Functional mitral regurgitation: medical therapy, surgical or percutaneous repair ?

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Valvular heart disease: clinical imaging pathways in challenging scenarios: a clinical case-guided discussion

Clinical Case

- 46 years old, male
- Past medical history
  - Hyperuricemia
- Cardiac history
  - Increasing SOB in the last 3 years
  - Permanent AF since 2010 (refractory to MT/DC Shock)
  - 3 hospital admissions for CHF in the previous 6 months
  - NYHA IIIB-IV
  - ECG: AF + RBB block
  - Coronary angiography: no CAD
  - TEE: severe functional MR, EF 15-20%, LVEDD 83 mm

Medical therapy

- Warfarin
- Carvedilol 6,25 mg bd
- Frusemide 125 mg bd
- Zofenopril 15 mg od
- Amiodarone 200 mg od
- Spironolactone 25 mg od
- Digoxin 0.125 mg od

Clinical Case

In the referring hospital

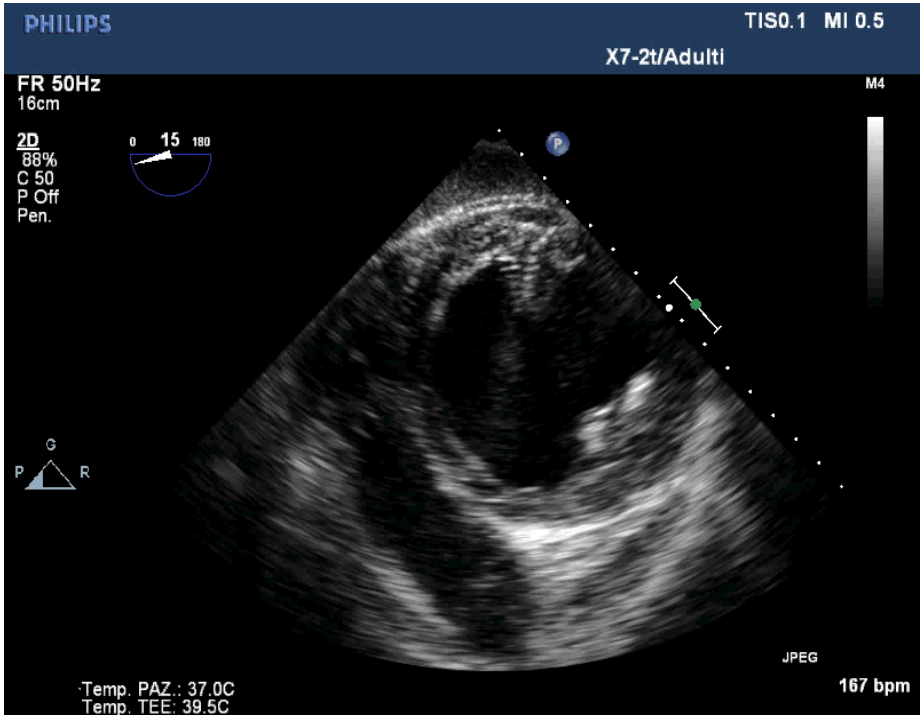
Only option → HTX

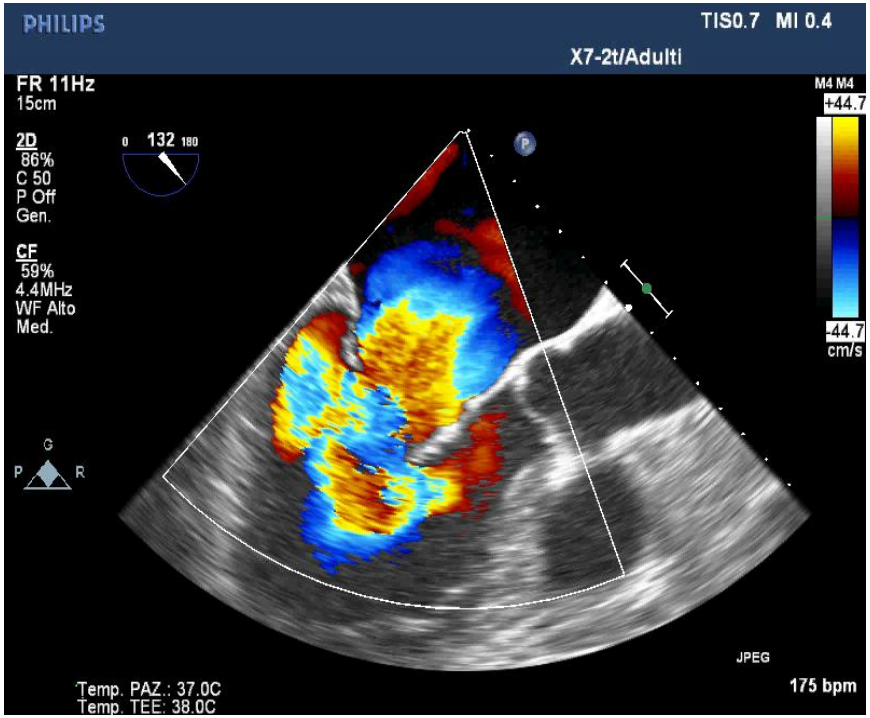
Cardiac Surgery Department San Raffaele Hospital

TTE +TEE

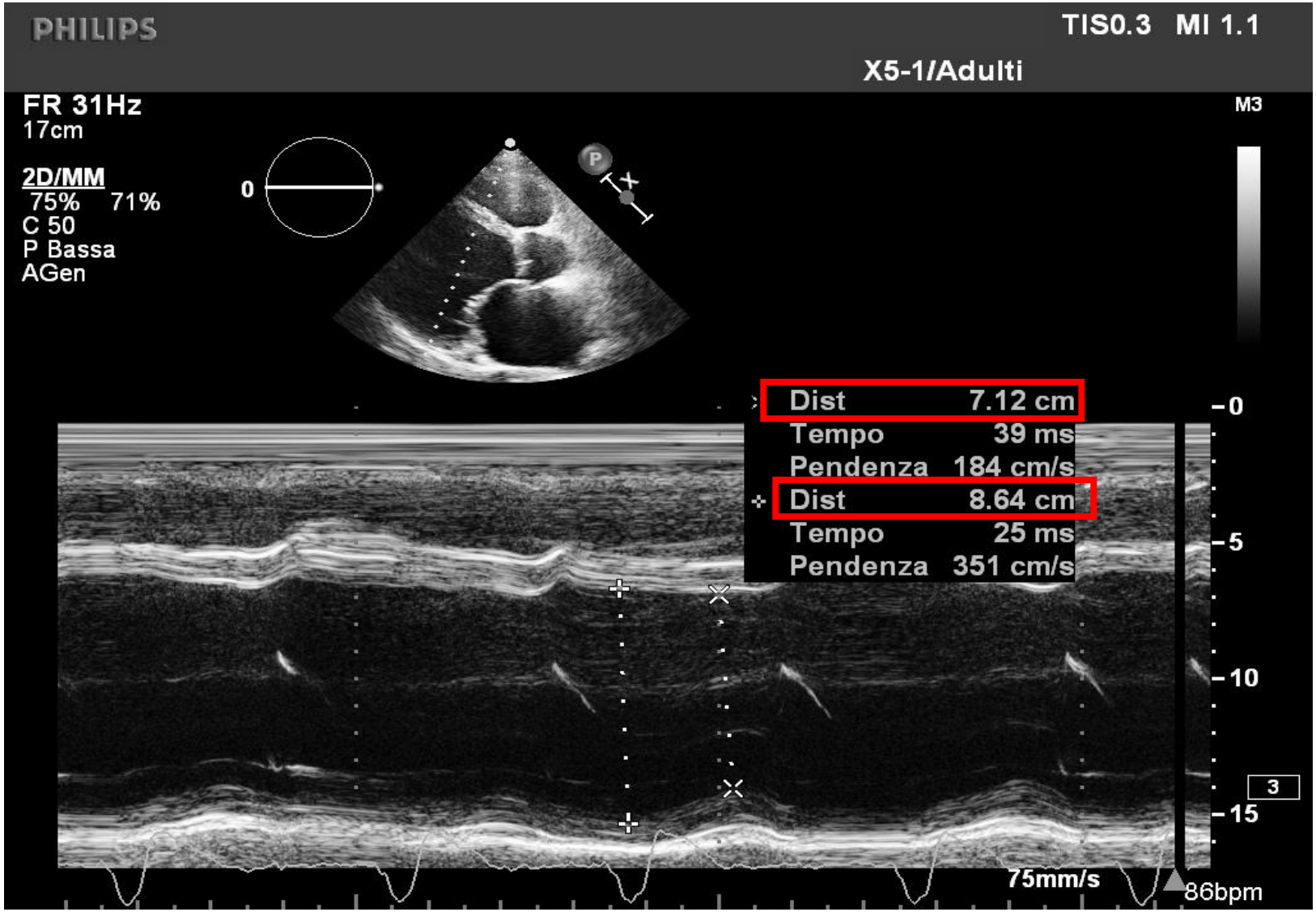
- Severe LV remodeling and dysfunction (EF 20%)
- Severe FMR (4+/4+), symmetric leaflet tethering + annular dilatation
- TR 2+/4+, tricuspid annulus > 40 mm
- SPAP 35 mmHg
- Mild RV dysfunction
- LV dyssinchrony (no indication to CRT due to RBB block)

TEE during high rate AF
Severe LV dysfunction + FMR





LVEDD/LVESD


PHILIPS
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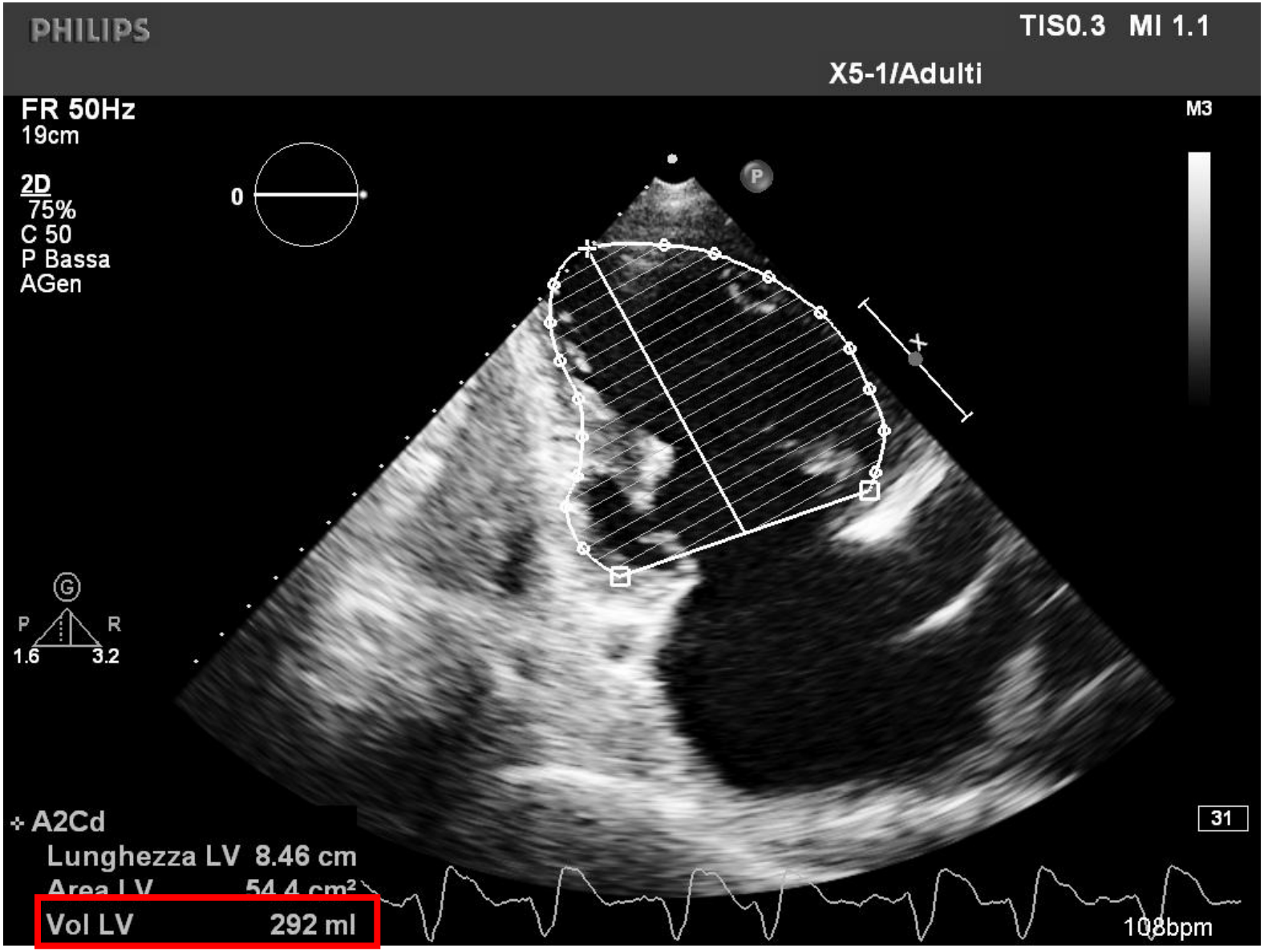
X5-1/Adulti
FR 31Hz
17cm
2D/MM
75% 71%
C 50
P Bassa
AGen
M3
Dist 7.12 cm
Tempo 39 ms
Pendenza 184 cm/s
Dist 8.64 cm
Tempo 25 ms
Pendenza 351 cm/s
0
5
10
15
3
75mm/s
86bpm

LVEDV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2D
75%
C 50
P Bassa
AGen
M3
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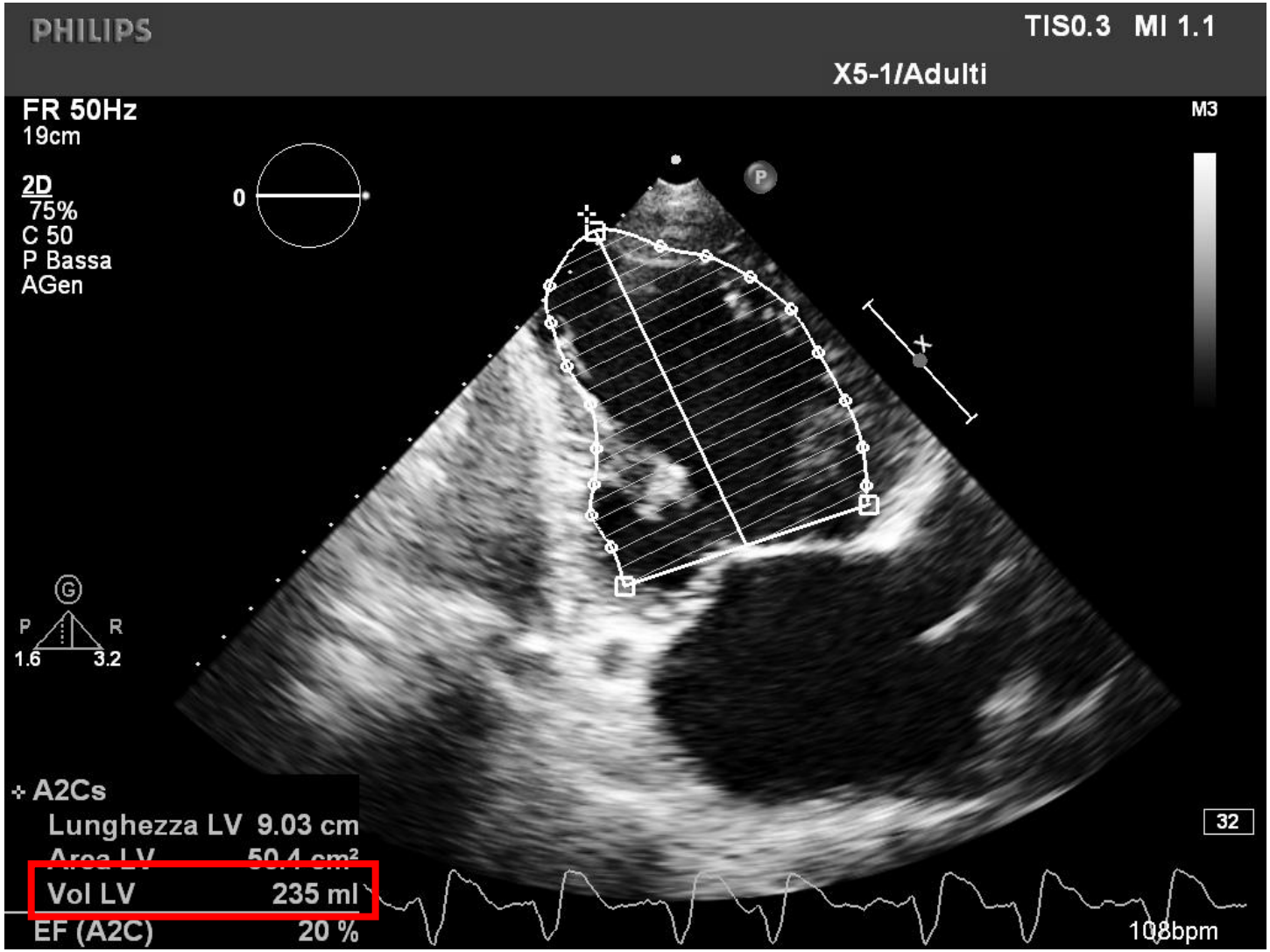
P
G
P
R
1.6
3.2
A2Cd
Lunghezza LV 8.46 cm
Area LV 54.4 cm²
Vol LV 292 ml
31
108bpm

LVESV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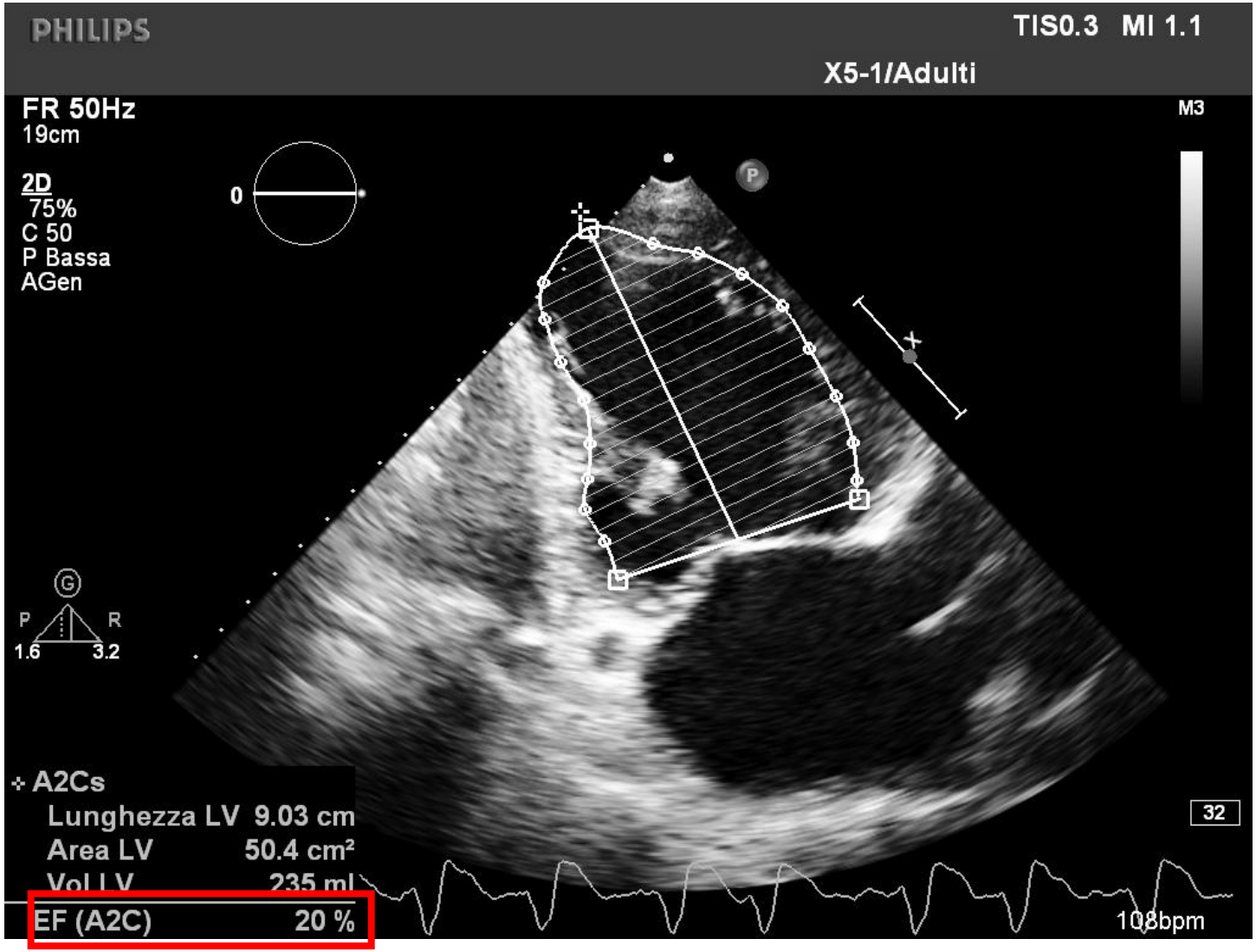
A2Cs
Lunghezza LV 9.03 cm
Vol LV 235 ml
EF (A2C) 20 %
32
108bpm

LVEF


PHILIPS
TIS0.3 MI 1.1
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FR 50Hz
19cm
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P Bassa
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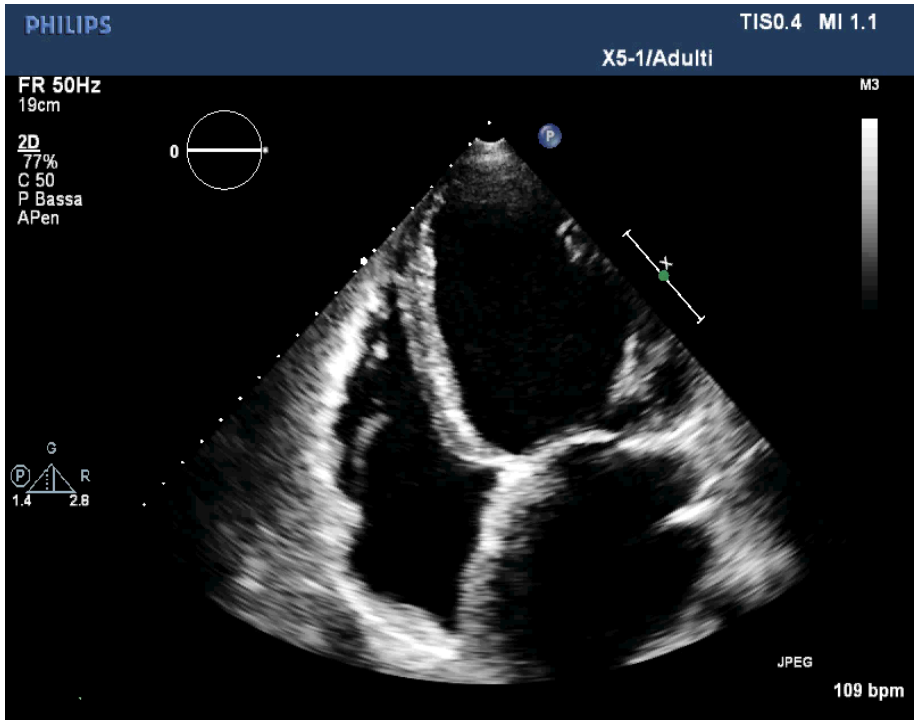
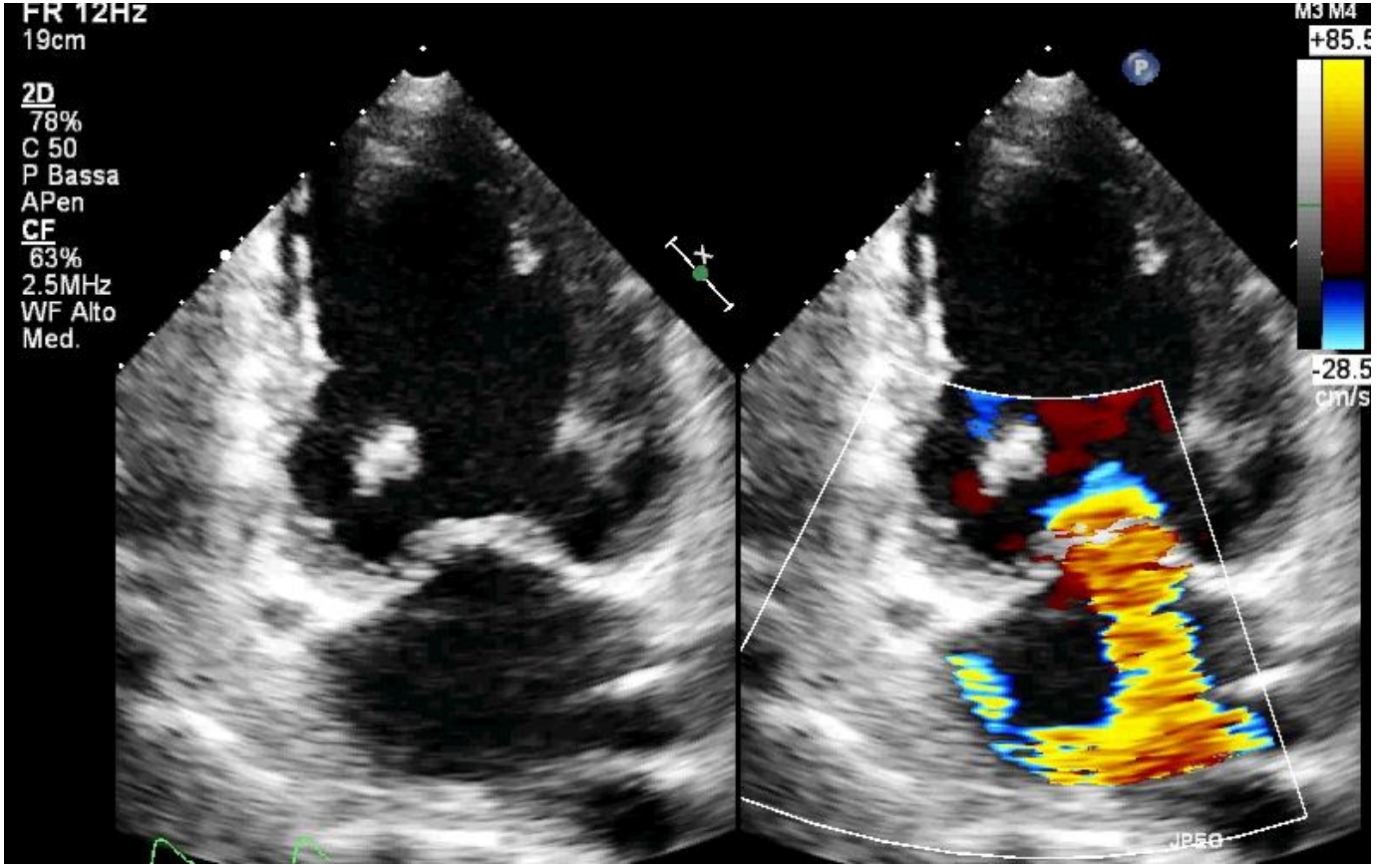
M3
0
P
1.6
3.2
A2Cs
Lunghezza LV 9.03 cm
Area LV 50.4 cm²
Vol LV 235 ml
EF (A2C) 20 %
32
108bpm

LV function and dimension improvement after AF rate control



- EF 30%
- LVEDD 75 mm
- LVESD 68 mm

Still severe MR after AF rate control



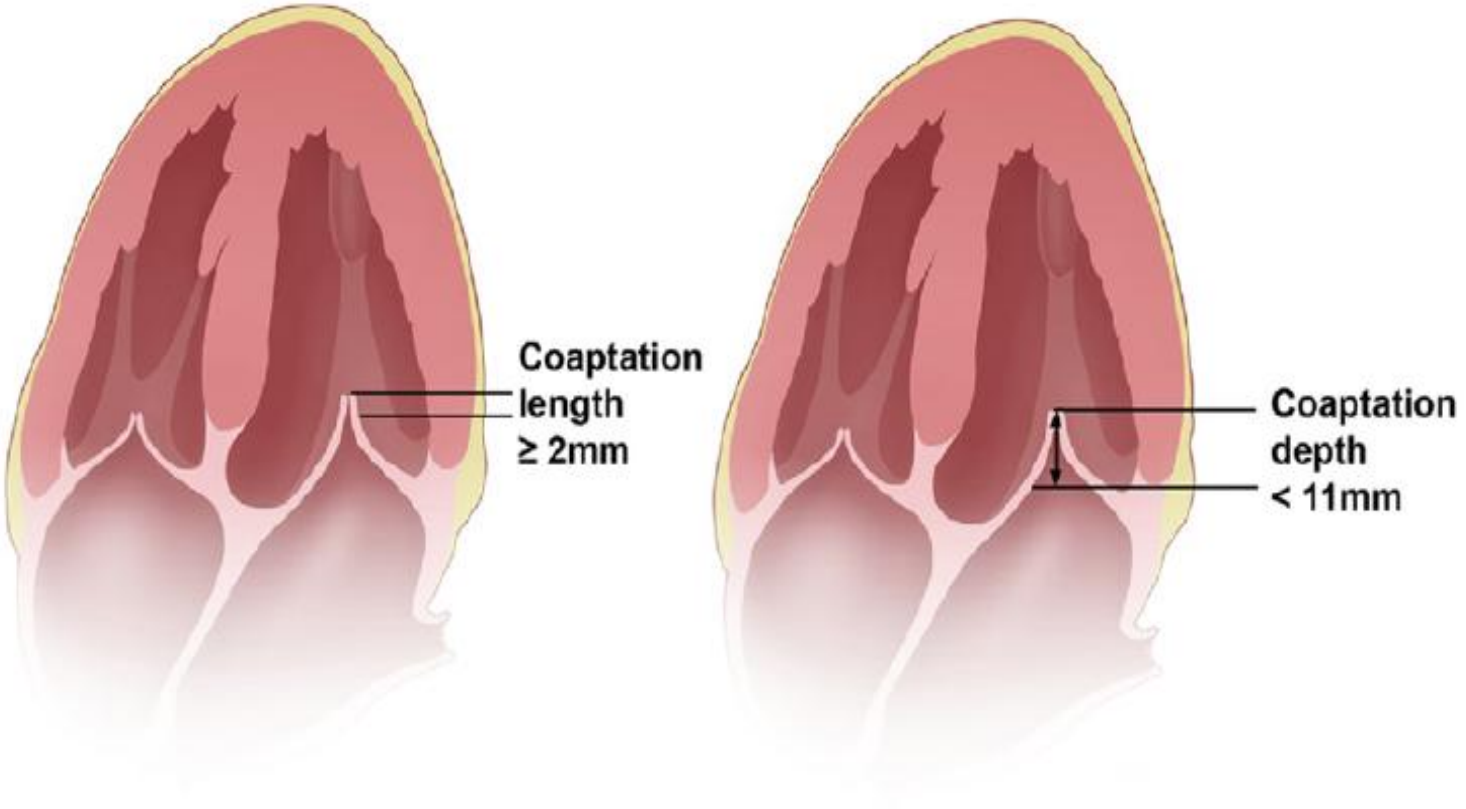
Possible scenarios: medical therapy and HTX listing

- MV surgery + surgical AF ablation non indicated
- Screening for HTx waiting list

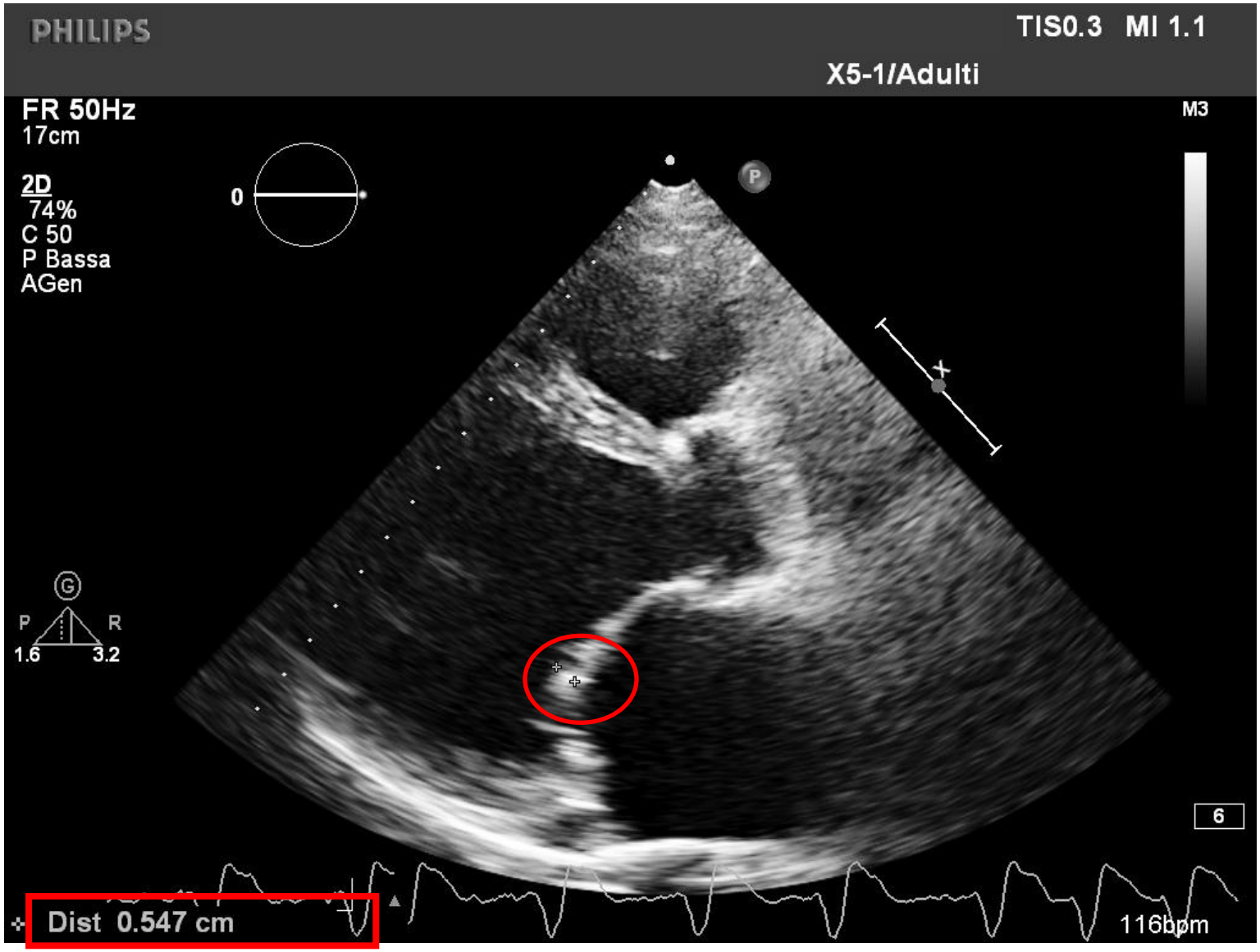
Possible scenarios: treating Functional MR

- Mitraclip ?
- MV surgery + surgical ablation of permanent AF + tricuspid annuloplasty?

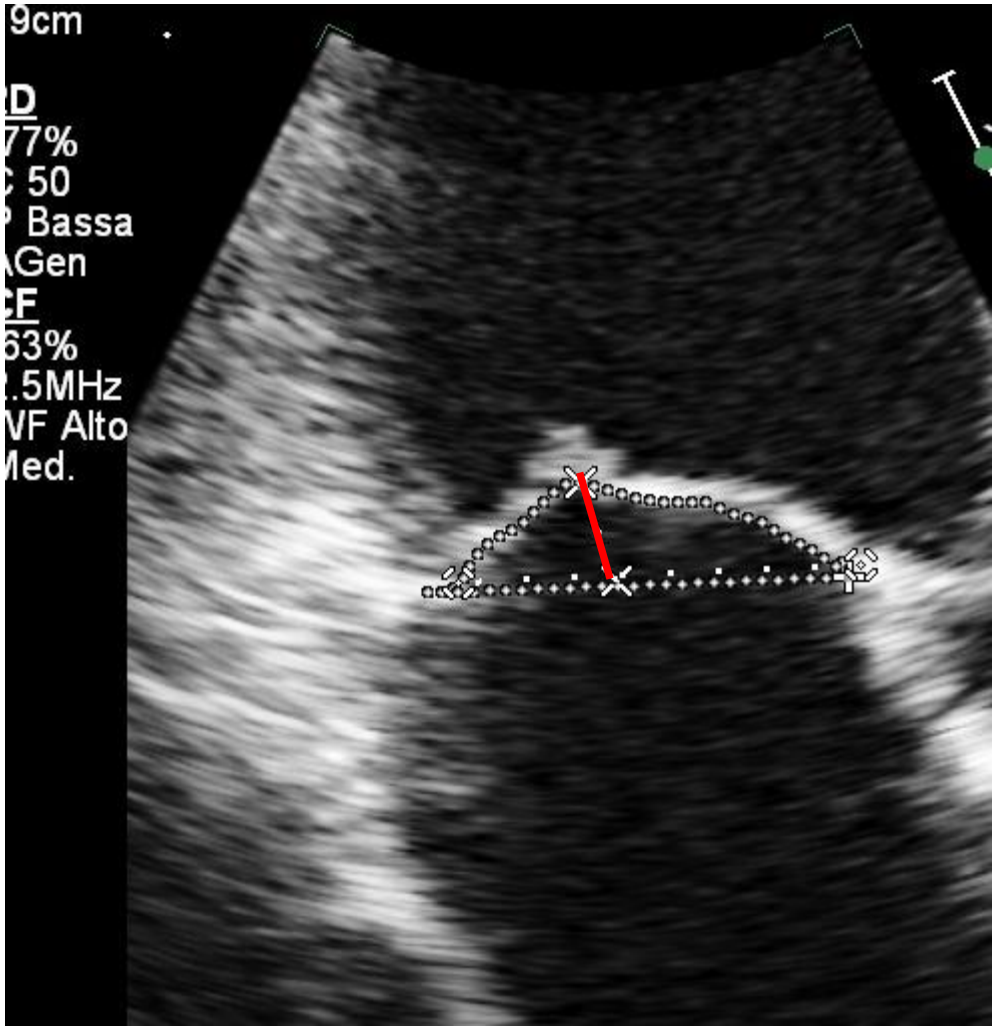
Mitraclip feasibility in Functional MR



Coaptation length > 2 mm

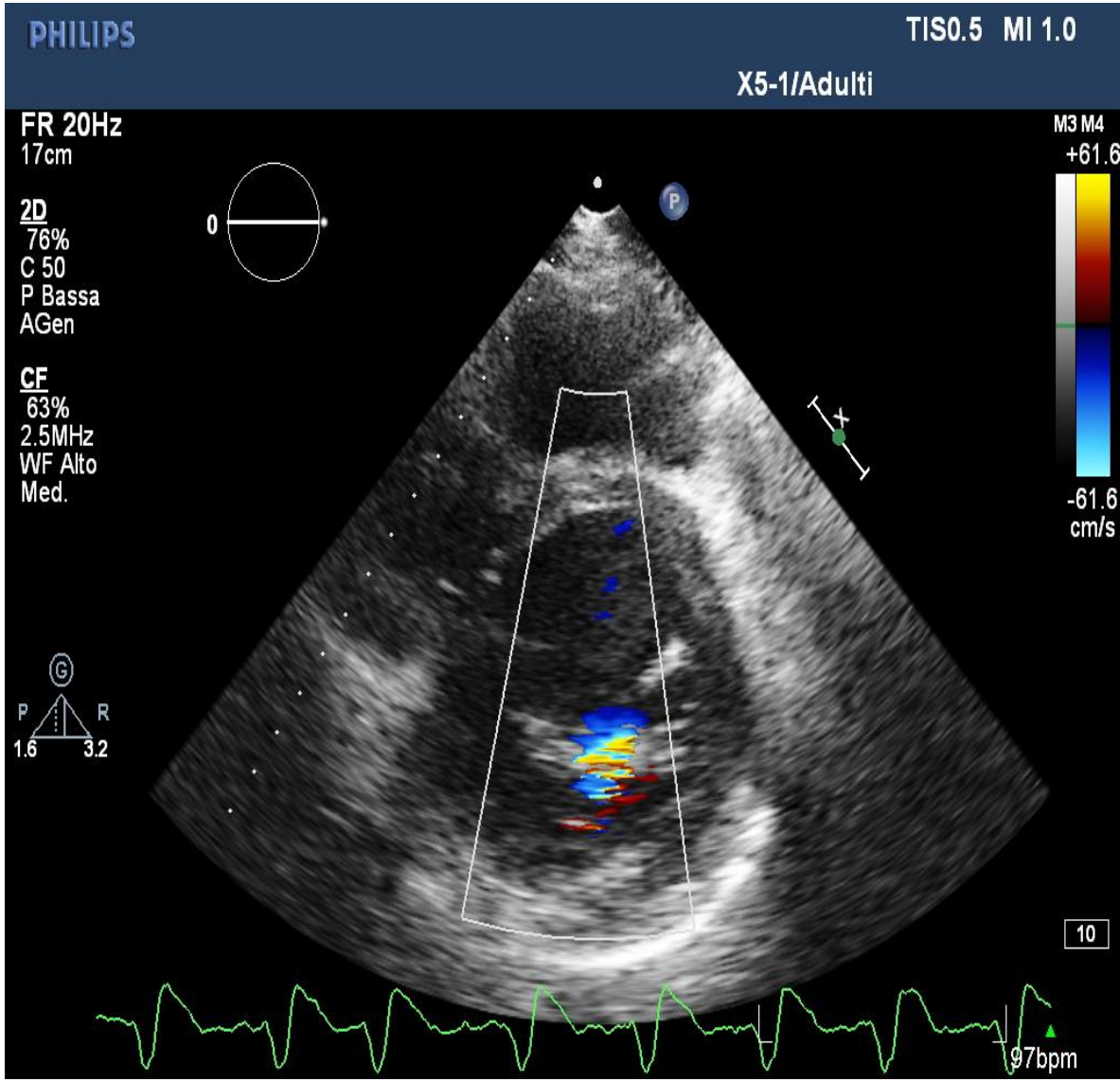


Coaptation depth 1 cm



Regurgitant jet

- Central origin
- Eccentric direction
- Extension <30% (intercommissural distance)

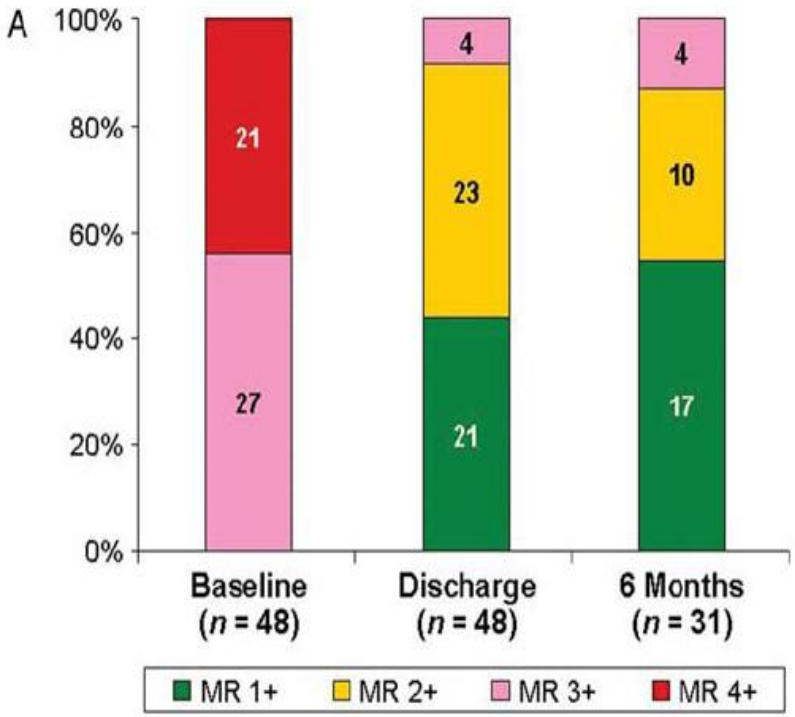


European Journal of Heart Failure (2011) 13, 569–576
doi:10.1093/eurjhf/hfr029

MitraClip® therapy in patients with end-stage systolic heart failure

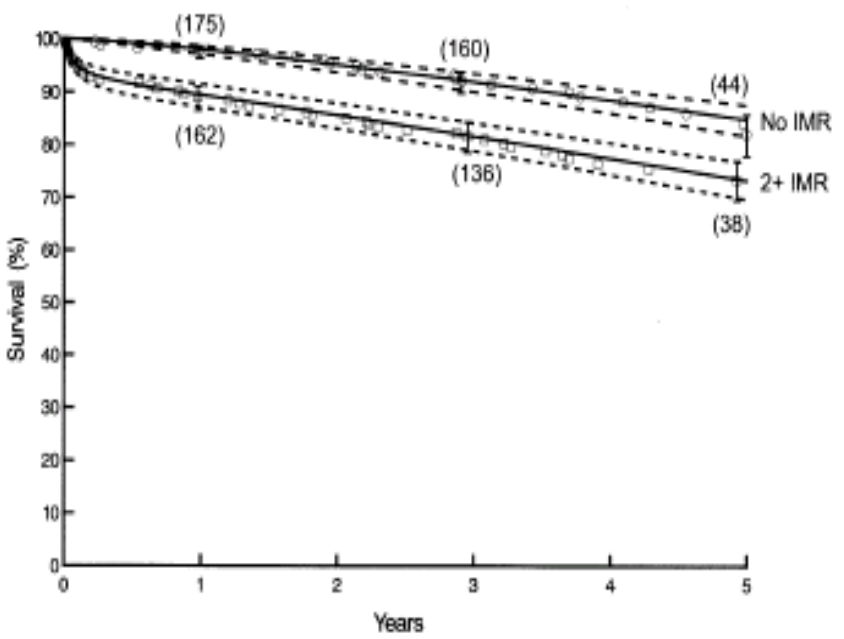
Olaf Franzen[1]*, Jan van der Heyden[2], Stephan Baldus[1], Michael Schlüter[1], Wolfgang Schillinger[3], Christian Butter[4], Rainer Hoffmann[5], Roberto Corti[6], Giovanni Pedrazzini[7], Martin J. Swaans[2], Michael Neuss[4], Volker Rudolph[1], Daniel Sürder[7], Jürg Grünenfelder[6], Christine Eulenburg[8], Hermann Reichenspurner[9], Thomas Meinertz[1], and Angelo Auricchio[7]

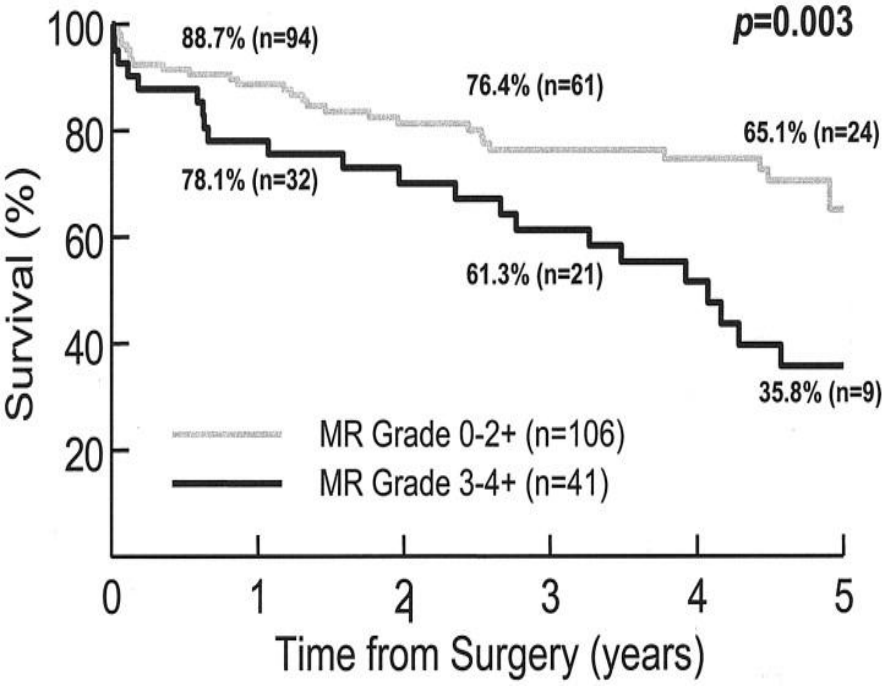
- Mean age 70 years
- Euroscore 34
- LVEDD 70 mm
- LVEDV 252 mL
- LVEF 19%
- Hospital mortality 17%

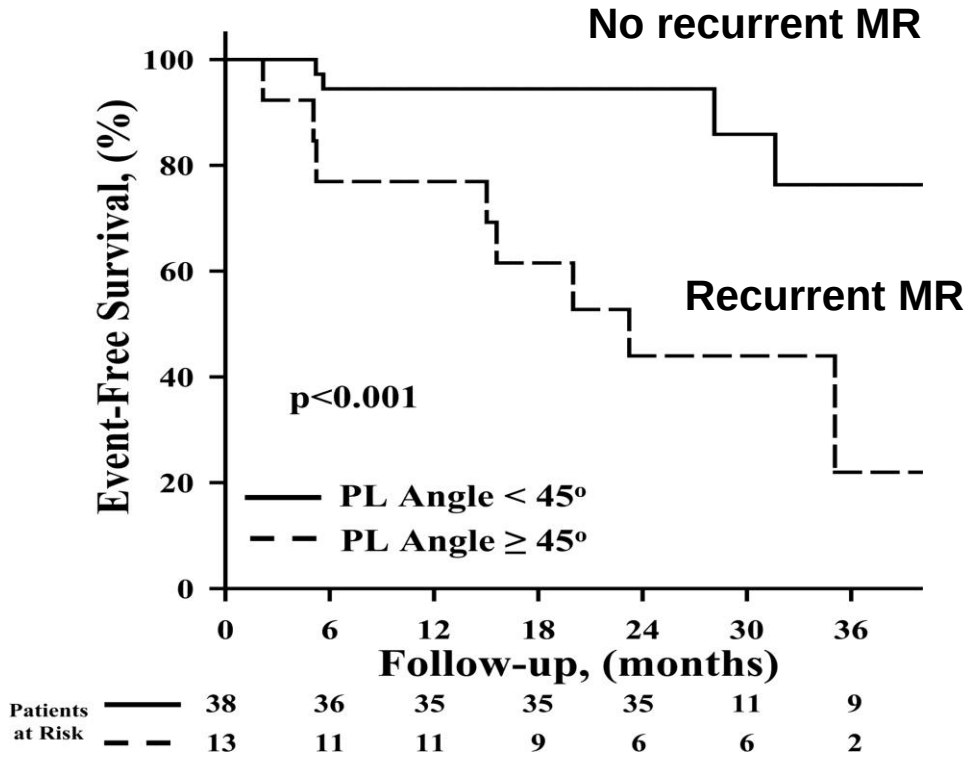


MR post-Mitraclip

Mortality in the follow-up is strictly related to residual/recurrent MR





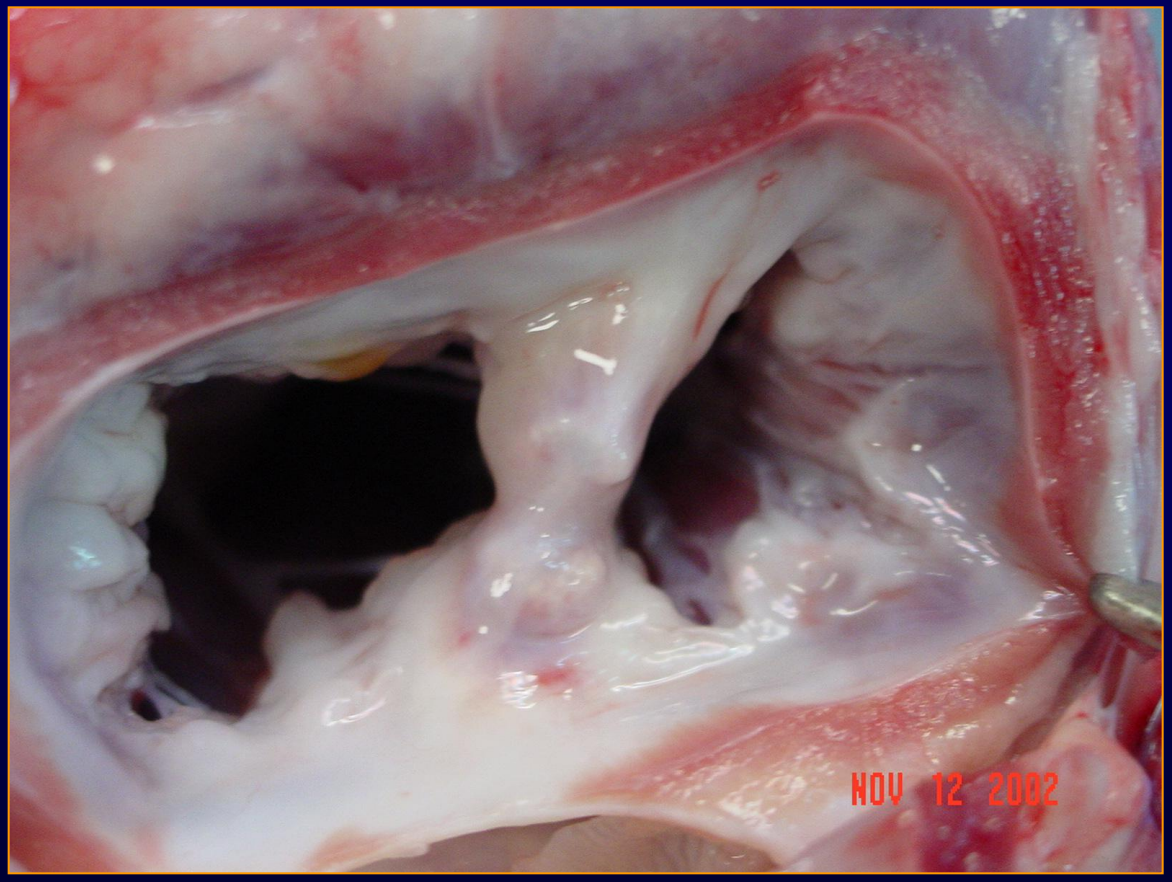


Possible scenarios: Mitraclip

……. Let's try with the Mitraclip …..

It would be less risky for the patient…. If it fails we will still have the surgical option……

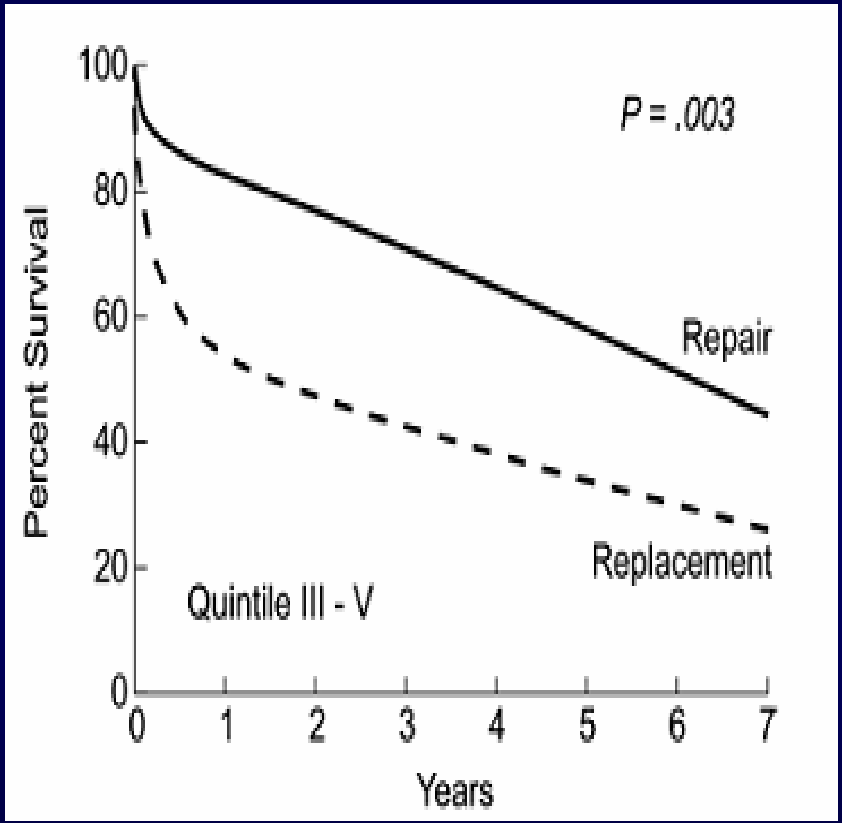
Is repair still feasible after Mitraclip implantation in FMR?

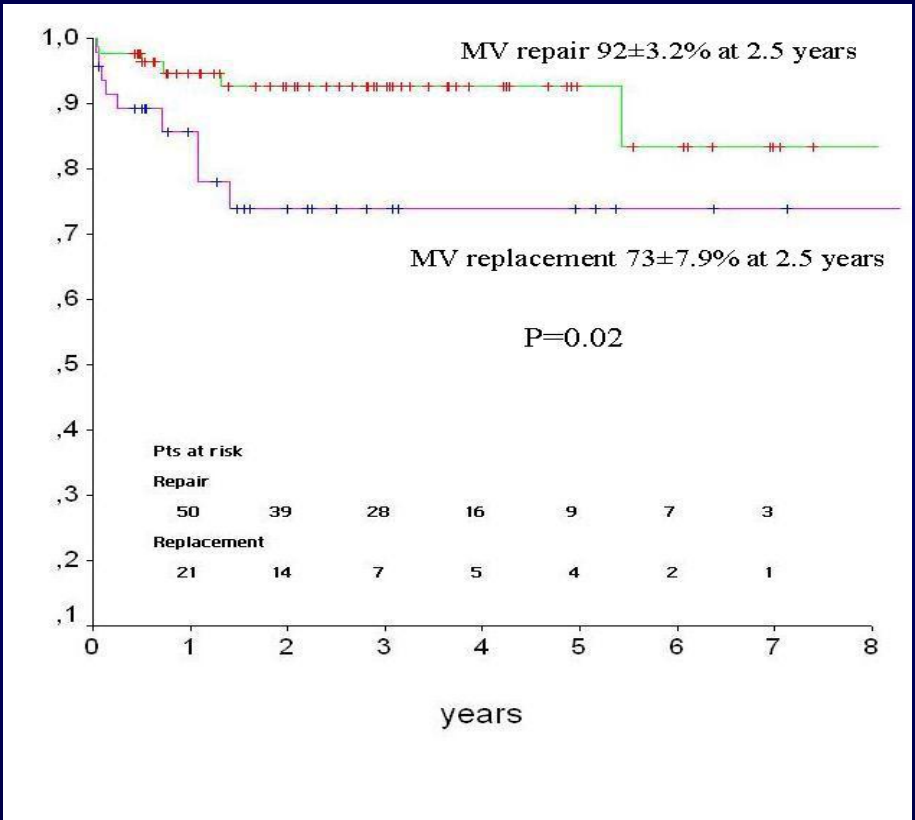


Is repair or replacement the same?

AATS Meeting
San Francisco 28 april- 2 May 2012

Repair might be better than replacement in FMR





J Thorac Cardiovasc Surg 2001;122:1107-24

De Bonis M et al. Ann Thorac Surg. 2012 Mar 20

Possible scenarios: Mitraclip

PROS:

- Lower procedural risk compared to surgery?

CONS:

- AF and TR not addressed
- Higher likelihood of residual/recurrent MR
  - Negative effect on reverse LV remodeling
- If residual/recurrent MR→ surgical MV repair unlikely

Possible scenarios: MV surgery

- Replacement
- Good repair
- Bad repair

Possible scenarios: MV surgery

- Replacement
- Good repair
- ~~Bad repair~~

Can we avoid bad repair?

Can we avoid bad repair?

Complete rigid ring

Patient selection

Can we avoid bad repair?

Complete rigid ring

Patient selection

Is a good repair feasible in this patient?

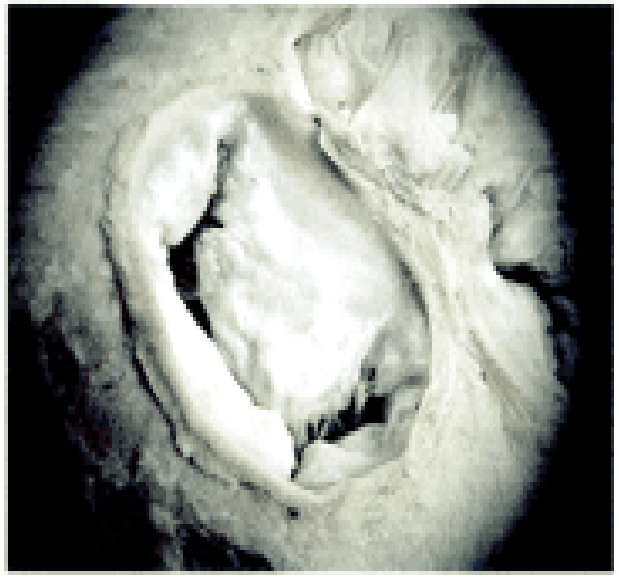
YES

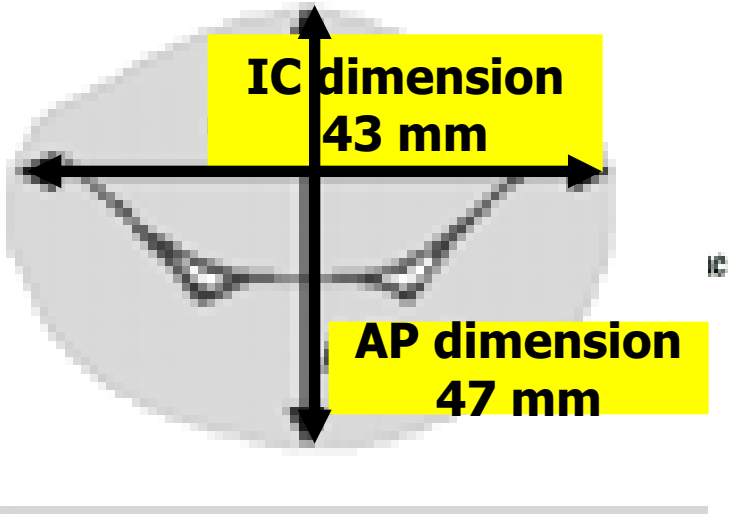
MV parameters predicting residual/recurrent MR after undersized annuloplasty

- Absence of annular dilatation
- Complex regurgitant jet
- Coaptation depth > 10 mm
- Distal anterior leaflet angle > 25°
- Posterior leaflet angle > 45°

Annular dilatation

Important annular dilatation in this patient





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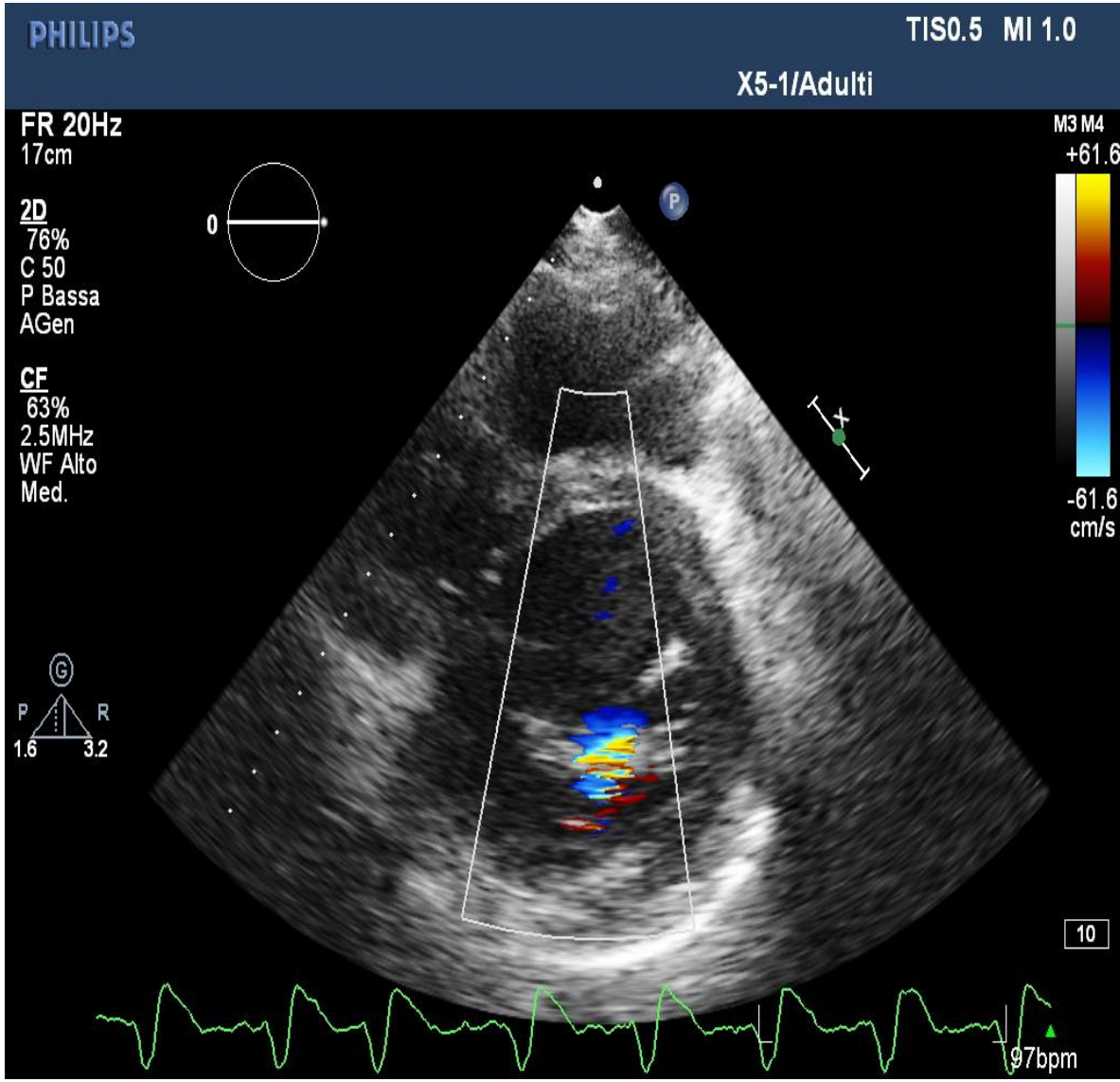
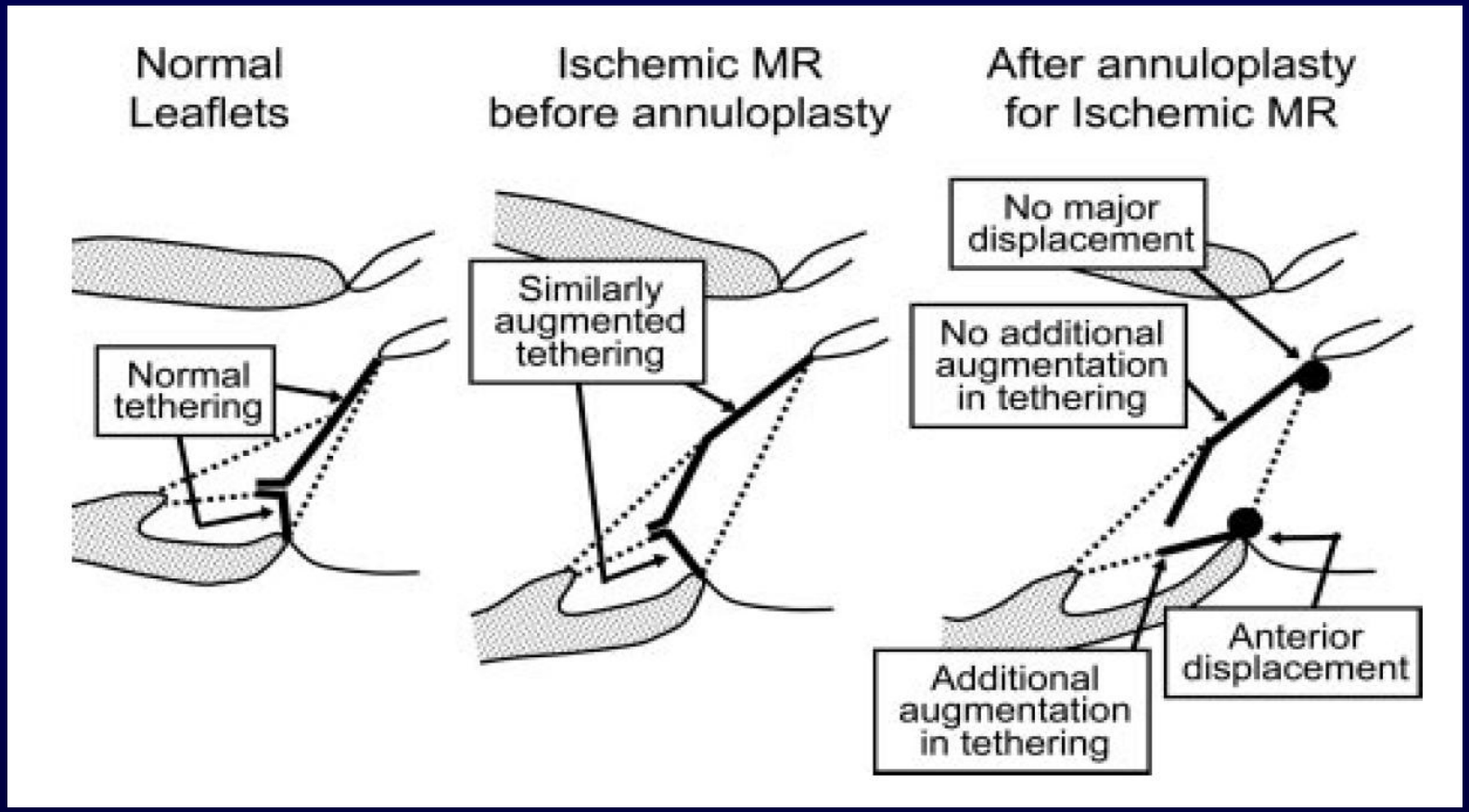
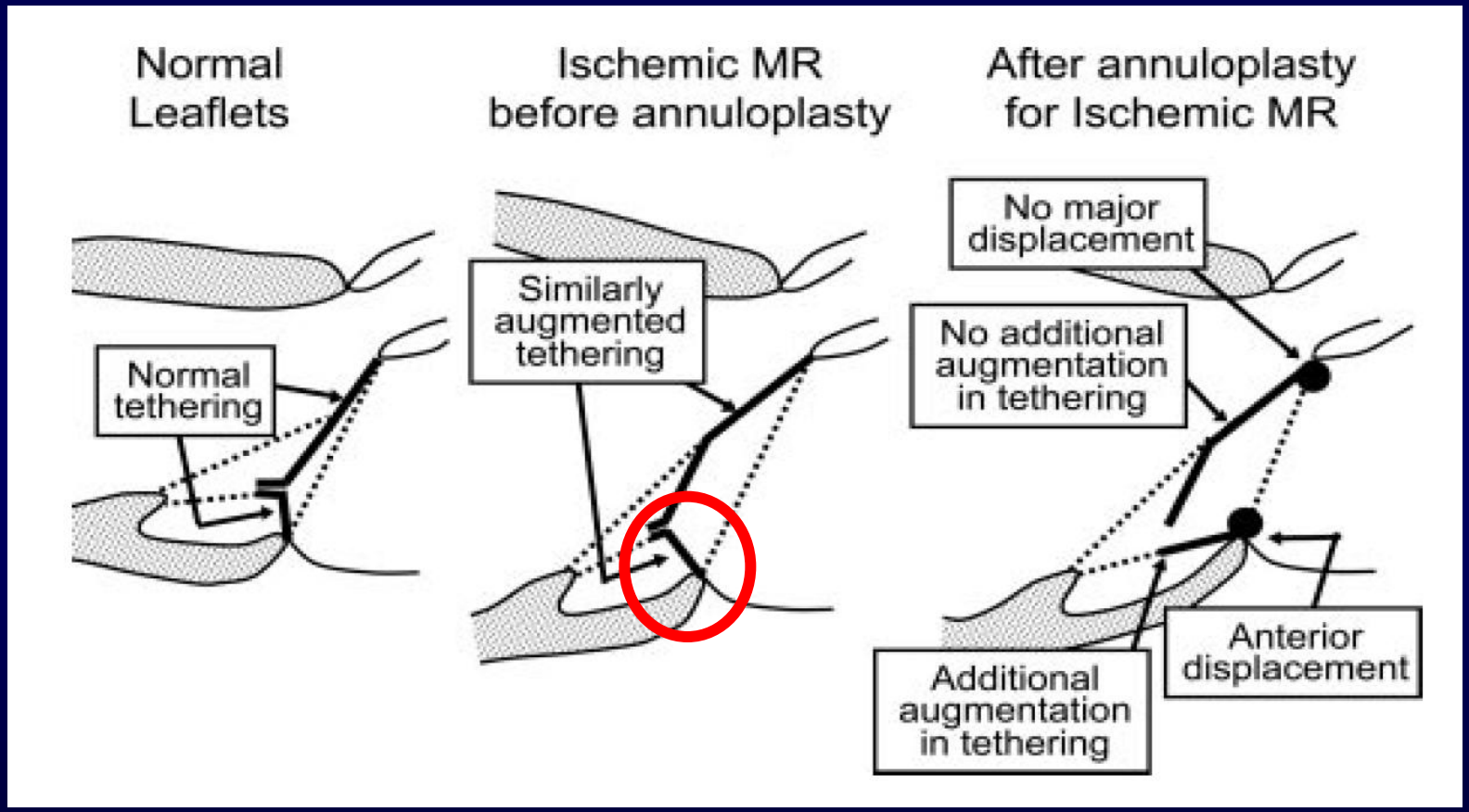


And what about tethering?

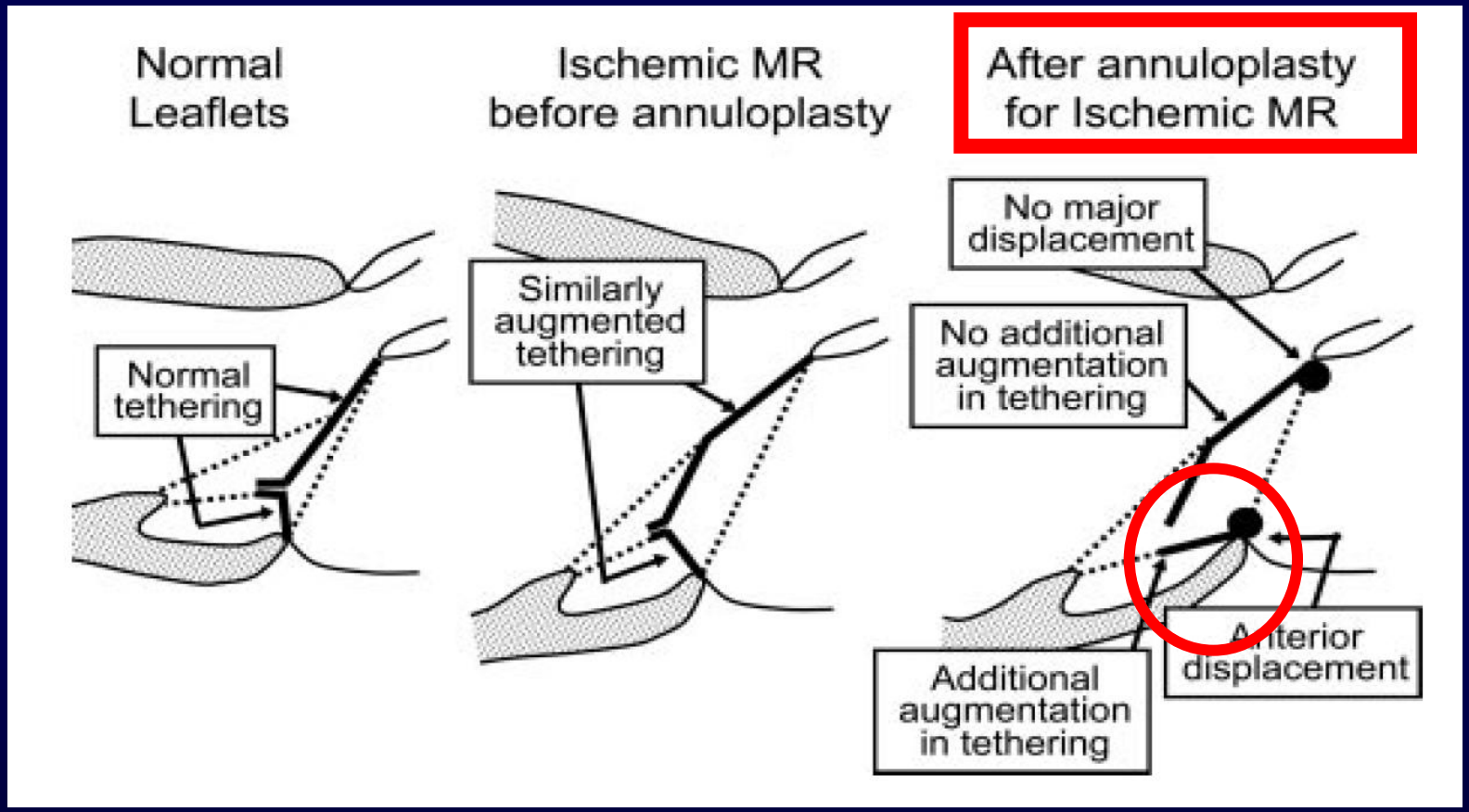
Augmented PL tethering after undersized annuloplasty



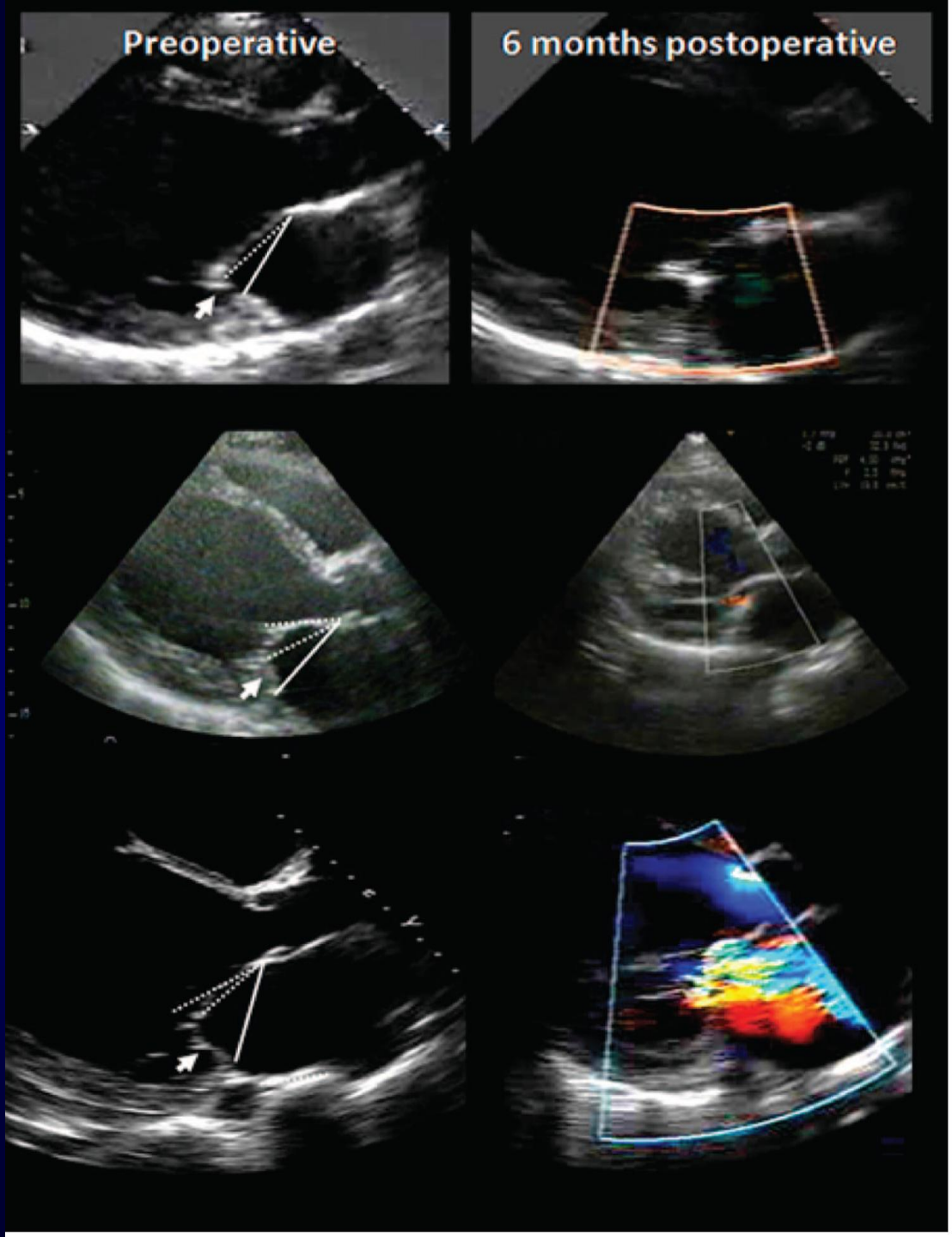
Augmented PL tethering after undersized annuloplasty



Augmented PL tethering after undersized annuloplasty

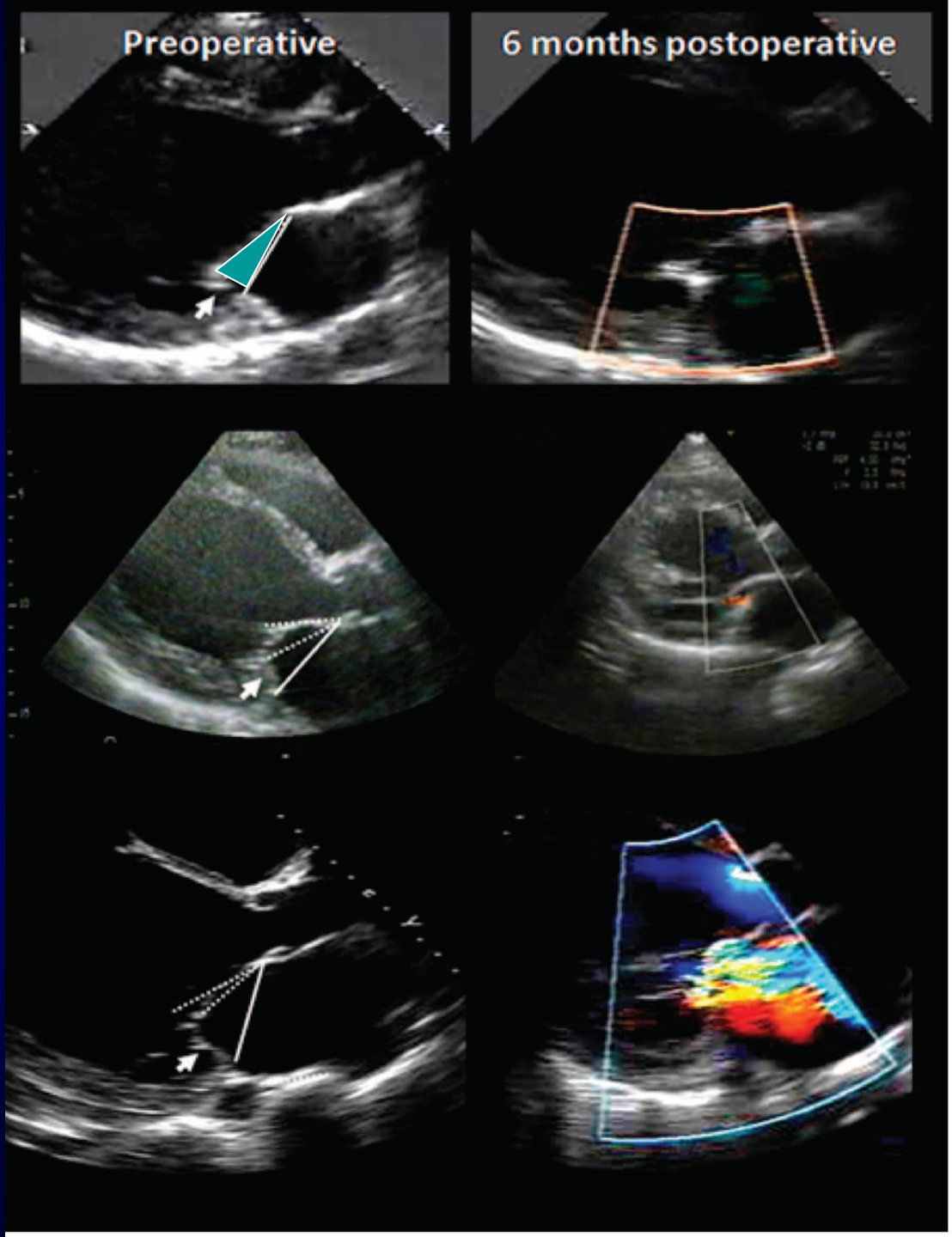


Distal anterior leaflet angle



Lee et al.
Circulation 2009;119:2606

Distal anterior leaflet angle



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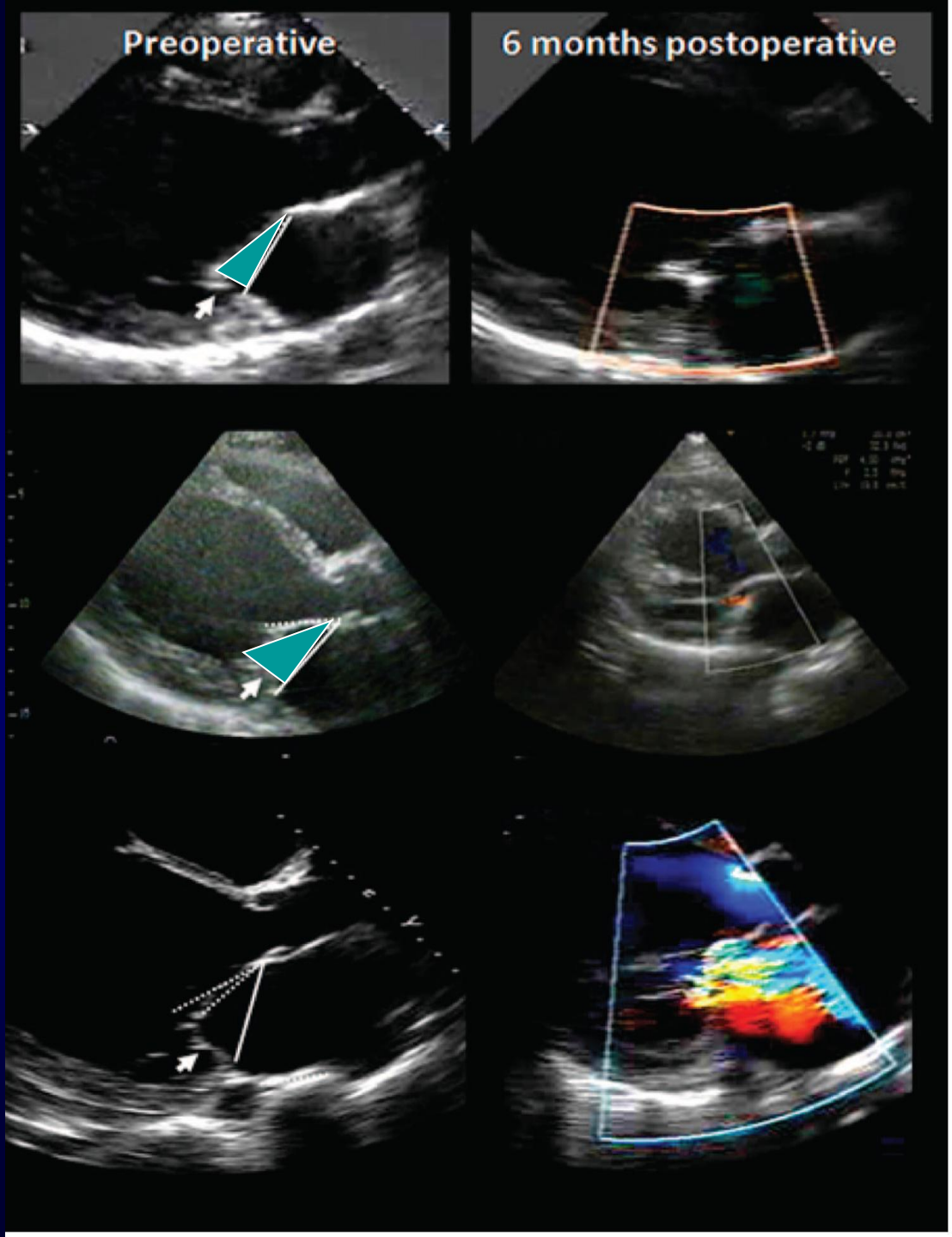

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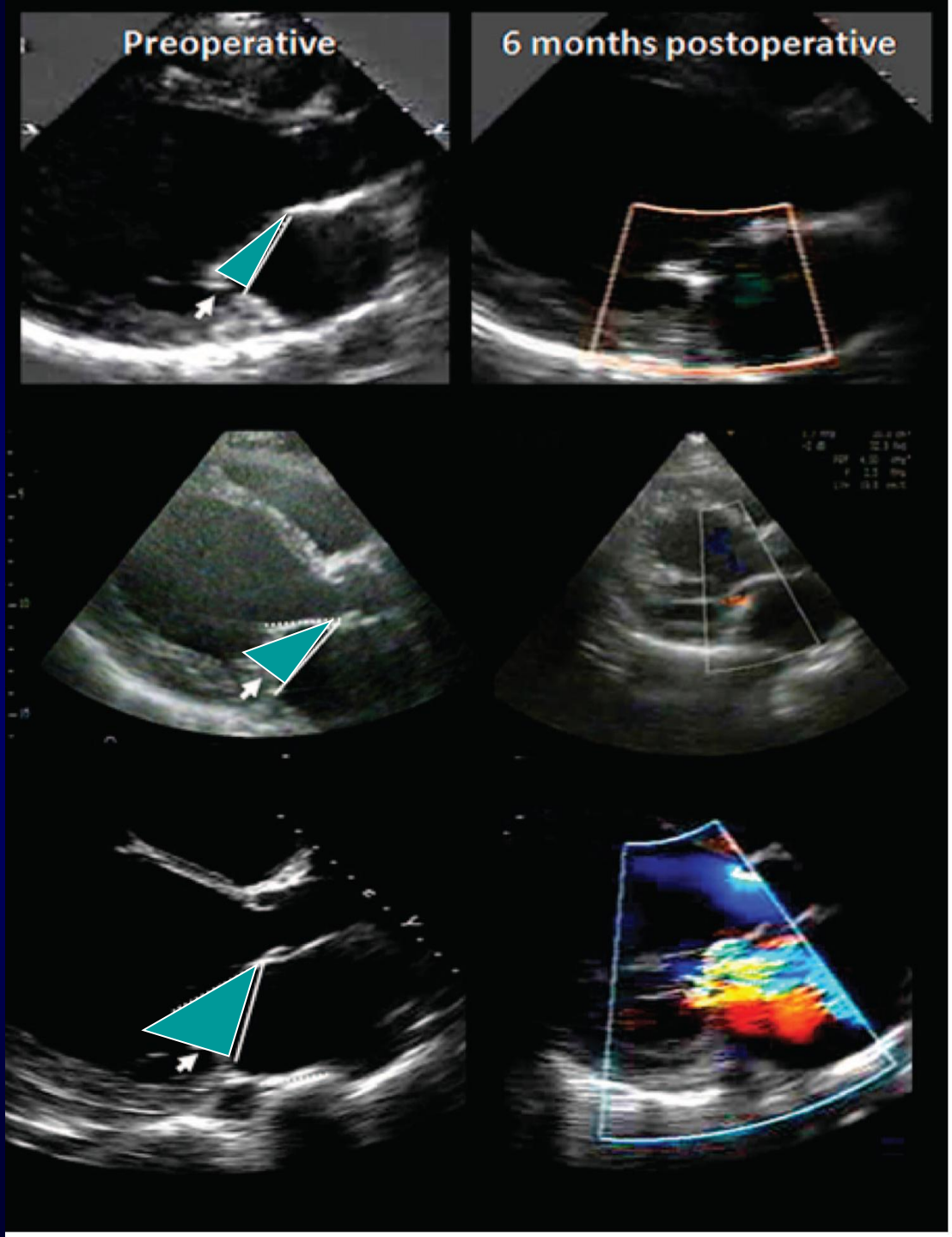

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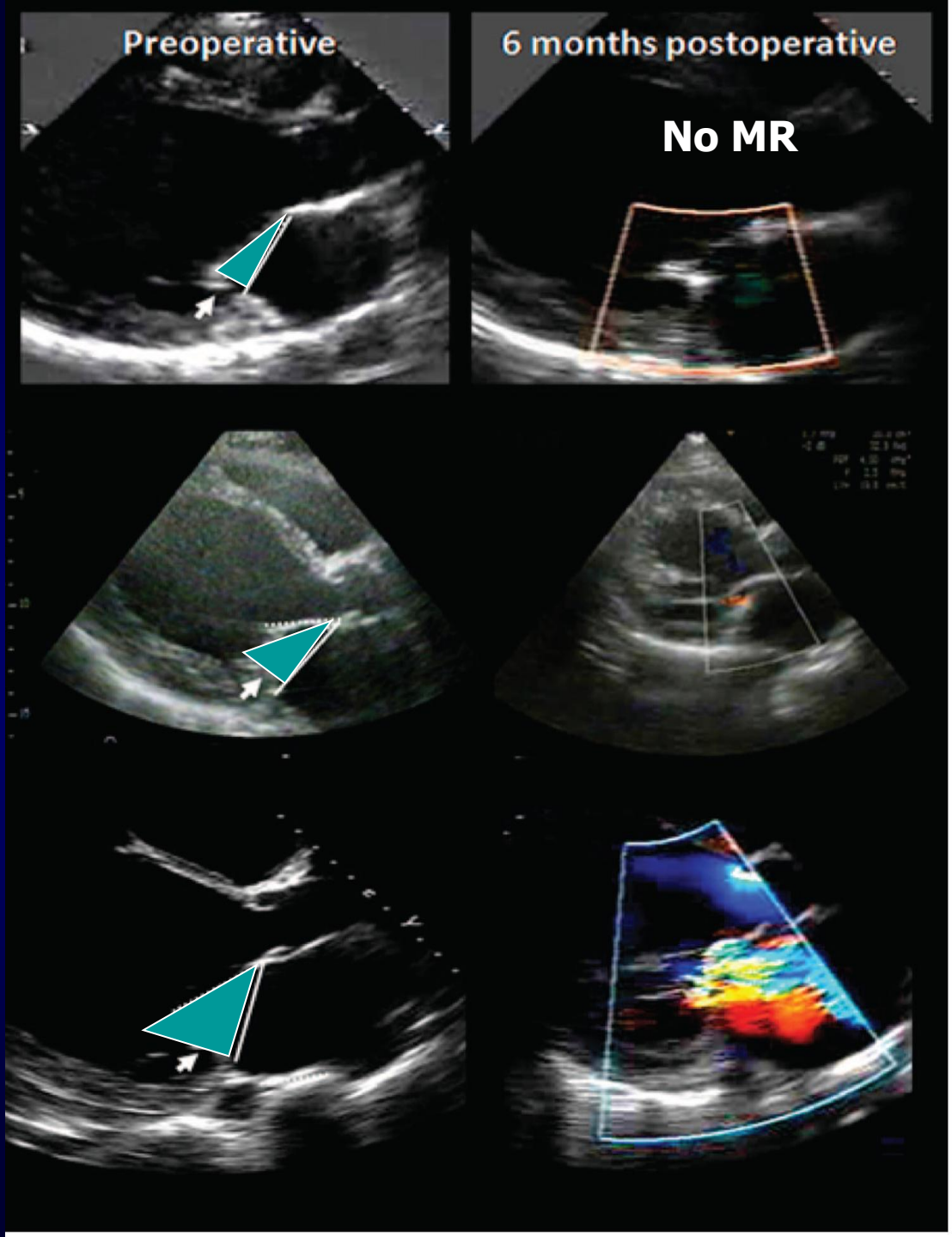
Distal anterior leaflet angle



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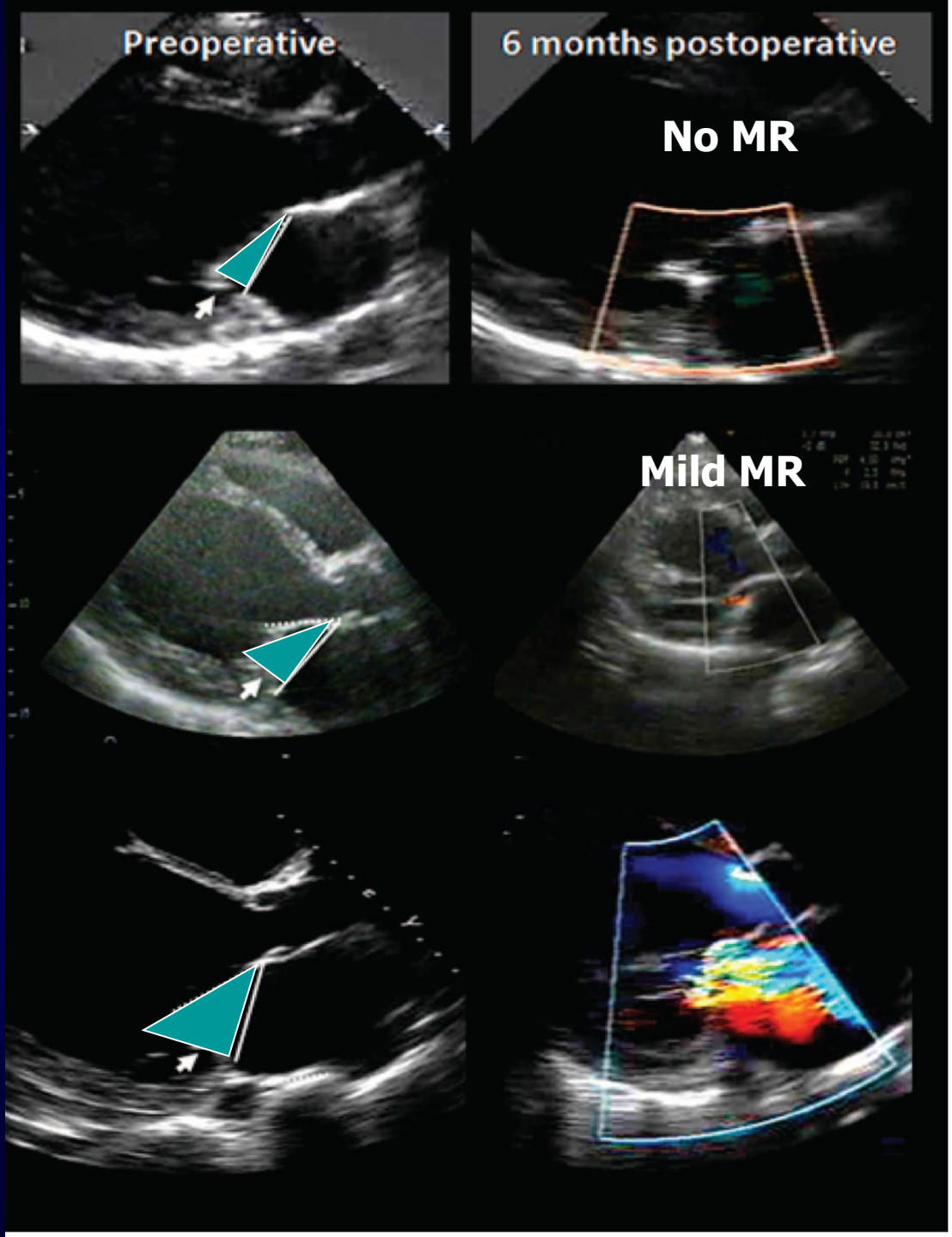

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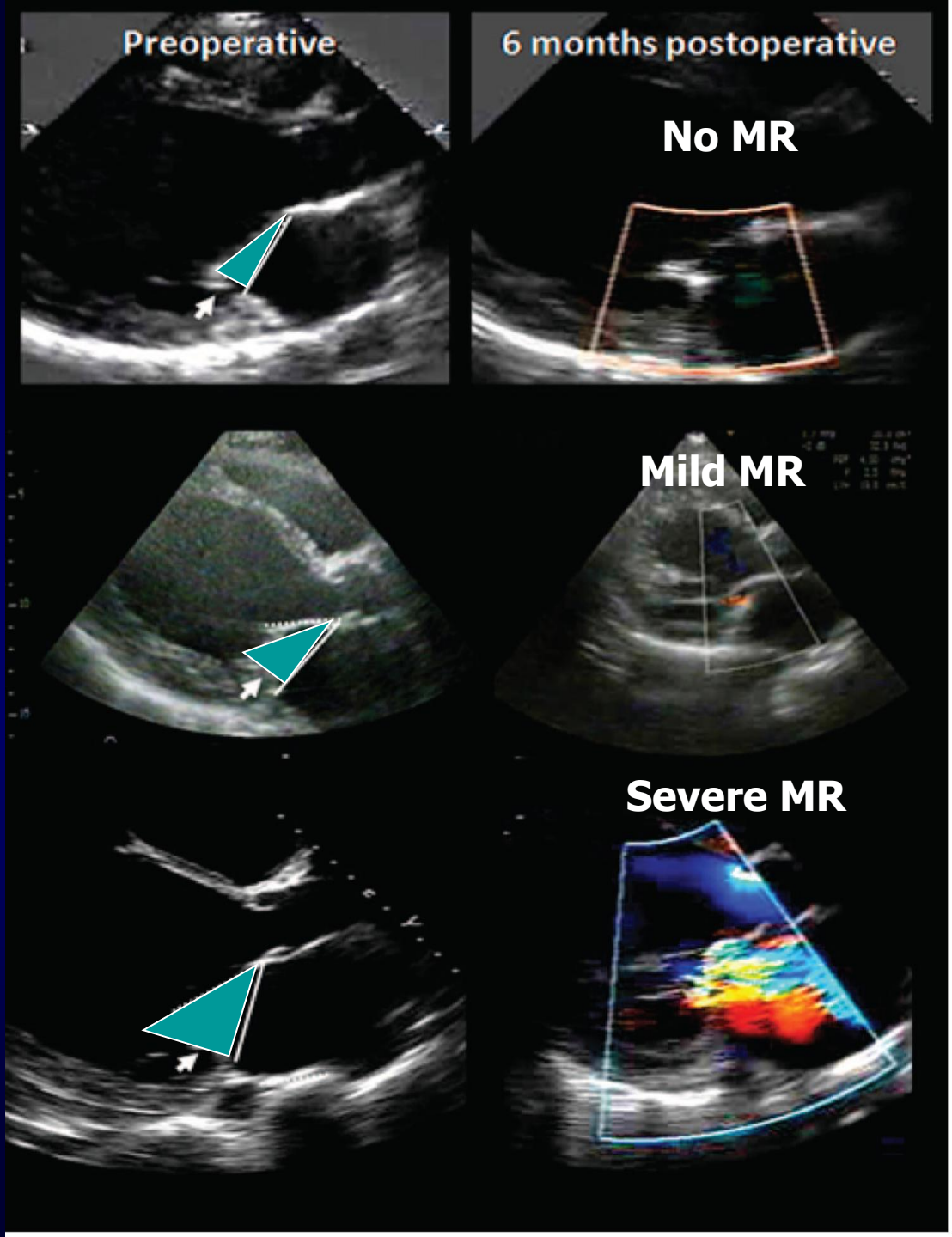

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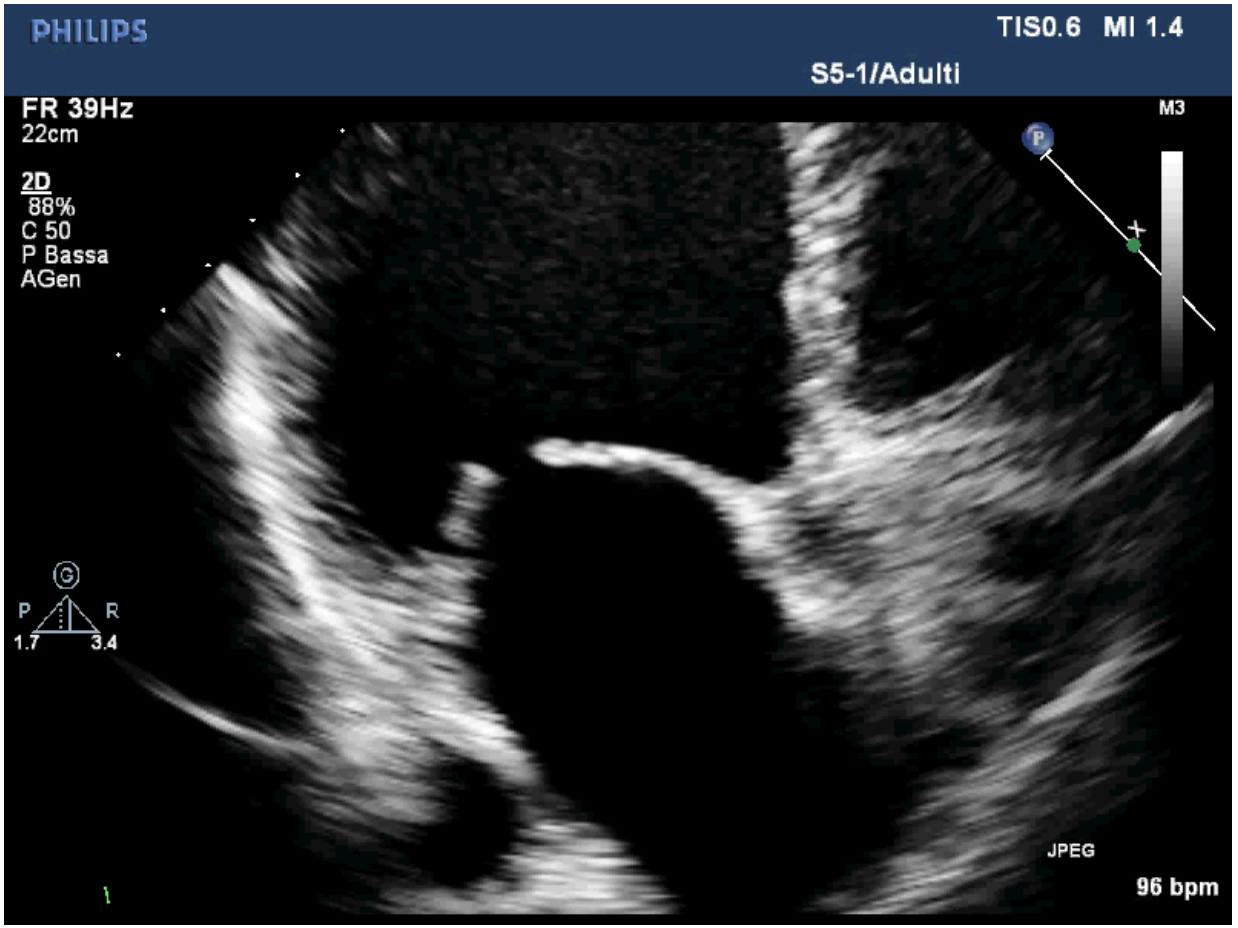
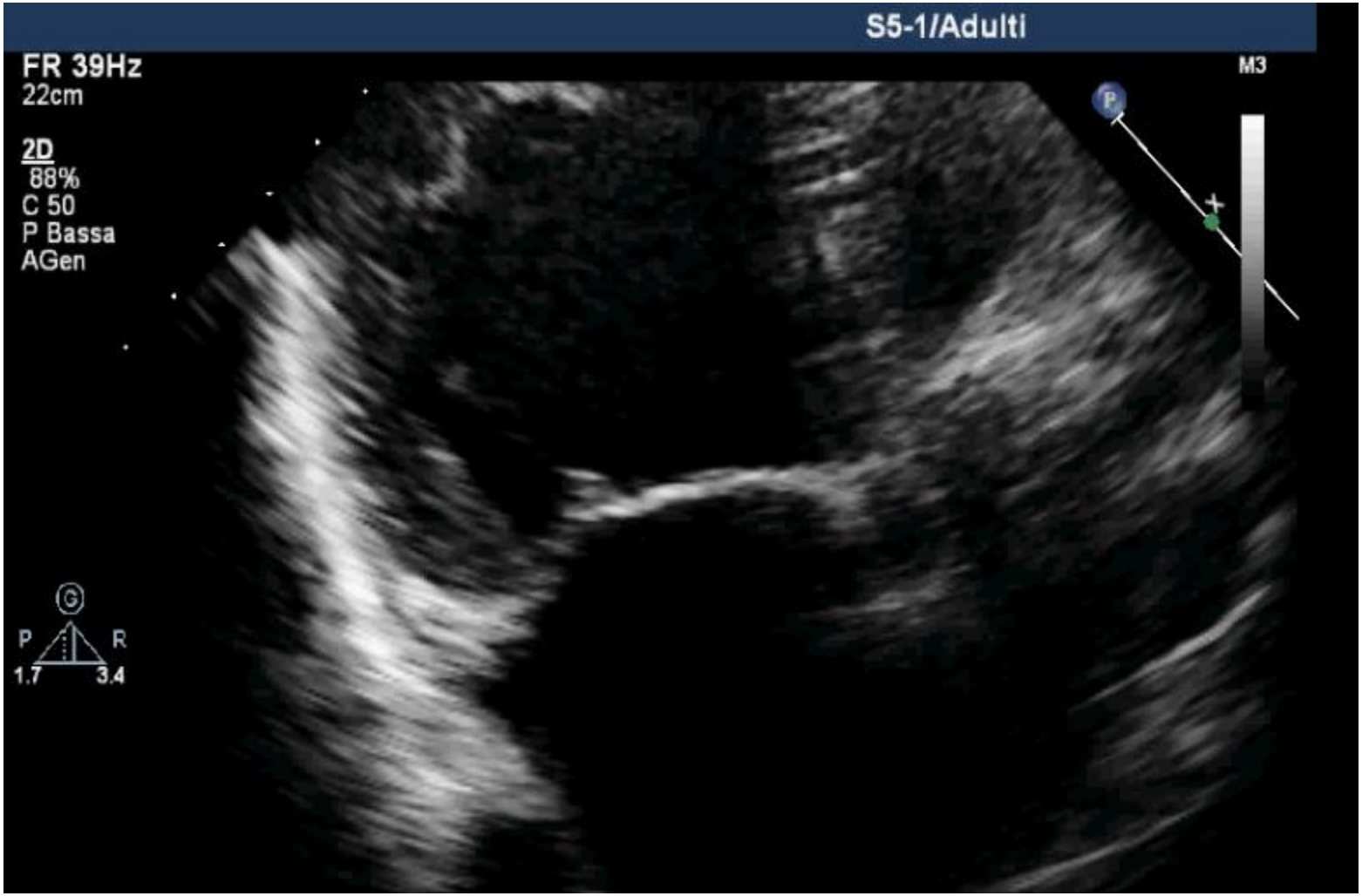
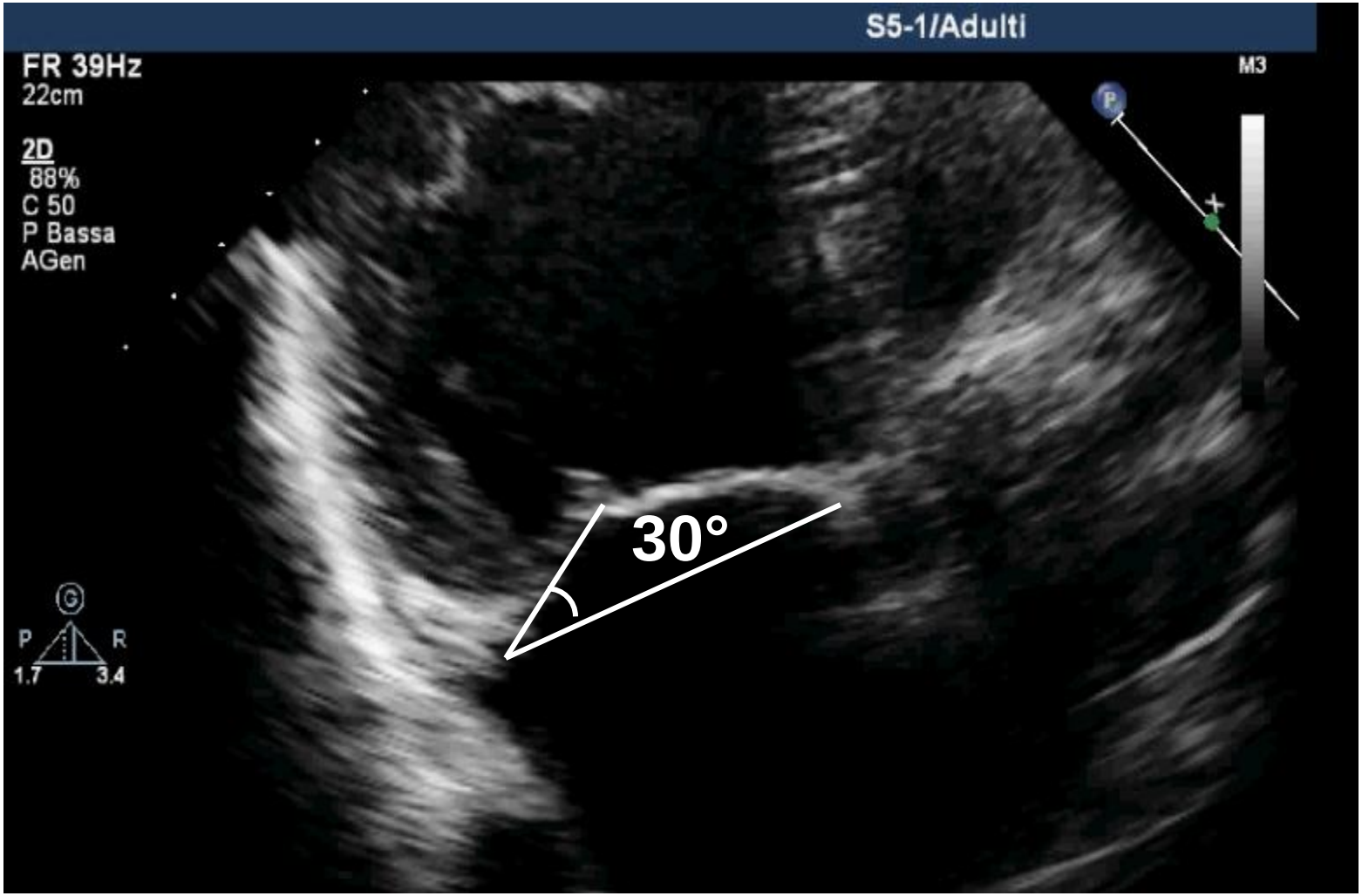
Symmetric MV tethring



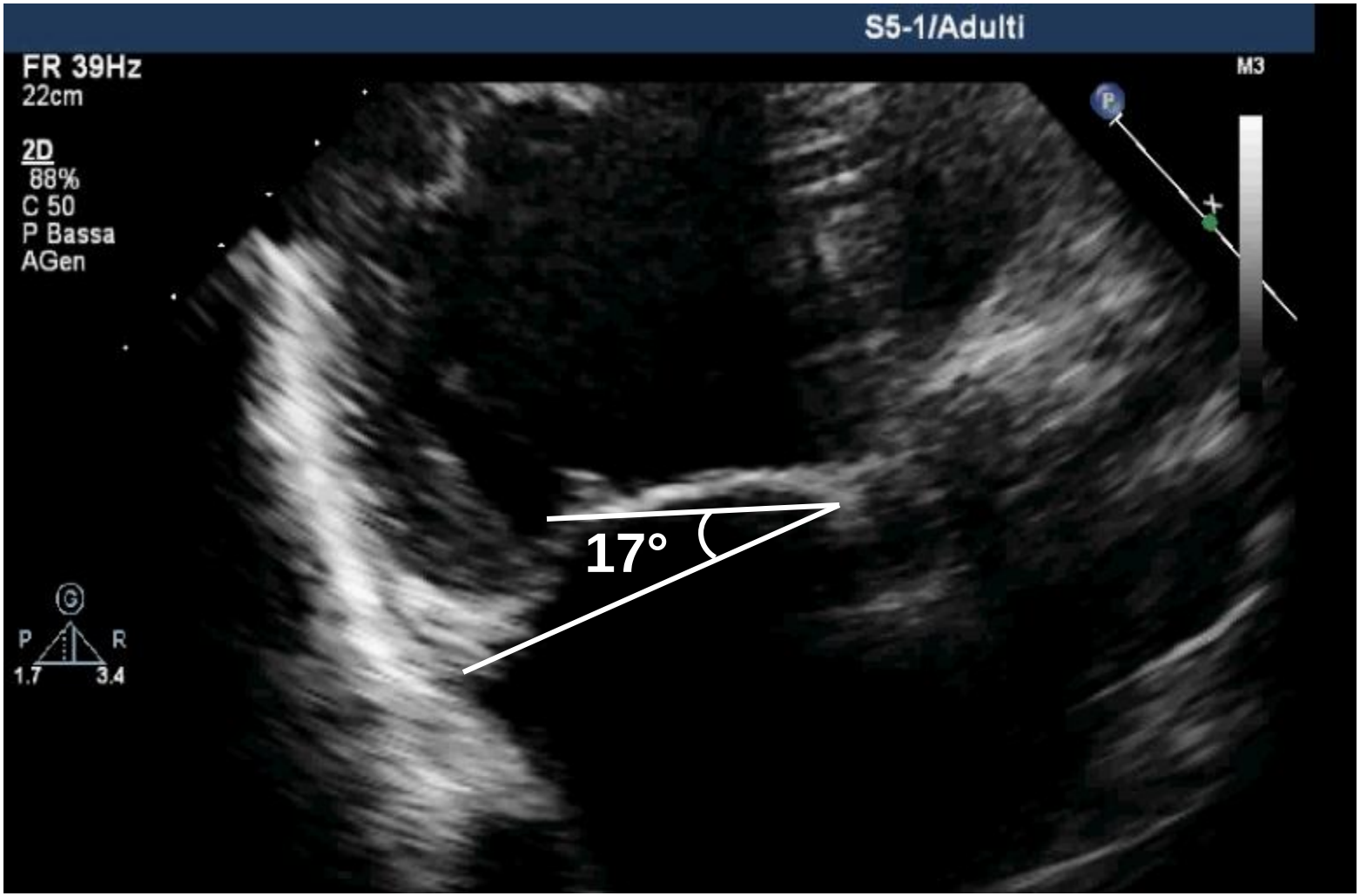
MV leaflet tethering



Posterior leaflet angle < 45°



Distal anterior leaflet angle < 20°



Possible scenarios: surgery ("good" MV repair)

PROS:

- Possibility to address all the pathophysiologic components of the disease
  - Functional MR
  - Tricuspid regurgitation
  - Permanent AF

Possible scenarios: surgery ("good" MV repair)

CONS:

- Surgical risk
- Reverse LV remodeling unpredictable

Undersized annuloplasty

Clinical outcomes for different strata of LV dimensions

	Preoperative LVEDD			Preoperative LVESD		
Outcome	≤65 mm	>65 mm	*p* Value	≤50 mm	>50 mm	*p* Value
Early mortality	3/72 (4.2%)	5/28 (17.9%)	0.037	2/58 (3.4%)	6/42 (14.3%)	NS
Late mortality	8/69 (11.6%)	9/23 (39.1%)	0.016	7/56 (12.5%)	10/36 (27.7%)	NS
All mortality	11/72 (15.3%)	14/28 (50.0%)	<0.0001	9/58 (15.5%)	16/42 (38.1%)	0.018
Readmission CHF	6/69 (8.7%)	5/23 (21.7%)	NS	2/56 (3.6%)	9/36 (25.0%)	0.005
Biventricular ICD	0/69	4/23 (17.4%)	<0.0001	0/56	4/36 (11.1%)	<0.0001

(Ann Thorac Surg 2008;85:430–7)

….but what about the risk of no reverse LV remodeling?

According to baseline LV dimensions →

- LV reverse remodeling unlikely
- However the real contribution of permanent AF to the severity of LV remodeling and dysfunction remains difficult to quantify

Restoring sinus rhythm may significantly improve LV function and promote reverse LV remodeling

European Journal of Cardio-Thoracic Surgery Advance Access published March 23, 2012

European Journal of Cardio-Thoracic Surgery 0 (2012) 1–7
doi:10.1093/ejcts/ezs078

ORIGINAL ARTICLE

Long-term results of mitral repair for functional mitral regurgitation in idiopathic dilated cardiomyopathy†

Michele De Bonis*, Maurizio Taramasso, Alessandro Verzini, David Ferrara, Elisabetta Lapenna, Maria Chiara Calabrese, Antonio Grimaldi and Ottavio Alfieri

Cardiac Surgery Department, San Raffaele University Hospital, Milan, Italy

Predictors of reverse LV remodeling

	Univariate			Multivariate		
	HR	**95% CI**	**p**	**HR**	**95% CI**	**p**
NYHA >3	0.6	0.2-1.8	0.4			
EF	0.9	0.8-1	0.1			
SPAP	0.9	0.9-1.0	**0.05**	0.9	0.9-1	**0.04**
LVEDVI	0.9	0.9-1	0.3			
LVESVI	0.9	0.9-1	0.4			
MR at discharge	0.6	0.2-1.2	0.1			
Edge-to-edge repair	2.3	0.9-6.1	0.07	1.8	0.6-4.8	0.2
AF ablation and/or CRT	2.7	1-7.6	**0.04**	3.4	1.2-9.7	**0.02**

De Bonis M et al. European J Cardiothoracic Surgery, March 2012

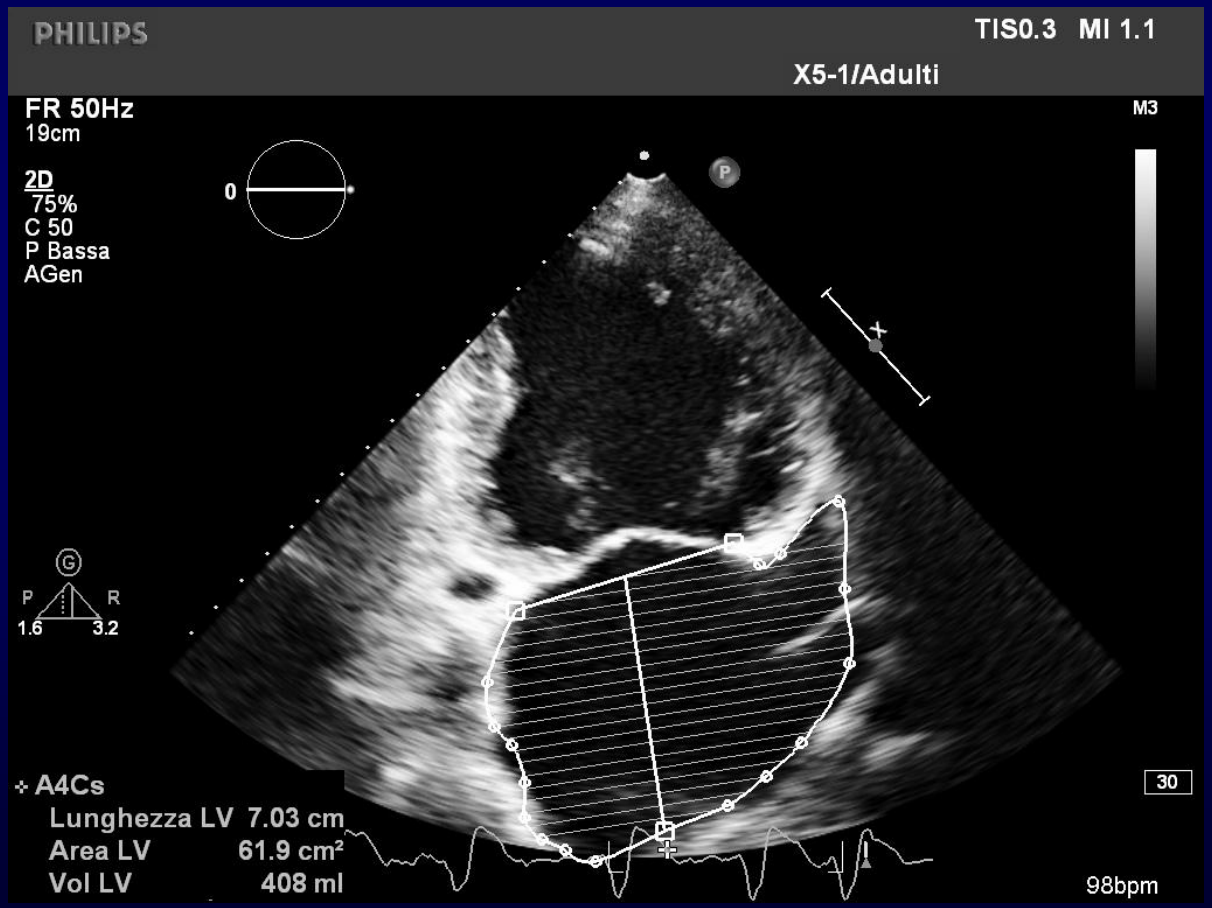
Is surgical ablation of AF going to be effective in this patient?

- Young pt ! (46 years)
- Short AF duration (about 1 year)

but....

Is surgical ablation of AF going to be effective in this patient?

..... Large left atrium ....



Indications for MV surgery in chronic secondary MR (ESC/EACTS Guidelines)

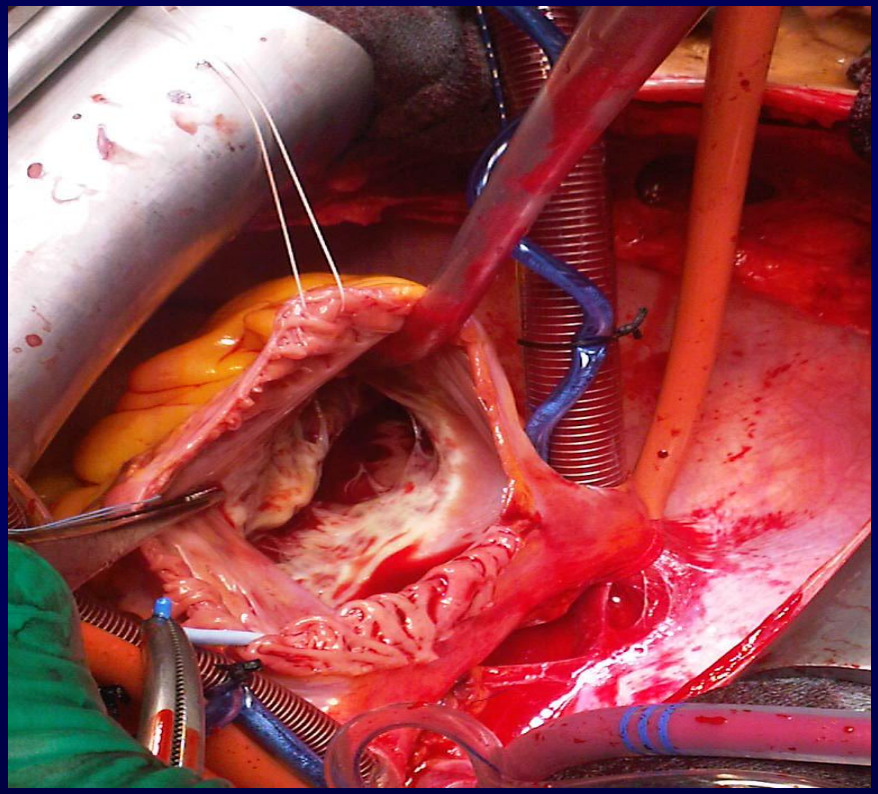
	Class[a]	Level[b]
Surgery is indicated in patients with severe MR* undergoing CABG, and LVEF >30%	I	C
Surgery should be considered in patients with moderate MR undergoing CABG**	IIa	C
Surgery should be considered in symptomatic patients with severe MR, LVEF <30%, option for revascularization	IIa	C
Surgery may be considered in patients with severe MR, LVEF >30%, who remain symptomatic despite optimal medical management (including CRT if indicated) and have low comorbidity, when revascularization is not indicated	IIb	C

Isolated undersized annuloplasty

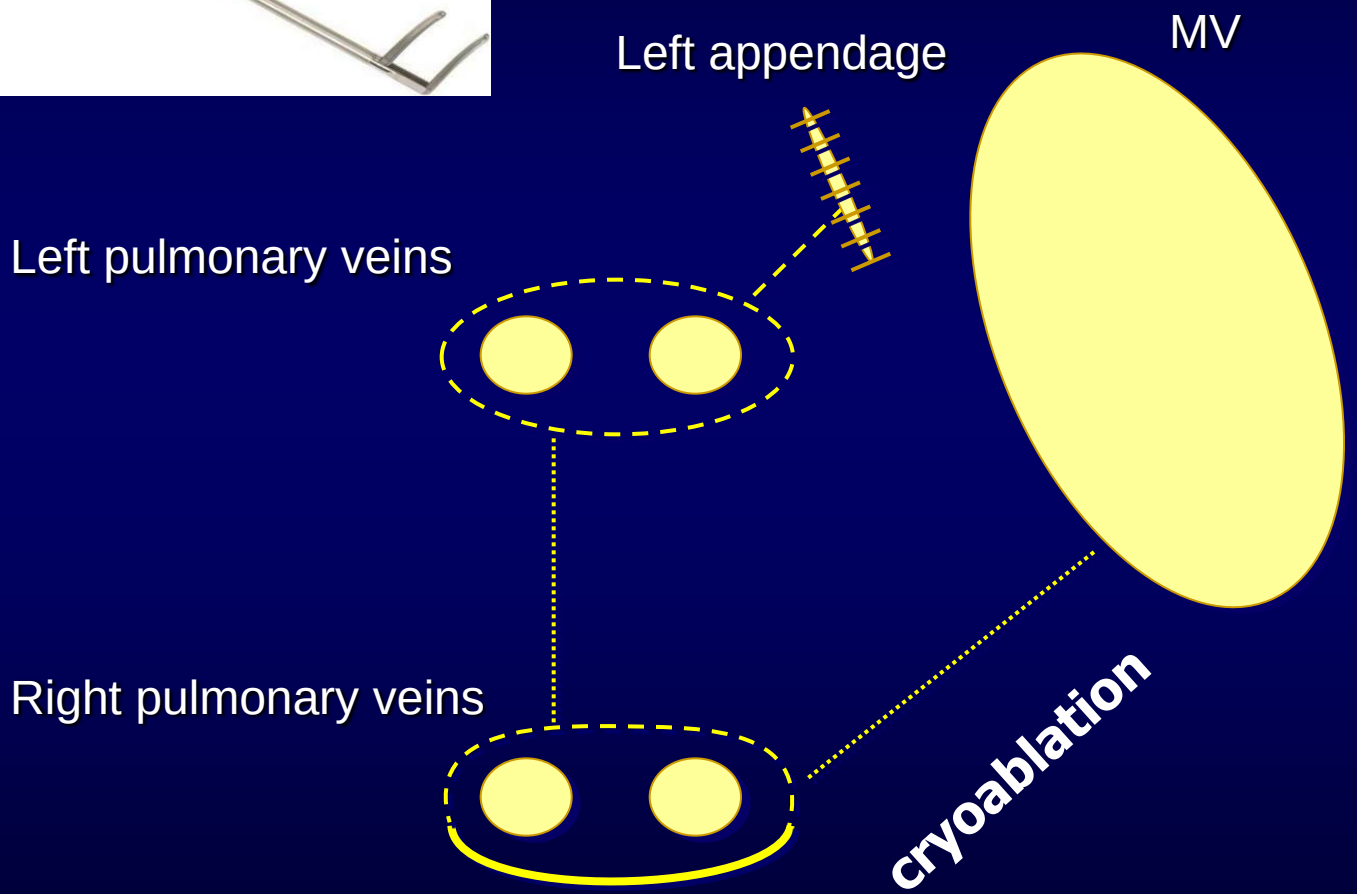
Saddle St. Jude Ring. N. 28

Remodeling tricuspid annuloplasty

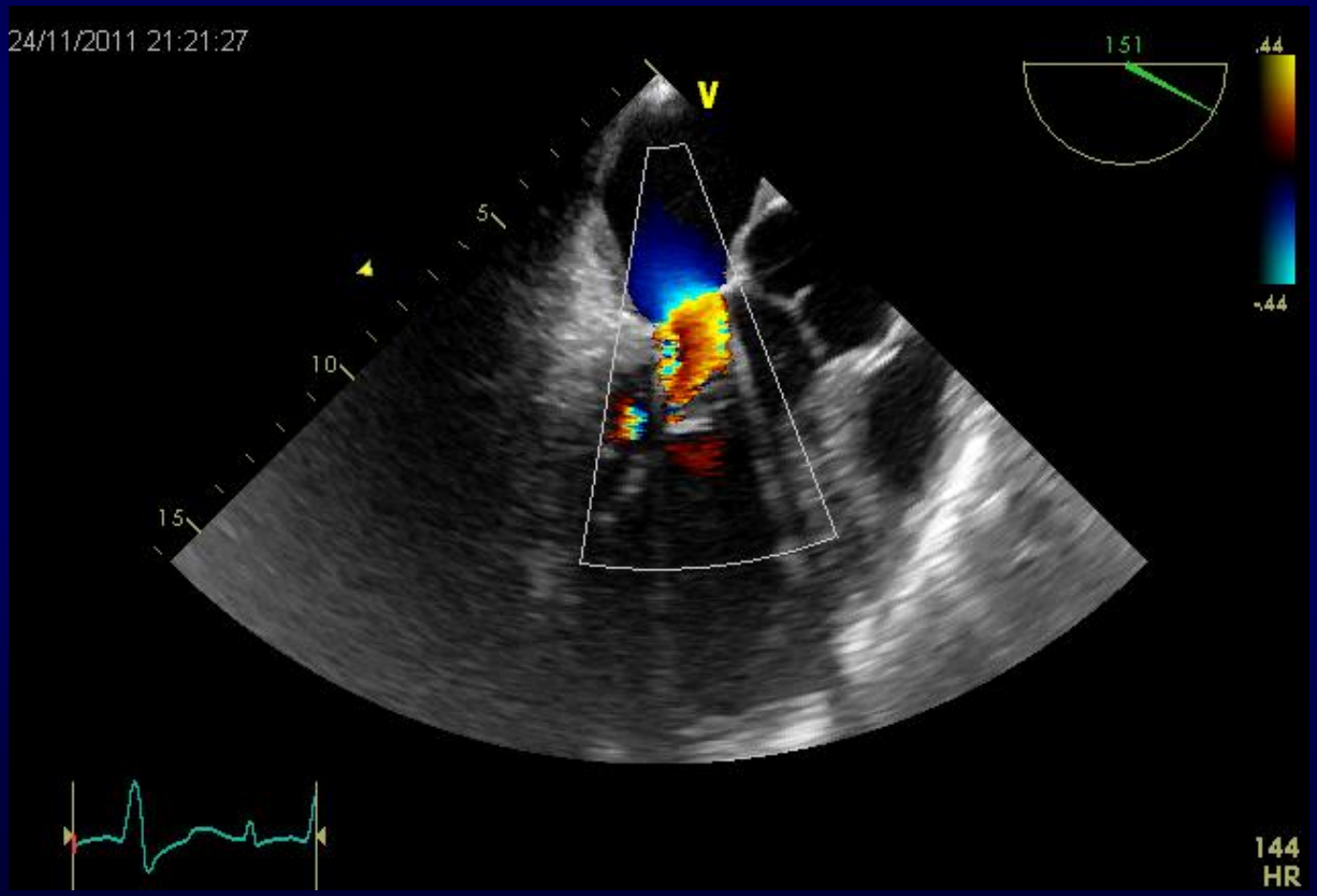
Edwards MC^3 tricuspid annuloplasty system n. 30



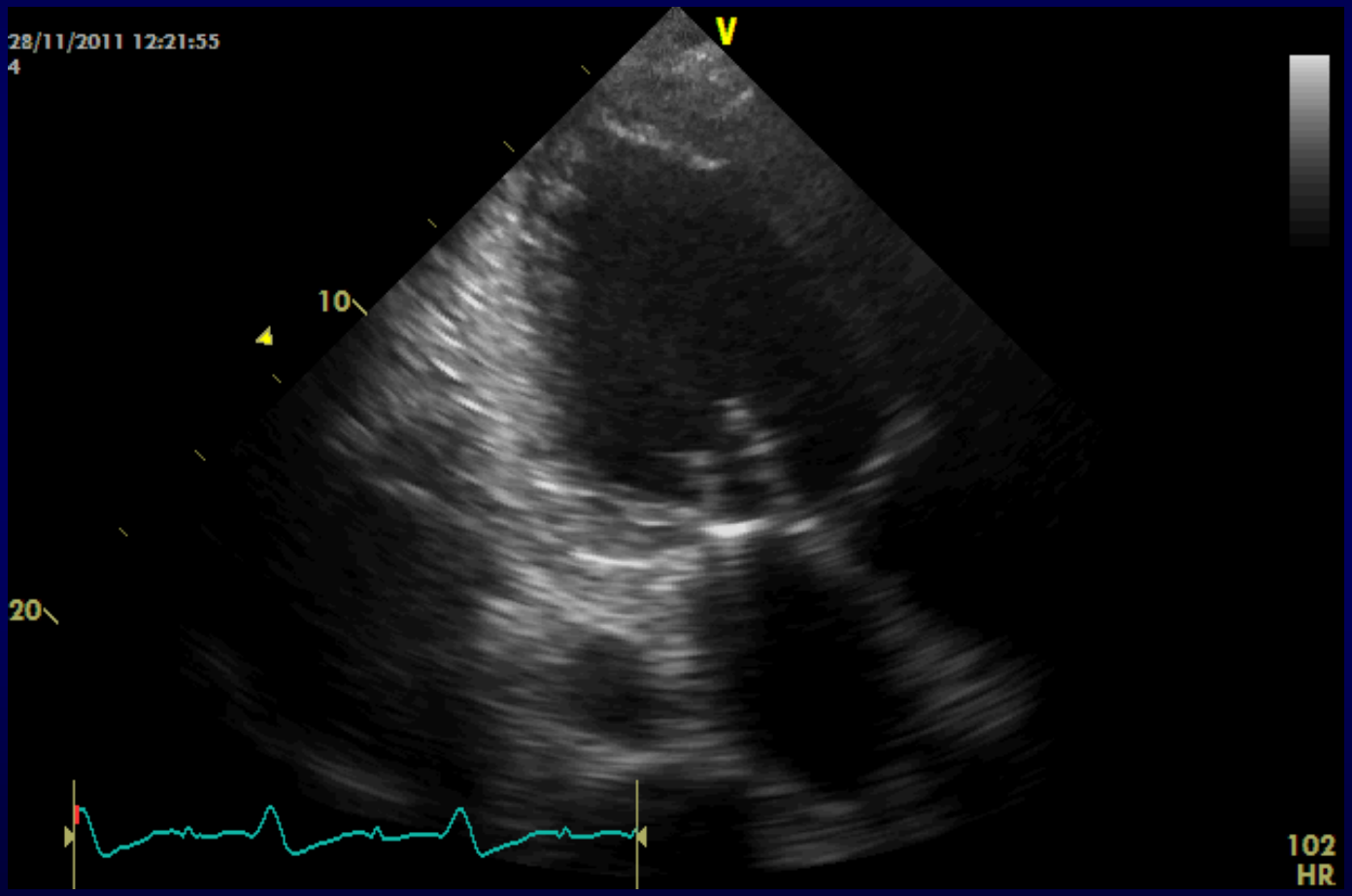
AF surgical ablation



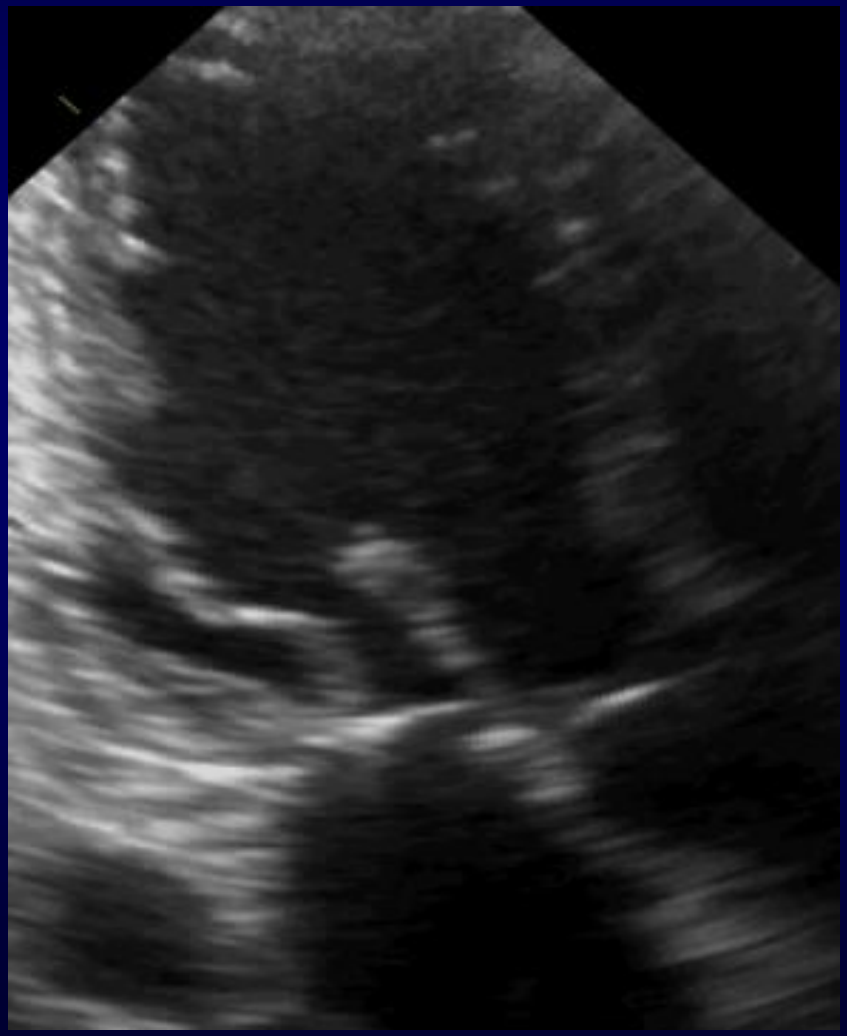
Postoperative TEE
No residual MR

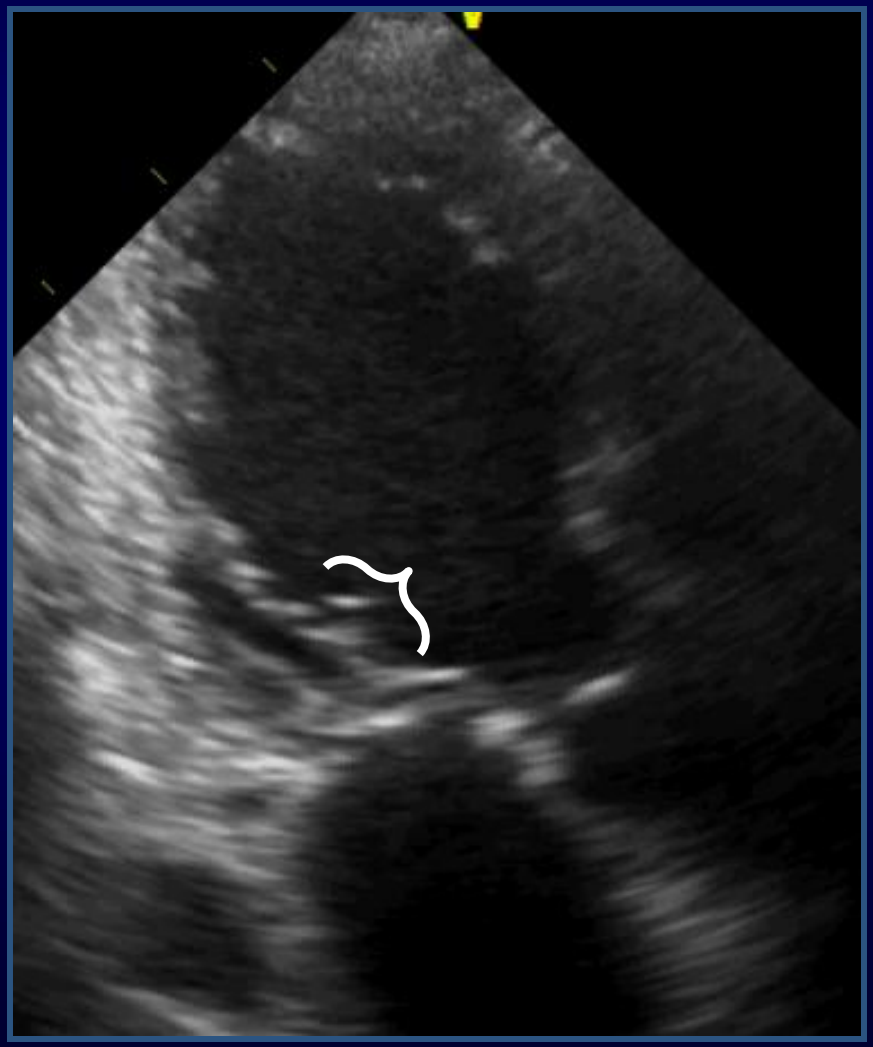


Good postoperative MV coaptation length

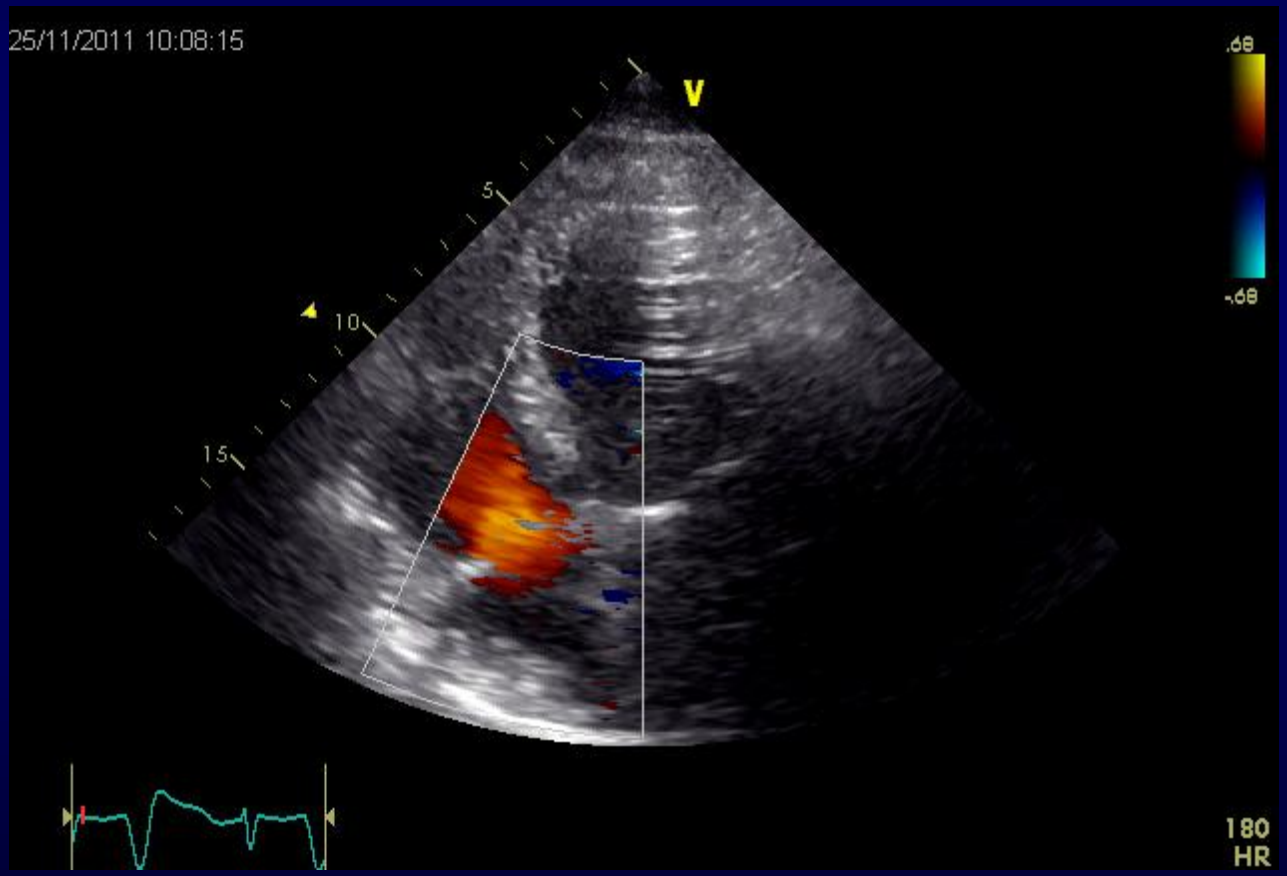


MV coaptation length 9 mm

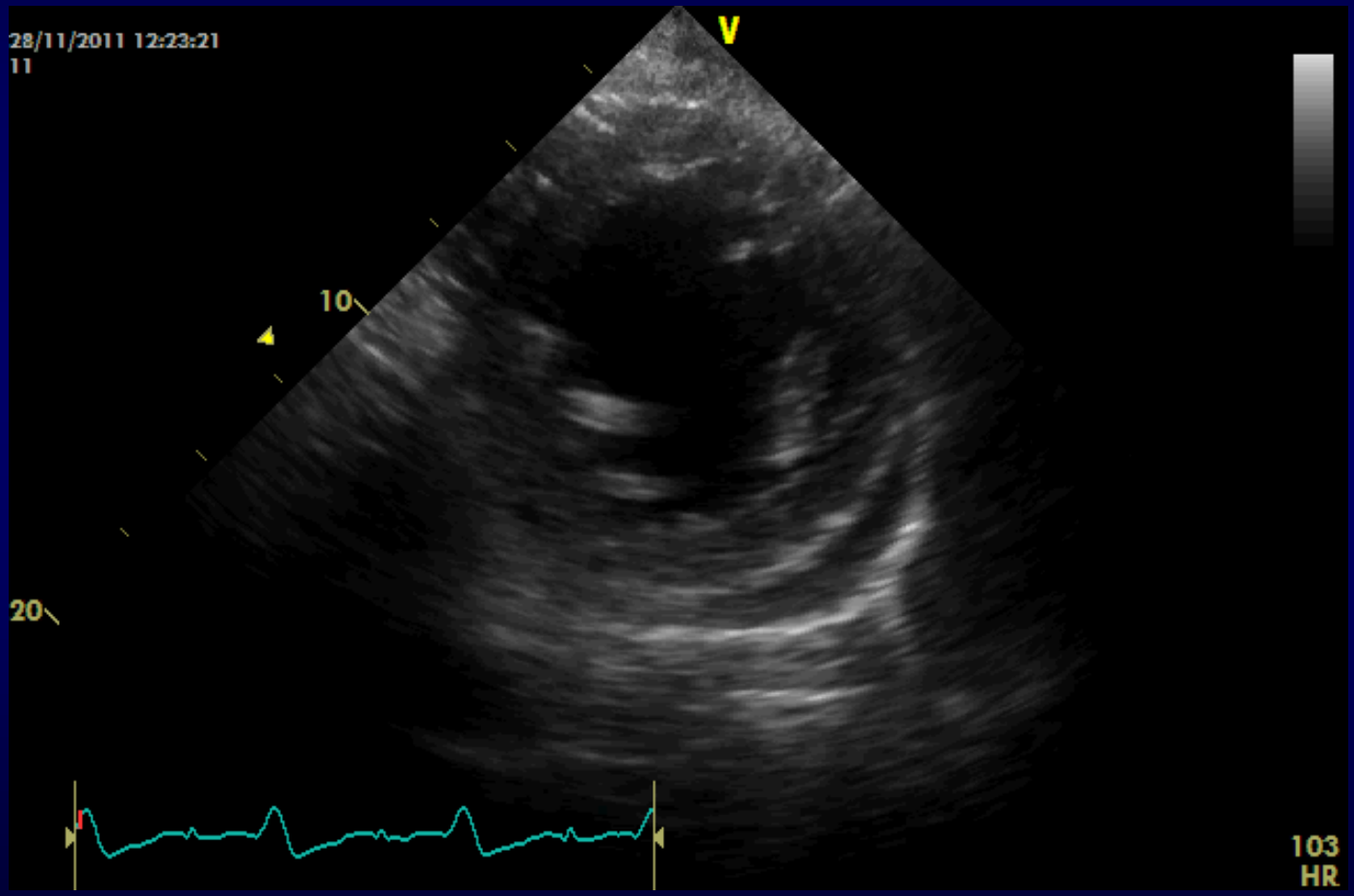




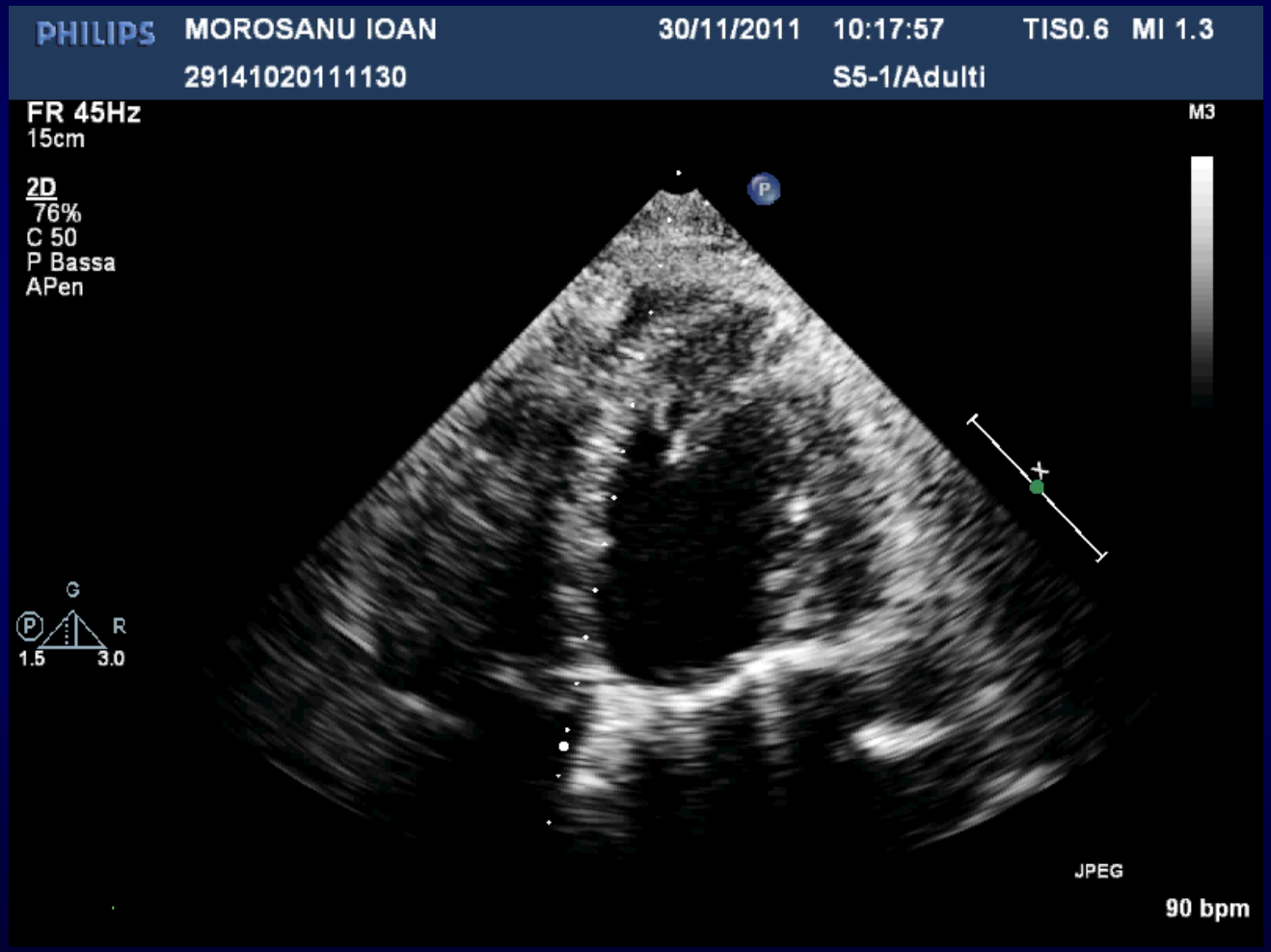
Postoperative TEE
No residual tricuspid regurgitation



Postoperative sinus rhythm



Hospital discharge



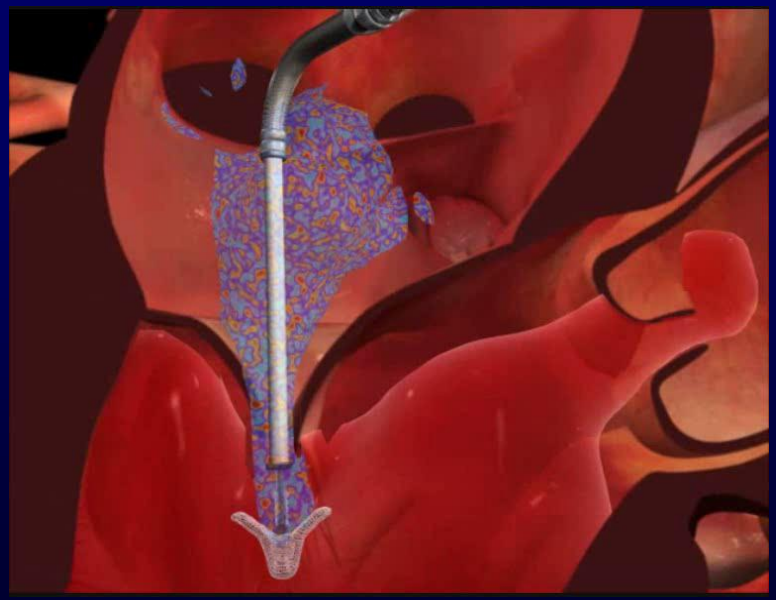
6 months follow-up

- NYHA I-IIA
- Major improvement in QoL
- No CHF episodes
- ECG: SR+RBB block
- TTE: No MR, No TR, EF 40-45%

Same patient but…

multiple comorbidities
(renal, epatic,
pulmonary …)

MITRACLIP



Complementary role of Mitraclip and Surgery


Thank you!
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Freedom from MR>2+ in FMR (HSR experience)