Paravalvular Leak.

Konstantinos Toutouzas

Prof. of Cardiology

1st Department of Cardiology University of Athens

Hippokrateion Hospital

Epidemiology.

- 5-17% in general population
- 17.6% AV
- 22.6% MV

Rihal et al, J Am Coll Cardiol Intv 2012;5:121–30

Causes – Natural history.

- Infective endocarditis
- Anatomical
- Nature of tissue bed
- Prosthetic valve sizing
- Surgical technique
- Myocardial contractility

Hemolytic Anemia
Infective Endocarditis
Congestive Heart Failure
Acute Ischemic Syndrome

Safi et al, Angiology. The Journal of Vascular Diseases.2000

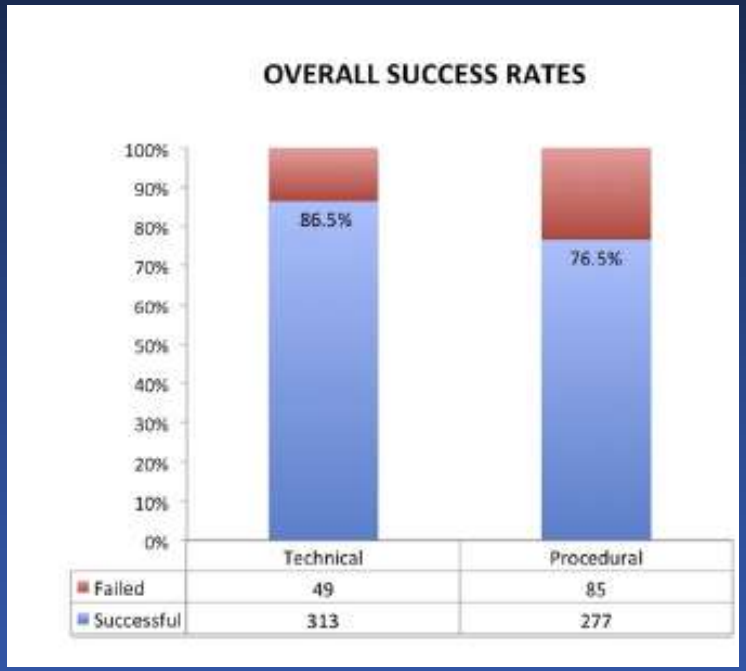
Validation of the paravalvular leak

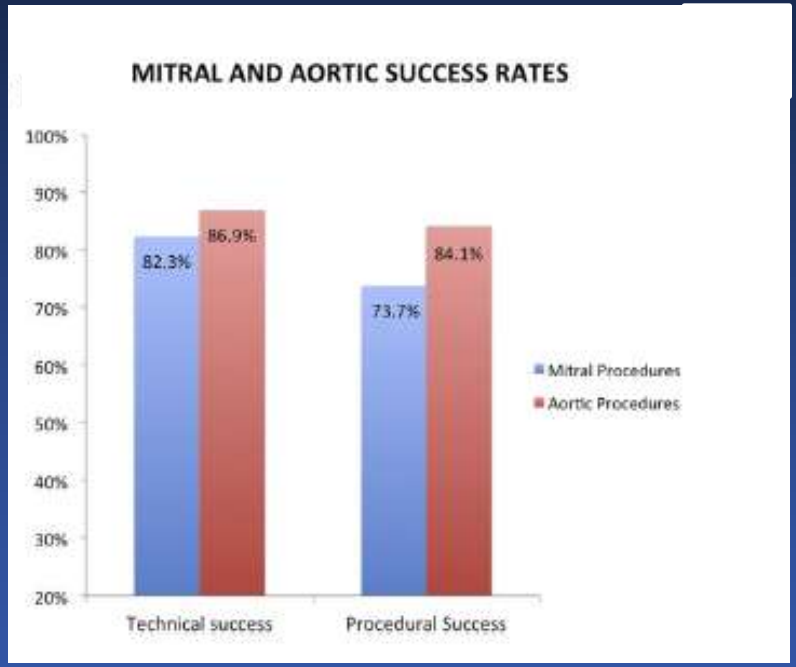
Ultrasound criteria

Parameter	Mild	Moderate	Severe
Structural parameters			
LV size	Normal*	Normal or dilated	Usually dilated‡
Prosthetic valve‖	Usually normal	Abnormal¶	Abnormal¶
Doppler parameters			
Color flow jet area‖ #	Small, central jet (usually <4 cm^2 or <20% of LA area)	Variable	Large central jet (usually >8 cm^2 or >40% of LA area) or variable size wall-impinging jet swirling in left atrium
Flow convergence**	None or minimal	Intermediate	Large
Jet density: CW Doppler‖	Incomplete or faint	Dense	Dense
Jet contour: CW Doppler‖	Parabolic	Usually parabolic	Early peaking, triangular
Pulmonary venous flow‖	Systolic dominance§	Systolic blunting§	Systolic flow reversal†
Quantitative parameters††			
VC width (cm)‖	<0.3	0.3-0.59	≥0.6
R vol (mL/beat)	<30	30-59	≥60
RF (%)	<30	30-49	≥50
EROA (cm^2)	<0.20	0.20-0.49	≥0.50

Zoghbi et al, J Am Soc Echocardiogr 2009;22:975–1014; 1082–1014.

Meta-analysis of 12 studies





Millán et al, Canadian Journal of Cardiology 31 (2015) 260e269

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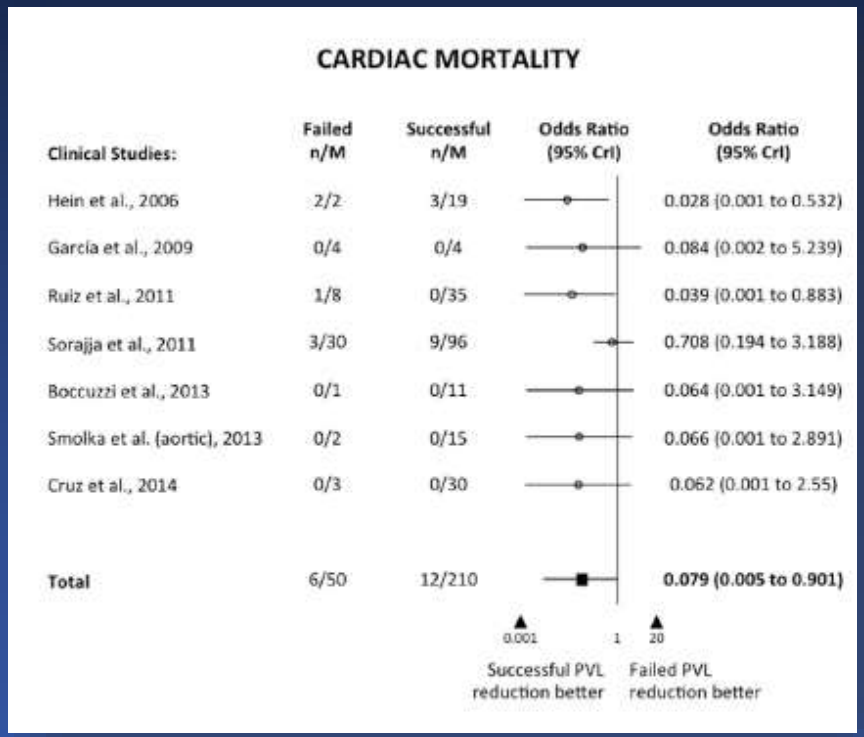
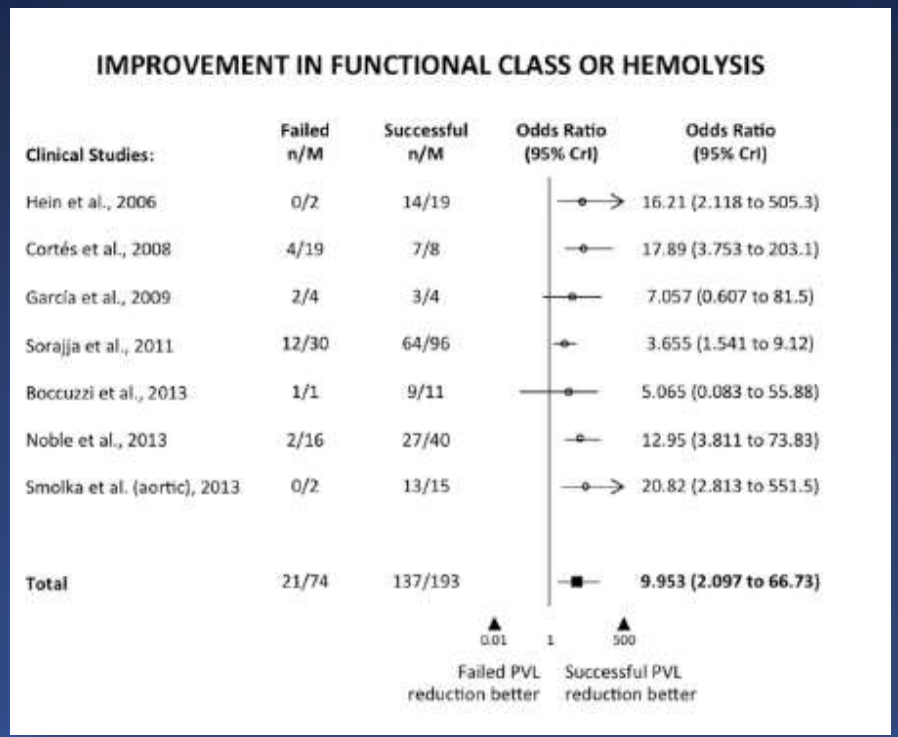




Millán et al, Canadian Journal of Cardiology 31 (2015) 260e269

Trancatheter procedure.

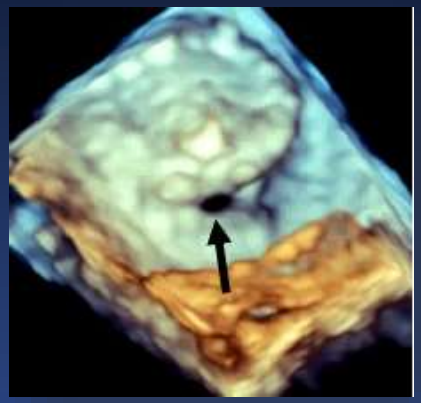
Closing devices

	Amplatzer septal occluder (ASO)	Amplatzer muscular VSD occluder (mVSD)	Amplatzer duct occluder (ADO)	Amplatzer vascular plug II (AVP II)	Amplatzer vascular plug III (AVP III)
					
Polyester cloth	Yes	Yes	Yes	No	No
Occlusive planes	4	4	3	6	4
Waist length	3–4 mm	7 mm	5–8 mm	6 mm	2–5 mm
Size difference between disc and waist	Proximal/distal disc: 8 mm/12 mm, (4–10 mm ASO), 10 mm/14 mm, (≥11 mm ASO)	8 mm	4 mm, (5/4–8/6 mm ADO), 6 mm, (10/8–16/14 mm ADO)	No difference	2 mm

Kligler et al, European Heart Journal (2013) 34, 638–648

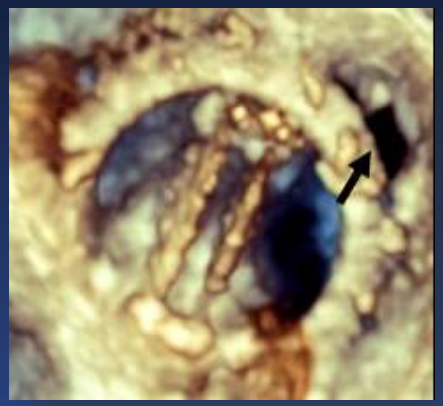
Closing devices-Anatomy

Circle

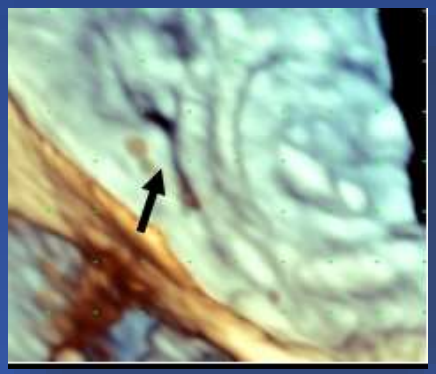


Oval

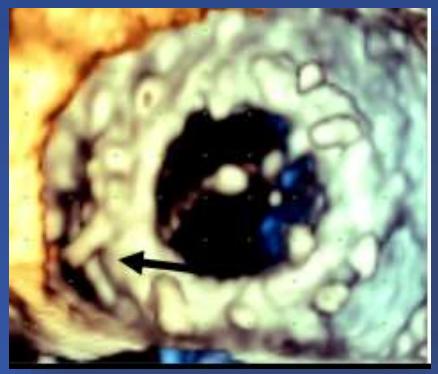
Semi-spheric



Sigmoid



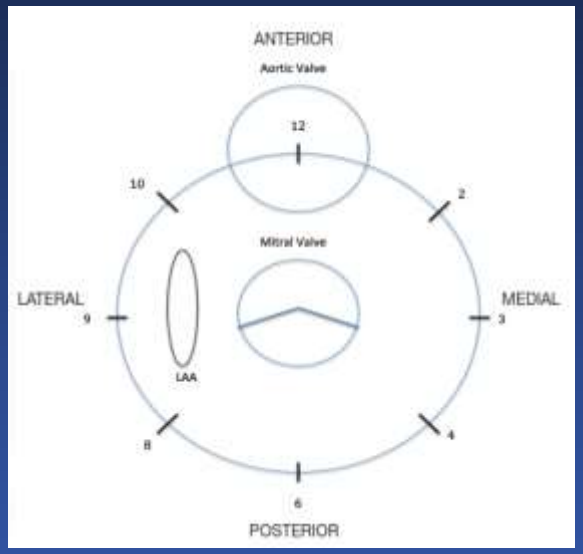
Semi-sigmoid

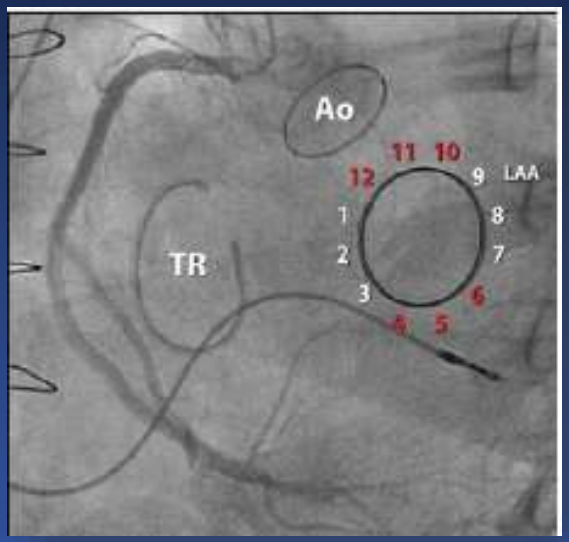


Imaging

- TTE
- TOE
- CT
- MRI

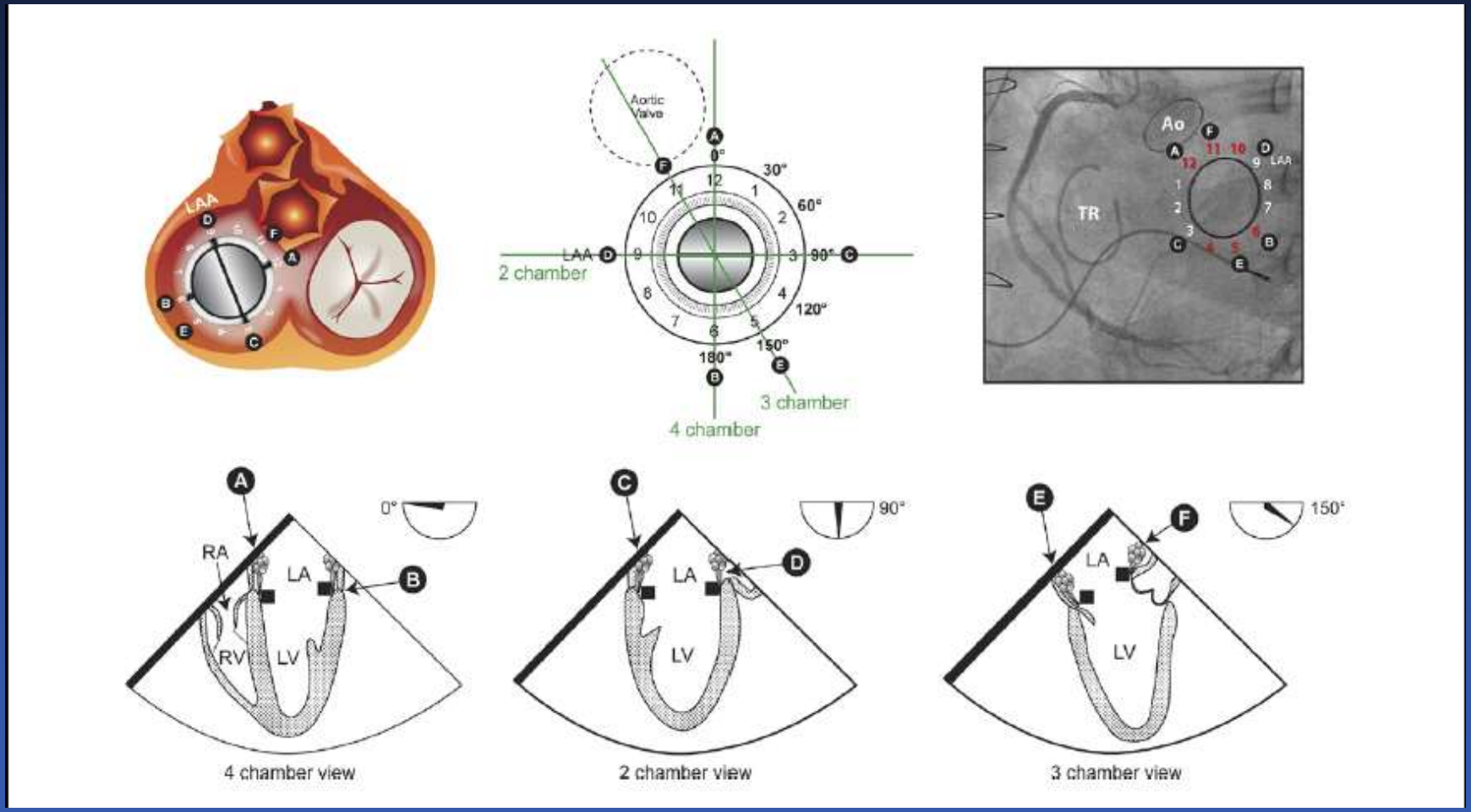
Pre-procedural control





Mahjoub et al, J Am Coll Cardiol Intv 2011;4:107–14

Pre-procedural control



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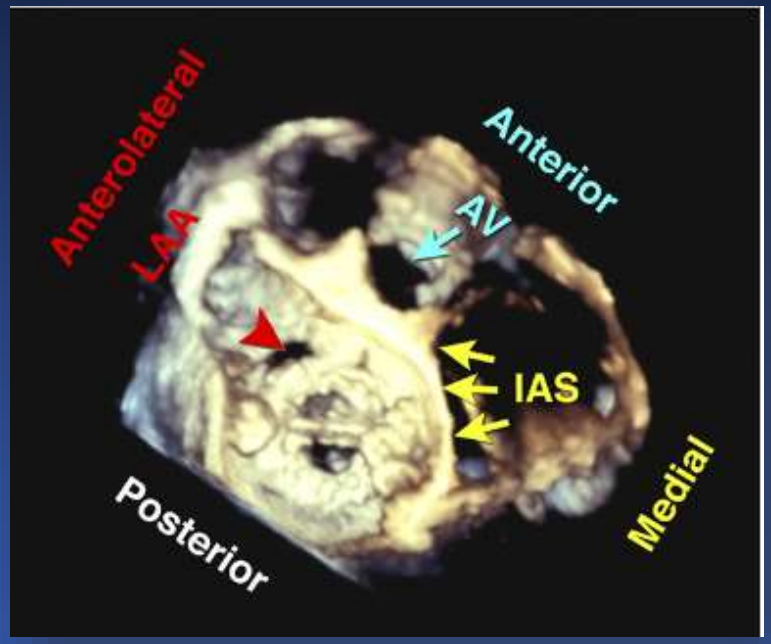

Lazaro et al, Cardiovasc Diagn Ther 2014;4(4):307-313

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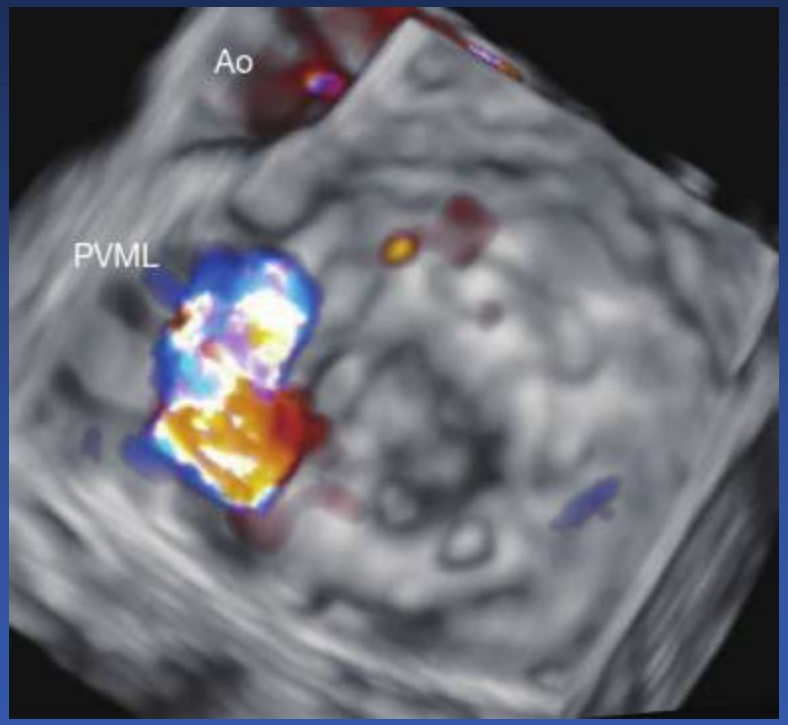

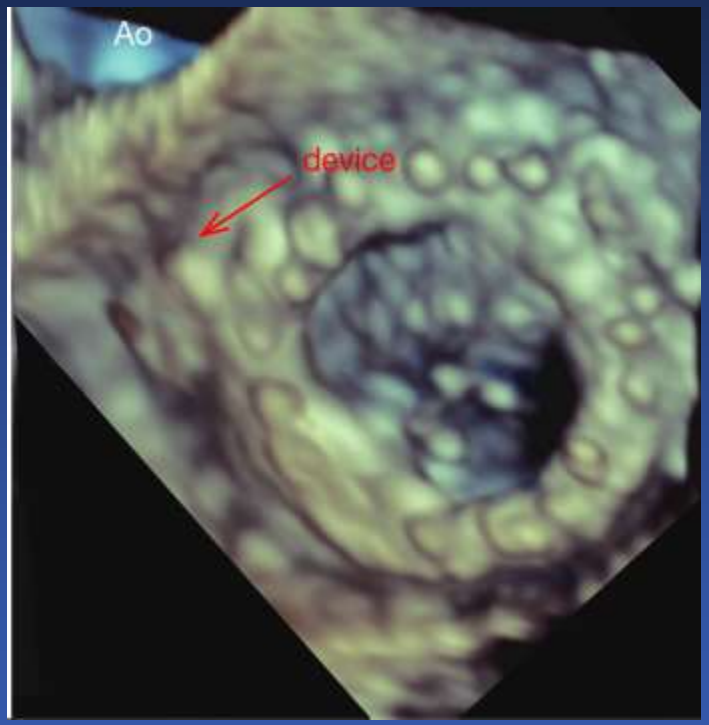

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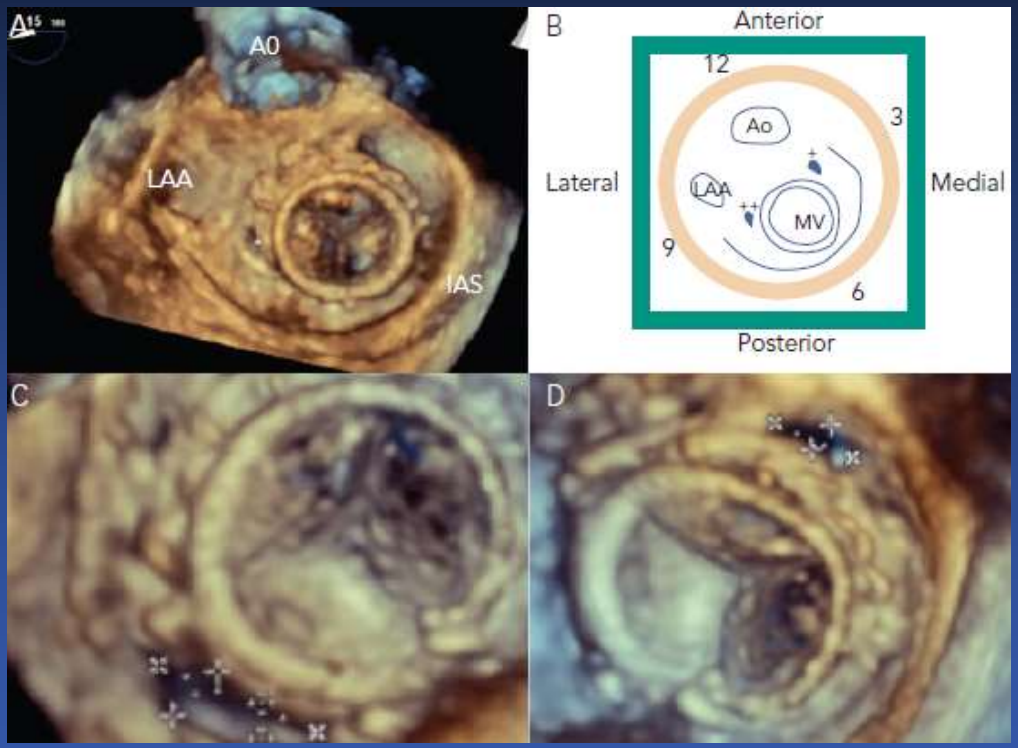
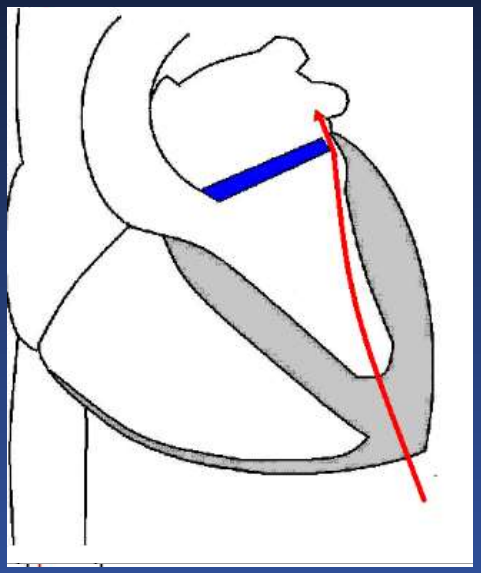


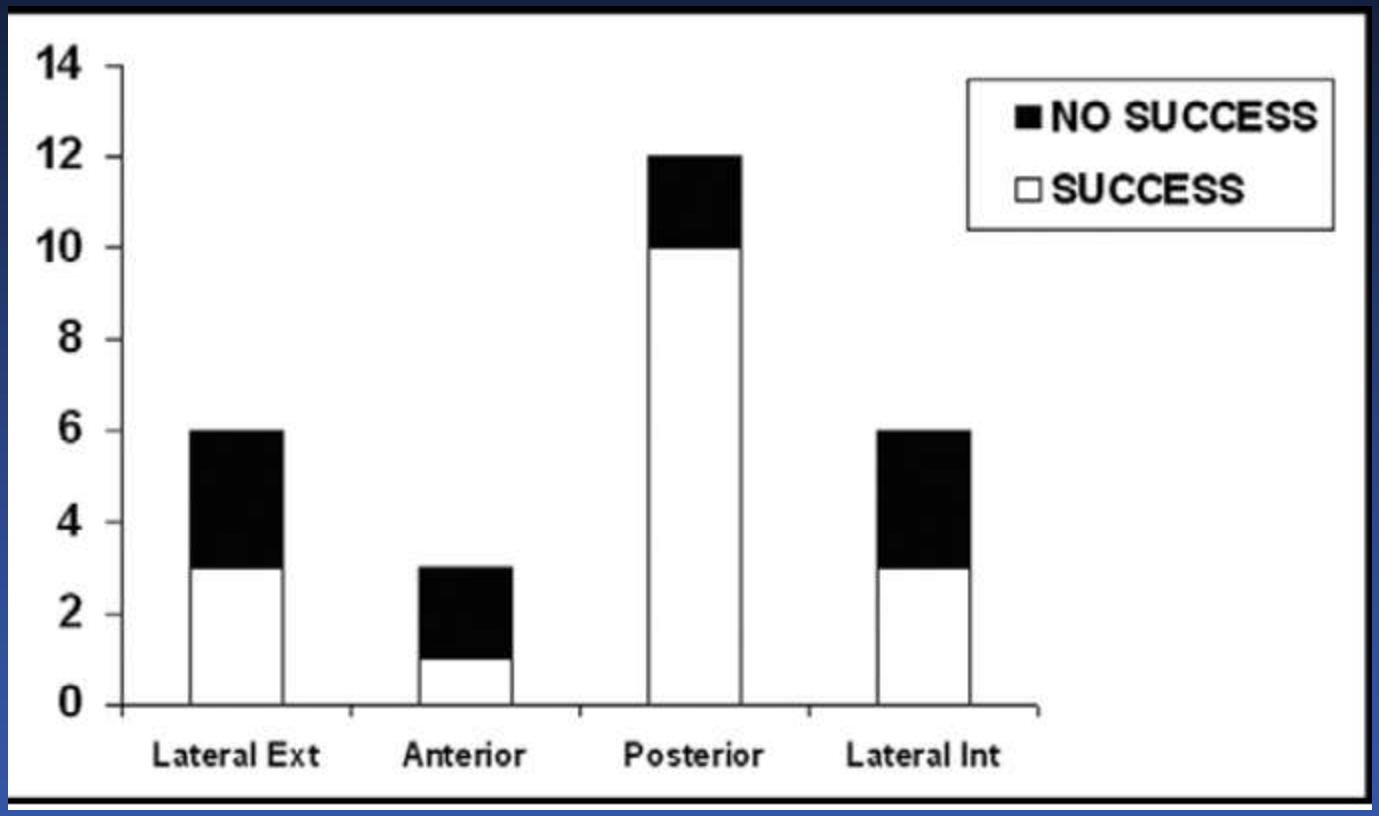
Kligler et al, European Heart Journal (2013) 34, 638–648

Trancatheter closure

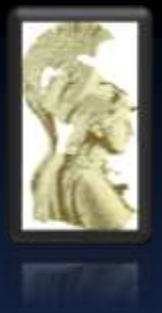
- Orthodroma from the LA.
- Anadromous from the aorta.
- Transapical.



Success depending on the site of the leak (MV)



Cortés et al, The American Journal of Cardiology, Volume 101, Issue 3, 2008, 382–386



Case Presentation

Case Presentation

- Man 65 years old feeling tired , weakness and with palpitation.
- Medical history: Chirurgical substitution of AV and MV 2 months ago using 2 metallic valves.

Clinical Findings

- Systolic Pression: 100/60mmHg, Pulses: 130/min.
- ECG: Atrial Flutter.
- Hematocrit: 27,7%.

Pre-Precedural control

TOE

Pre-Precedural control

TOE

Pre-Precedural control

TOE

Case presentation.

- Successful Cardiac conversion to Sinus rythm.
- From the laboratory control: **LDH (>1000 U/L), low concentration of the aptospherin (<7,25mg/dl) and high level of bilirubin)**.
- Other causes of paravalvular leak were excluded (such as endocarditis).

Laboratory control

Blood test

Haemolysis can be identified by a serum lactate dehydrogenase level >460 U/L and any two of the four following criteria: blood haemoglobin <13.8 g/dL for males or <12.4 g/dL for females, serum haptoglobin <50 mg/dL, and reticulocyte count >2%.[20] In addition, plasma free haemoglobin levels >40 mg/dL are suggestive of haemolysis. Plasma N-terminal pro-brain natriuetic peptide is typically elevated (>400 pg/mL) in CHF and increases with a greater severity of aortic or mitral regurgitation, reflecting regurgitant volume, LV size and function, and symptomatic status.[21,22]

Kligler et al, European Heart Journal (2013) 34, 638–648

Indications for transcatheter procedure

11.2.5 Management of haemolysis and paravalvular leak

Blood tests for haemolysis should be part of routine follow-up after valve replacement. Haptoglobin measurement is too sensitive and lactate dehydrogenase, although non-specific, is better related to the severity of haemolysis. The diagnosis of haemolytic anaemia requires TOE to detect a paravalvular leak (PVL) if TTE is not contributive. Reoperation is recommended if PVL is related to endocarditis, or if PVL causes haemolysis requiring repeated blood transfusions or leading to severe symptoms (recommendation class I, level of evidence C). Medical therapy, including iron supplementation, beta-blockers and erythropoietin, is indicated in patients with severe haemolytic anaemia and PVL not related to endocarditis, where contraindications to surgery are present, or in those patients unwilling to undergo reoperation.[235] Transcatheter closure of PVL is feasible but experience is limited and there is presently no conclusive evidence to show a consistent efficiency.[236] It may be considered in selected patients in whom reintervention is deemed high-risk or is contraindicated.

Class I

1. Surgery is recommended for operable patients with mechanical heart valves with intractable hemolysis or HF due to severe prosthetic or paraprosthetic regurgitation (617, 618). *(Level of Evidence: B)*

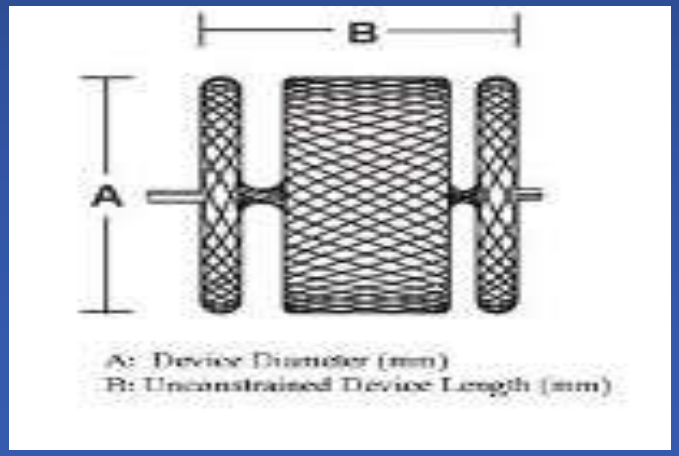
Class IIa

2. **Percutaneous repair of paravalvular regurgitation is reasonable in patients with prosthetic heart valves and intractable hemolysis or NYHA class III/IV HF who are at high risk for surgery and have anatomic features suitable for catheter-based therapy when performed in centers with expertise in the procedure (620-622). *(Level of Evidence B)***

Pre-Precedural control

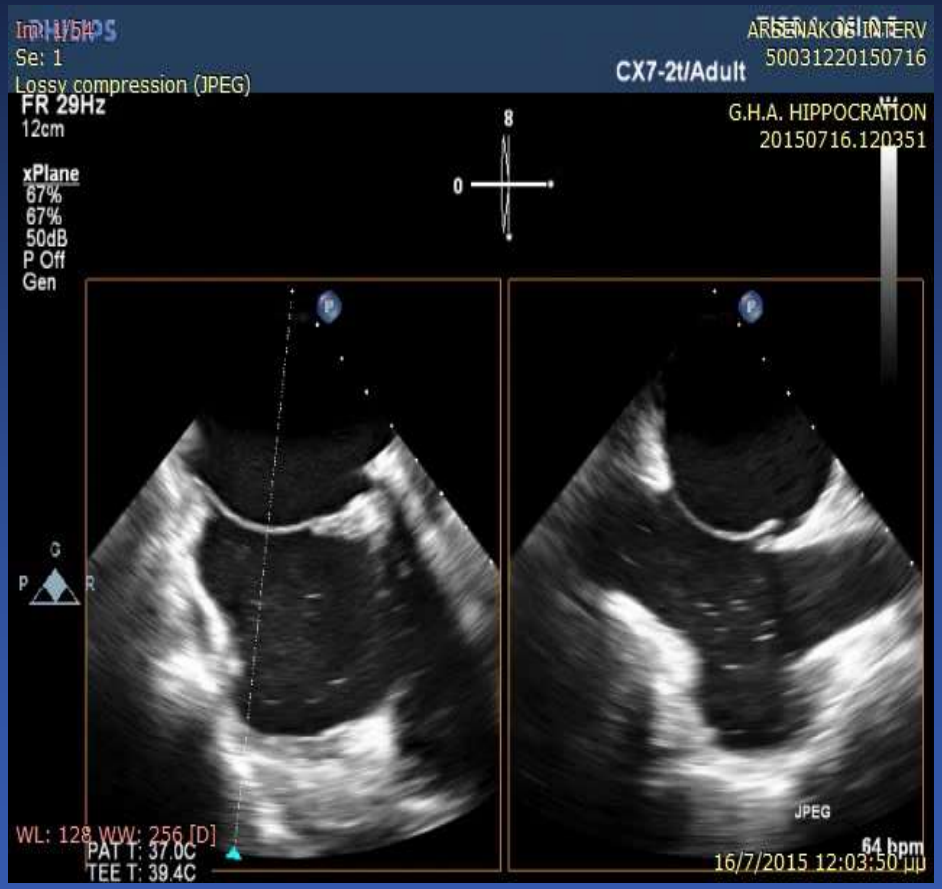
Closing device

An Amplatzer Vascular Plug II device was chosen (St. Jude Medical) of 10mm x 7mm.



Case presentation.

The procedure was done under general anesthesia and continuous TEE guidance through the interatrial septum.



Case presentation.

Case presentation.

A multipurpose catheter, was positioned near the Left Atrium Appendage (LAA) and a Terumo wire was advanced through the paravalvular hole, from the LA in the LV.

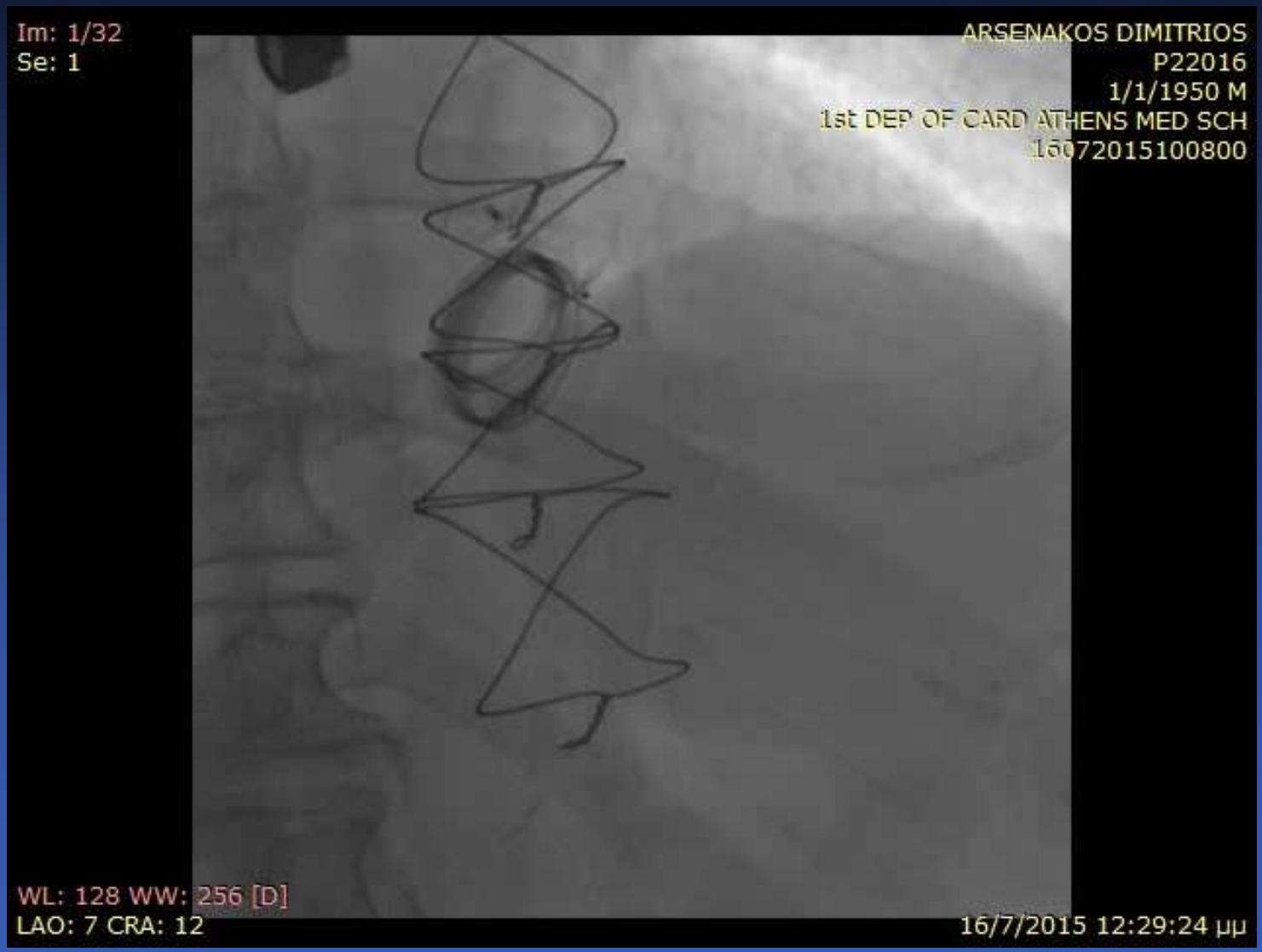
Case presentation.

Case presentation.

Case presentation.

Closing procedure

Closing procedure



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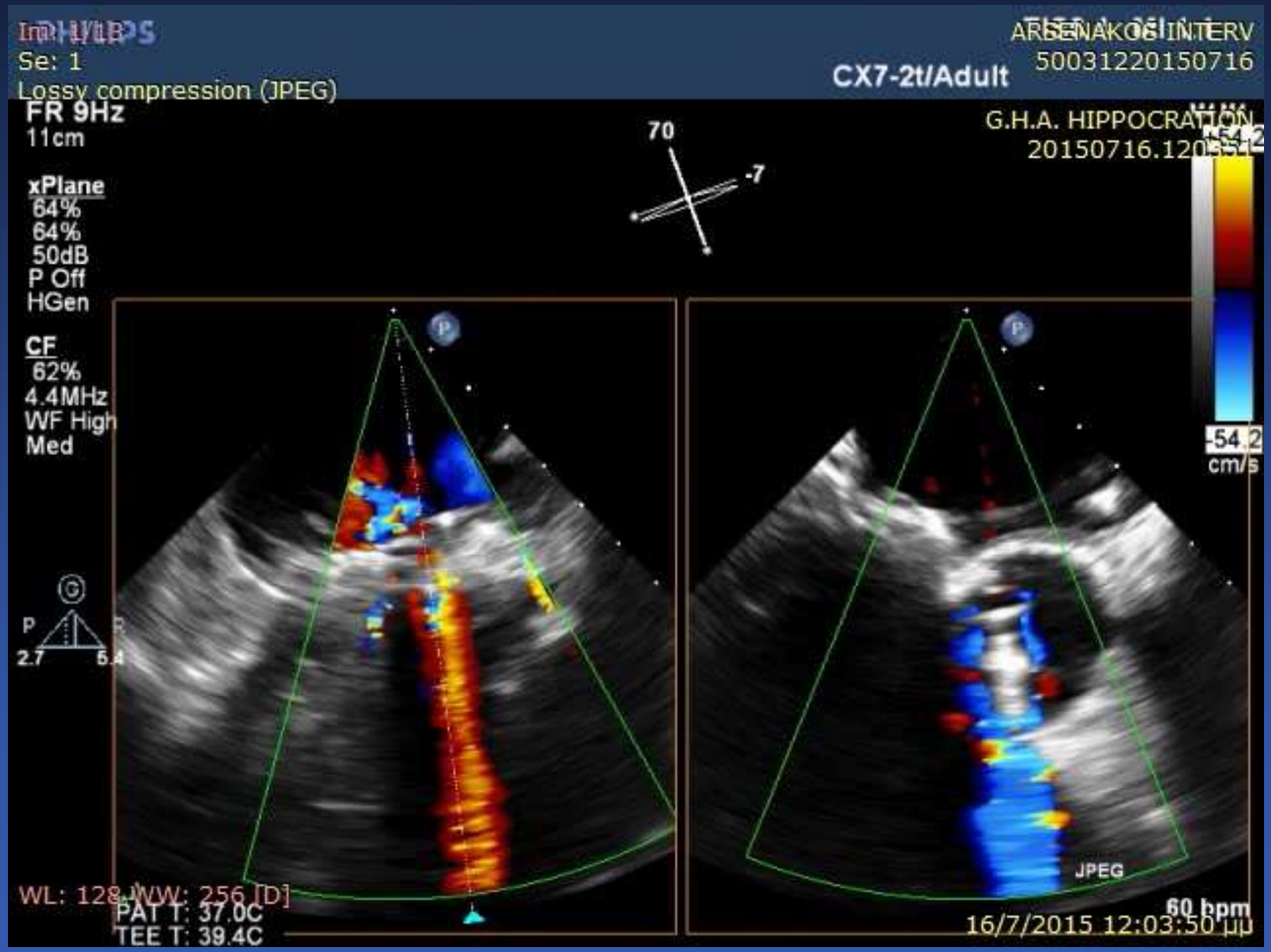
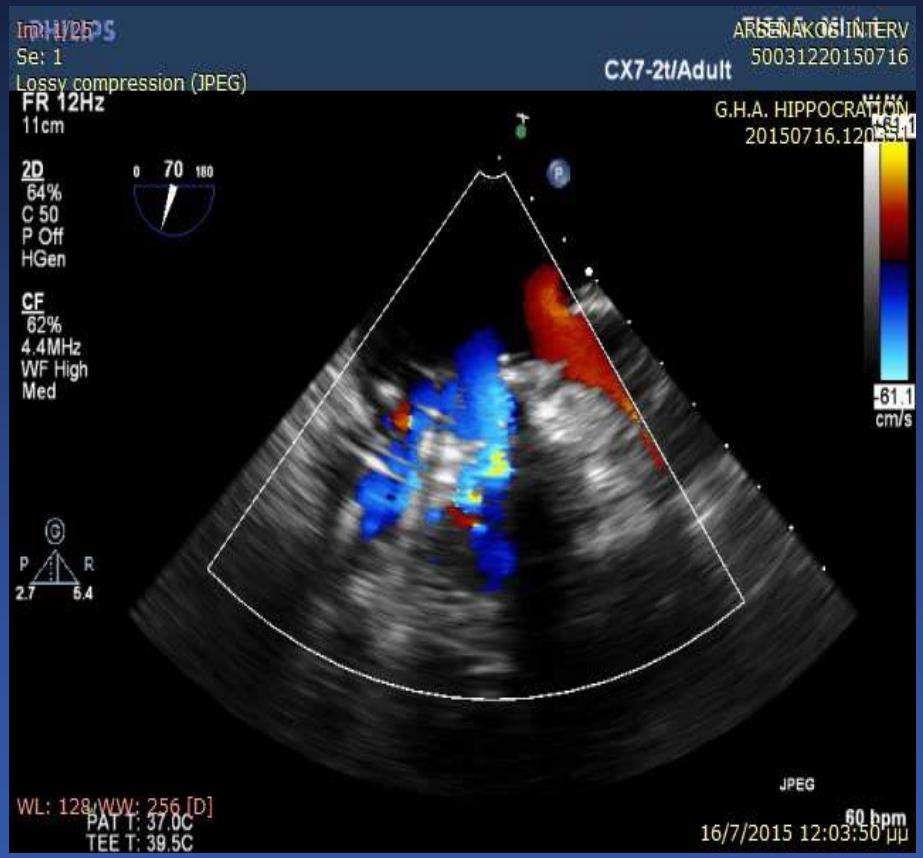


Closing procedure



Case presentation.

Case presentation.

Case presentation.

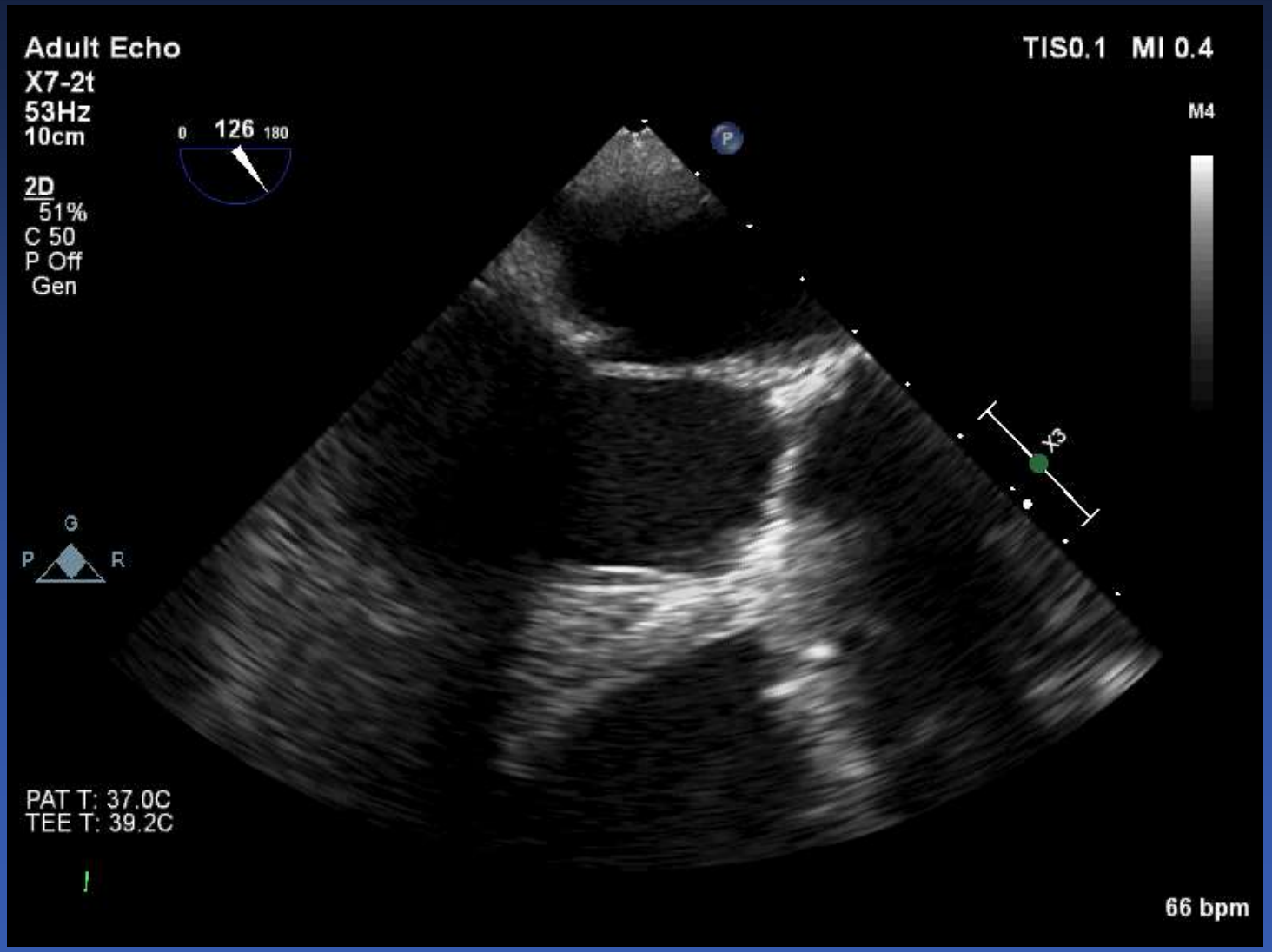
Case Presentation 2

- Male 70 years old.
- Onset of symptoms 4 months ago (Shortness of breath, fatigue in exercise).
- **Hct: 25,6% Hgb: 7,6g/dL**.
- WBC: 7.000 PLT: 340.000.
- Hs Troponin I: 2,90 pg/ml.
- BNP: 60pg/ml.
- Glu: 93mg/dL, LDL: 38mg/dL, Trigl.: 135mg/dL, Creat.: 1,5mg/dL, K^+: 4,6mmol/L, **LDH: >1995 U/L**, **Tot. Bilirubin: 2,63mg/dL**.

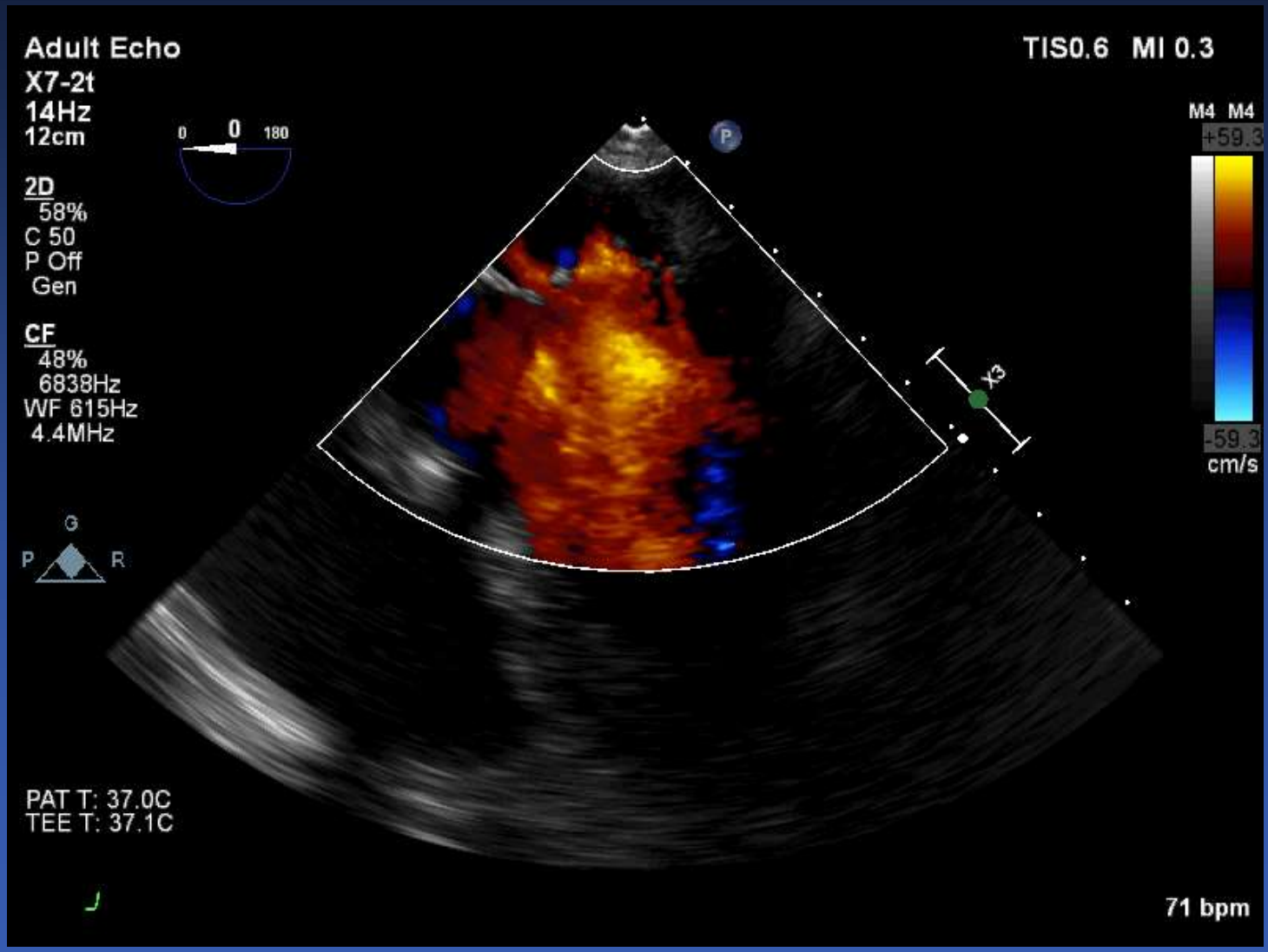
Case Presentation

The patient had a background of severe **degenerative mitral regurgitation** secondary to **ruptured tendinous cord** of the anterior mitral leaflet, for which he underwent complex mitral valve reconstruction including annuloplasty with a **25-mm circular flexible Duran ring** (Medtronic, Minneapolis, Minnesota), implantation of the ruptured tendinous cord into the anterior papillary muscle, and placement of new **synthetic chordae tendineae**. At the same time, he received a **prosthetic metallic aortic valve** (ATS Open Pivot Heart Valve 25 mm, ATS Medical, Inc. Minneapolis, Minnesota) due to severe aortic insufficiency.

Case Presentation



Case Presentation



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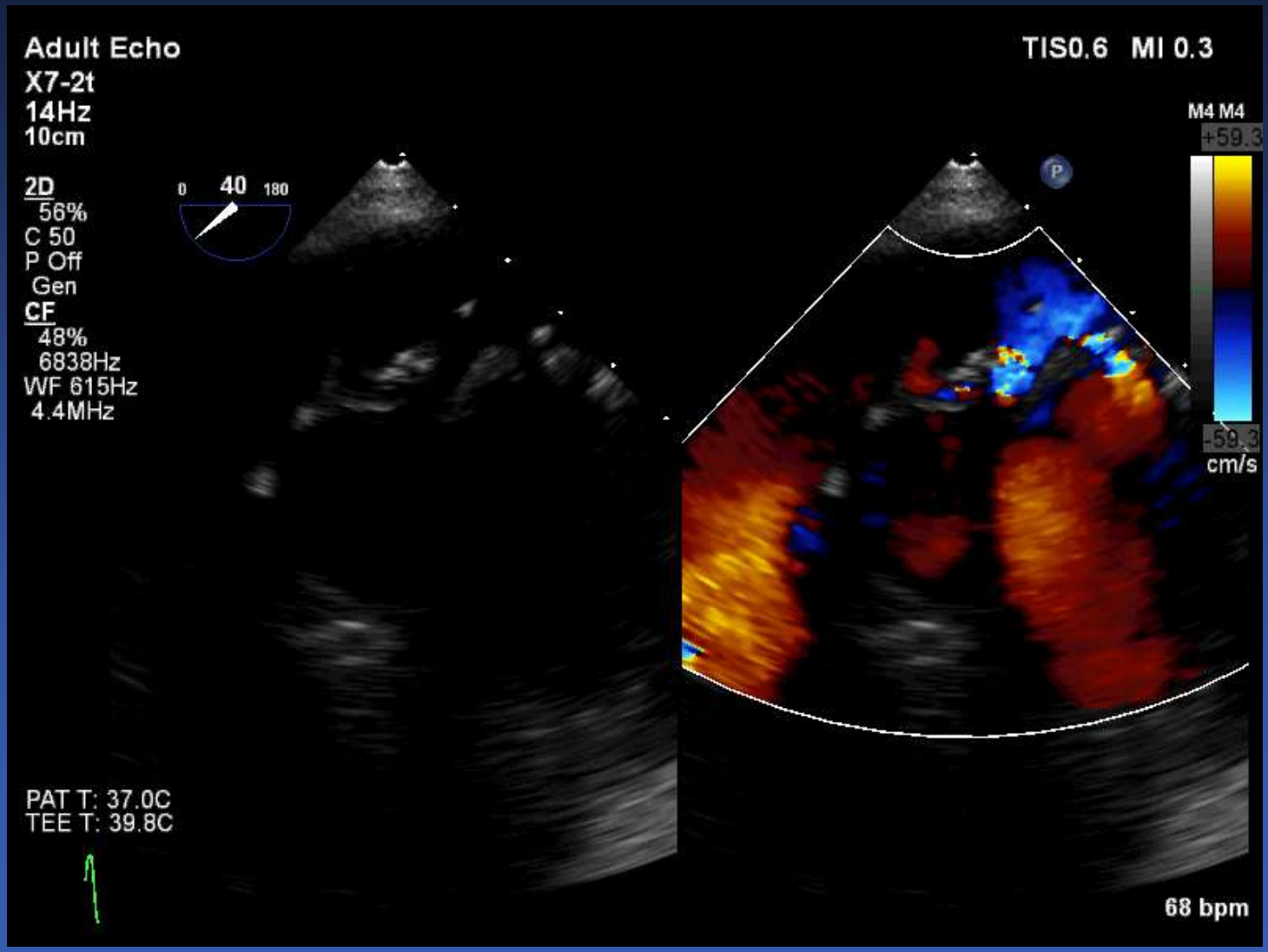
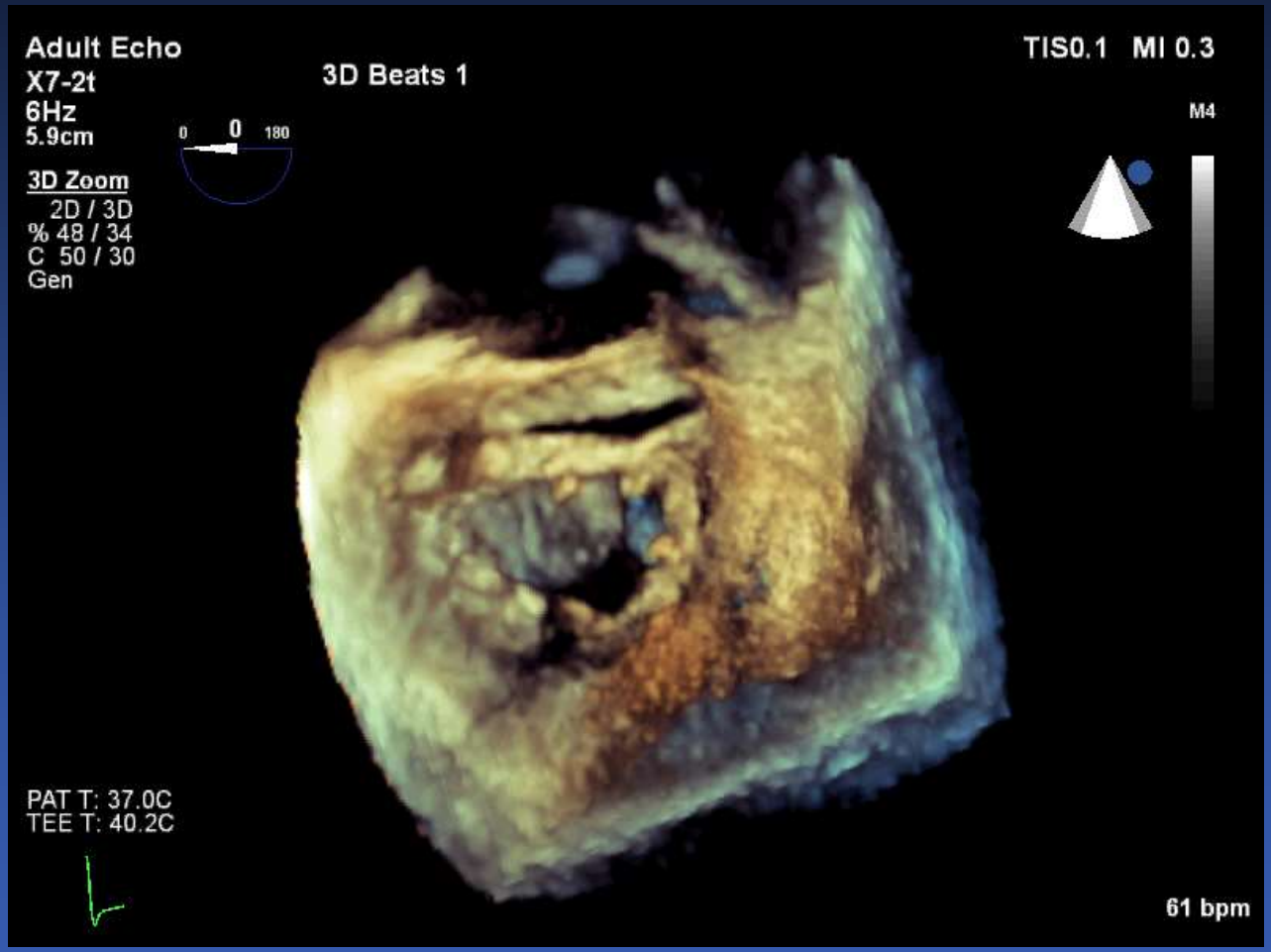


Case Prsentation



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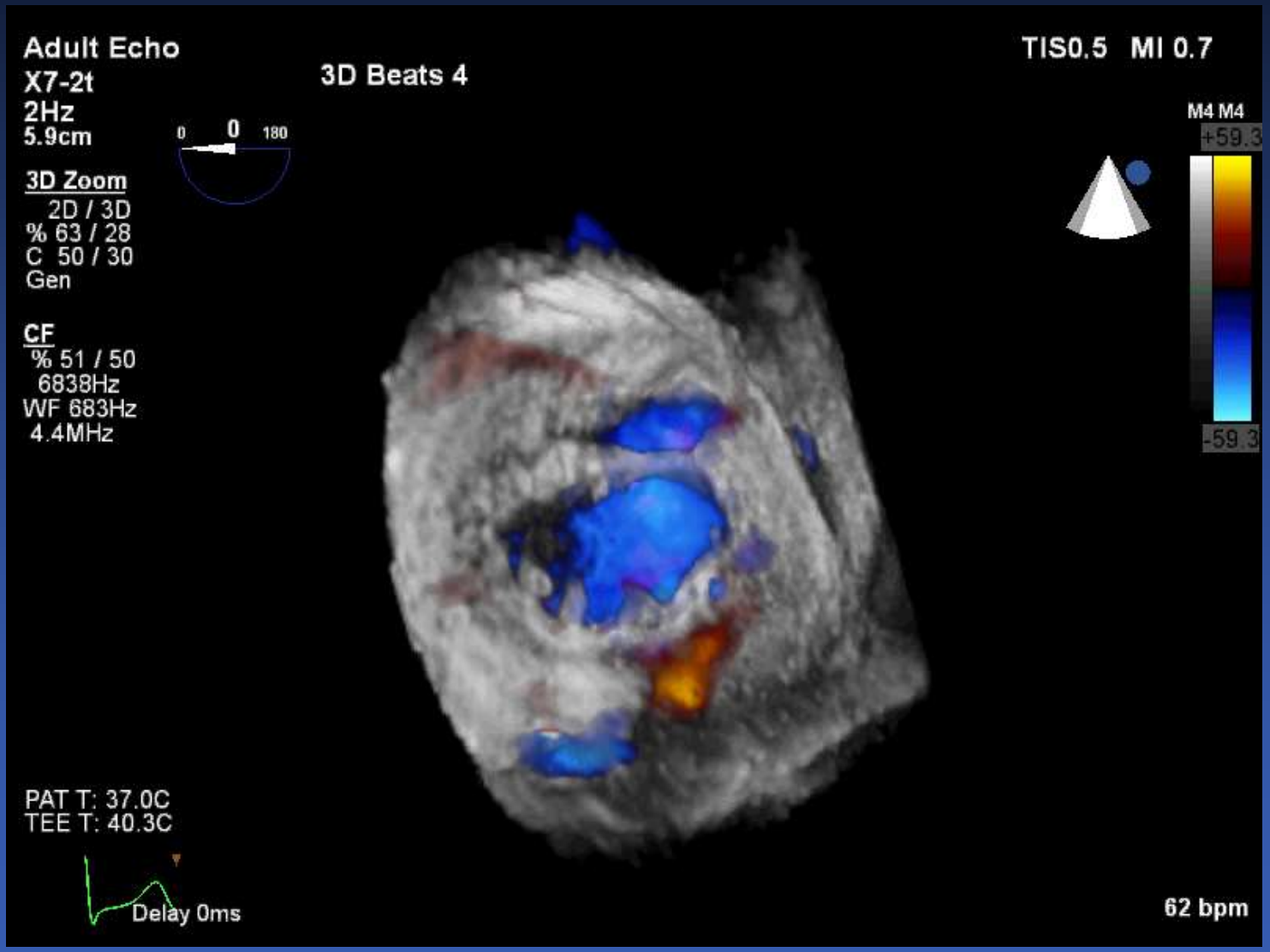
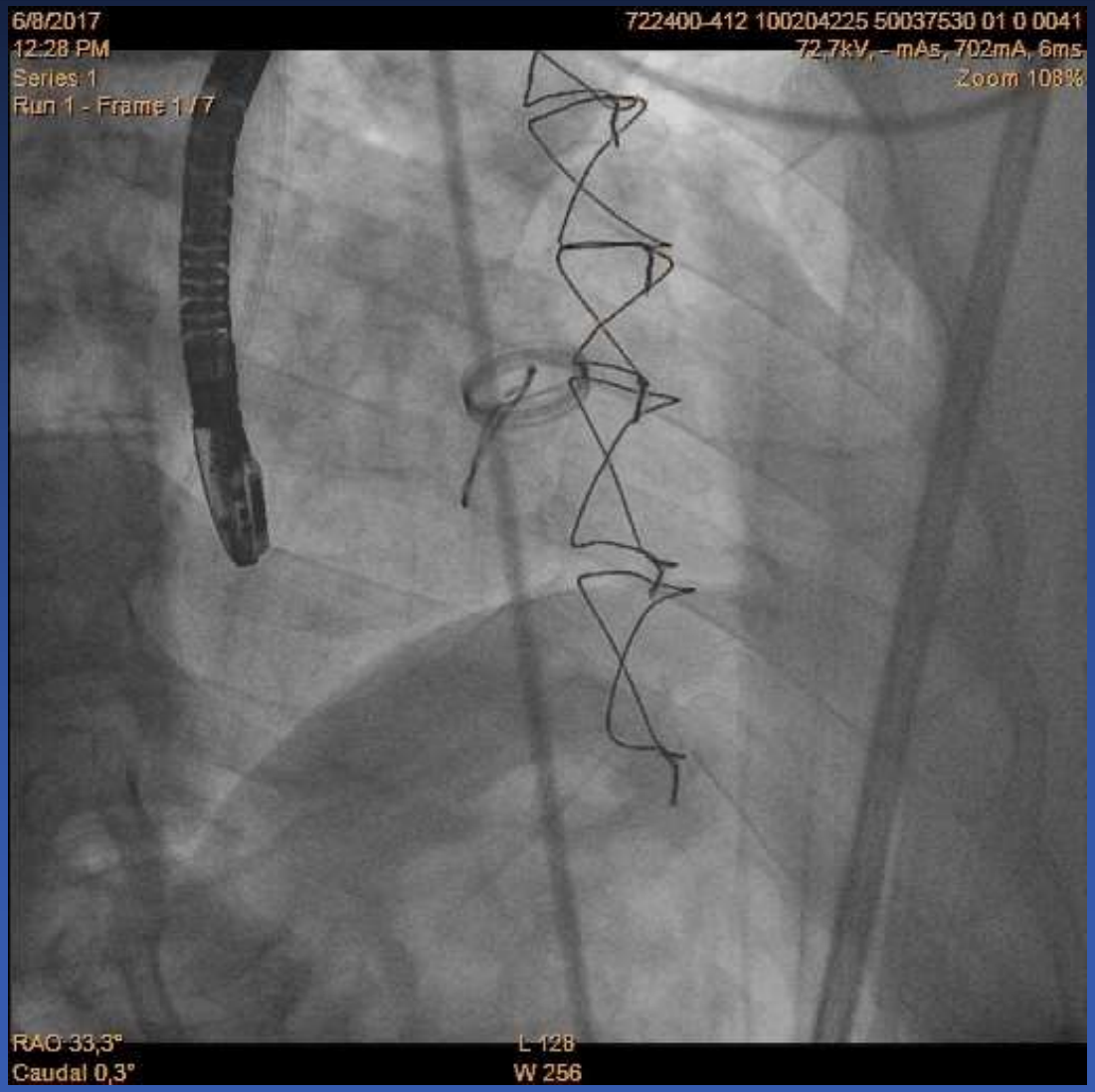


Case Prsentation

- Due to the high surgical risk of the patient and the favorable characteristics of the annuloplasty ring (flexible with circular geometry), the Heart Team decided to proceed to a transcatheter valve-in-ring procedure.

- In case of inefficacious sealing, decision was made to implant an Amplatzer occluder device (St. Jude Medical, St. Paul, Minnesota) in the perivalvular space of ring dehiscence.

Case Prsentation



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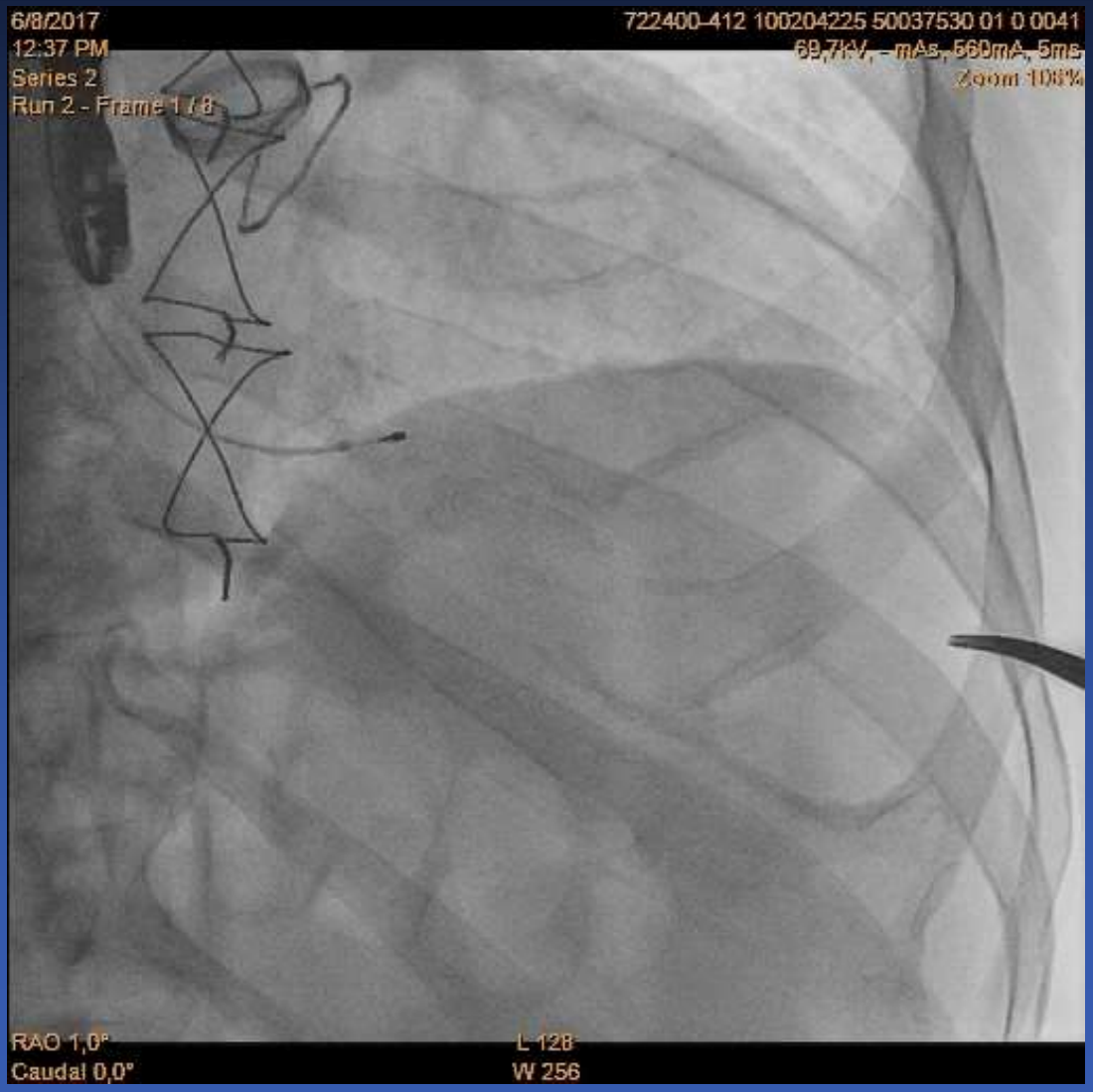

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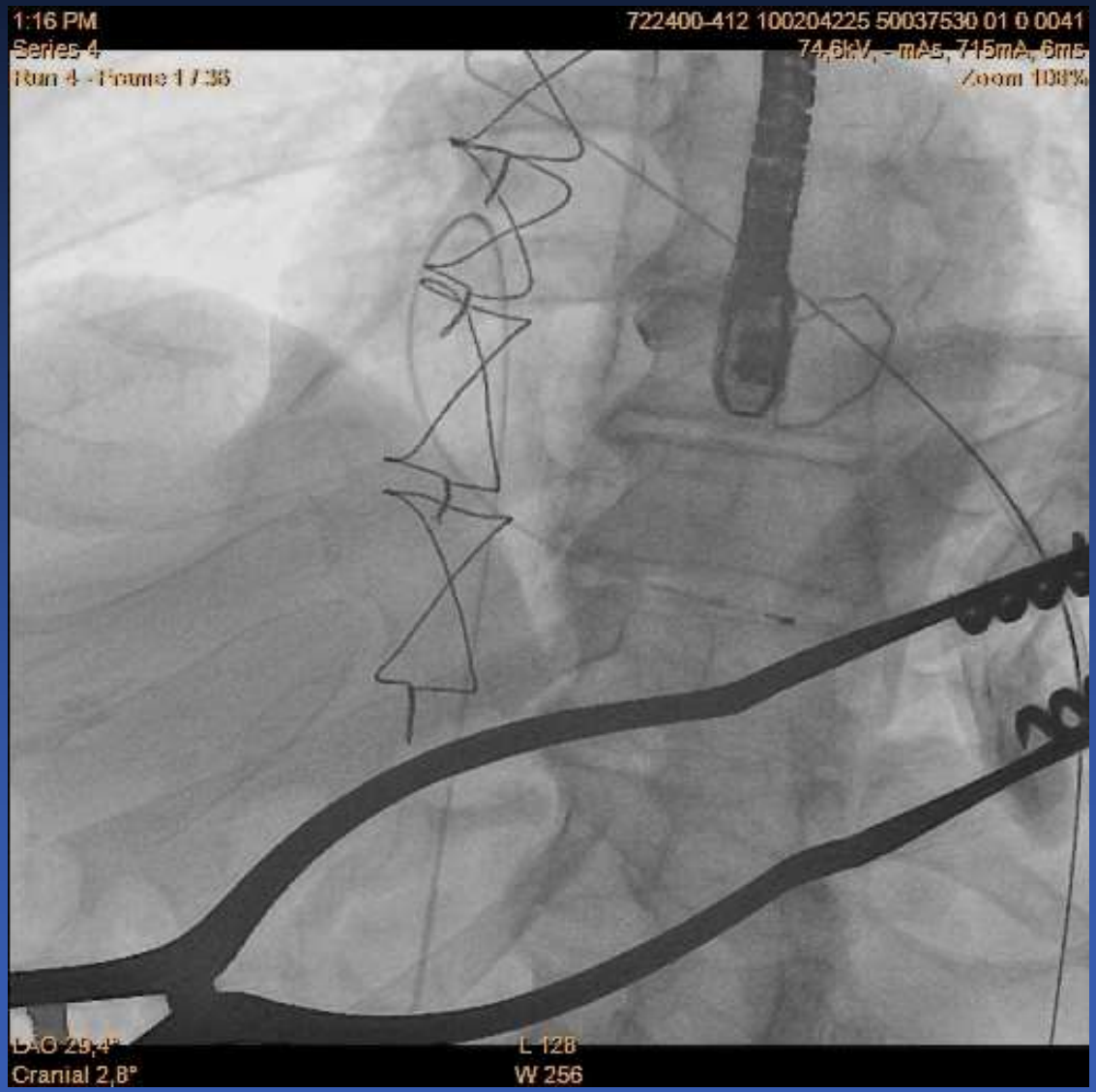

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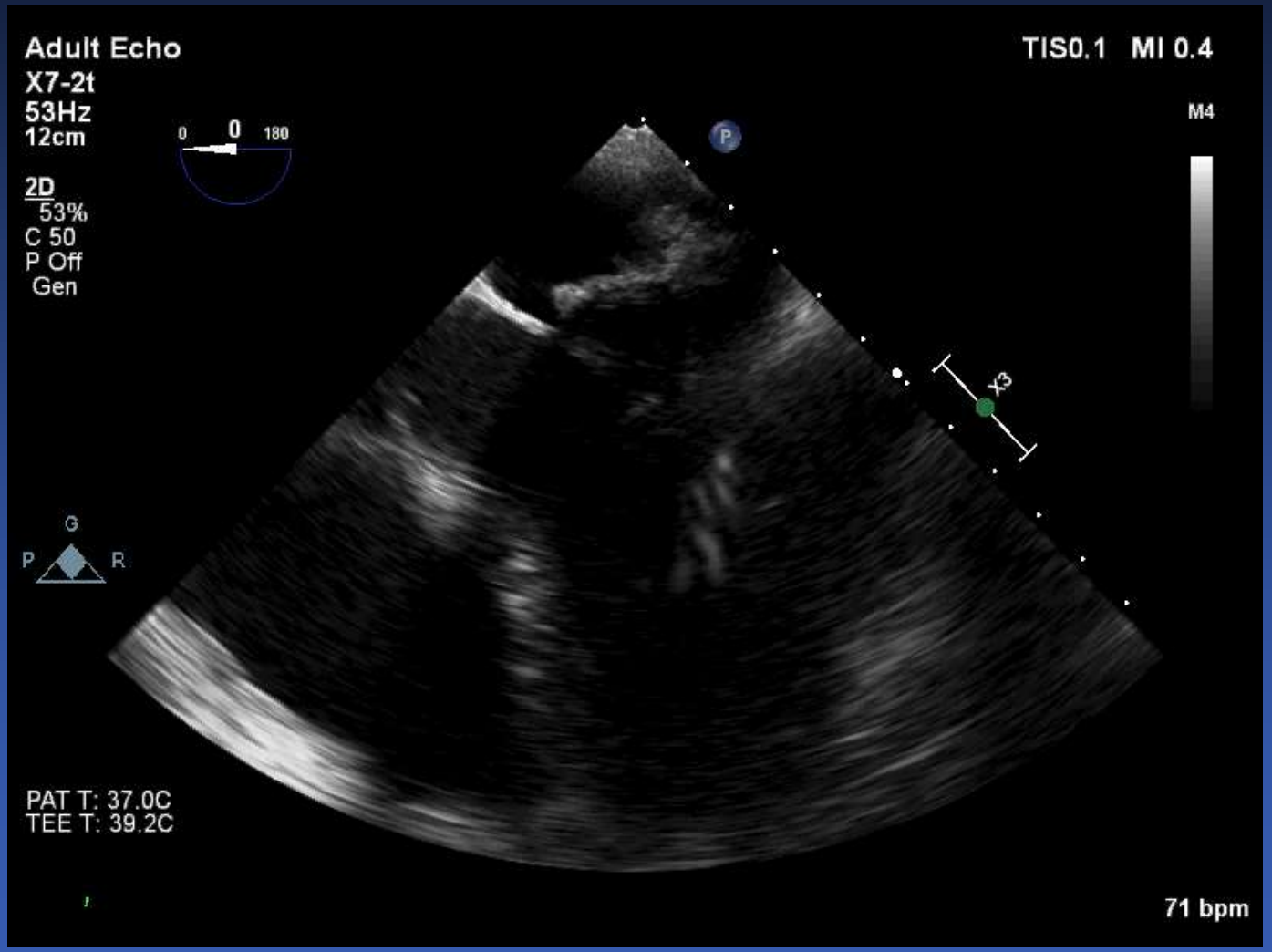

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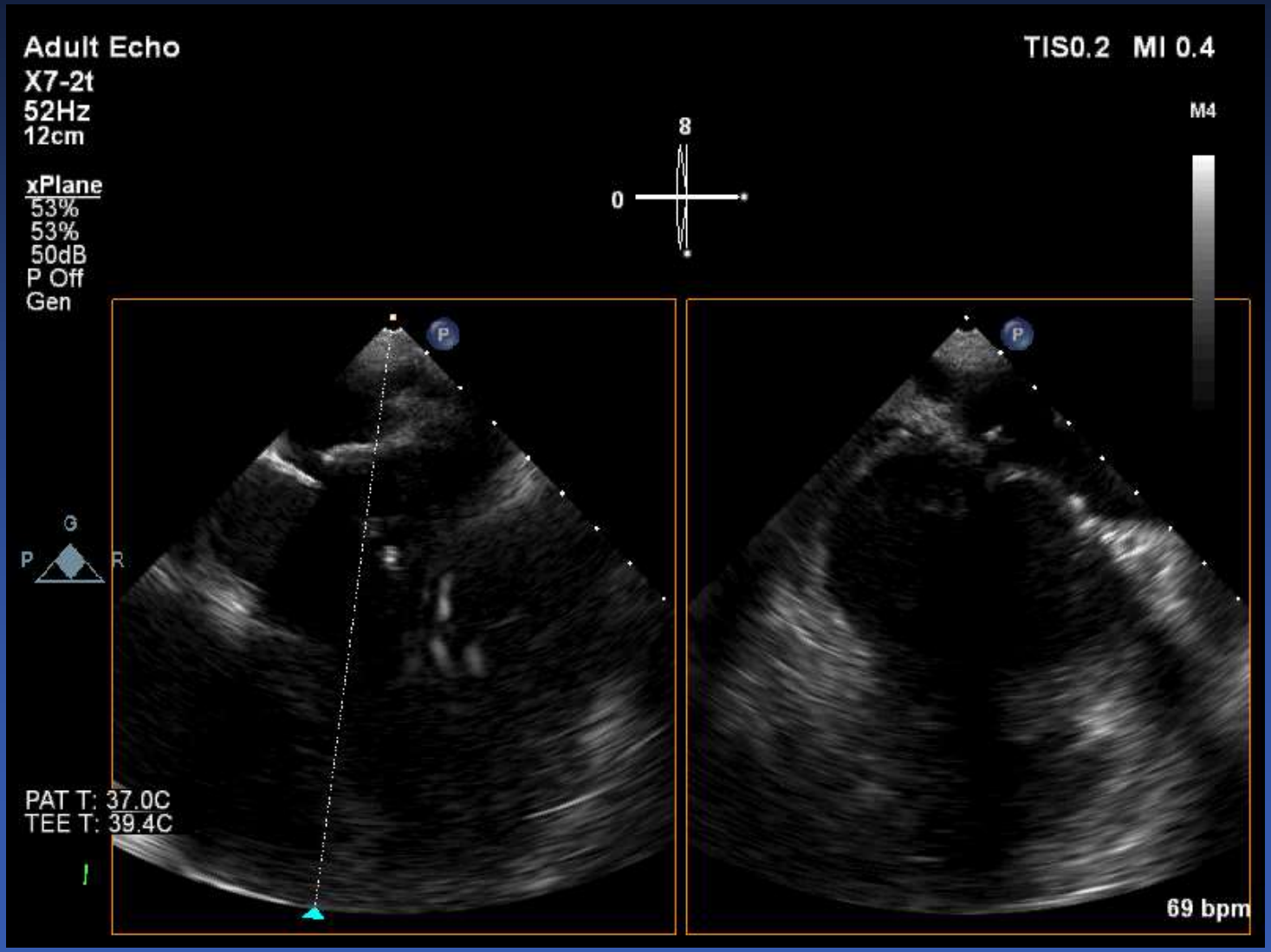

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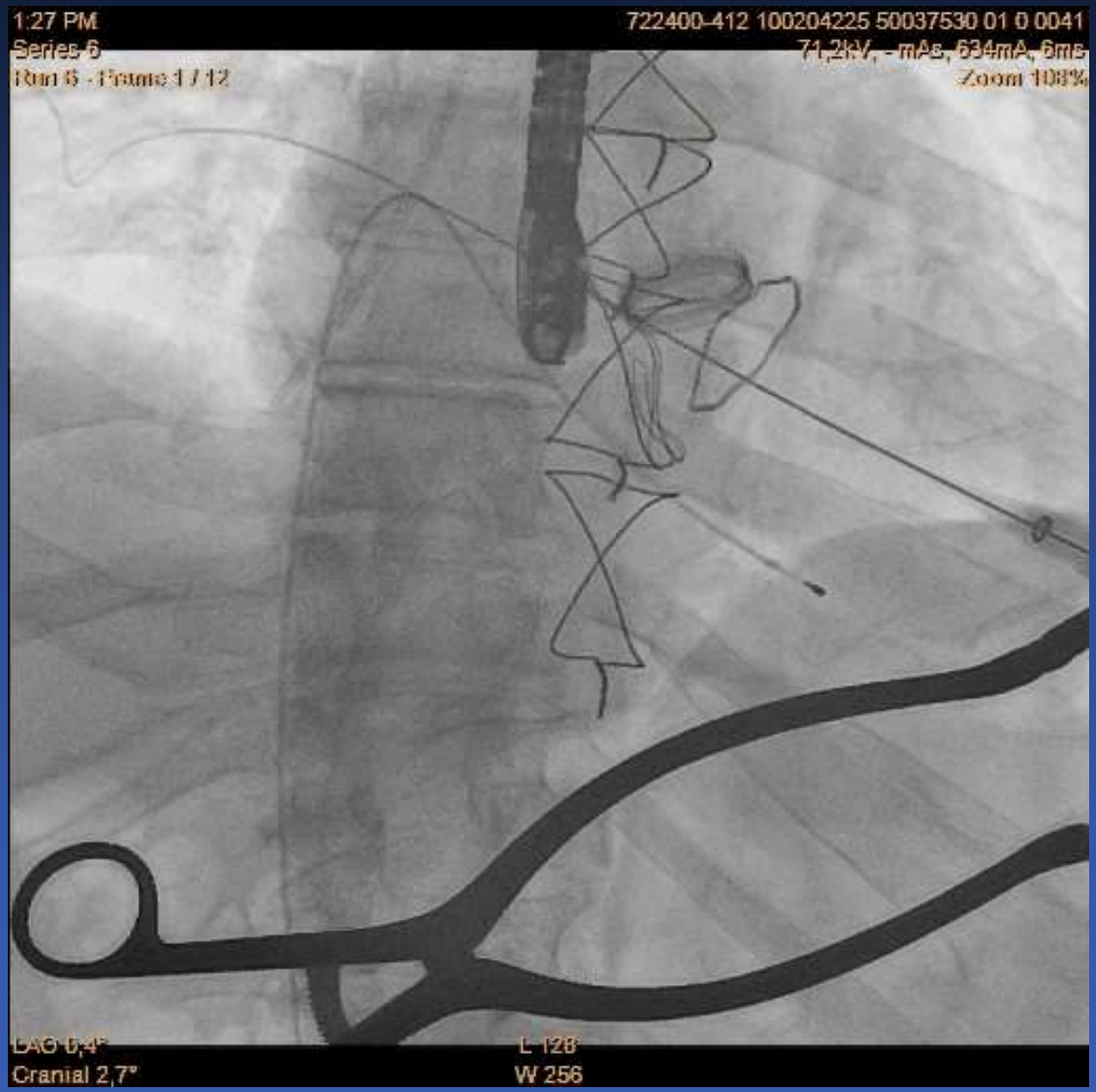

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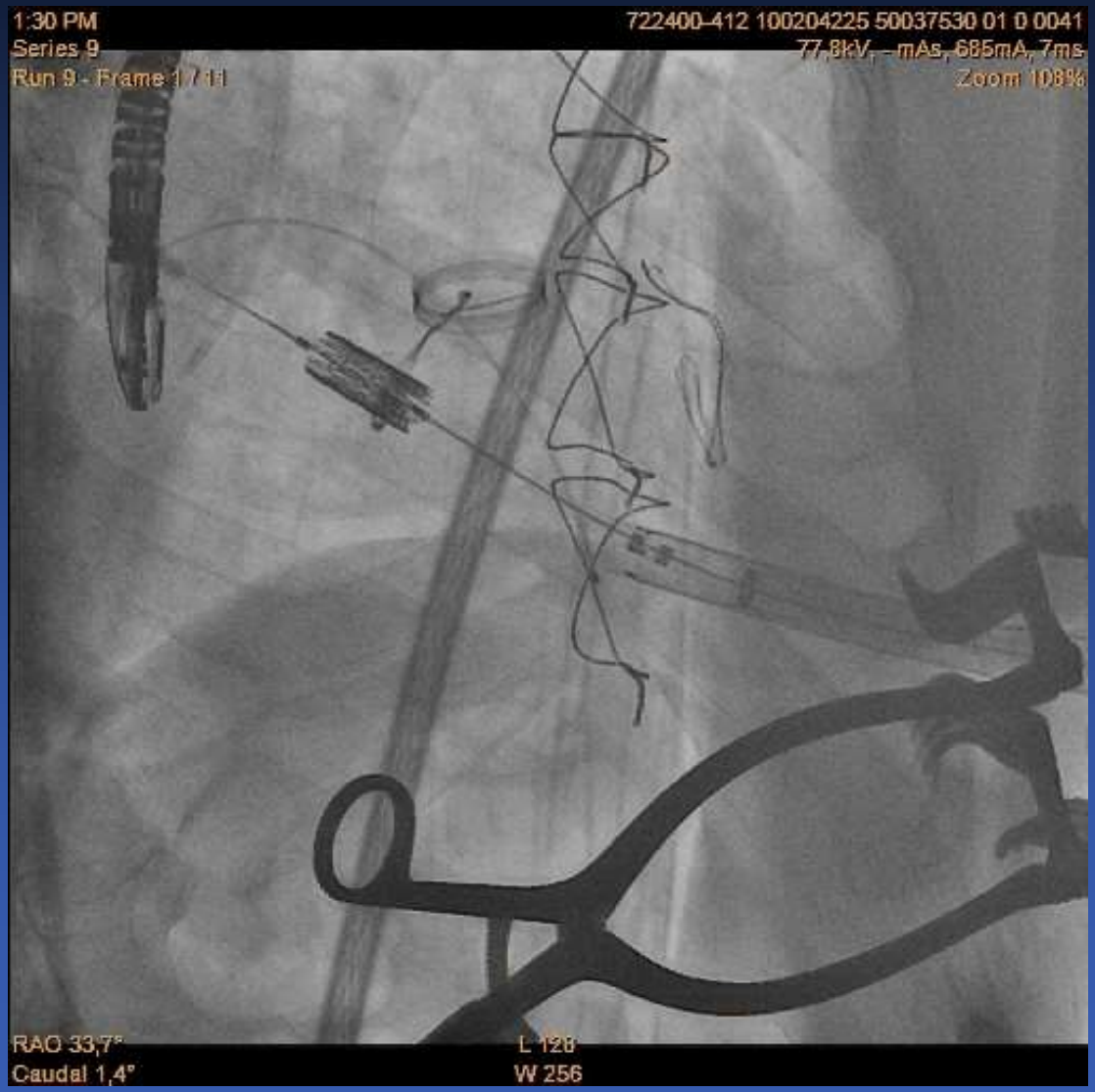

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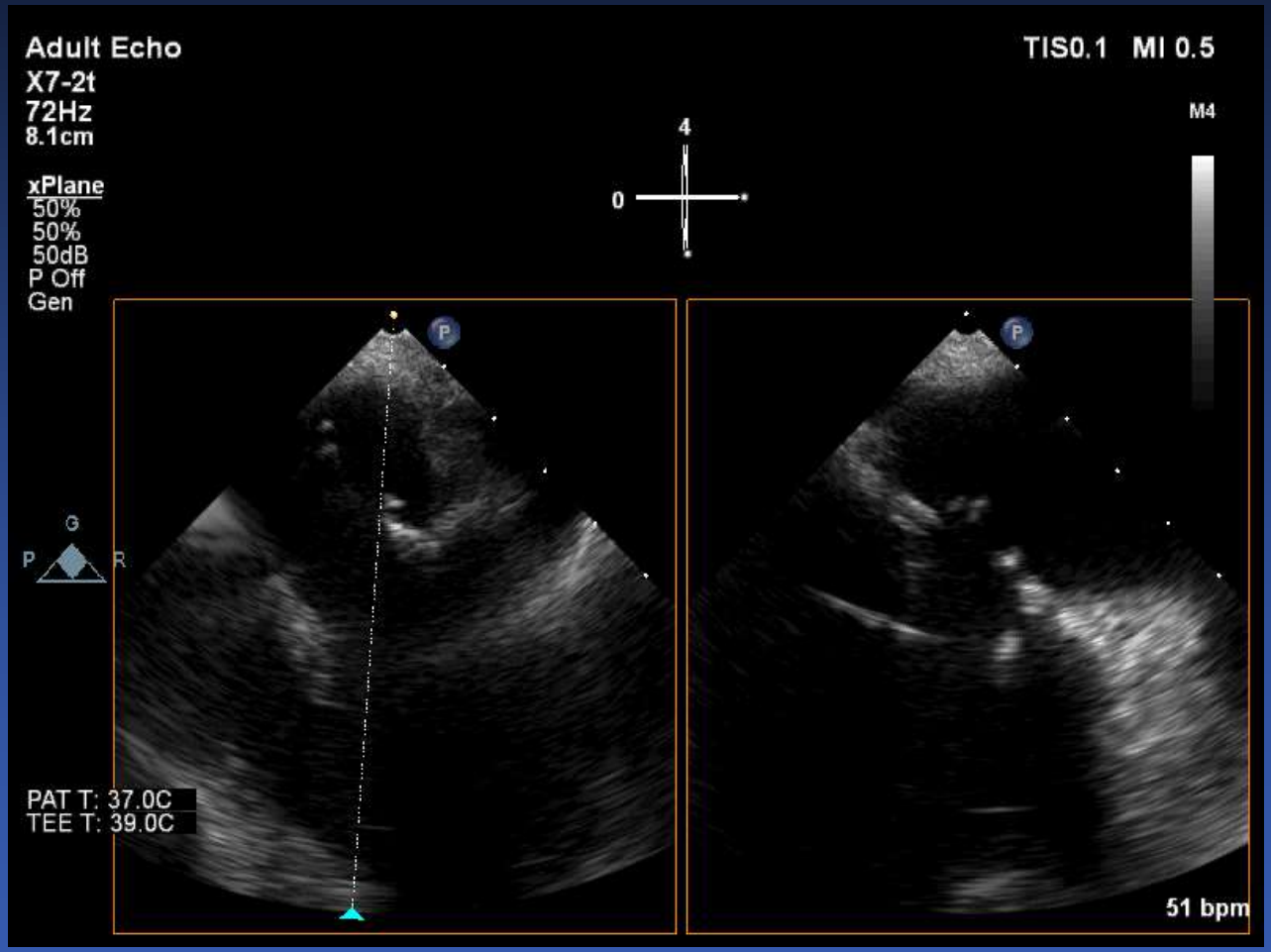

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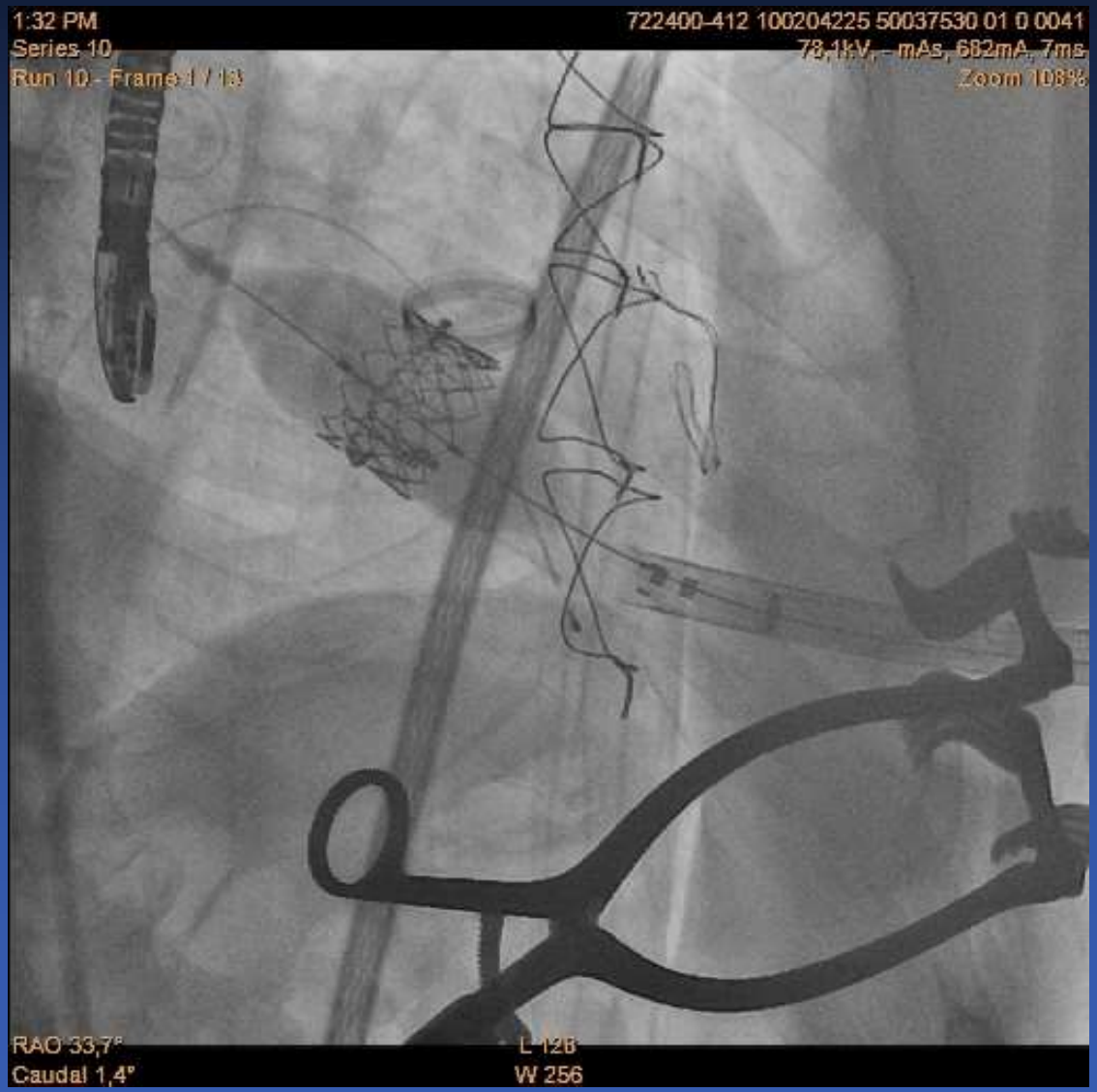

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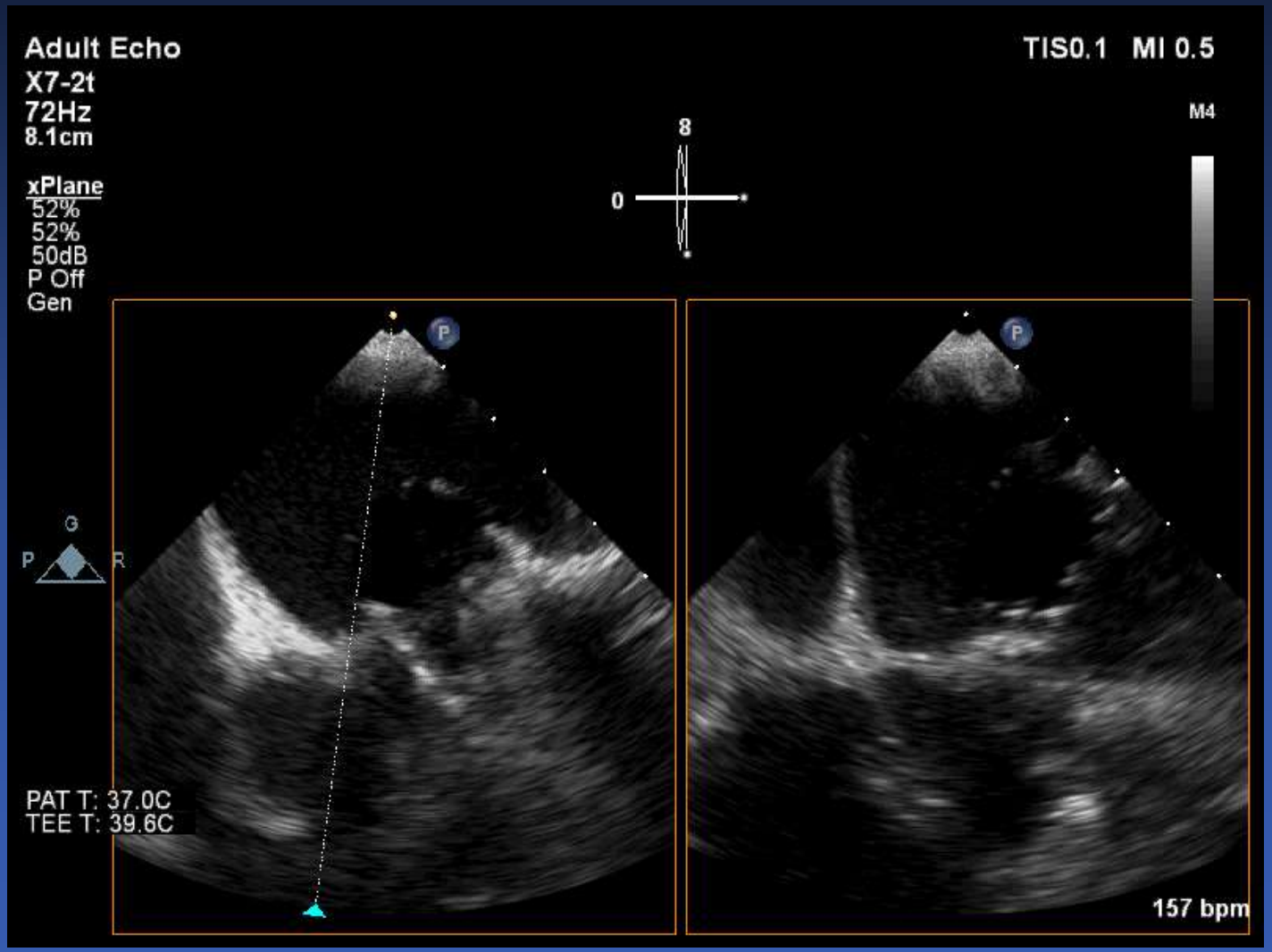

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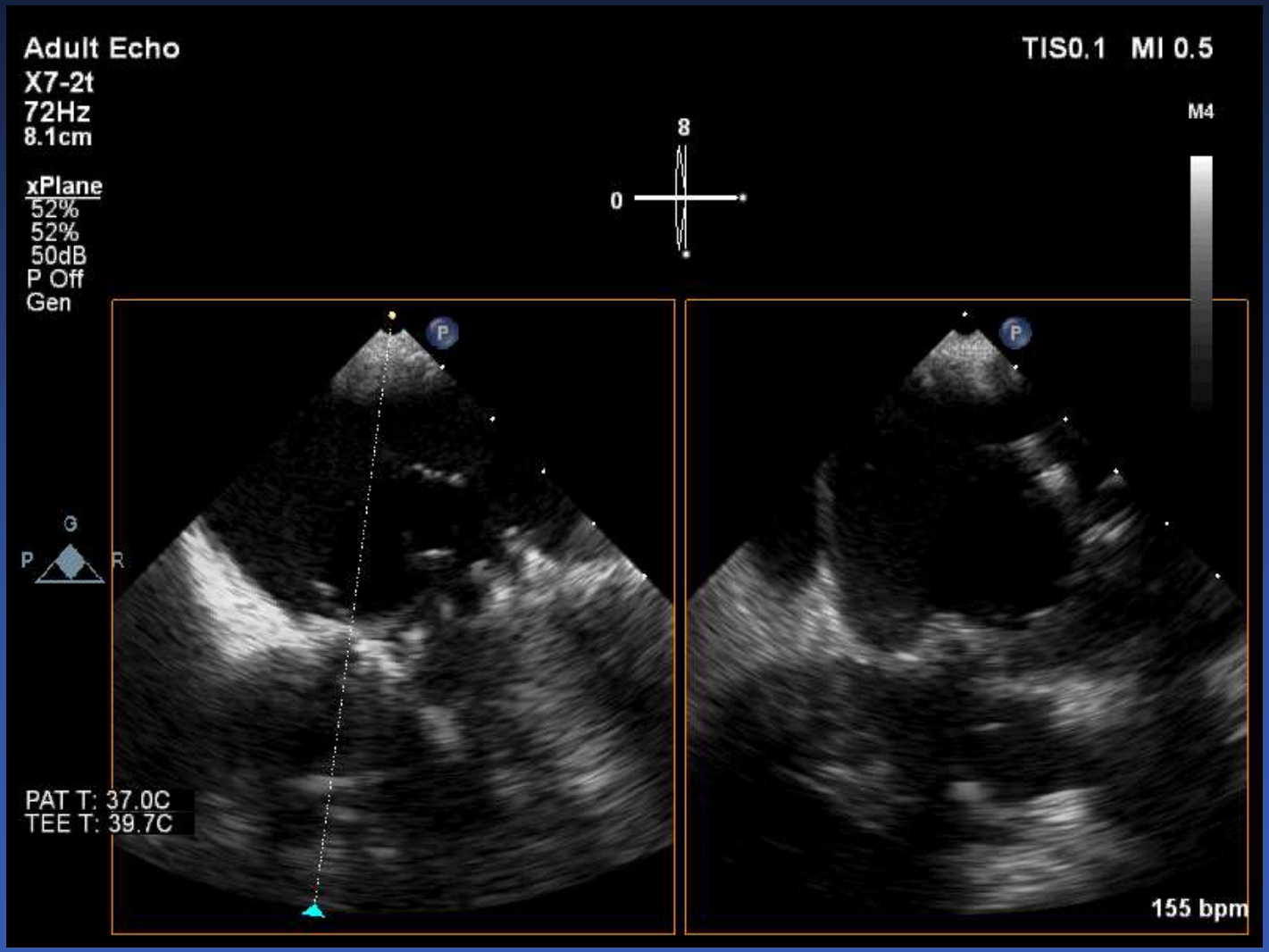

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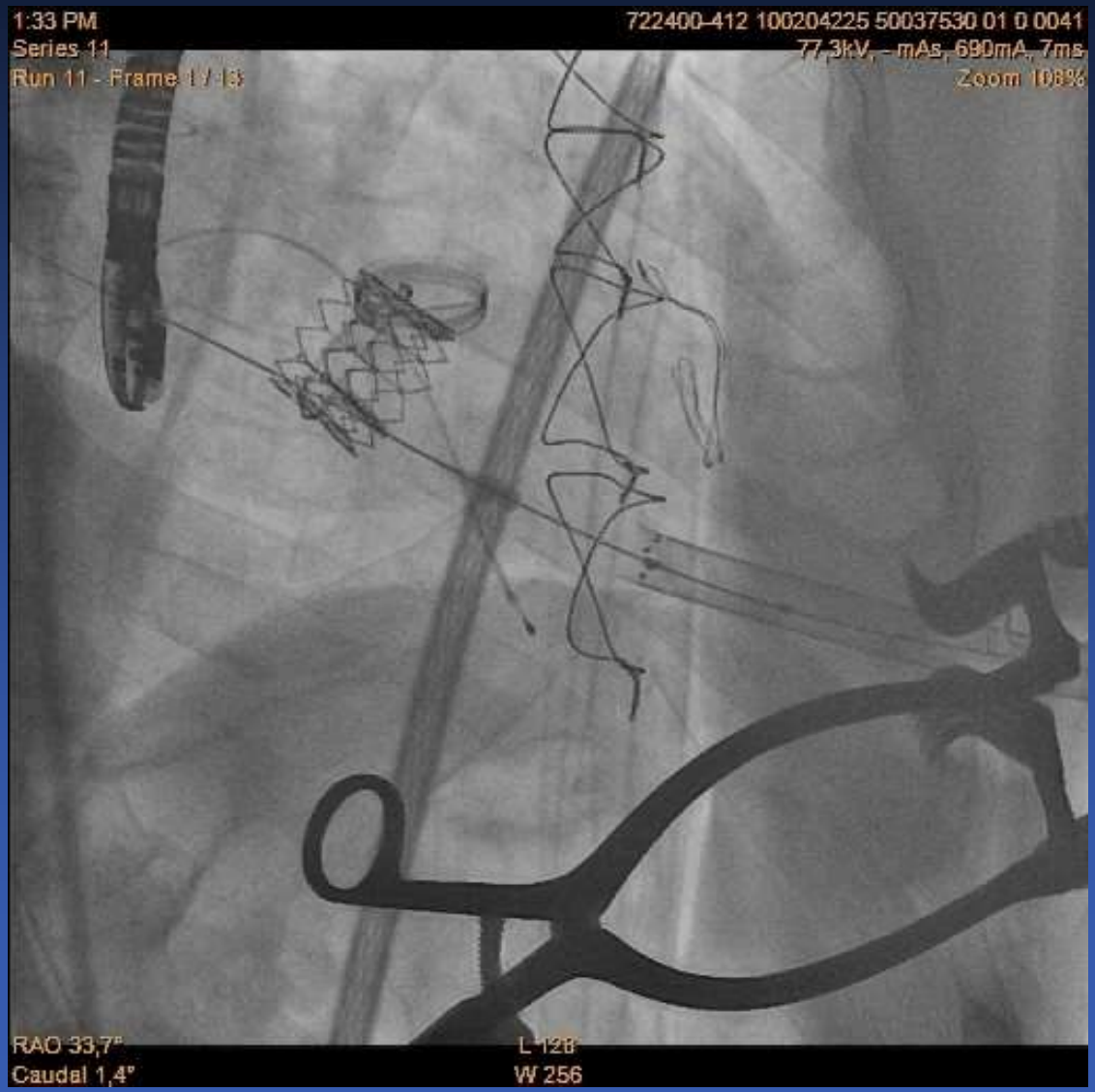

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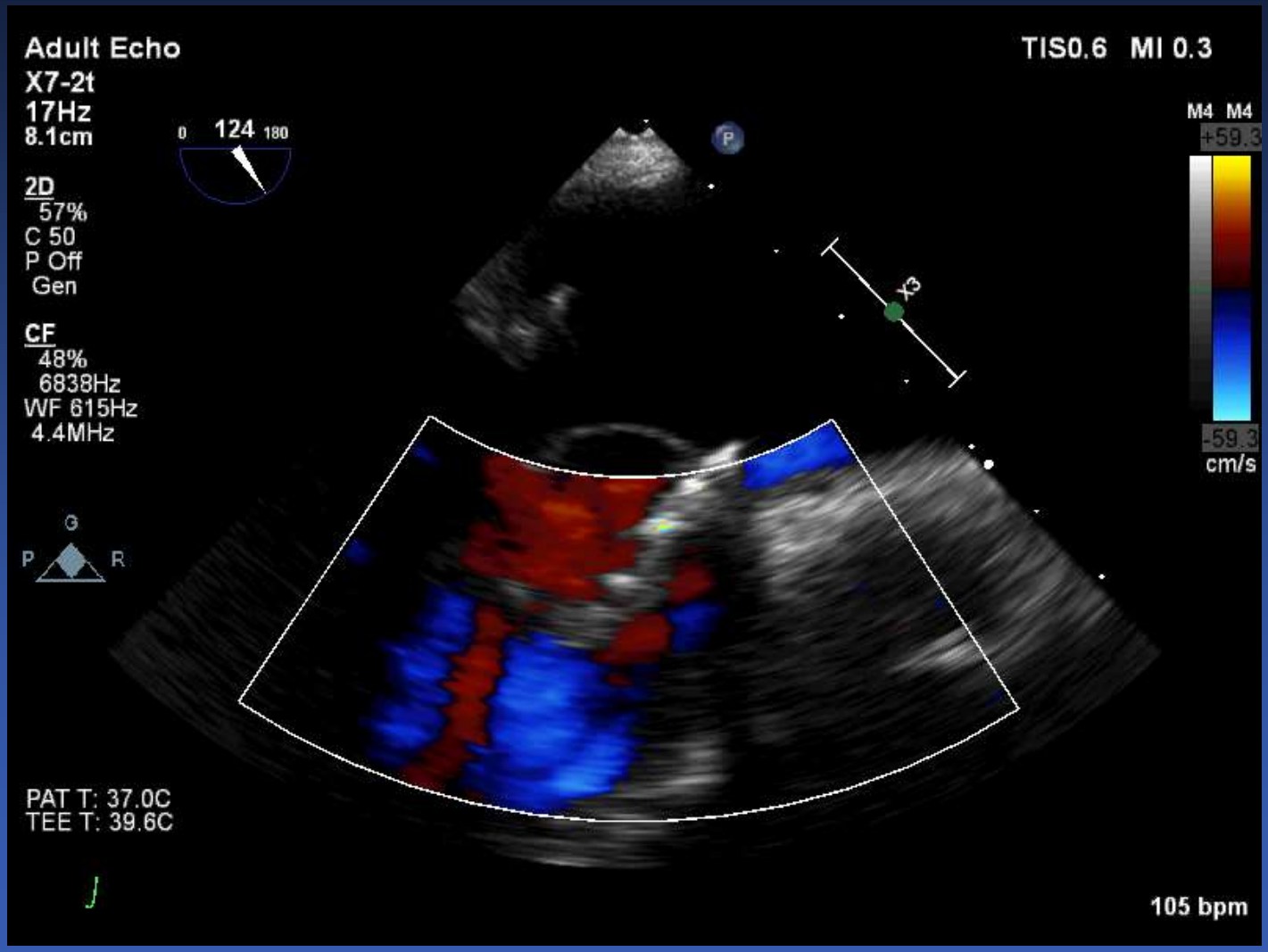

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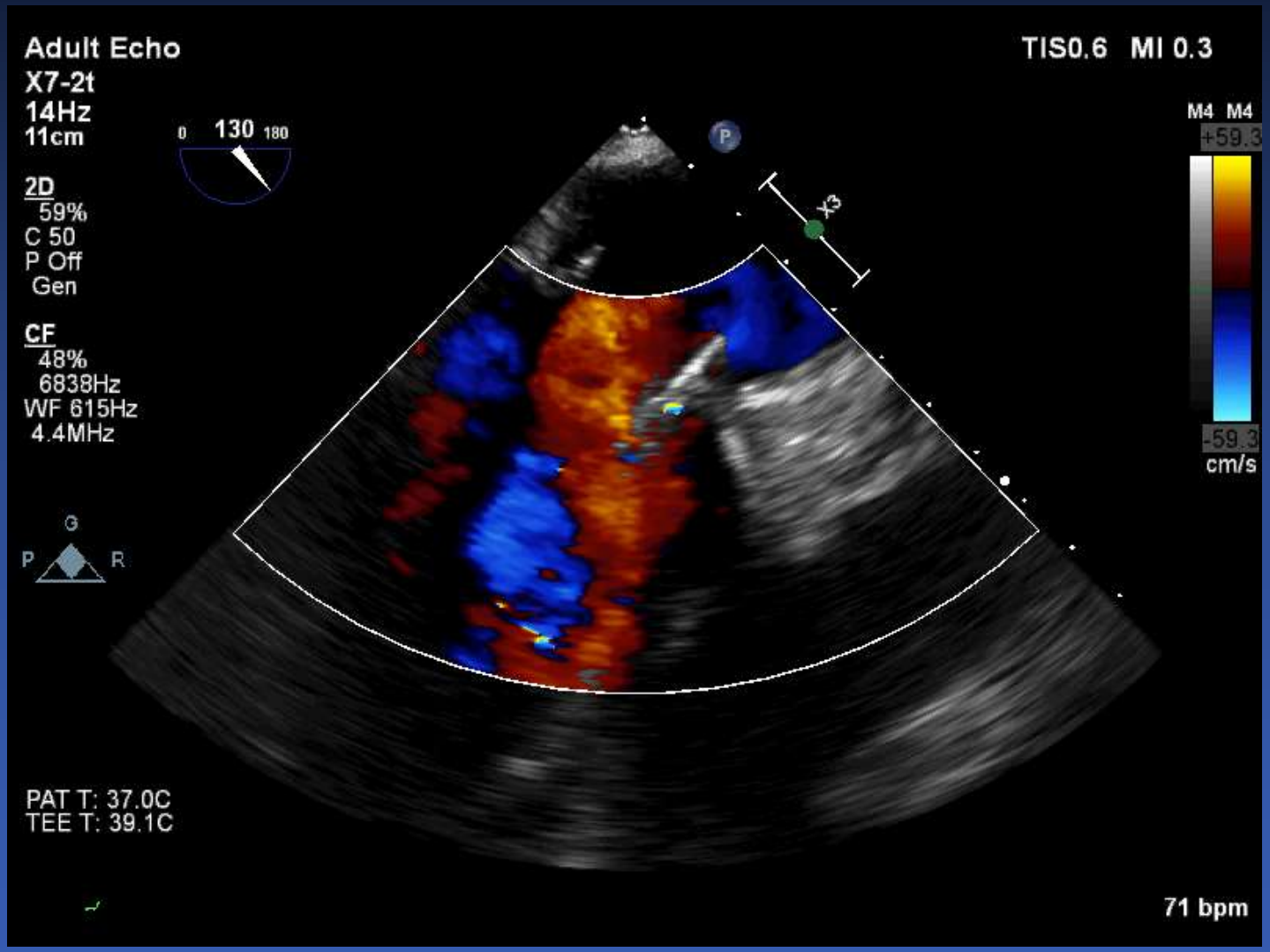

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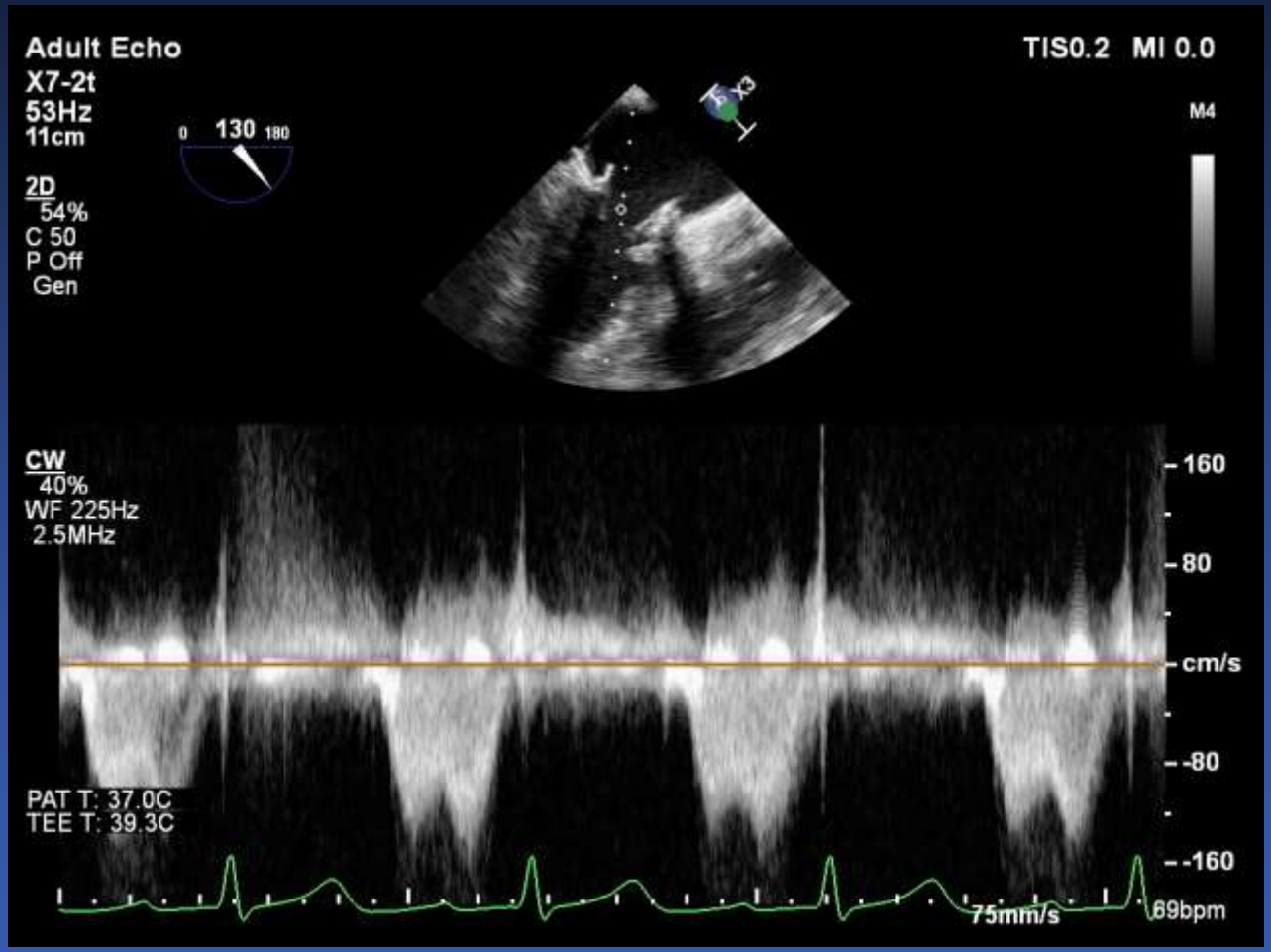

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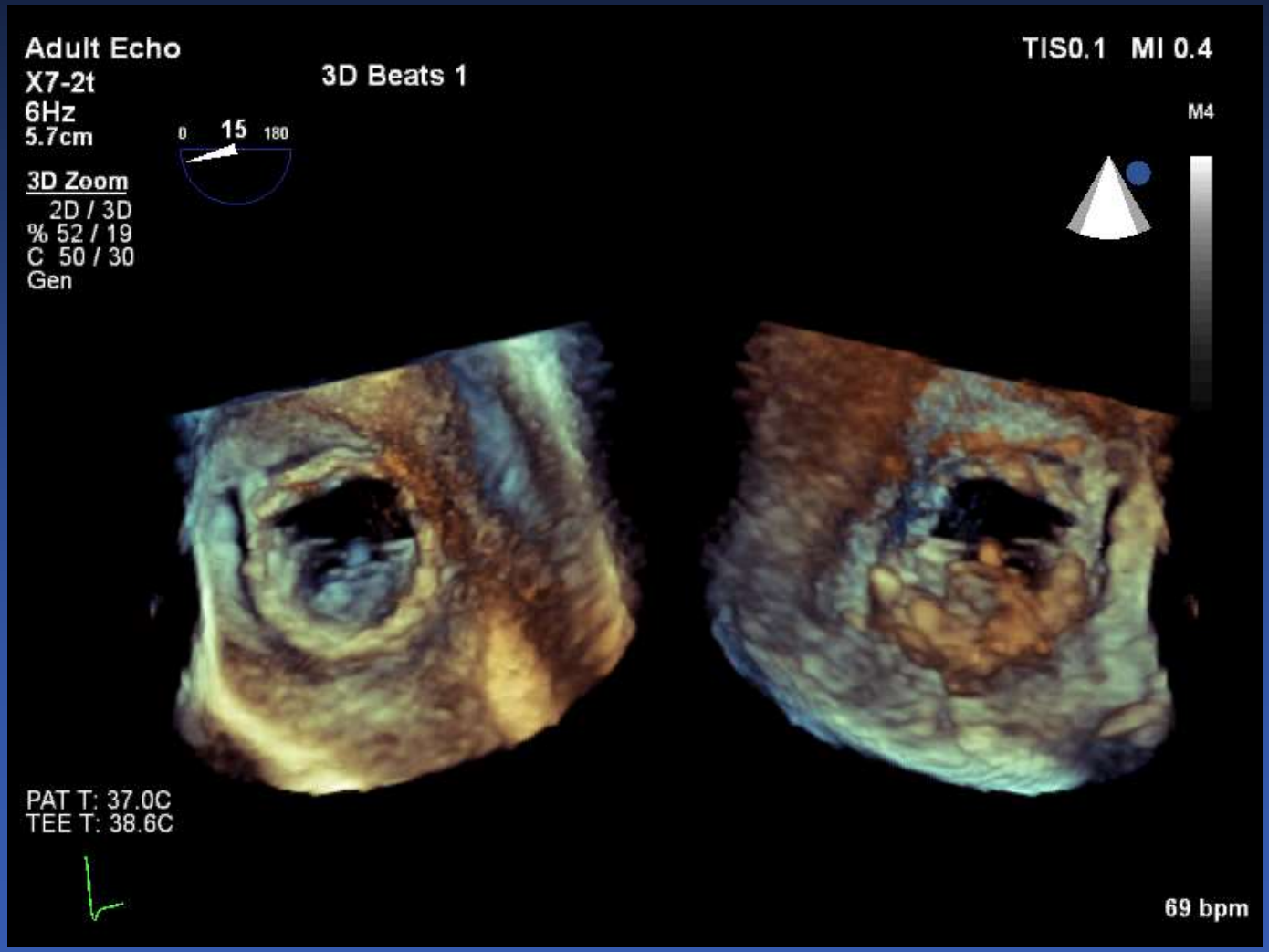

Questions

1. Ενδείξεις σύγκλεισης παραβαλβιδικής διαφυγής.

Α. Κλείνουμε όλες τις παραβαλβιδικές.
Β. Κάνουμε σε όλες χειρουργείο εκ νέου.
Γ. Αιμόλυση, Ενδοκαρδίτιδα, Συμφορητική Καρδιακή Ανεπάρκεια, Οξύ στεφανιαίο σύνδρομο.
Δ. Φαρμακευτική Αγωγή.

Questions

1. Στον προεγχειρητικό έλεγχο, τι εξετάσεις θα χρειαστούμε για την στρατηγική που θα ακολουθήσουμε;

Α. Τίποτα.

Β. Διοισοφαγικό υπέρηχο.

Γ. Διοισοφαγικό υπέρηχο και Αξονική Τομογραφία.

Thank you!