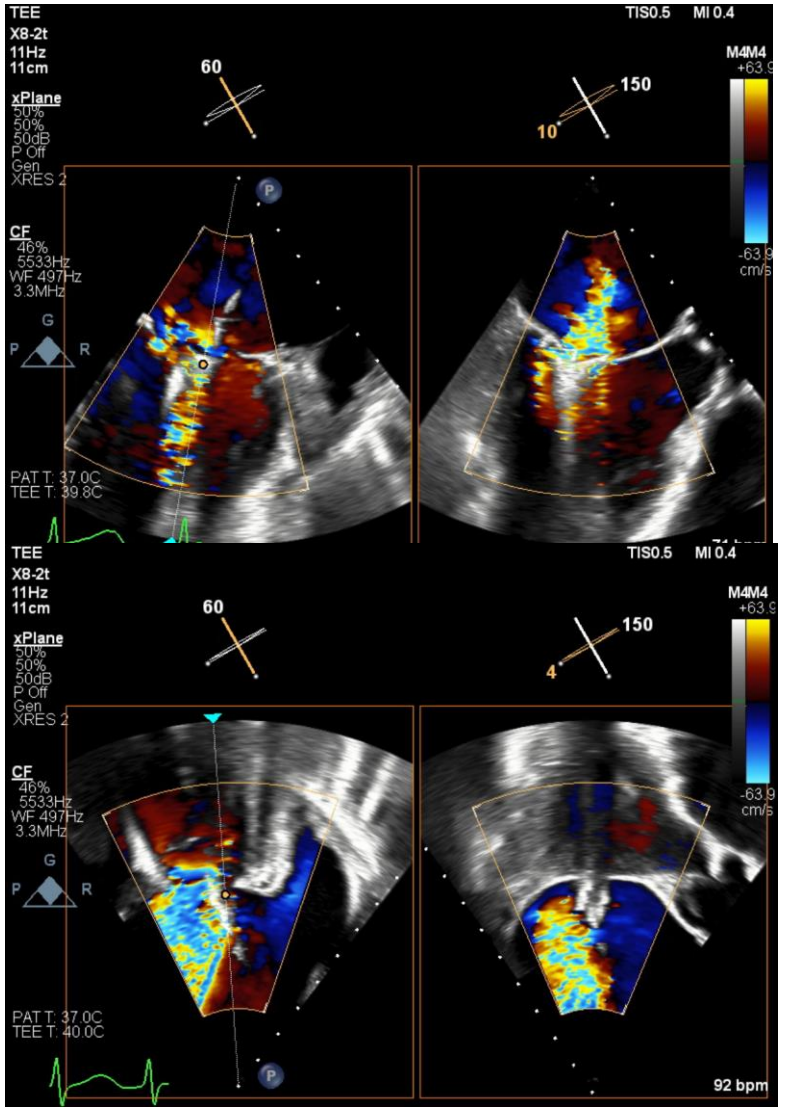
Residual MR → 2nd clip

TEER – Several attempts with 2nd clip

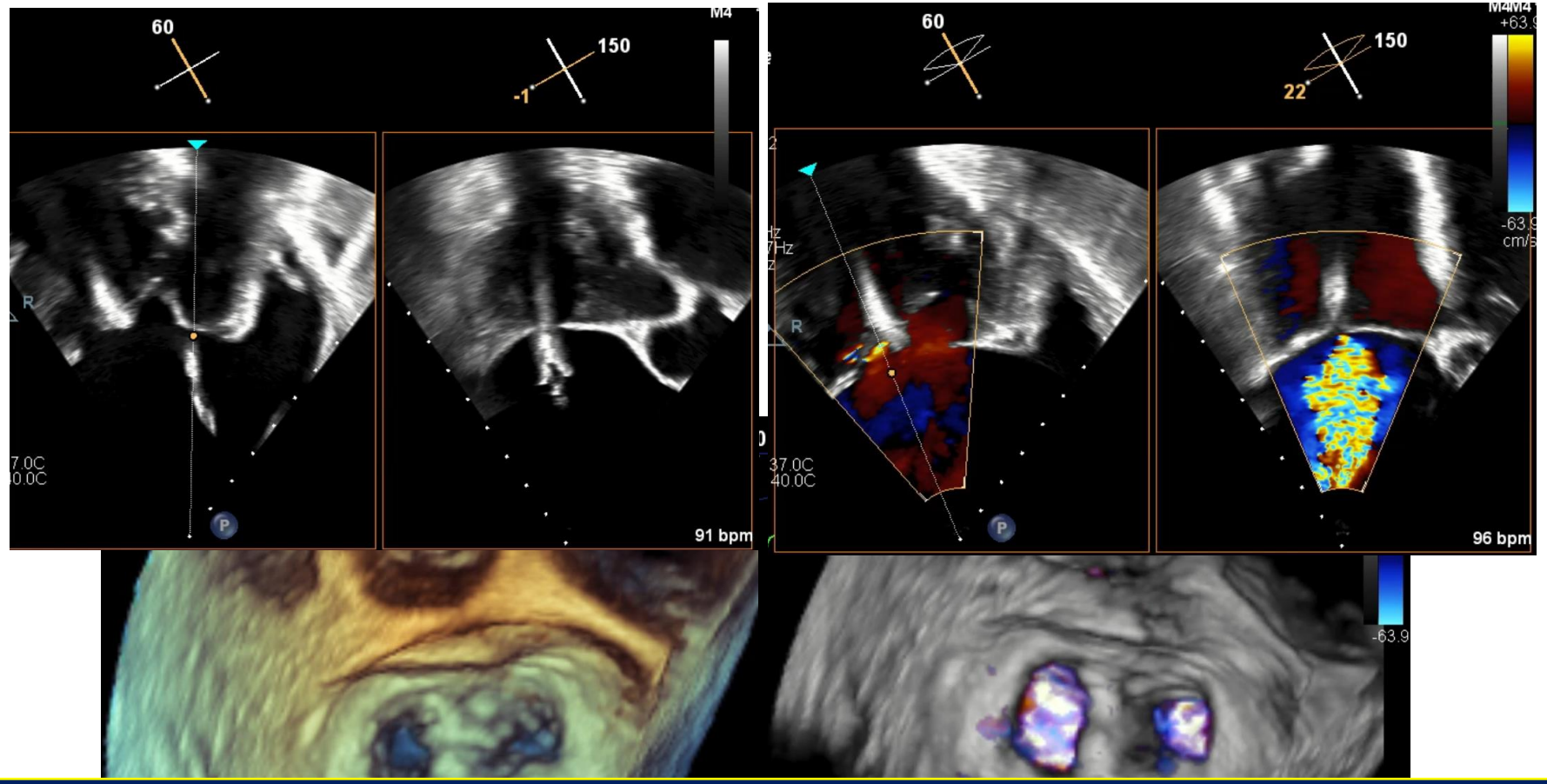
XT -> XTW







TEER – Final TEE



Increased MR d/t MV leaflet tear and unstable vital sign → Emergent MV replacement

Prevention of leaflet damage

- Excessive tension should be avoided in case with long clip and annular calcification
- An important measure of caution is a slight advancement of the clip in ventricular direction during clip closure.
- The hypothesis of an increased risk for XTR to injure the leaflets due to the longer arms with a higher force on the leaflet per area.
- An effective bailout maneuver can be to grasp the injured leaflet further at the base either by a different device position or with a device with longer clip arms.

Schnitzler K, et al. Curr Cardiol Rep 2021;23:131

Mitral Stenosis

How to reduce mitral gradient ?

- **Reposition MitraClip with *less tissue grasped* -> reduce the tension on the leaflets.**
  -> This should be done with caution and not at the expense of safe tissue grasped to avoid SLDA

- **Reposition MitraClip with *a more lateral placement* to the jet**
- **Use NT instead of XT**

Once the clip is released, gradients may potentially decrease by up to 20%.

If residual MR is significant, this may drive the transmitral gradient falsely higher due to increased flow across the valve.

Al-Azizi K, et al. Curr Cardiol Rep 2020;22:50

SLDA and Embolization

What is the cause of SLDA and Clip embolization ?

Continuous reduction in SLDA over years, which likely reflects the *implanter's learning curve* and *advances in the clip systems*: EVEREST I 11.0%, EVEREST II 5.1%, ACCESSEU 4.8%, TRAMI 2.0%, TVT 1.5%, Praz et al. 4.0%, Mitra EXPAND 1.9%, and "G4" 1.7%

Only two studies, the TCVT and TVT, describe clip embolization in 0.7% and 0.1% - Right axillar artery, renal artery and apex of the LV.

Success rate of re-intervention with TEER: Around 25 -50 %

Schnitzler K, et al. Curr Cardiol Rep 2021;23: 131

CAUSE FOR SLDA	SPECIFIC EXPLANATION
Inadequate leaflet capture	• Poor echo imaging[21] • Short leaflet (NTR <6 mm, XTR <9 mm) • Gripper below leaflet
Poor tissue quality	• Thin leaflet[13] • Connective tissue disorder[15] • Myxomatous leaflet • Steroid use[23] • Calcified leaflet or annulus[7]
Excessive clip-leaflet tension	• Severe mitral annular dilation[12] • Use of individual grippers and aggressive anterior or posterior torque • Cardioversion[23] • Device malrotation
Chordal entanglement	• Gripper and clip arm attached to mitral valve chords

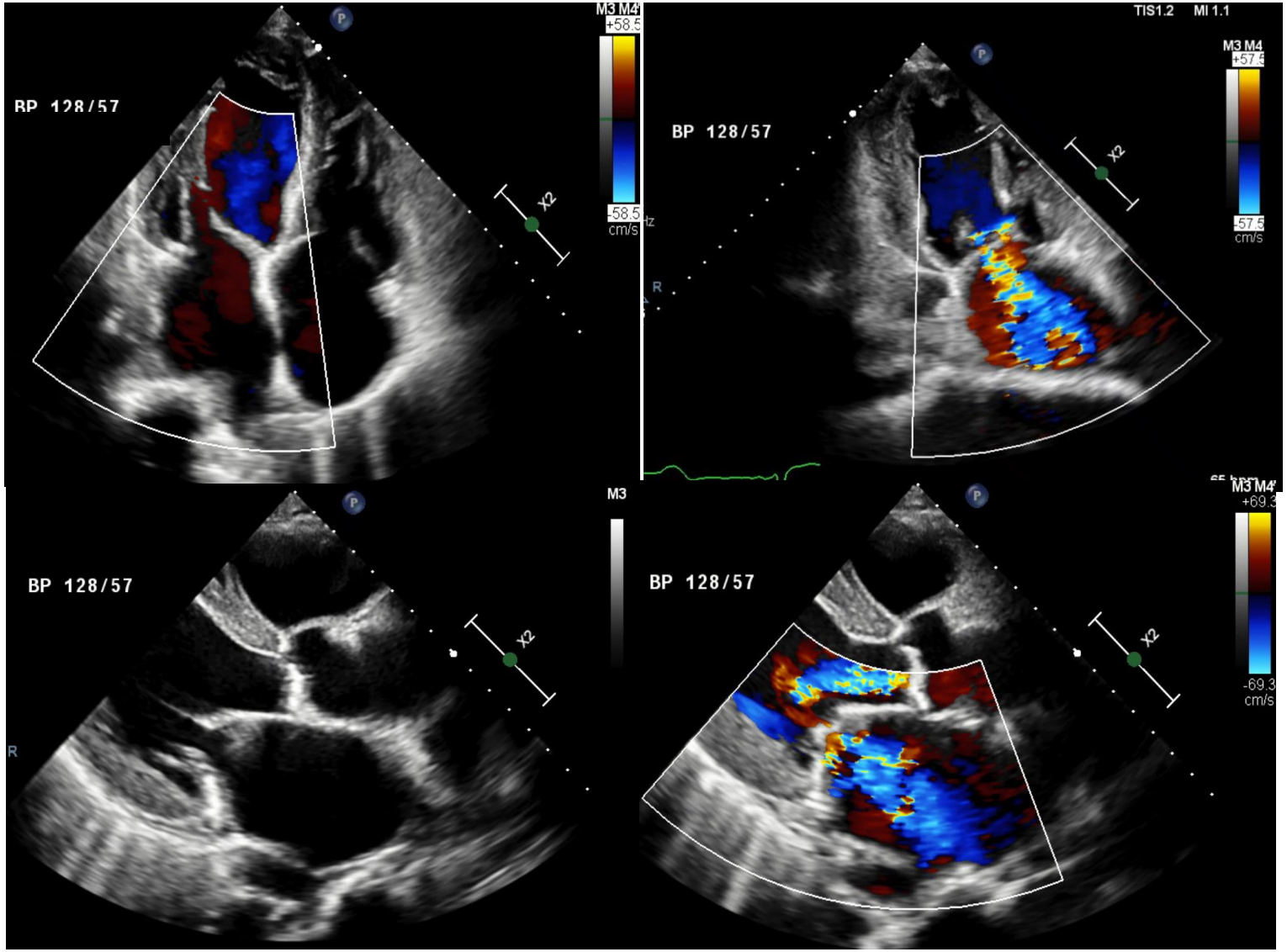
SCAI Textbook Transcatheter Edge-to-Edge Repair

M/80 PeAF, ESRD on HD

Pre-procedural TTE

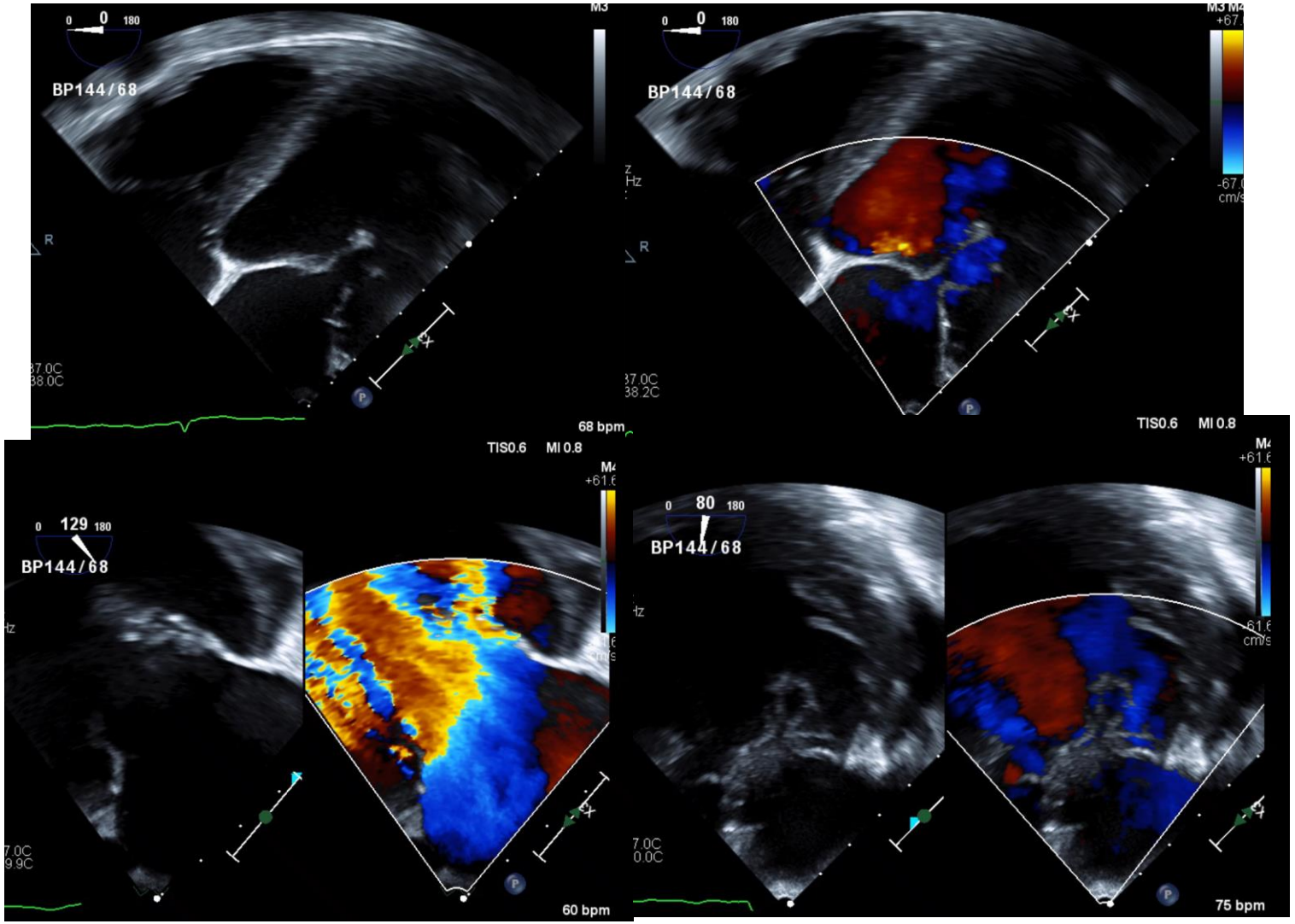
ERO : 38mm^2
RV : 73cc

LA AP : 54mm
LVEDD : 63mm



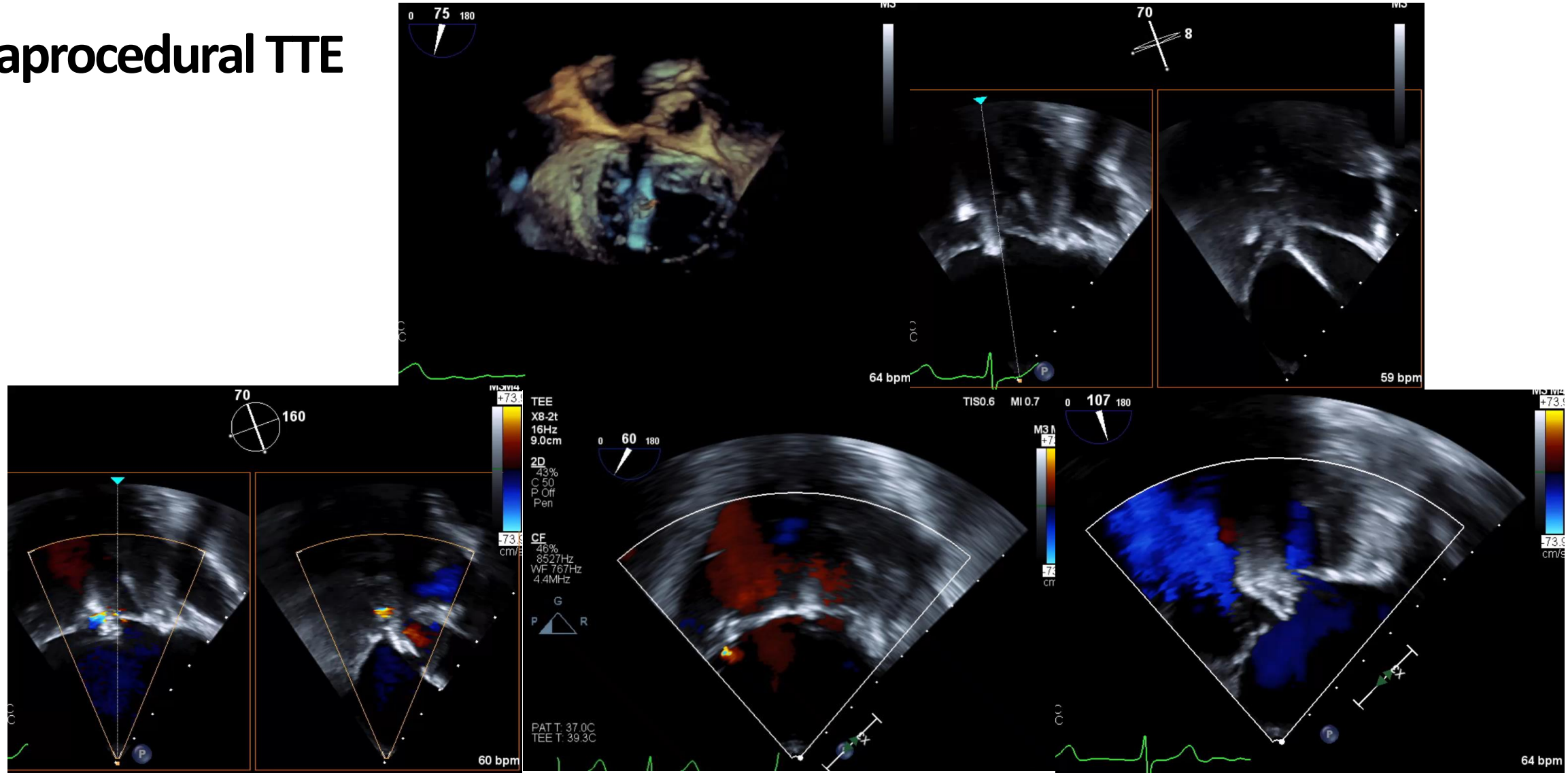
Severe MR and Rreduced LV systolic function (EF 51%), considering the degree of MR

Pre-procedural TEE



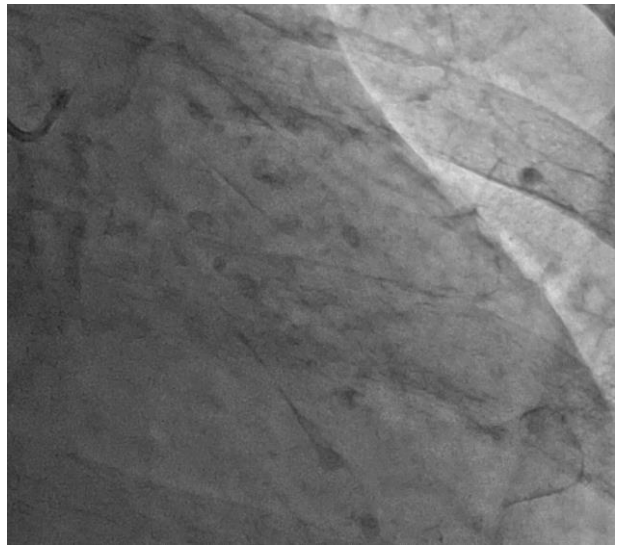
Severe MR, Thickened and Tethered MV

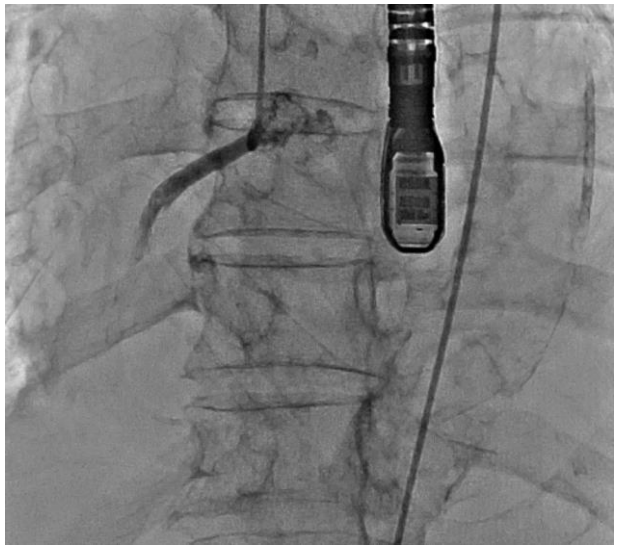
Intraprocedural TTE

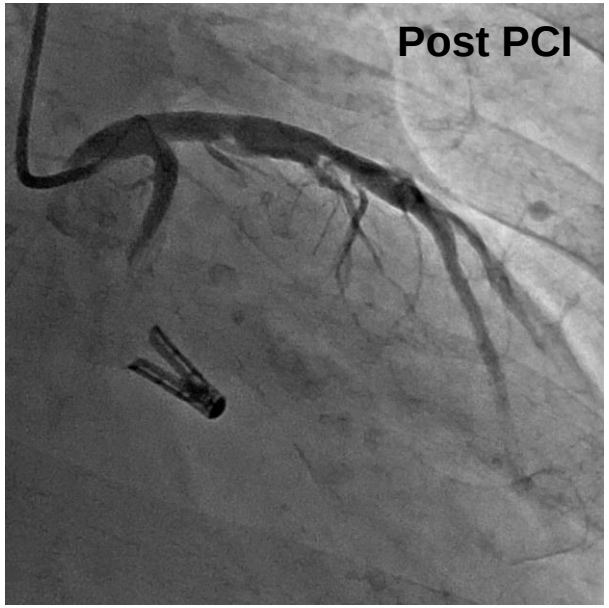


After leaflet grasped at lateral side and mild residual MR was seen and MDPG was 4 mmHg, XT device system was finally released

Coronary angiography



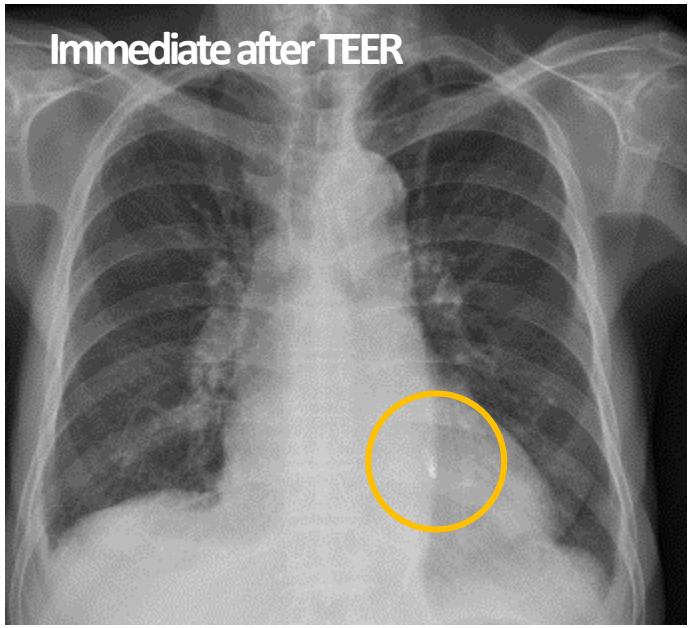


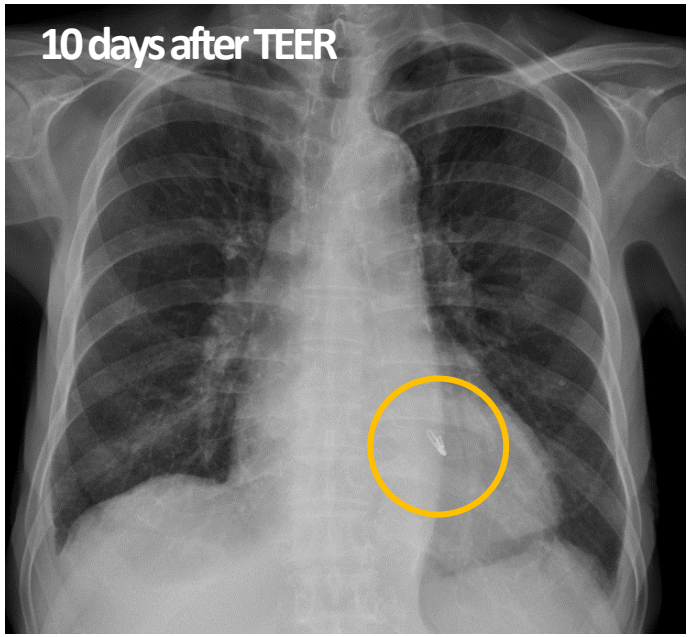


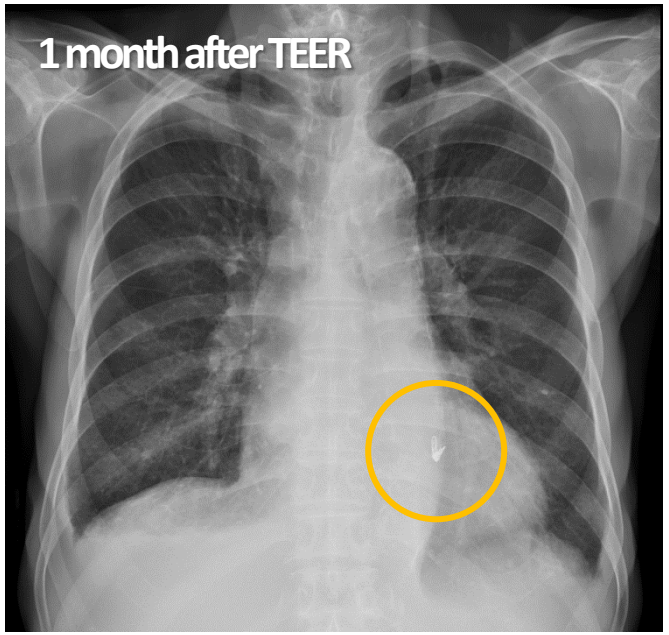
PCI was done at pLCx
due to
significant stenosis

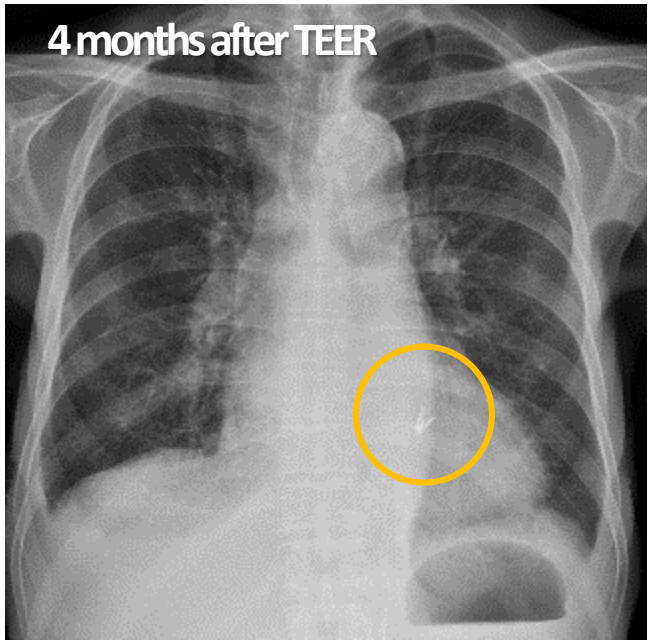
after Clipping

Serial CXR

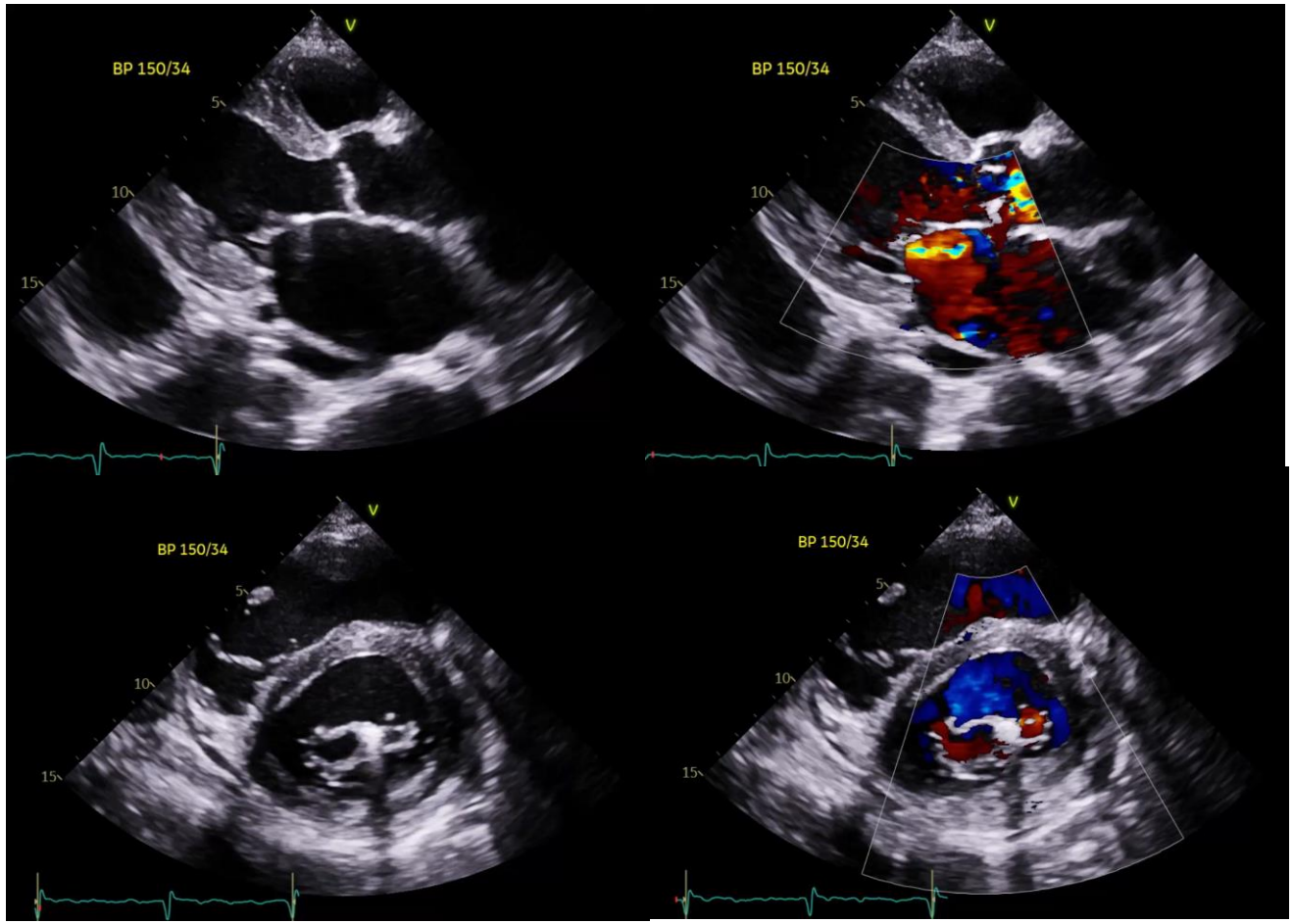

Immediate after TEER


10 days after TEER


1 month after TEER

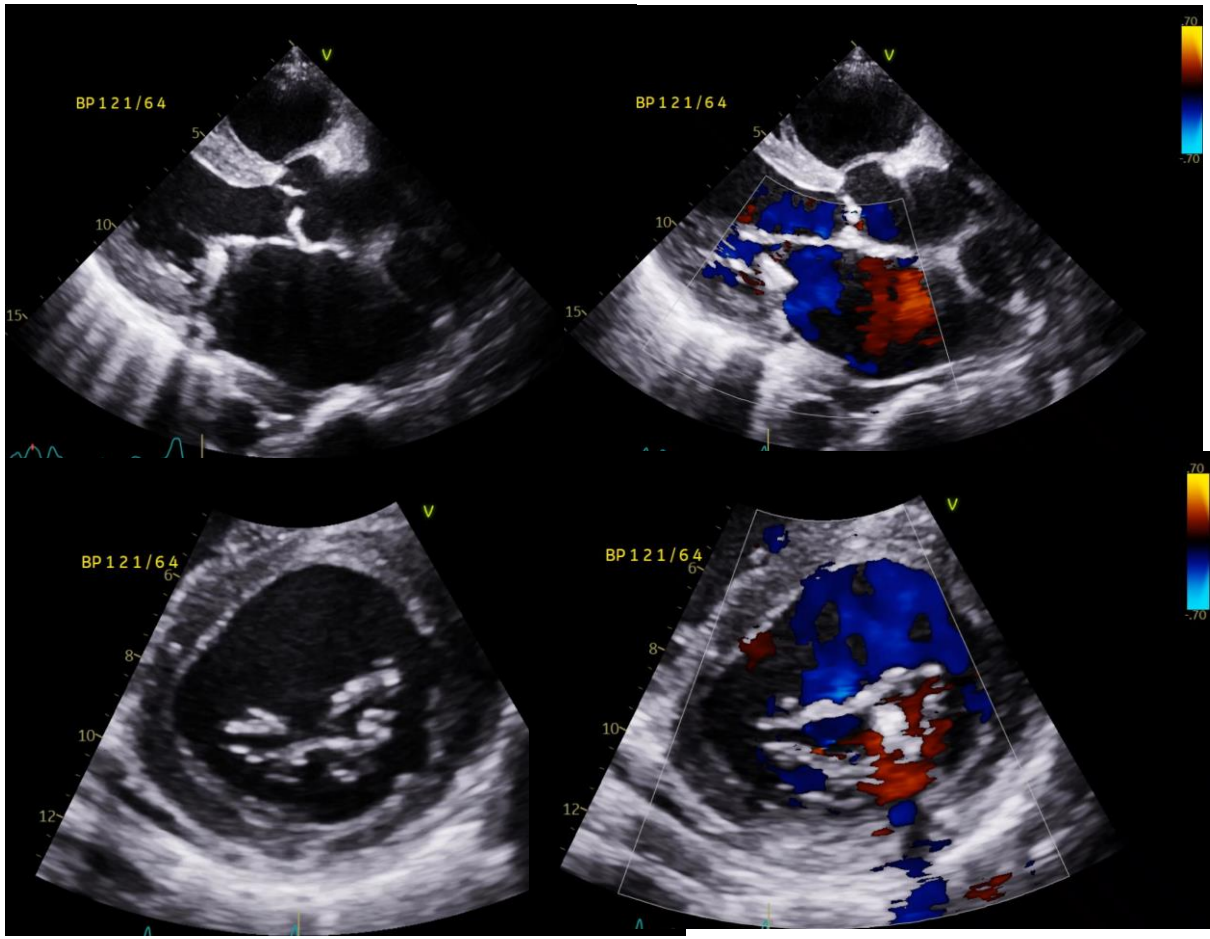

4 months after TEER

Post-procedural TTE



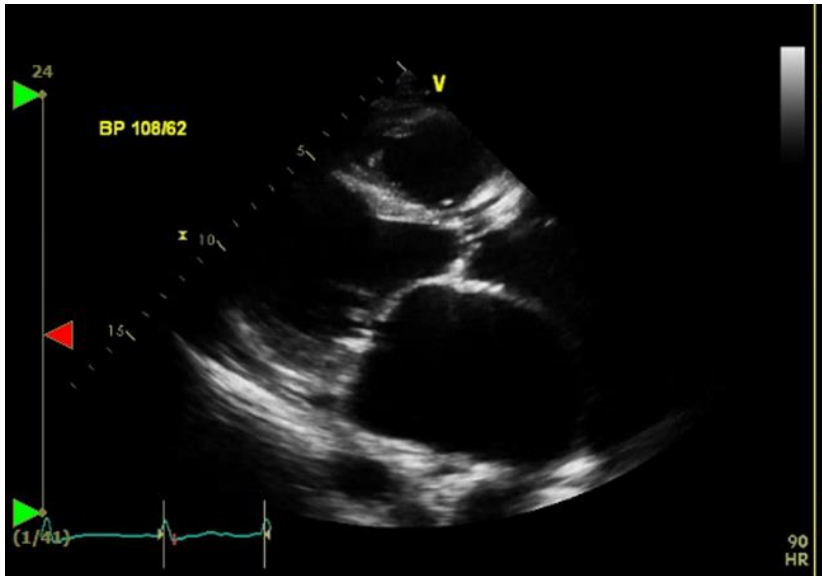
Mitral Clipping device was located at A&P 1-2 portion of MV
Decreased MR

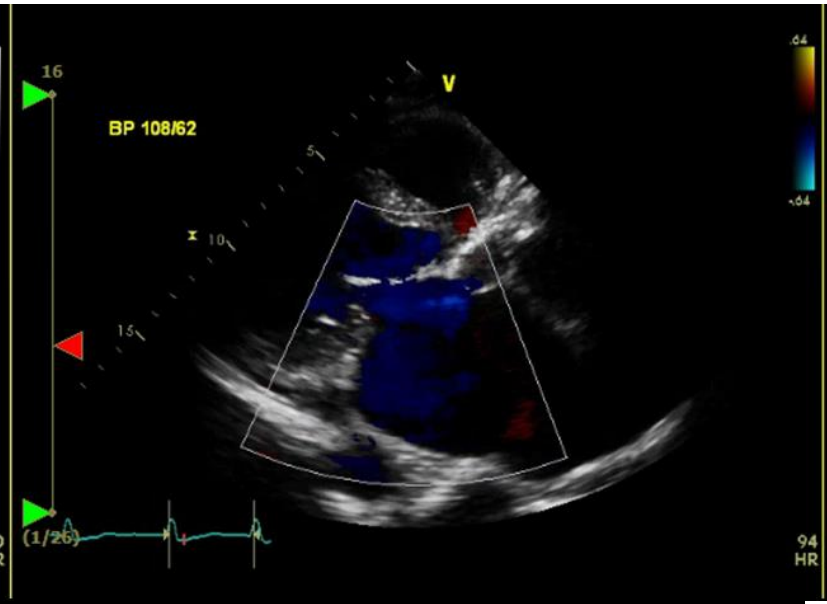
TTE at 4 months after TEER

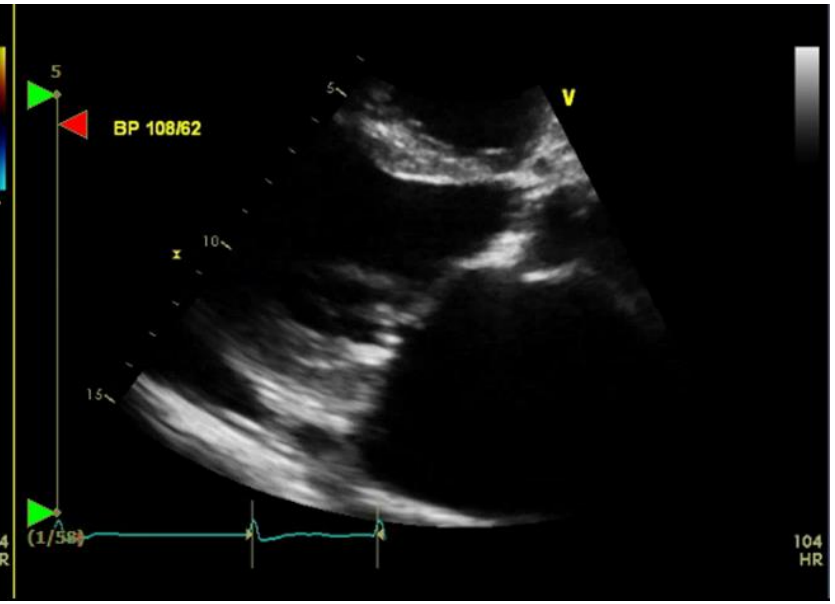


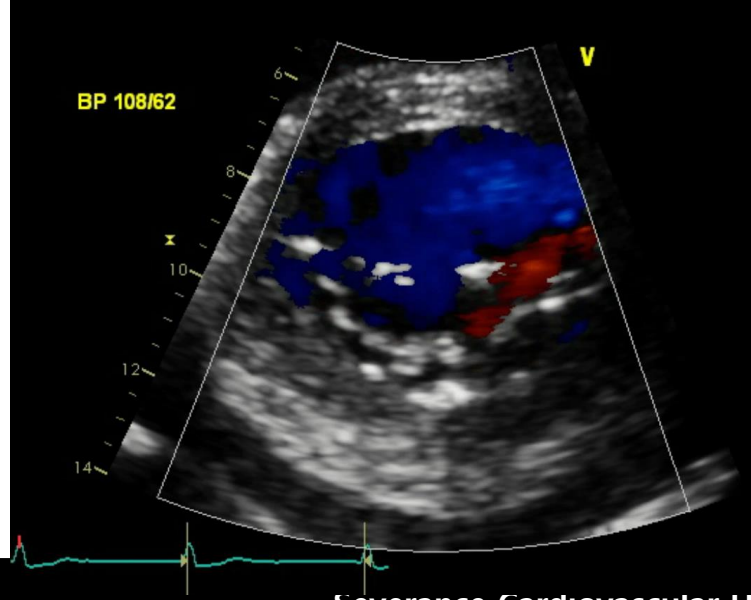
Single leaflet detachment at AML
Increased to severe MR

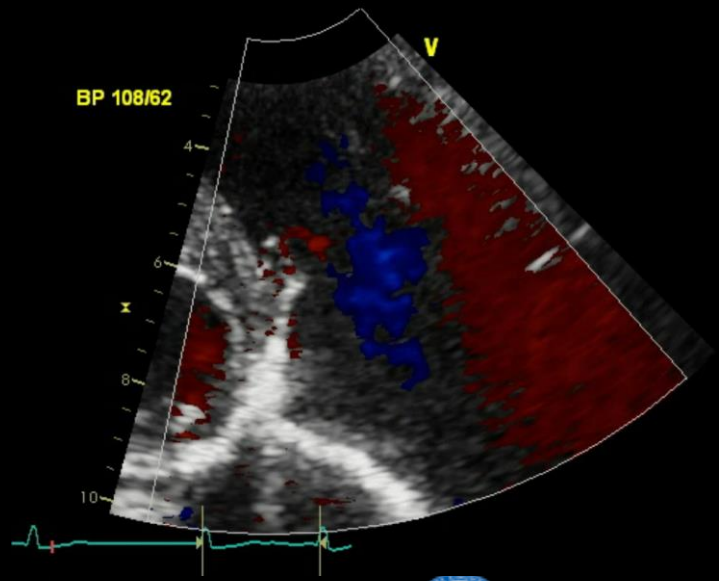
F/84 PeAF, TTE







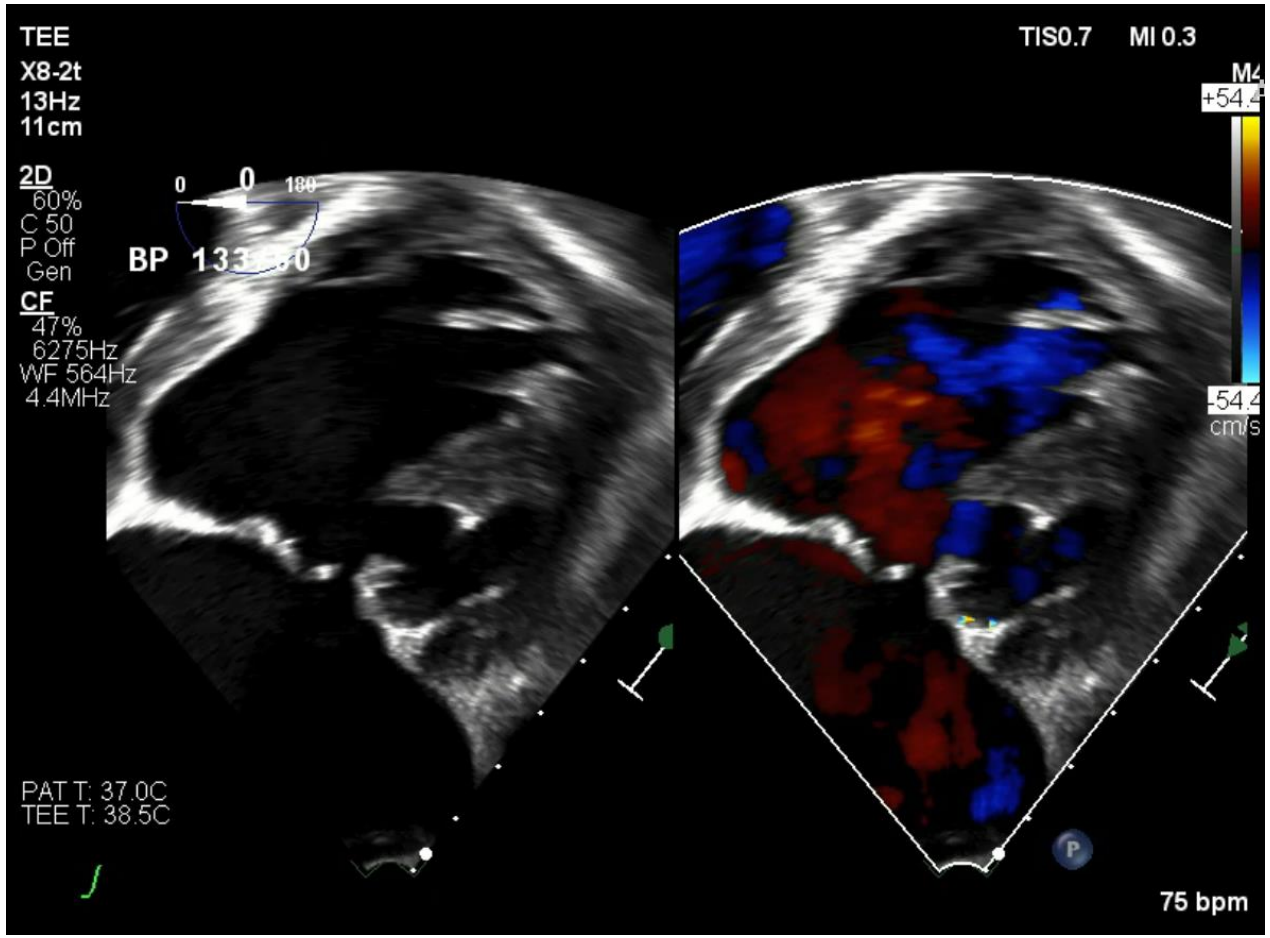


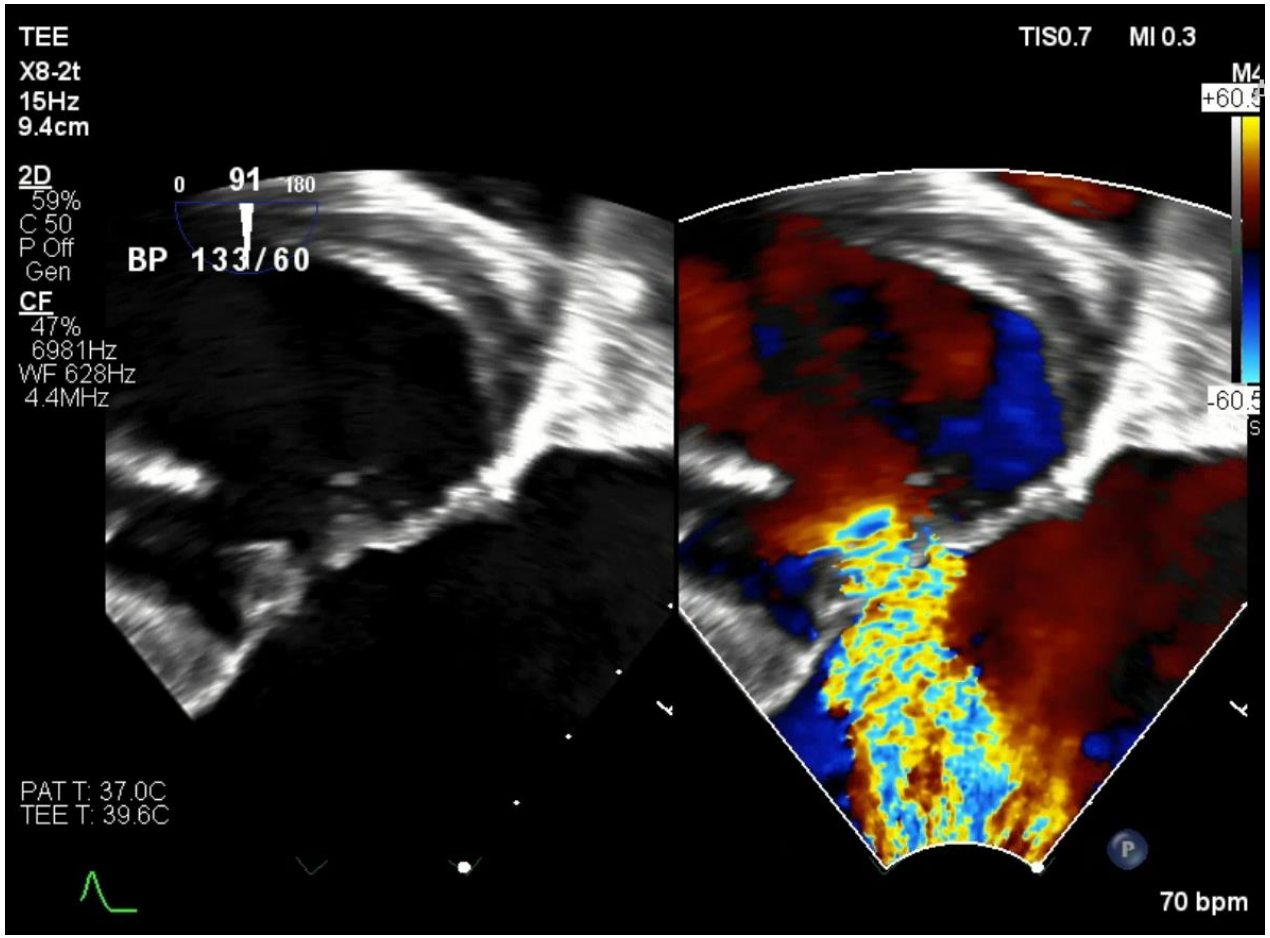


Severe MR
(ERO 29mm2, RV: 60cc by PISA)
- Tethering of PML and overriding AML

Severe TR (GIII/IV) with
dilated TV annulus 40mm

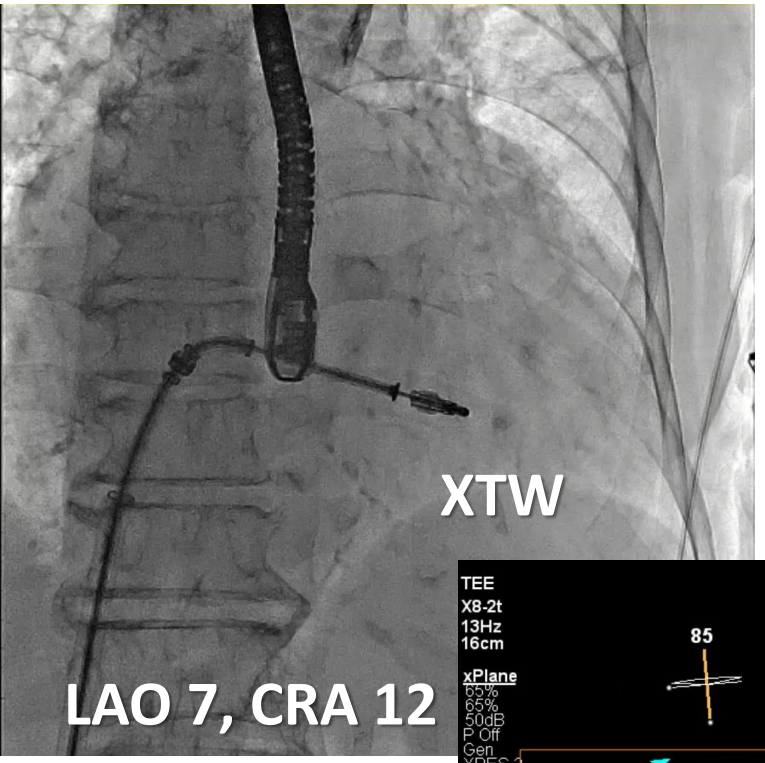
TEE

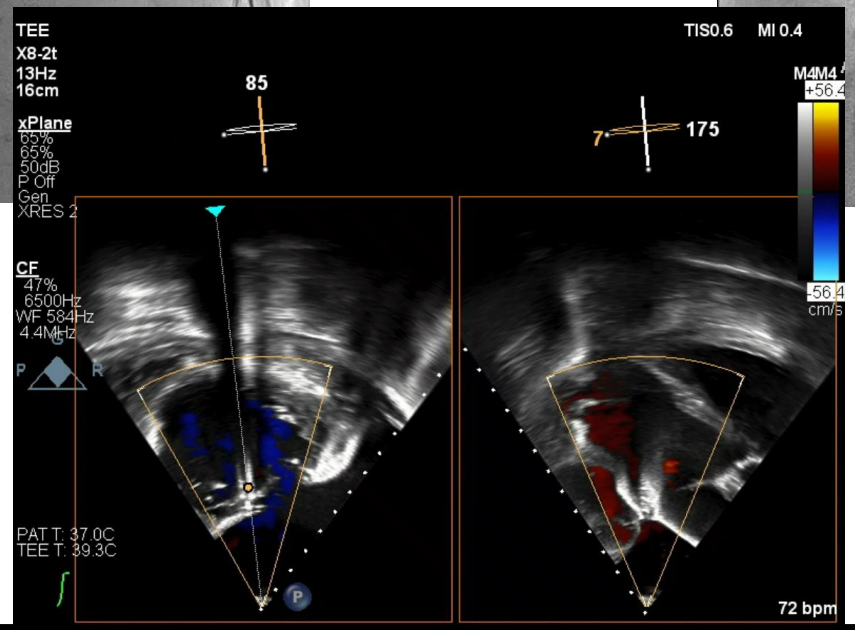


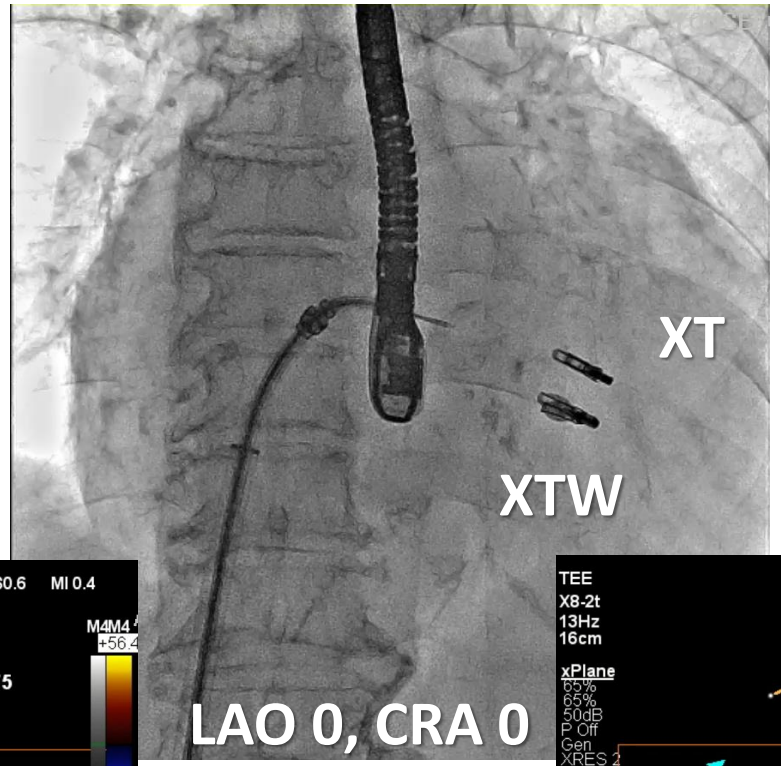


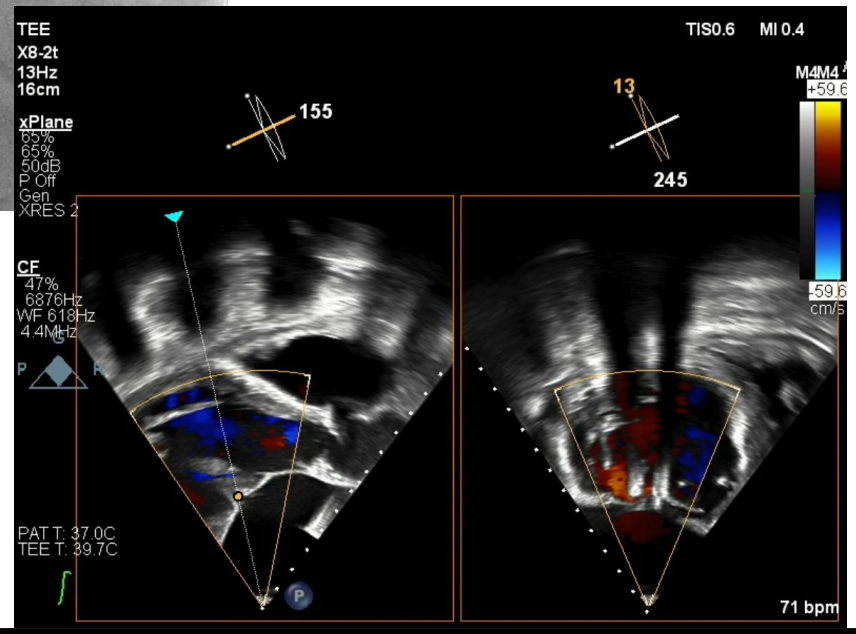
Severe MR (GIV/IV) d/t annular dilatation (53.6mm) and overriding AML and tethering PML

MitraClip Procedure

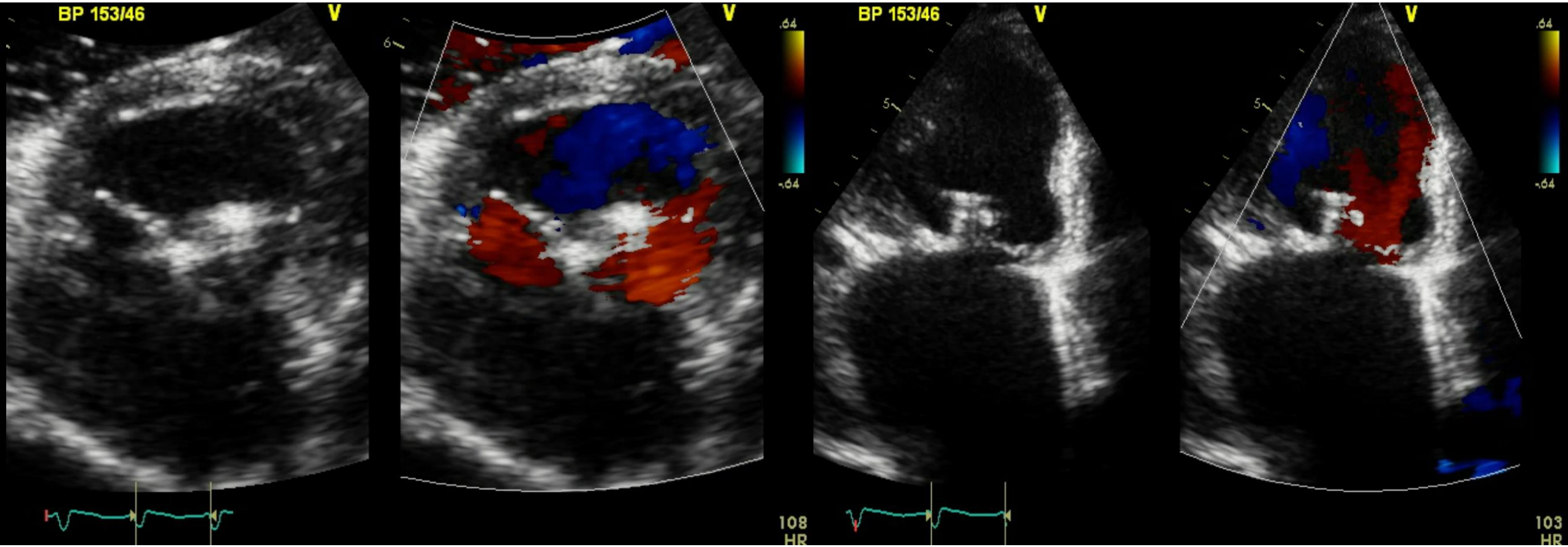








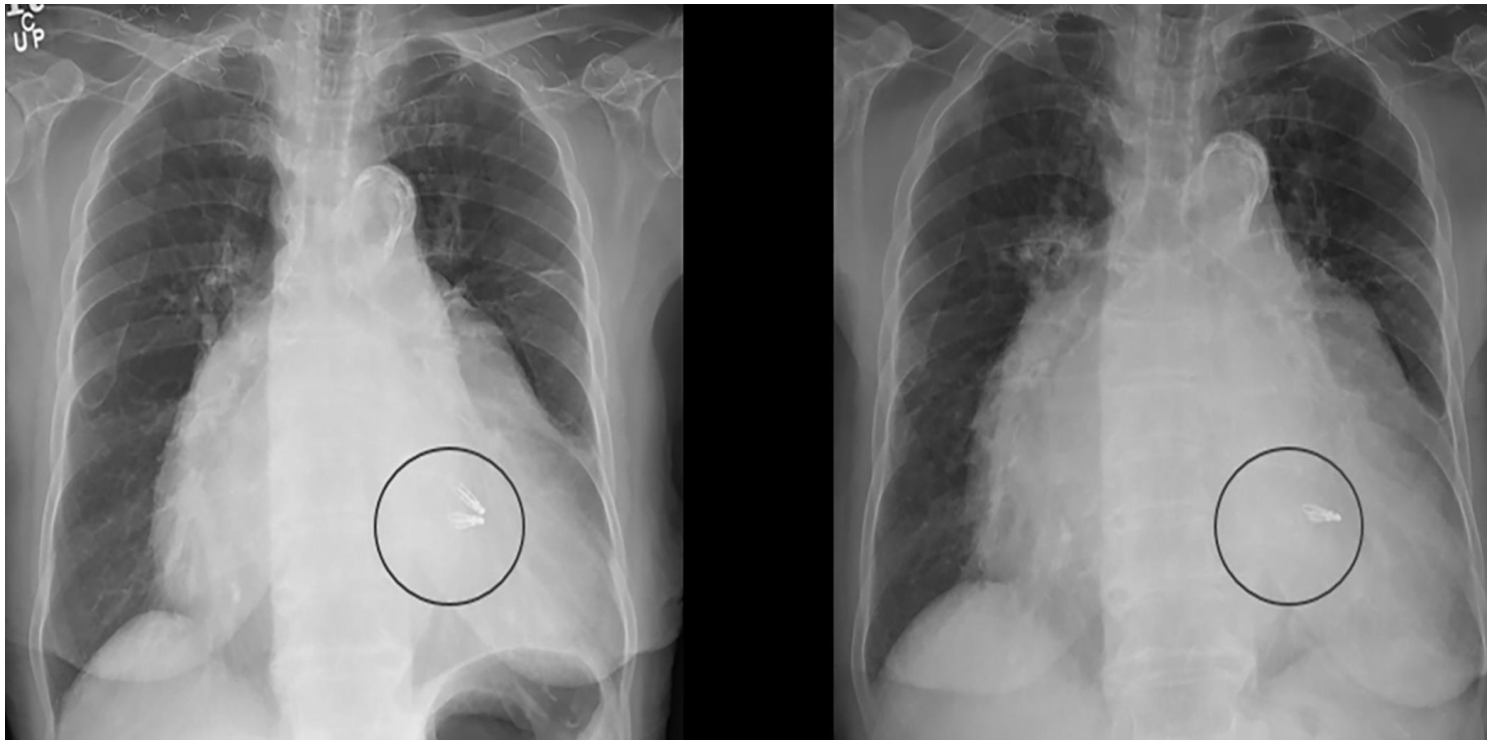
TTE POD #1

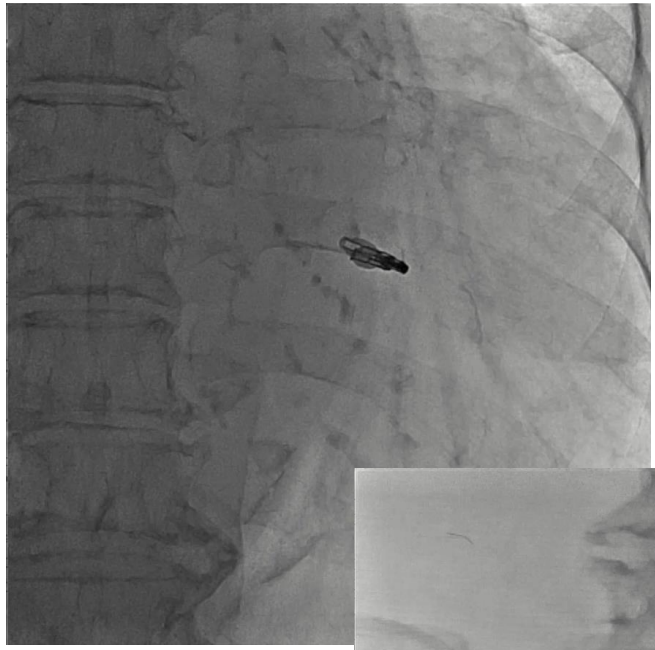


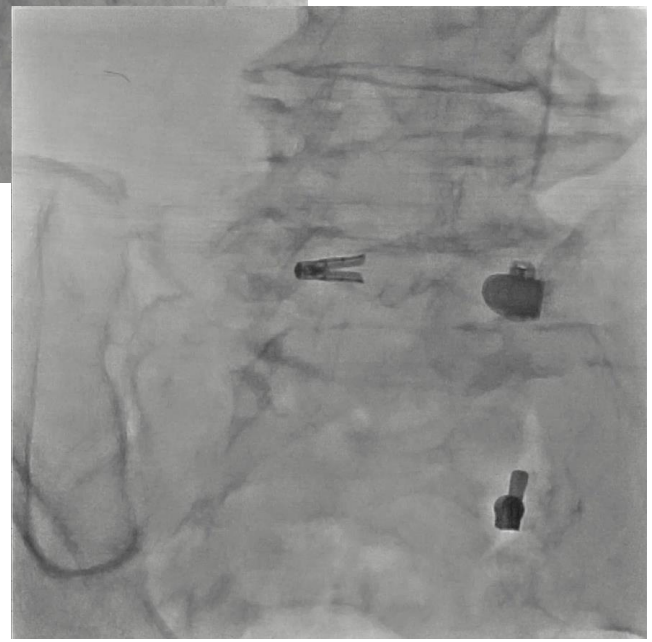
MDPG: 3.4mmHg

Markedly decreased MR

Fluoroscopy (POD #15)

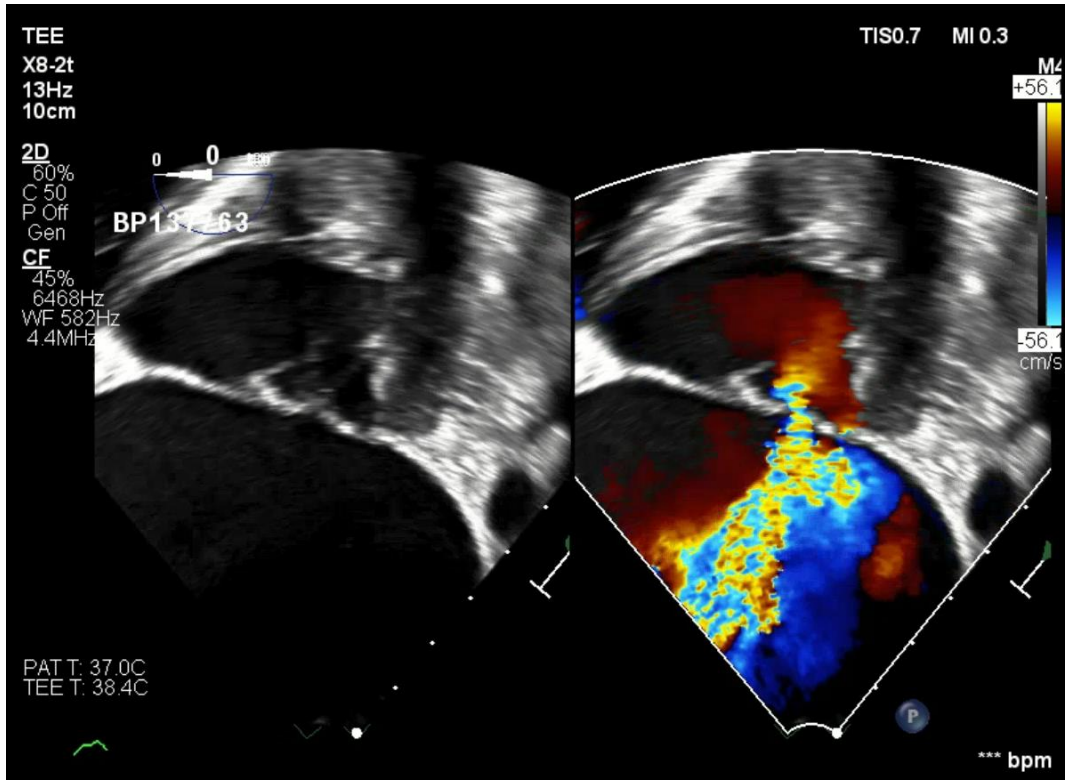


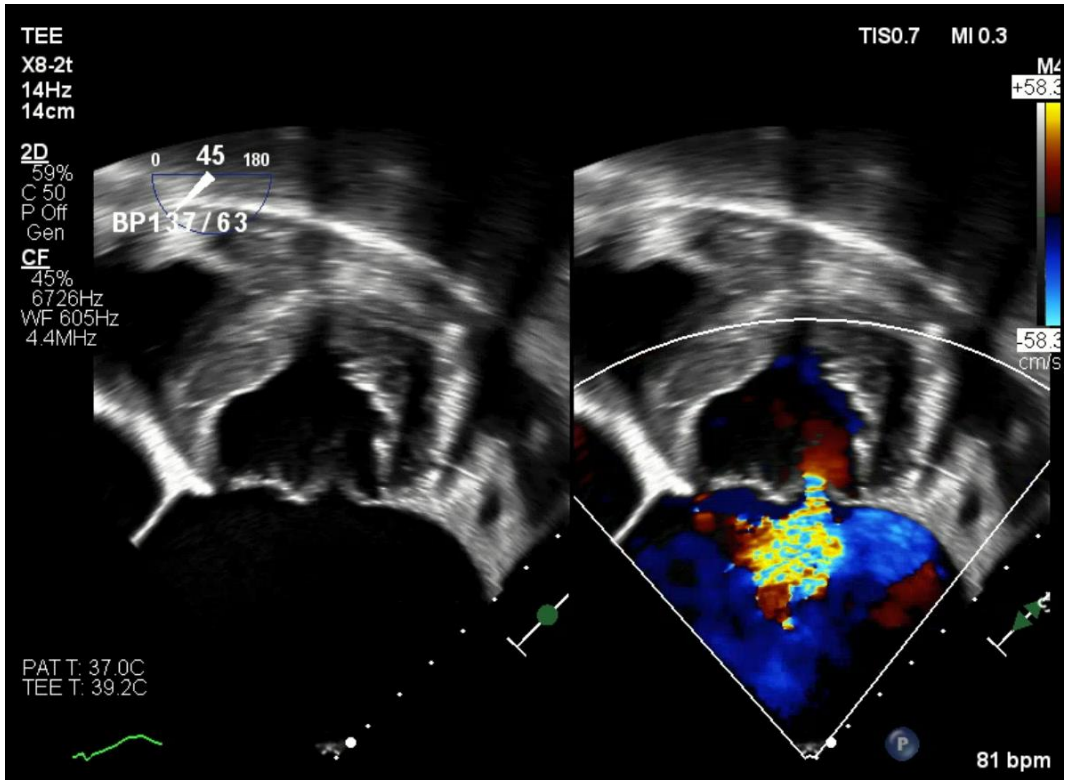




Embolized MitraClip (XT) into Rt. Common iliac artery

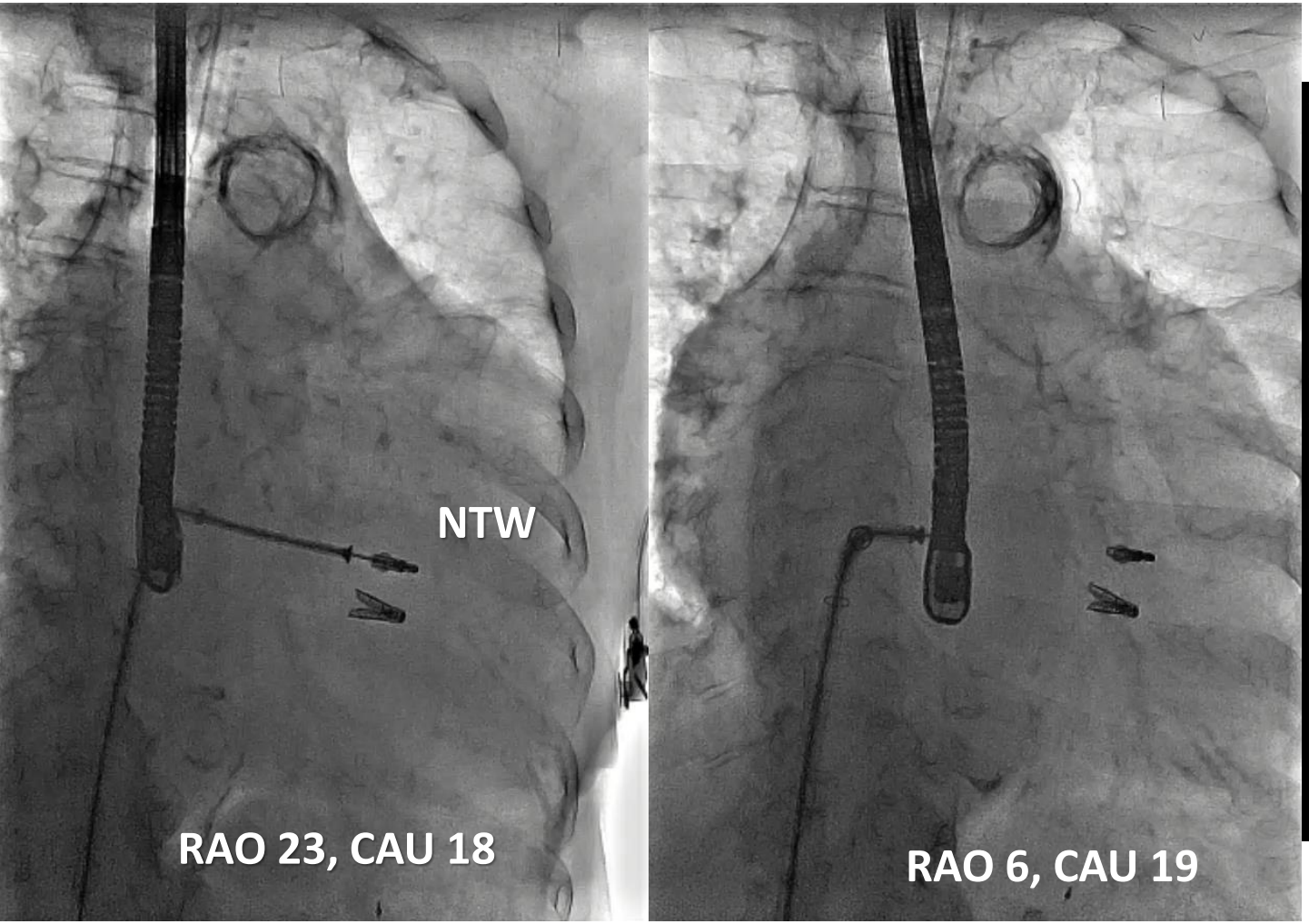
TEE (POD #33)

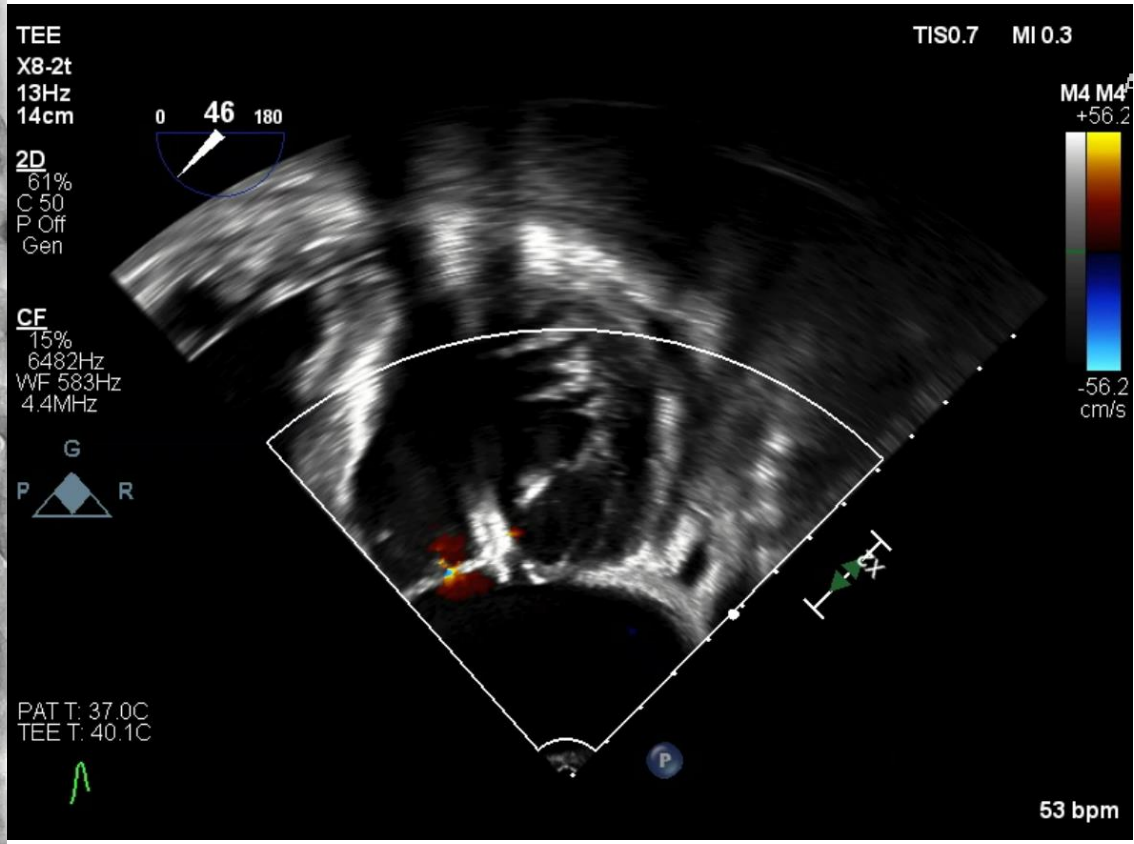




Increased MR (GIII-IV/IV)

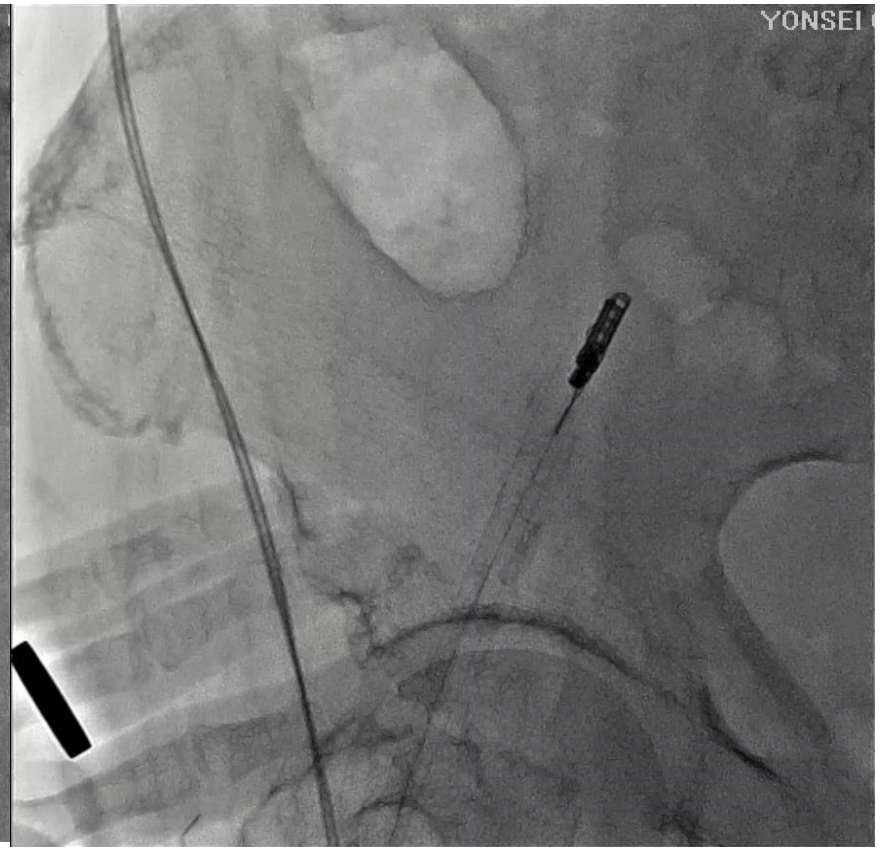
Re-do MitraClip & Retrieval of embolized clip (POD #34)





After re-do Mitraclip, markedly decreased MR was noted.

Re-do MitraClip & Retrieval of embolized clip (POD #34)



Successful retrieval of embolized mitraclip with 16 Fr sheath and double snaring method

Summary

1. Appropriate plans and target goals are needed for difficult cases.

2. To reduce complications, operators have to be aware of these adverse events and their risk factors and be familiar with their prophylaxis and bailout options.

3. Further improvement of devices and experience of operator should be warranted to reduce complications.

Severance

With the Love of God, Free Humankind from Disease and Suffering