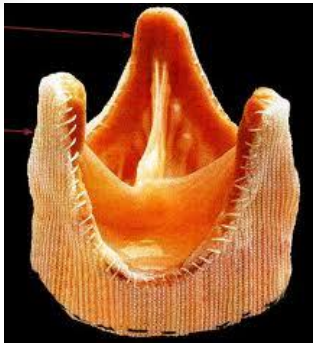
Paravalvular leaks of prosthetic valves – interventional management

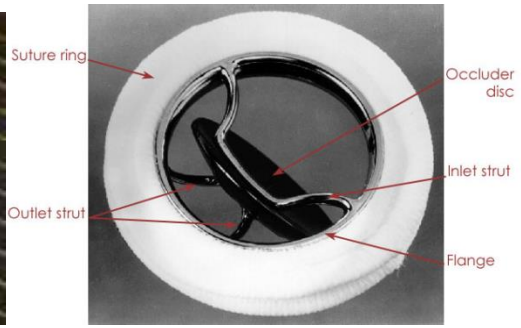
Rafael Hirsch, Adult Congenital Heart Unit Dept. of Cardiology Rabin Medical Center – Beilinson Campus & Tel Aviv University Sackler School of Medicine, Israel

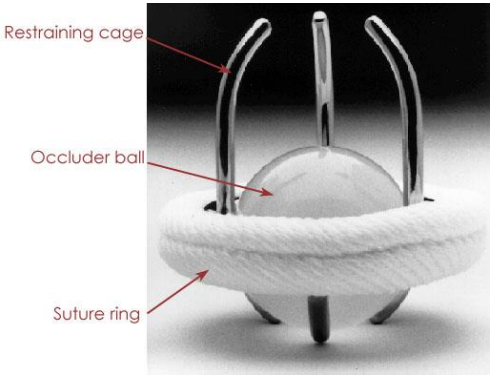
Prosthetic valves

Biological



Mechanical





Incidence of leaks

- Minor leak – up to 30%
- Clinically important leak - 3%
- Incidence increases with repeated operations
- Incidence increases post endocarditis or with annulus calcification
- Paradoxically, incidence is highest after valve replacement performed for paravalvular leaks

Two major clinical problems
1. Mechanical hemolysis

- Most common in moderate sized leaks
- High velocity jet through a narrow and jagged surface
- Erythrocyte fracture (can be seen on blood smear)
- Chronic anemia, sometimes even jaundice. High LDH levels
- Frequent blood transfusions, sometimes weekly. Cross matching becomes increasingly difficult. Severe impairment of quality of life
- Treatment with Erythropoietin has limited benefit
- Sometimes hemolysis is the result of incomplete device closure of an initially larger leak

2. Congestive heart failure

- Large leaks or multiple leaks
- Dilatation of the left ventricle and decrease in function
- Pulmonary hypertension, sometimes at systemic levels, tricuspid regurgitation and right heart failure (often the presenting symptom)
- Many patients will present with a combined clinical picture, hemolysis and heart failure (anemia contributing to heart failure), but usually one of the two predominates.

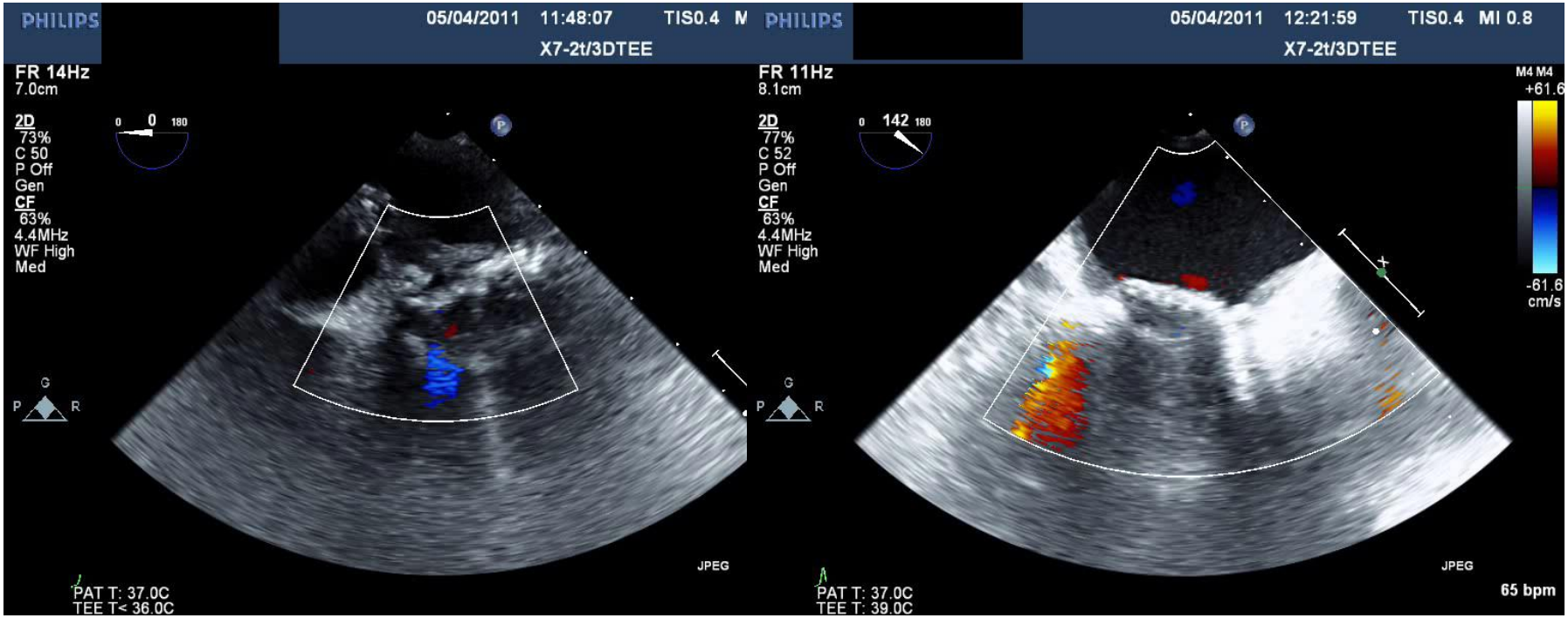
Clinical and echocardiographic assessment 1

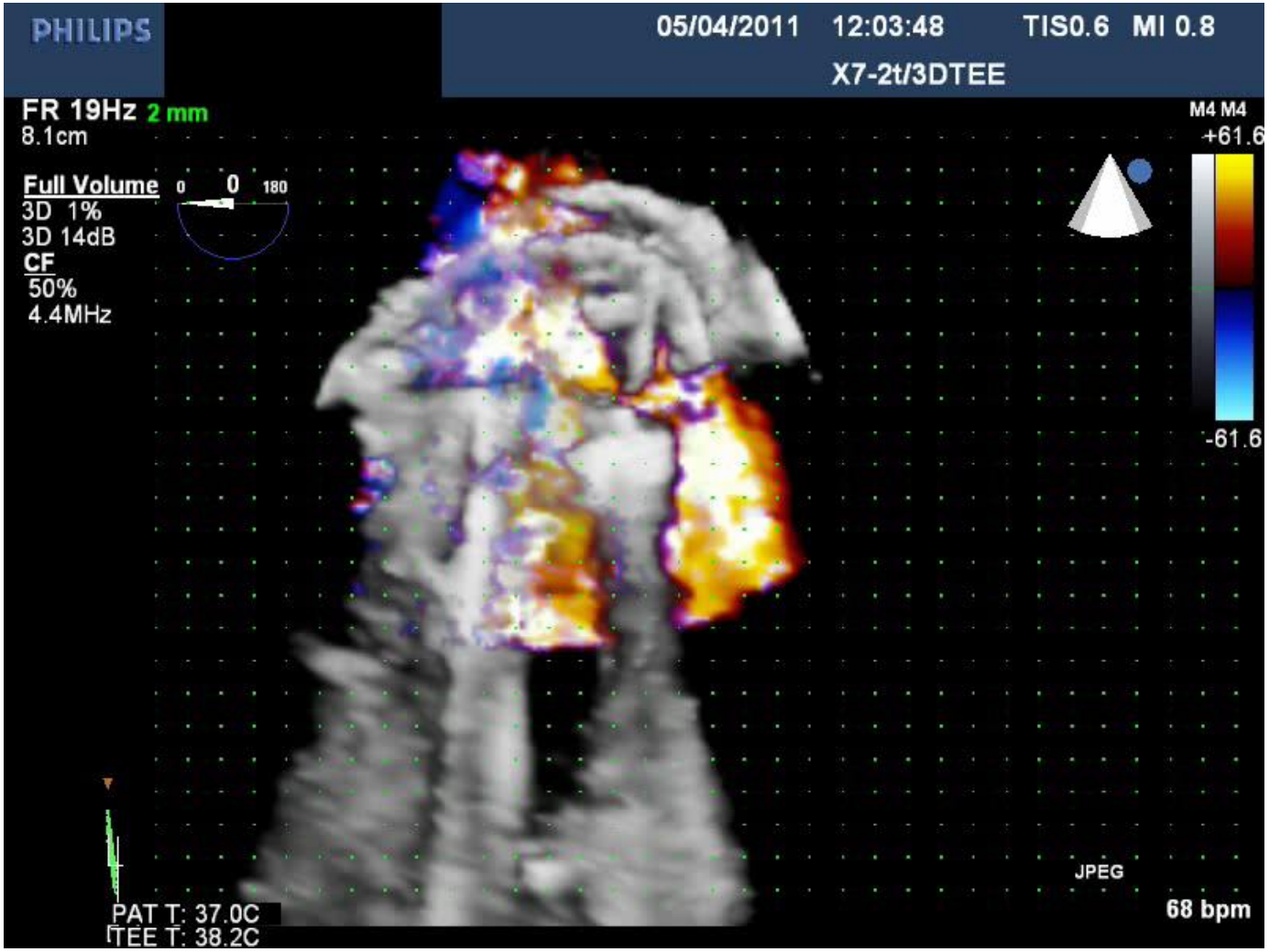
- It is not easy to quantitate the severity of the leak with standard echo parameters of mitral regurgitation.
- Severity is frequently underestimated
- A decision to intervene should be based on clinical judgment, not echocardiographic appearance
- In the mitral position, transthoracic echo has difficulty in even showing a leak due to acoustic shadowing by the valve ring. It is almost impossible to assess the actual size and shape of the defect(s).

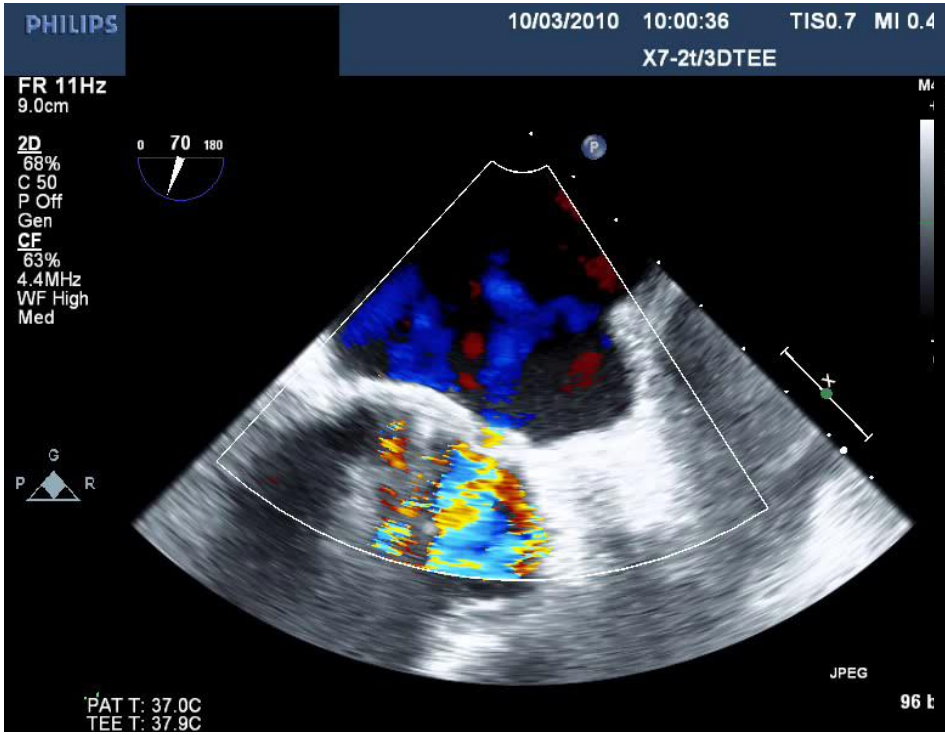
Clinical and echocardiographic assessment 2

- TEE is the method of choice for defining the anatomy and severity of the leak(s) in the mitral position, especially 3D.
- TTE is acceptable in many cases of para-aortic leaks. TEE is less helpful
- Patients with a prosthetic valve and unexplained symptoms or clinical findings should have TEE to look for an undiagnosed leak
- MRI and CT have a limited role in the diagnosis and quantitation of leaks, and we don't use them routinely

The geometry of the defects




PHILIPS
05/04/2011 12:03:48 TIS0.6 MI 0.8
X7-2t/3DTEE
FR 19Hz 2 mm
8.1cm
Full Volume
3D 1%
3D 14dB
CF
50%
4.4MHz
0 0 180
M4 M4
+61.6
-61.6
JPEG
68 bpm
PAT T: 37.0C
TEE T: 38.2C


PHILIPS
10/03/2010 10:00:36 TIS0.7 MI 0.4
X7-2t/3DTEE
FR 11Hz
9.0cm
2D
68%
C 50
P Off
Gen
CF
63%
4.4MHz
WF High
Med
0 70 180
G
P R
JPEG
PAT T: 37.0C
TEE T: 37.9C


PHILIPS
10/03/2010 10:16:20 TIS0.2 MI 0.5
X7-2t/3DTEE
FR 22Hz
13cm
Full Volume
3D 19%
3D 40dB
0 90 180
M4
JPEG
101 bpm
PAT T: 37.0C
TEE T: 39.1C

Surgical approach

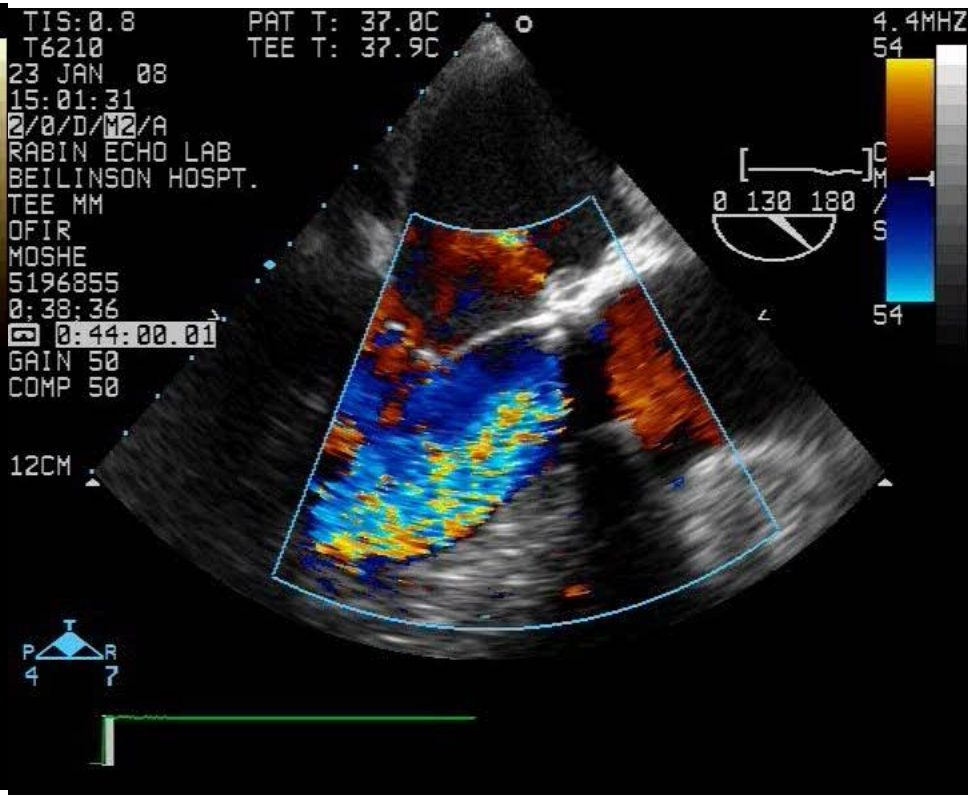
- It is common practice to replace the prosthetic valve
- Repair of the leak itself is usually not sufficient
- Surgical risk is often very high due to numerous previous operations, anemia, heart failure, pulmonary hypertension, older age
- A risk of around 10% or more is often quoted
- If the leak is due to an infective process, surgical approach is mandatory (this should always be adequately r/o)
- As mentioned before, there is a relatively high chance of recurrence of the leak post surgery.

Catheterization technique

- Amplatzer plug III

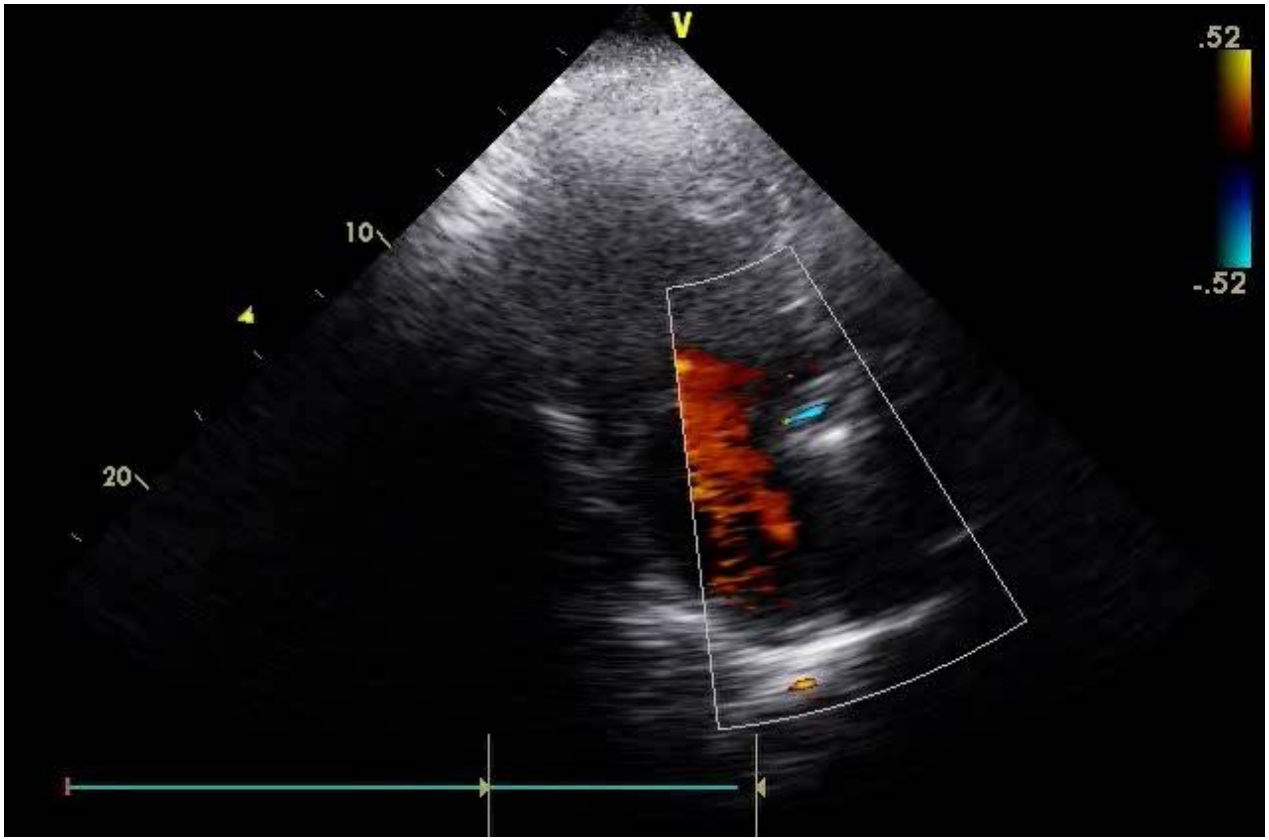
- Different devices: ASD, VSD, PDA, coils

Echocardiogram – TEE

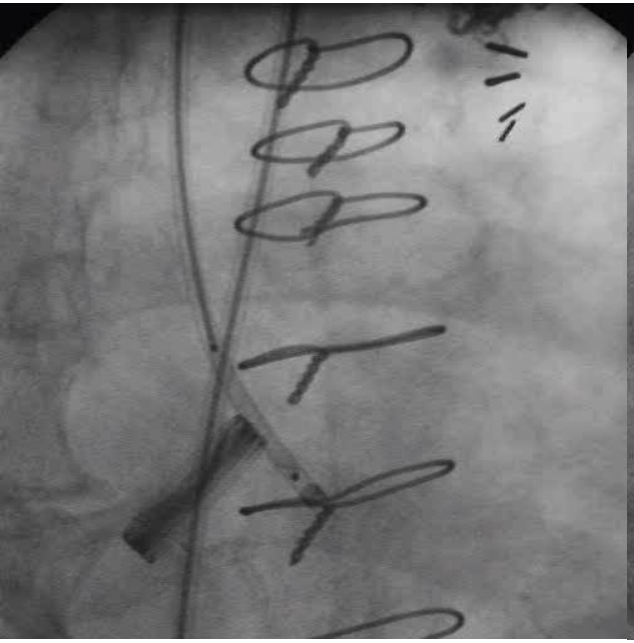
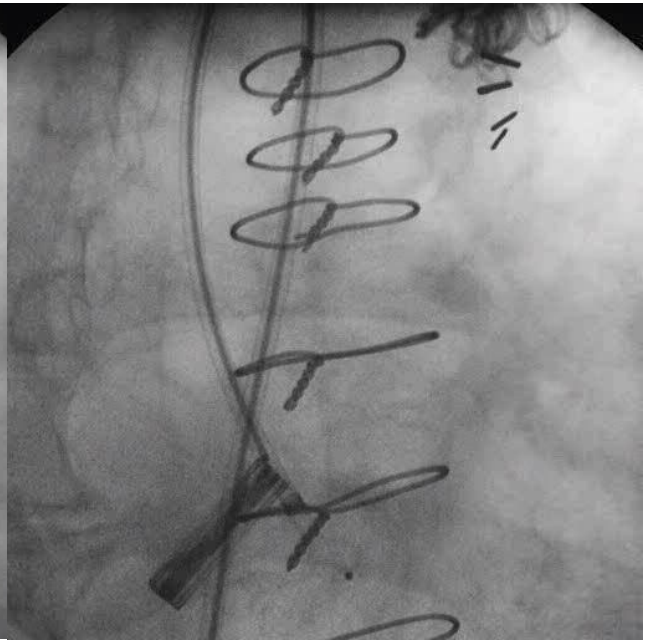
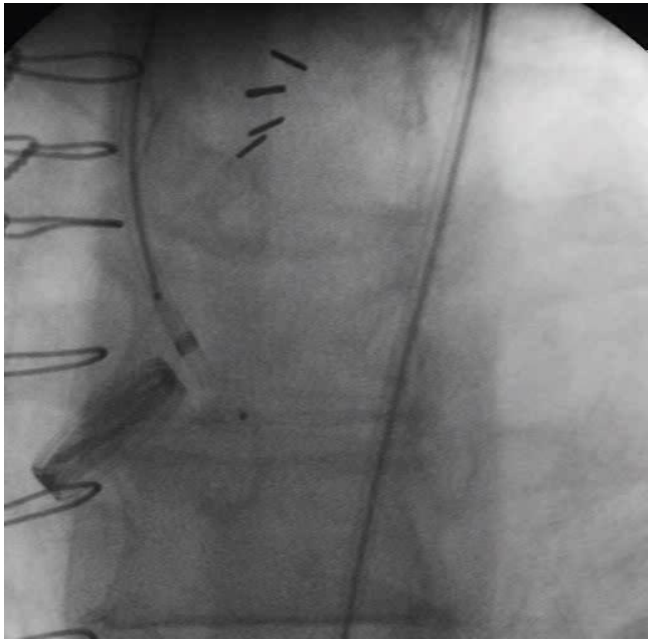


Aortography LAO Cranial

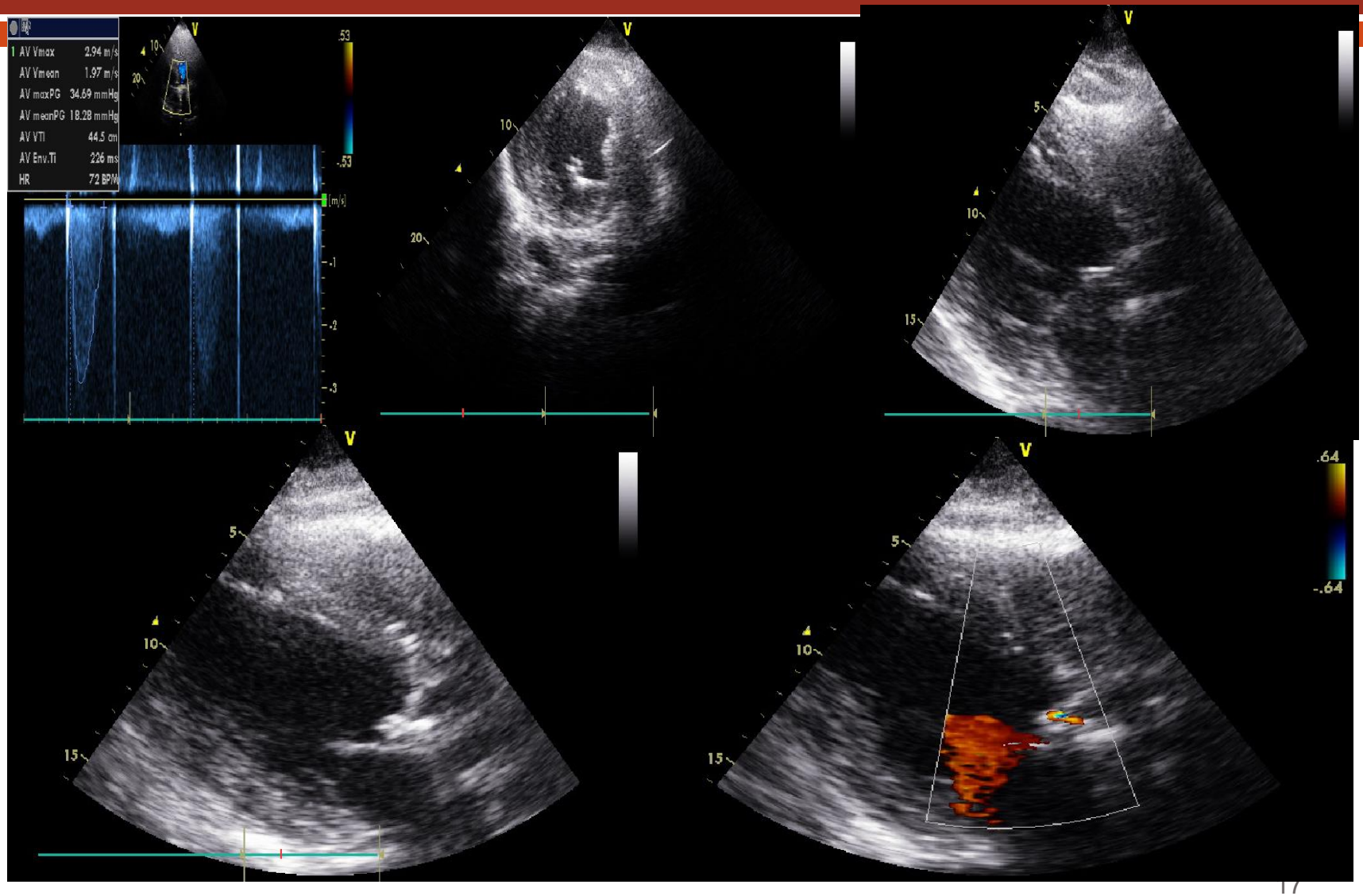
Intraprocedural TTE



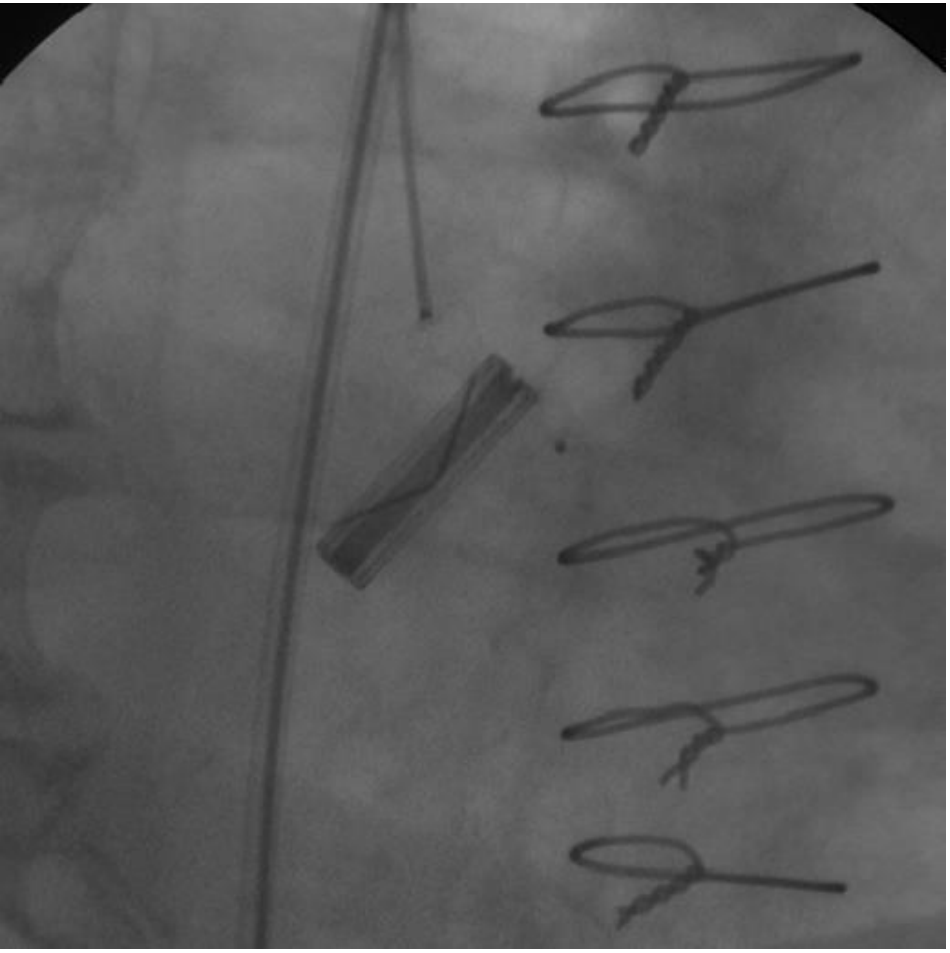
Delivery of the Amplatzer 8/6 mm PDA device, cine

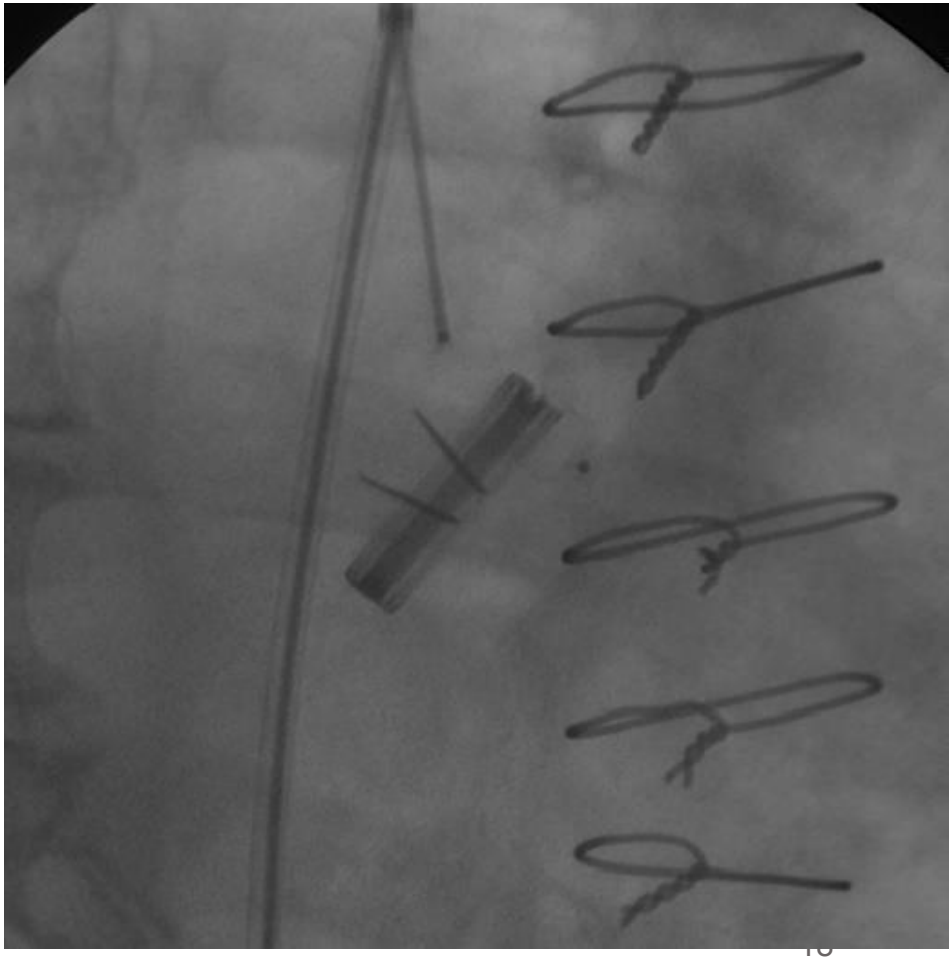




Device delivery - TTE

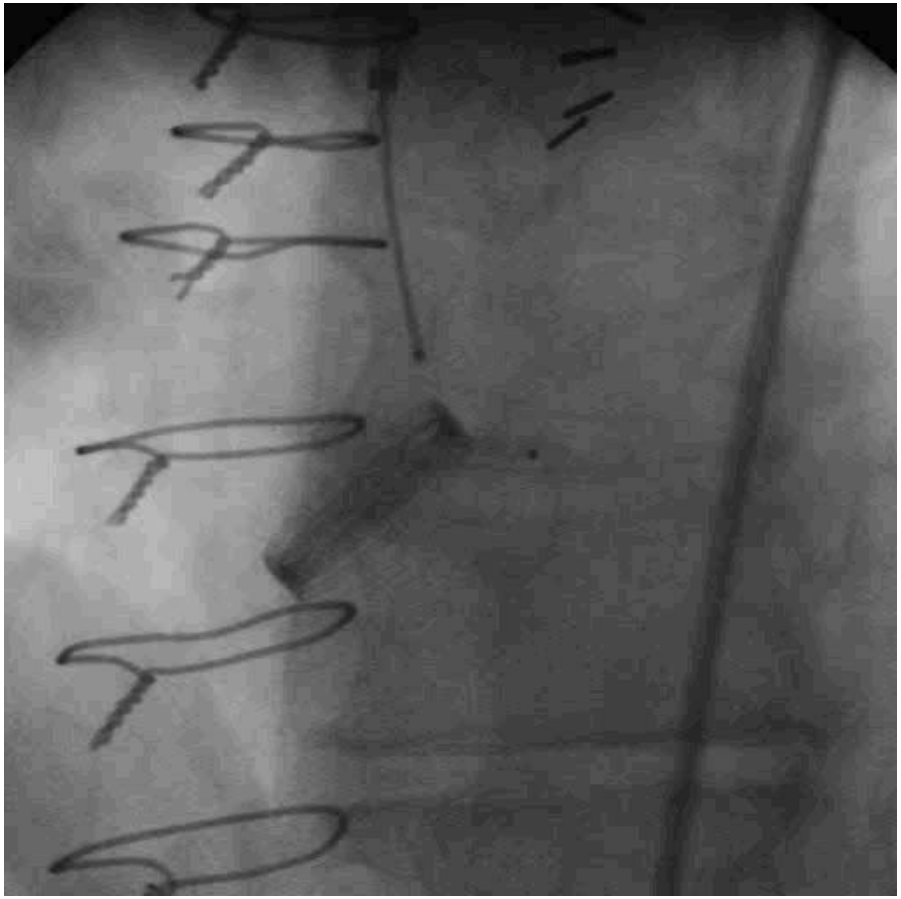


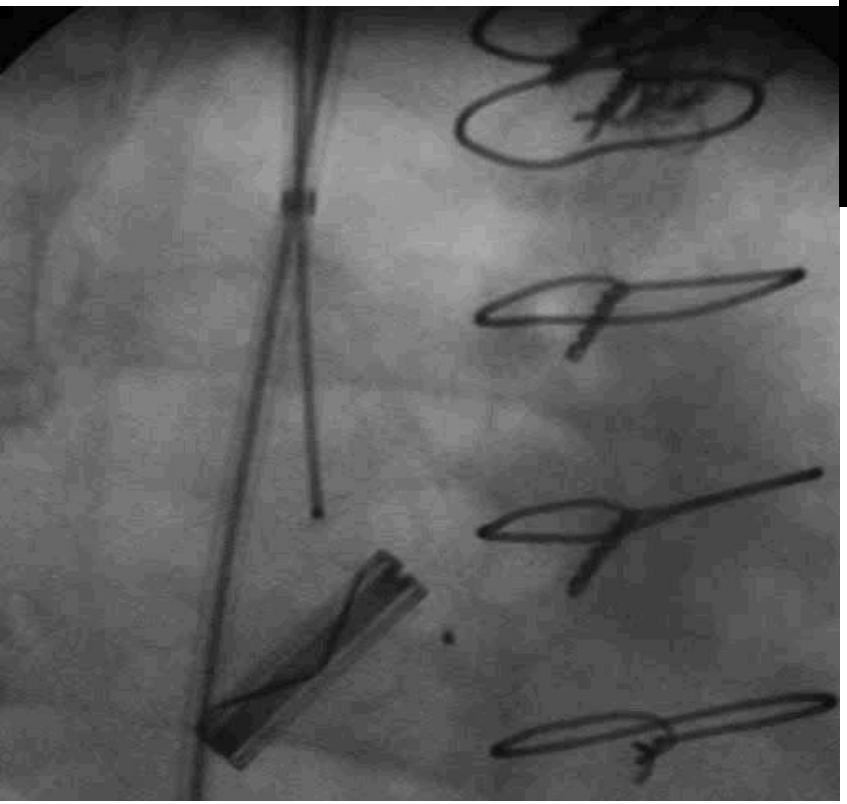
Pivot view for confirmation of normal valve function



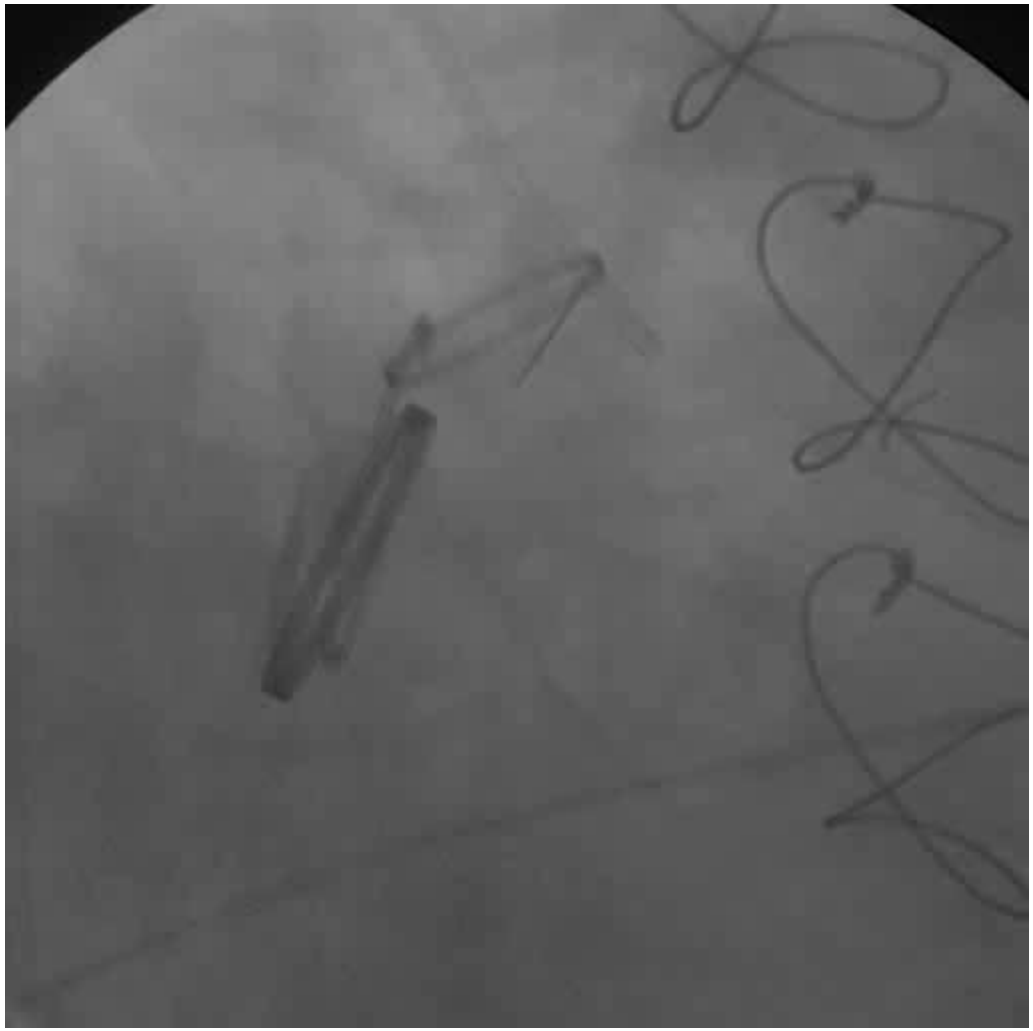


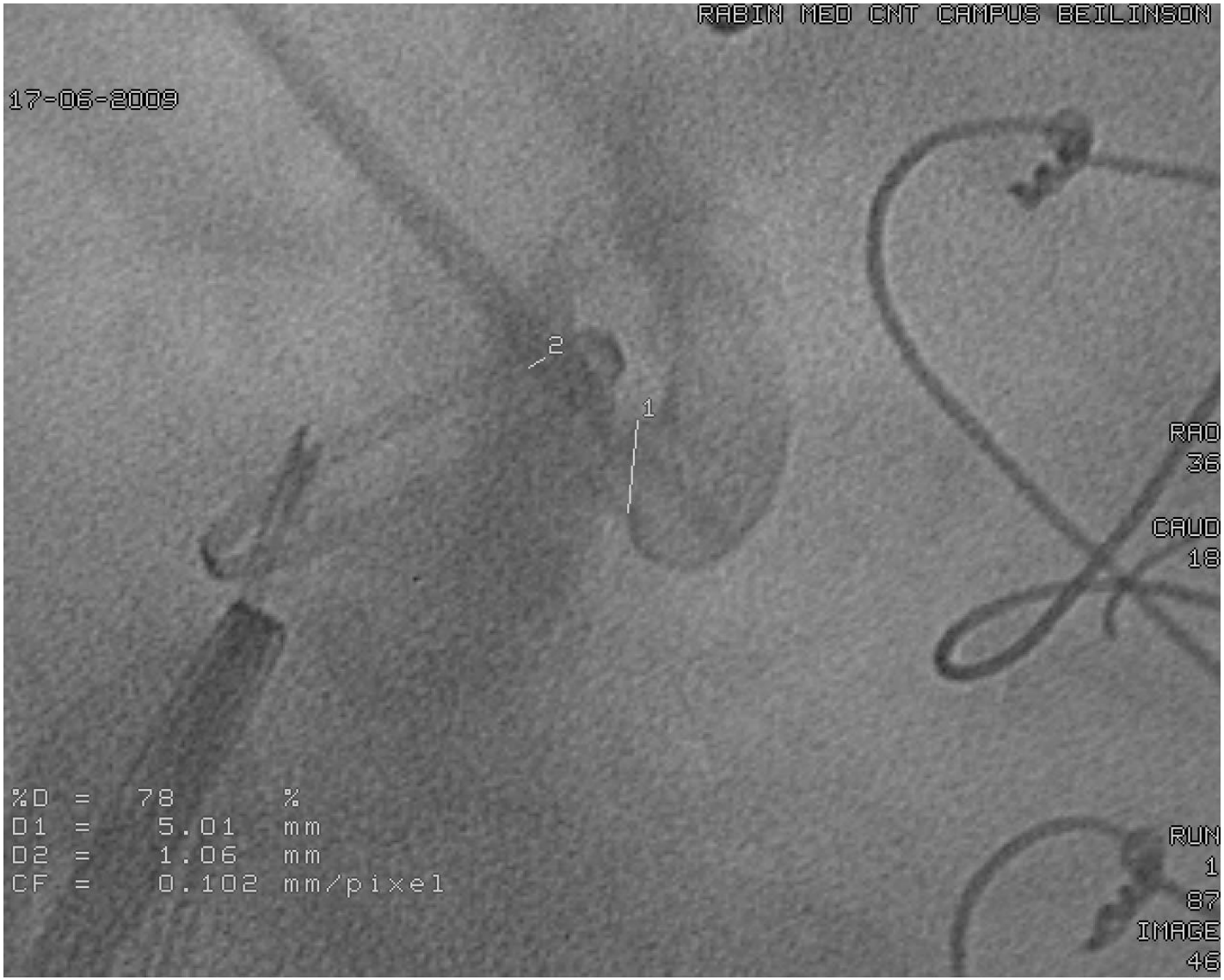
Pre-release aortography - unexpected aortic regurgitation release the device?

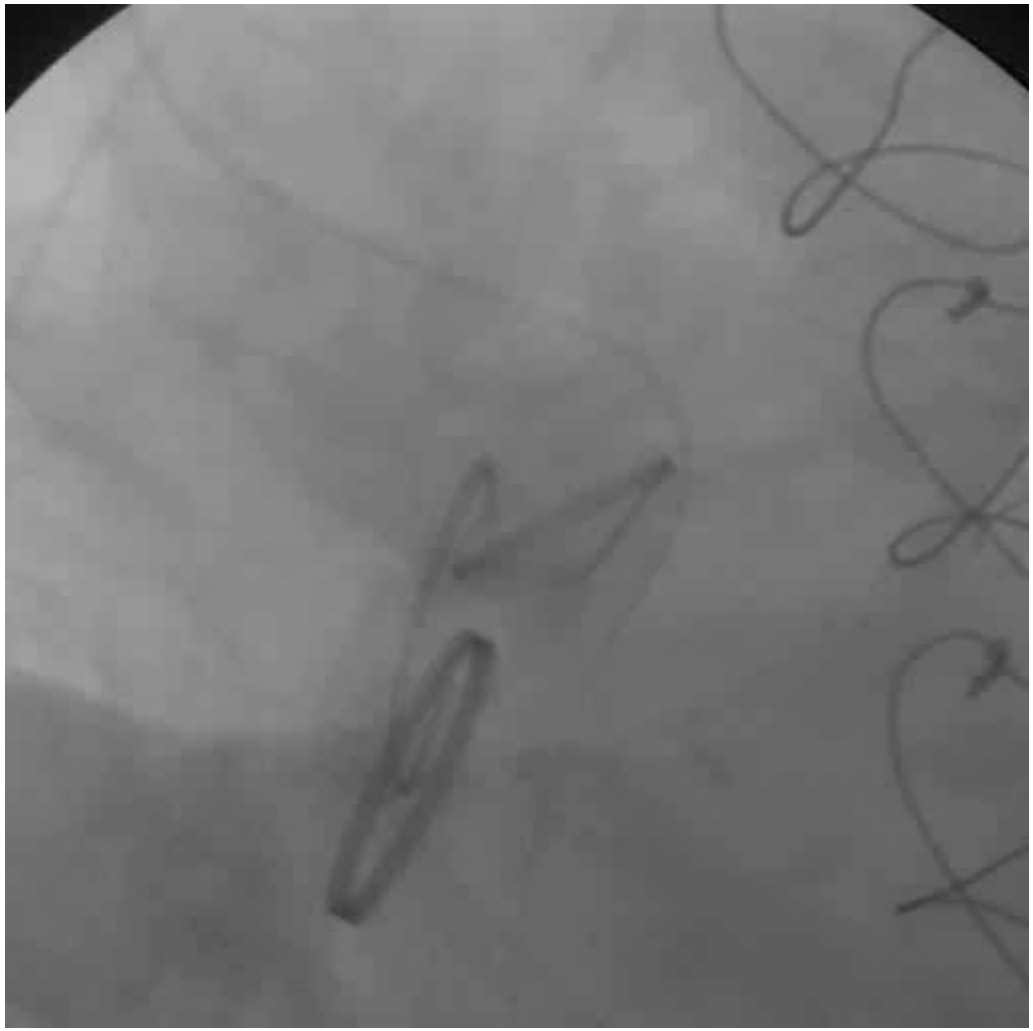


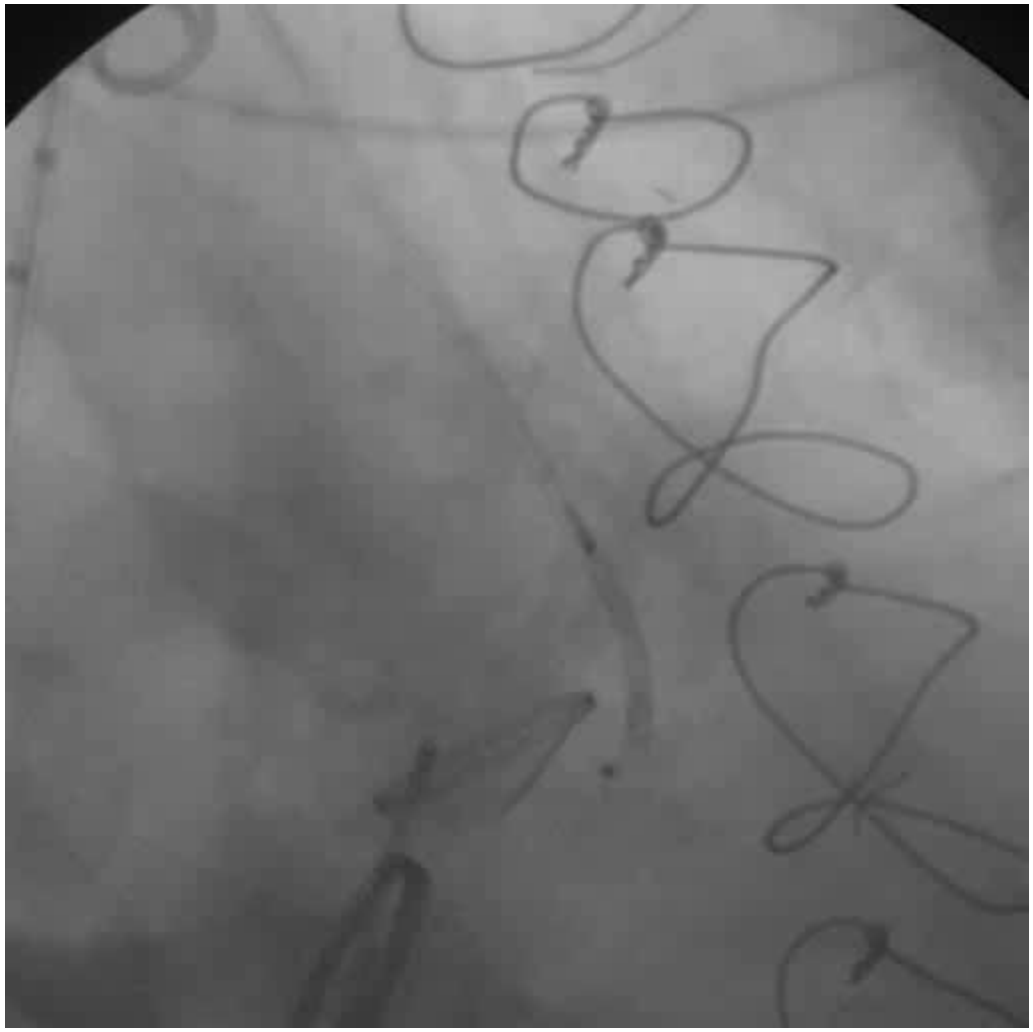


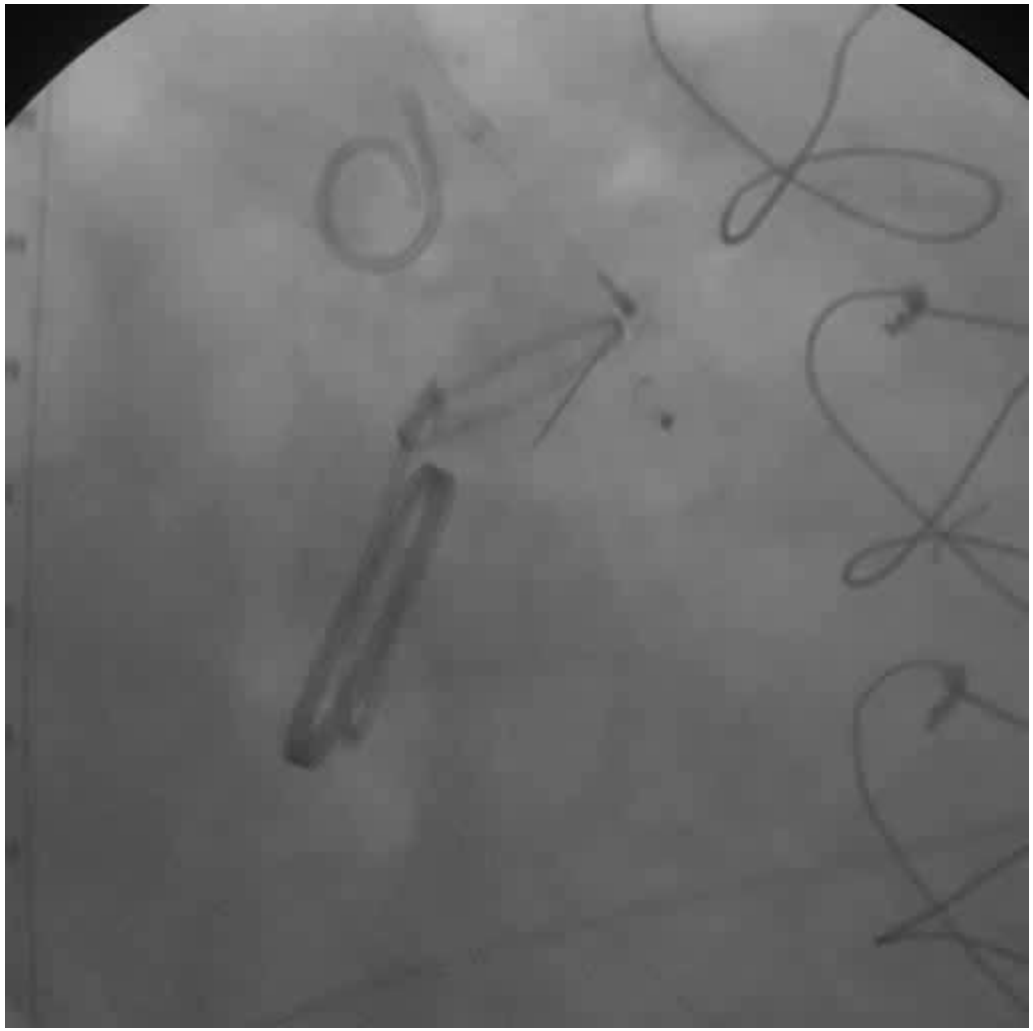

V
.64
-.64
5
10
15

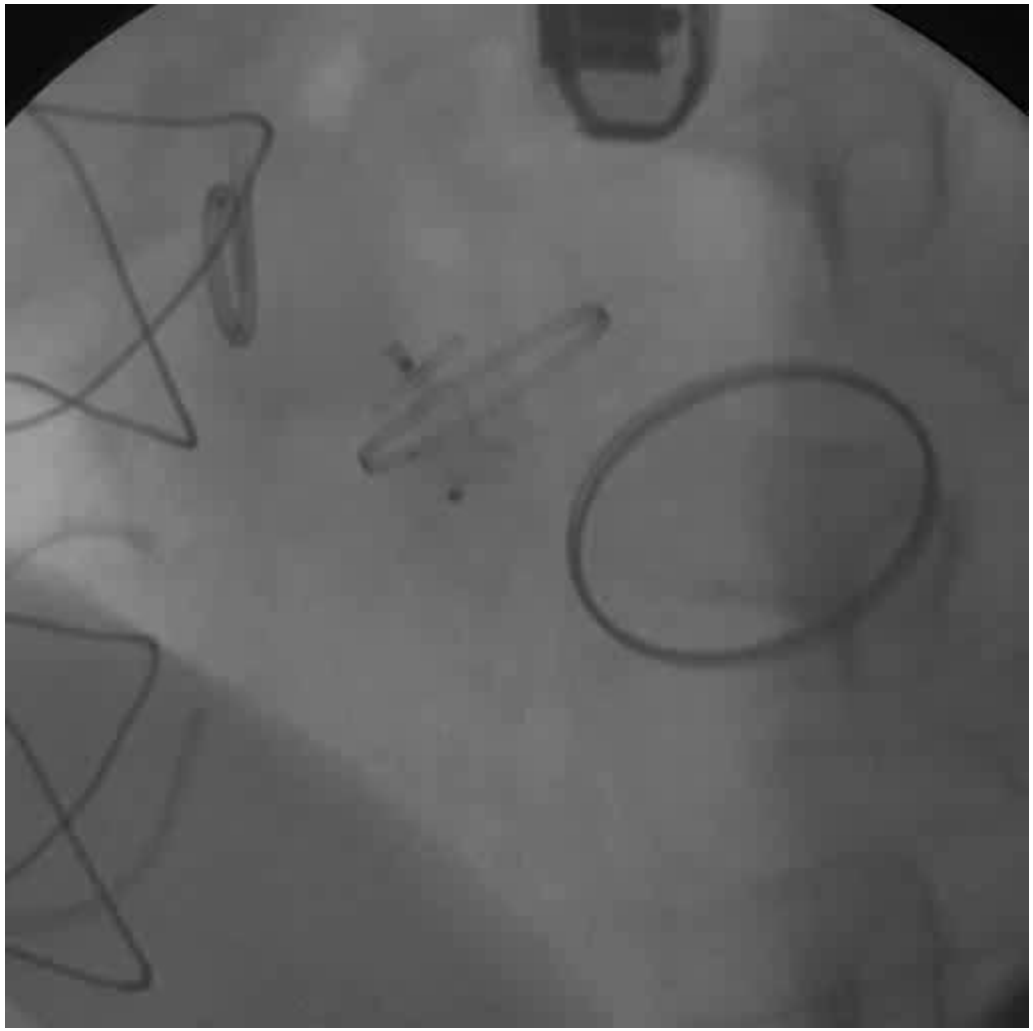


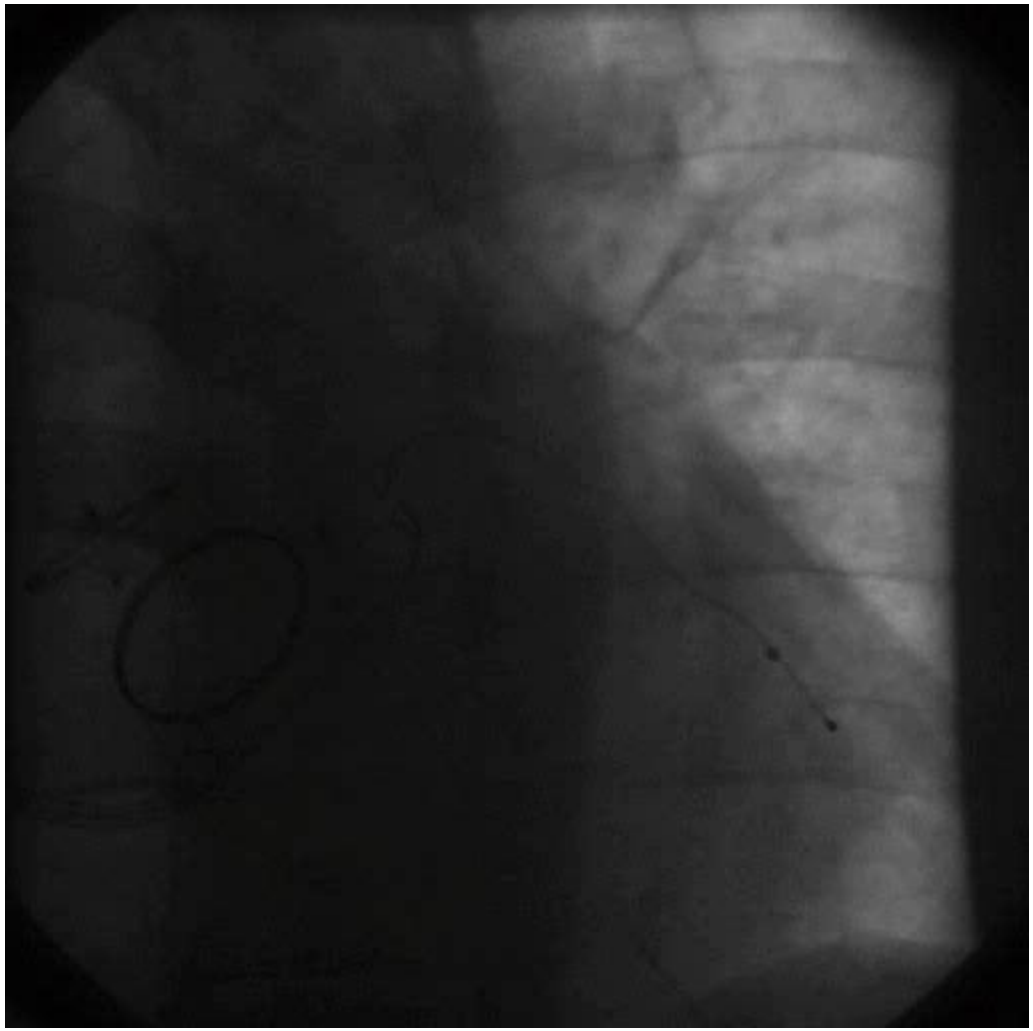

RABIN MED CNT CAMPUS BEILINSON
17-06-2009
2
1
RAD
36
CAUD
18
%D = 78 %
D1 = 5.01 mm
D2 = 1.06 mm
CF = 0.102 mm/pixel
RUN
1
87
IMAGE
46

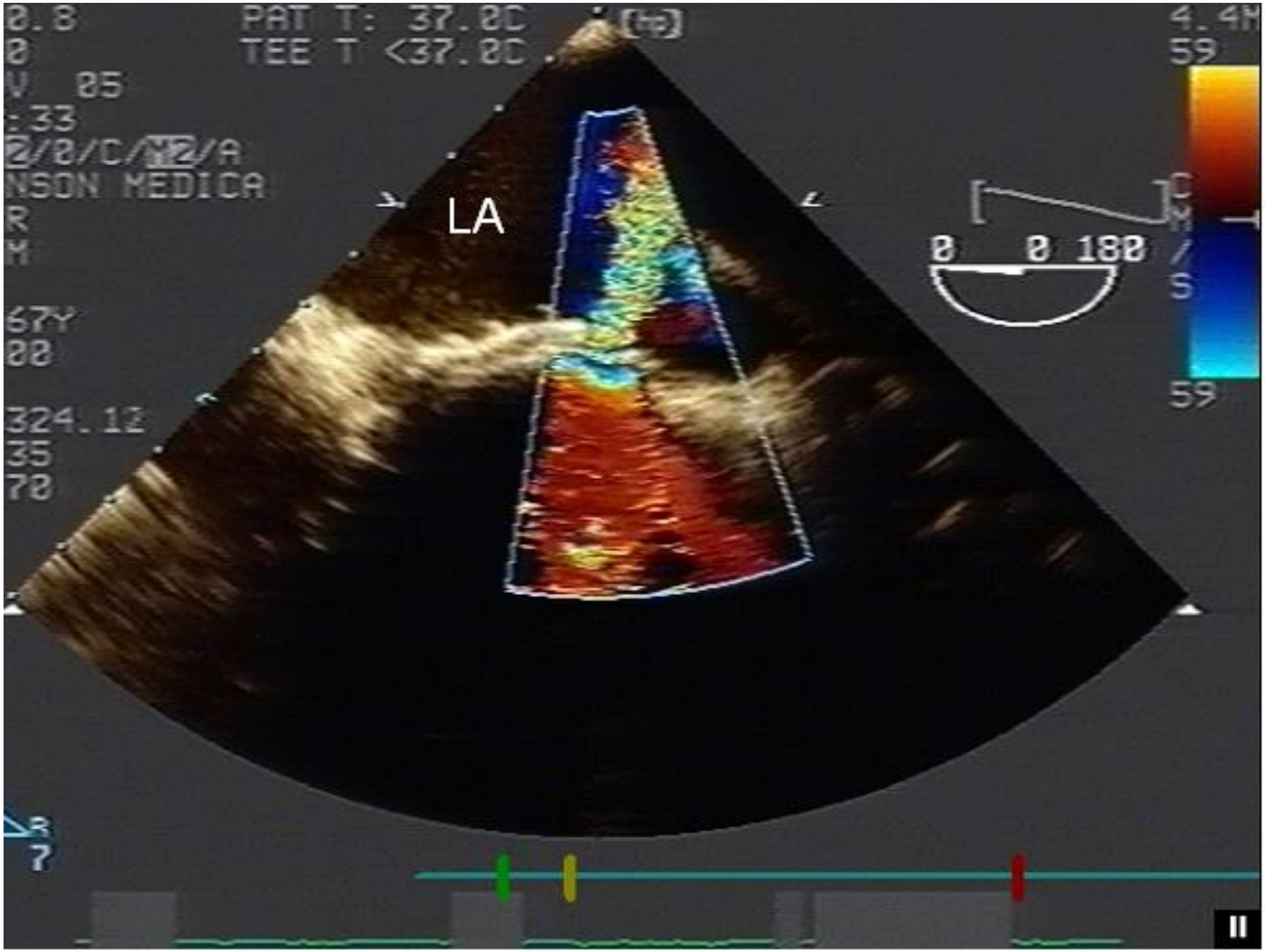


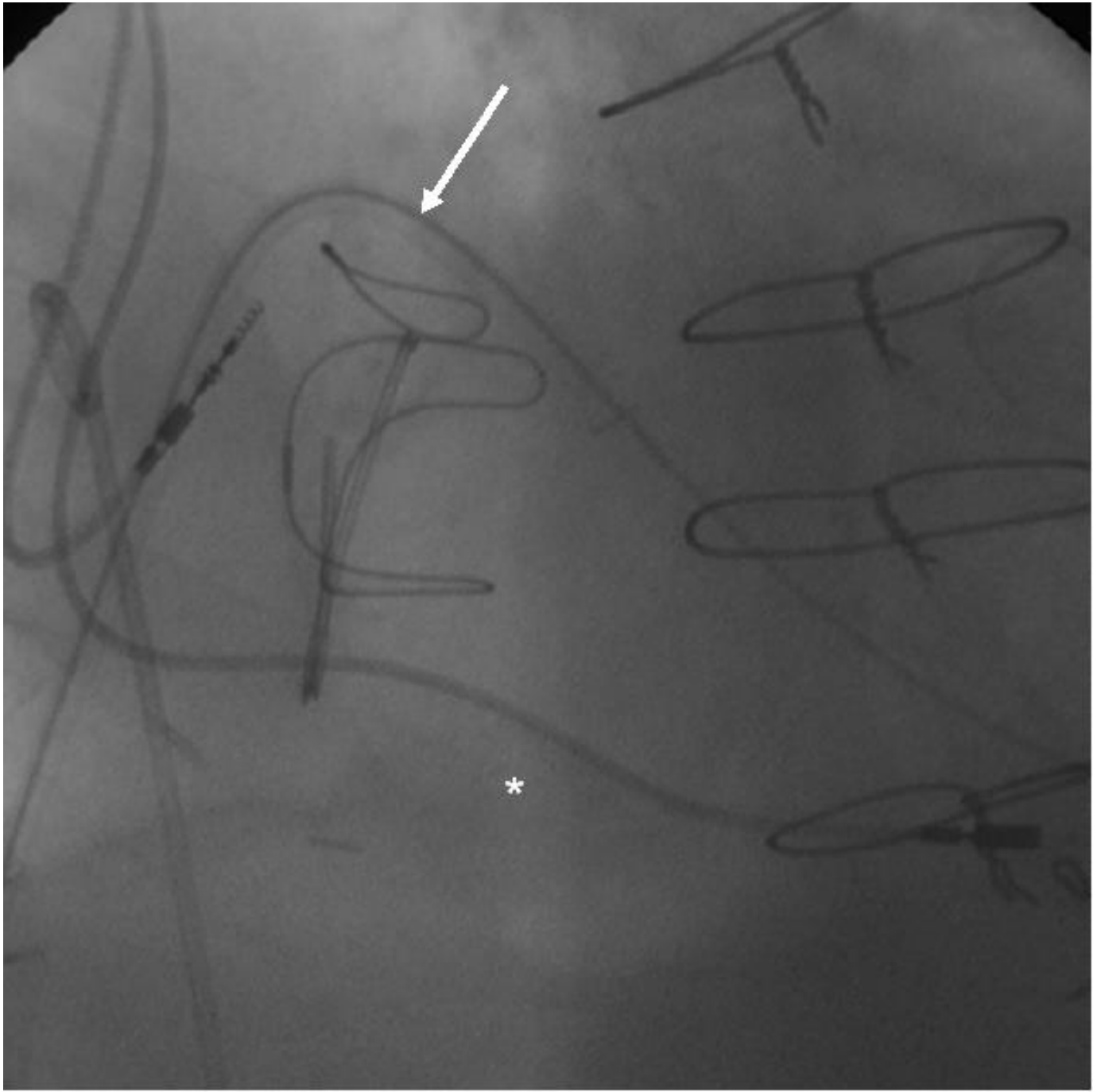


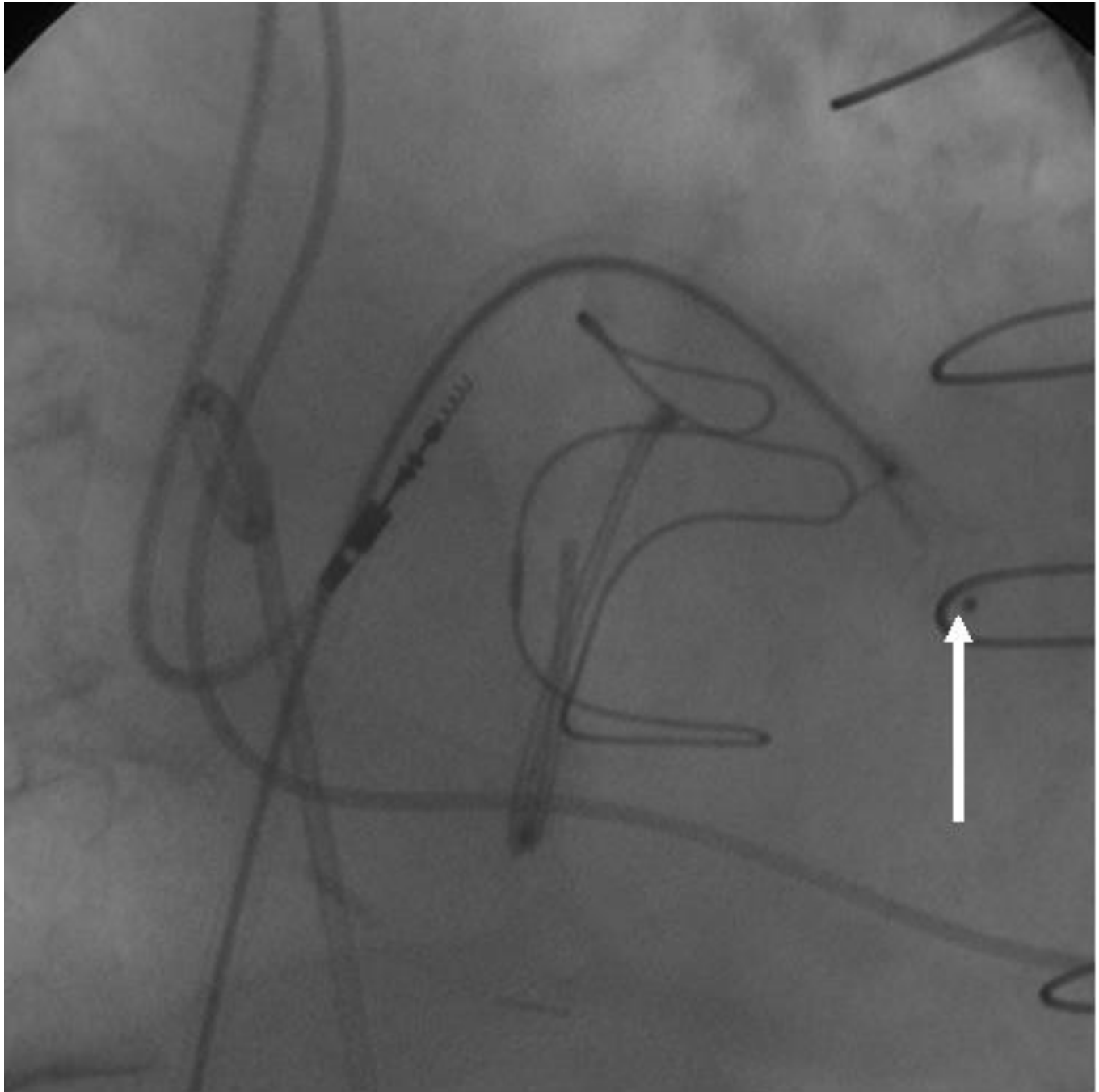


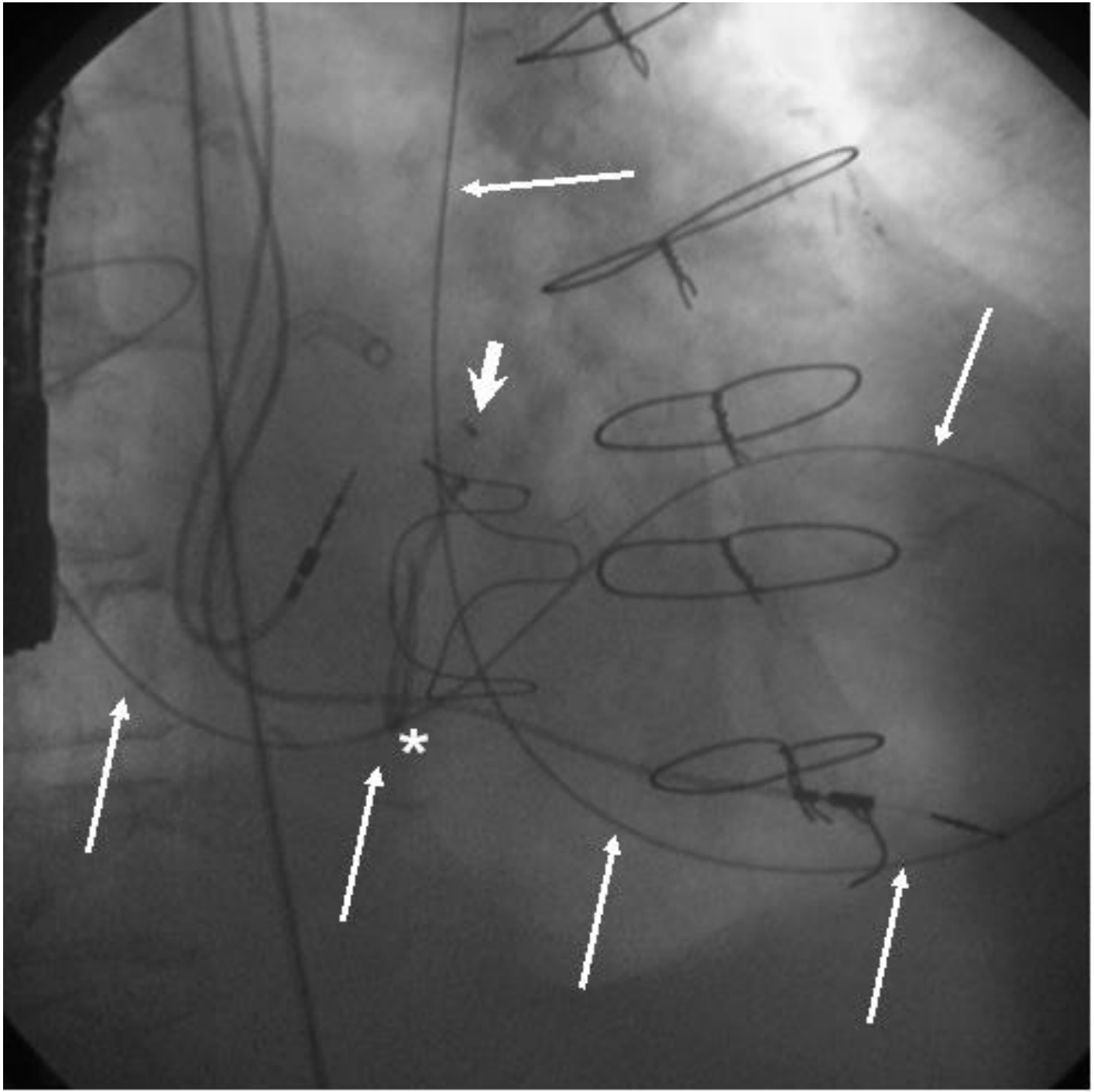


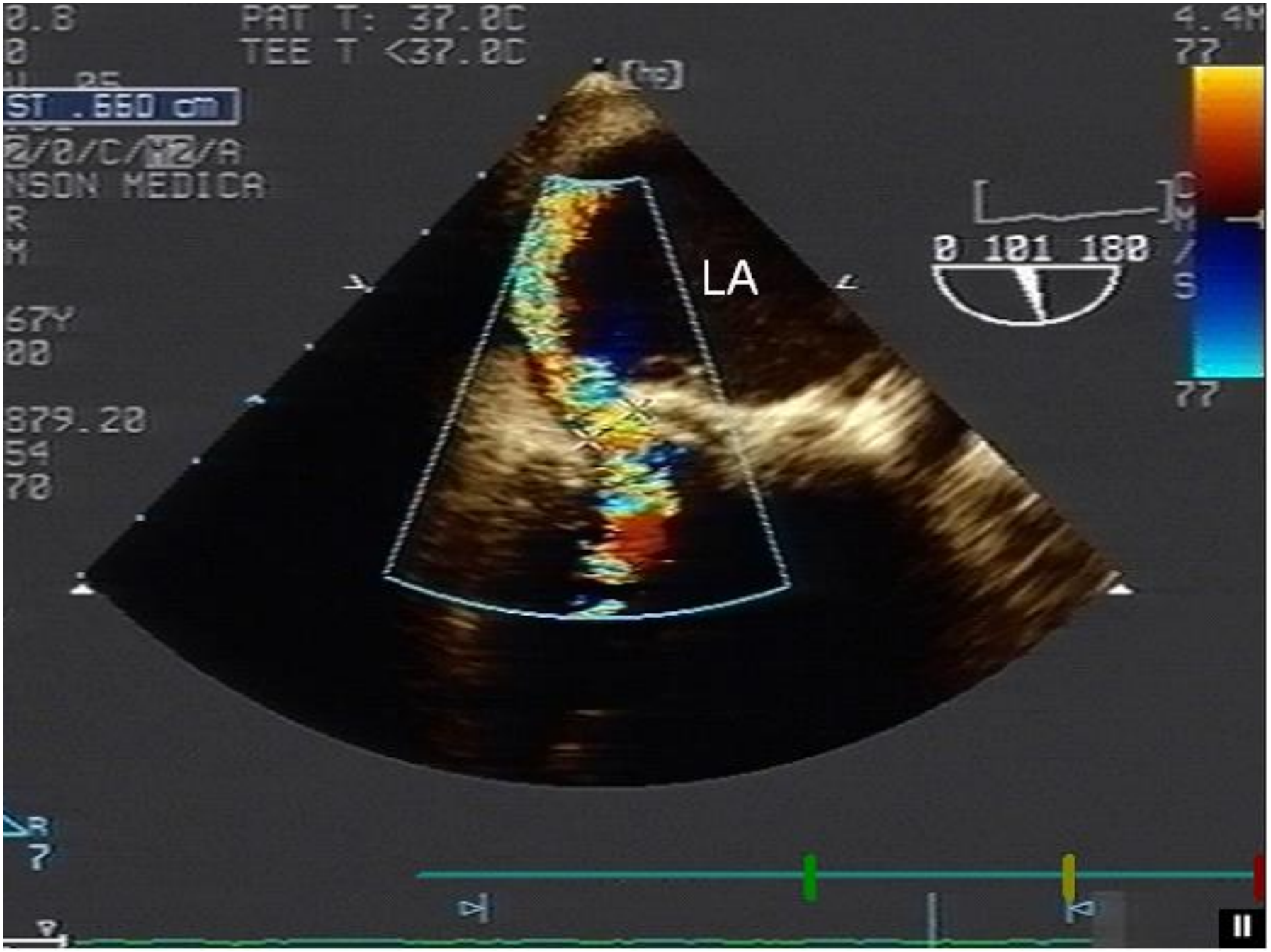


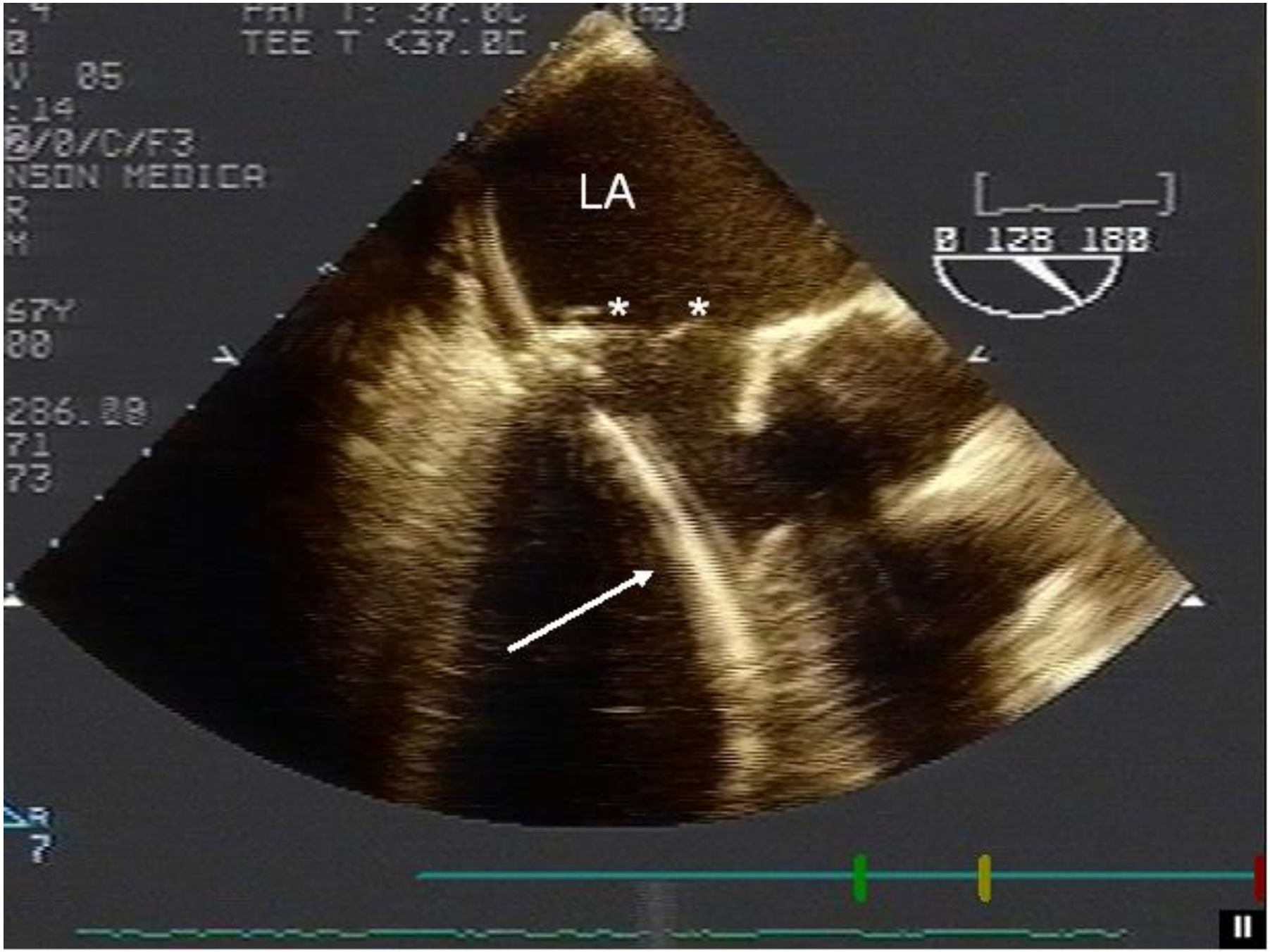

PAT T: 37.0C
TEE T <37.0C
LA
0 0 180
59
59

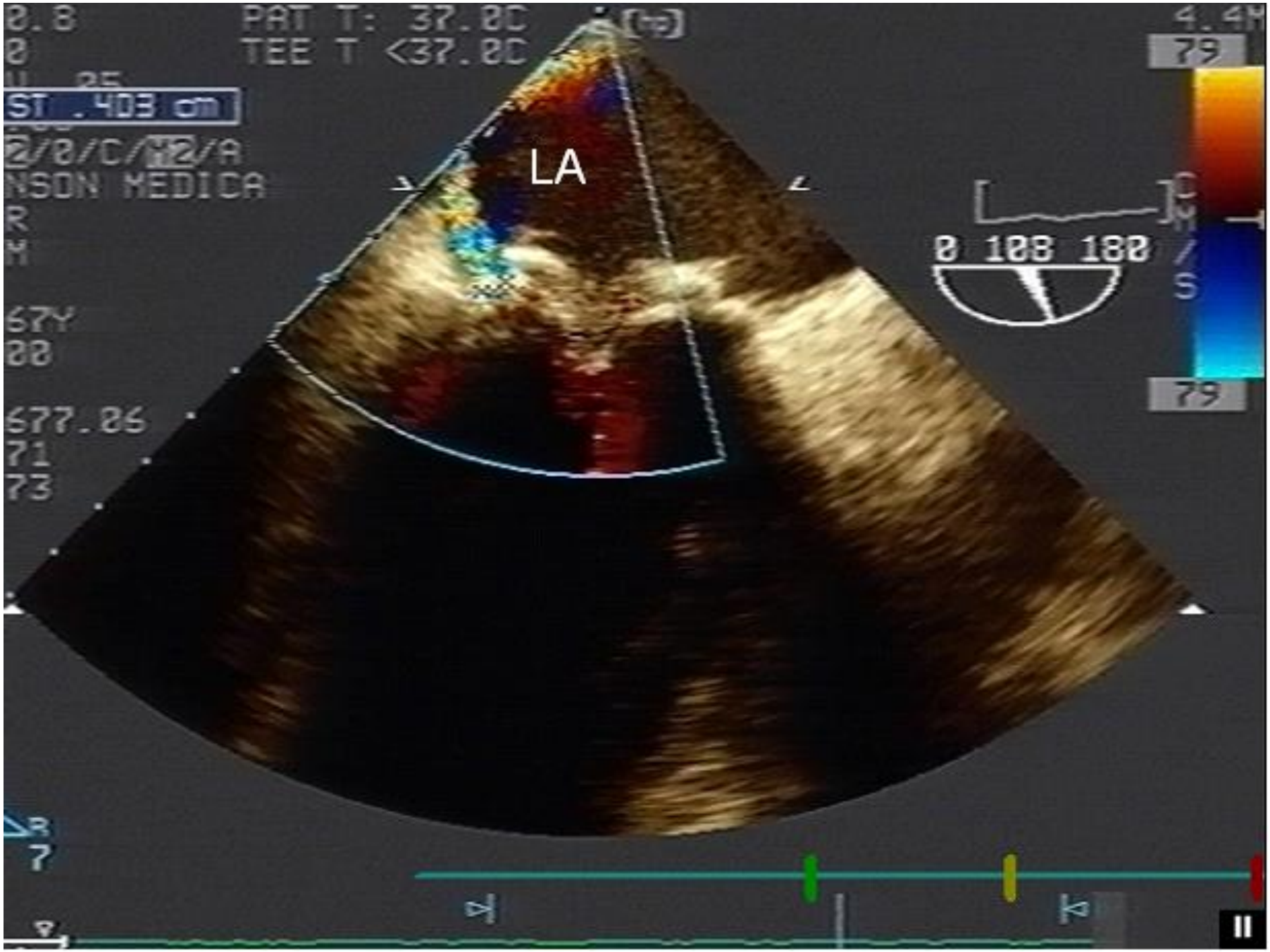


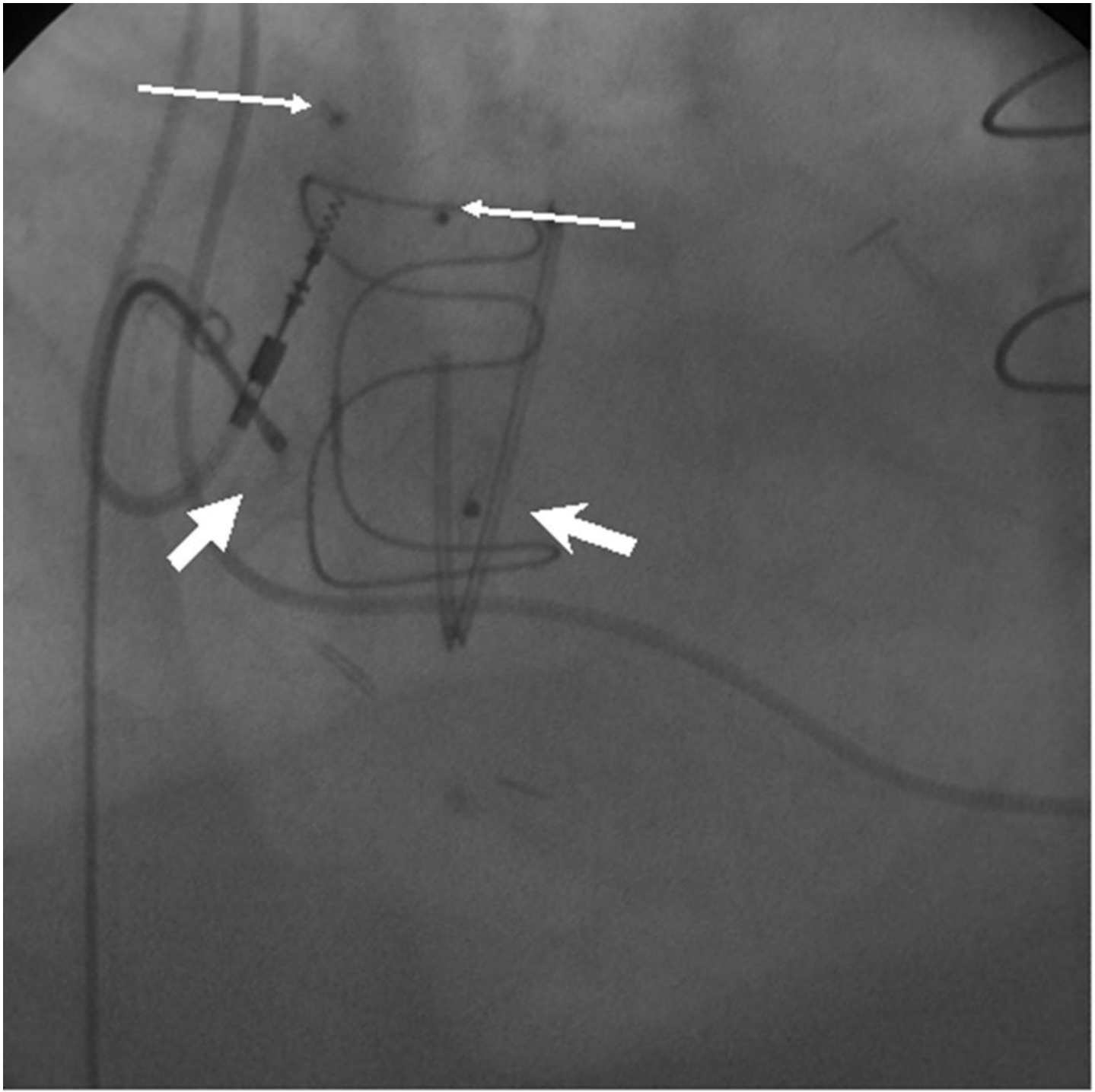


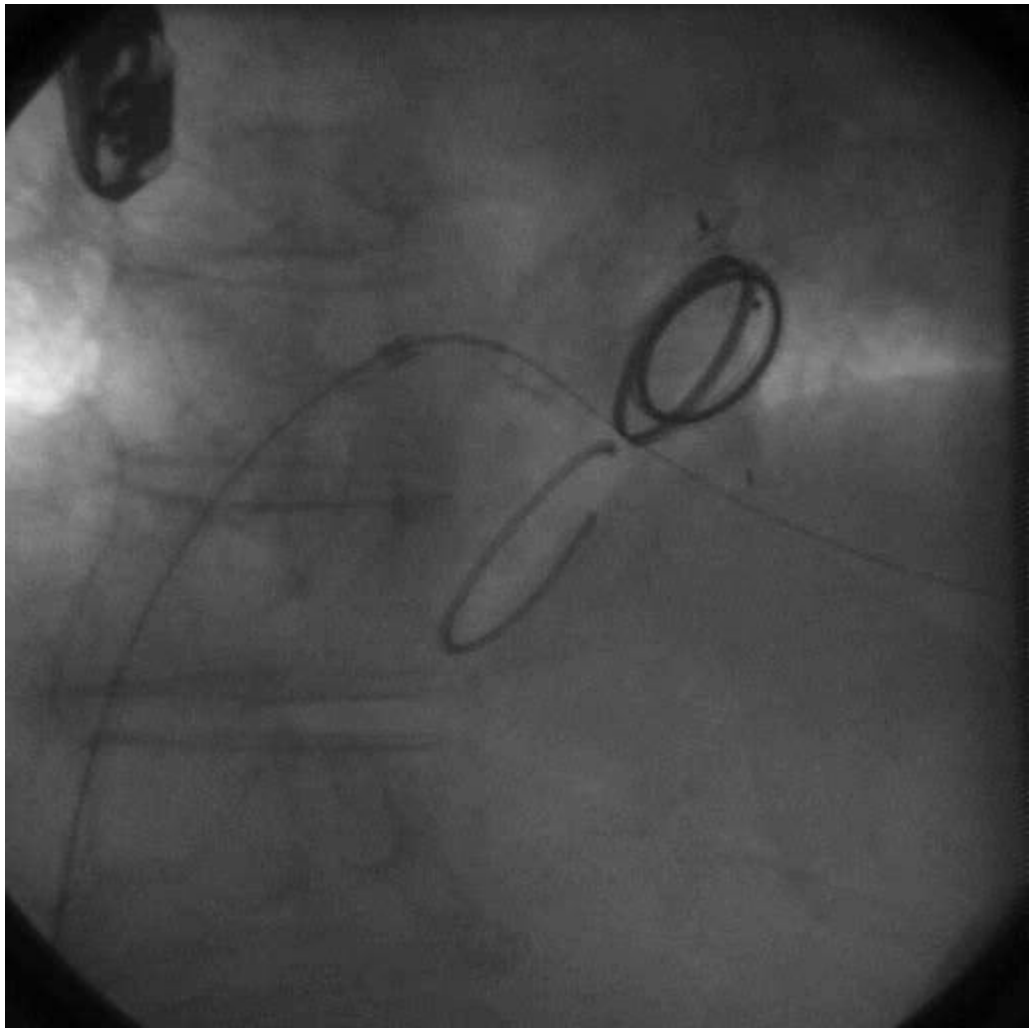


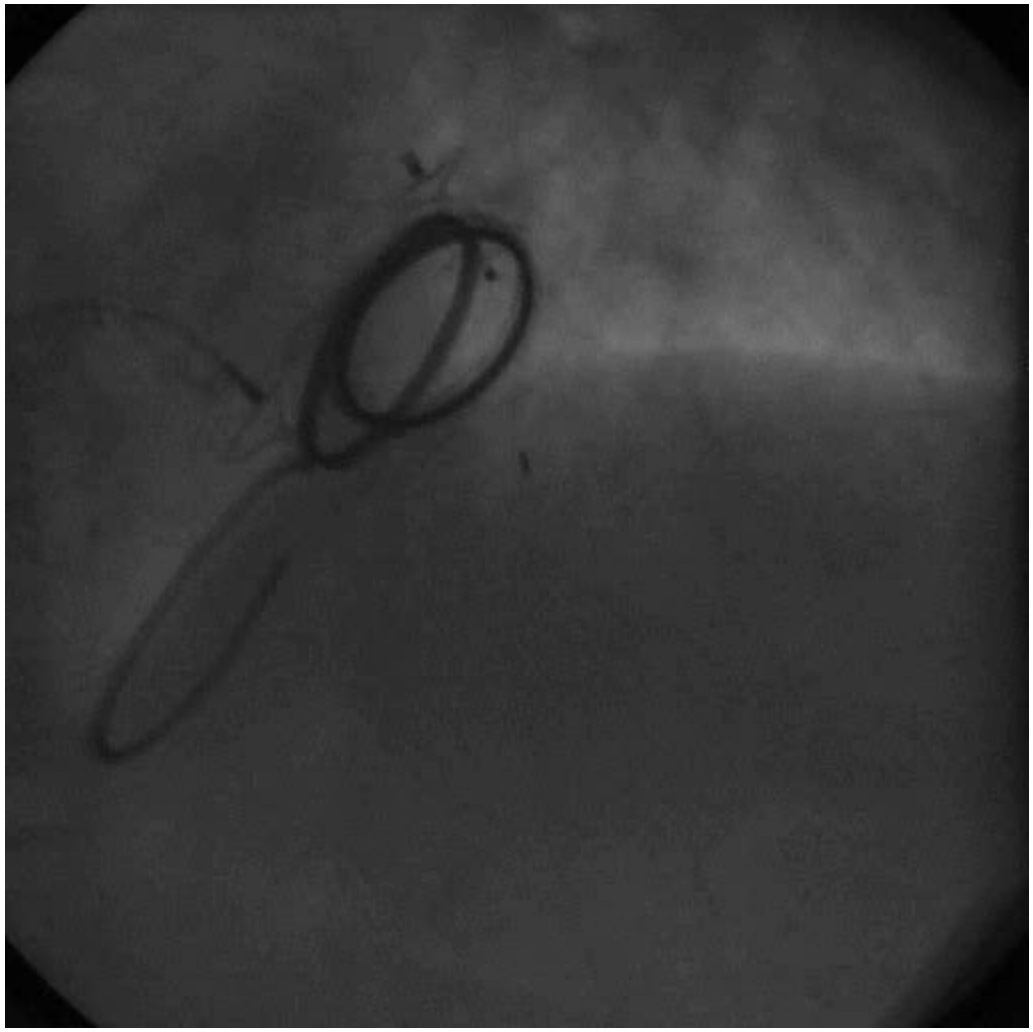

PAT T: 37.0C
TEE T <37.0C
LA
0 101 180

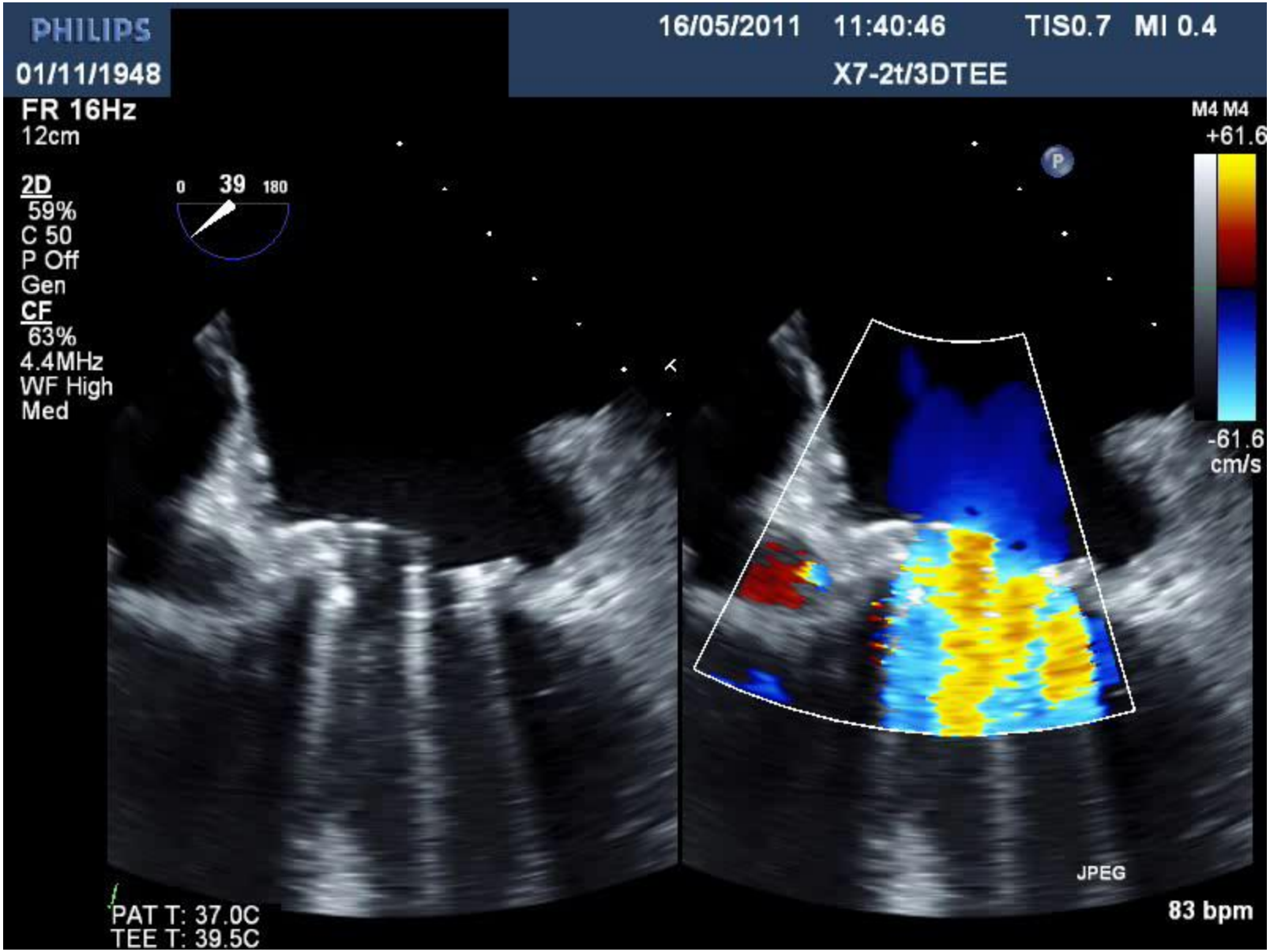

LA

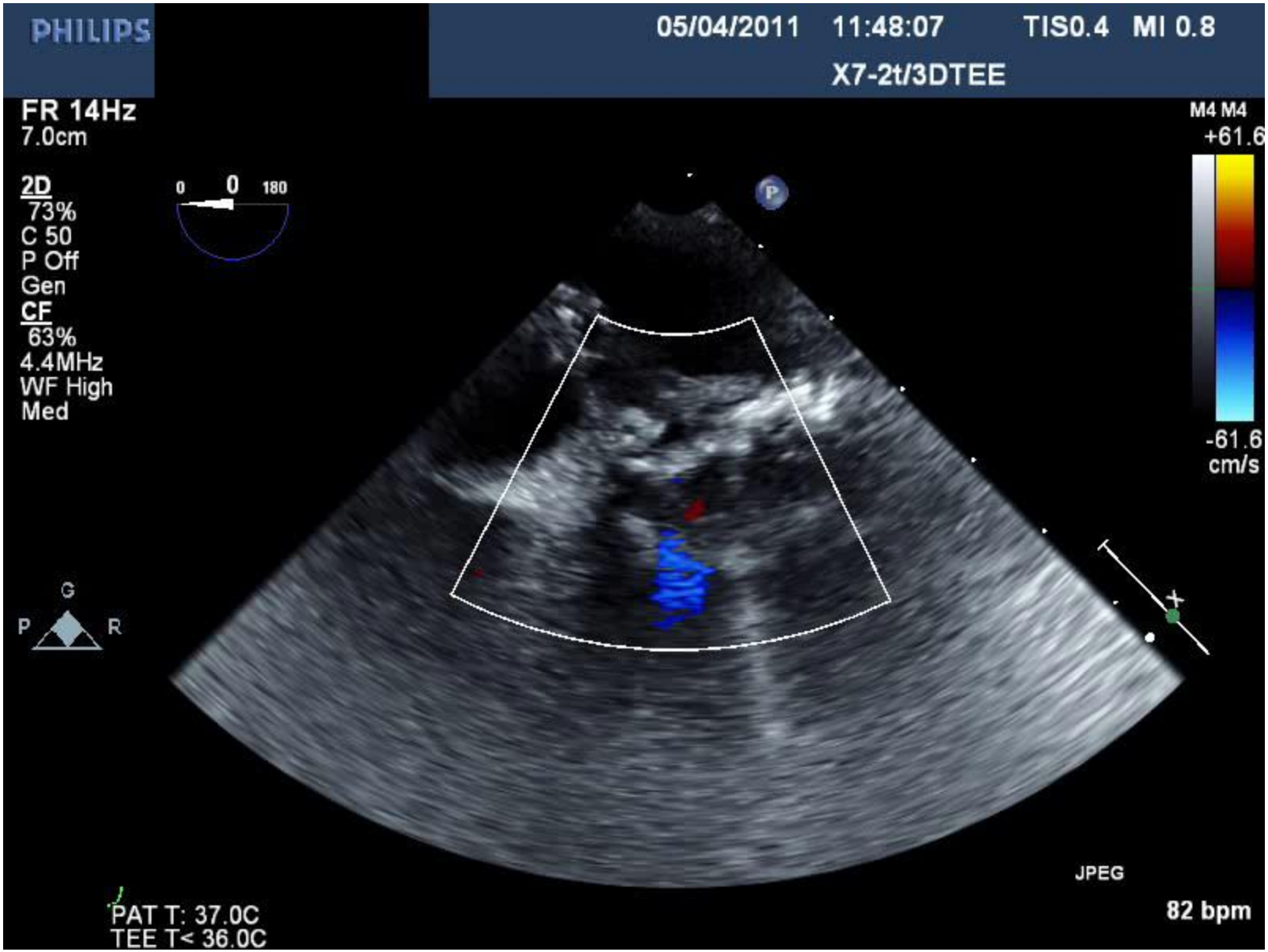

PAT T: 37.0C
TEE T <37.0C
LA
0 100 180
79
79

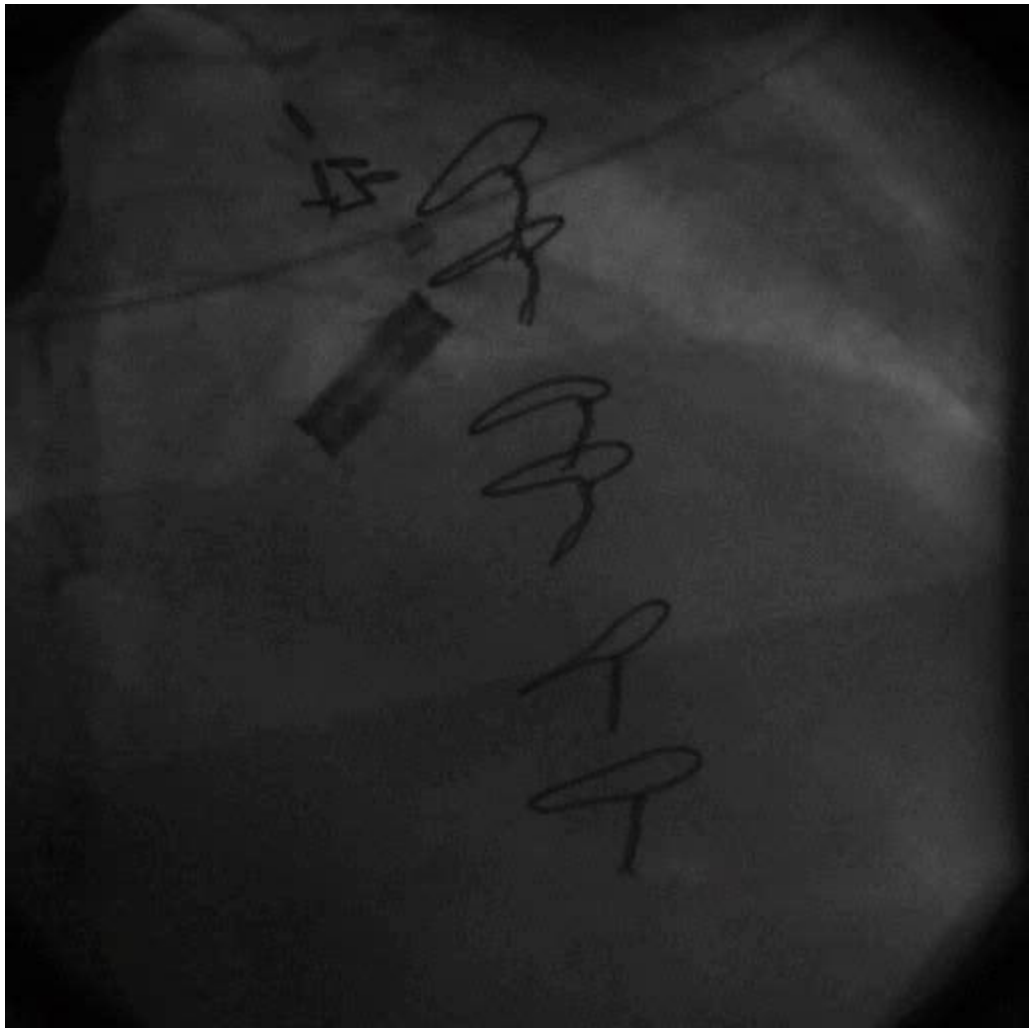


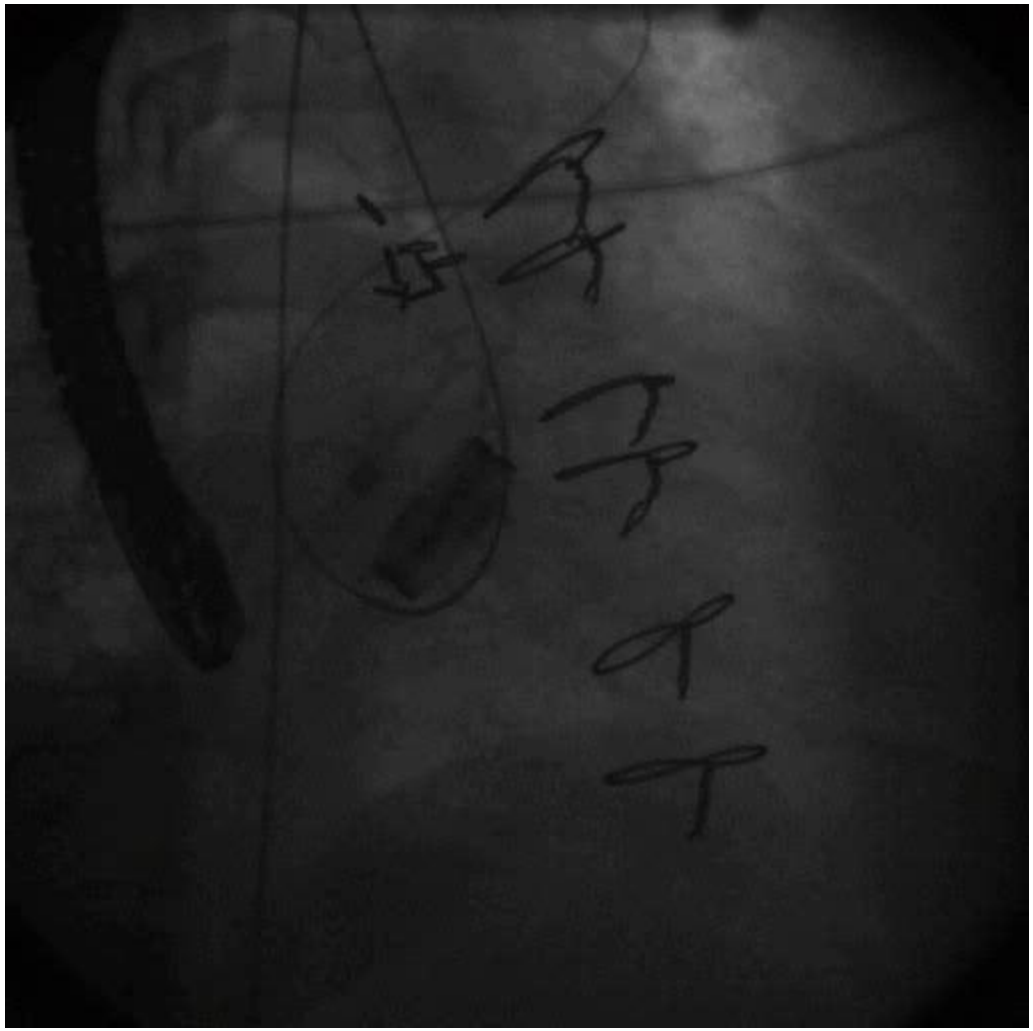


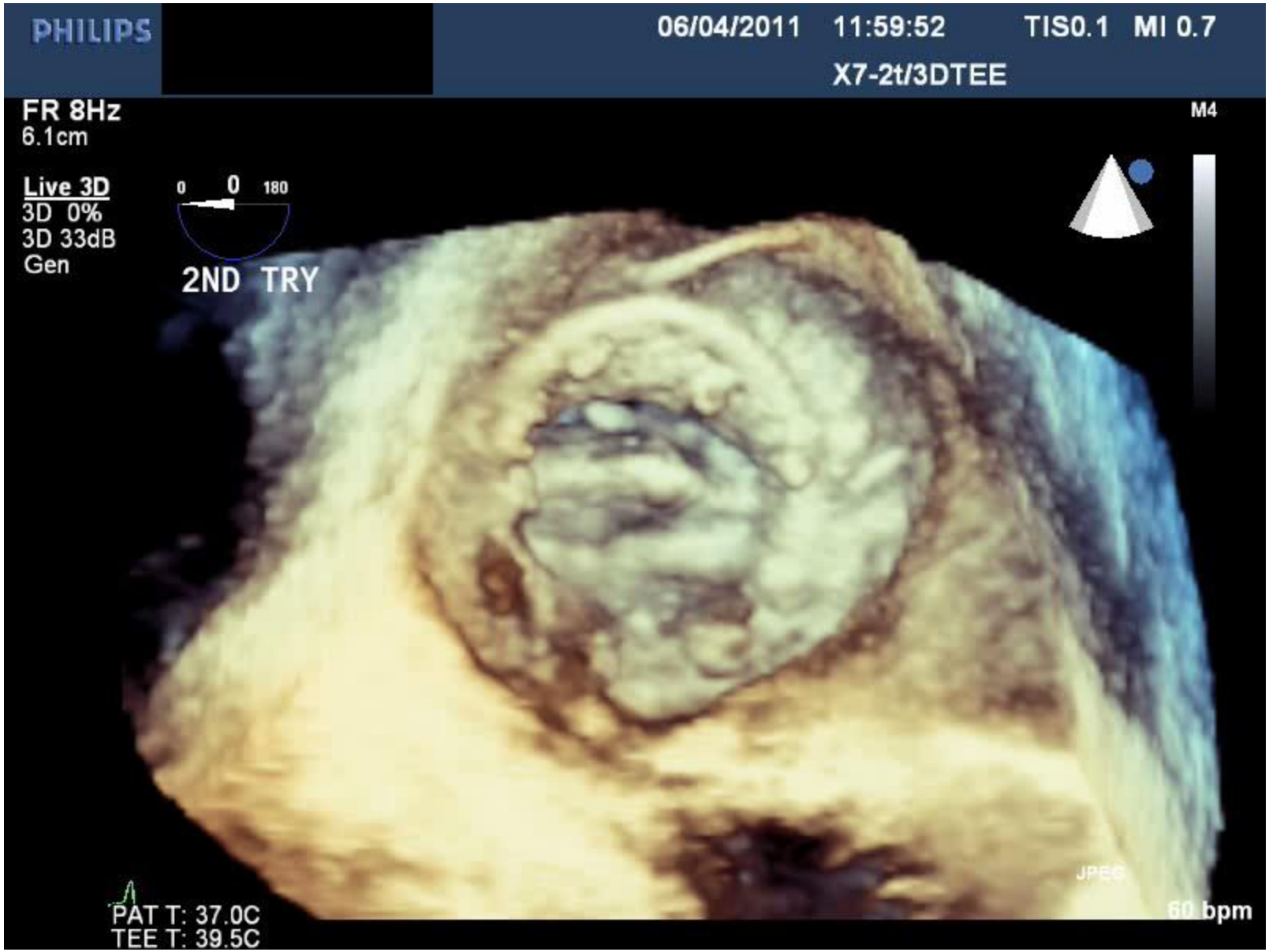


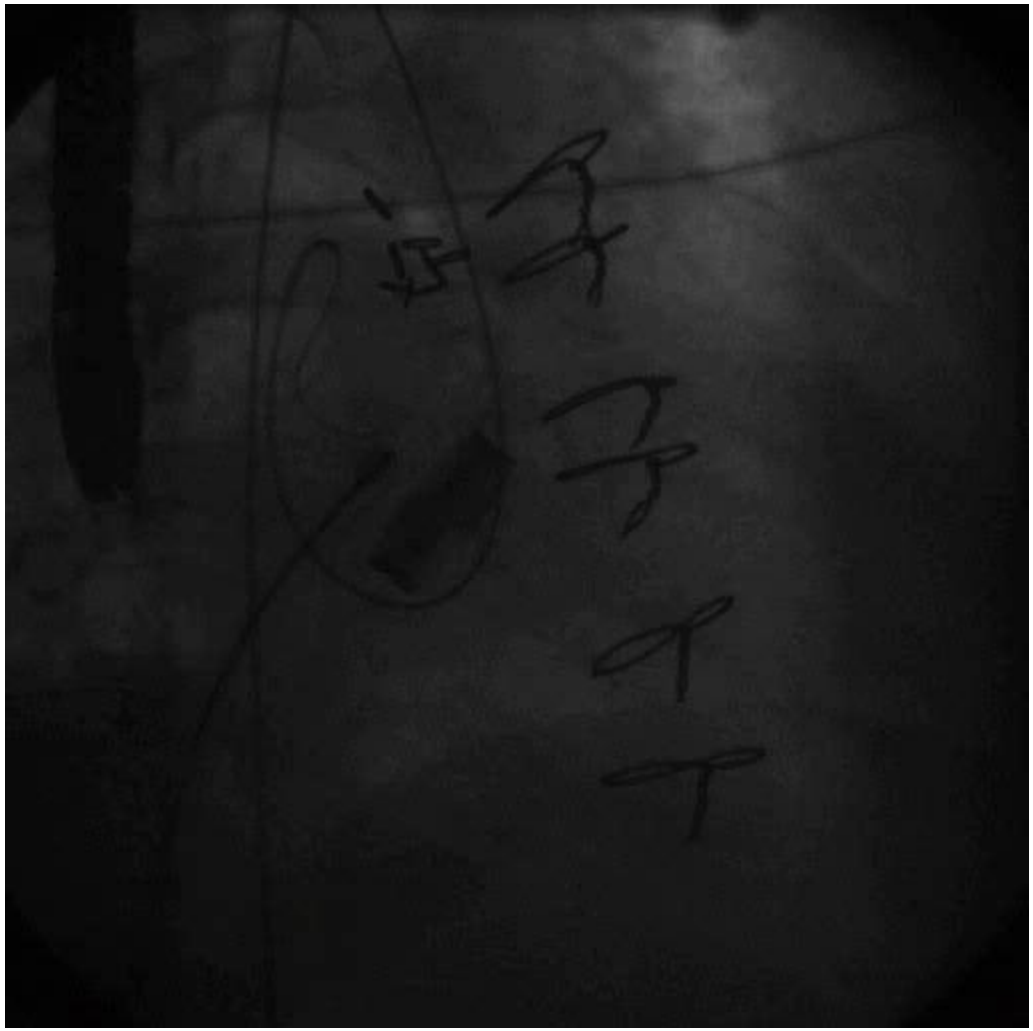

PHILIPS
01/11/1948
16/05/2011 11:40:46 TIS0.7 MI 0.4
X7-2t/3DTEE
FR 16Hz
12cm
2D
59%
C 50
P Off
Gen
CF
63%
4.4MHz
WF High
Med
0 39 180
M4 M4
+61.6
-61.6
cm/s
JPEG
PAT T: 37.0C
TEE T: 39.5C
83 bpm

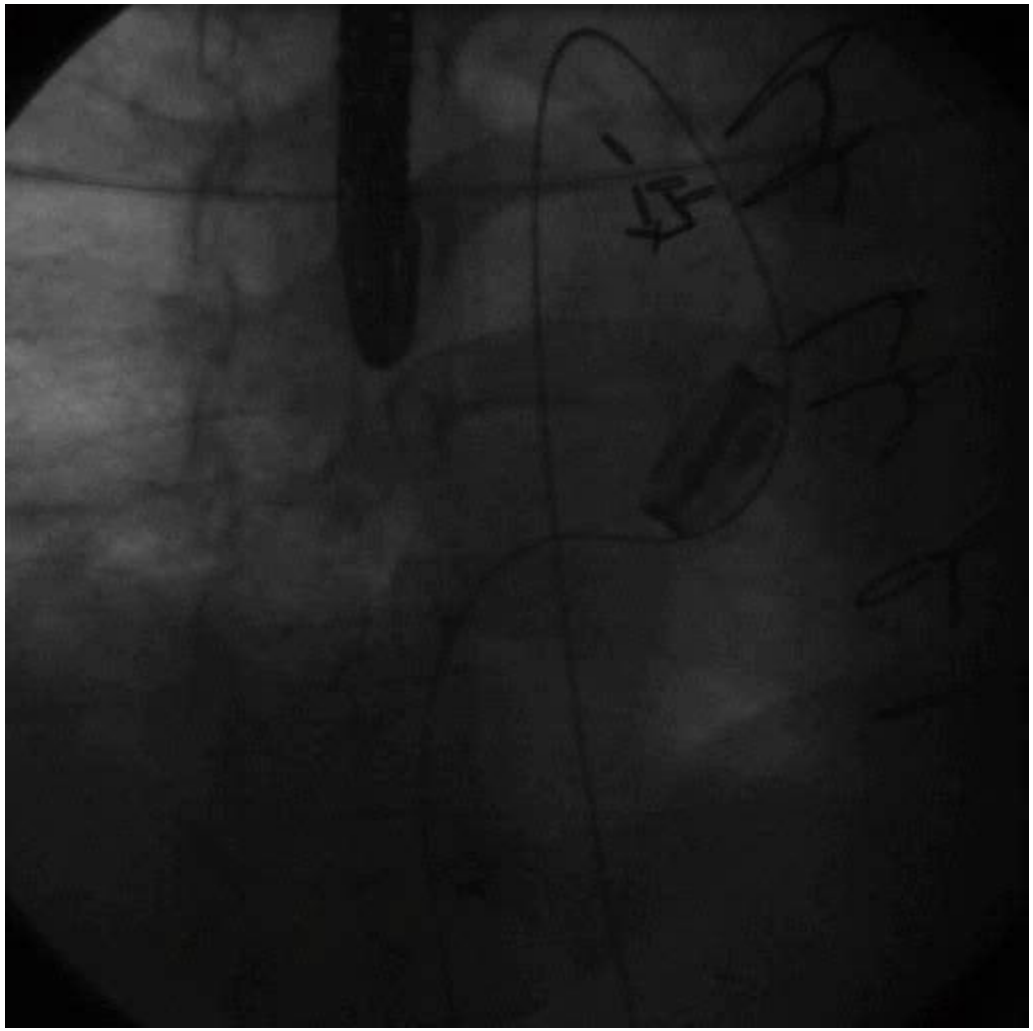

PHILIPS
05/04/2011 11:48:07 TIS0.4 MI 0.8
X7-2t/3DTEE
FR 14Hz
7.0cm
2D
73%
C 50
P Off
Gen
CF
63%
4.4MHz
WF High
Med
0 0 180
M4 M4
+61.6
-61.6
cm/s
G
P R
JPEG
82 bpm
PAT T: 37.0C
TEE T< 36.0C

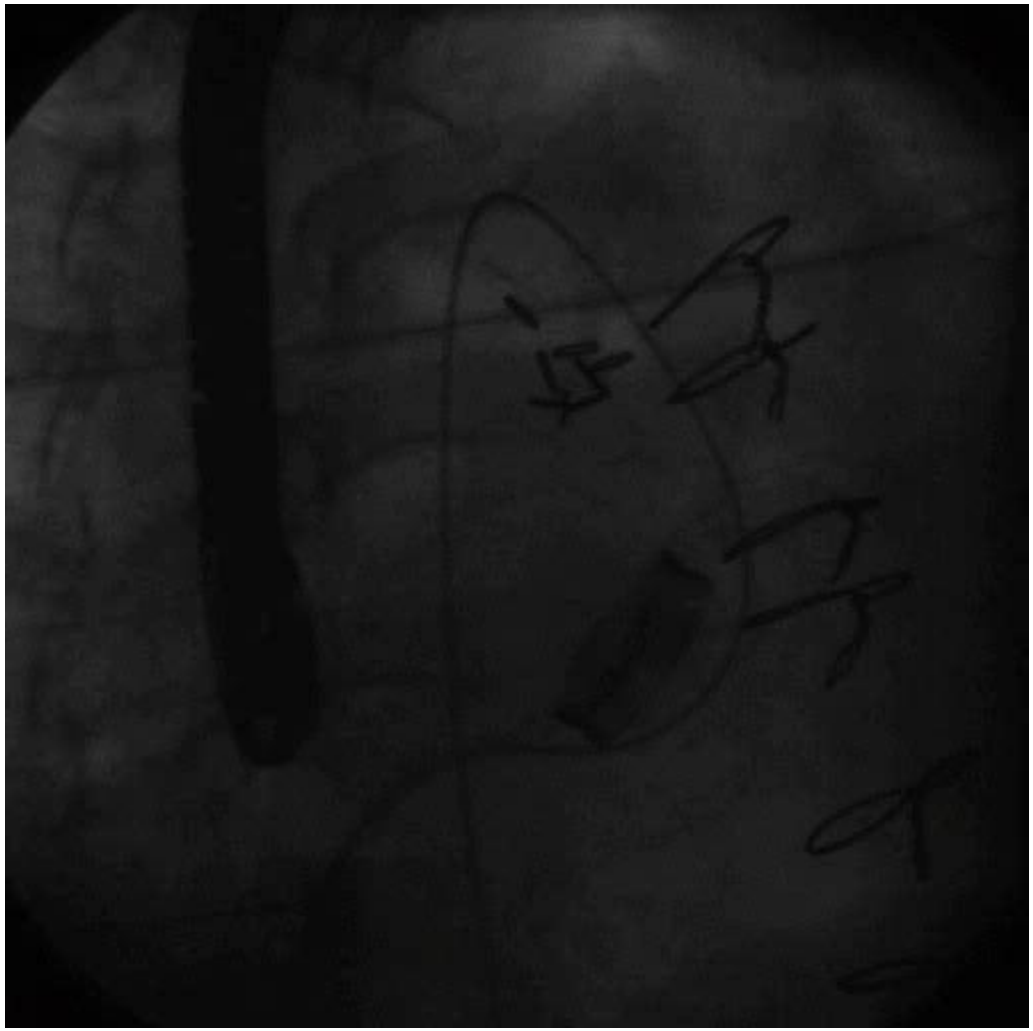


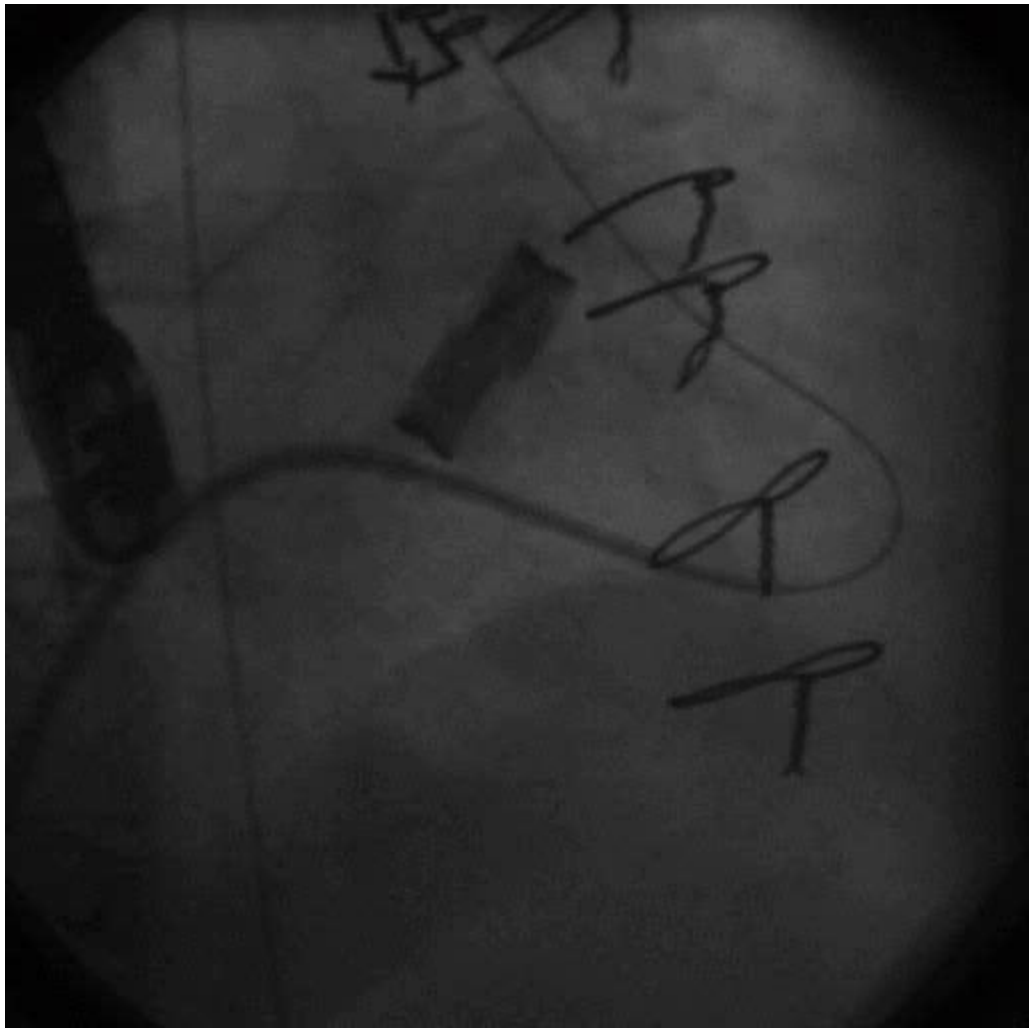


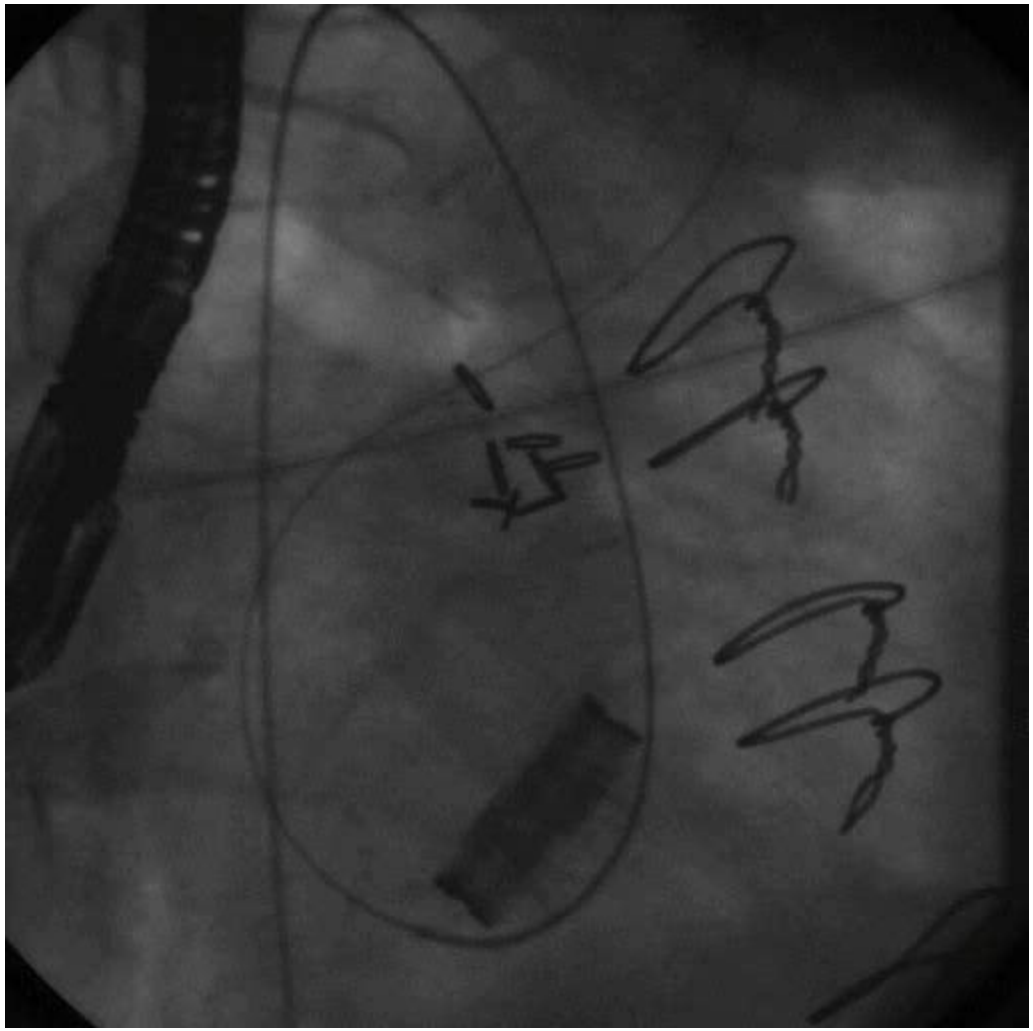

PHILIPS
06/04/2011 11:59:52 TIS0.1 MI 0.7
X7-2t/3DTEE
FR 8Hz
6.1cm
M4
Live 3D
3D 0%
3D 33dB
Gen
0 0 180
2ND TRY
JPEG
60 bpm
PAT T: 37.0C
TEE T: 39.5C

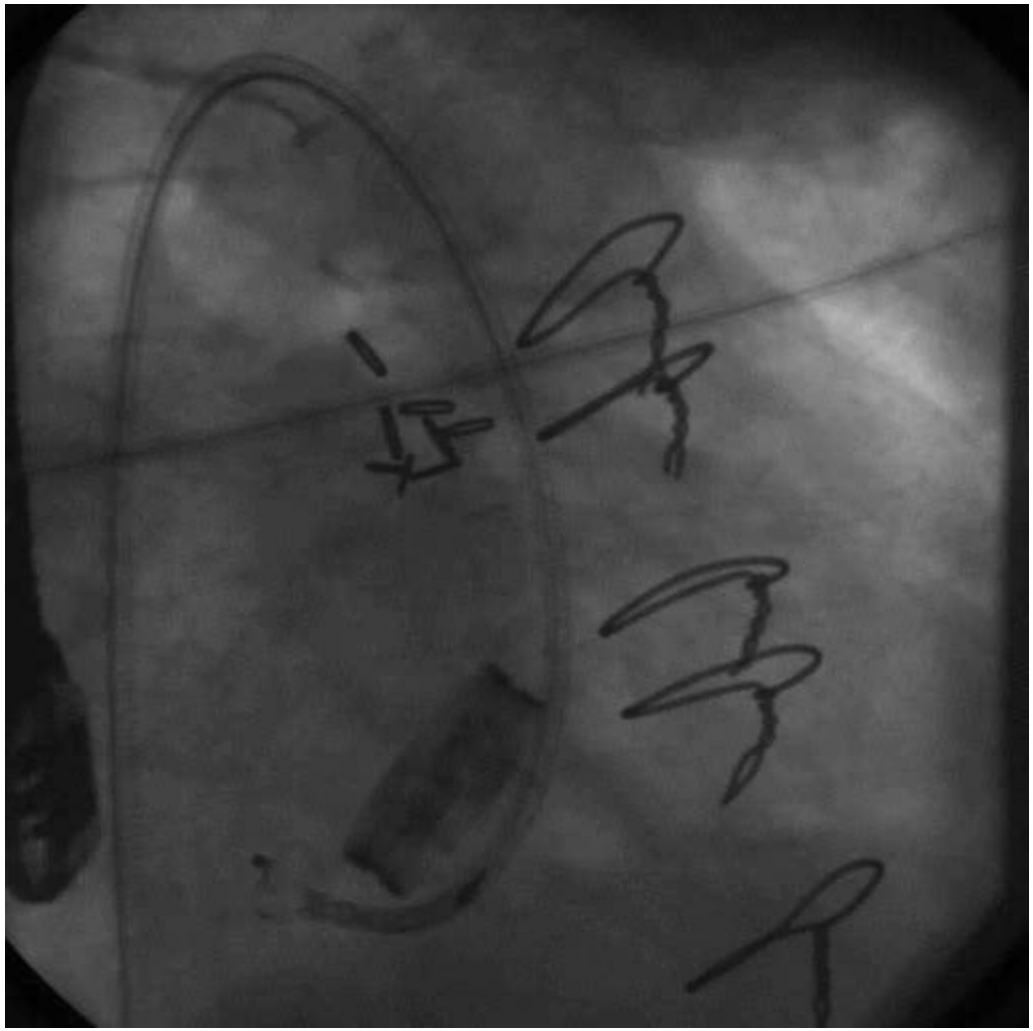


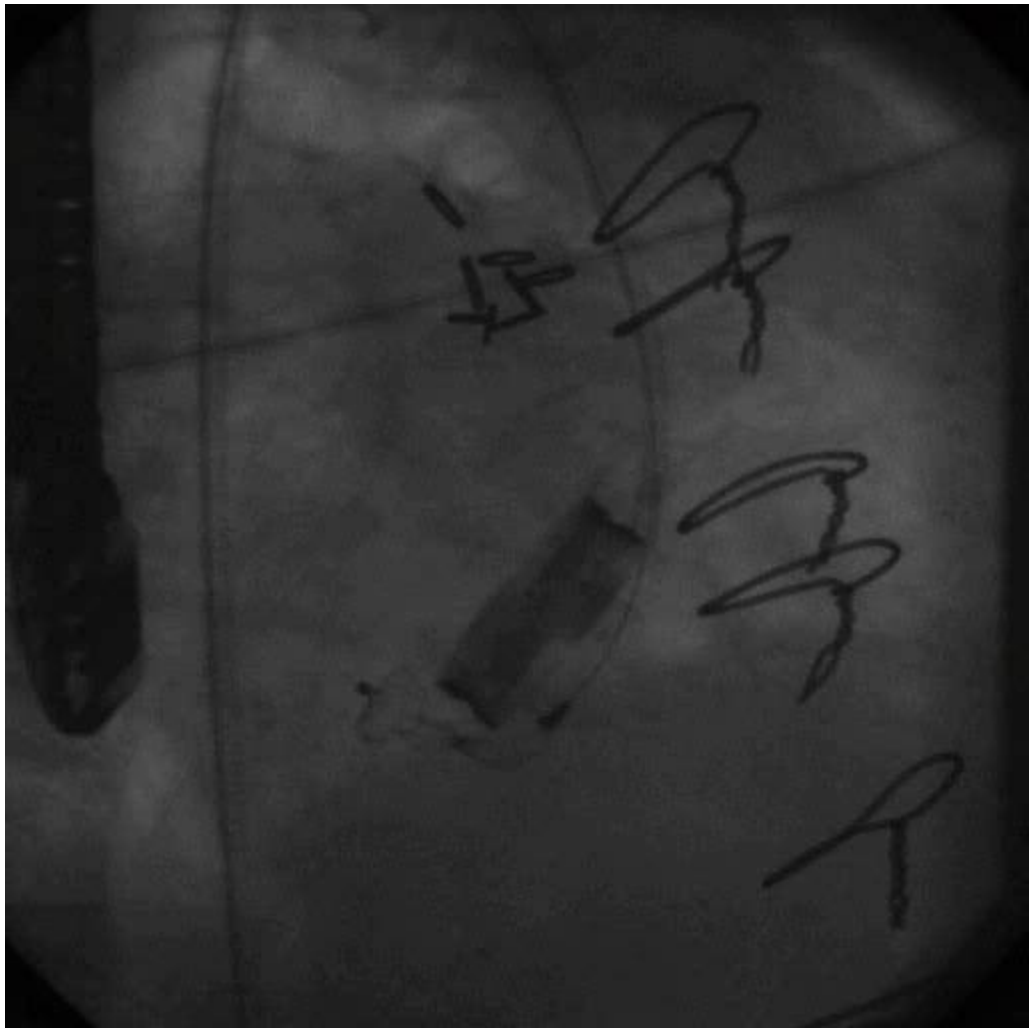


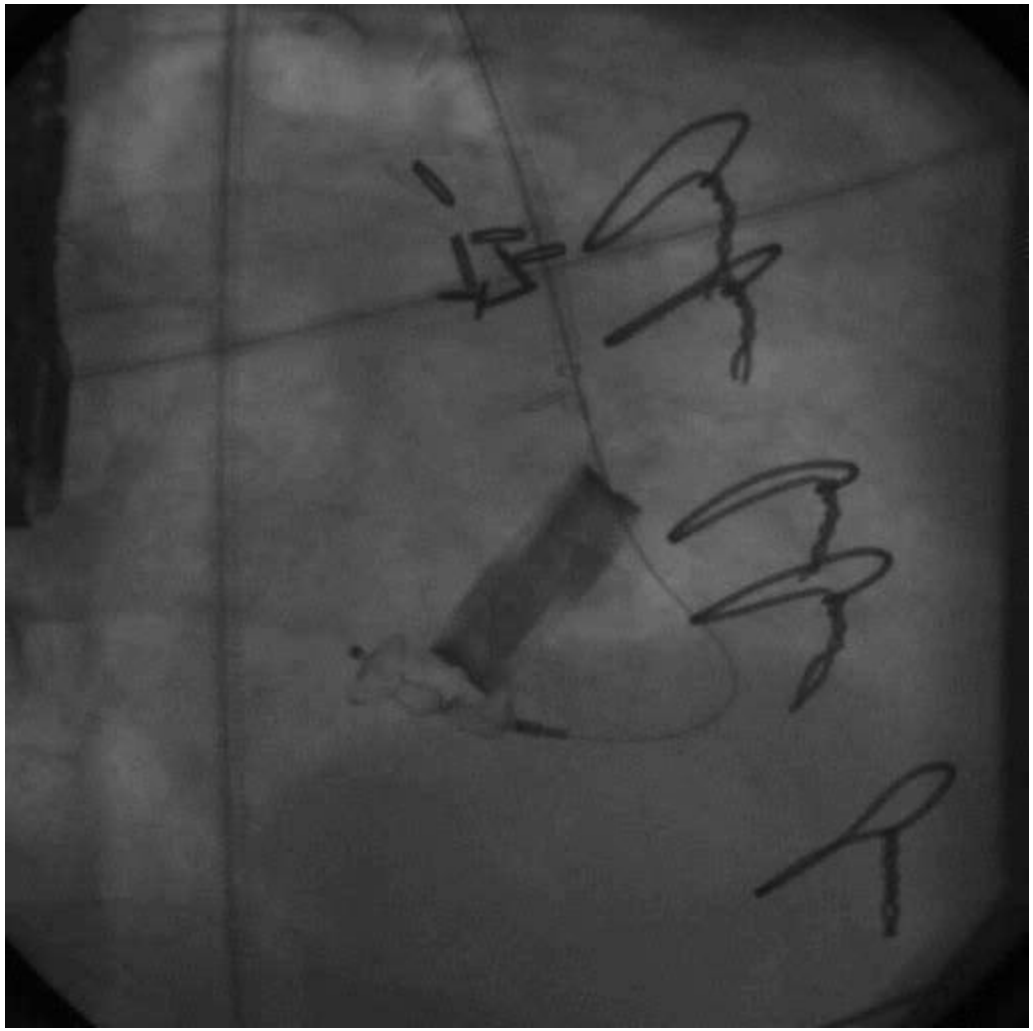






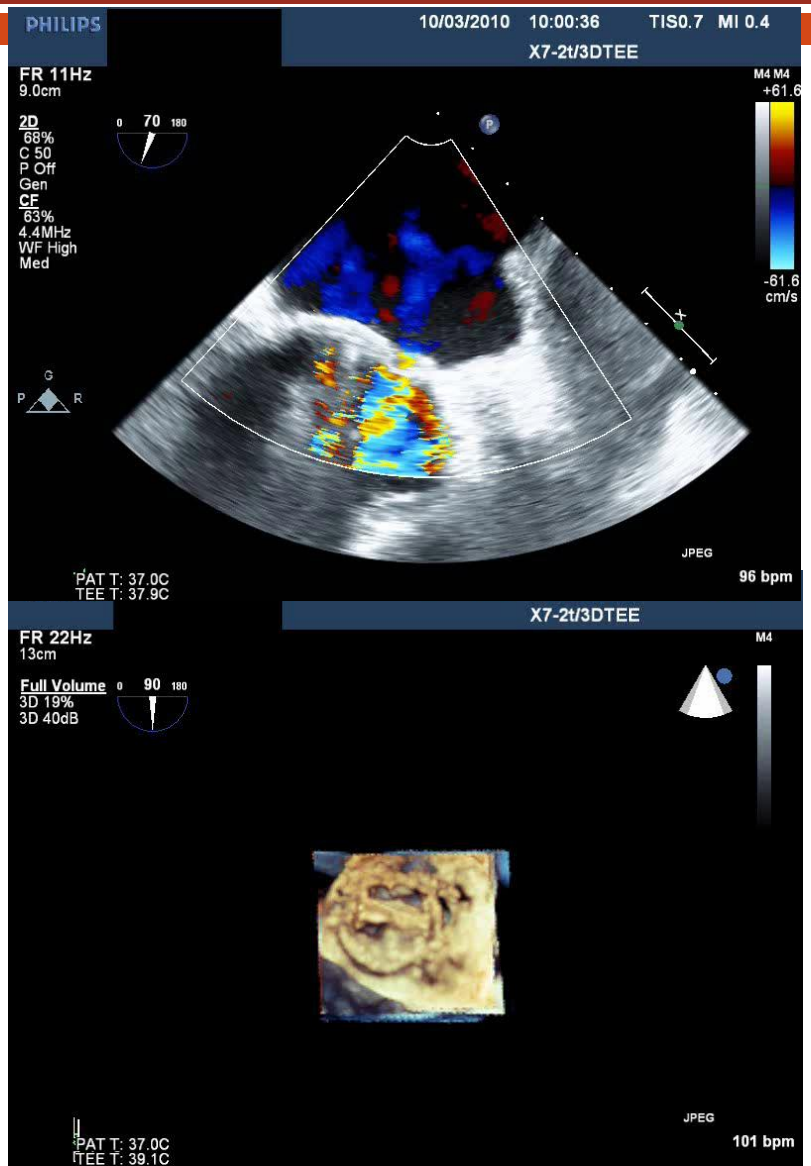




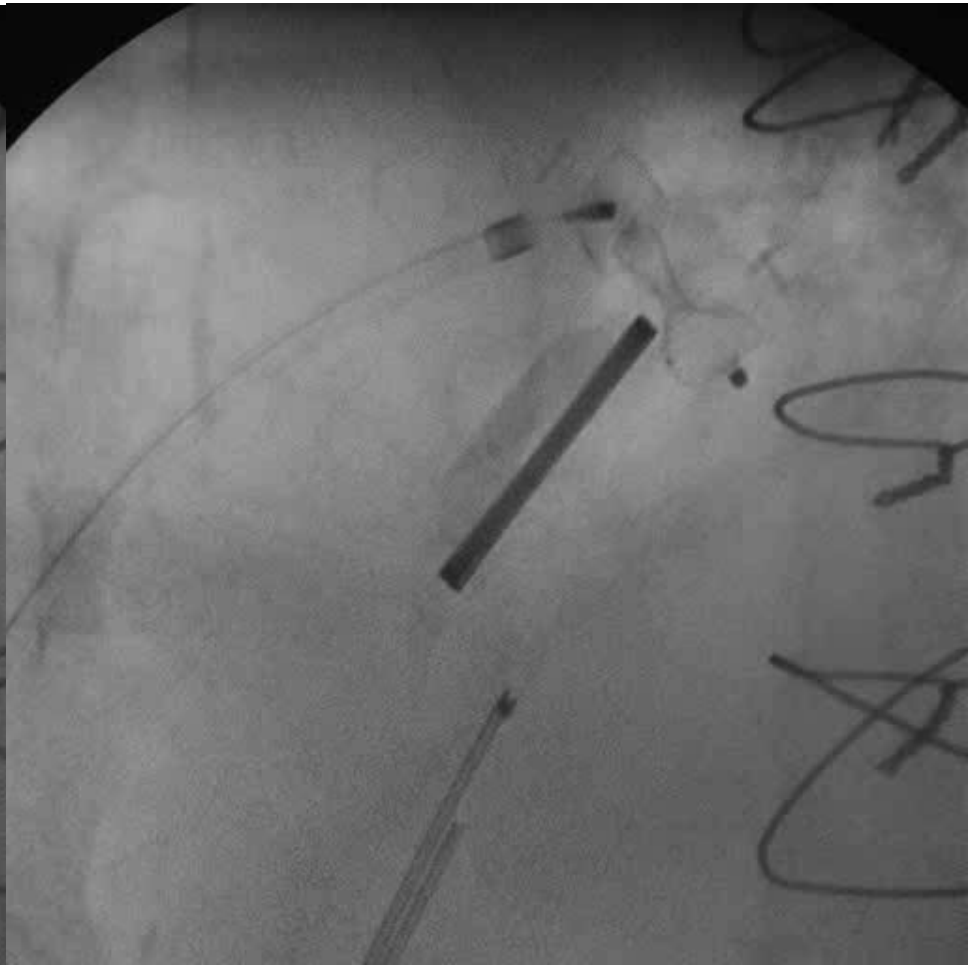


73 y.o. gentleman with severe peri-prosthetic mitral leak

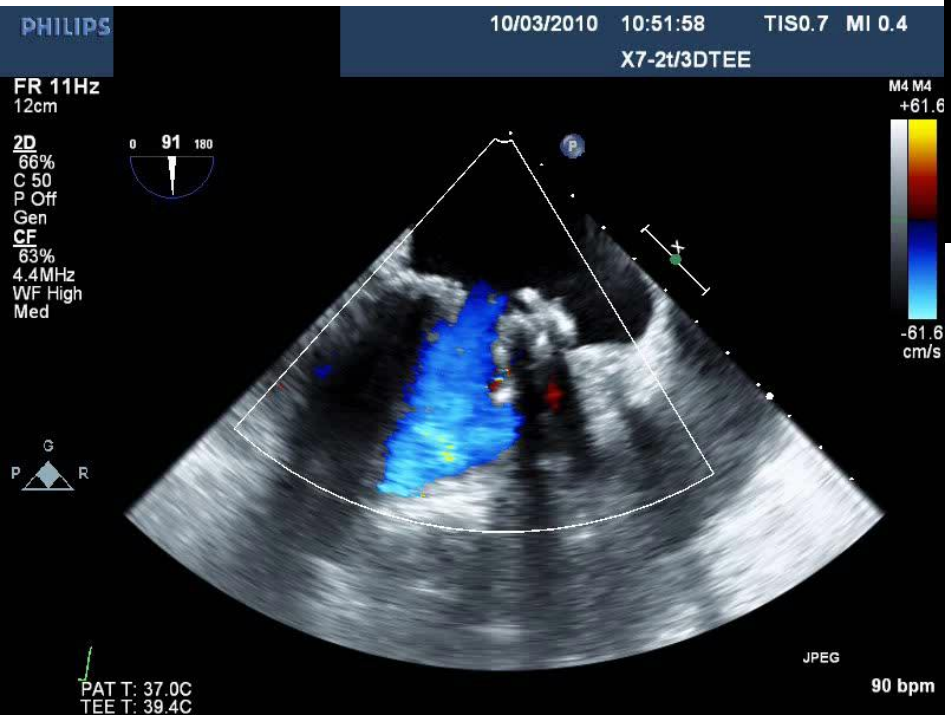
- Previous surgical valvoplasty, and MVR X2 + CABG + TV annuloplasty
- Last operation 2008 for severe peri-prosthetic leak post endocarditis
- Recurrent leak - CHF PHT
- Bedridden



First procedure 3/2010
Implantation of Amplatzer plug III 14/5 mm

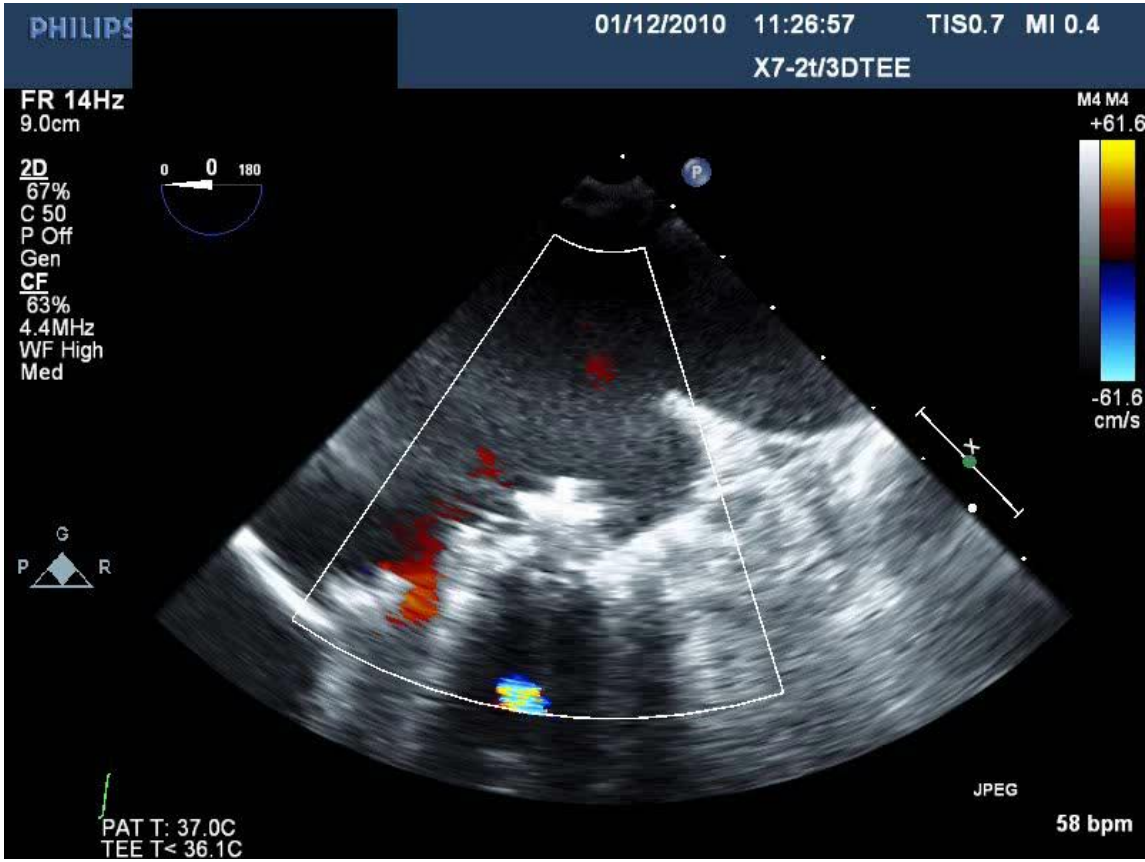


Echocardiographic result

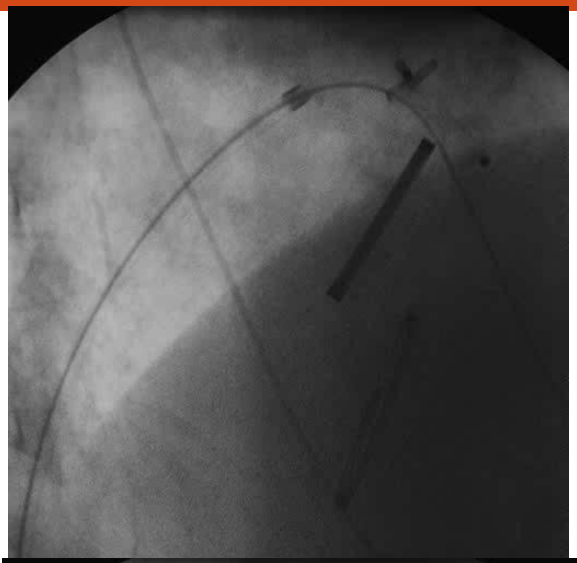


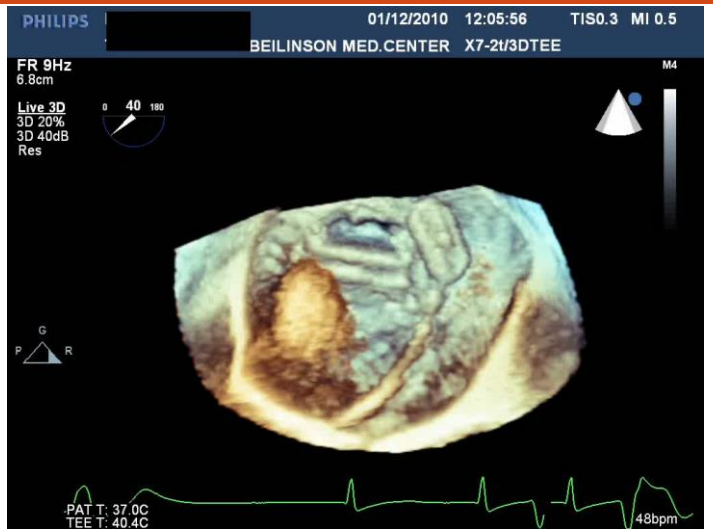
Marked clinical improvement - but…

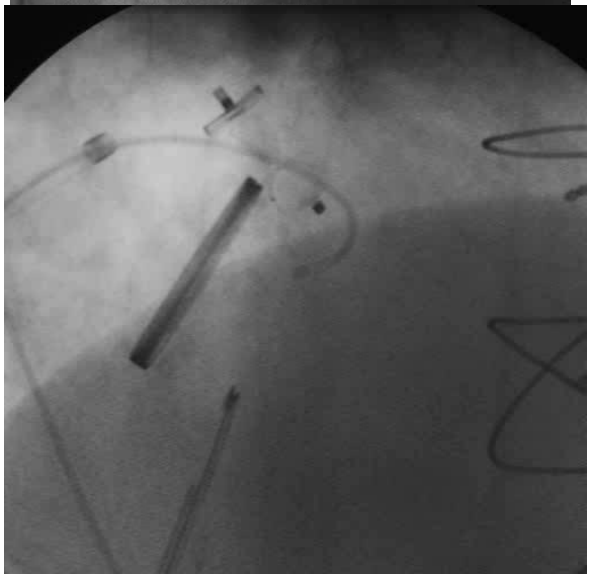
- Patient recovered remarkably
- Also had talkage of pleural effusion
- After several months, some deterioration of RV function
- Recurrence of leak

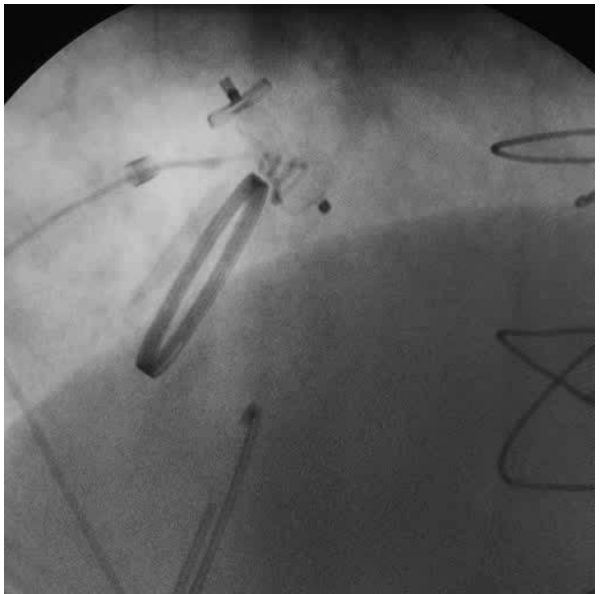


2nd procedure - 12/2010
implantation of Nit-occlud device









final result