Ospedale "*Sacro Cuore di Gesù*"
Fatebenefratelli Benevento
U.O.C. Cardiologia/UTIC/Emodinamica
Primario: *Prof. Bruno Villari*

La diagnostica nelle valvulopatie. Ecocardiogramma da sforzo o ecostress farmacologico?

Quirino Ciampi, MD, PhD, FESC
Resp UOS UTIC/Echolab

Milano, 27 marzo 2017

European Heart Journal – Cardiovascular Imaging (2014) **15**, 158–163
doi:10.1093/ehjci/jet082

Stress echocardiography in clinical practice: a United Kingdom National Health Service Survey on behalf of the British Society of Echocardiography

Sanjeev Bhattacharyya[1], Omar Chehab[1], Rajdeep Khattar[1], Guy Lloyd[2], and Roxy Senior[1,3]*, on behalf of the British Society of Echocardiography

Units which perform stress echo for assessment of valvular heart disease	*n* (%)
Low-flow, low-gradient aortic stenosis	81 (95.3)
Asymptomatic severe aortic stenosis	34 (40)
Asymptomatic severe mitral regurgitation	26 (30.6)
Asymptomatic severe mitral stenosis	21 (24.7)
Symptomatic mild/moderate mitral regurgitation	32 (37.6)
Symptomatic mild/moderate mitral stenosis	24 (28.2)
Asymptomatic severe aortic regurgitation	15 (17.6)

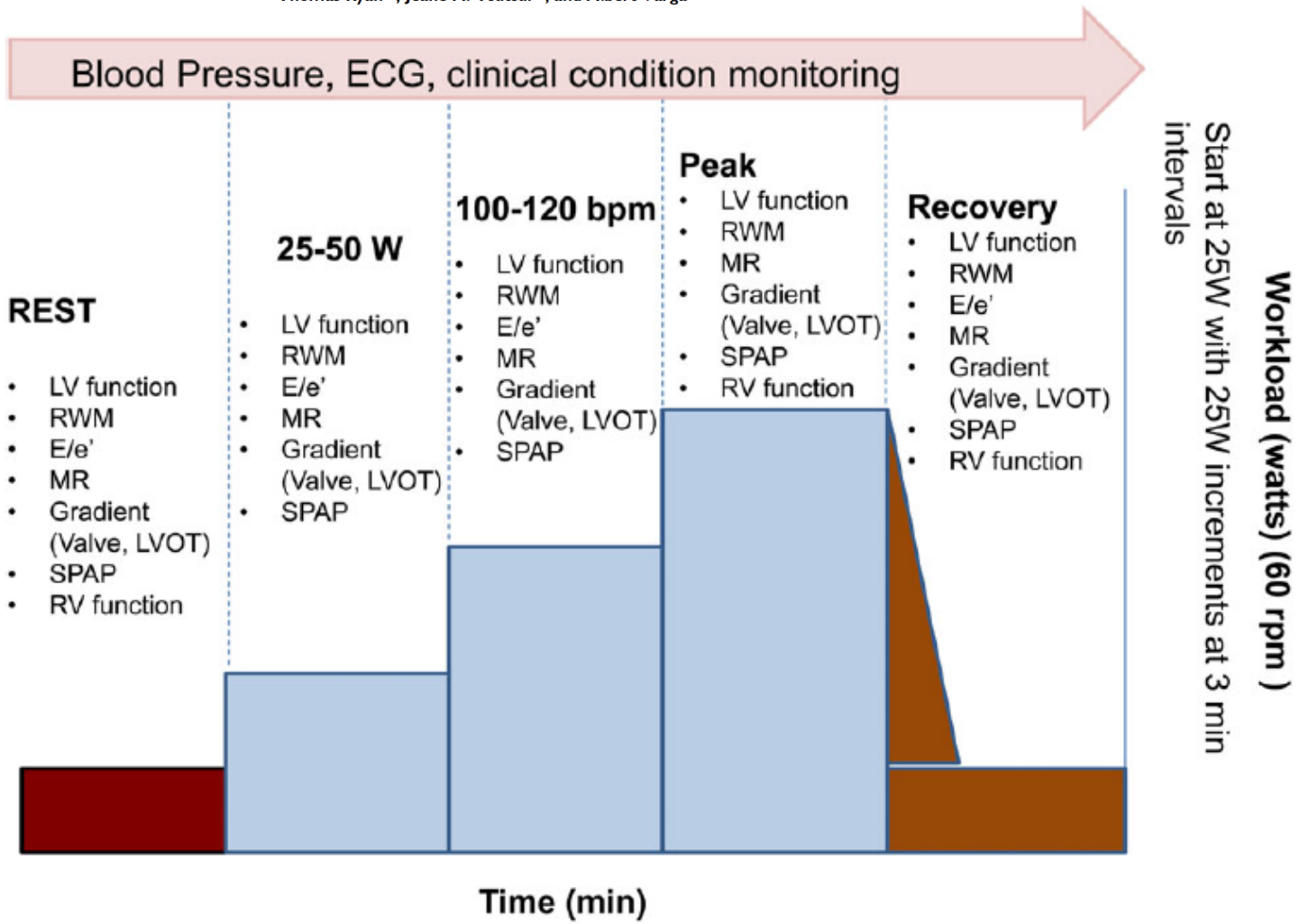
Ecostress da sforzo o farmacologico

- L'esercizio fisico rappresenta lo stress fisiopatologicamente più elegante con maggiori evidenze scientifiche:
  - focus su funzione valvolare
    - Insufficienza mitralica organica e/o funzionale
    - Stenosi mitralica
    - Stenosi aortica severa asintomatica
- Lo stress farmacologico con dobutamina:
  - focus su funzione ventricolare
    - Stenosi aortica low-flow flow-gradient
    - Insufficienza mitralica funzionale

European Heart Journal – Cardiovascular Imaging (2016) 17, 1191–1229
doi:10.1093/ehjci/jew190

The clinical use of stress echocardiography in non-ischaemic heart disease: recommendations from the European Association of Cardiovascular Imaging and the American Society of Echocardiography

Patrizio Lancellotti[1,2]*, Patricia A. Pellikka[3], Werner Budts[4], Farooq A. Chaudhry[5], Erwan Donal[6], Raluca Dulgheru[1], Thor Edvardsen[7], Madalina Garbi[8], Jong-Won Ha[9], Garvan C. Kane[3], Joe Kreeger[10], Luc Mertens[11], Philippe Pibarot[12], Eugenio Picano[13], Thomas Ryan[14], Jeane M. Tsutsui[15], and Albert Varga[16]



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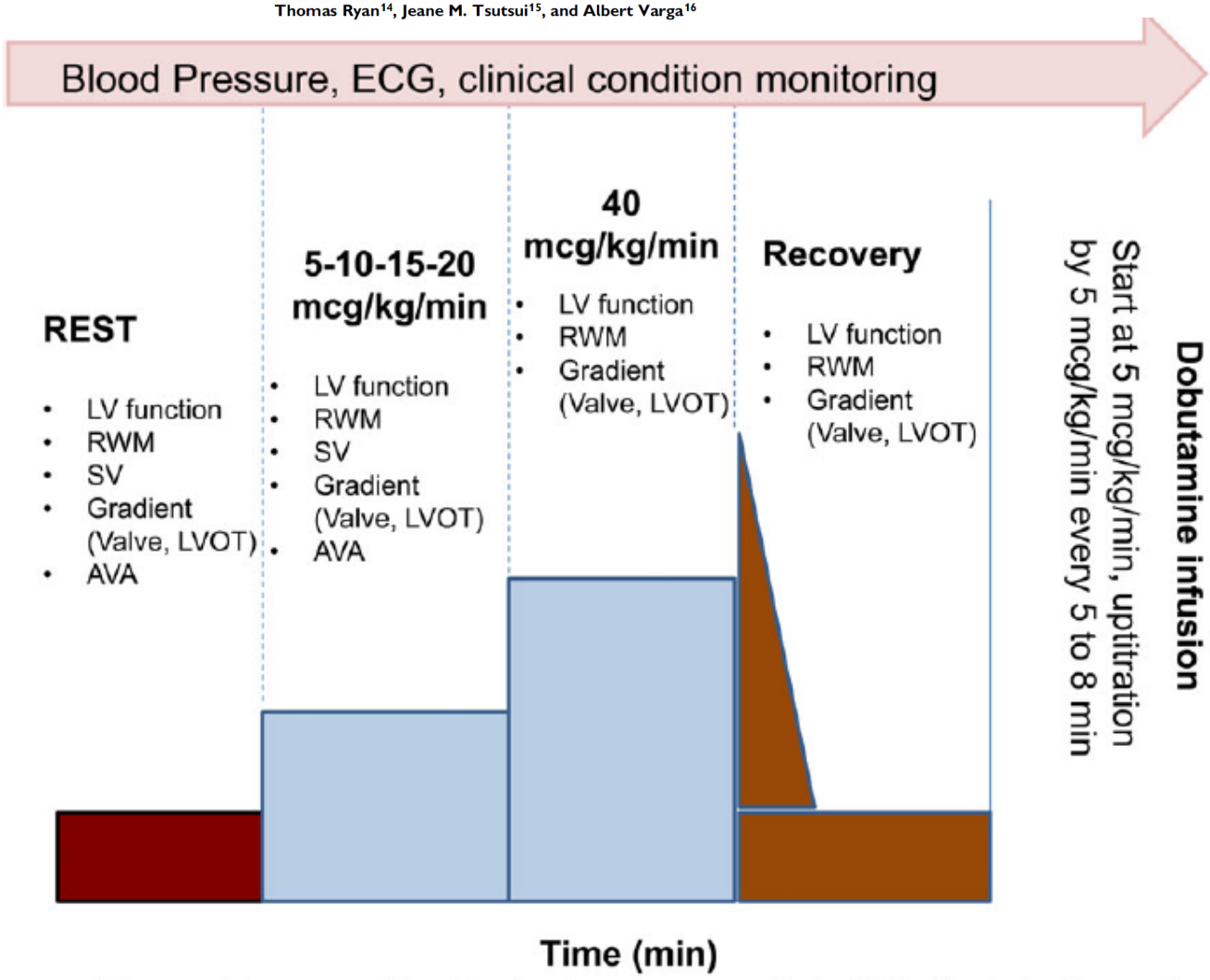
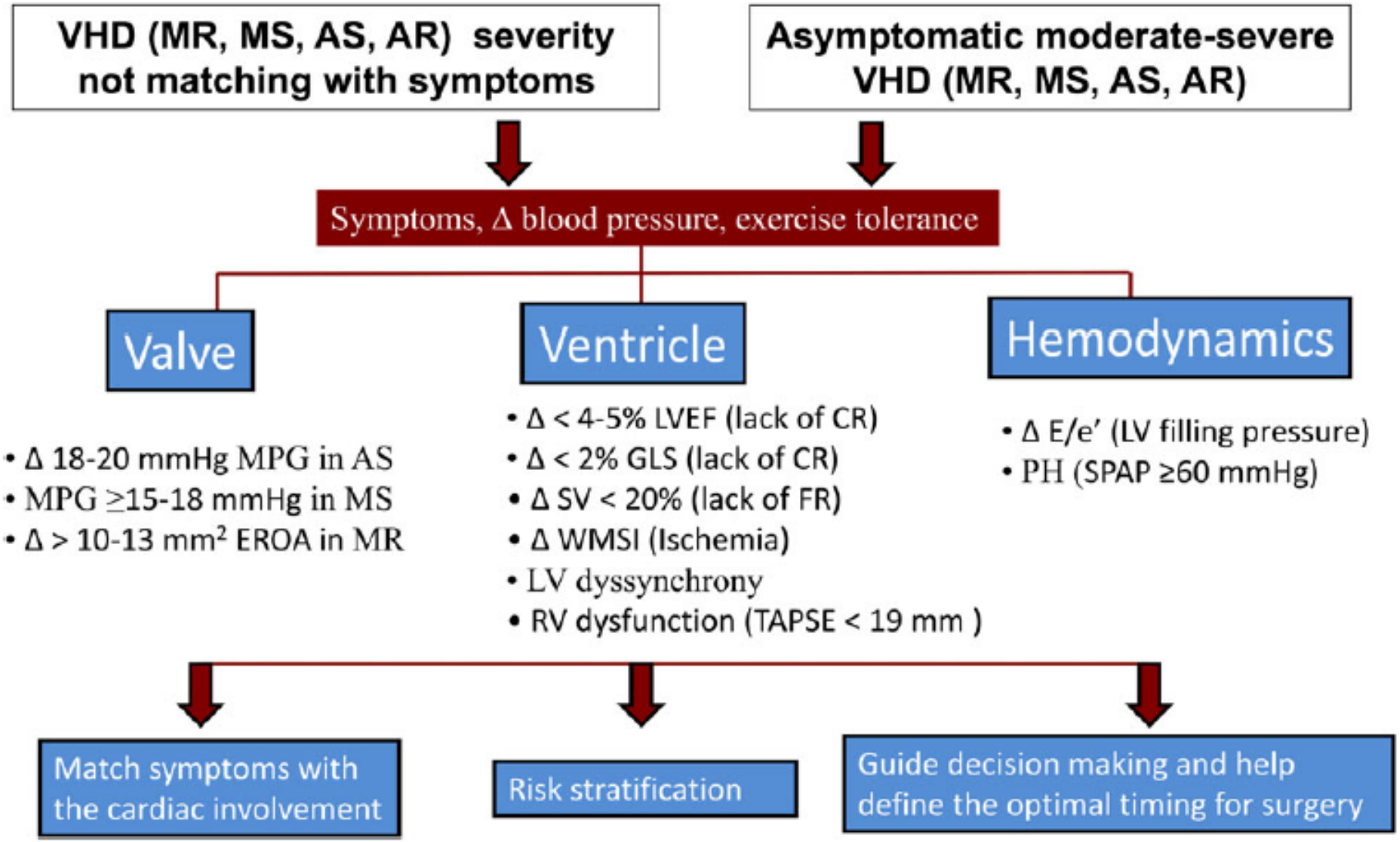
The clinical use of stress echocardiography in non-ischaemic heart disease: recommendations from the European Association of Cardiovascular Imaging and the American Society of Echocardiography

Patrizio Lancellotti[1,2*], Patricia A. Pellikka[3], Werner Budts[4], Farooq A. Chaudhry[5], Erwan Donal[6], Raluca Dulgheru[1], Thor Edvardsen[7], Madalina Garbi[8], Jong-Won Ha[9], Garvan C. Kane[3], Joe Kreeger[10], Luc Mertens[11], Philippe Pibarot[12], Eugenio Picano[13], Thomas Ryan[14], Jeane M. Tsutsui[15], and Albert Varga[16]





Lancellotti P, *EHJ CI* 2016

Ecostress da sforzo o farmacologico?

	Gradiente Aortico	CR VSx	Gradiente mitralico	IM (color)	B-lines	PAPs
STENOSI AORTICA						
Severa asintomatica	**	**			**	
Basso-flusso basso-gradiente ridotta FE	***	***			***	
Basso-flusso basso-gradiente "paradossa" con normale FE	*	*			**	
INSUFFICIENZA AORTICA						
Severa asintomatica, FE borderline		*			*	
STENOSI MITRALICA						
Lieve –moderata sintomatica			***		***	***
Severa asintomatica			***		***	***
INSUFFICIENZA MITRALICA						
Lieve –moderata sintomatica		**		***	***	***
Severa asintomatica		**		***	***	***

Ciampi Q, Manuale SIEC 2017

Ecostress da sforzo o farmacologico?

	Gradiente Aortico	CR VSx	Gradiente mitralico	IM (color)	B-lines	PAPs
STENOSI AORTICA						
Severa asintomatica	**	**			**	
Basso-flusso basso-gradiente ridotta FE	***	***			***	
Basso-flusso basso-gradiente "paradossa" con normale FE	*	*			**	
INSUFFICIENZA AORTICA						
Severa asintomatica, FE borderline		*			*	
STENOSI MITRALICA						
Lieve –moderata sintomatica			***		***	***
Severa asintomatica			***		***	***
INSUFFICIENZA MITRALICA						
Lieve –moderata sintomatica		**		***	***	***
Severa asintomatica		**		***	***	***

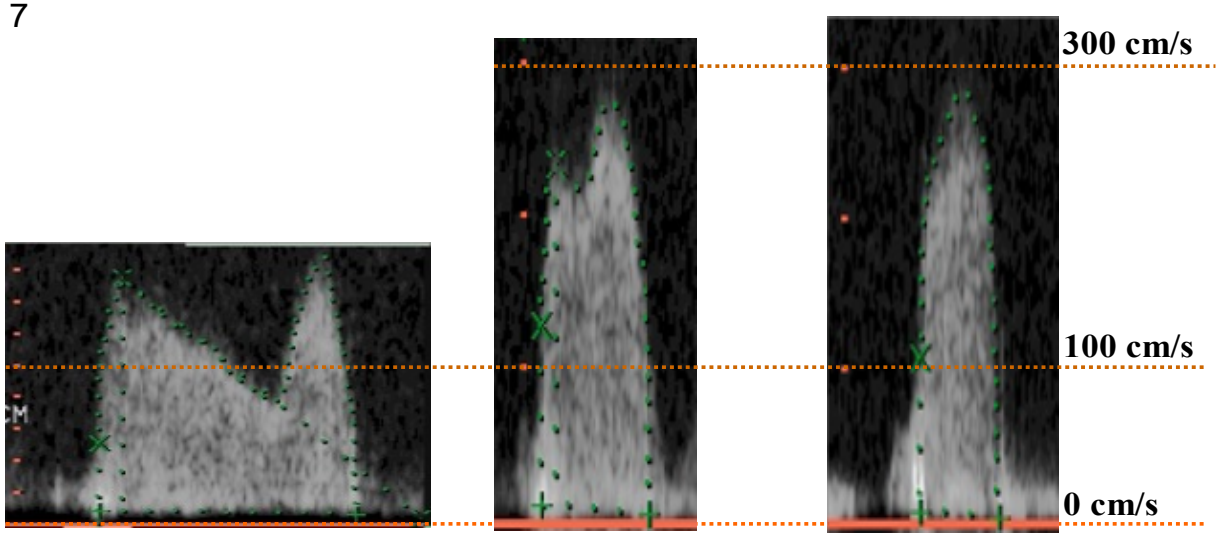
Ciampi Q, Manuale SIEC 2017

Stenosi mitralica ed ecostress

SM è definita severa <1 cm^2 nelle linee guida ESC/EACTS e <1.5 cm^2 nelle linee guida ACC/AHA

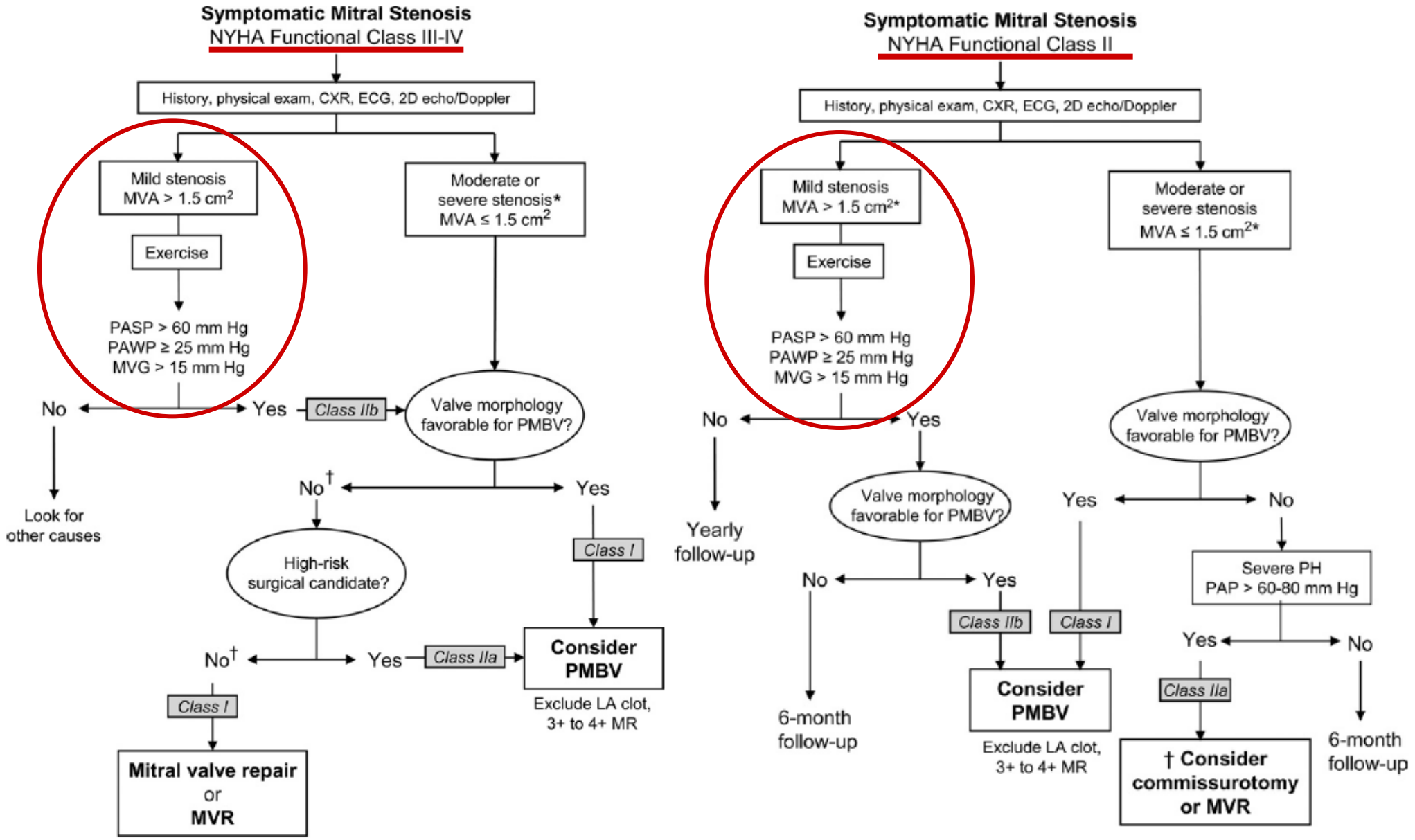
Dato il concetto di riserva mitralica, stressare la valvola mitrale significa aumentare il flusso ematico transmitralico.

Fig 7

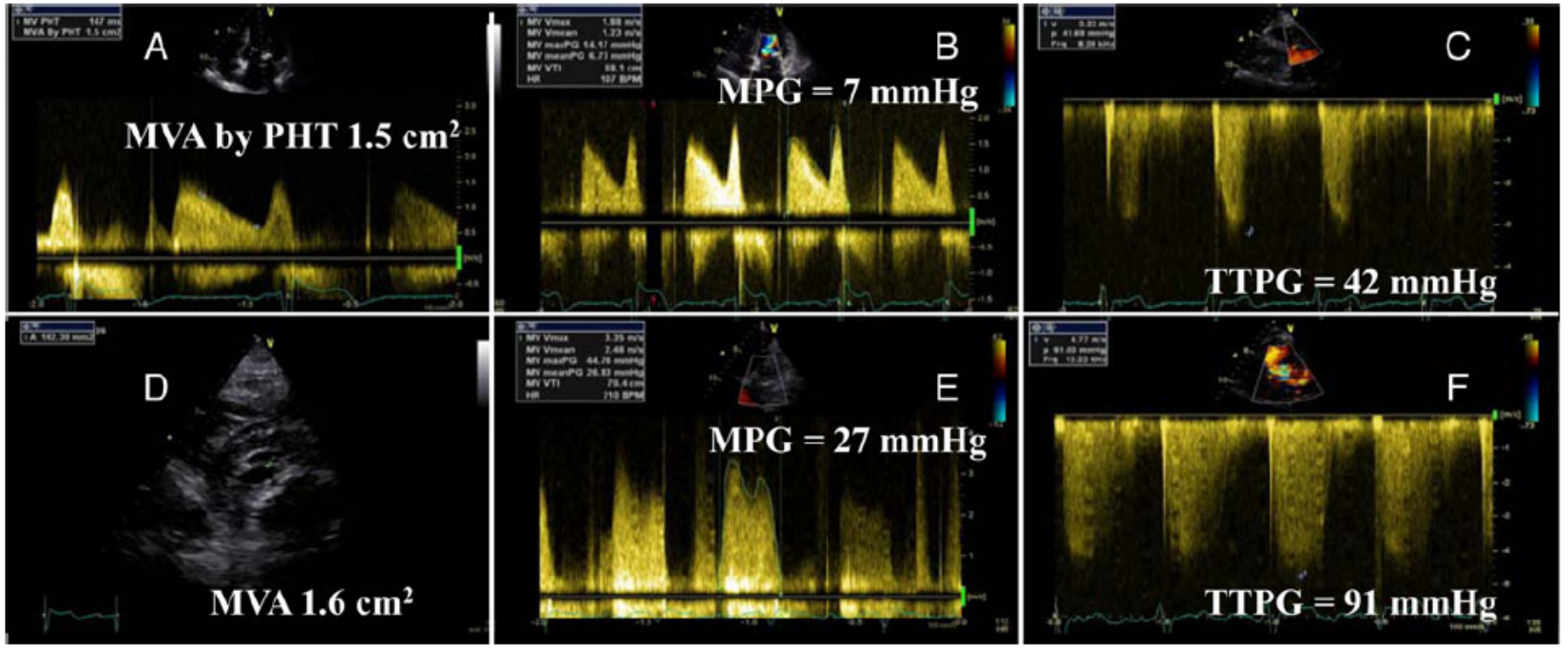


	Rest	30-W exercise	Peak exercise
HR (b/min):	55	116	159
DFT (ms):	607	228	200
SV (ml):	66	59	57
Q_{mean} (ml/s):	109	259	284
ΔP (mmHg):	5	23	27
PAPs (mmHg)	40	62	69

Picano E *J Am Coll Cardiol* 2009



Bonow RO *Focus Update Guidelines valvular disease ACC/AHA 2014*



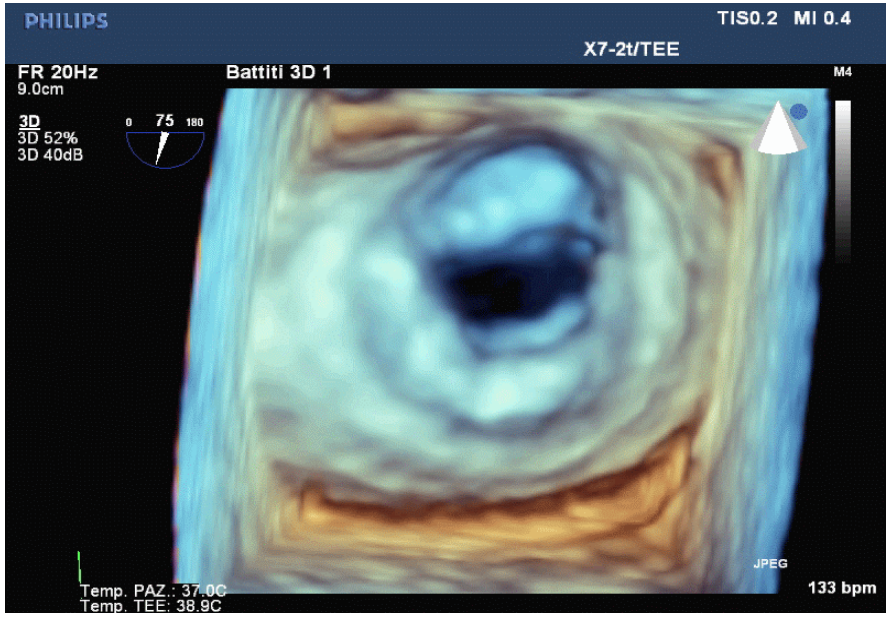
Key points

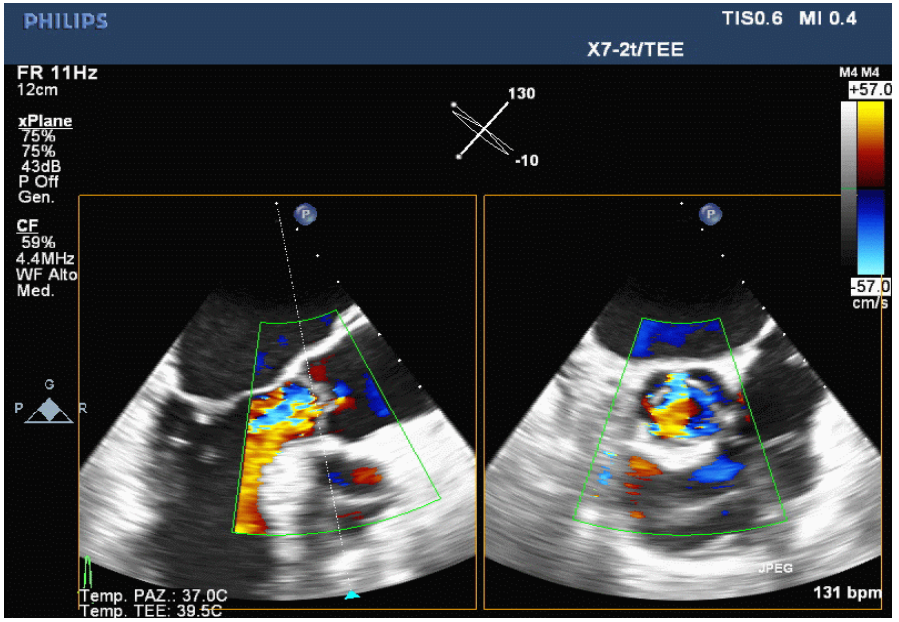
SE is indicated to reveal symptoms and assess haemodynamic consequences of MS—based on the gradient and SPAP increase during stress—in patients with discordance between symptoms and stenosis severity. Exercise SE is preferred for SPAP assessment. MS should be considered severe if exertion results in a mean gradient >15 mmHg and SPAP >60 mmHg.

Lancellotti P, *EHJ CI* 2016

Caso clinico:

- Donna di 49 anni
  - Storia di dispnea da alcuni anni con significativa riduzione dell'attività fisica, della qualità di vita ed incapacità a svolgere le normali attività quotidiane
  - Classe NYHA III

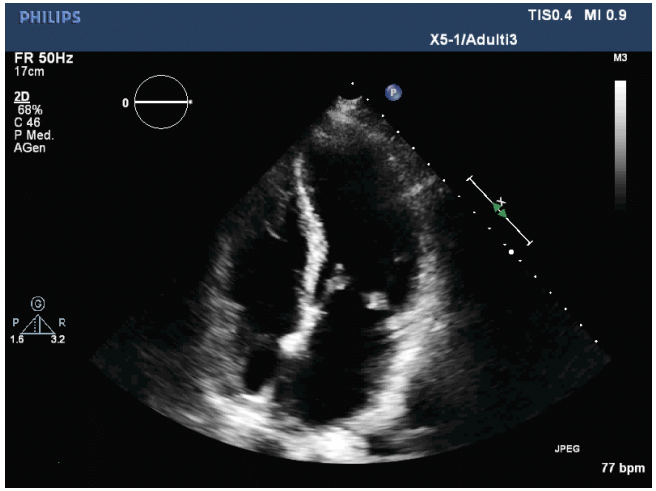


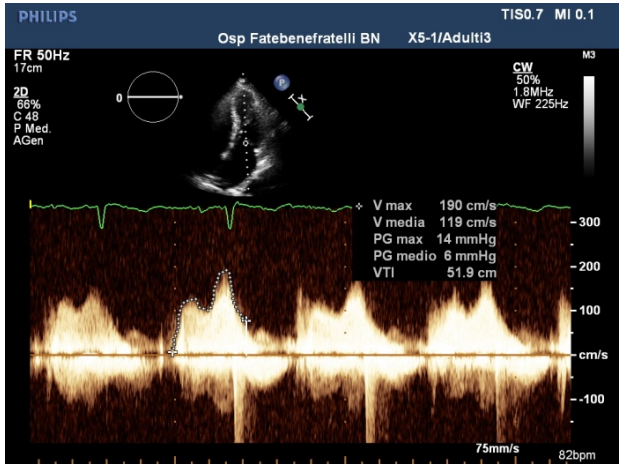


Ex-Stress Echo

Durata di esercizio: 3 min

Rest

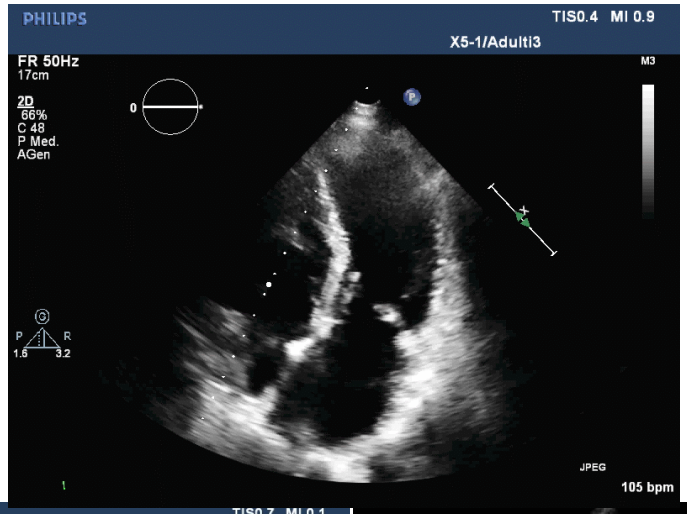


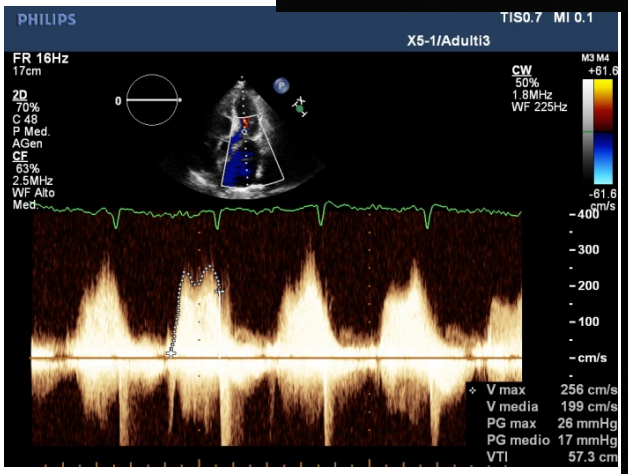


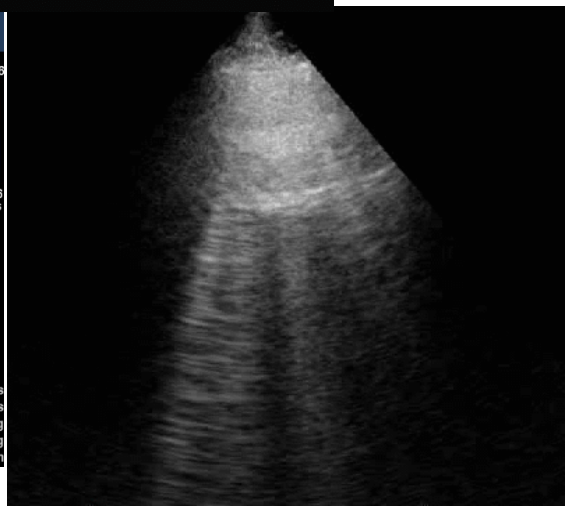
Gradiente medio: 6 mmHg

PAPs: 19 mmHg + RAP

Peak exercise







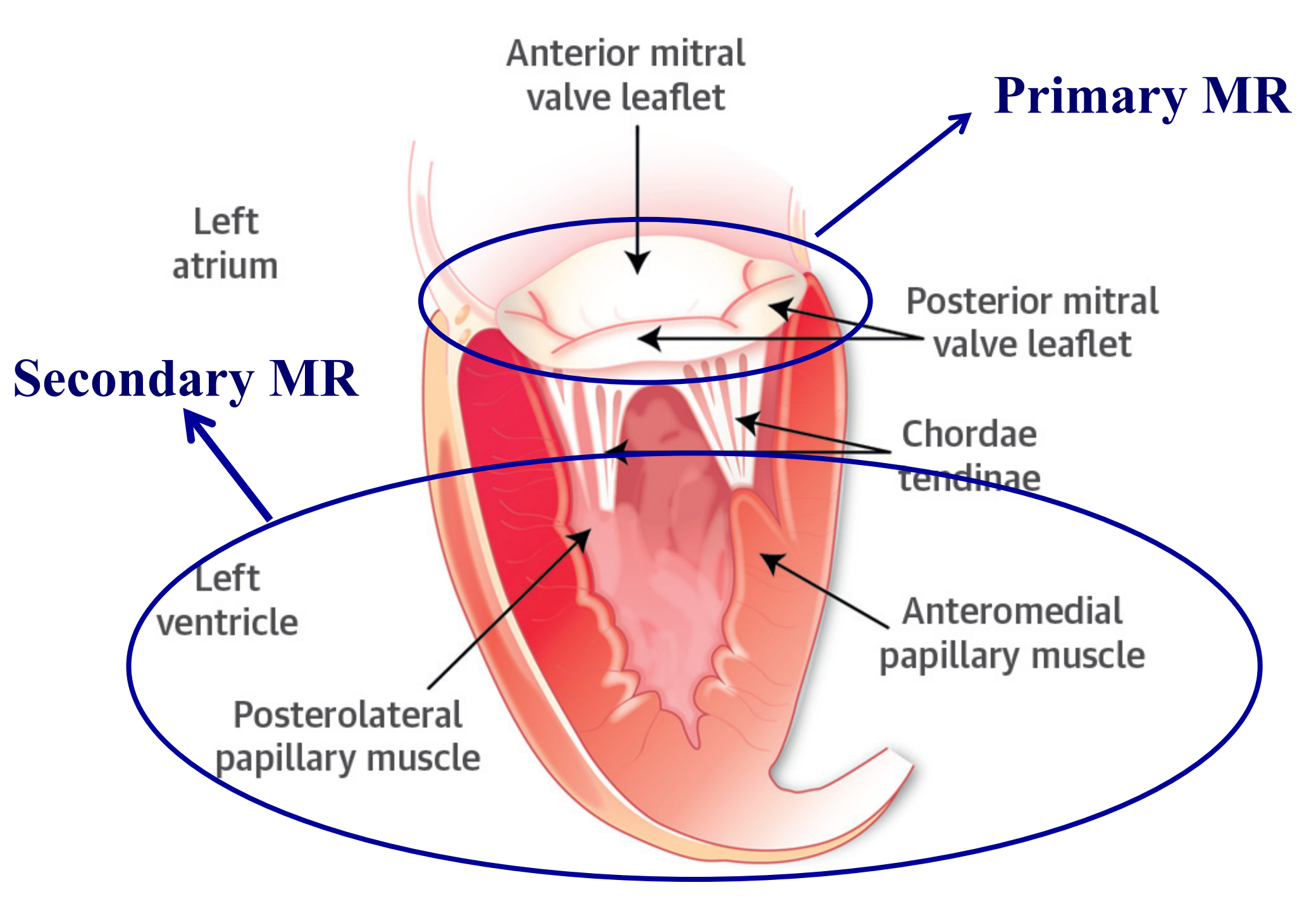
Gradiente medio: 17 mmHg

PAPs: 48 mmHg + RAP

Ecostress da sforzo o farmacologico?

	Gradiente Aortico	CR VSx	Gradiente mitralico	IM (color)	B-lines	PAPs
STENOSI AORTICA						
Severa asintomatica	**	**			**	
Basso-flusso basso-gradiente ridotta FE	***	***			***	
Basso-flusso basso-gradiente "paradossa" con normale FE	*	*			**	
INSUFFICIENZA AORTICA						
Severa asintomatica, FE borderline		*			*	
STENOSI MITRALICA						
Lieve –moderata sintomatica			***		***	***
Severa asintomatica			***		***	***
INSUFFICIENZA MITRALICA						
Lieve –moderata sintomatica		**		***	***	***
Severa asintomatica		**		***	***	***

Ciampi Q, Manuale SIEC 2017


Anterior mitral valve leaflet
Primary MR
Left atrium
Posterior mitral valve leaflet
Secondary MR
Chordae tendinae
Left ventricle
Anteromedial papillary muscle
Posterolateral papillary muscle

7.3.1.5. DIAGNOSTIC TESTING—EXERCISE TESTING: RECOMMENDATIONS

CLASS IIa

1. Exercise hemodynamics with either Doppler echocardiography or cardiac catheterization is reasonable in symptomatic patients with chronic primary MR where there is a discrepancy between symptoms and the severity of MR at rest (stages B and C) (377,378). *(Level of Evidence: B)*

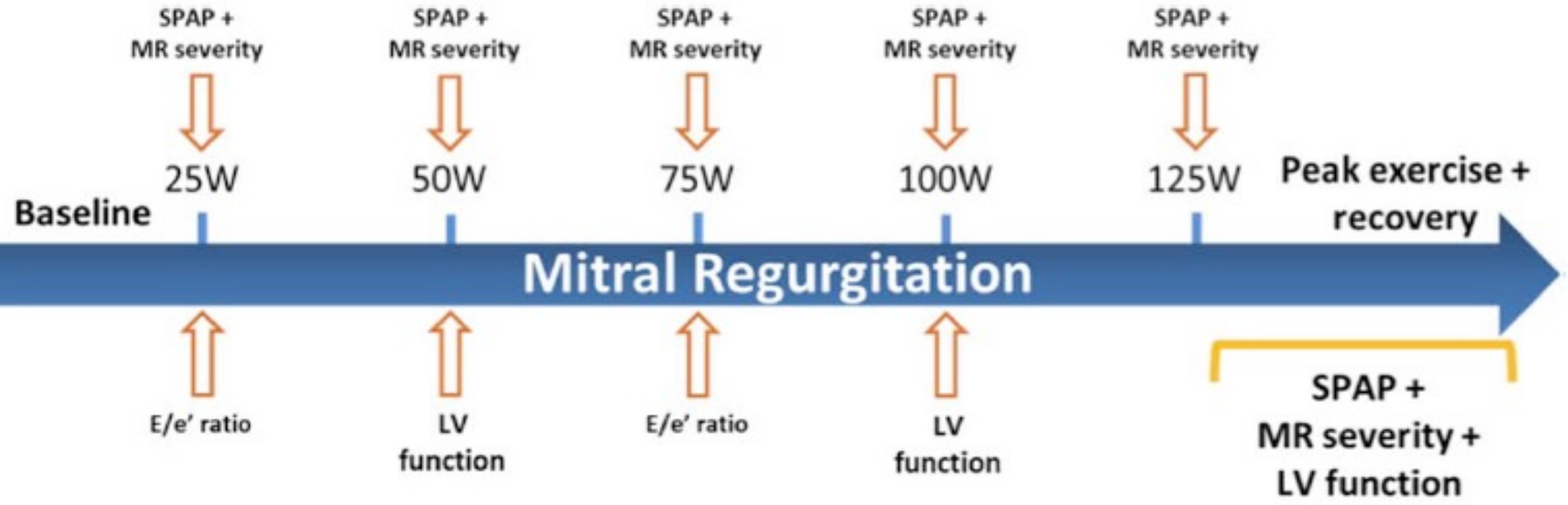
CLASS IIa

2. Exercise treadmill testing can be useful in patients with chronic primary MR to establish symptom status and exercise tolerance (stages B and C). *(Level of Evidence: C)*

Stress Echocardiography in Regurgitant Valve Disease

Patrizio Lancellotti, MD, PhD; Julien Magne, PhD

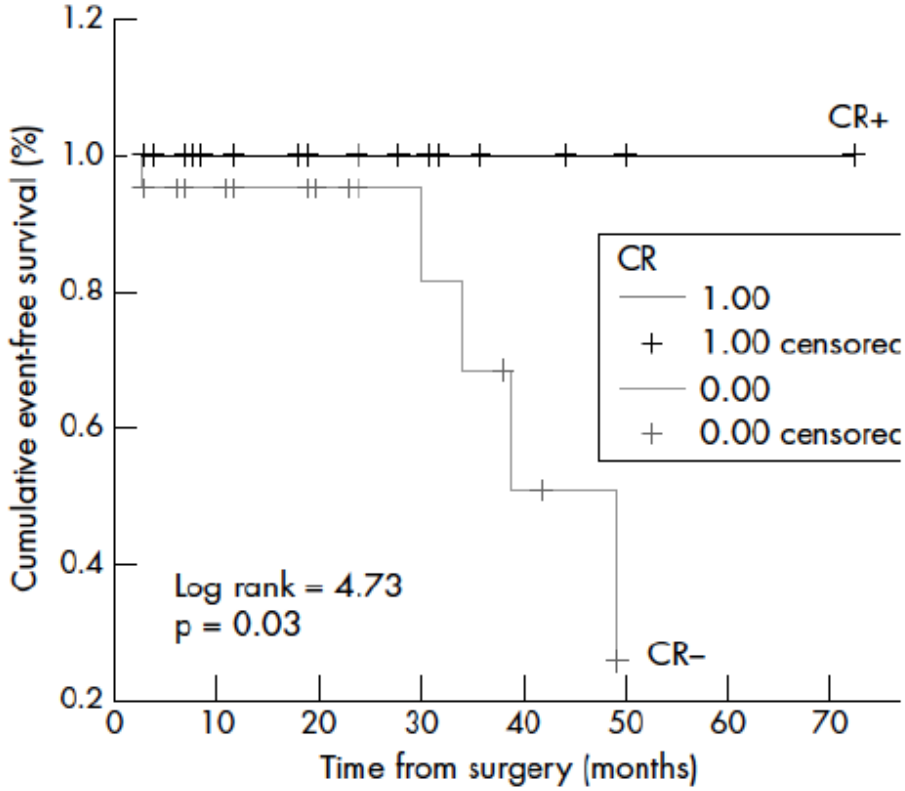
Circ Cardiovasc Imaging September 2013

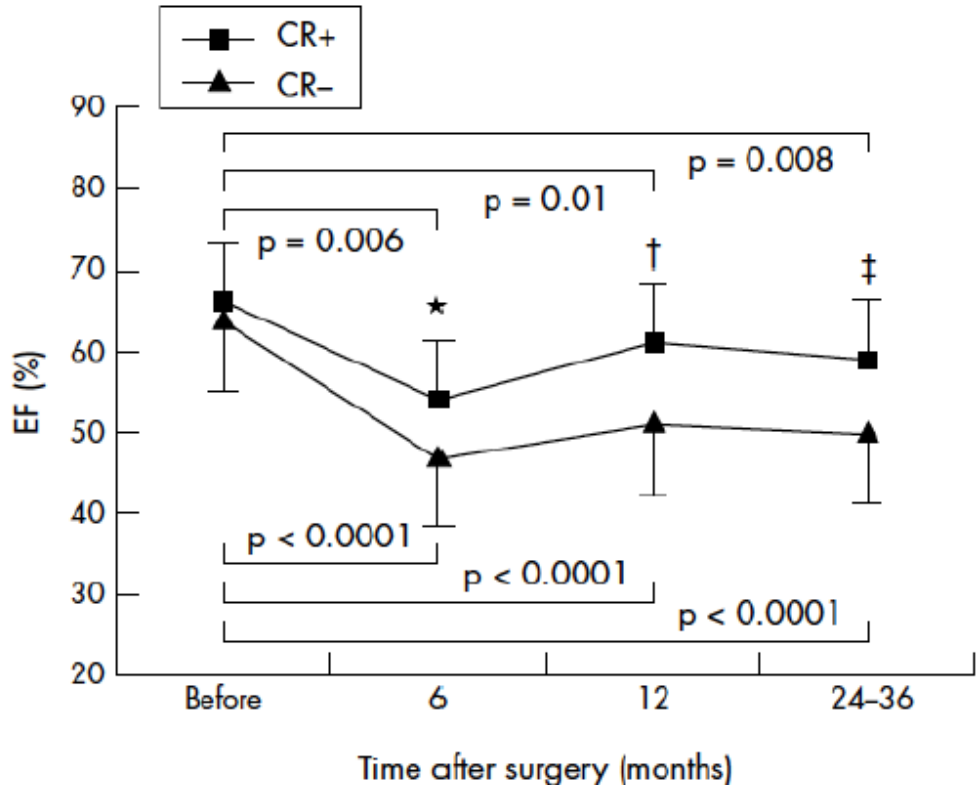


Functional and prognostic implications of left ventricular contractile reserve in patients with asymptomatic severe mitral regurgitation

R Lee, B Haluska, D Y Leung, C Case, J Mundy, T H Marwick

Heart 2005;**91**:1407–1412. doi: 10.1136/hrt.2004.047613

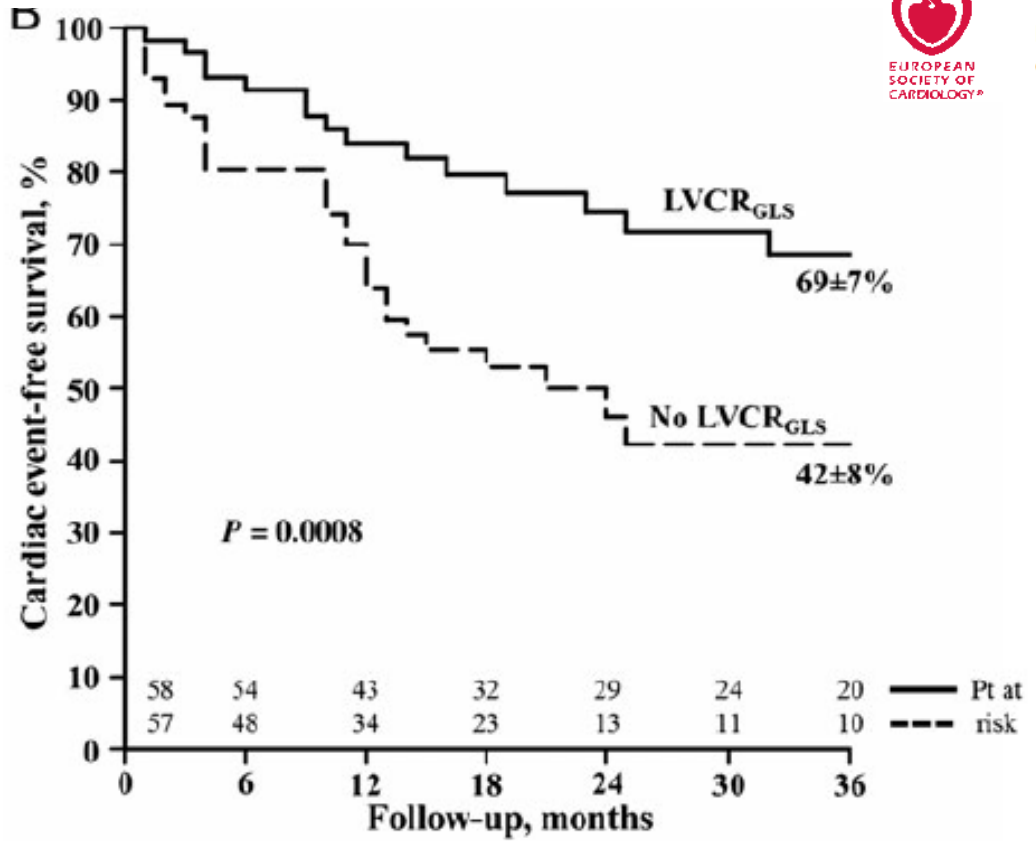




Left ventricular contractile reserve in asymptomatic primary mitral regurgitation

Julien Magne[1†], Haifa Mahjoub[2†], Raluca Dulgheru[1], Philippe Pibarot[2], Luc. A. Pierard[1*], and Patrizio Lancellotti[1*]

European Heart Journal (2014) **35**, 1608–1616
doi:10.1093/eurheartj/eht345



Conclusion In asymptomatic primary MR, LVCR seems to be better assessed using EX-induced changes in LV myocardial longitudinal function rather than in LVEF. In patients with preserved LV function, the absence of LVCR is independently associated with two-fold increase in risk of cardiac events. Left ventricular contractile reserve may be useful to improve risk stratification and clinical decision-making in these patients.

European Association of Echocardiography recommendations for the assessment of valvular regurgitation. Part 2: mitral and tricuspid regurgitation (native valve disease)

Key point

Exercise echocardiography is useful in asymptomatic patients with severe organic MR and borderline values of LV ejection fraction (60–65%) or LV end-systolic diameter (closed to 40 mm or 22 mm/m^2). The absence of contractile reserve could identify patients at increased risk of cardiovascular events. Moreover, exercise echocardiography may also be helpful in patients with equivocal symptoms out of proportion of MR severity at rest.

Stress Echocardiography and Mitral Valvular Heart Disease

Julien Magne, PhD, Patrizio Lancellotti, MD, PhD*, Luc A. Pierard, MD, PhD*

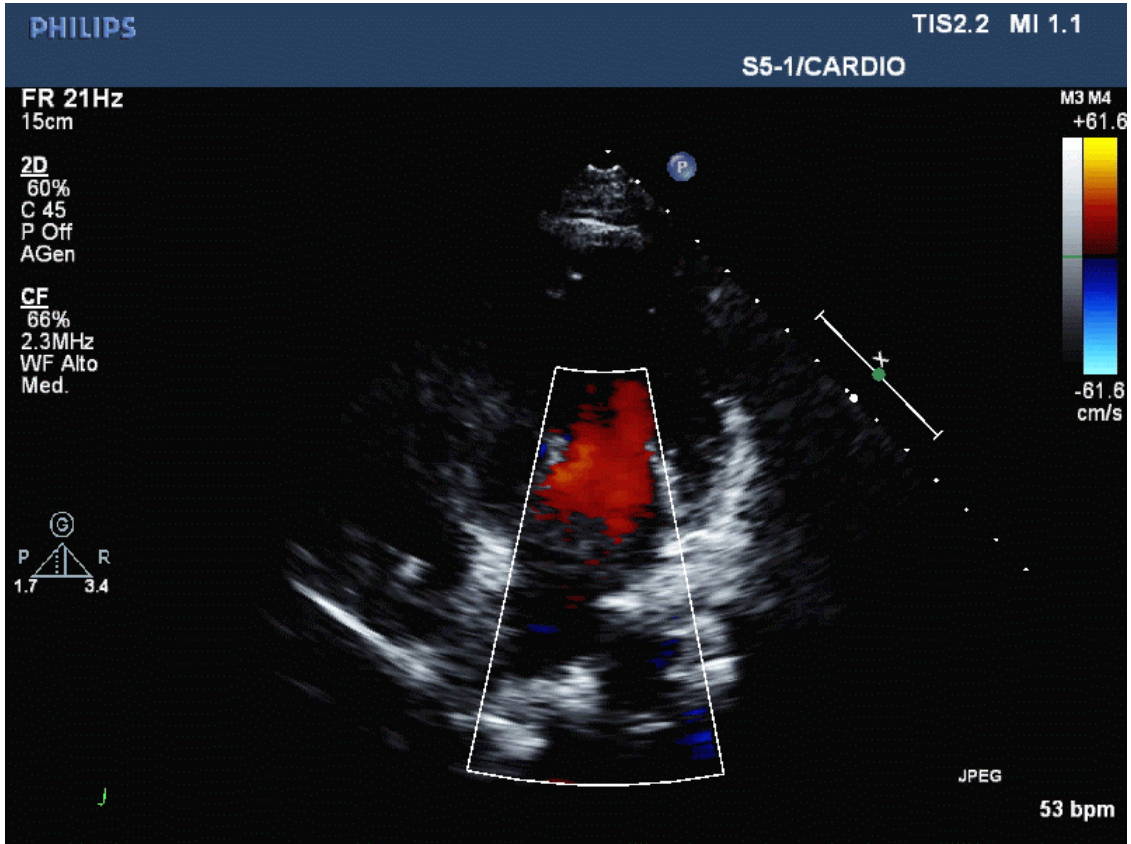
Cardiol Clin 31 (2013) 311–321

Exercise echocardiographic parameters useful for risk stratification

Parameters	
Primary MR	
Exercise-induced increase in ERO area	>+10 mm^2
Exercise-induced increase in regurgitant volume	>+15 mL
Exercise systolic pulmonary arterial pressure	>60 mm Hg
LV contractile reserve	
Exercise-induced changes in LV ejection fraction	>+4%
Exercise-induced changes in LV global long strain	>+2%

Caso clinico:

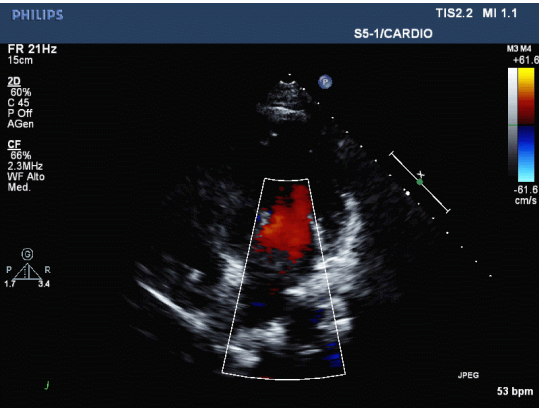
- Donna di 32 anni
  - Miocardio noncompattato. Morte resuscitata a 20 anni e portatrice di ICD
  - Classe NYHA I

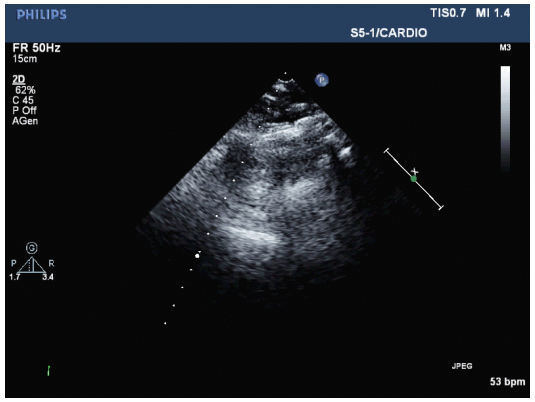


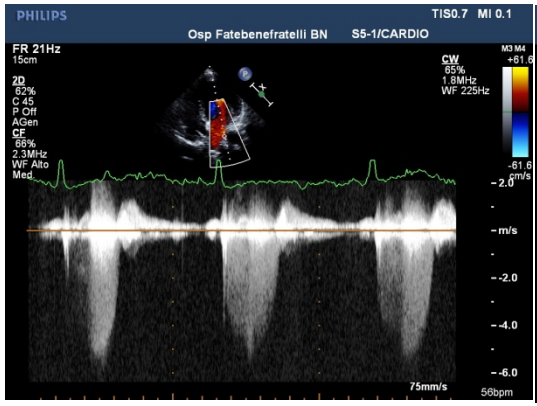
Ex-Stress Echo

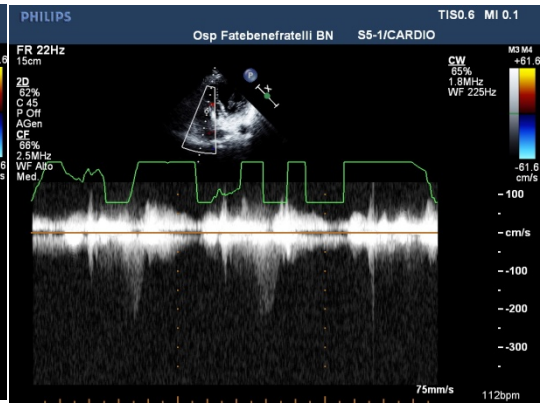
Durata di esercizio: 16 min

Rest



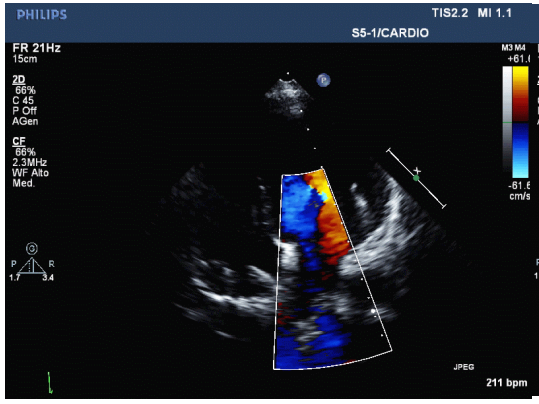


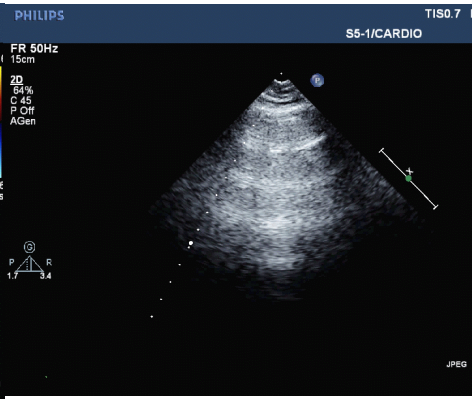


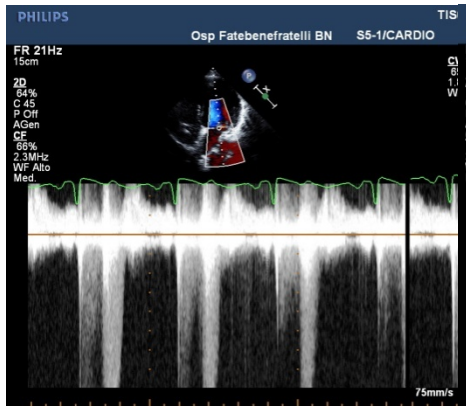


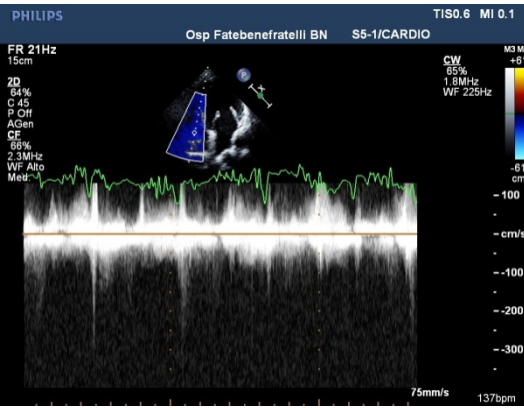
PAPs: 19 mmHg + RAP
EF 59%

Peak exercise









PAPs: 27 mmHg + RAP
EF 78%
CR Vsx: SP/ESVi 2.8
No Linee B

STATE-OF-THE-ART REVIEW

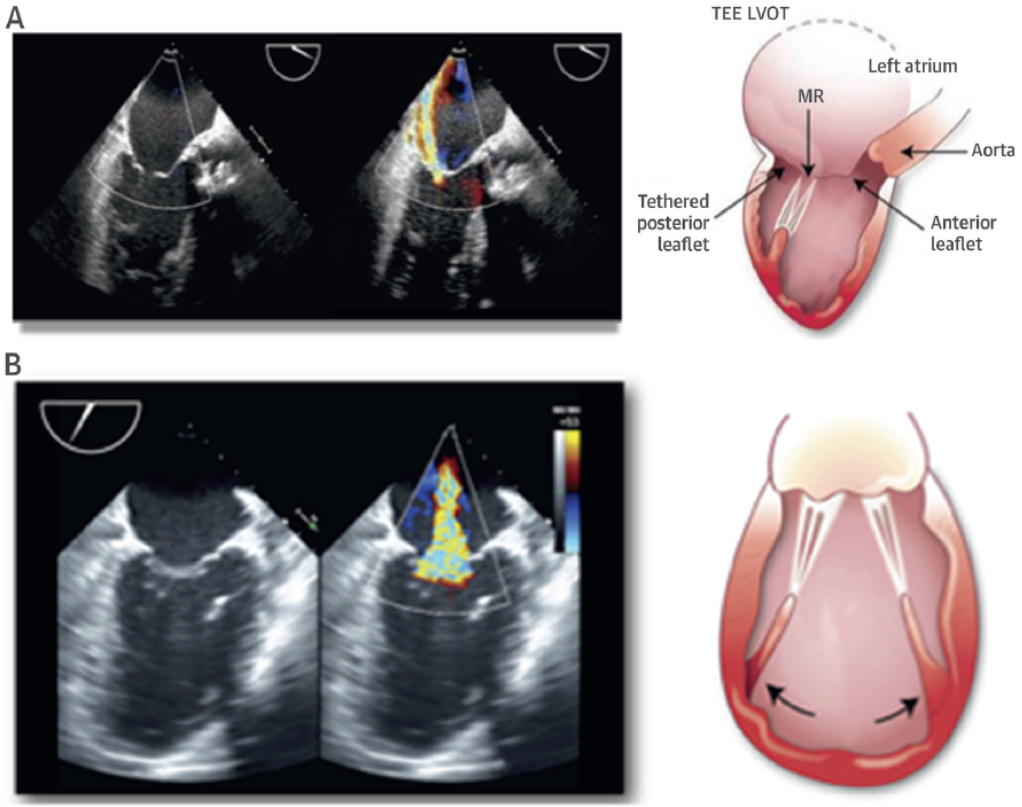
Secondary Mitral Regurgitation in Heart Failure

Pathophysiology, Prognosis, and Therapeutic Considerations

Anita W. Asgar, MD,* Michael J. Mack, MD,† Gregg W. Stone, MD‡

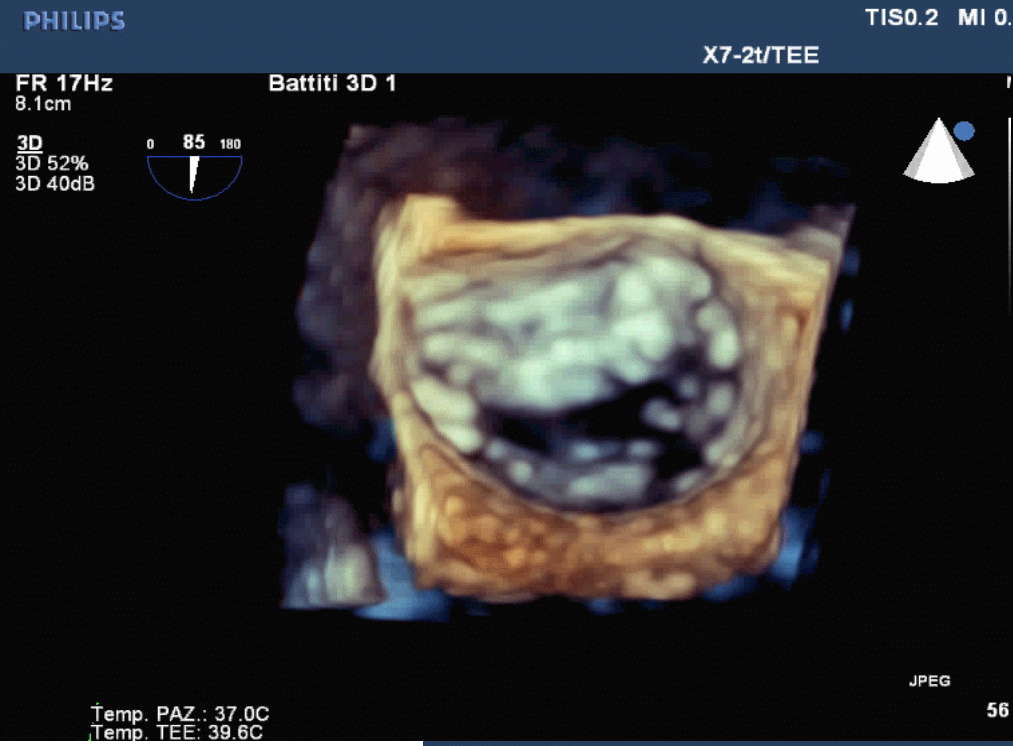
JACC 15

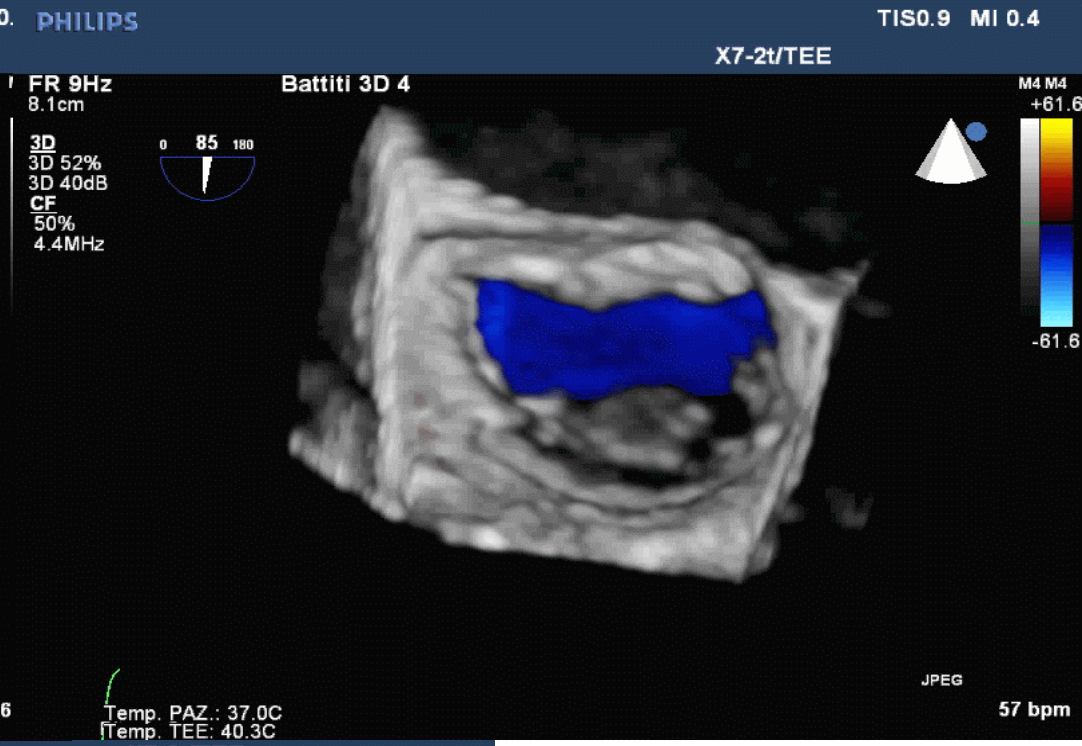
The development of secondary mitral regurgitation (MR) due to left ventricular dysfunction, also known as functional MR, is strongly associated with a poor prognosis in patients with heart failure. The mechanisms underlying secondary MR are multifactorial; accurate imaging assessment of secondary MR may be challenging and nuanced; and the appropriate roles of medical, surgical, and interventional therapies for management of secondary MR are controversial and evolving.

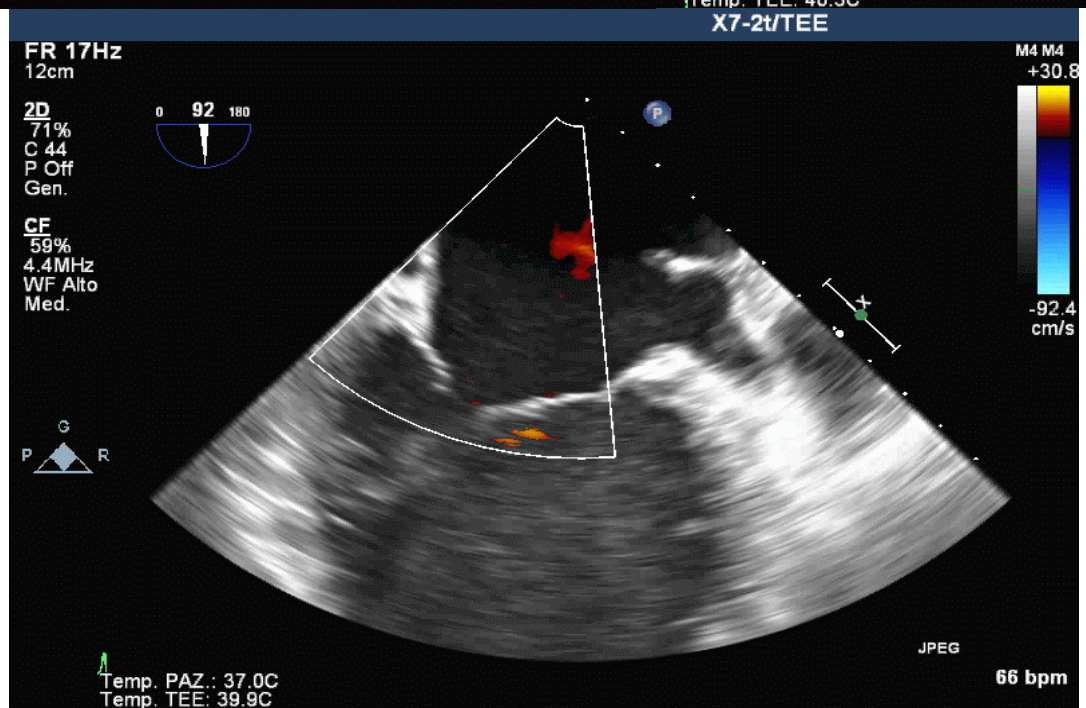


Caso clinico 1

- Paziente giunge in PS per edema polmonare acuto
  - Pregresso infarto anteriore esteso
  - Rivascolarizzazione chirurgica
  - Impianto di ICD bicamerale (QRS 95 ms)
- L'esame ecocardiografico mostrava
  - Severa riduzione della funzione sistolica (FE 24%)
  - Acinesia ed assottigliamento medio-settale parete anteriore ed apicale in toto
  - Pattern transmitralico restrittivo

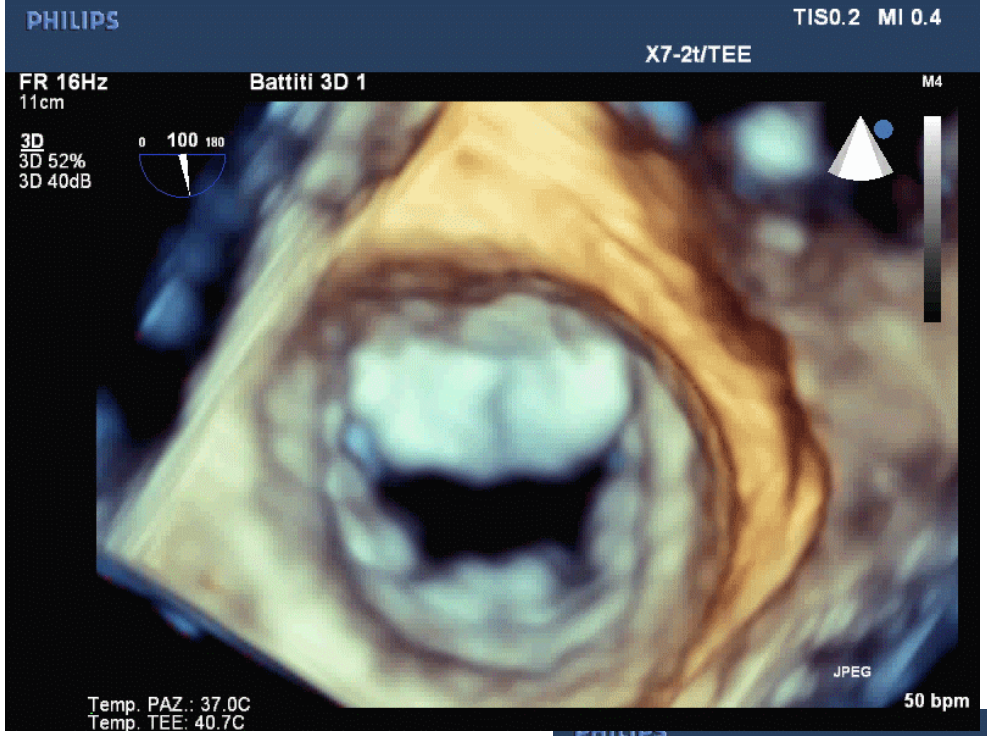

PHILIPS
TIS0.2 MI 0.
X7-2t/TEE
FR 17Hz
8.1cm
Battiti 3D 1
3D
3D 52%
3D 40dB
0 85 180
JPEG
56
Temp. PAZ.: 37.0C
Temp. TEE: 39.6C

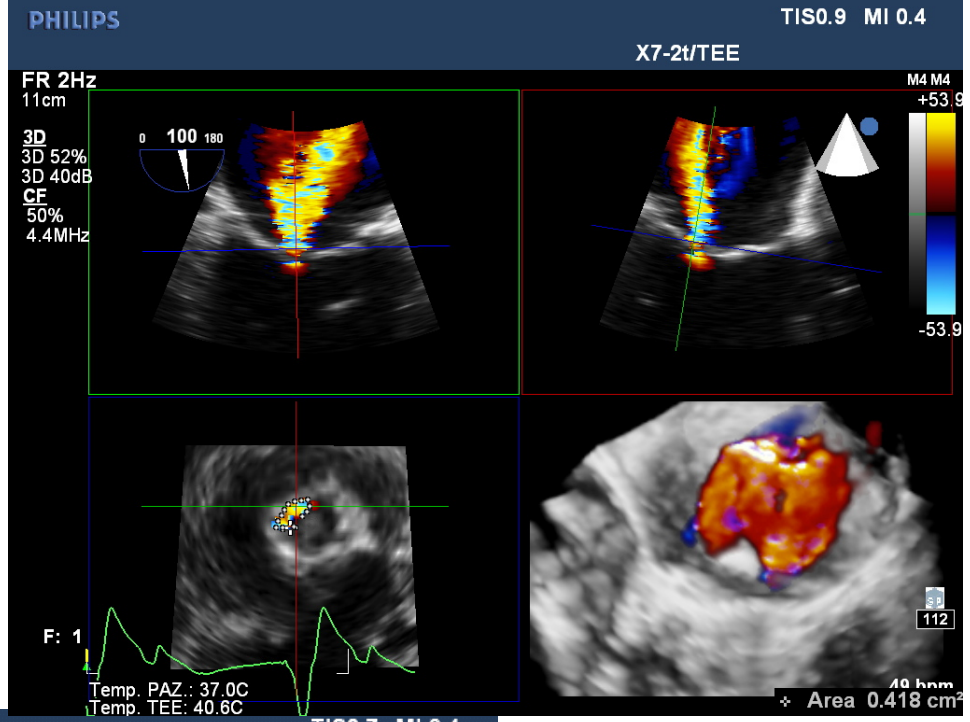

PHILIPS
TIS0.9 MI 0.4
X7-2t/TEE
FR 9Hz
8.1cm
Battiti 3D 4
3D
3D 52%
3D 40dB
CF
50%
4.4MHz
0 85 180
M4 M4
+61.6
-61.6
JPEG
57 bpm
Temp. PAZ.: 37.0C
Temp. TEE: 40.3C

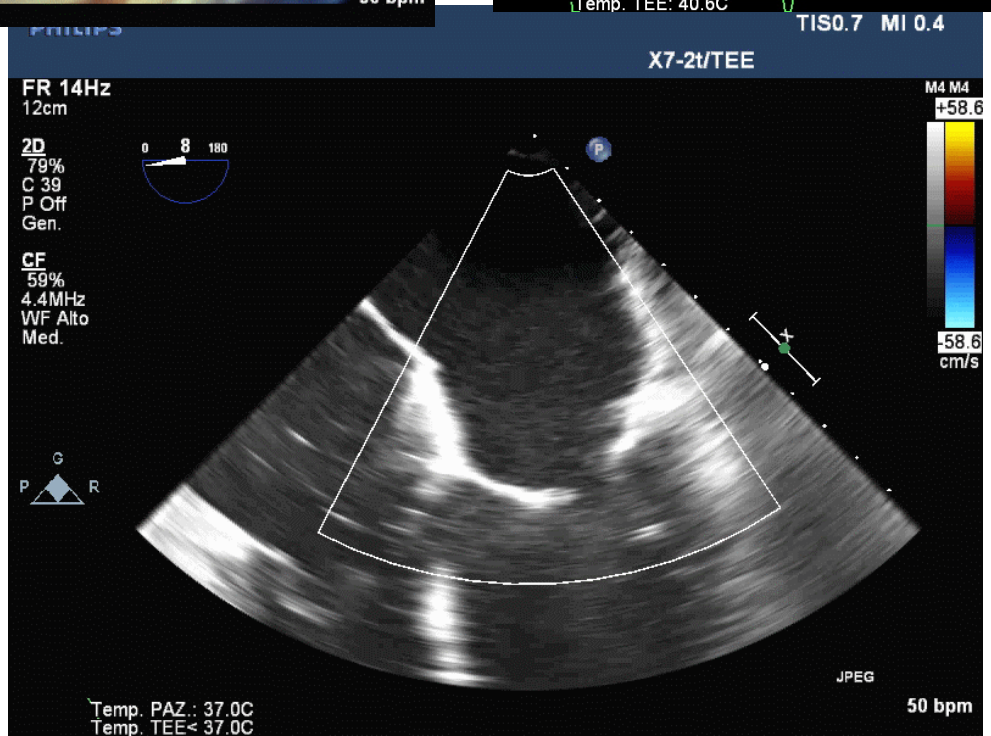

X7-2t/TEE
FR 17Hz
12cm
2D
71%
C 44
P Off
Gen.
0 92 180
CF
59%
4.4MHz
WF Alto
Med.
M4 M4
+30.8
-92.4
cm/s
G
P
R
JPEG
66 bpm
Temp. PAZ.: 37.0C
Temp. TEE: 39.9C

Caso clinico 2

- Paziente giunge in PS per edema polmonare acuto
  - Pregresso infarto anteriore esteso
  - Rivascolarizzazione percutanea di IVA e Cx
  - Impianto di ICD bicamerale (QRS 105 ms)
- L'esame ecocardiografico mostrava
  - Severa riduzione della funzione sistolica (FE 27%)
  - Acinesia ed assottigliamento medio-settale parete anteriore ed apicale in toto
  - Pattern transmitralico pseudonormale

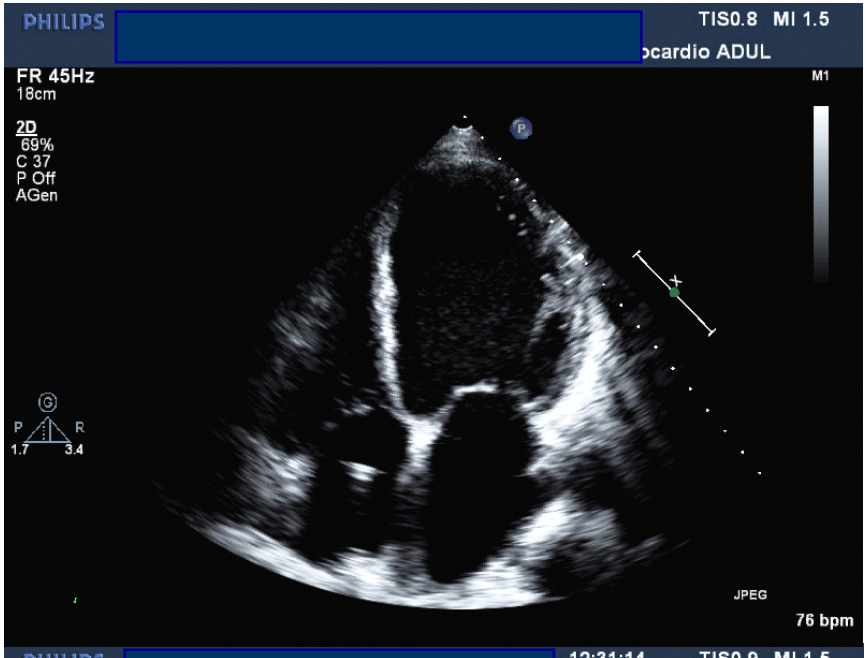

PHILIPS
TIS0.2 MI 0.4
X7-2t/TEE
FR 16Hz
11cm
Battiti 3D 1
M4
3D
3D 52%
3D 40dB
0 100 180
JPEG
50 bpm
Temp. PAZ.: 37.0C
Temp. TEE: 40.7C

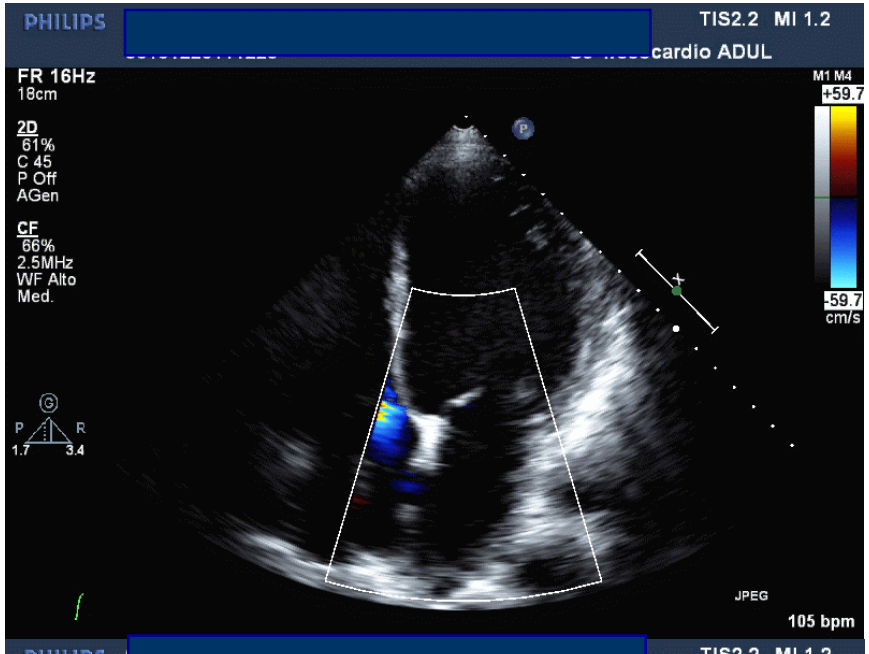

PHILIPS
TIS0.9 MI 0.4
X7-2t/TEE
FR 2Hz
11cm
3D
3D 52%
3D 40dB
CF
50%
4.4MHz
0 100 180
M4 M4
+53.9
-53.9
F: 1
Temp. PAZ.: 37.0C
Temp. TEE: 40.6C
112
Area 0.418 cm²


TIS0.7 MI 0.4
X7-2t/TEE
FR 14Hz
12cm
2D
79%
C 39
P Off
Gen.
CF
59%
4.4MHz
WF Alto
Med.
0 8 180
M4 M4
+58.6
-58.6
cm/s
G
P
R
JPEG
50 bpm
Temp. PAZ.: 37.0C
Temp. TEE< 37.0C

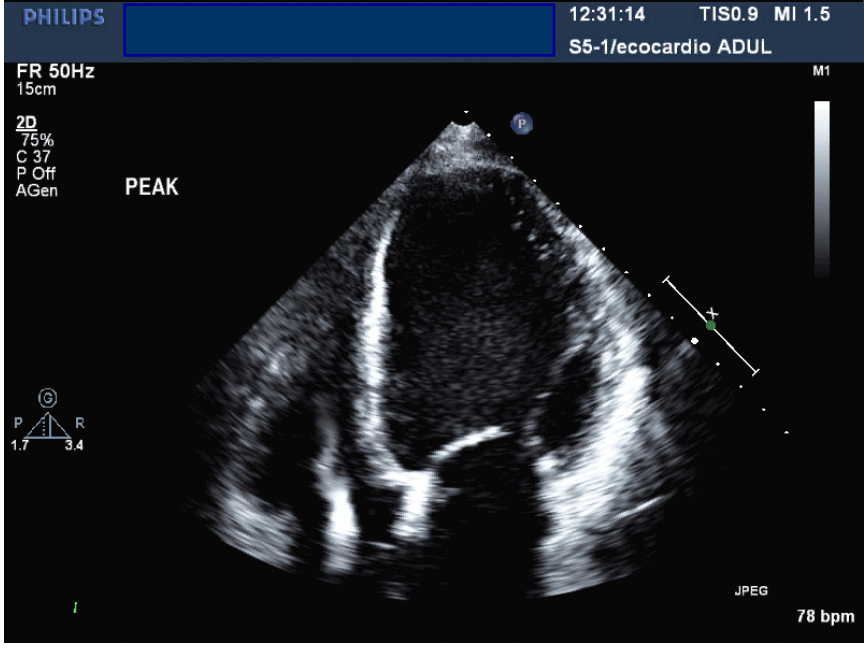
Caso clinico 1

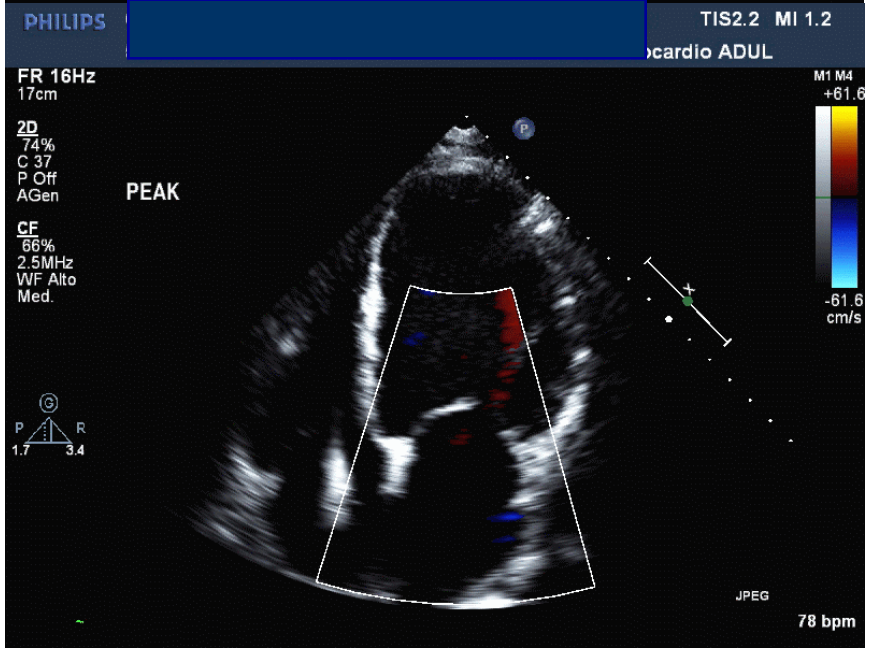
Rest





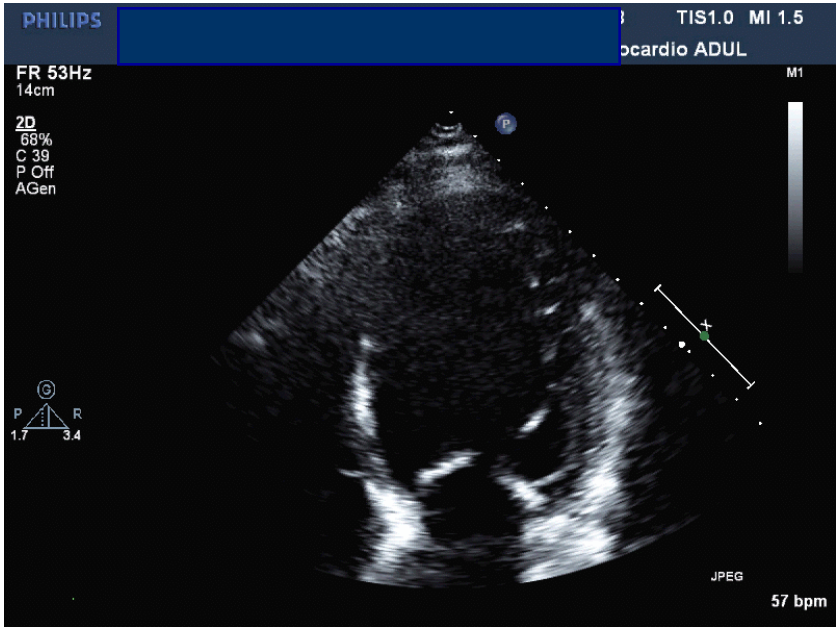
Peak

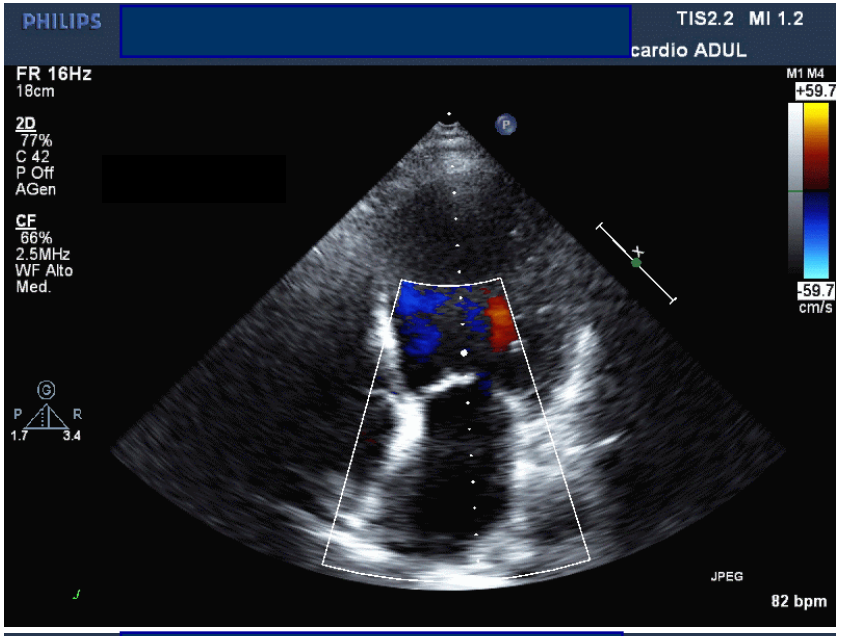




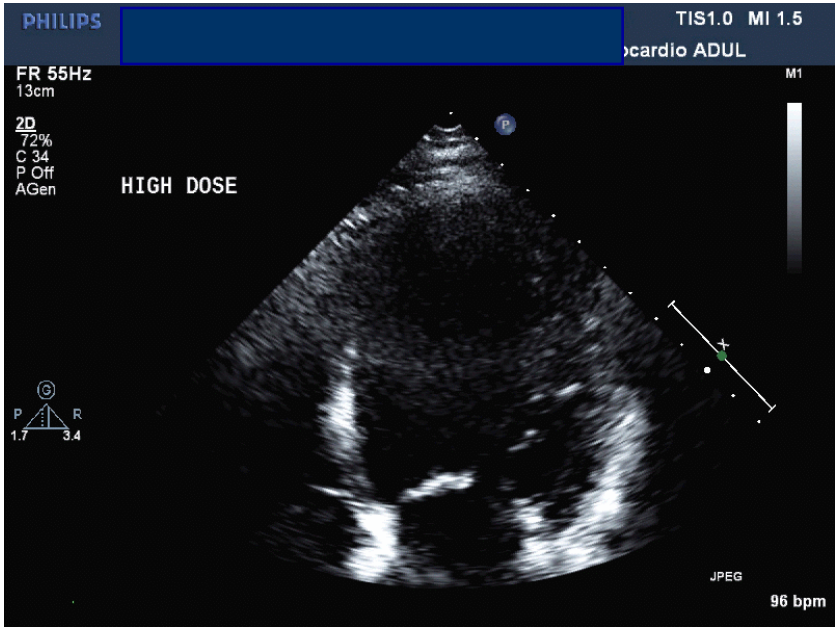
Caso clinico 2

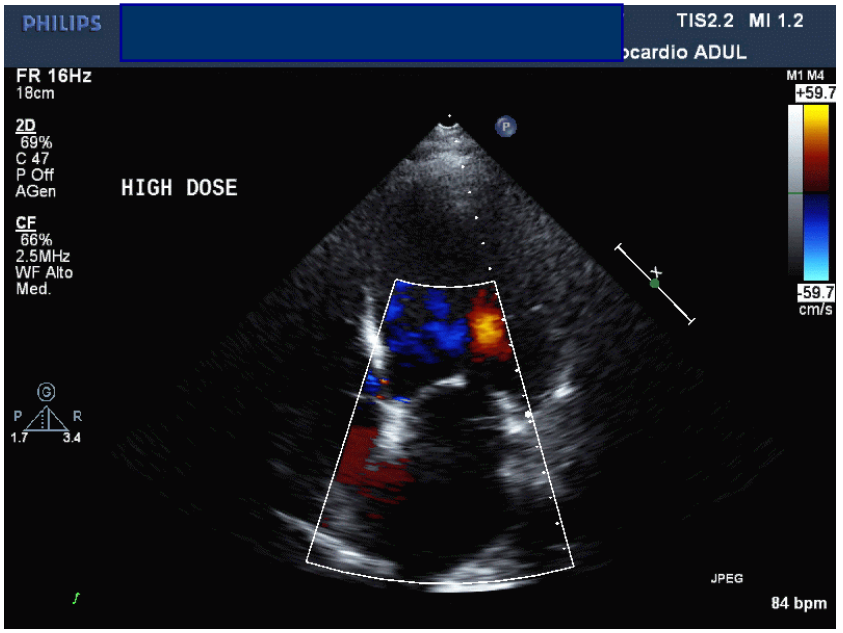
Rest

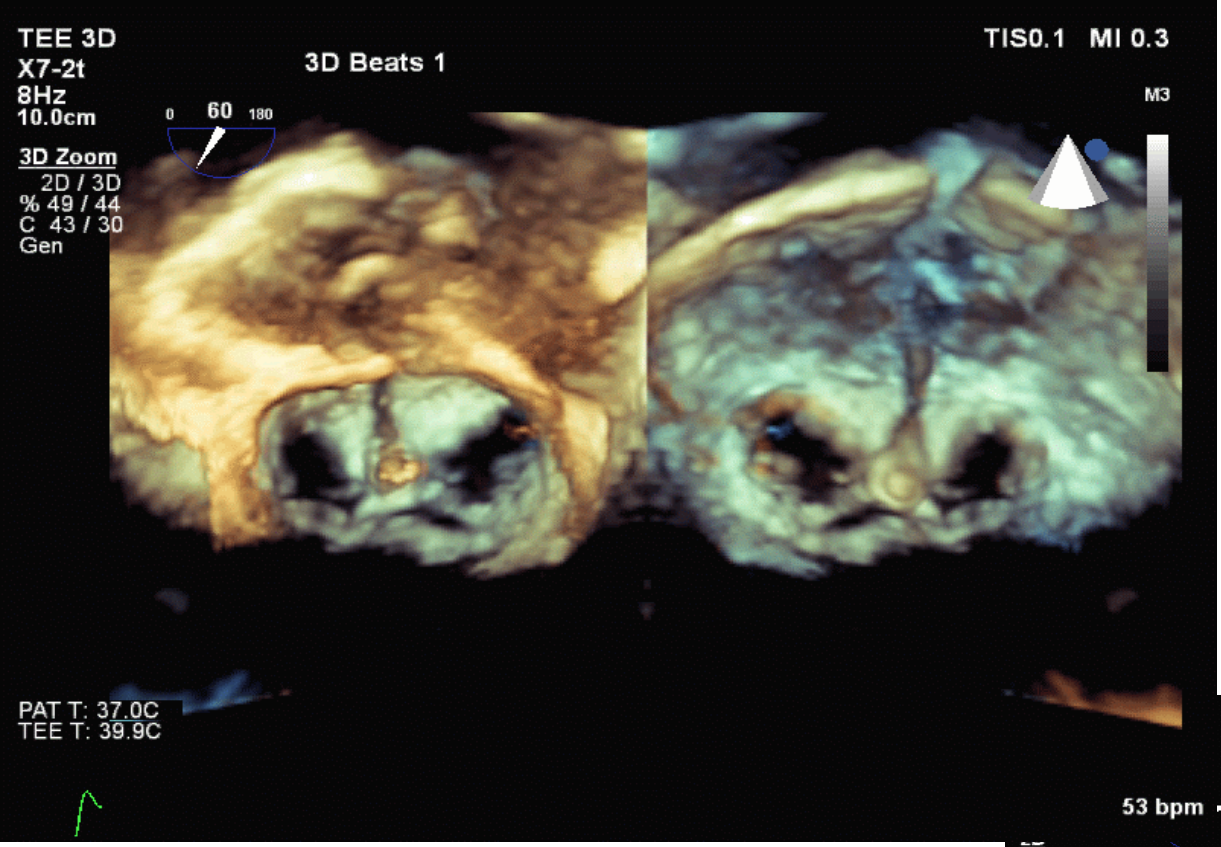


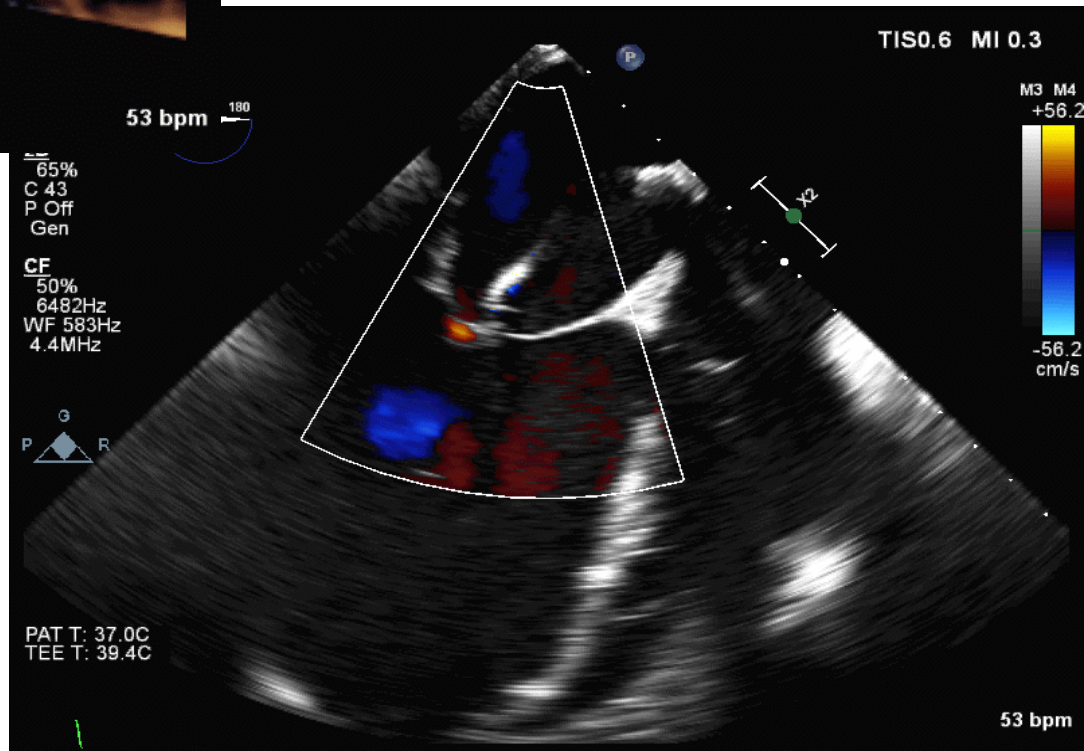


Peak

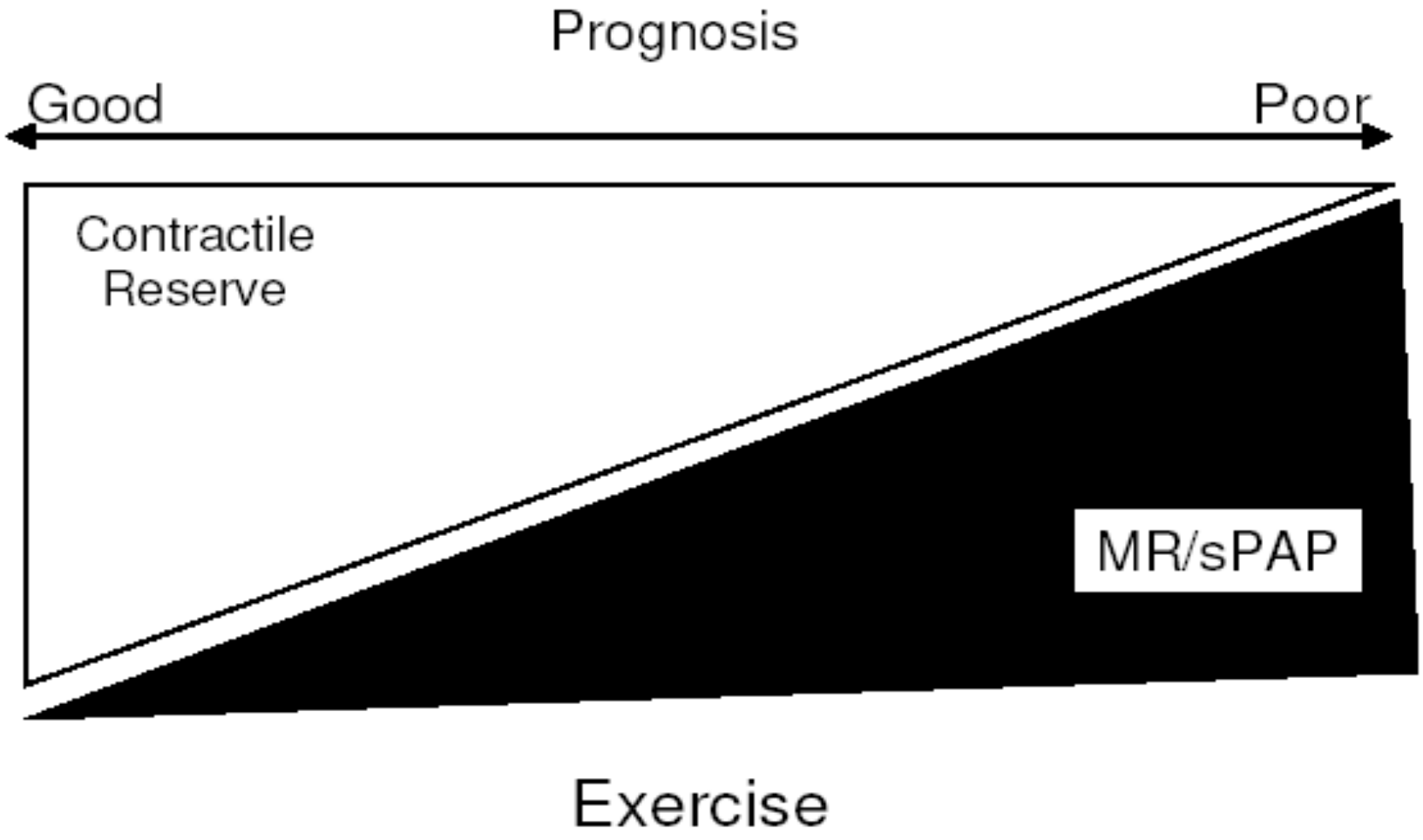





TEE 3D
X7-2t
8Hz
10.0cm
3D Zoom
2D / 3D
% 49 / 44
C 43 / 30
Gen
3D Beats 1
TIS0.1 MI 0.3
M3
0
60
180
PAT T: 37.0C
TEE T: 39.9C


TIS0.6 MI 0.3
53 bpm
180
65%
C 43
P Off
Gen
CF
50%
6482Hz
WF 583Hz
4.4MHz
M3 M4
+56.2
-56.2
cm/s
X2
PAT T: 37.0C
TEE T: 39.4C
53 bpm

Insufficienza mitralica durante stress eco in DCM



Agricola E *Cardiovascular Ultrasound* 2004

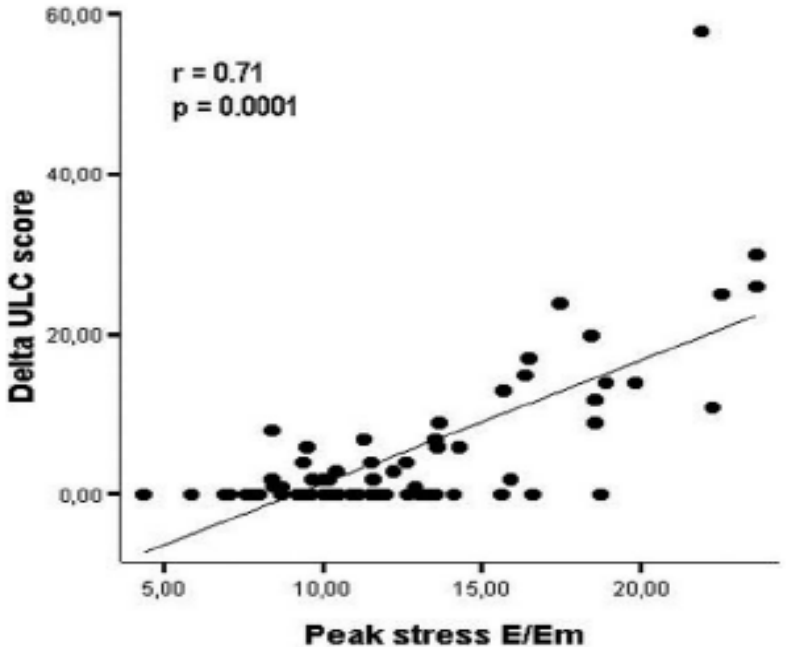
Pulmonary congestion stress-Echo

baseline ULC →

- **PASP** (r = 0.69, p = .0001)
- **E/Em** (r = 0.70, p = .0001)
- **estimated PCWP** (r = 0.69, p = .0001)
- **MR** (r = 0.49, p = .001)

delta ULC →

- **ΔPCWP** (r = 0.62, p =.0001)
- **peak stress E/Em** (r = 0.71, p = .0001)
- **severity MR at peak** (r = 0.58, p = .001)



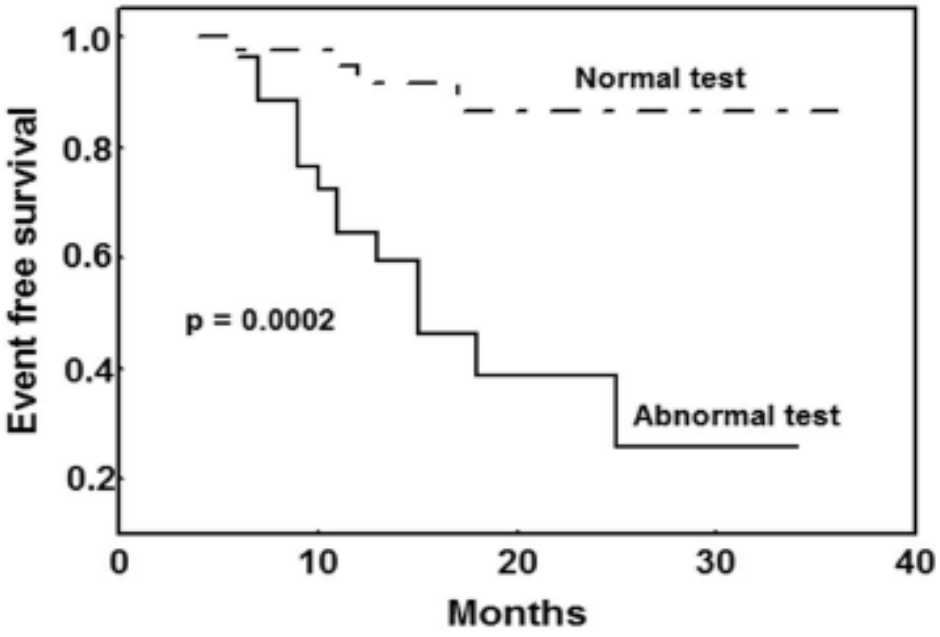
Agricola E, Picano E et al. *J Am Soc Echocardiogr* 2006;19:457

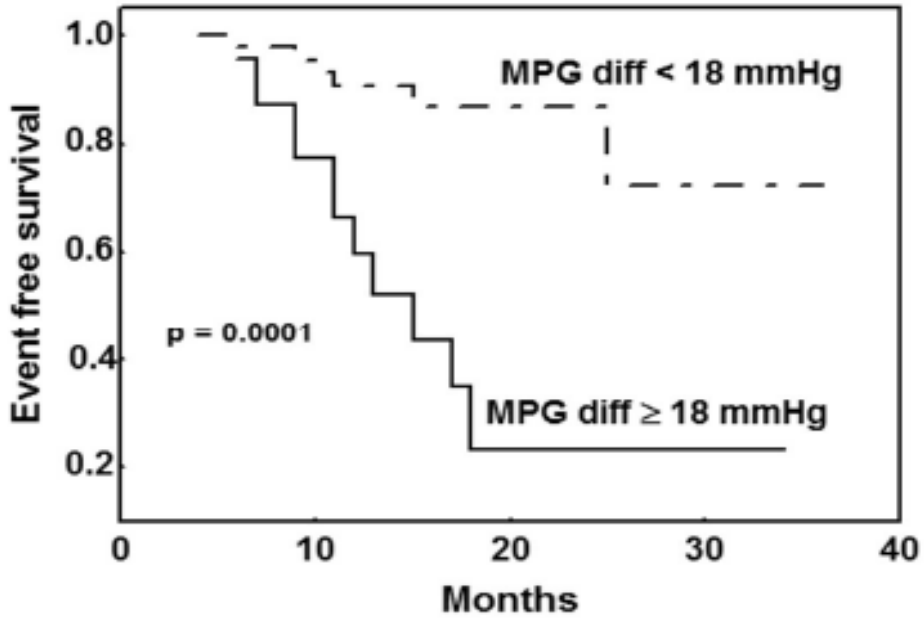
Ecostress da sforzo o farmacologico?

	Gradiente Aortico	CR VSx	Gradiente mitralico	IM (color)	B-lines	PAPs
STENOSI AORTICA						
Severa asintomatica	**	**			**	
Basso-flusso basso-gradiente ridotta FE	***	***			***	
Basso-flusso basso-gradiente "paradossa" con normale FE	*	*			**	
INSUFFICIENZA AORTICA						
Severa asintomatica, FE borderline		*			*	
STENOSI MITRALICA						
Lieve –moderata sintomatica			***		***	***
Severa asintomatica			***		***	***
INSUFFICIENZA MITRALICA						
Lieve –moderata sintomatica		**		***	***	***
Severa asintomatica		**		***	***	***

Ciampi Q, Manuale SIEC 2017

Ruolo dell'eco-sforzo nella stenosi aortica severa asintomatica

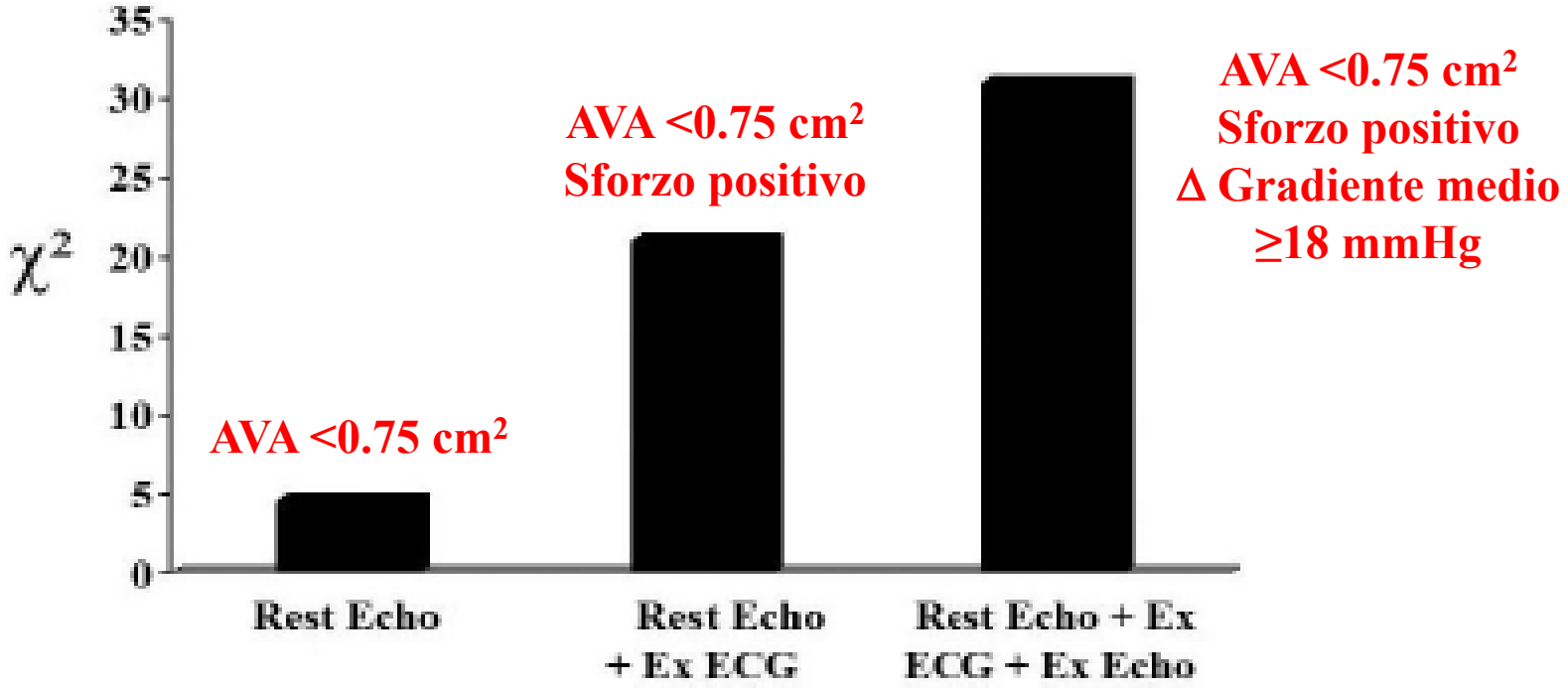




- Angina
- Dispnea
- > 2 mm sottoslivellamento ST
- Risposta pressoria *flat* o ipotensiva

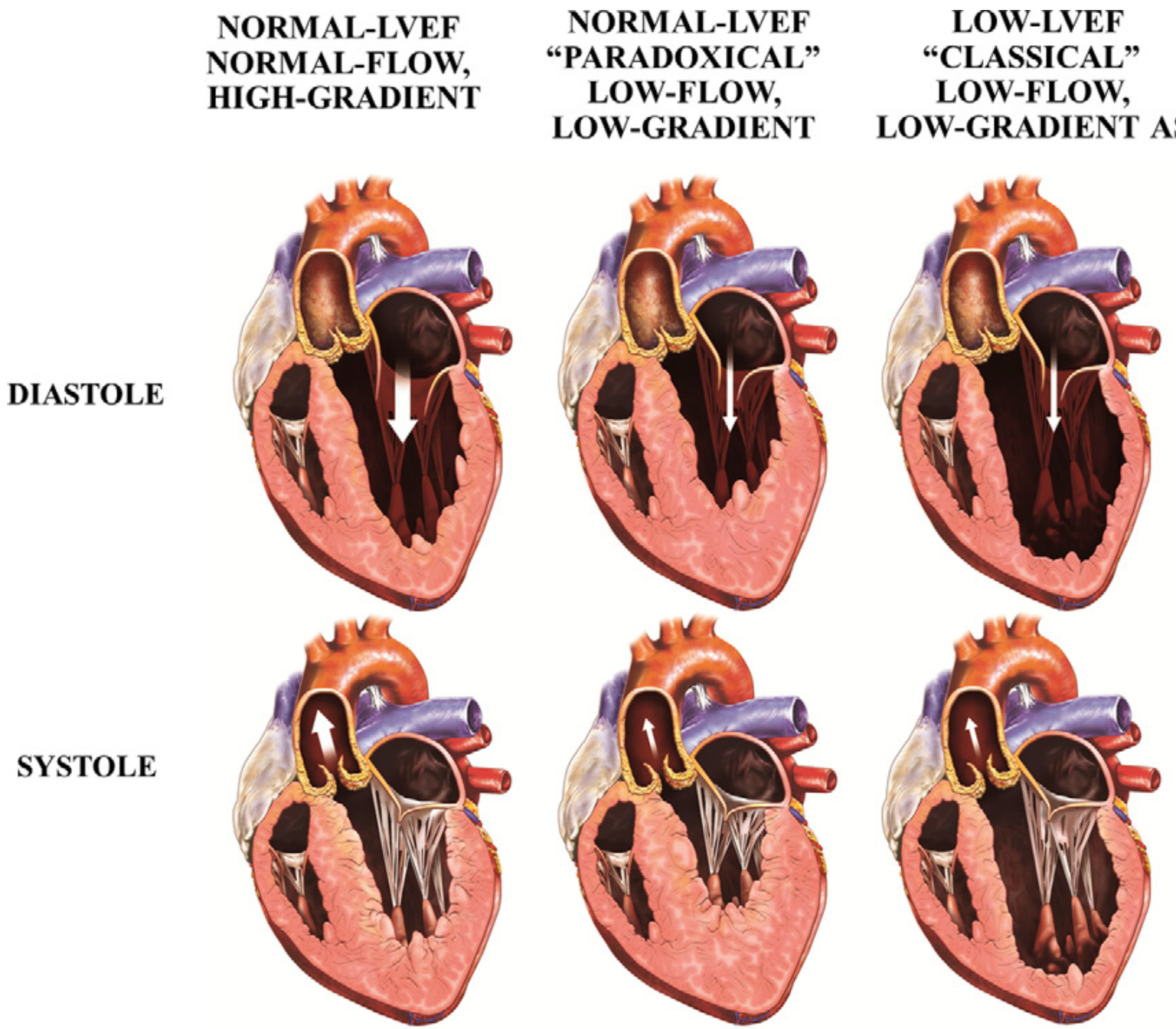
Lancellotti P *Circulation* 2005

Ruolo additivo dell'eco-sforzo nella stenosi aortica severa asintomatica



- L'ecocardiogramma da sforzo da un valore prognostico incrementale rispetto all'ecocardiogramma basale ed alla prova da sforzo
  - Identifica un sottogruppo di pazienti ad alto rischio

Lancellotti P *Circulation* 2005



Pibarot P *J Am Coll Cardiol* 2012

Doppler limit's

Flow-dependent measures

- i.e. aortic regurgitation increased of trans-aortic volume

↳ **Overestimation of severity of aortic stenosis**

- i.e. LV systolic dysfunction or mitral regurgitation reduced of trans-aortic volume

↳ **Underestimation of severity of aortic stenosis**

Mechanisms of LV systolic dysfunction

- **Afterload mismatch**

  Low-flow high-gradient

  - Reduced systolic function
  - High mean gradient (surrogate of afterload mismatch)

- **Coronary artery disease or cardiomyopathy**

  Low-flow low-gradient

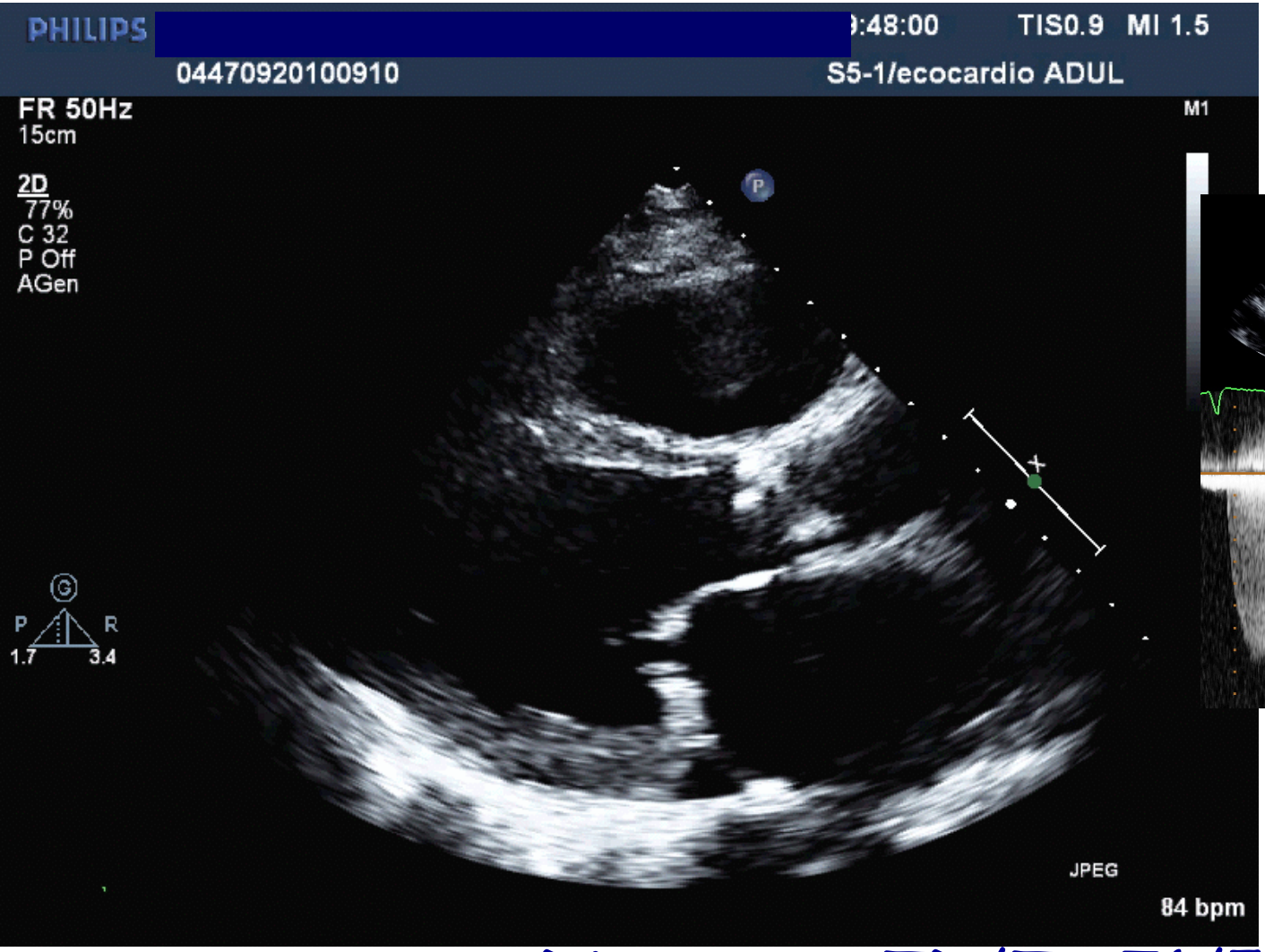
  - Reduced systolic function
  - Low mean gradient <30 mmHg

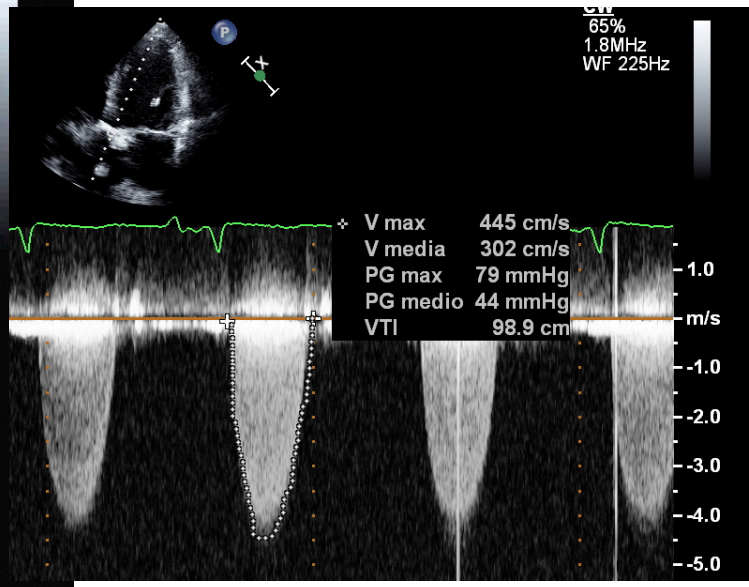
DSE assessment

- Dobutamine stress echocardiography is used in this setting with a low-to-moderate dose of dobutamine (5 up to 20 µg/kg/min)
  - to obtain an increase in HR of 10–20 bpm.
- The infusion of dobutamine should be stopped in the case of maximal dose permitted, an increase in HR more than 20 bpm and clear inotropic response.
- During the test may be measured at each step
  - Wall-motion changes
  - LV volumes changes
  - LV outflow tract and aortic velocity time integrals
    - Particular attention should be paid to keep the same position of recording throughout the test.

Caso clinico

- Un uomo di 79 si presenta in P.S. per dispnea a carattere ingravescente
- Anamnesi
  - Linfoma non-Hodgkin
  - Ipertensione arteriosa in terapia
- Esame obiettivo
  - Rantoli a medie bolle
  - Edemi declivi
  - Ortopnea
  - Soffio rude 4/6 L





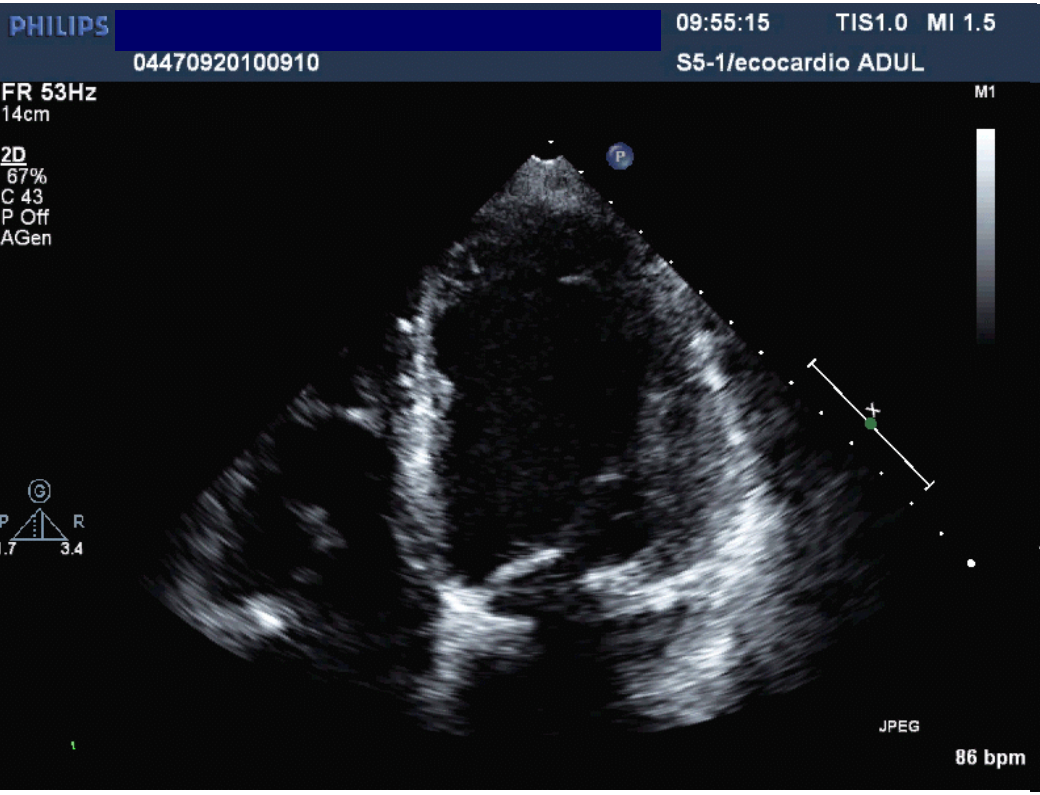
Diameters TD/TS 71/56 mm

Volumes TD/TS 157/126 ml EF: 20%

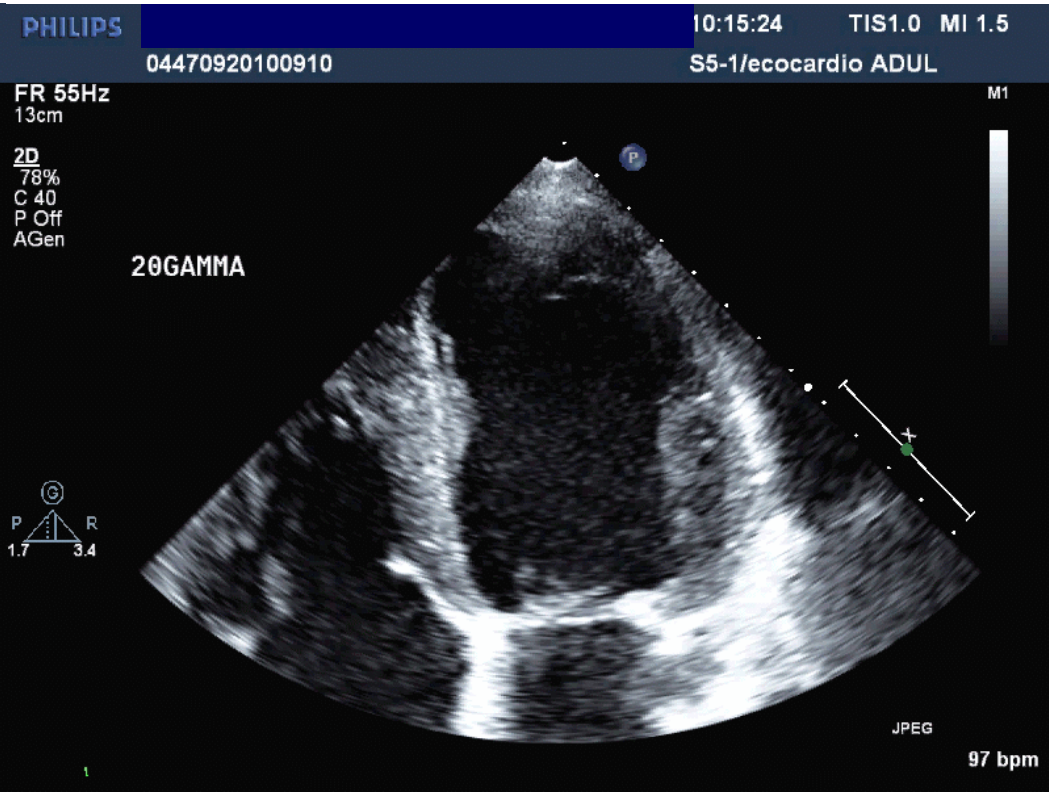
Grad max 79 mmHg, mean 44 mmHg

Dobutamine stress echo

Rest



Low dose DSE



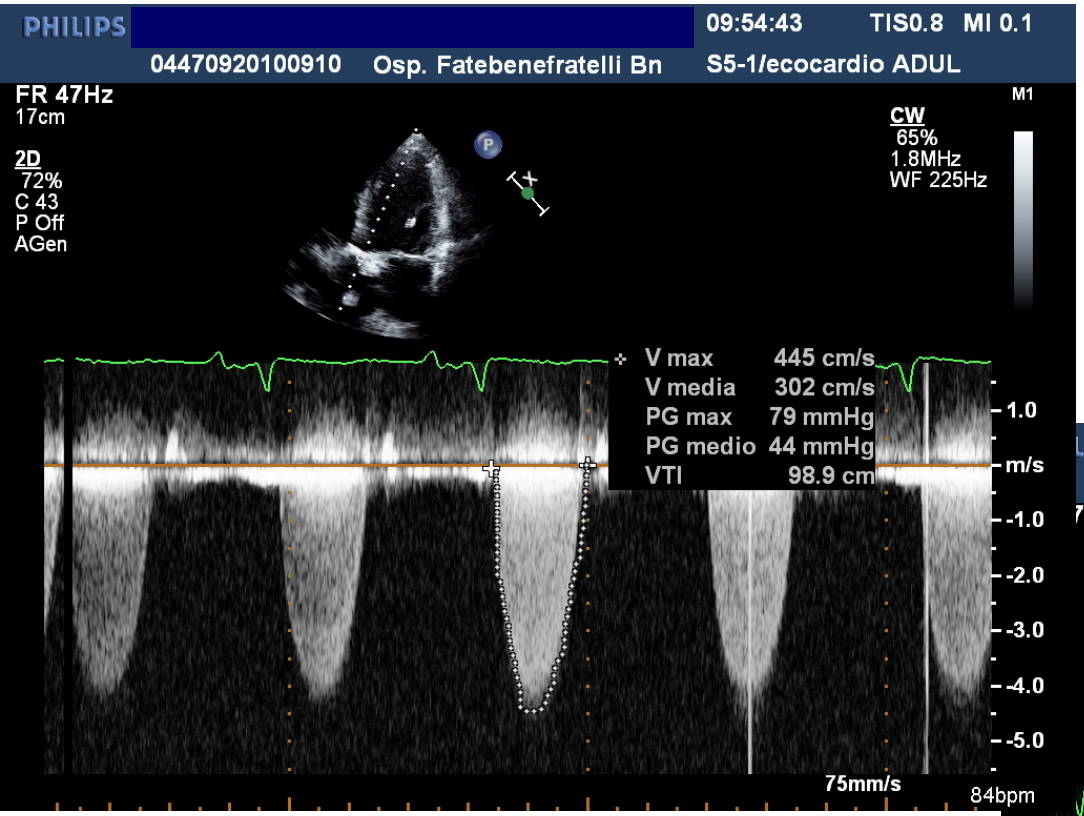
Volume TS from 126 ml to 104 ml (Δ-18%)

EF from 20% to 34% (diff.+14%)

Aortic valve area: from 0.35 cm^2/m^2 to 0.32 cm^2/m^2

Dobutamine stress echo

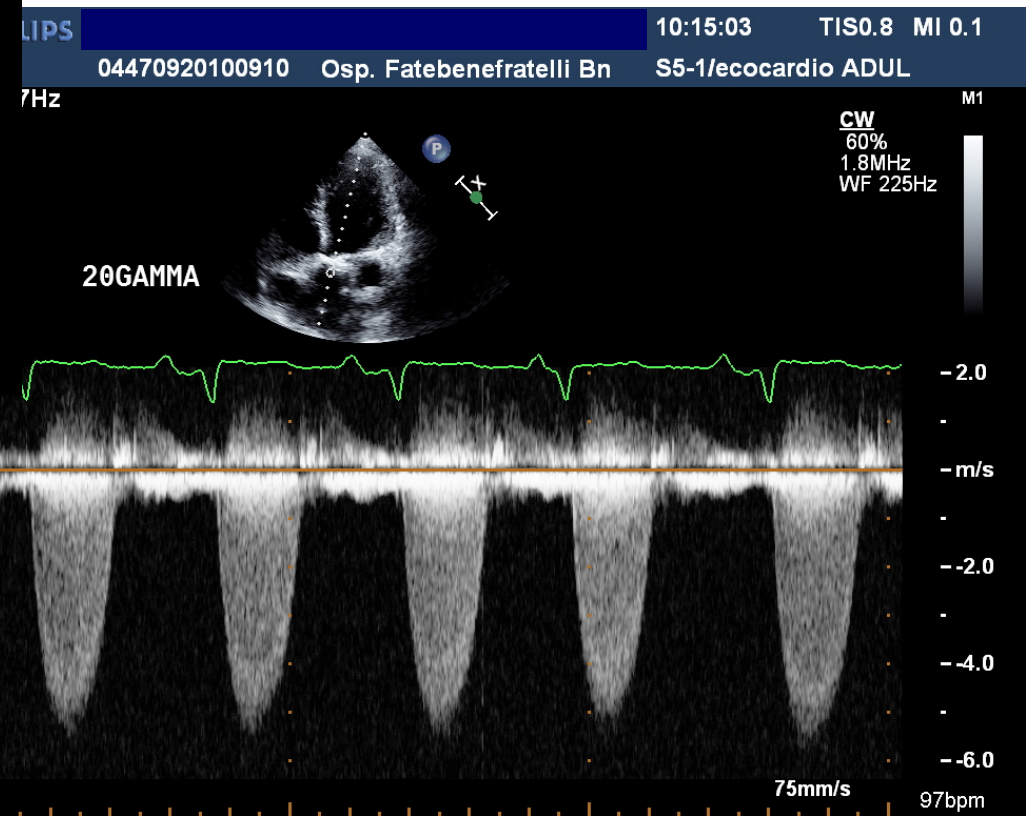
Rest



Grad max 79 mmHg

mean 44 mmHg

Low dose DSE

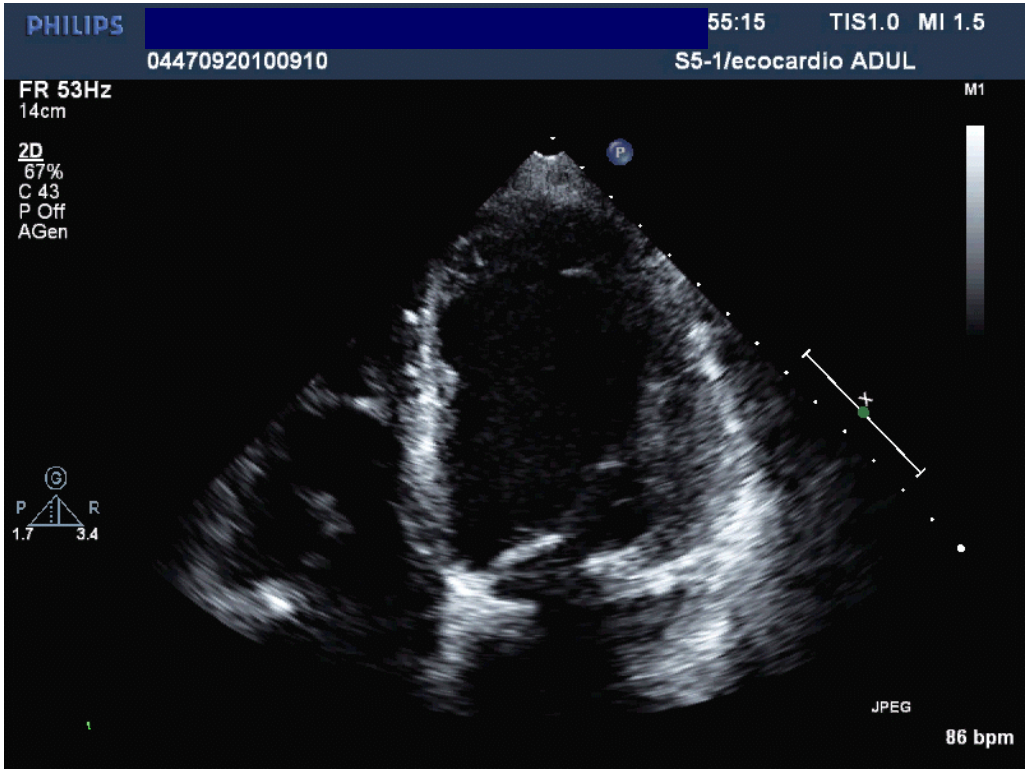


Grad max 130 mmHg

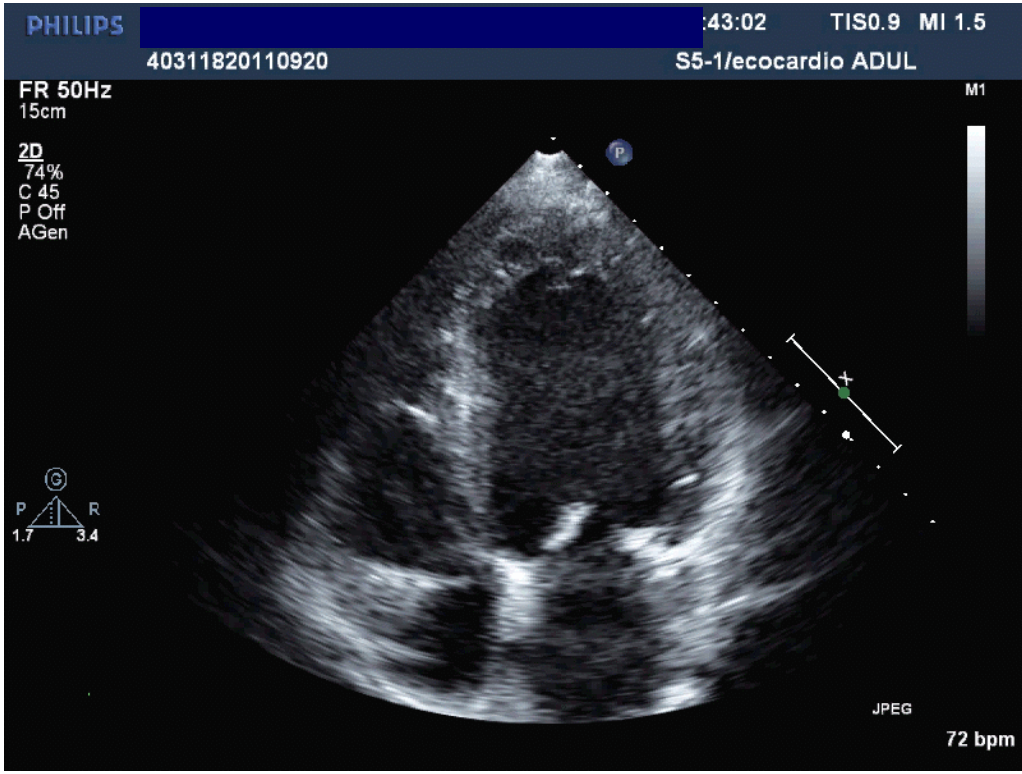
mean 78 mmHg

Δ+34 mmHg

Base

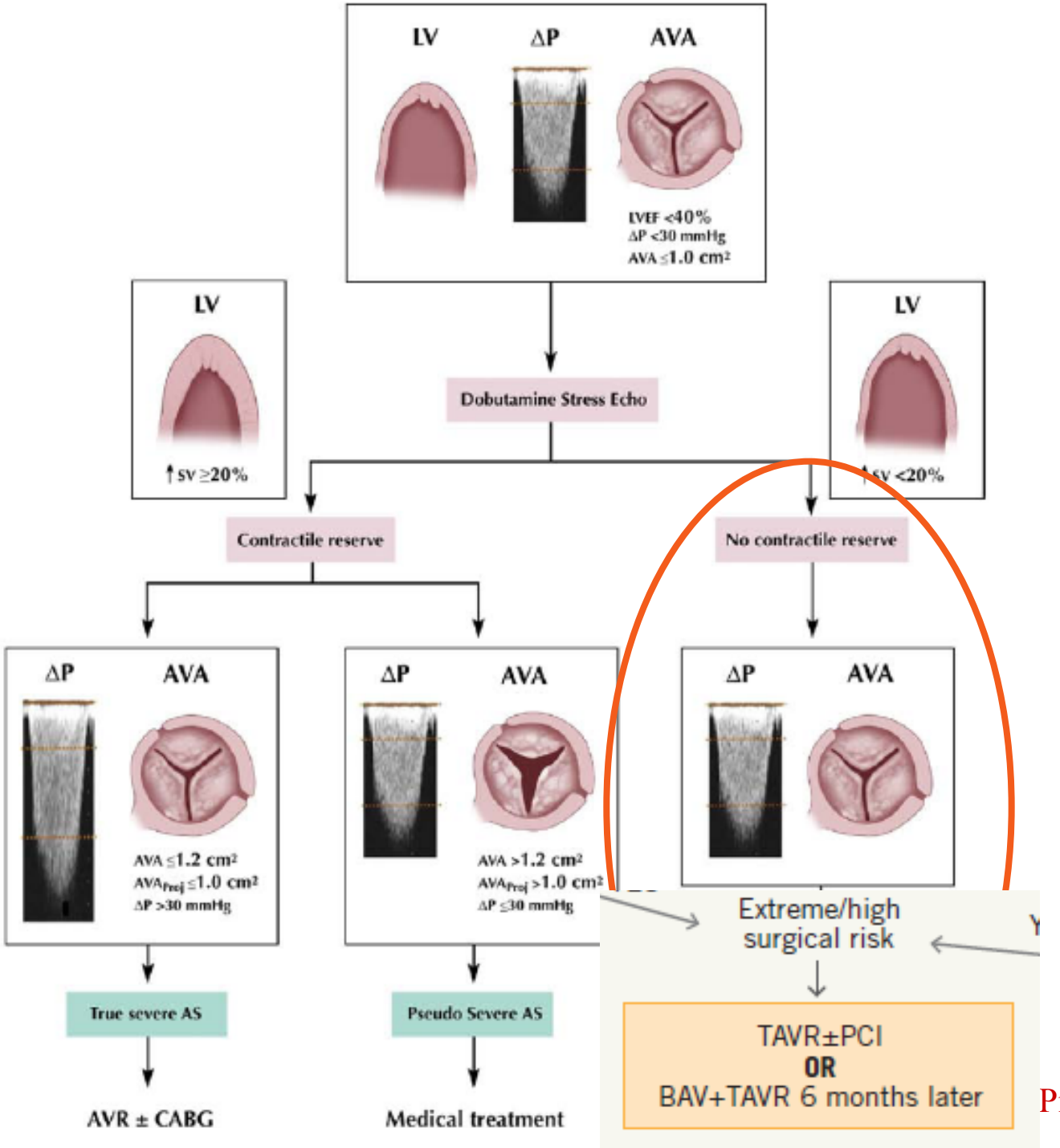


Follow-up



Volume TS da 126 ml a 98 ml (Δ -22%)

FE da 20% a 44% (diff.+24%)

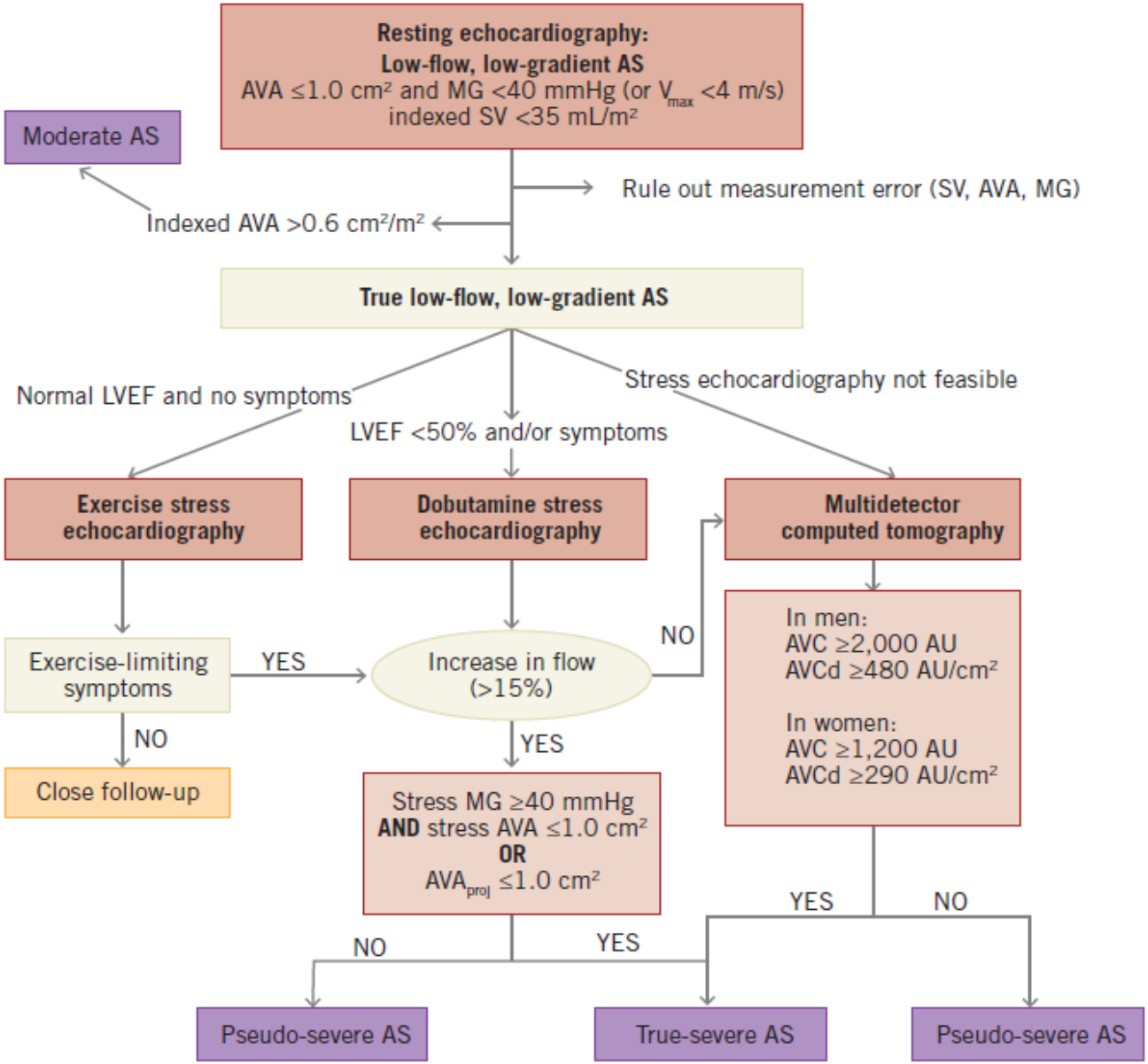


Picano E *JACC* 2009

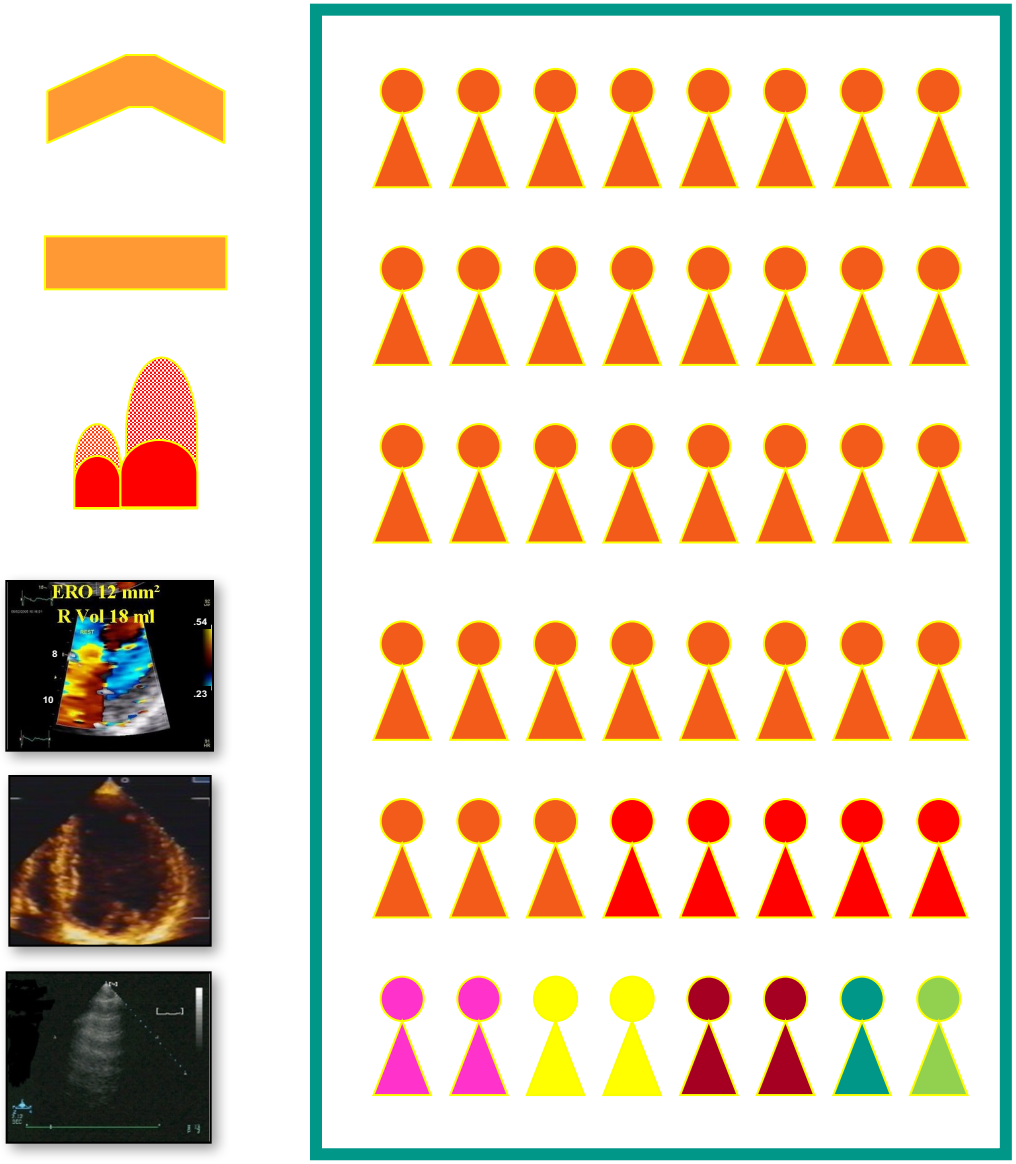
Assessment of low-flow, low-gradient aortic stenosis: multimodality imaging is the key to success

Marie-Annick Clavel, DVM, PhD; Philippe Pibarot*, DVM, PhD, FACC, FAHA, FESC, FASE

EuroIntervention 2014;10:



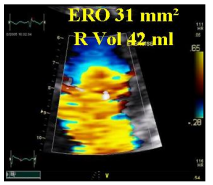
Stress echo 2020: versatility



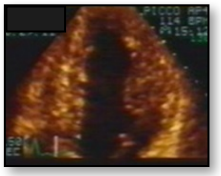
Ischemia

Viability

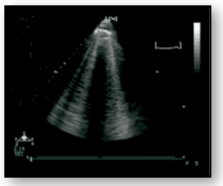
CFVR



Mitral Insufficiency



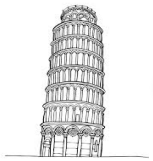
LV elastance



Extravascular lung water

CAD
HFrEF HFpEF
Valvular HD
Congenital HD
Extreme physiology
Pulmonary arterial hypertension
HCM

The Road to Stress Echo 2020



Lab accreditation
(EACVI,National societies)

Quality Control for Regional Wall Motion Abnormalities

10,000 patients enrolled

2020

N= 500

N= 1,500

N= 3,000

N= 7,000

2017

2018

2019

High Volume labs
(>100/year)

Declaration of interest for SE2020 from head of lab

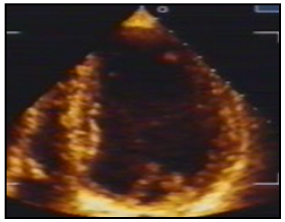
SECS 2.0 Software

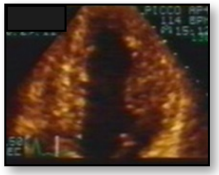
2016
Start recruiting

Se2020

- CRT
- B-lines
- HCM
- Diastolic heart failure
- Post-TAVI and AVR
- Extreme Physiology
- Repaired ToF
- PAH (at risk, borderline, early)
- Triple imaging in CAD
- Genetic SE

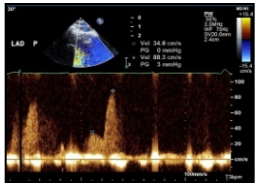
10 – GENES
(phenotype-negative carriers of HCM, DCM, PAH)

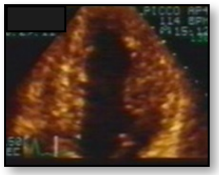


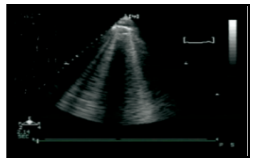


1- CHEF
(pre-CRT)

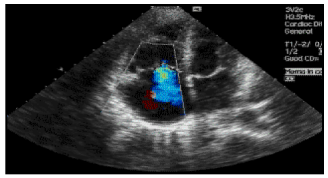
9 – DITSE
(triple imaging in CAD)



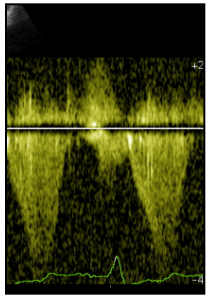




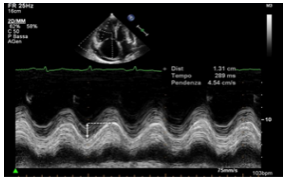
2- BHEF
(HFdEF)



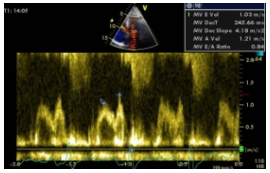
8- DOPSAH
(at risk, borderline, early PAH)

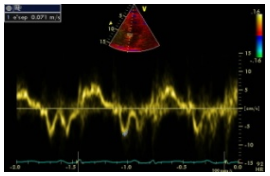


3- SEHCA
(HCM)

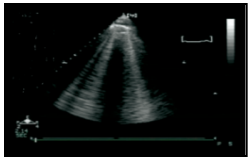


7 – SETOF
(repaired Fallot)

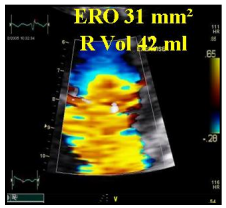




4 – SEDIA
(HFpEF)



6-SEO
(outdoor at high altitude, extreme physiology)



5 – SETA
(post-TAVI or AVR)

Stress Echo 2020

SOCIETÀ ITALIANA DI ECOGRAFIA CARDIOVASCOLARE
SIEC

Why Italy works

Picano E, Ciampi Q et al. *Cardiovascular Ultrasound* 2017

StressEcho 2020 study group

"Under white clouds, cielo di Pisa,
out of all this beauty something must come"

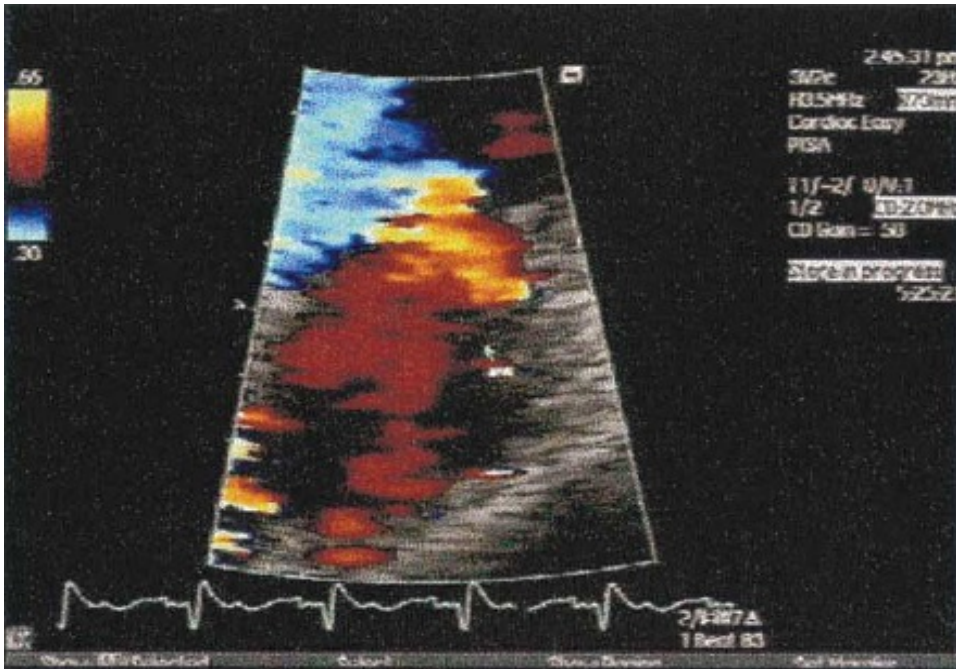
(Ezra Pound, The Pisan cantos, 1948)

Picano E, Ciampi Q et al. *Cardiovascular Ultrasound* 2017

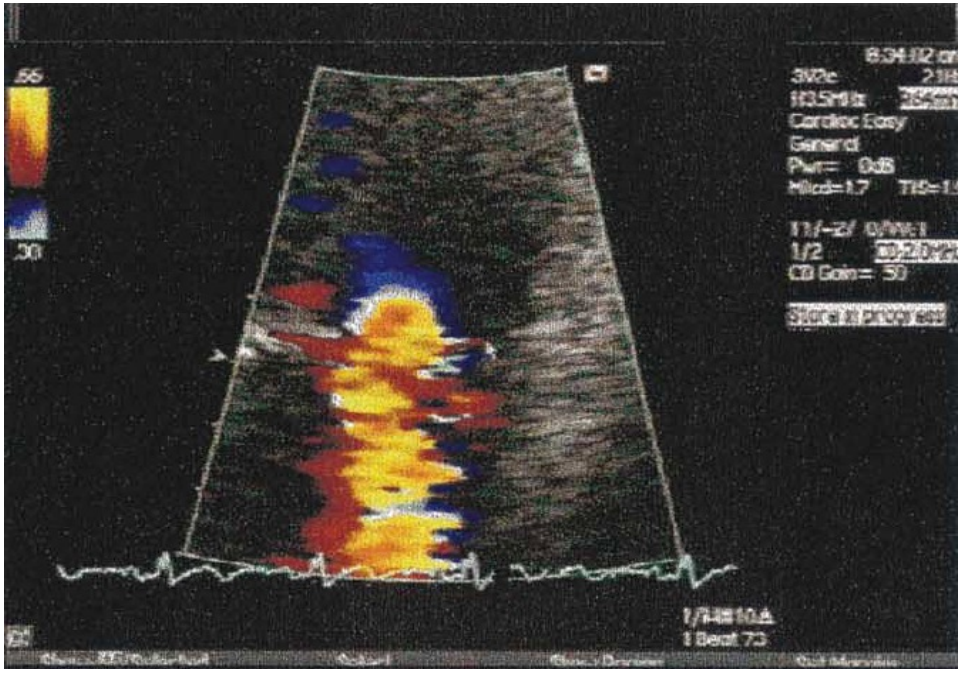
Ecosforzo ed insufficienza mitralica

Lebrun F *J Am Coll Cardiol* 2001

Base



Esercizio

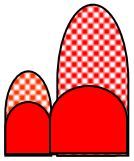


- La valutazione dell'insufficienza mitralica è fattibile e riproducibile
  - **PISA**
  - **Volume rigurgitante**
  - Vena contracta
  - Rapporto area jet/area atrio

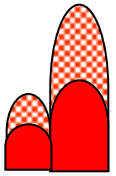
When to do stress echo?

CAD →

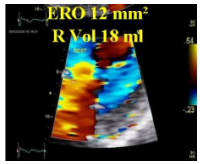
TO STENT?



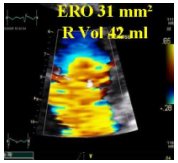
DCM →



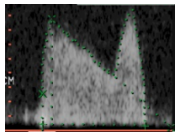
TO ReSYNCH?



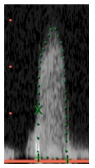
Mitral insufficiency →



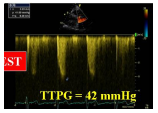
TO REPAIR?



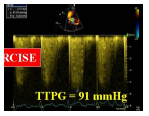
Mitral stenosis →



TO DILATE?



PASP →



TO DRUG?

Cardiovascular Ultrasound

BioMed Central

Research

Open Access

Rest and Dobutamine stress echocardiography in the evaluation of mid-term results of mitral valve repair in Barlow's disease

Giovanni Minardi*[1], Carla Manzara[1], Giovanni Pulignano[1], Giampaolo Luzi[2], Daniele Maselli[2], Giovanni Casali[2] and Francesco Musumeci[2]

2007

Variable		Baseline	One month	Follow-up	p (ANOVA)
LA size (mm)		50 ± 8	46 ± 6	44 ± 6	ns
LVEDD (mm)		61 ± 5	55 ± 6	52 ± 7	0.01
LVESD (mm)		33 ± 6	35 ± 6	34 ± 9	ns
FS (%)		44 ± 7	36 ± 6	35 ± 10	0.008
LVEDV (ml)		127 ± 4	112 ± 33	114 ± 56	ns
LVESV (ml)		55 ± 30	56 ± 21	57 ± 20	ns
EF (%)		60 ± 10	50 ± 7	54 ± 12	0.038
MR grade	(3+;4+)	11; 9	0;0	ns	0.001*
	(0;1+;2+)	0;0;0	11;8;1	11;8;1	ns**
sPAP (mmHg)		42 ± 16	38 ± 14	30 ± 11	ns

Conclusion: Basal and Dobutamine stress echocardiography proved to be valuable tools for evaluation of mid-term results of mitral valve repair. In our study population, the surgical technique employed had a favourable impact on several cardiac parameters, evaluated by these methods.

Stress Echocardiography in Regurgitant Valve Disease

Patrizio Lancellotti, MD, PhD; Julien Magne, PhD

Circ Cardiovasc Imaging September 2013

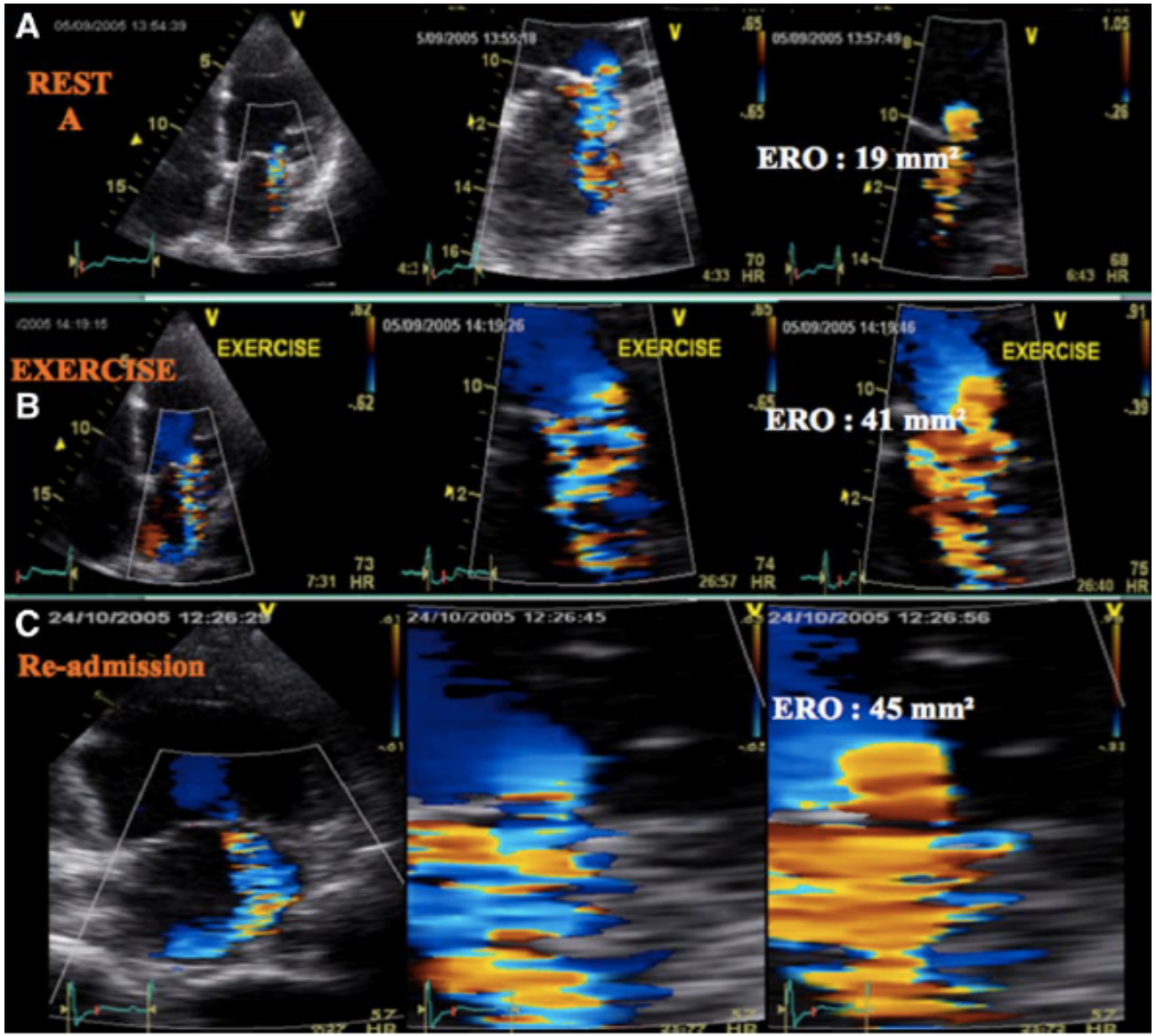
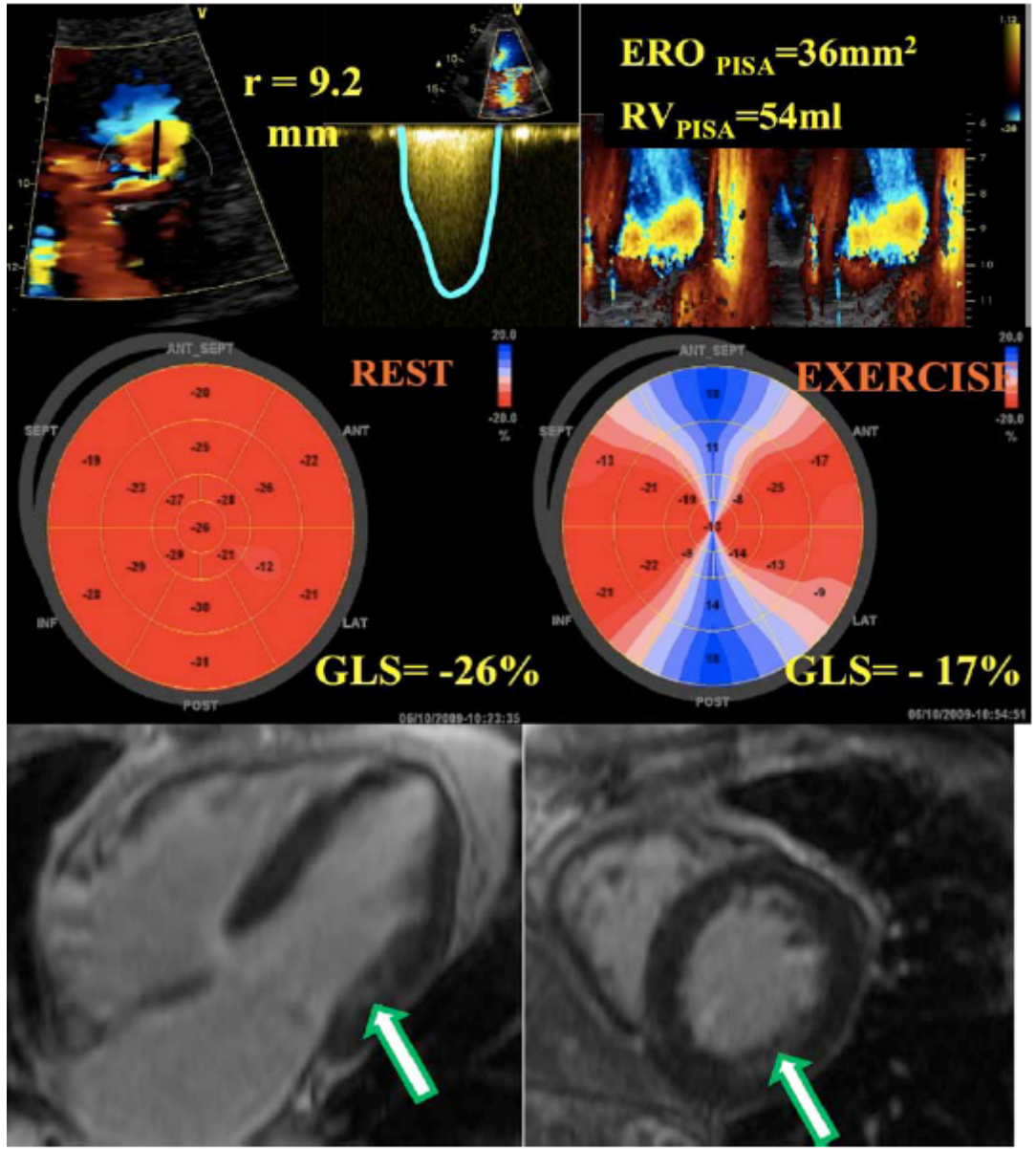


Figure 8. A and **B**, Dynamic exercise mitral regurgitation in a patient admitted with acute pulmonary edema without evident contributing factors. **C**, Echocardiographic examination performed at the acute stage of a recurrent episode of pulmonary edema showing severe mitral regurgitation. ERO indicates effective regurgitant orifice.

Stress Echocardiography and Mitral Valvular Heart Disease

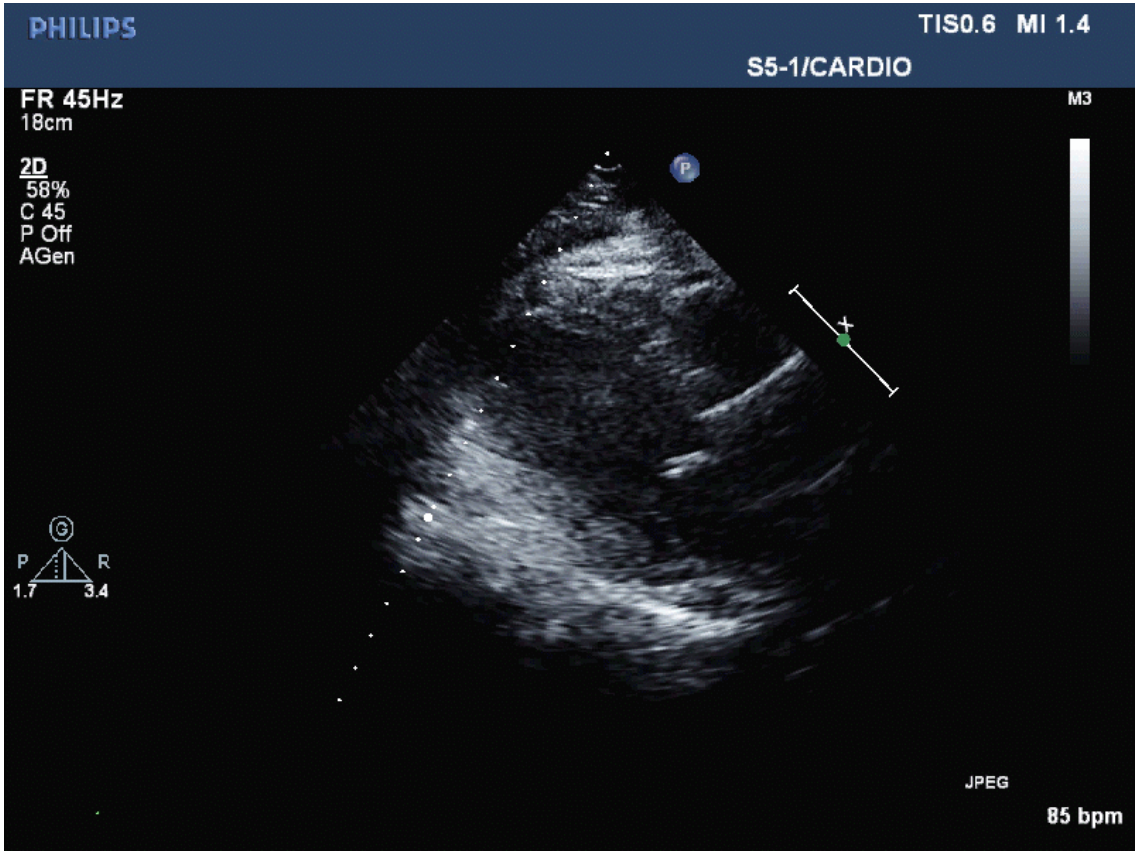
Julien Magne, PhD, Patrizio Lancellotti, MD, PhD*,
Luc A. Pierard, MD, PhD*

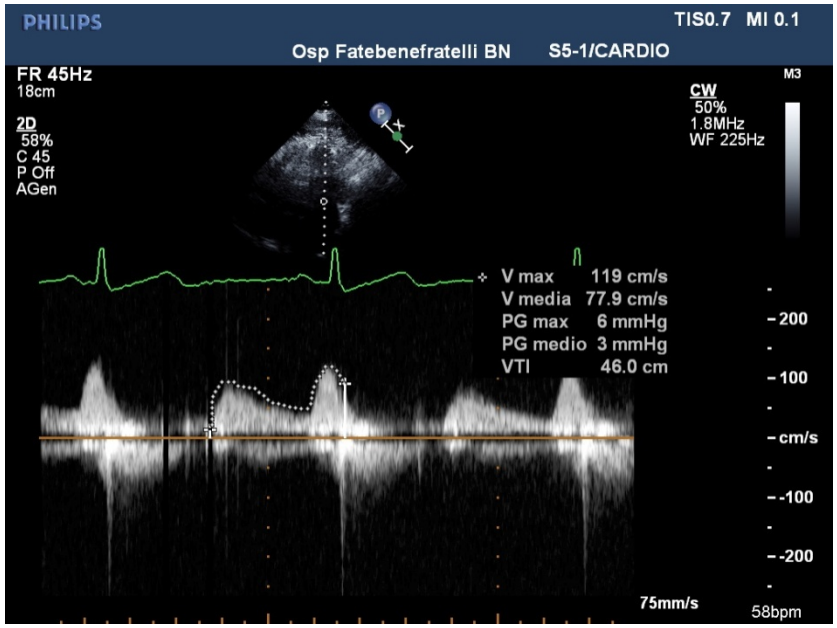
Cardiol Clin 31 (2013) 311–321



Caso clinico:

- Donna di 52 anni
  - Lieve dispnea da sforzo da alcuni mesi

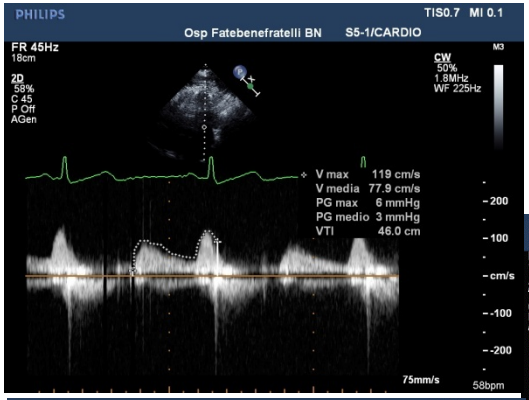


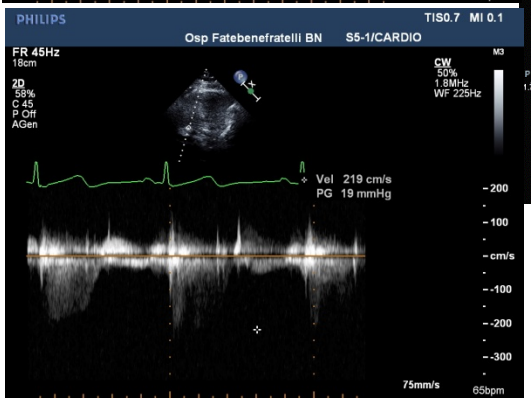


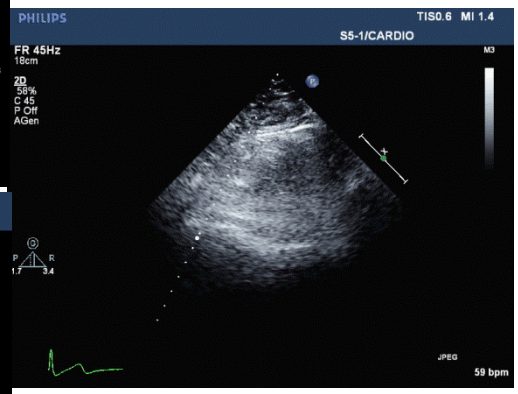
Ex-Stress Echo

Durata di esercizio: 5 min

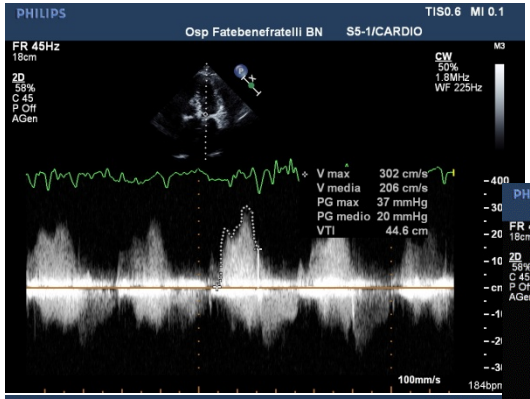
Rest

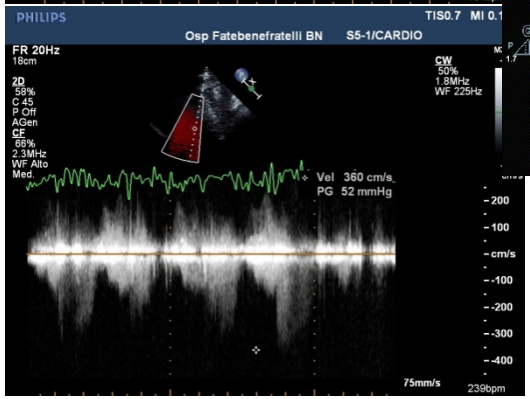


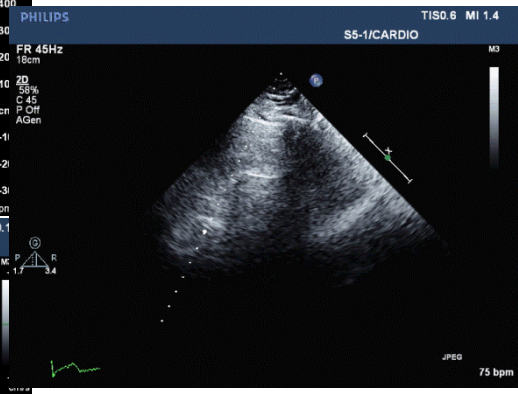




Peak exercise



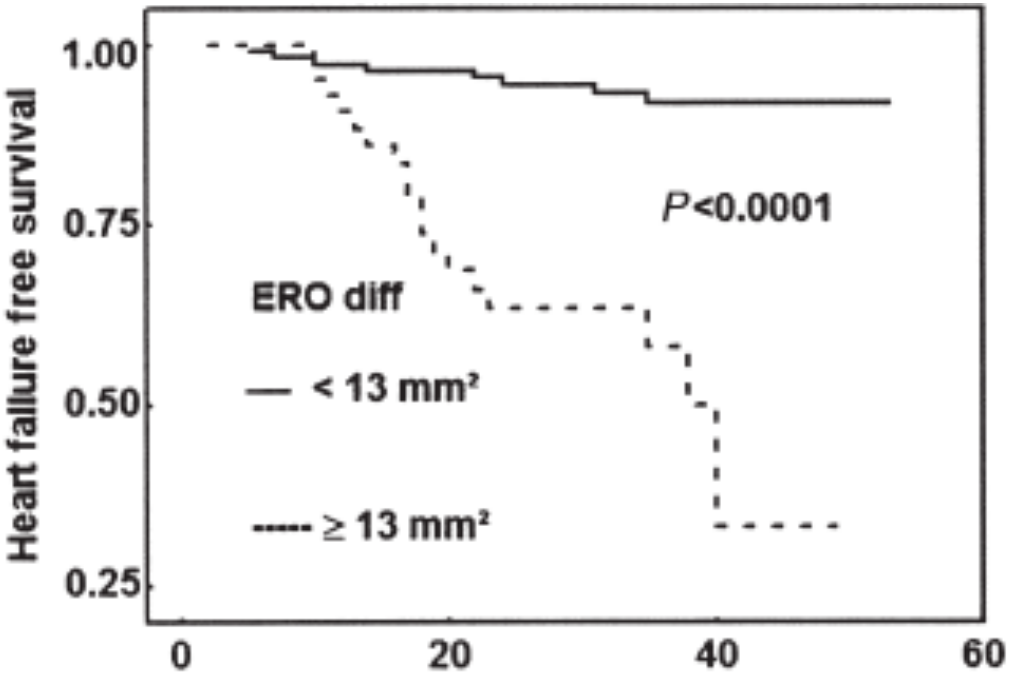




Gradiente medio: 3 mmHg
PAPs: 19 mmHg + RAP

Gradiente medio: 20 mmHg
PAPs: 52mmHg + RAP

Insufficienza mitralica funzionale ischemica: Prognosi



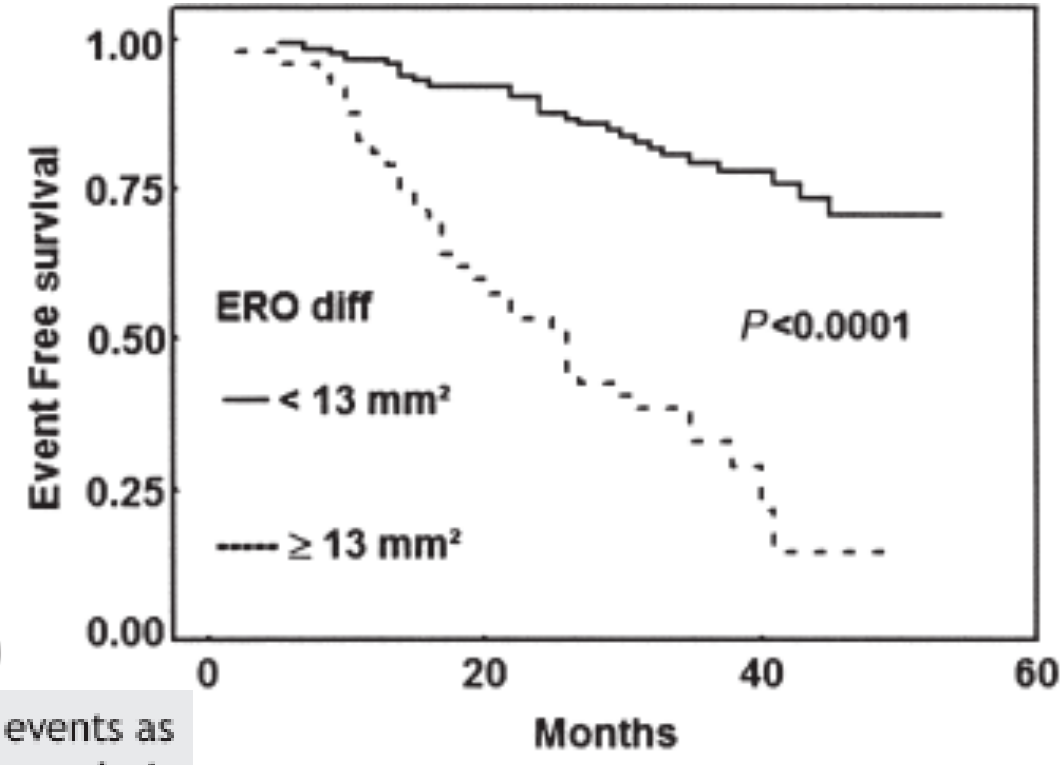
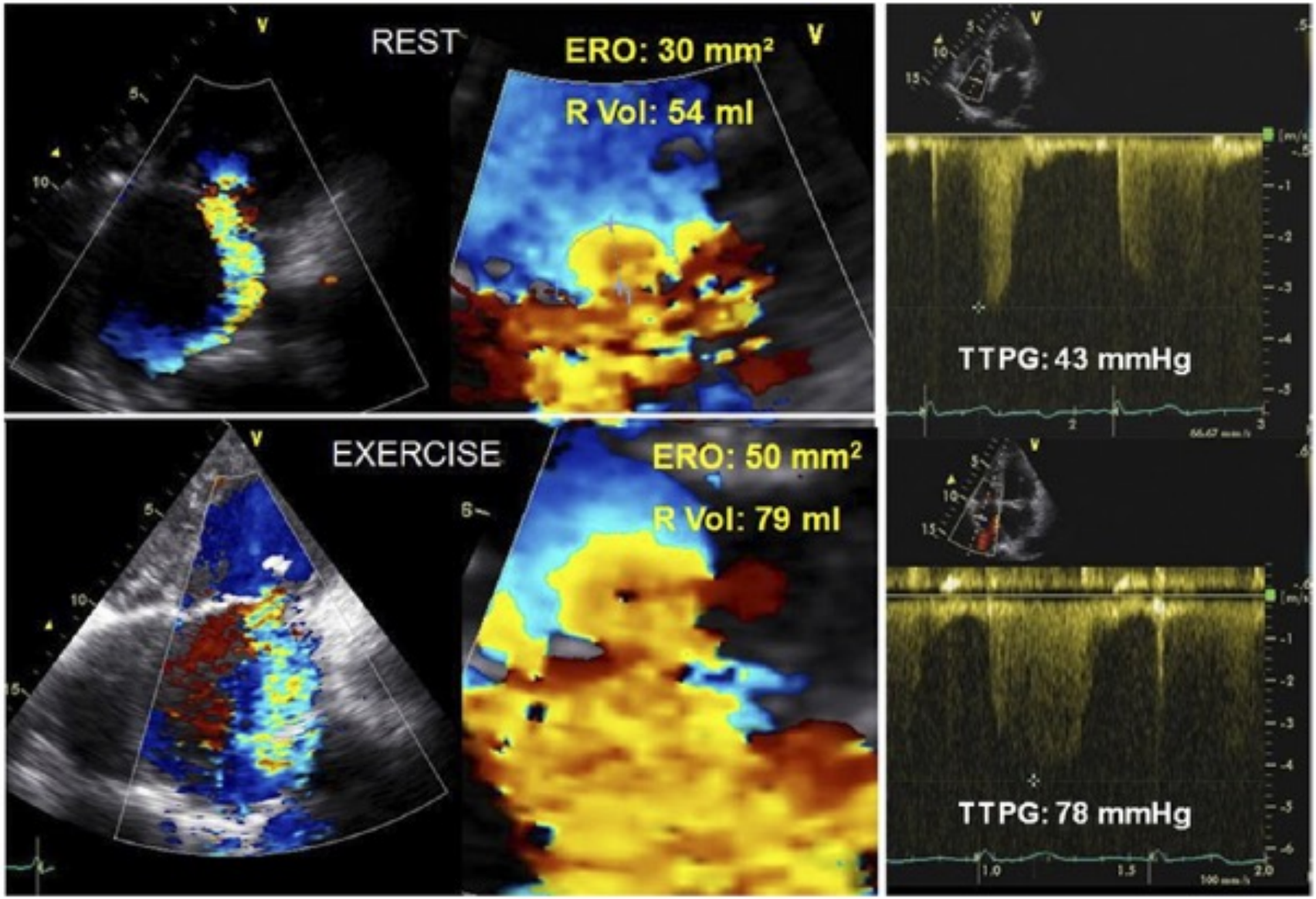


Table 4 Factors predictive of major adverse cardiac events as obtained by stepwise Cox proportional hazard regression analysis ($n = 161$ patients)

	HR (95% CI)	*P*-value
ERO diff ≥ 13 mm²	4.42 (2.61–7.53)	0.0001
LV ejection fraction diff	1.04 (1.00–1.09)	0.023
LV end-diastolic volume	1.01 (1.00–1.02)	0.032

Lancellotti P *Eur Heart J* 2005

Insufficienza mitralica ed ecostress



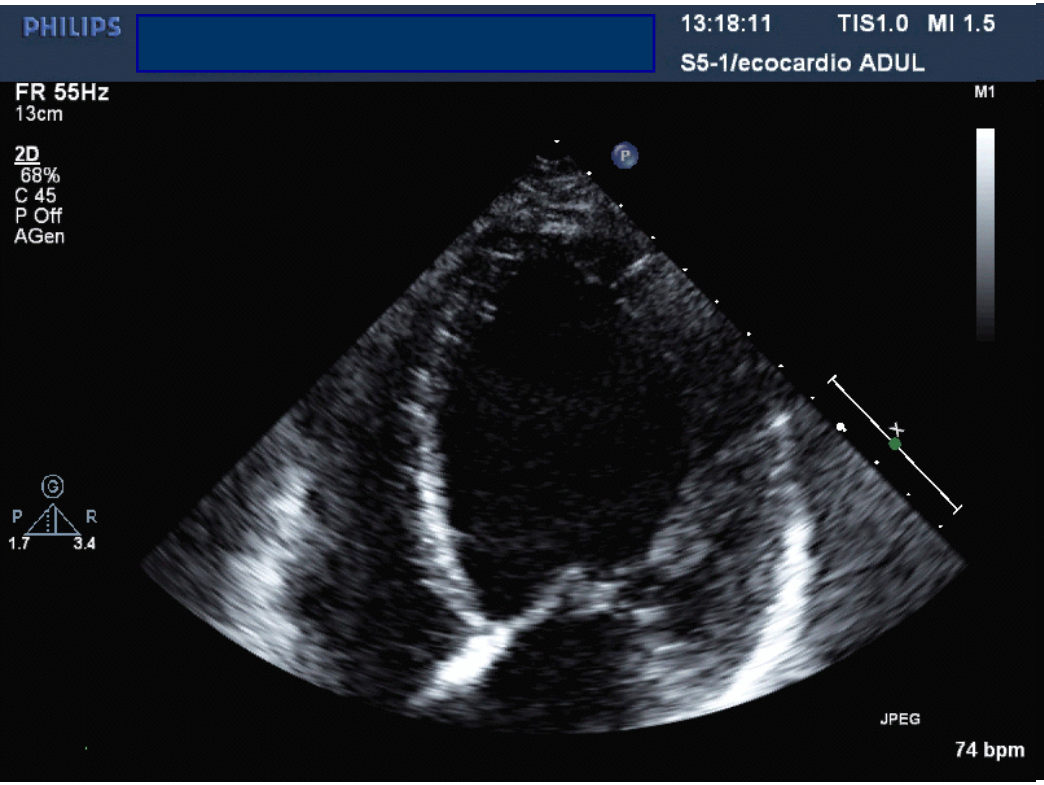
Picano E *J Am Coll Cardiol* 2009

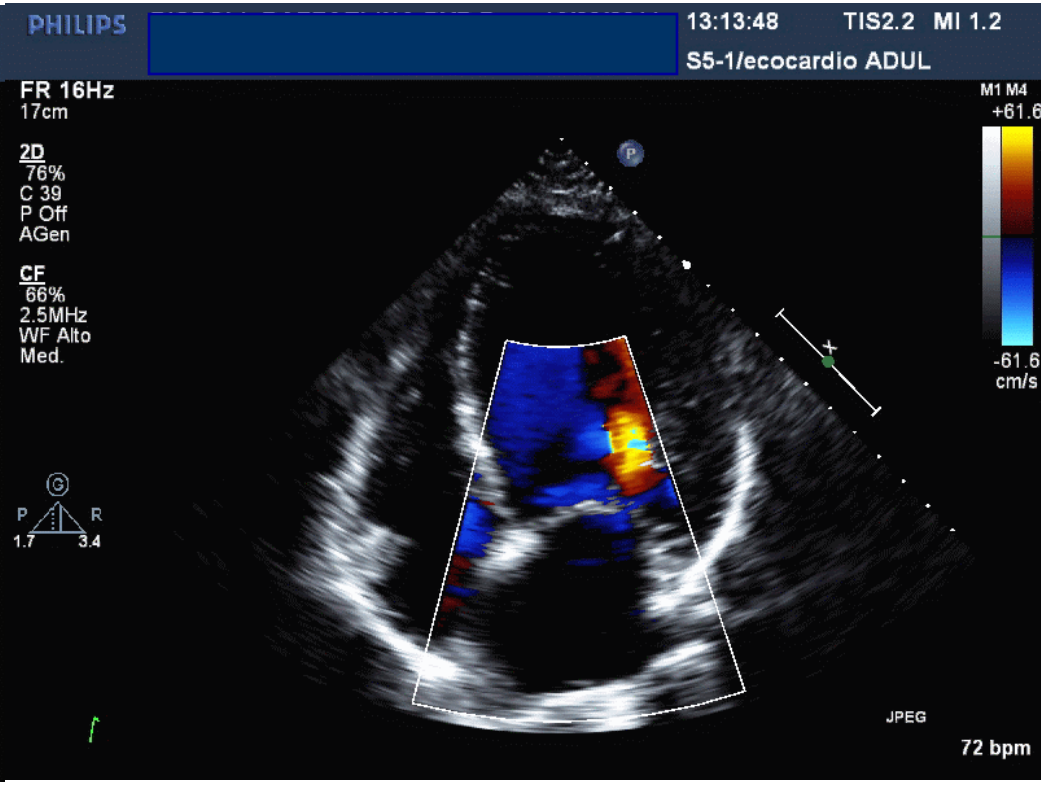
European Association of Echocardiography recommendations for the assessment of valvular regurgitation. Part 2: mitral and tricuspid regurgitation (native valve disease)

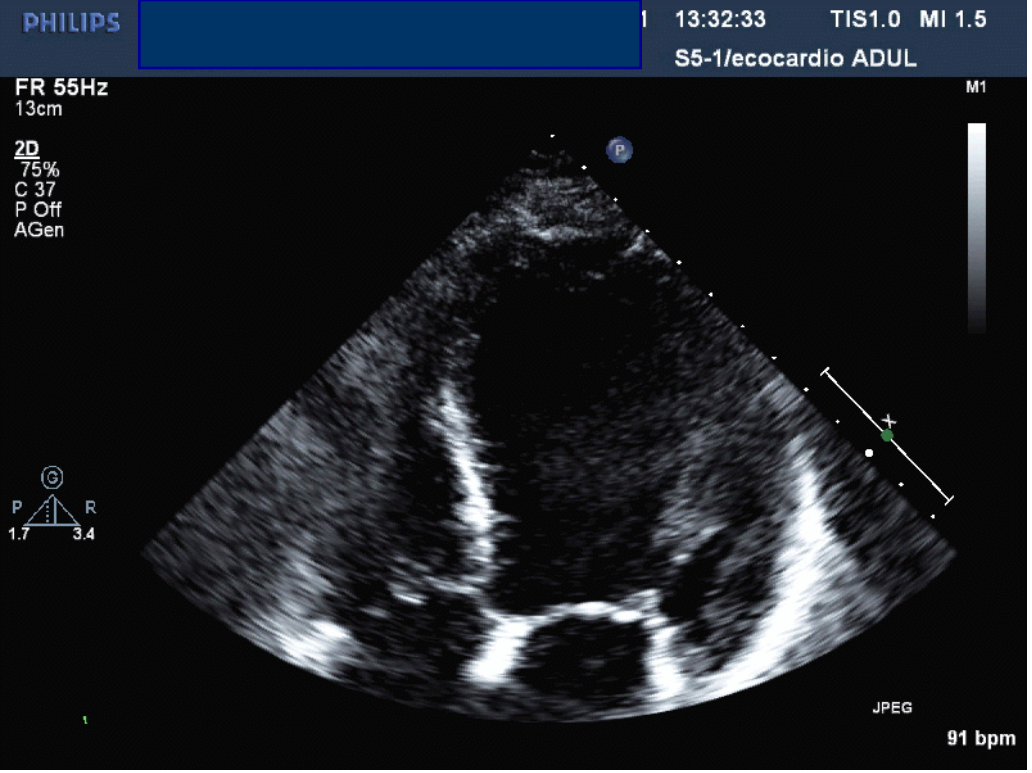
Key point

Exercise echocardiography is useful in patients with functional ischaemic MR and chronic LV systolic dysfunction to unmask the dynamic behaviour of MR. Patients with an increase in EROA by $\geq 13\,mm^2$ are patients at increased risk of cardiovascular events. In these patients, exercise echocardiography also helps to identify the presence and extent of viable myocardium at jeopardy.

Eco basale pre CRT







➢ **Rest:**

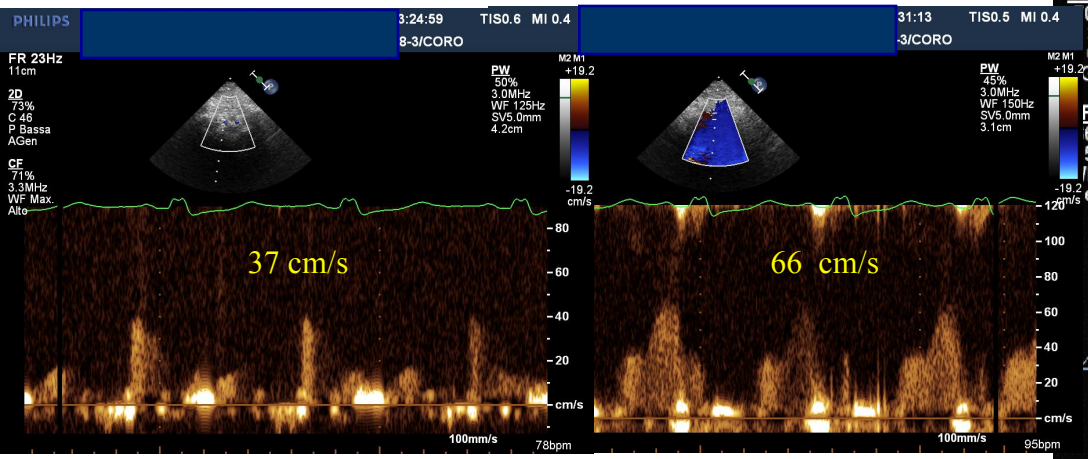
Vol TD/TS: 163/135 ml

EF: 17% IM 3+

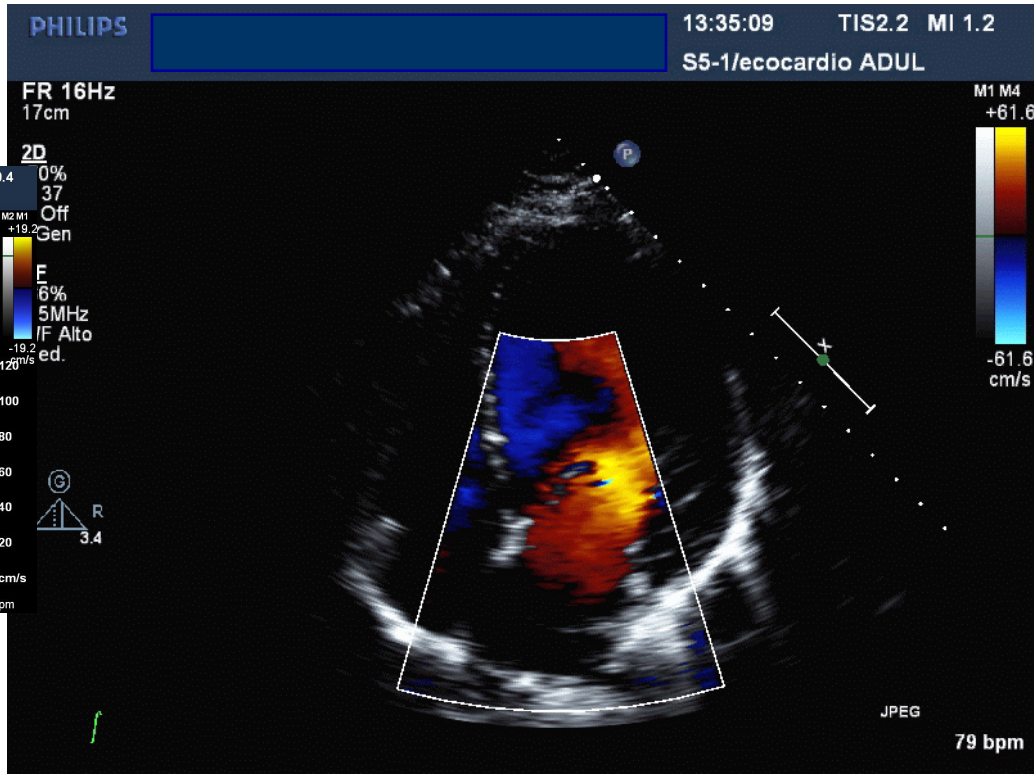
➢ **Peak stress:**

Vol TD/TS: 158/94 ml

EF: 40% IM+

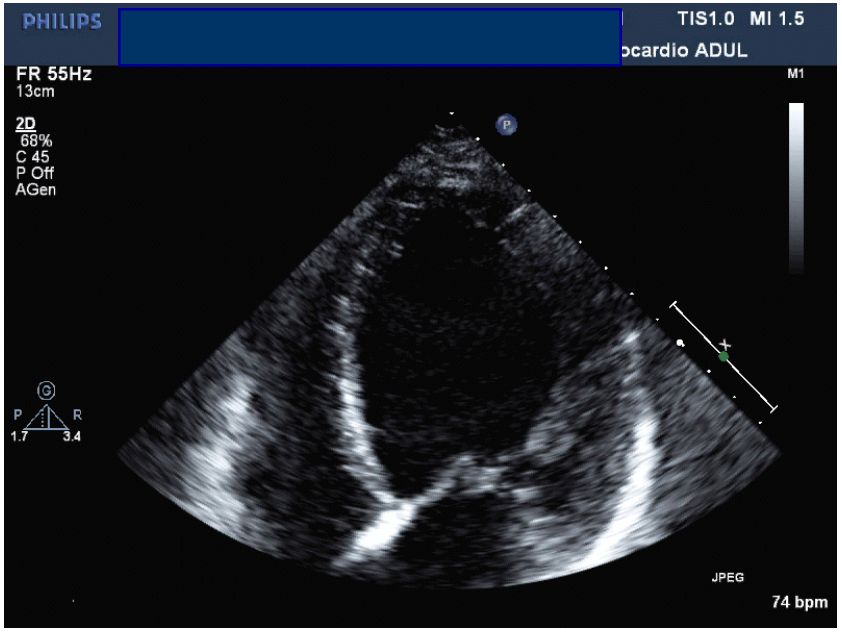


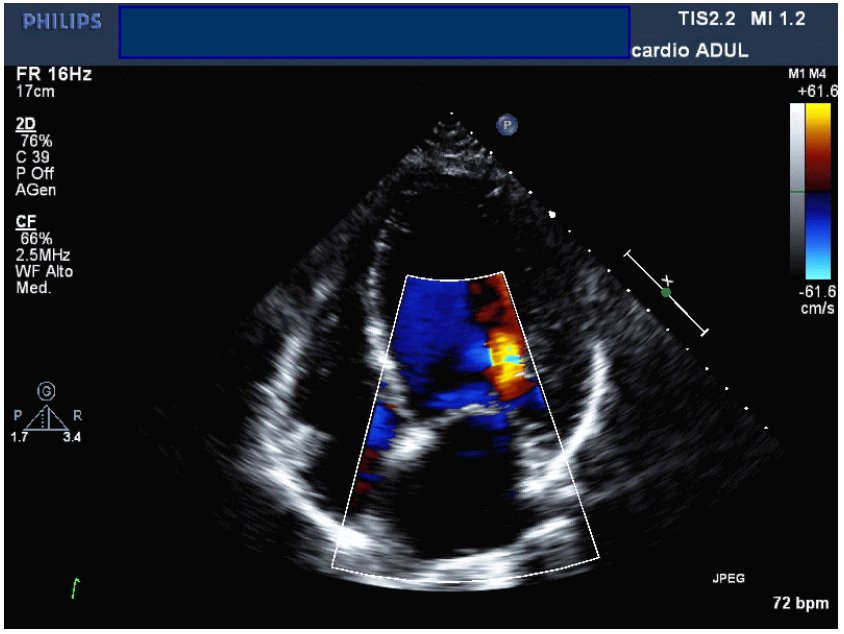
CFR: 1,74



Post CRT

Pre-CRT





Follow-up Post-CRT