Οργάνωση:
ΕΛΛΗΝΙΚΟ ΚΟΛΛΕΓΙΟ **ΚΑΡΔΙΟΛΟΓΙΑΣ**

14ο Ετήσιο Συνέδριο Ελληνικού Κολλεγίου **ΚΑΡΔΙΟΛΟΓΙΑΣ**

28-30
Ιουνίου/June
2018

Course Directors:
Lampros K. Michalis, Konstantinos P. Toutouzas, Dimitris I. Karmpaliotis

Cardio-Cath

Meeting 2018

Live Demonstration Course

Ξενοδοχείο Du Lac,
ΙΩΑΝΝΙΝΑ
Hotel Du Lac,
ΙΩΑΝΝΙΝΑ, Greece

Θα αξιολογηθεί από τον Πανελλήνιο Ιατρικό Σύλλογο για Χορήγηση Μορίων Συνεχιζόμενης Ιατρικής Εκπαίδευσης (CME- CPD credits)

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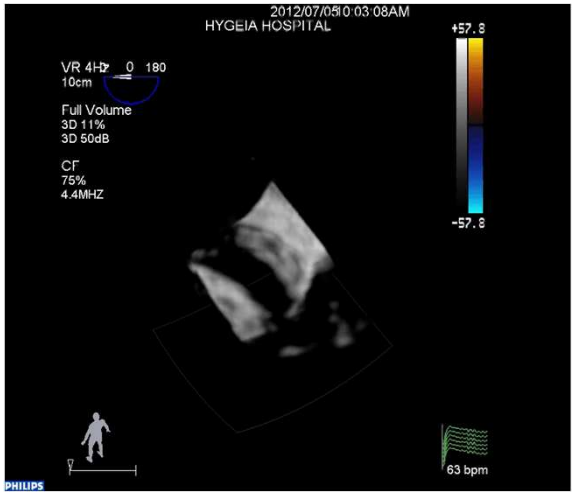
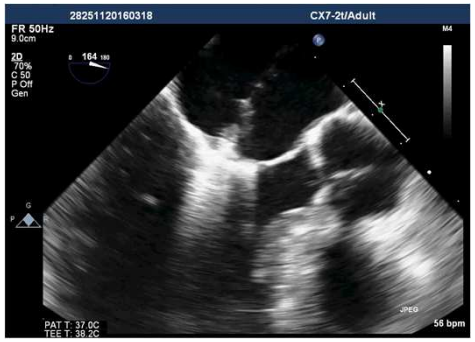
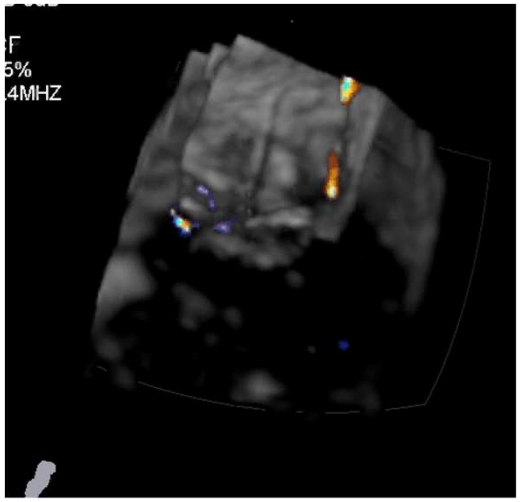
Case 3: Who is technically the appropriate candidate? The role of echo imaging







M.Chrissoheris, MD
From the Department of Transcatheter Heart Valves HYGEIA Hospital Athens

Disclosures

-Proctoring activities for Abbott Vascular, Edwards Lifesciences

I and the HYGEIA Hospital «Heart Team» have received
research and/or travel grants and/or lecture fees from:
- ABBOTT Vascular, Europe, Edwards Lifesciences, Medtronic

HYGEIA Hospital Heart Team

Cardiologists: G. Kourkoveli, K Papadopoulos, A Halapas, M Chrissoheris, N. Georgakopoulos, K Spargias

CT Surgeons: G. Pattakos, N Bouboulis, S Skardoutsos, A Tsolakis, S Pattakos

Anesthesiologist: N.Papanikolaou, I Nikolaou

Pediatric and Adult Congenital Cardiology: A Tzifa

Vascular Surgeons: I Belos, S Kaliafas

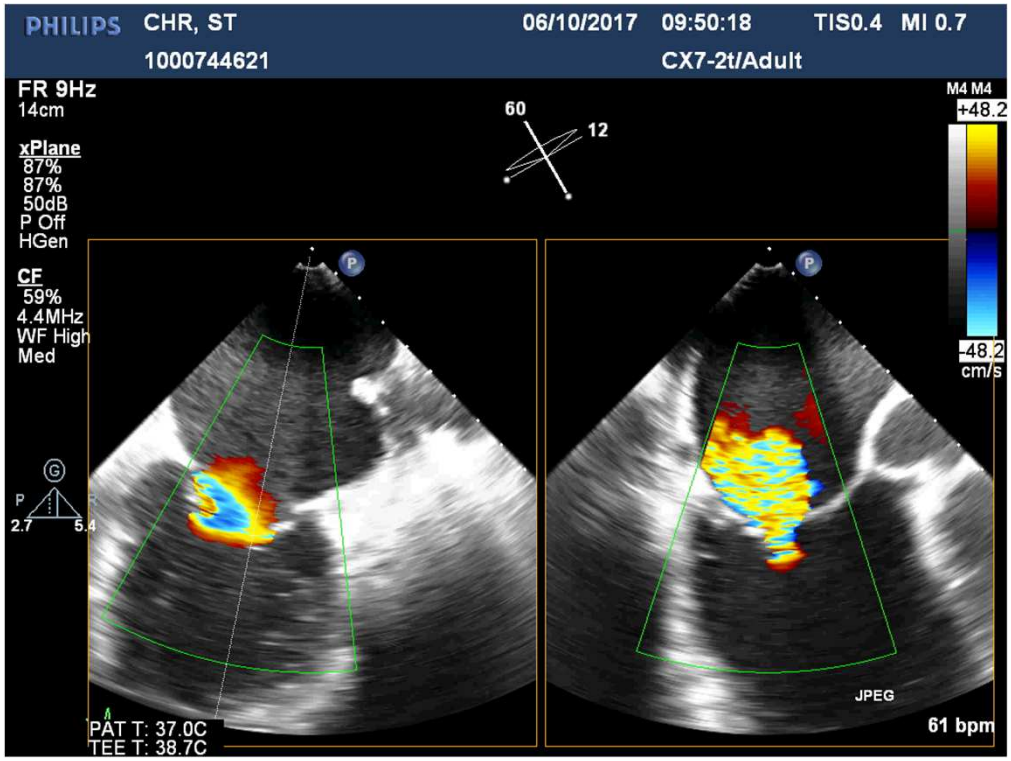
Radiologists: F Laspas, C Mourmouris

Electrophysiology: L Papavassiliou, S. Kourouklis, G Zervopoulos, T Apostolopoulos

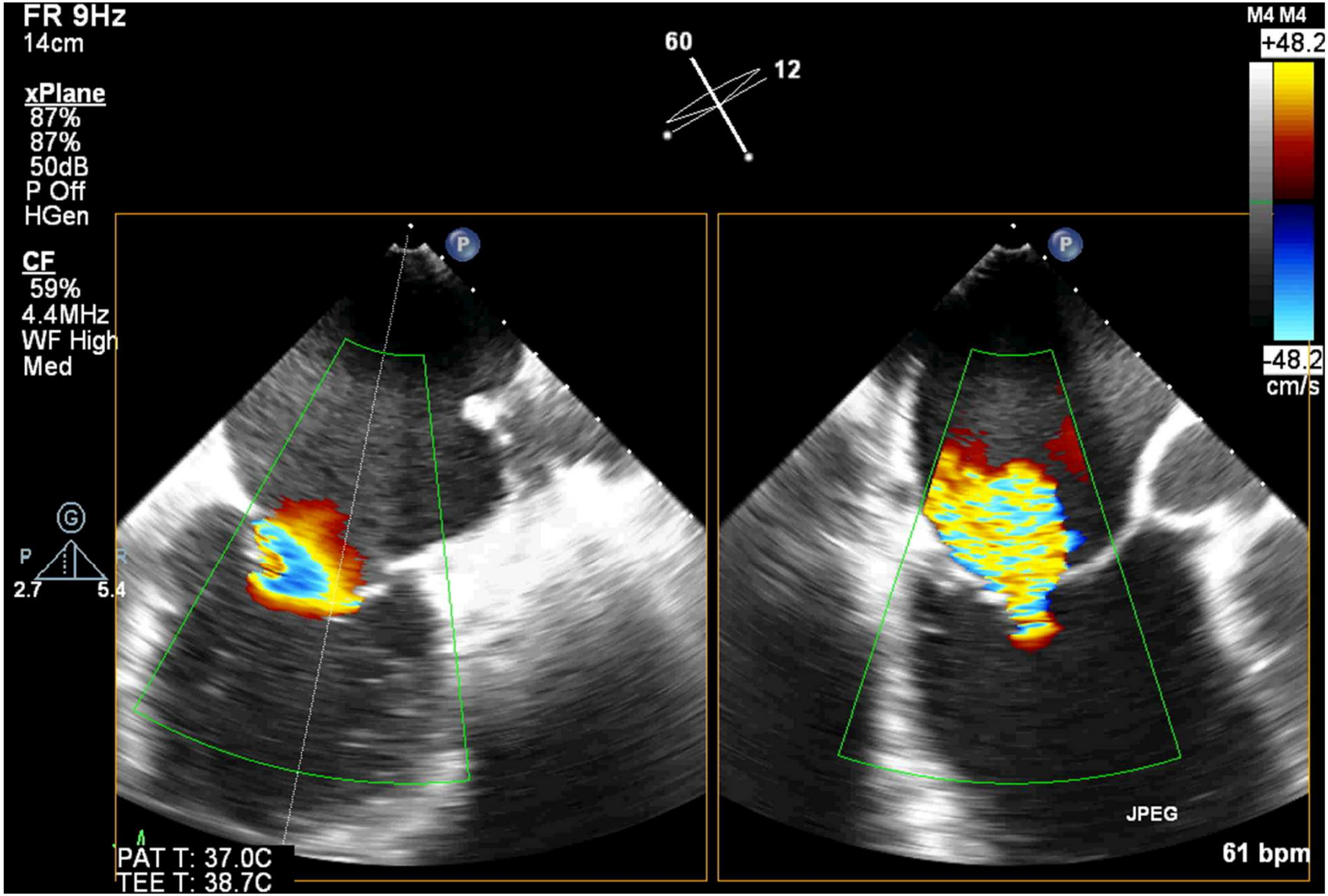
Research Nurse: E. Dafnomyli

Heart Failure Patient with Significant Ischemic MR

- 56 year old male
- NYHA III-IV dyspnea
- 11/2016 AMI, primary PCI in LCx
- Staged LAD PCI with multiple stents
- Gradually developing SOB symptoms together with MR (initially mild)
- ECHO MR 4/4, ERO 50mm^2, RV 66ml, LVEF 30-35%, PAP 60mmHg
- Paroxysmal AF, TIAs (most recent 3m ago)
- HEART TEAM decision: MitraClip



TEE X-plane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14cm
xPlane
87%
87%
50dB
P Off
HGen
CF
59%
4.4MHz
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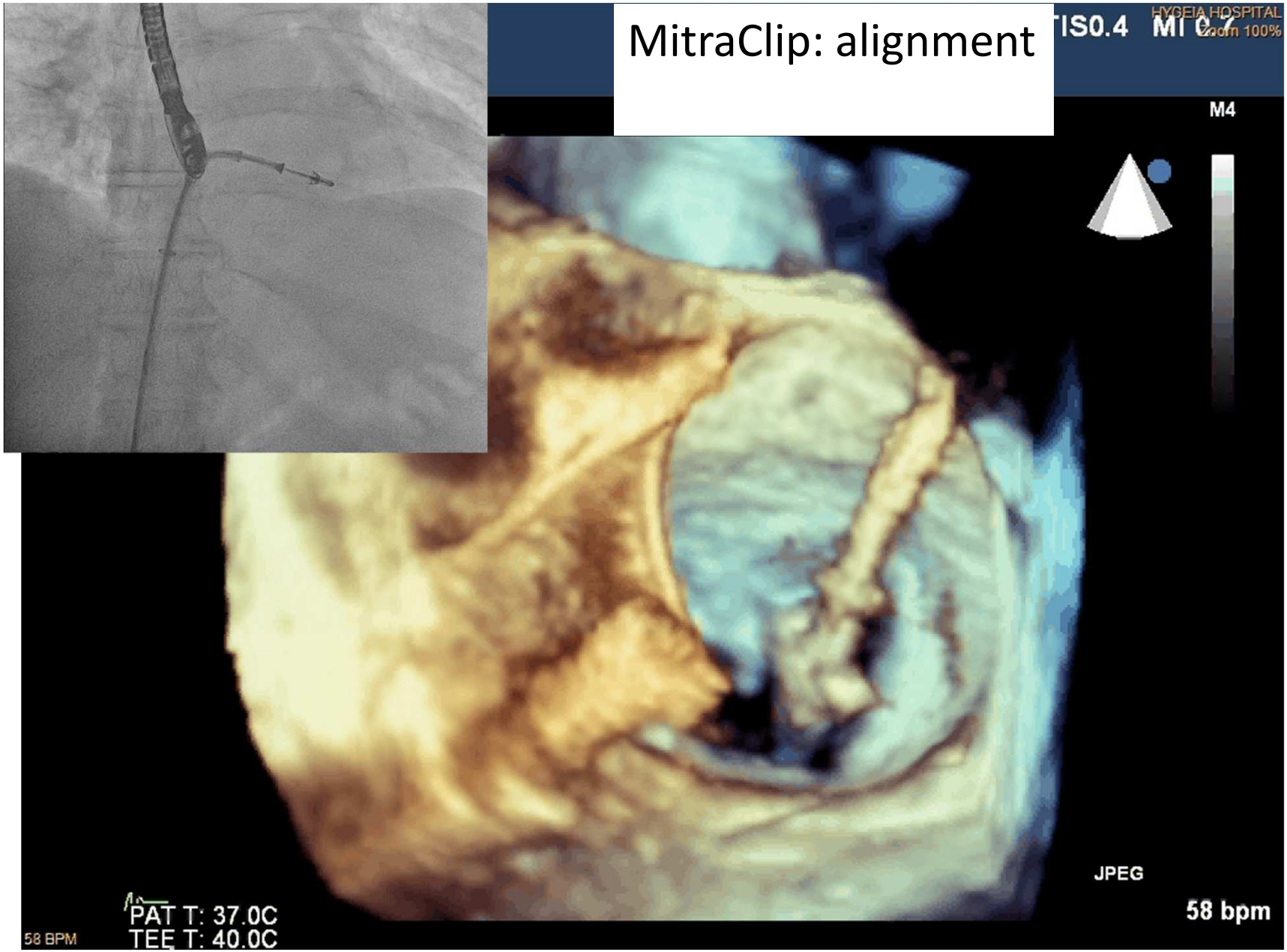
Med
60
12
M4 M4
+48.2
-48.2
cm/s
P
2.7
5.4
PAT T: 37.0C
TEE T: 38.7C
JPEG
61 bpm

MR: Live 3D color

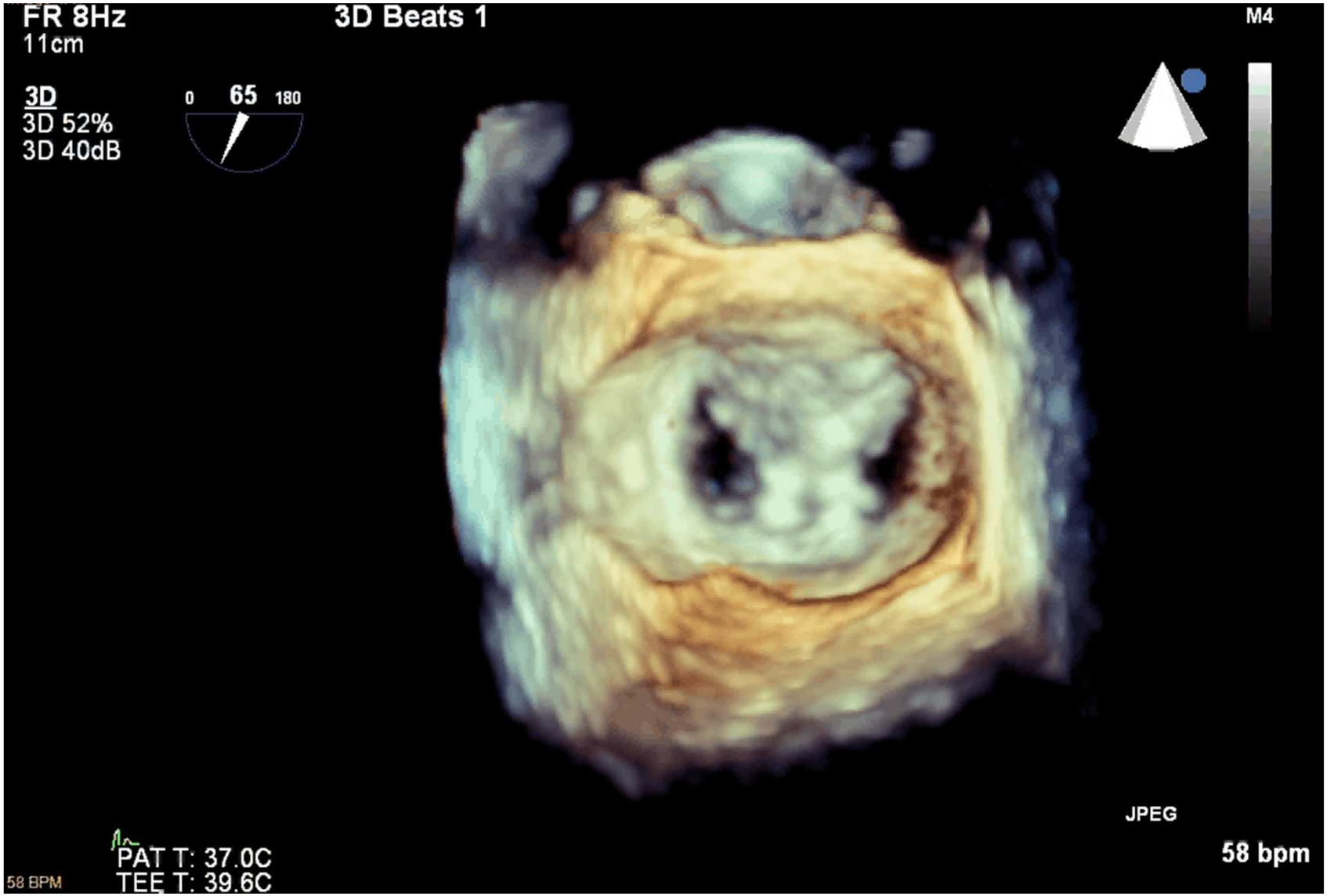
MitraClip NT: Next generation device

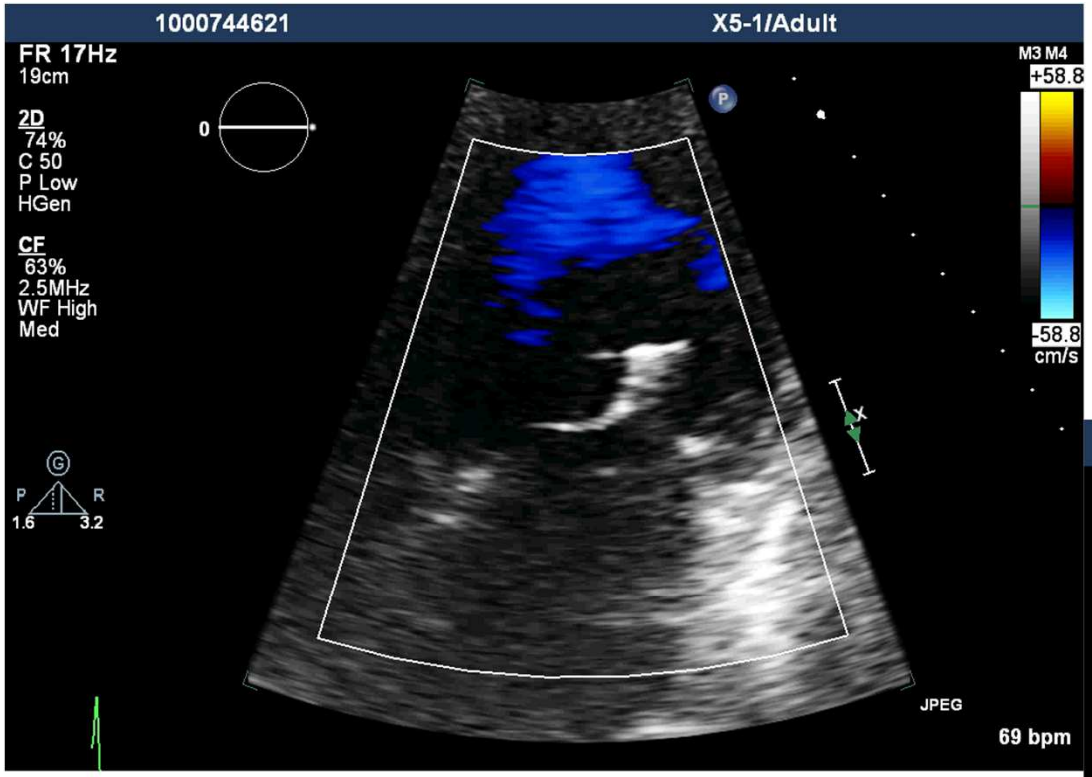
- Active nitinol grippers with 120° opening
- Redesigned delivery system and handle (single operator device)
- Enhanced steerability
- Less sleeve shortening
- Less need of M Knob rotation resulting in less tension
- Facilitated delivery system removal in case clip not implanted

MitraClip: alignment



2 Clip bridge

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X5-1/Adult
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19cm
2D
74%
C 50
P Low
HGen
CF
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2.5MHz
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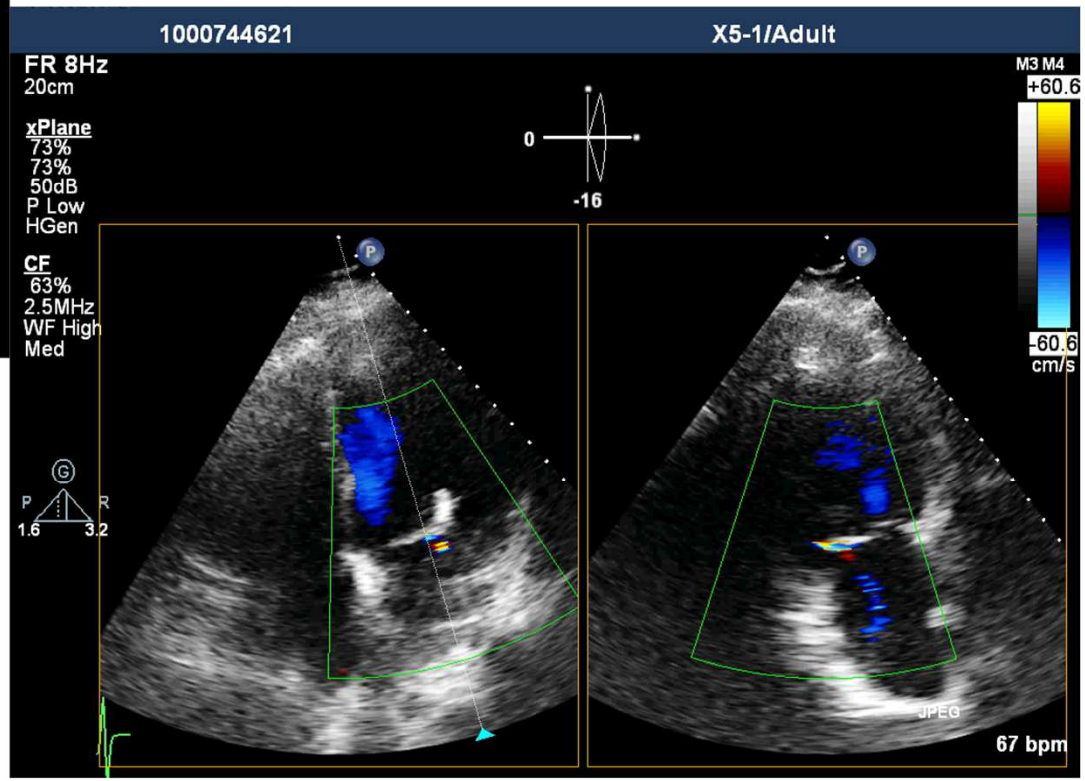
Med
M3 M4
+58.8
-58.8
cm/s
JPEG
69 bpm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73%
50dB
P Low
HGen
CF
63%
2.5MHz
WF High
Med
M3 M4
+60.6
-60.6
cm/s
-16
JPEG
67 bpm

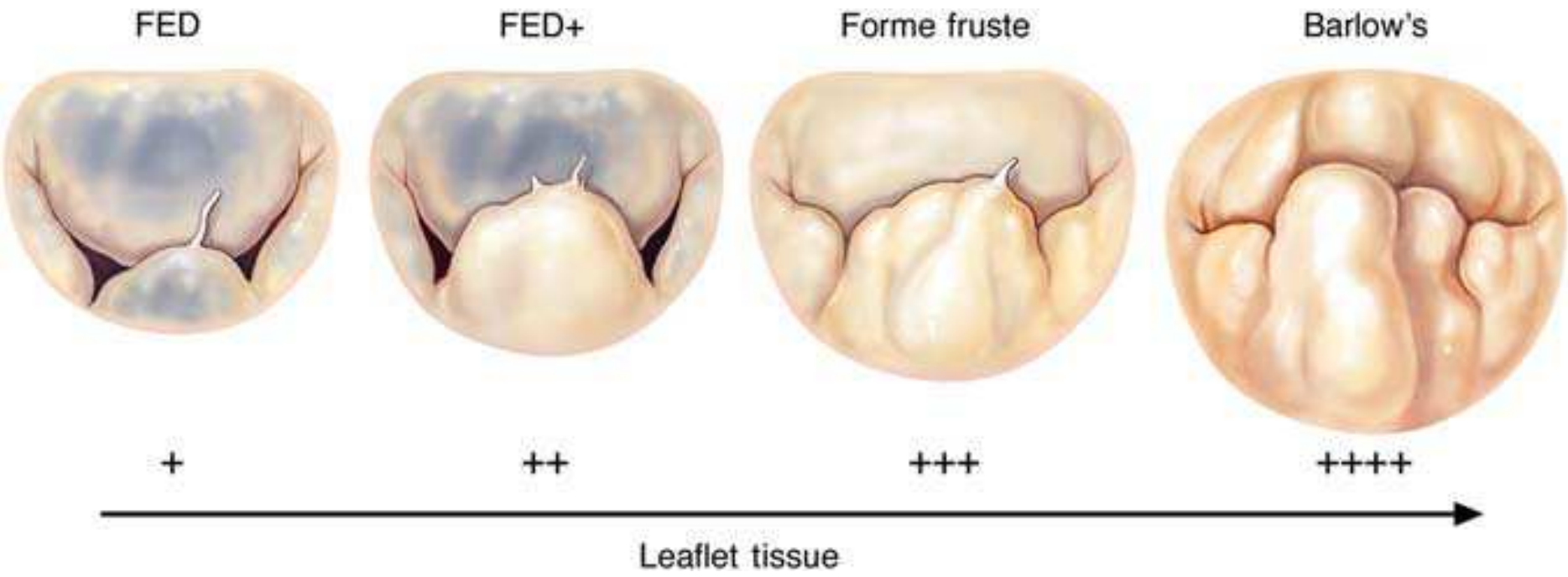
Modern Classification of MR

Etiology and Mechanism of MR

		MR mechanism				
		Organic MR			Functional MR	
		Type I*	Type II**	Type IIIa***	Type I*	Type IIIb***
MR etiology	Nonischemic	*Endocarditis*: perforation *Degenerative*: annular calcification *Congenital*: cleft leaflet	*Degenerative*: billowing/ flail leaflets *Endocarditis*: ruptured chordae *Traumatic*: ruptured chord/PM *Rheumatic*: acute RF	*Rheumatic*: chronic RF *Iatrogenic*: radiation/ drug *Inflammatory*: lupus/ anticardi-olipin, eosinophilic endocardial disease, endomy-ocardial fibrosis	Cardiomyopathy, myocarditis left ventricular dysfunction (any cause)	
	Ischemic		Ruptured PM		Functional ischemic MR	

Contemporary Cardiology: Valvular Heart Disease Chapter 10:221-246

Organic / Primary Mitral Regurgitation



Degenerative / Primary Mitral Regurgitation: Guidelines for MitraClip

CLINICAL PRACTICE GUIDELINE: FOCUSED UPDATE

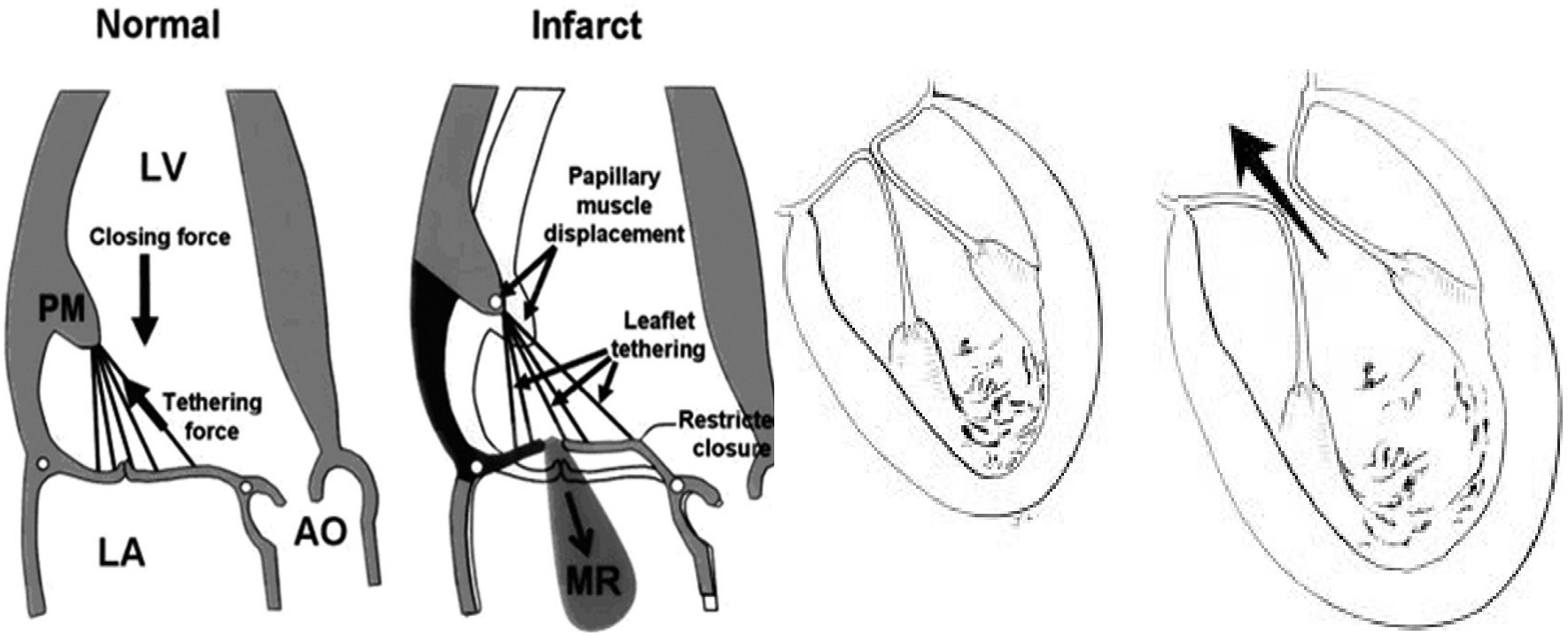
2017 AHA/ACC Focused Update of the 2014 AHA/ACC Guideline for the Management of Patients With Valvular Heart Disease

Transcatheter mitral valve repair may be considered for severely symptomatic patients (NYHA class III to IV) with **chronic severe primary MR** (stage D) who have favorable anatomy for the repair procedure and a reasonable life expectancy but who have a prohibitive surgical risk because of severe comorbidities and remain severely symptomatic despite optimal GDMT for HF (Level of Evidence: B)

EACTS **Indications for intervention in severe primary mitral regurgitation *(continued)*** ESC European Society of Cardiology

Recommendations	Class	Level
Mitral valve replacement may be considered in symptomatic patients with severe LV dysfunction (LVEF <30% and/or LVESD >55 mm) refractory to medical therapy when likelihood of successful repair is low and comorbidity low.	IIb	C
Percutaneous edge-to-edge procedure may be considered in patients with symptomatic severe primary mitral regurgitation who fulfil the echocardiographic criteria of eligibility and are judged inoperable or at high surgical risk by the Heart Team, avoiding futility.	IIb	C

Functional Mitral Regurgitation



Indications for mitral valve intervention in chronic secondary mitral regurgitation *(continued)*

Recommendations	Class	Level
When revascularization is not indicated, surgery may be considered in patients with severe secondary mitral regurgitation and LVEF >30%, who remain symptomatic despite optimal medical management (including CRT if indicated) and have a low surgical risk.	IIb	C
In patients with severe secondary mitral regurgitation and LVEF <30% who remain symptomatic despite optimal medical management (including CRT if indicated) and who have no option for revascularization, the Heart Team may consider percutaneous edge-to-edge procedure or valve surgery after careful evaluation for ventricular assist device or heart transplant according to individual patient characteristics.	IIb	C

Stages of Secondary Mitral Regurgitation

Grade	Definition	Valve Anatomy	Valve Hemodynamics*	Associated Cardiac Findings	Symptoms
A	At risk of MR	• Normal valve leaflets, chords, and annulus in a patient with coronary disease or cardiomyopathy	• No MR jet or small central jet area <20% LA on Doppler • Small vena contracta <0.30 cm	• Normal or mildly dilated LV size with fixed (infarction) or inducible (ischemia) regional wall motion abnormalities • Primary myocardial disease with LV dilation and systolic dysfunction	• Symptoms due to coronary ischemia or HF may be present that respond to revascularization and appropriate medical therapy
B	Progressive MR	• Regional wall motion abnormalities with mild tethering of mitral leaflet • Annular dilation with mild loss of central coaptation of the mitral leaflets	• ERO <0.40 cm^2† • Regurgitant volume <60 mL • Regurgitant fraction <50%	• Regional wall motion abnormalities with reduced LV systolic function • LV dilation and systolic dysfunction due to primary myocardial disease	• Symptoms due to coronary ischemia or HF may be present that respond to revascularization and appropriate medical therapy
C	Asymptomatic severe MR	• Regional wall motion abnormalities and/or LV dilation with severe tethering of mitral leaflet • Annular dilation with severe loss of central coaptation of the mitral leaflets	• ERO ≥0.40 cm^2 † • Regurgitant volume ≥60 mL • Regurgitant fraction ≥50%	• Regional wall motion abnormalities with reduced LV systolic function • LV dilation and systolic dysfunction due to primary myocardial disease	• Symptoms due to coronary ischemia or HF may be present that respond to revascularization and appropriate medical therapy
D	Symptomatic severe MR	• Regional wall motion abnormalities and/or LV dilation with severe tethering of mitral leaflet • Annular dilation with severe loss of central coaptation of the mitral leaflets	• ERO ≥0.40 cm^2† • Regurgitant volume ≥60 mL • Regurgitant fraction ≥50%	• Regional wall motion abnormalities with reduced LV systolic function • LV dilation and systolic dysfunction due to primary myocardial disease	• HF symptoms due to MR persist even after revascularization and optimization of medical therapy • Decreased exercise tolerance • Exertional dyspnea

Circulation. **2017;DOI:** 10.1161/CIR.0000000000000503

Change in severe fMR criteria

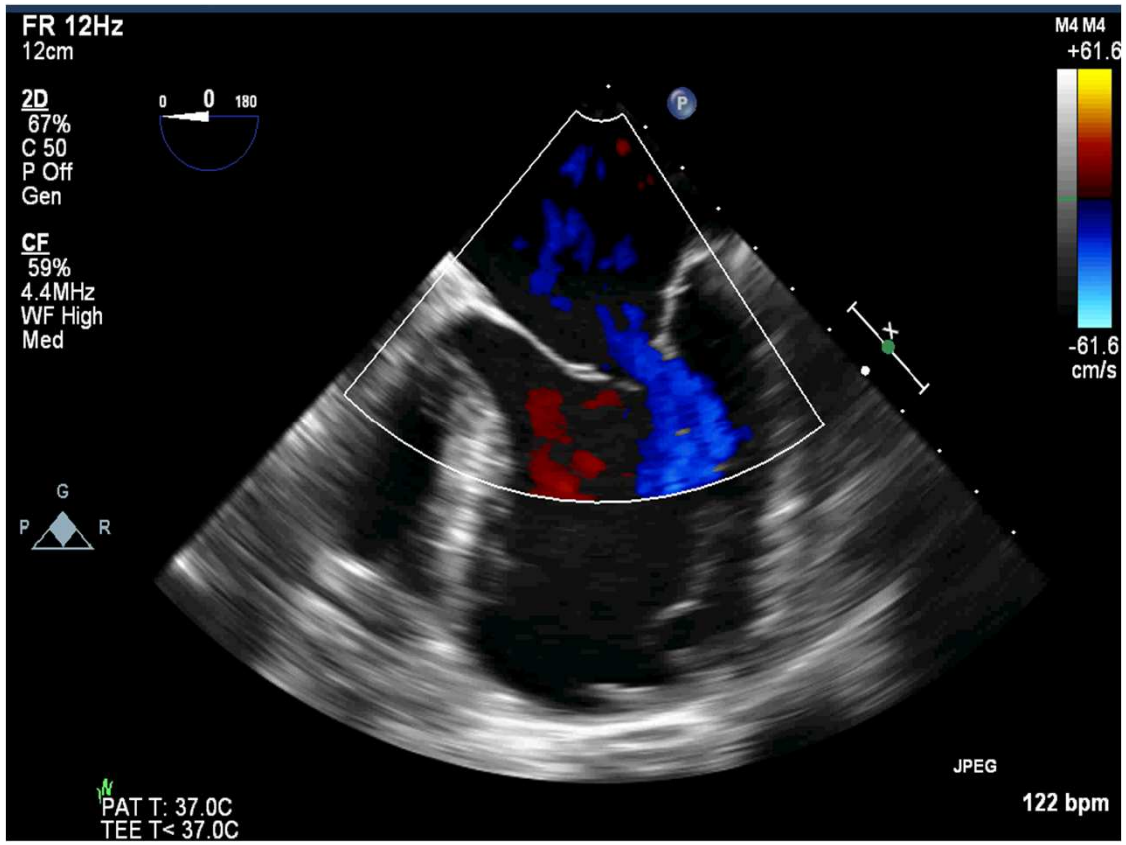
…the recommended definition of severe secondary MR is now the same as for primary MR (effective regurgitant orifice ≥0.4 cm_2 and regurgitant volume ≥60 mL), with the understanding that effective regurgitant orifice cutoff of >0.2 cm^2 is more sensitive and >0.4cm^2 is more specific for severe MR.

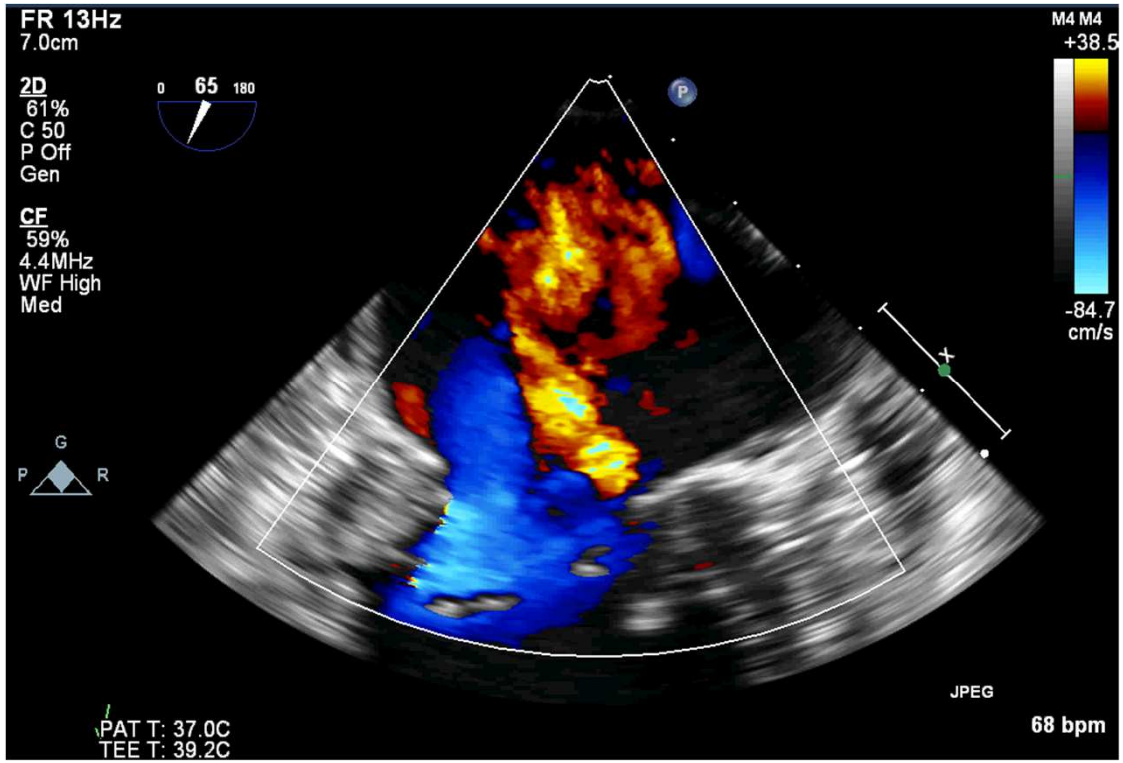
Circulation. **2017;DOI: 10.1161/CIR.0000000000000503**

Is “moderate” MR acceptable in patients with severe heart failure?

Is “moderate” MR acceptable in patients with severe heart failure?

- 89 year old female, NYHA IV
- Acute anterior MI → 1o PCI
- Ischemic cardiomyopathy
  - EF 35%, LVEDD 62mm, LVESD 56mm
- Multiple hospitalizations for acute pulmonary edema
- “*Moderate* mitral regurgitation”
- R_{VOL}34ml, RF 45%, EROA 20mm^2

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2D
61%
C 50
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CF
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WF High
Med
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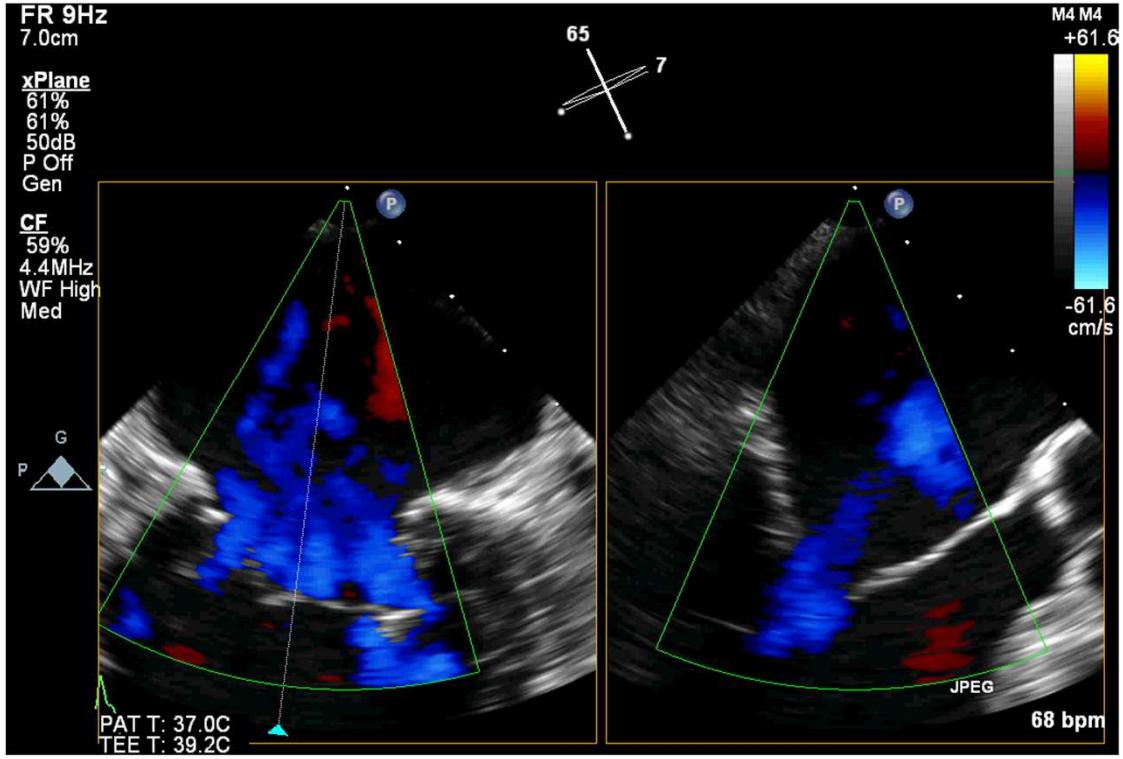
M4 M4
+38.5
-84.7
cm/s
JPEG
68 bpm
PAT T: 37.0C
TEE T: 39.2C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P Off
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CF
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4.4MHz
WF High
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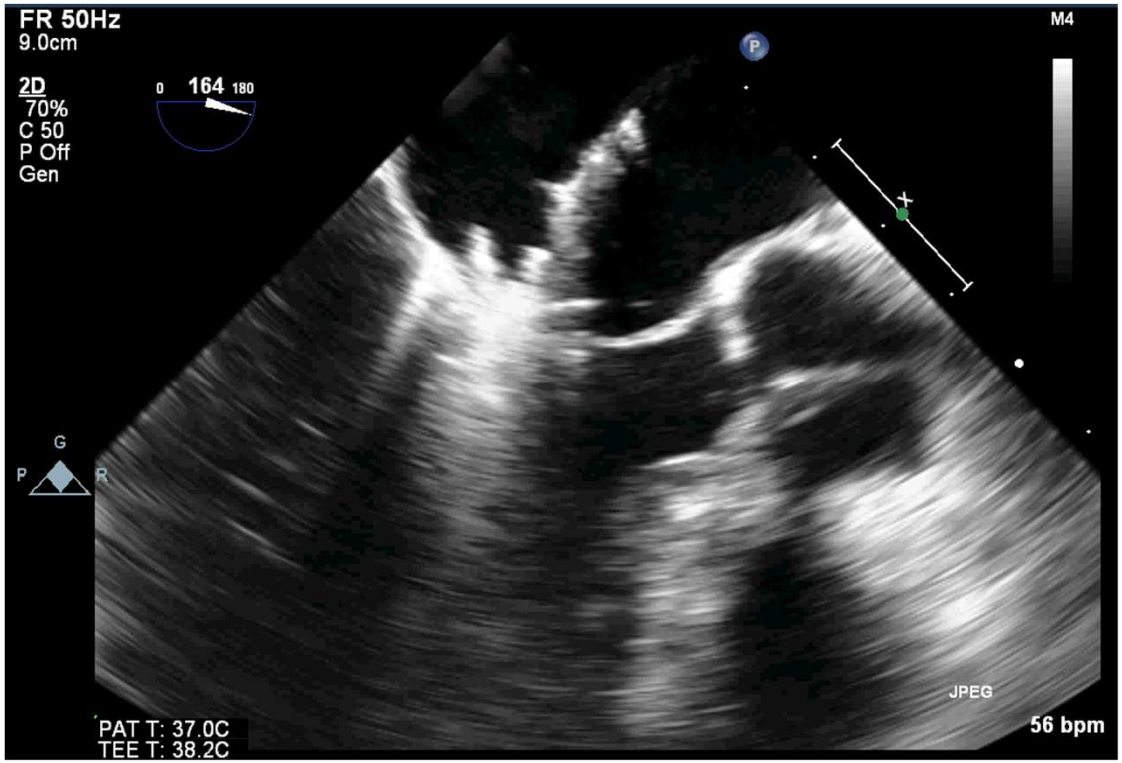
M4 M4
+61.6
-61.6
cm/s
G
P
PAT T: 37.0C
TEE T: 39.2C
JPEG
68 bpm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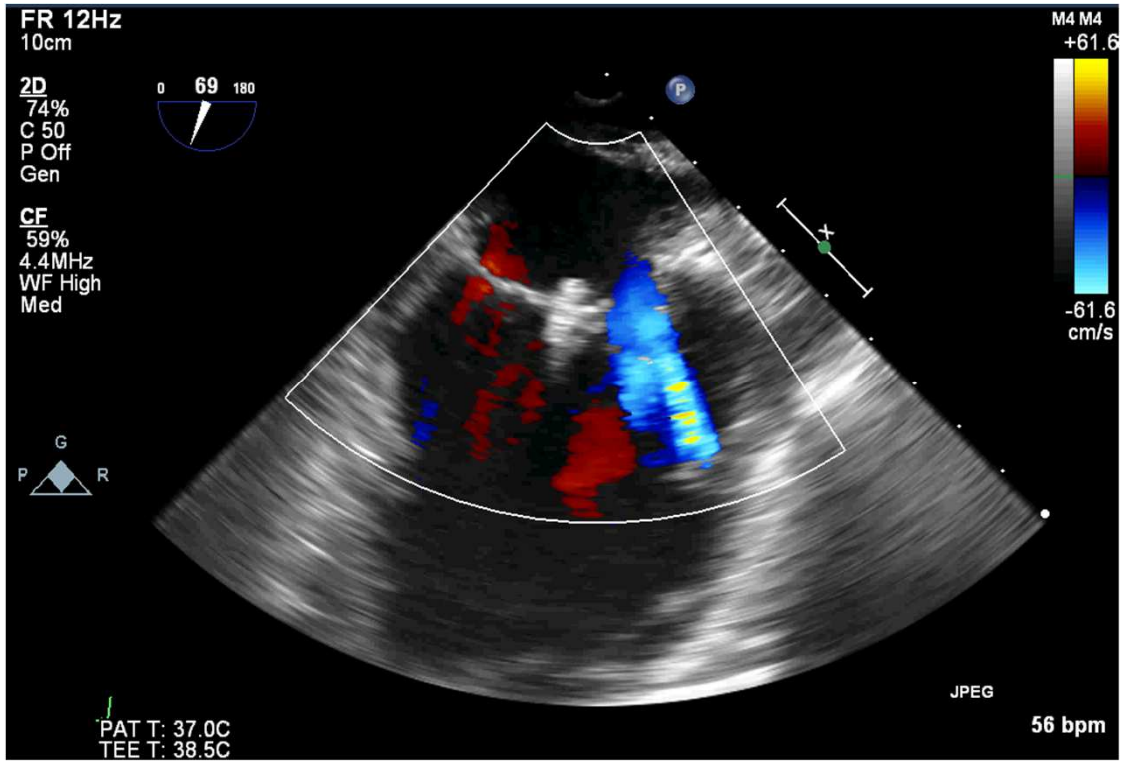
9.0cm
2D
70%
C 50
P Off
Gen
0
164
180
M4
G
P
R
JPEG
PAT T: 37.0C
TEE T: 38.2C
56 bpm


FR 12Hz
10cm
2D
74%
C 50
P Off
Gen
CF
59%
4.4MHz
WF High
Med
0
69
180
G
P
R
M4 M4
+61.6
-61.6
cm/s
JPEG
56 bpm
PAT T: 37.0C
TEE T: 38.5C

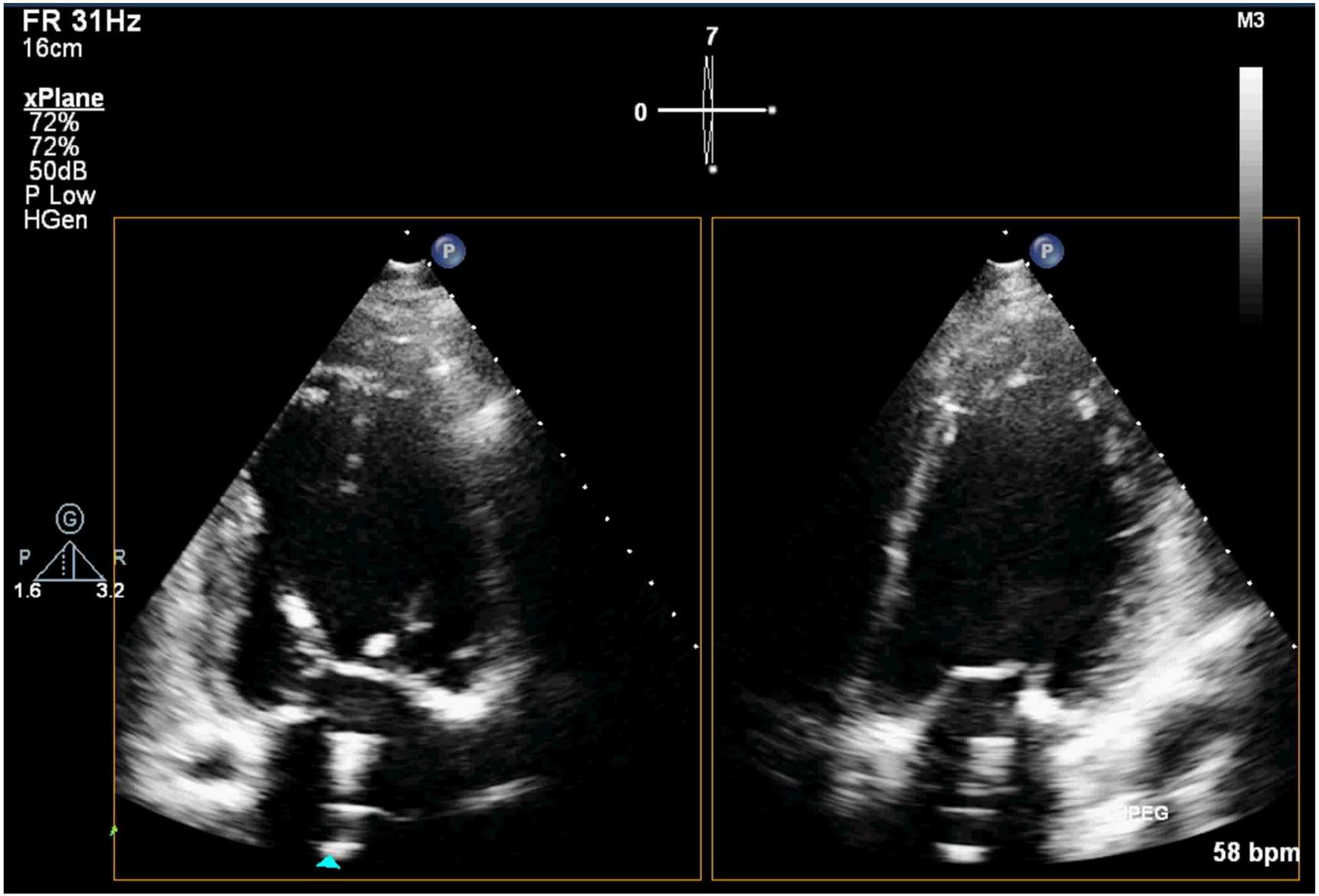
Is “moderate” MR acceptable in patients with severe heart failure?

- Patient hospital course uneventful
- At 12 months, no readmissions for heart failure, NYHA class I-II
- Sustained mitral regurgitation reduction on follow up

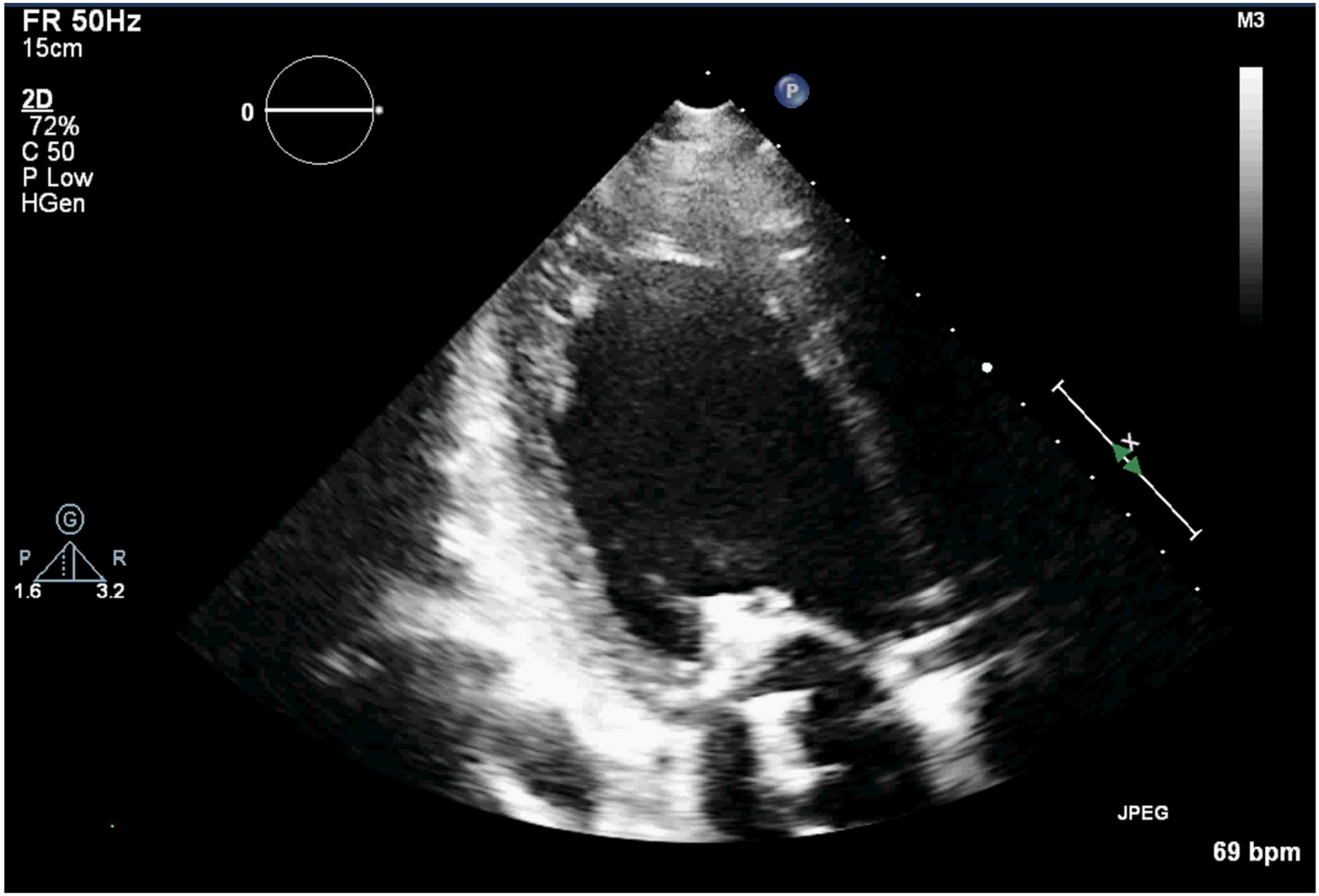
- “Moderate” MR should be considered as a therapeutic target in patients with severe heart failure symptoms
- Stress echo by supine bicycle, or simply raising the blood pressure may uncover the true significance of MR in the patient

Optimal TEE Imaging

- Patient / anatomical factors
  - Adequate imaging in majority of patients
  - In rare patients, impossible to obtain adequate TEE imaging planes for steering
- Technical factors
  - Image degradation after prolonged procedure
  - Need for breath holding during grasping of leaflets to ensure stable imaging



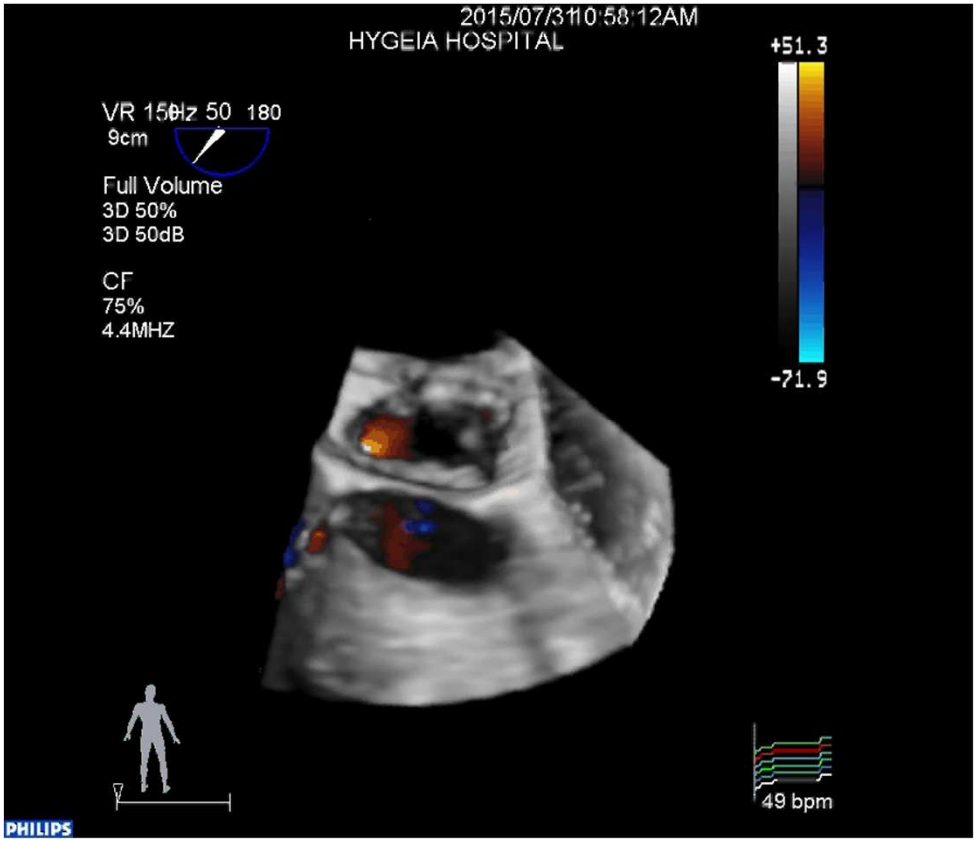
J Echocardiogr. 2017 Nov 27. doi: 10.1007/s12574-017-0358-0



J Echocardiogr. 2017 Nov 27. doi: 10.1007/s12574-017-0358-0

Defining Mitral Regurgitant Jet(s)

- 3-Dimensional with Color Flow Imaging
- Vena contracta area assessment (area of the narrowest point of the mitral regurgitant jet)
  - Marker of severity
- In addition to evaluation of MV inflow, pulmonary vein flow, ERO calculations, chamber size, degree of pulmonary hypertension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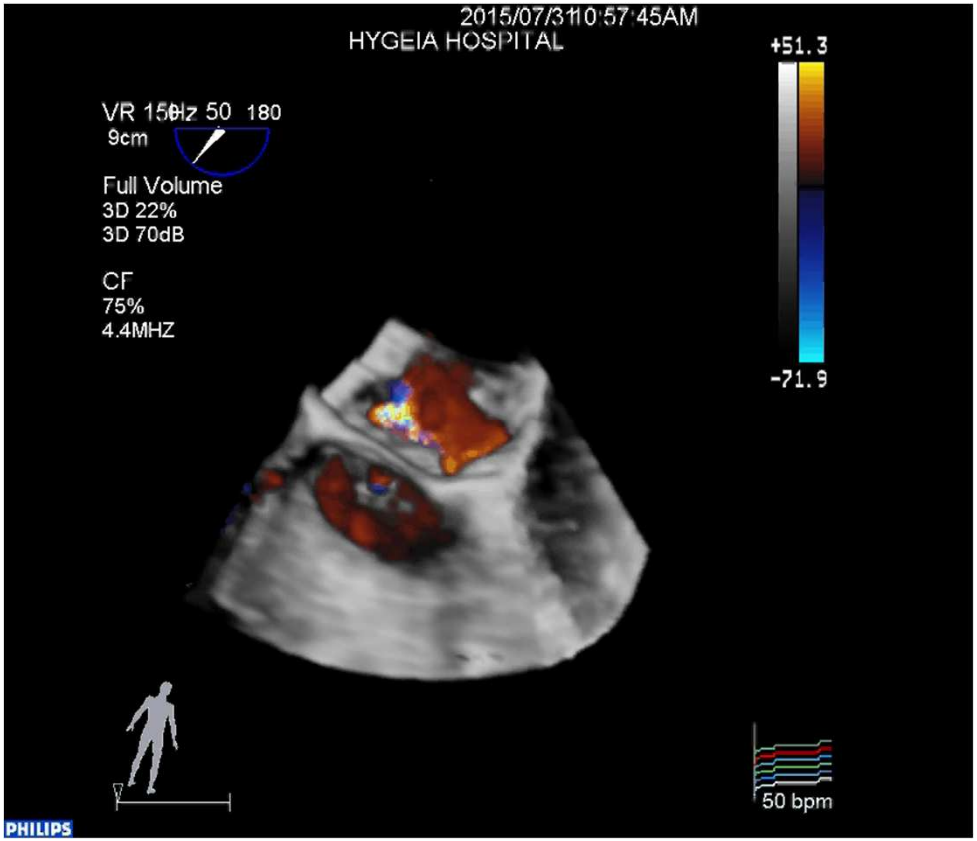
HYGEIA HOSPITAL
+51.3
-71.9
VR 150Hz 50 180
9cm
Full Volume
3D 50%
3D 50dB
CF
75%
4.4MHZ
49 bpm
PHILIPS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9cm
Full Volume
3D 22%
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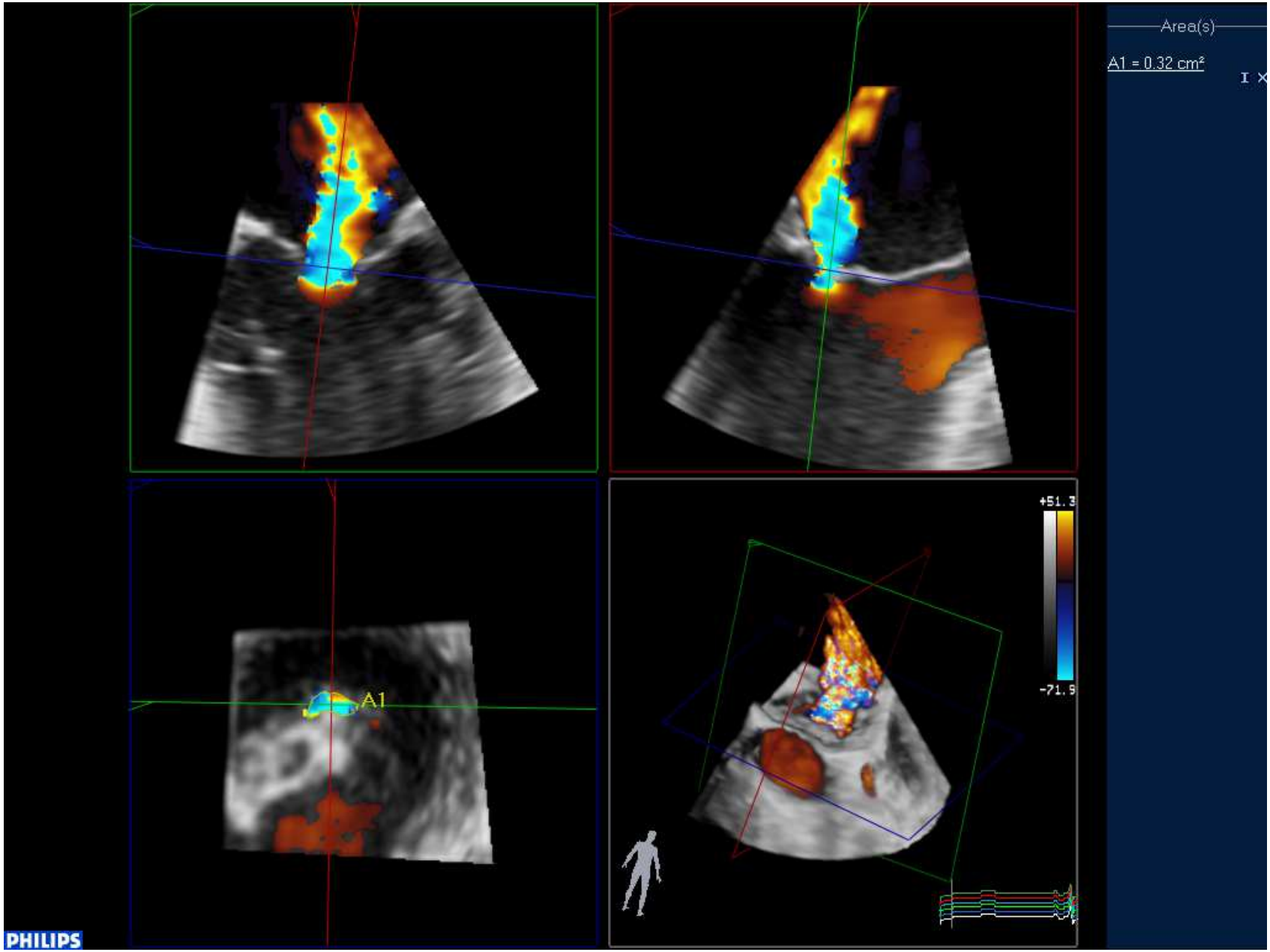
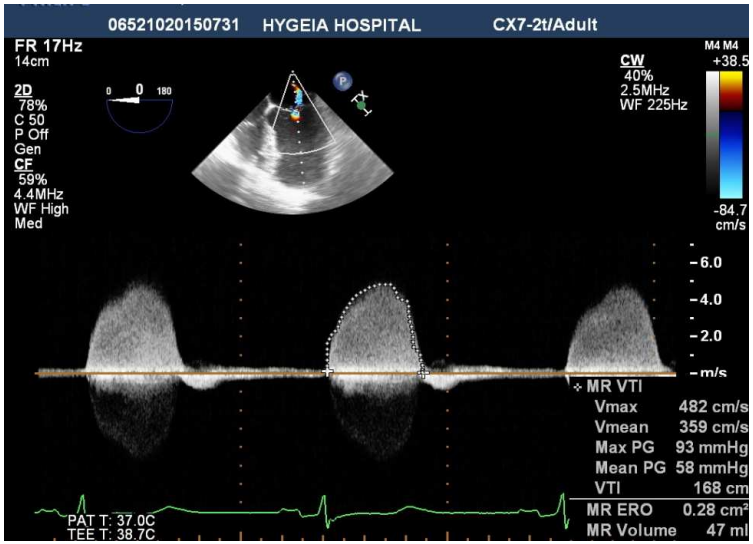
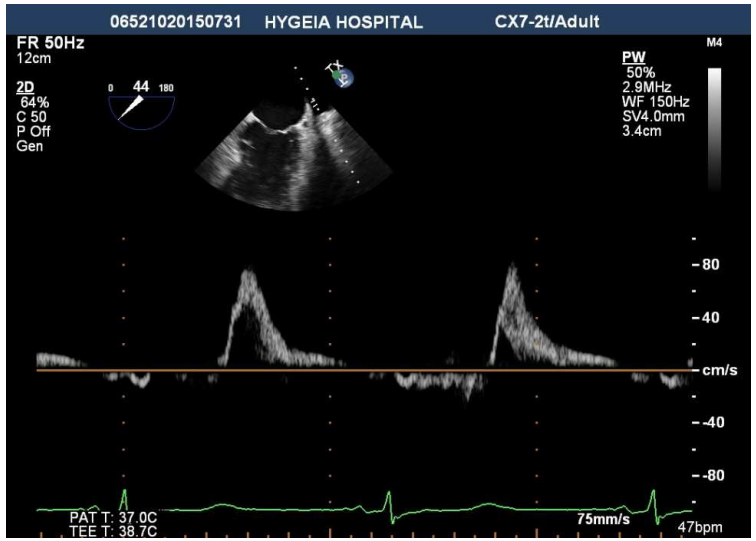
4.4MHZ
50 bpm
PHILIPS


Area(s)
A1 = 0.32 cm²
A1
+51.3
-71.9
PHILIPS

Baseline MR Evaluation



MR_{VOL} 47ml, ERO 28mm^2

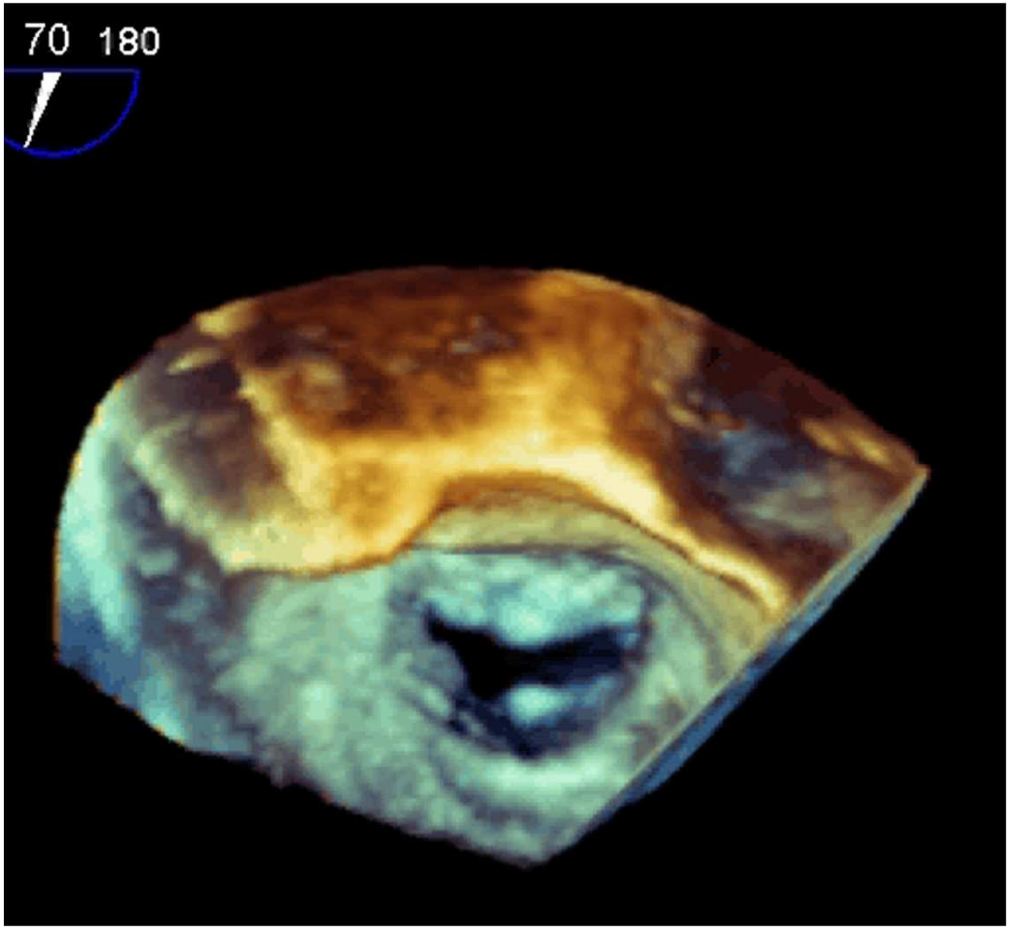


Suppression of systolic PV flow

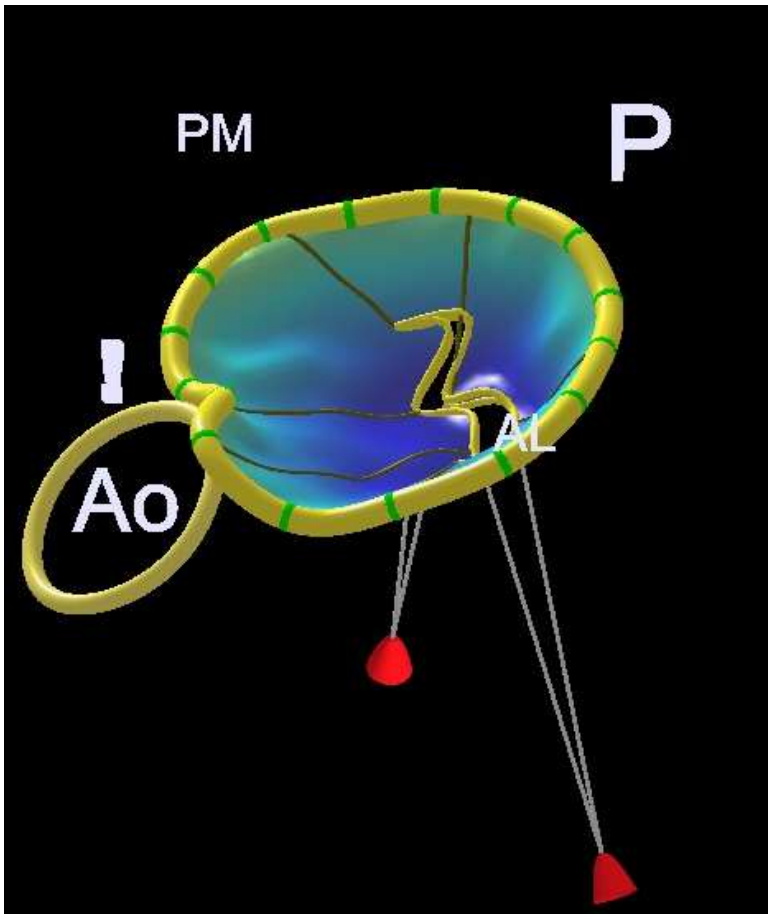
Defining Mitral Valve Pathology

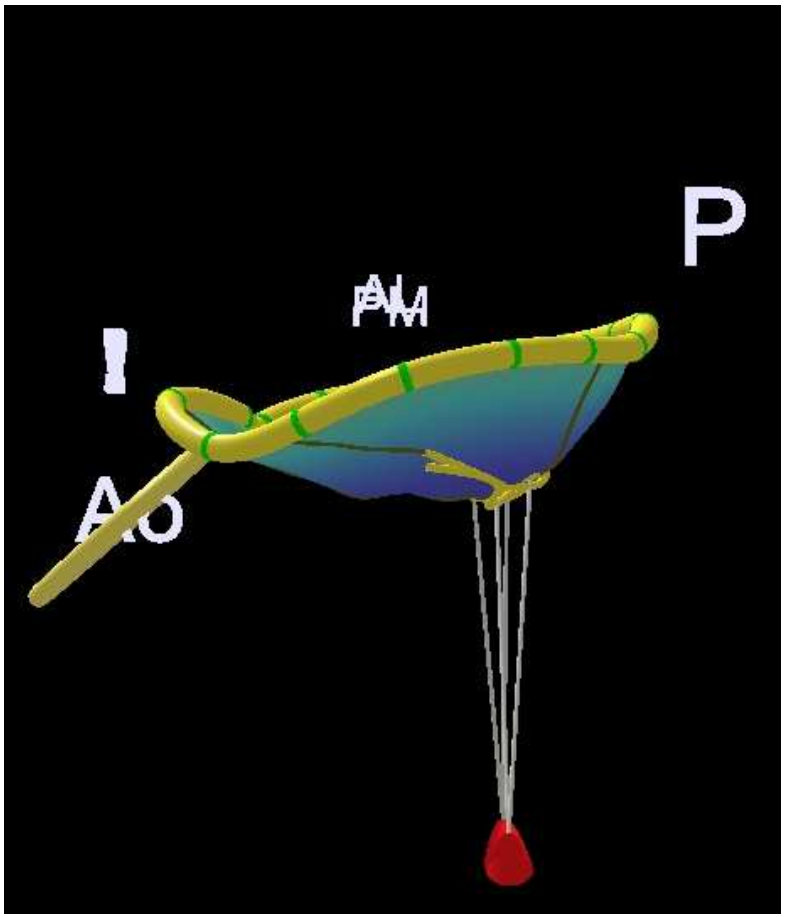
- Functional
- Degenerative

3-D Mitral Valve

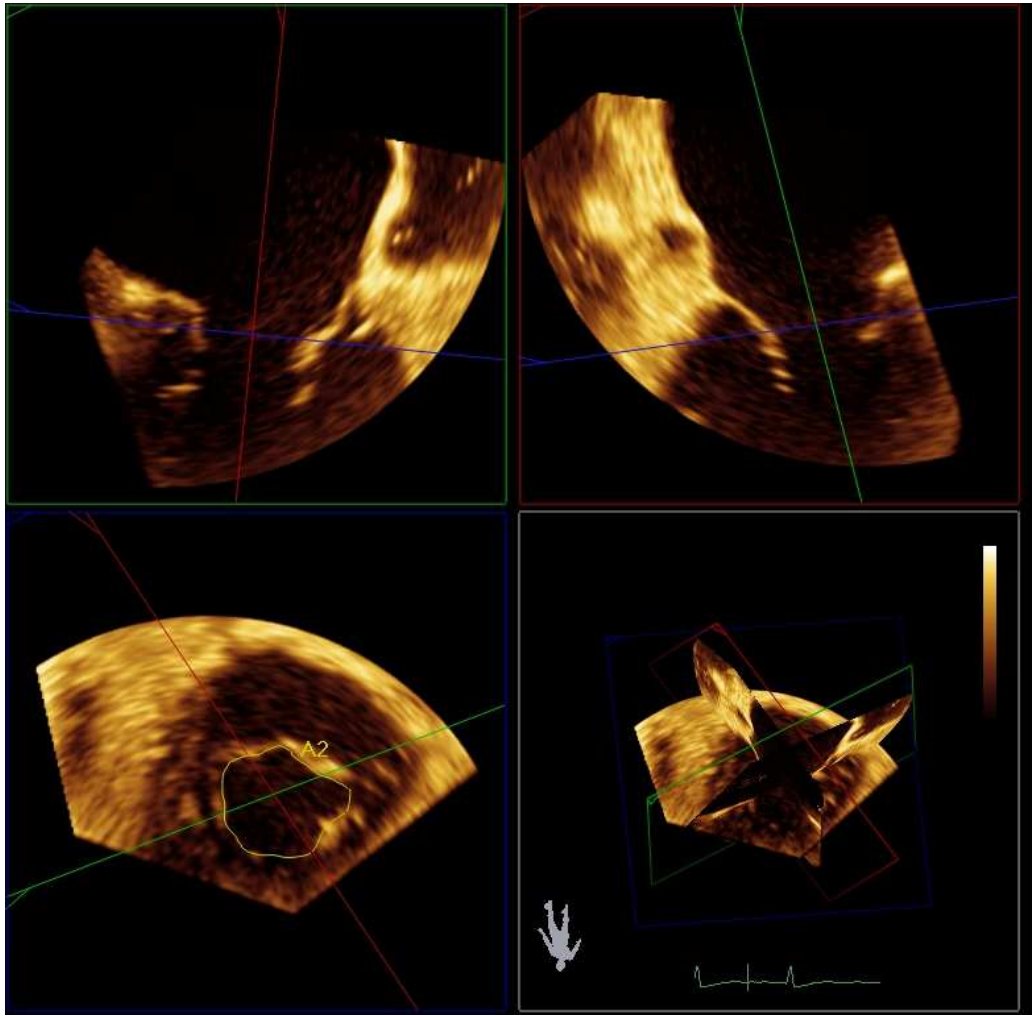


Modelling of Mitral Valve - MVQ



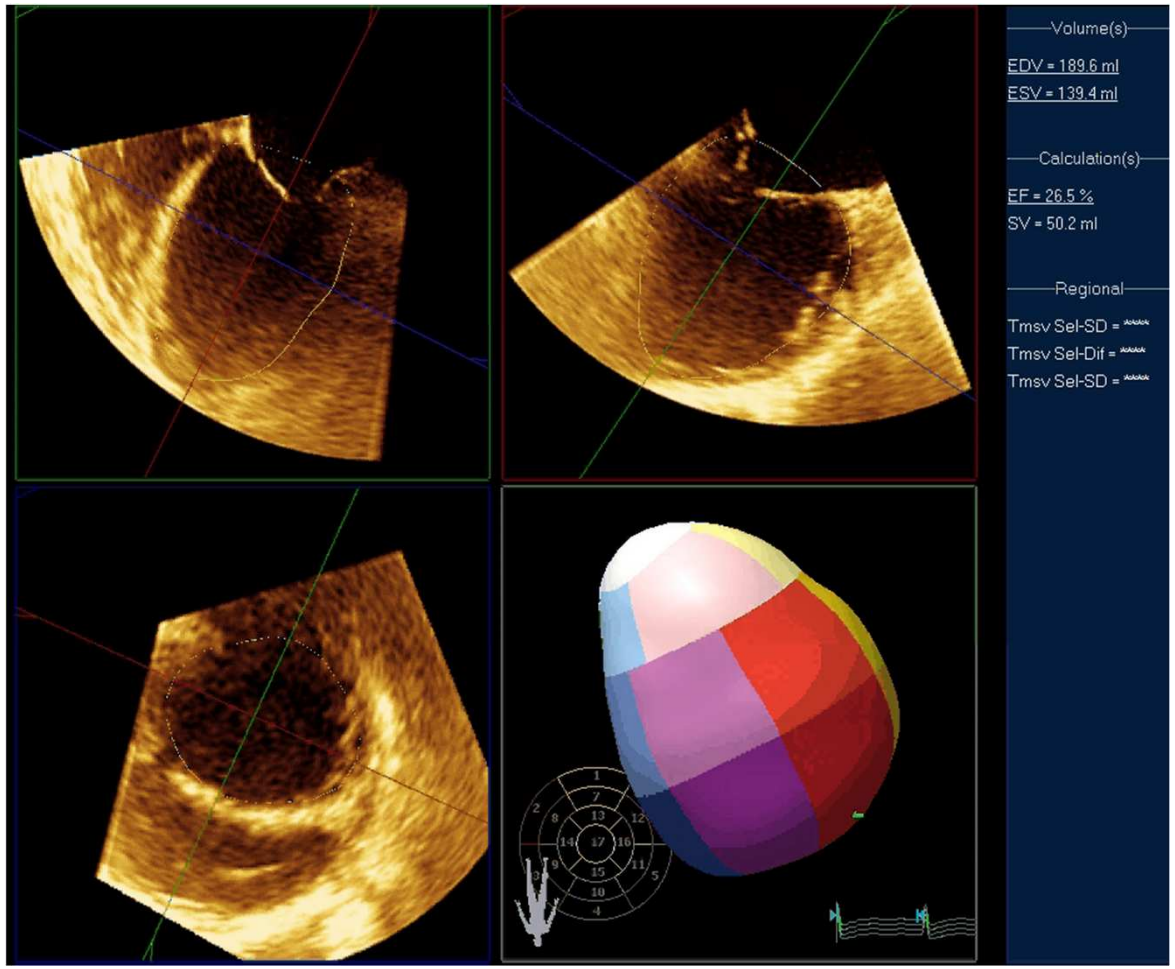


Evaluation of MV Area with Multiplanar Reconstruction

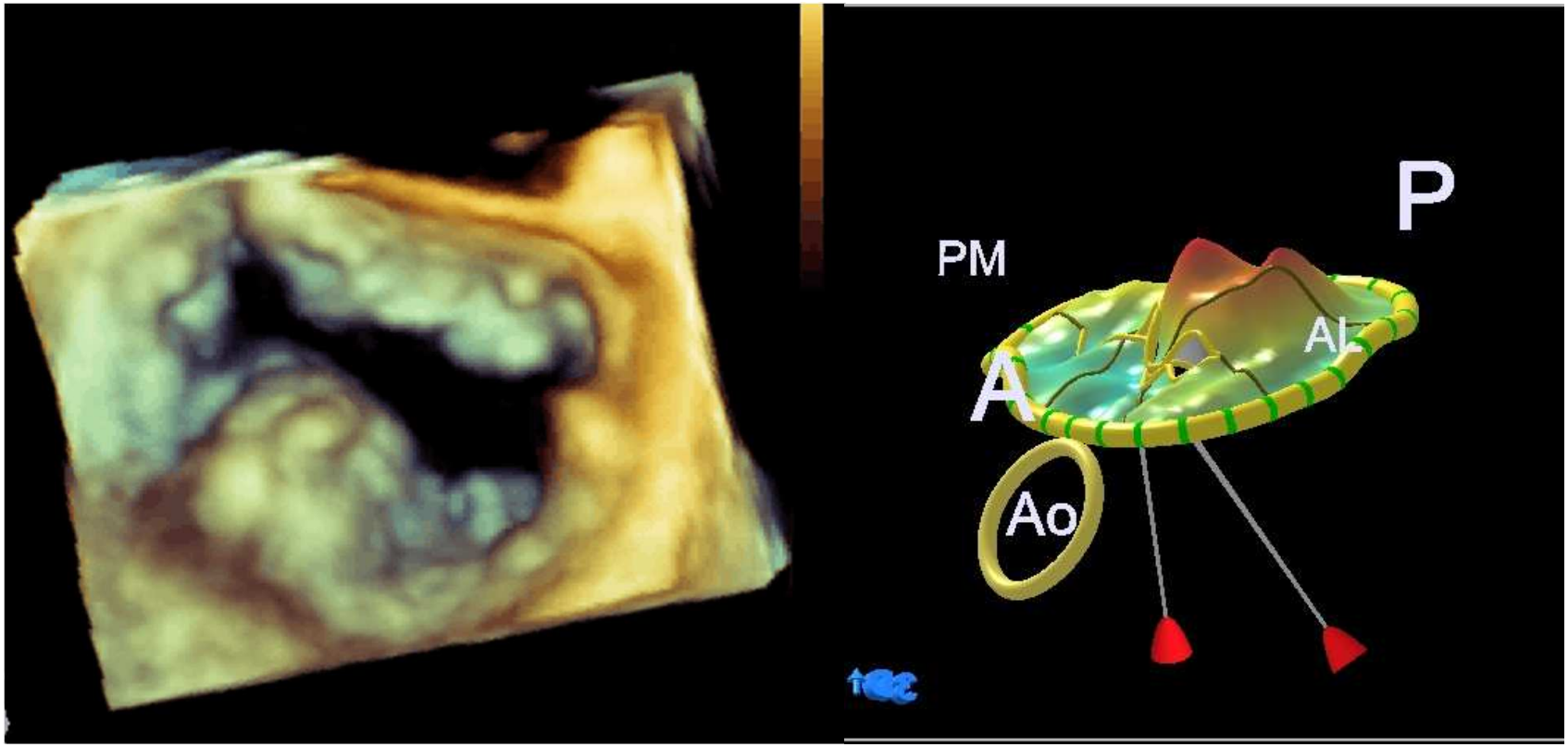


MVA 4.9cm^2

Left Ventricular Function Assessment

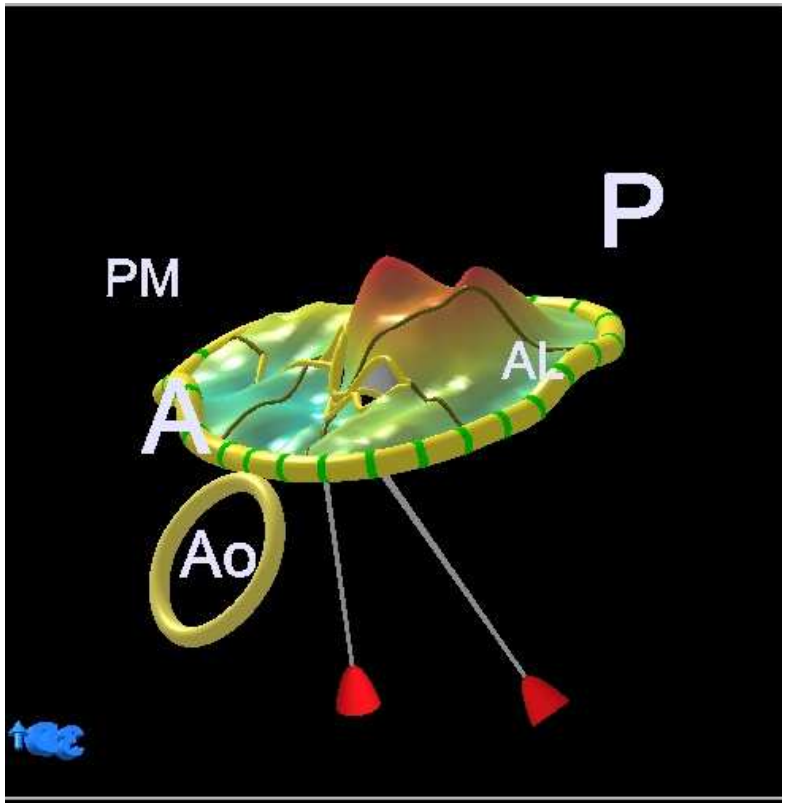


Prolapse / flail of the P2



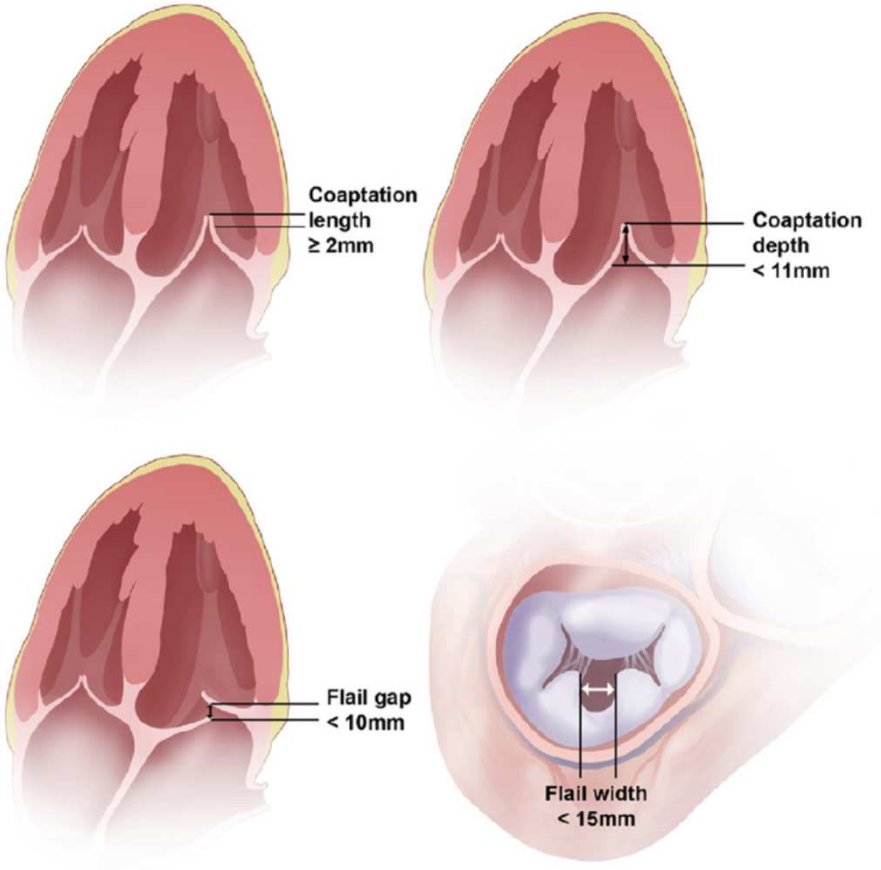
Prolapse / flail P2 seen in 3D
zoom (anatomically oriented)

MVQ Analysis and 3D Color Flow



MitraClip: Initial Inclusion Criteria (EVEREST studies)

- **Valve geometry features**:
  - Coaptation length ≥2 mm, coaptation depth <11 mm,
  - Flail gap <10 mm, flail width <15 mm
- **Ventricle function/ geometry**:
  - Ejection fraction [EF] >25%,
  - LV end-systolic diameter ≤55mm



MitraClip Anatomic Evaluation: Basic Requirements

- Ability to *approximate leaflets*
- Adequate *mitral valve orifice ar*ea (to avoid iatrogenic mitral stenosis)
- Adequate transesophageal *imaging* to guide the procedure
- ➔ Expanding indications to non-EVEREST anatomies

Percutaneous interventional mitral regurgitation treatment using the Mitra-Clip system

P. Boekstegers · J. Hausleiter · S. Baldus · R. S. von Bardeleben · H. Beucher · C. Butter · O. Franzen · R. Hoffmann · H. Ince · K. H. Kuck · V. Rudolph · U. Schäfer · W. Schillinger · N. Wunderlich

Table 2 Morphology for a Mitraclip therapy

Optimal valve morphology	Conditionally suitable valve morphology	Unsuitable valve morphology
Central pathology in Segment 2	Pathology in Segment 1 oder 3	Perforated mitral valve leaflet or cleft
No leaflet calcification	Mild calcification outside of the grip-zone of the clip system; ring calcification, post annuloplasty	Severe calcification in the grip-zone
Mitral valve opening area >4 cm^2	Mitral valve opening area >3 cm^2 with good residual mobility	Haemodynamically significant mitral stenosis (valve opening area <3 cm^2, MPG ≥ 5 mmHg)
Mobile length of the posterior leaflet ≥10 mm	Mobile length of the posterior leaflet 7–<10 mm	Mobile length of the posterior leaflet <7 mm
Coaption depth <11 mm	Coaption depth ≥11 mm	
Normal leaflet strength and mobility	Leaflet restriction in systole (Carpentier IIIB)	Rheumatic leaflet thickening and restriction in systole and diastole(Carpentier IIIA)
Flail-width <15 mmFlail-Gap <10 mm	Flail-width >15 mm only with a large ring width and the option for multiple clips	Barlow's syndrome with multisegment flail leaflets

Clin Res Cardiol (2014) 103:85–96

Optimal Anatomy for MitraClip

Optimal valve morphology
Central pathology in Segment 2
No leaflet calcification
Mitral valve opening area >4 cm^2
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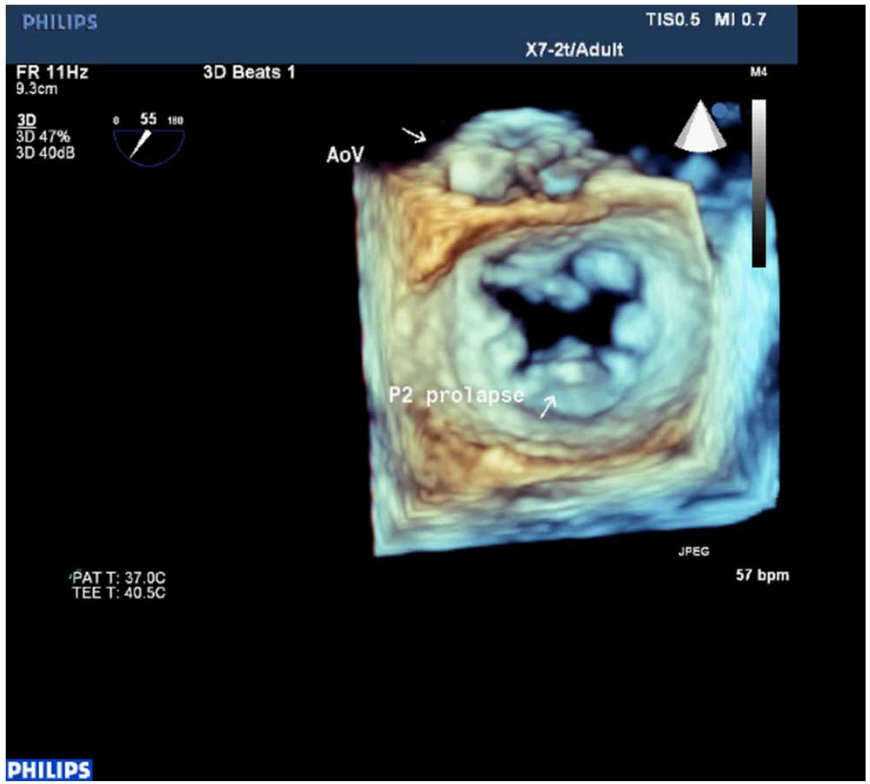

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HYGEIA Hospital Heart Team

Conditionally Suitable Anatomy for MitraClip

Conditionally suitable valve morphology
Pathology in Segment 1 oder 3
Mild calcification outside of the grip-zone of the clip system; ring calcification, post annuloplasty
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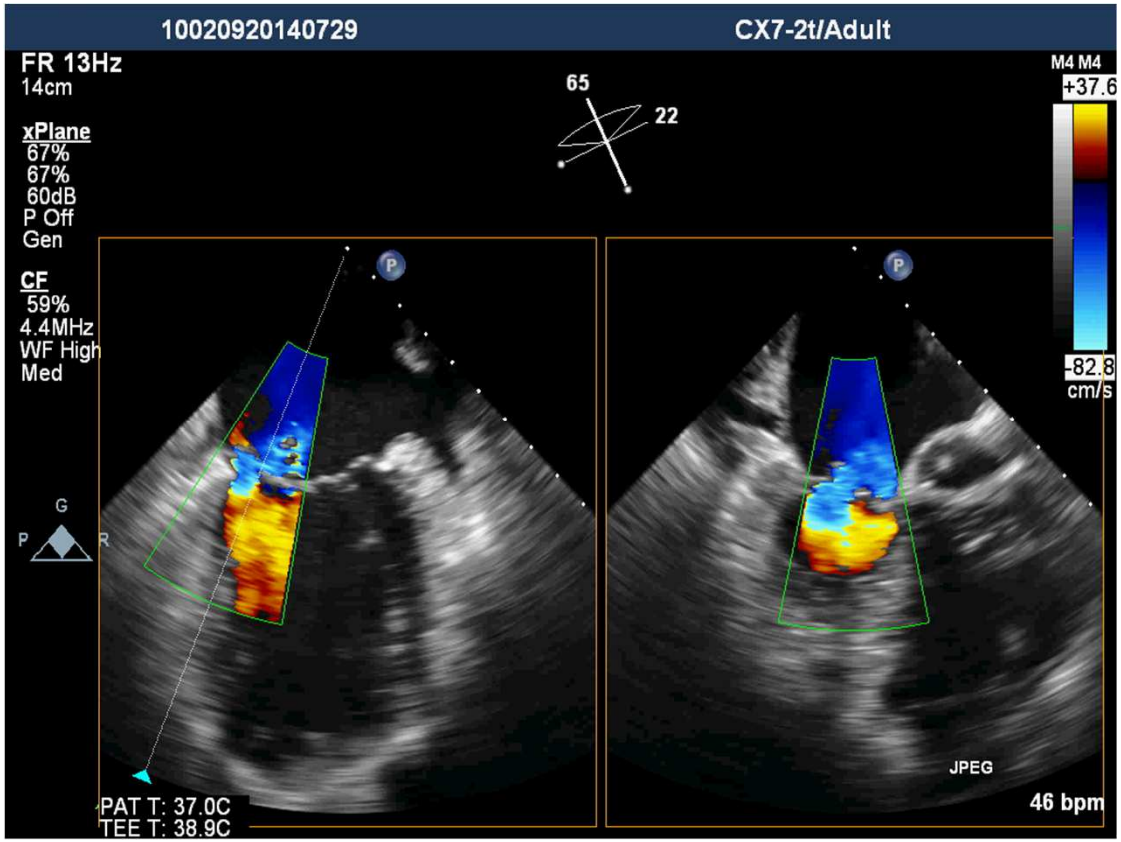

Clin Res Cardiol (2014) 103:85–96

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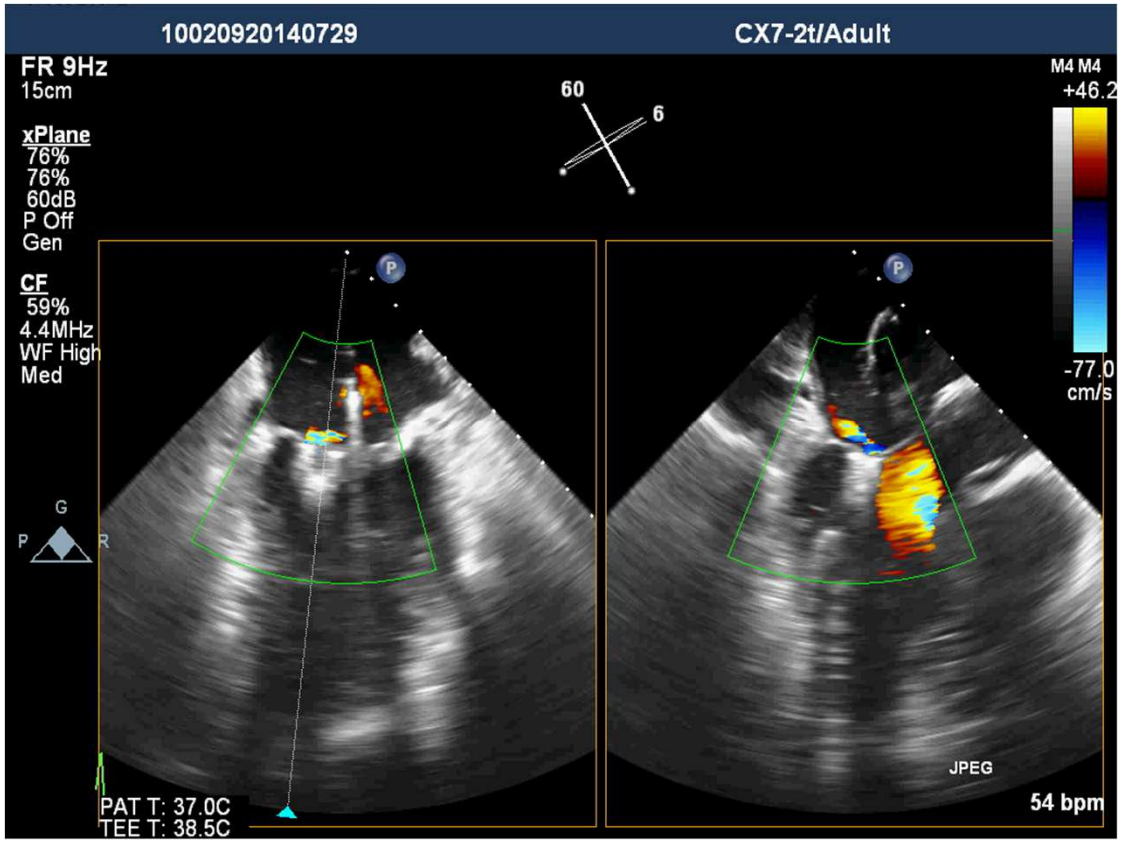

Clin Res Cardiol (2014) 103:85–96

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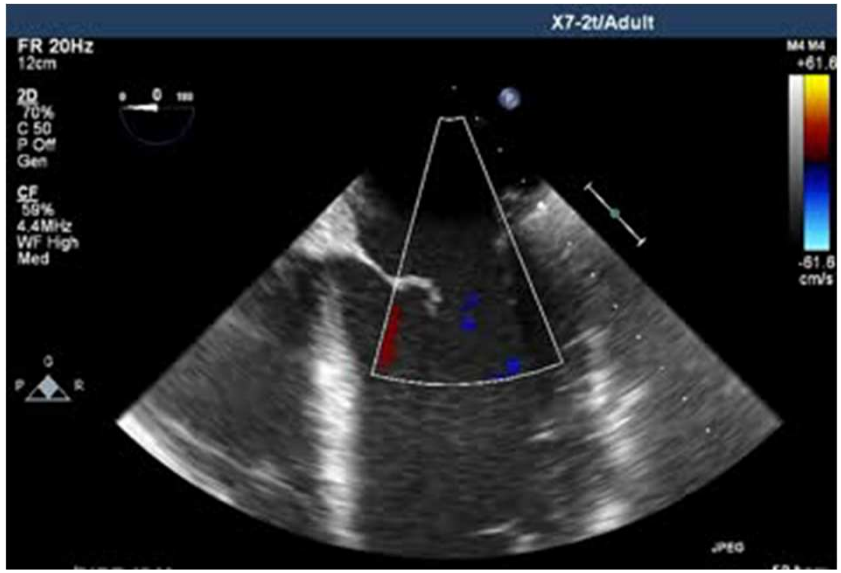
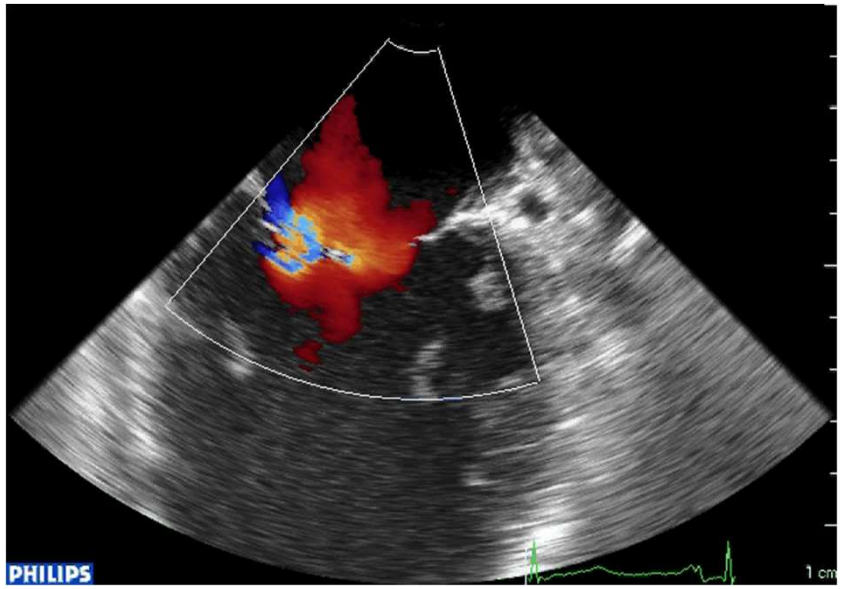
Clin Res Cardiol (2014) 103:85–96





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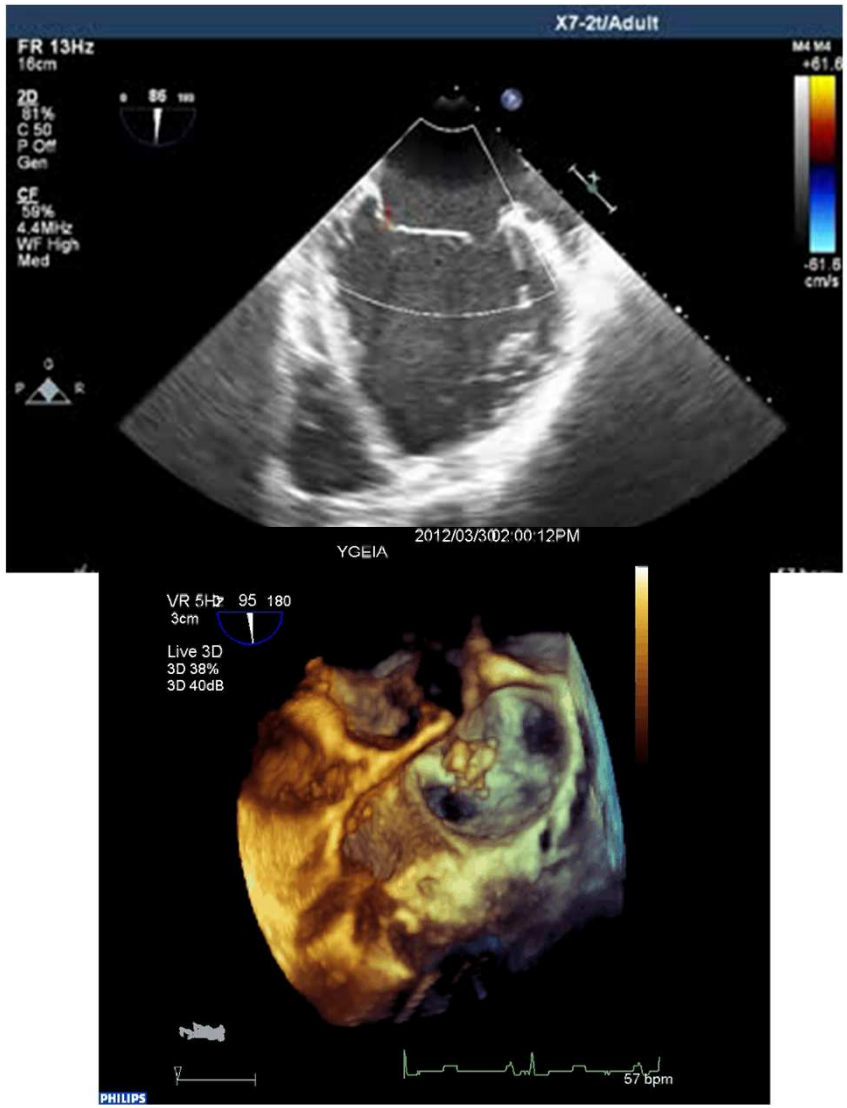
Clin Res Cardiol (2014) 103:85–96



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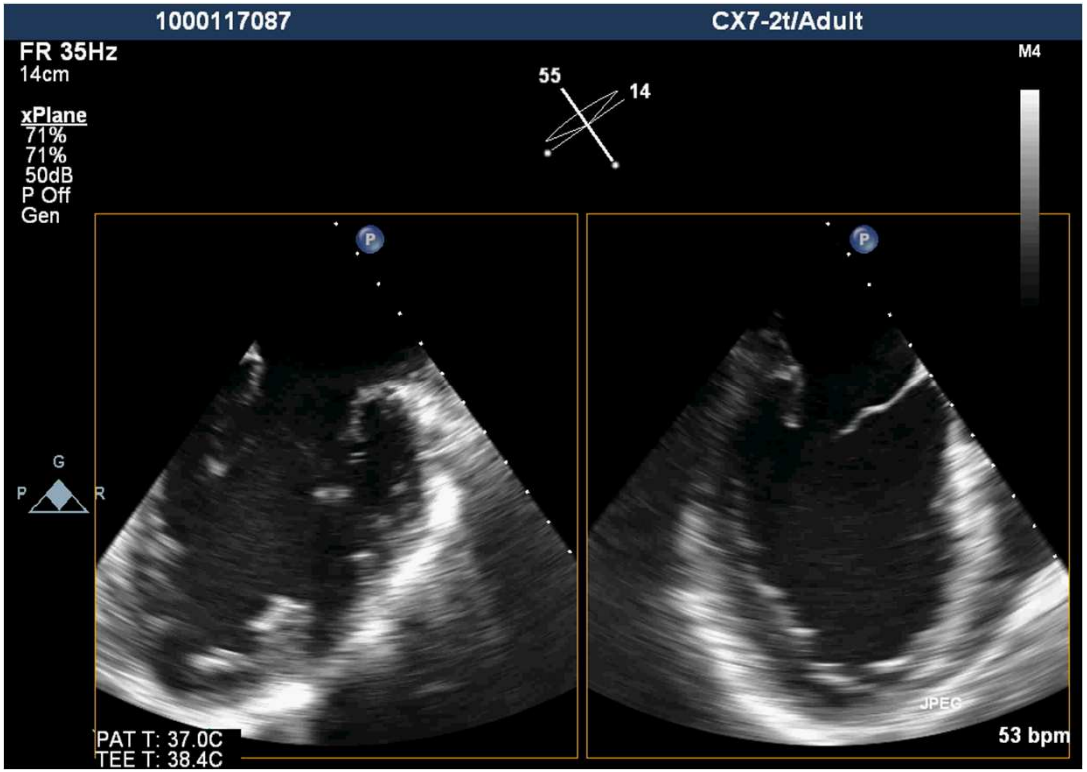

Clin Res Cardiol (2014) 103:85–96

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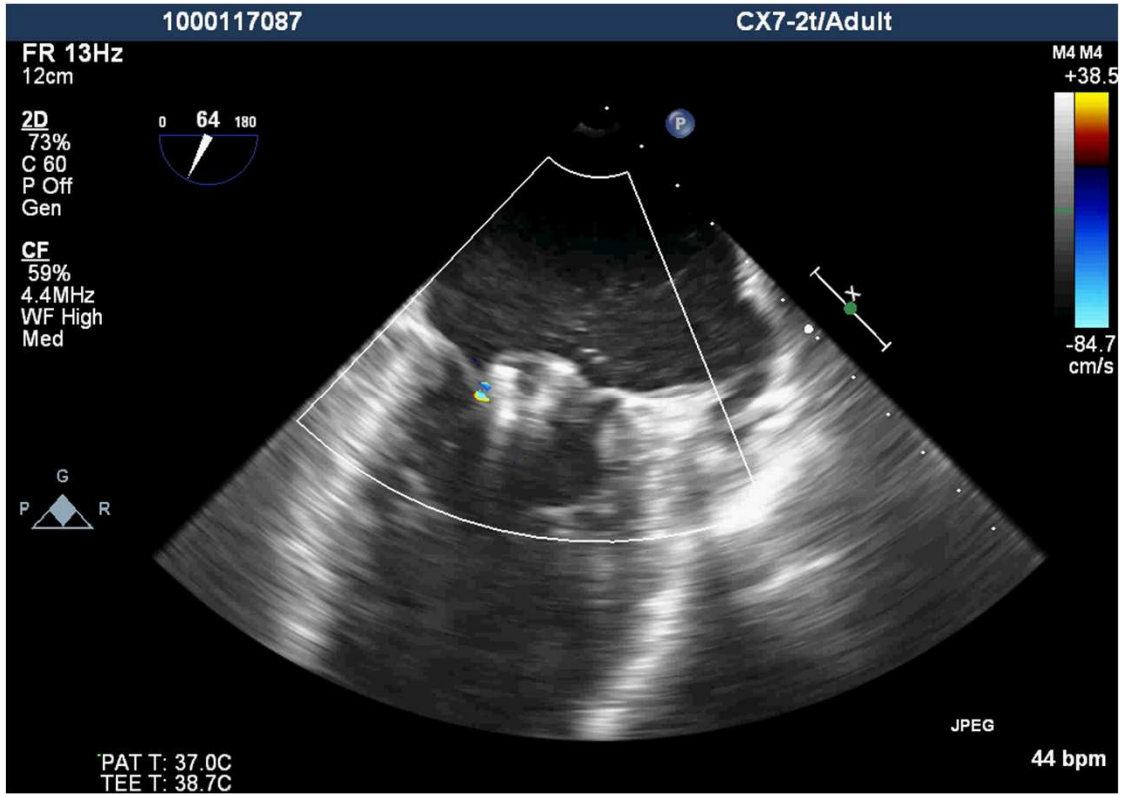

Clin Res Cardiol (2014) 103:85–96

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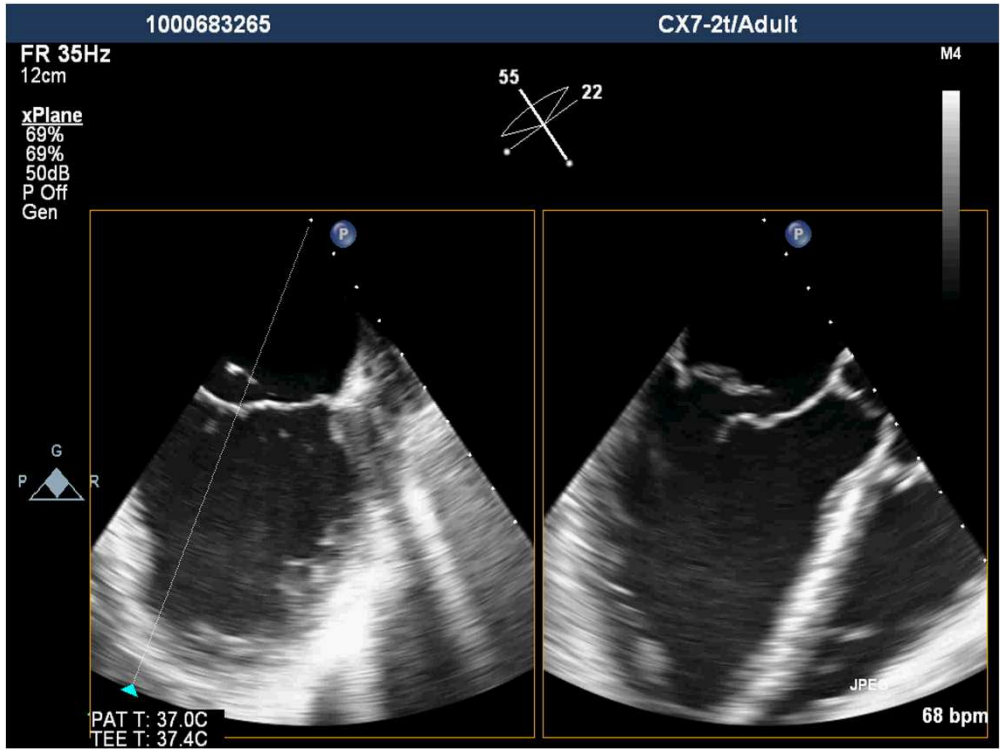

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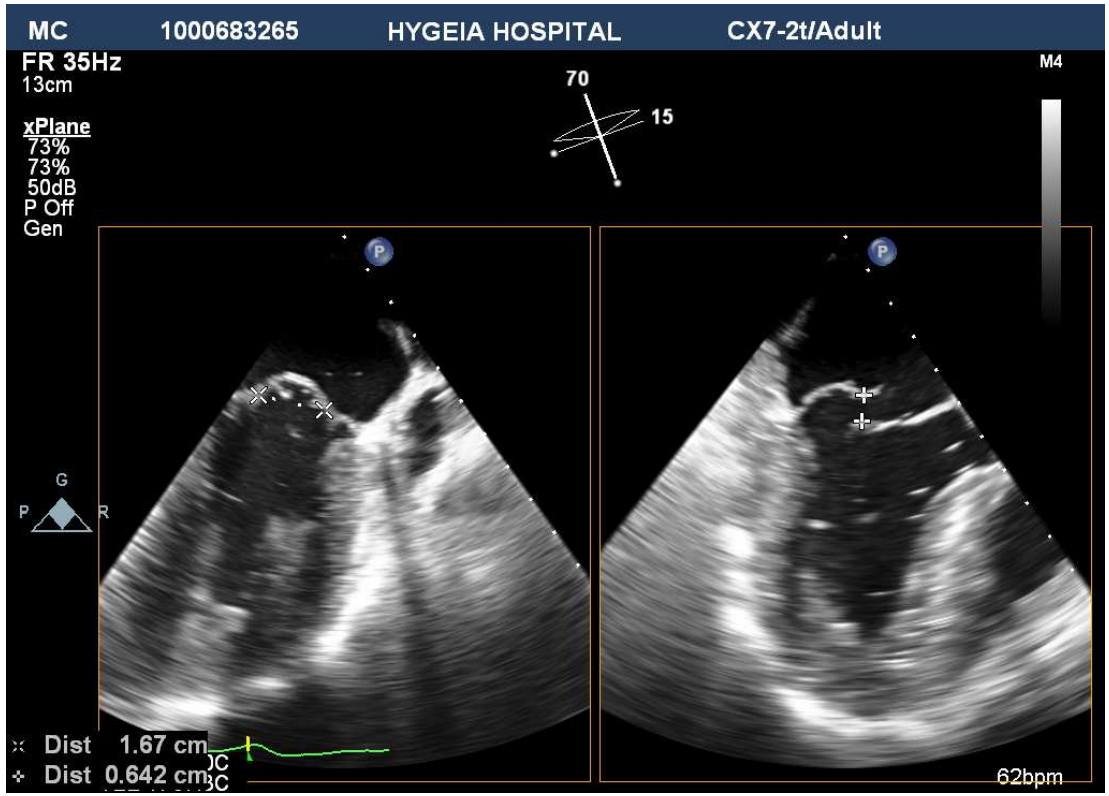

Clin Res Cardiol (2014) 103:85–96

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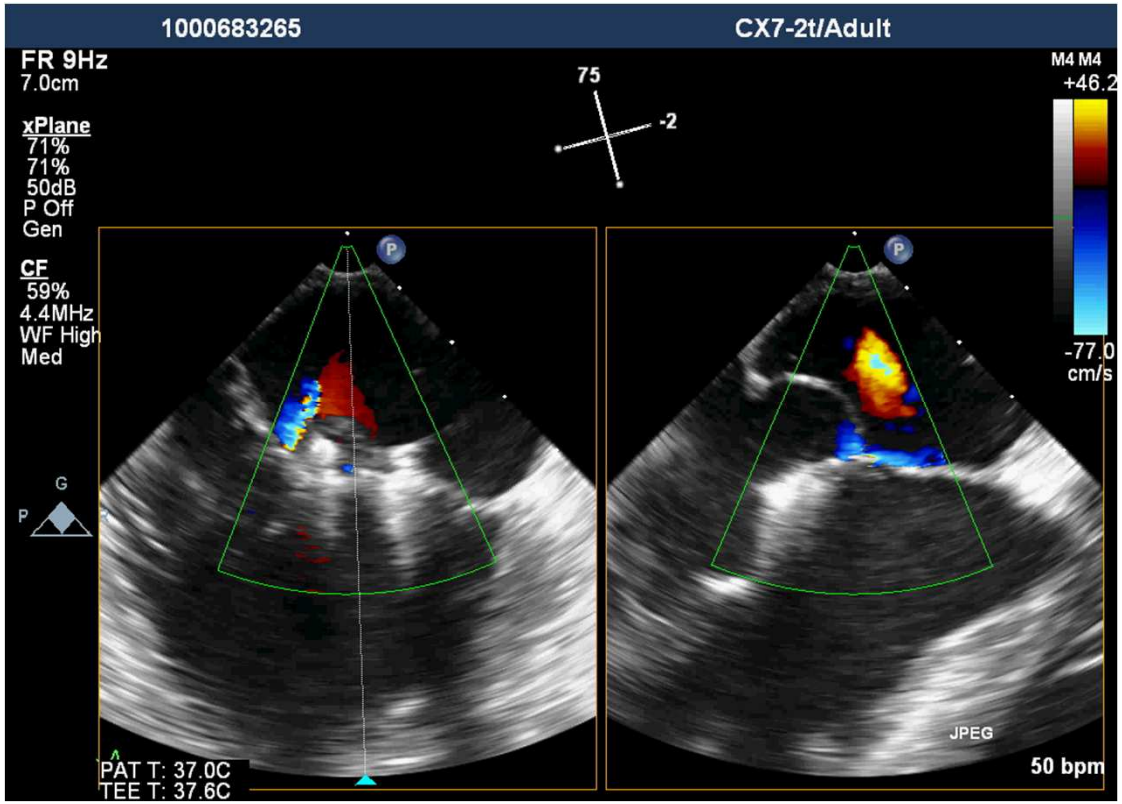

Clin Res Cardiol (2014) 103:85–96

Unsuitable Valve Morphology for MitraClip

Perforated mitral valve leaflet or cleft
Severe calcification in the grip-zone
Haemodynamically significant mitral stenosis (valve opening area <3 cm^2, MPG $\geq$ 5 mmHg)
Mobile length of the posterior leaflet <7 mm
Rheumatic leaflet thickening and restriction in systole and diastole(Carpentier IIIA)
Barlow's syndrome with multisegment flail leaflets

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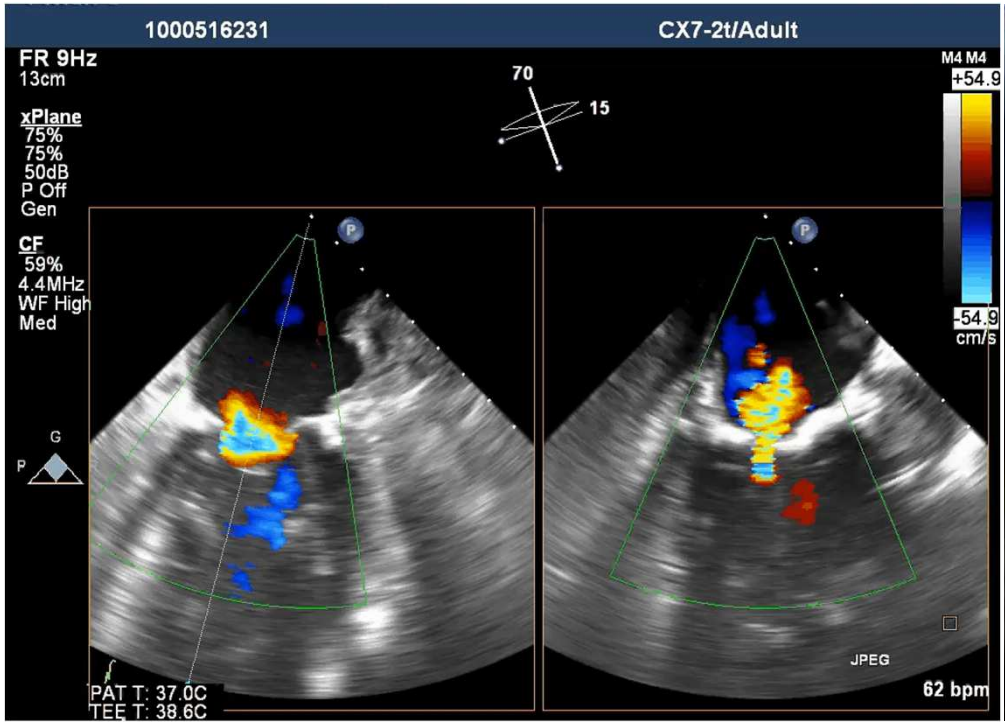
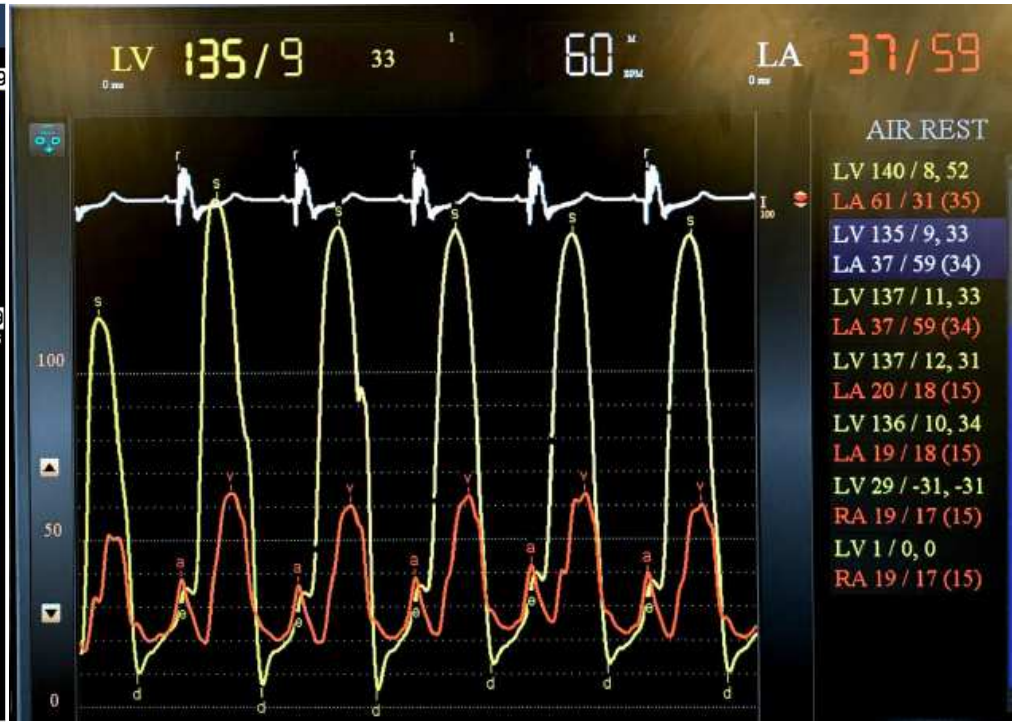
Severely degenerated mitral valve in 3D-Zoom

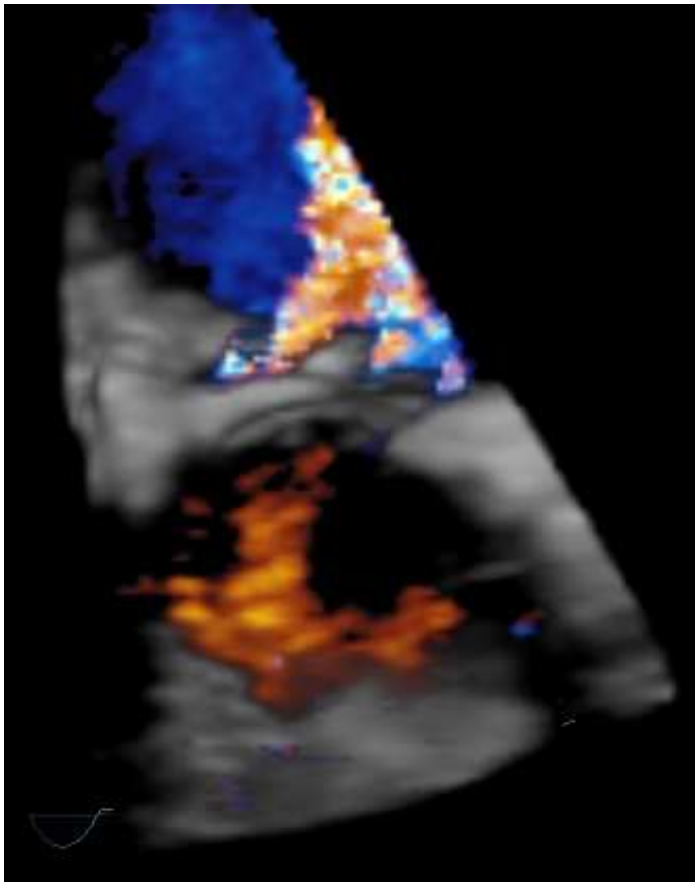
Mixed mitral valve disease with significant MR



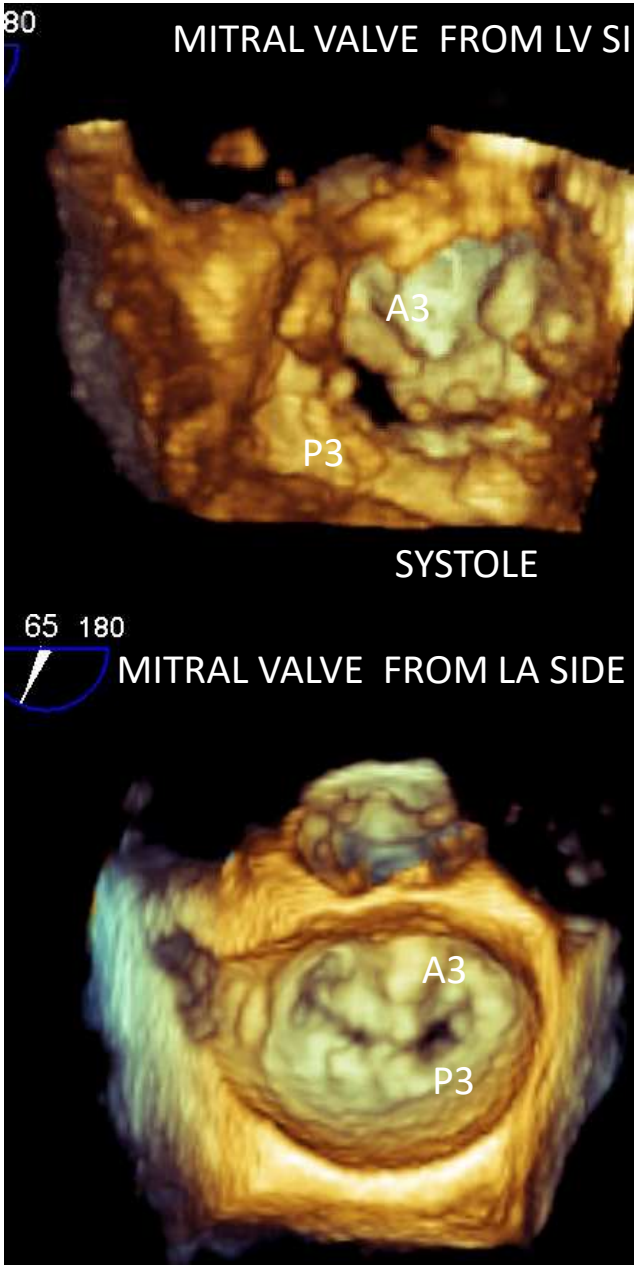


Note LA pressure waveform with V waves up to 59mmHg (mean LA pressure 34mmHg)

Degenerative MR



Short posterior leaflet (<7mm)
not suitable for MitraCLip



MitraClip in 2018

- Larger flail gaps and widths
- Commissural jets
- Multiple jets
- Diminutive posterior leaflet
- Post surgical repair
- Bridge to transplant
- Acute MI mechanical complications

MitraClip as a Bridge to Heart Transplant

LETTER TO THE EDITORS

Percutaneous mitral valve repair using the MitraClip in acute cardiogenic shock

C. S. Zuern · J. Schreieck · H. J. Weig · M. Gawaz · A. E. May

Clin Res Cardiol (2011) 100:719–721

Mitraclip Procedure as a Bridge Therapy in a Patient With Heart Failure Listed for Heart Transplantation

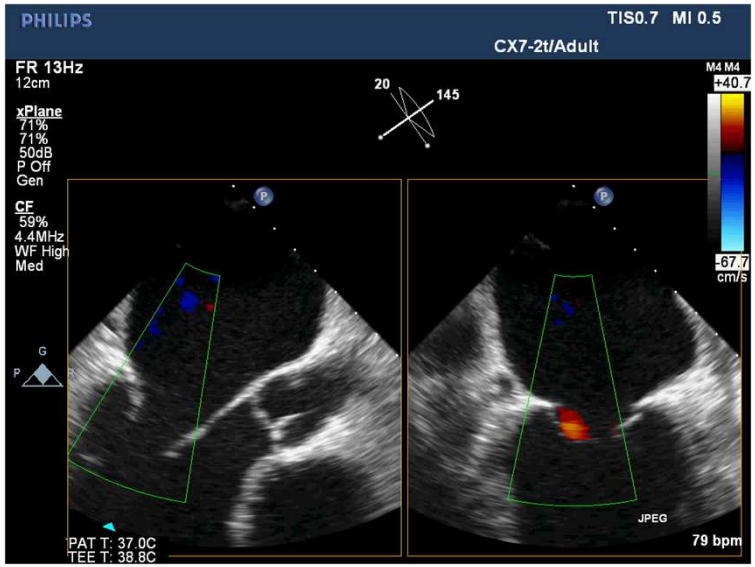
Andrea Garatti, MD, Serenella Castelvecchio, MD, Francesco Bandera, MD, Massimo Medda, MD, Lorenzo Menicanti, MD

Cardiac Surgery and Heart Failure Units, IRCCS Policlinico San Donato, Milan, Italy

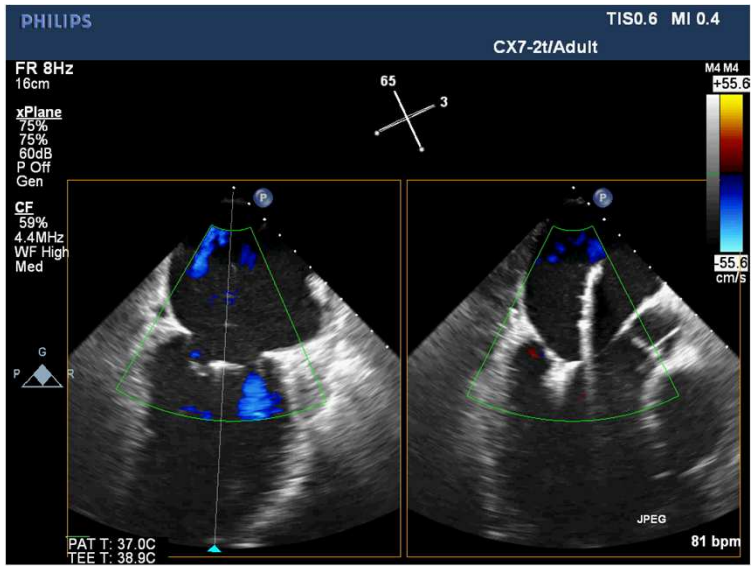
The Annals of Thoracic Surgery , Volume 99 , Issue 5 , 1796 - 1799

MitraClip in a Patient with Advanced Heart Failure

Baseline



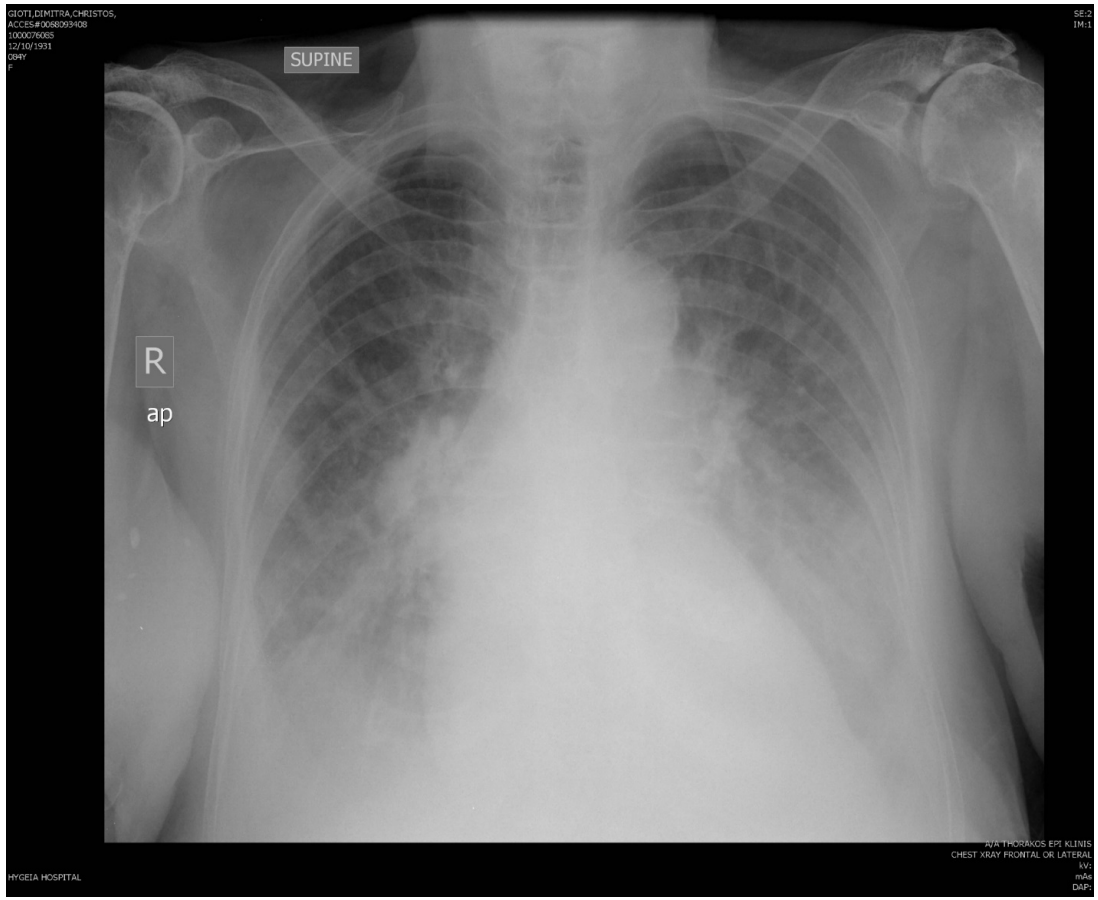
Final

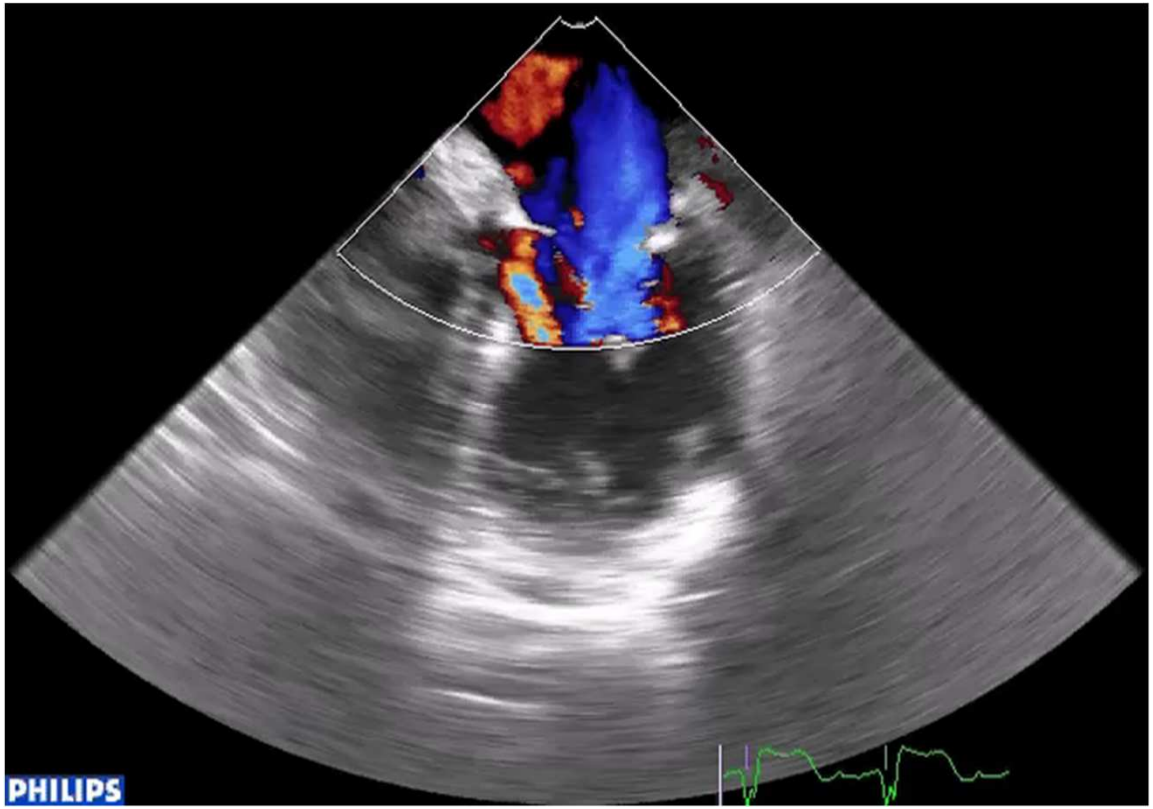


55 year old male with dilated cardiomyopathy, NYHA IV_a on maximal medical Rx, BIV-AICD, paroxysmal atrial fibrillation, BNP 2210,
Post MitraClip, clinical stabilization x12months , eventual cardiac transplantation

Acute Heart Failure Complicating Myocardial Infarction

- 85 year-old female
- Subacute dyspnea on exertion
- Delayed presentation anterior myocardial infarction
- Coronary angiography: PCI stent to large ramus intermedius
- LVEF ~40%
- *Initial* improvement and response to medical Rx
- Clinical deterioration
- Acute pulmonary edema despite high doses of iv Lasix

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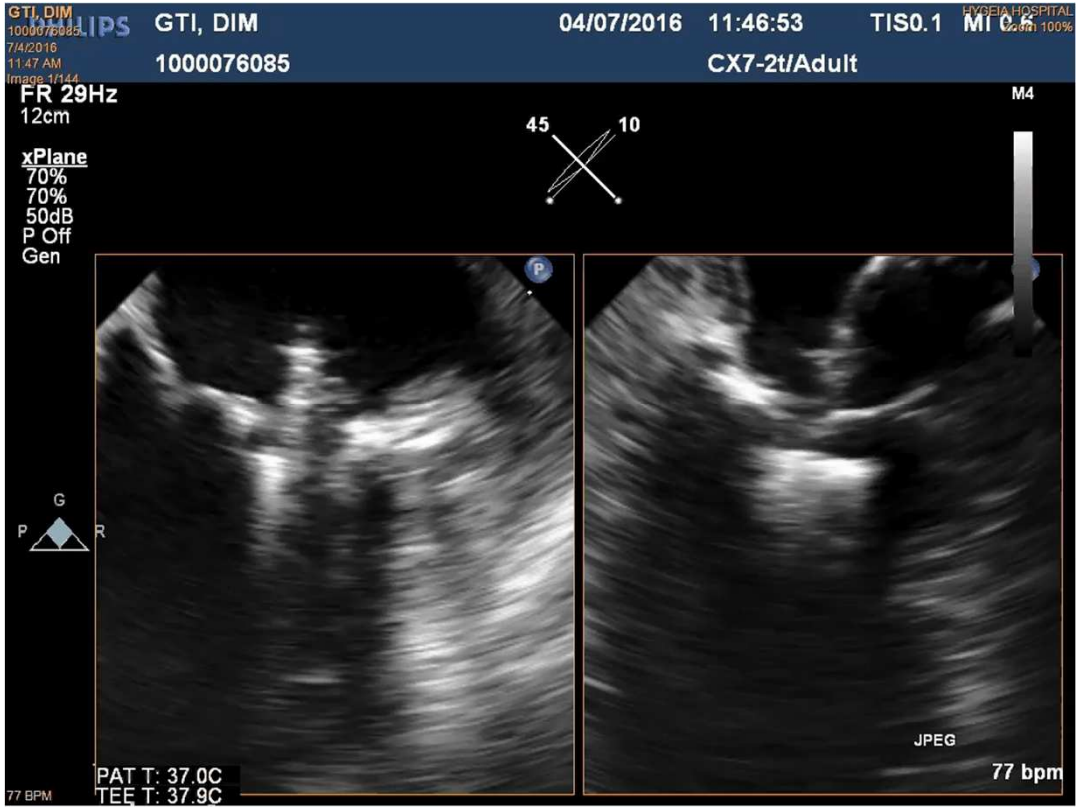
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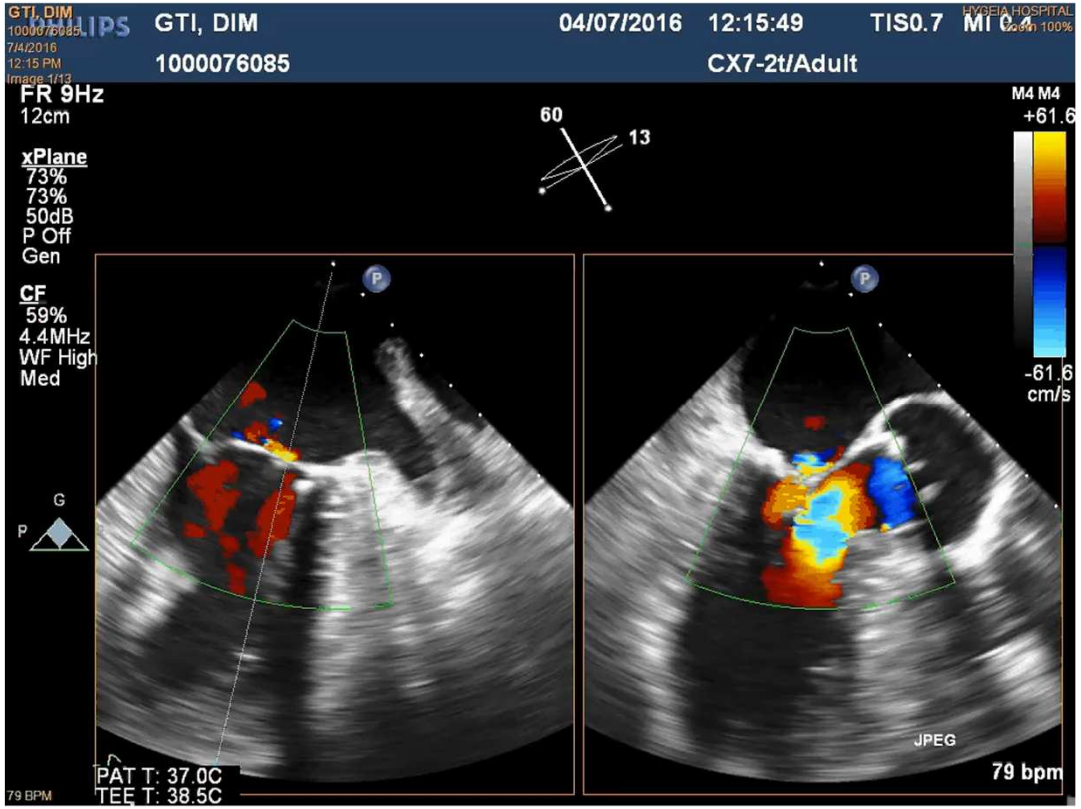
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Emerging Novel MitraClip Application: In Hypertrophic Obstructive Cardiomyopathy

MitraClip Implantation as a New Treatment Strategy against Systolic Anterior Motion-induced Outflow Tract Obstruction in Hypertrophic Obstructive Cardiomyopathy

Ulrich Schäfer, MD, Felix Kreidel, MD, Christian Frerker, MD
Asklepios Clinics Sankt Georg, Hamburg, Germany

EuroIntervention. 2014 Aug 30. pii: 20130310-02. doi: 10.4244/EIJY14M08_13. [Epub ahead of print]

Targeting systolic anterior motion and left ventricular outflow tract obstruction in hypertrophic obstructed cardiomyopathy with a MitraClip.

Schäfer U[1], Frerker C, Thielsen T, Schewel D, Bader R, Kuck KH, Kreidel F.

In Summary

- Echo evaluation is fundamental for patients considered for transcatheter mitral interventions
- Ability to successfully approximate mitral leaflets and reduce MR, while not causing stenosis, are key for a successful MitraClip procedure
- Anticipate results of the COAPT and MITRAFR trials to further refine indications for functional MR patients