Mitral Regurgitation

2016-Lugano

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Mitral Regurgitation

Which of these circumstances does not represent a high-risk MR:

-MVP with MR and LA volume 60 mL/m2

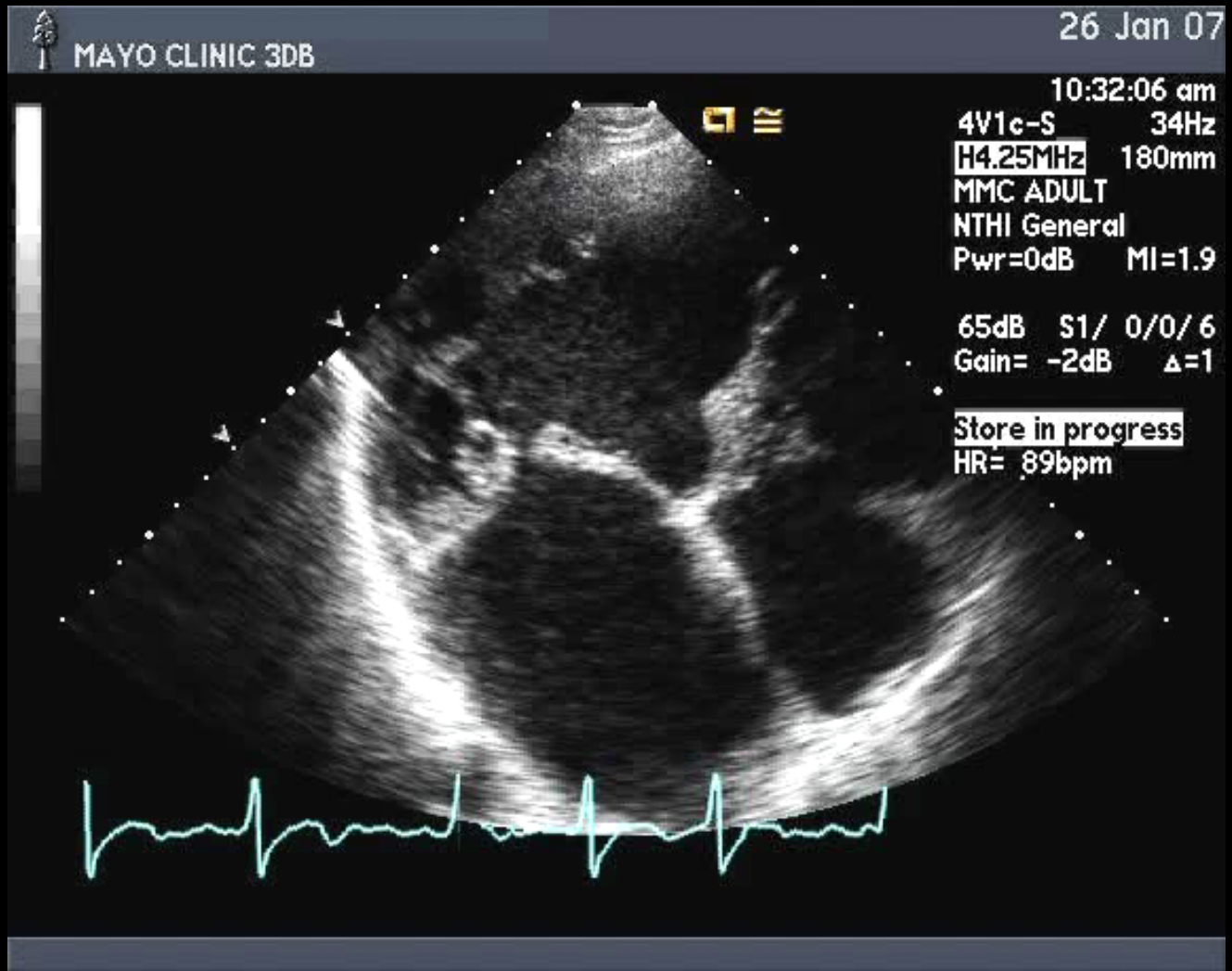
-MVP with mid-late systolic MR and ERO 60 mm2

-Bileaflet prolapse with regurgitant volume 60 mL

-MVP-MR with end-systolic LV dimension 42 mm

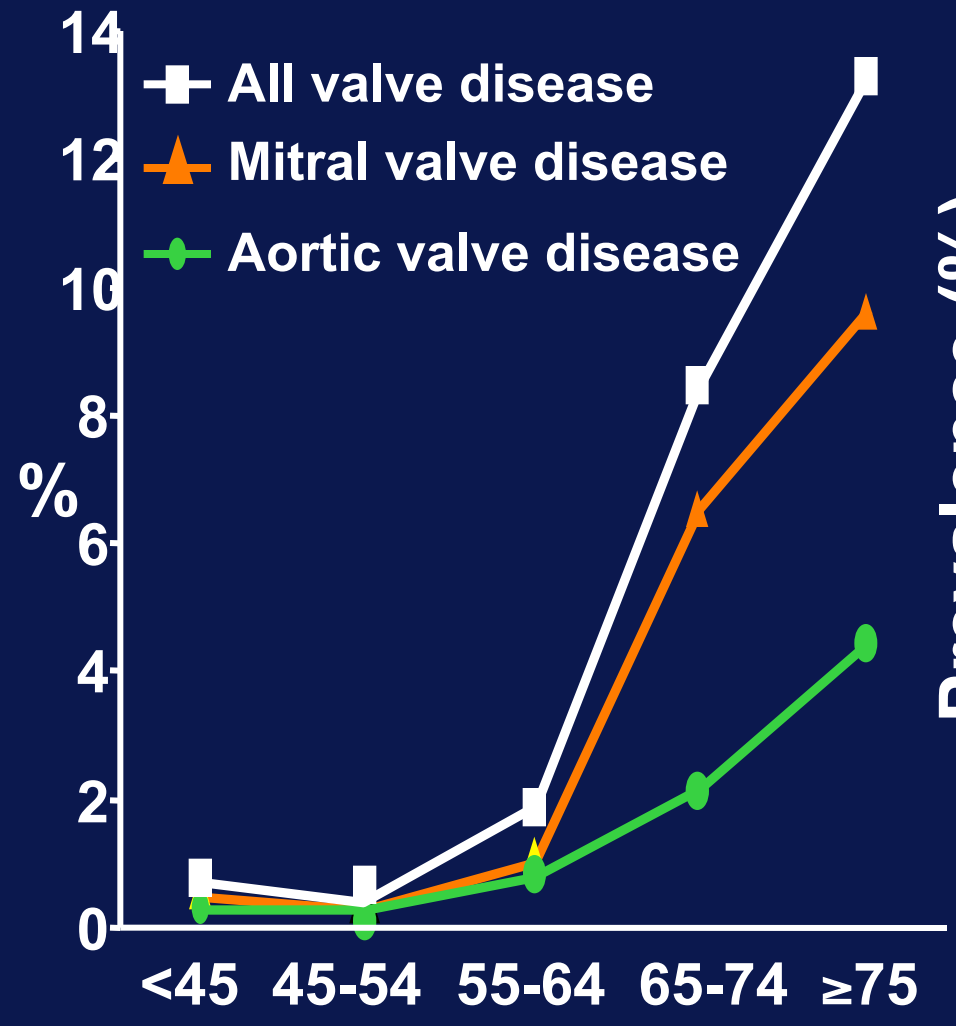
-MVP holosystolic MR and EF 56%

Why are we interested in Mitral Regurgitation ?

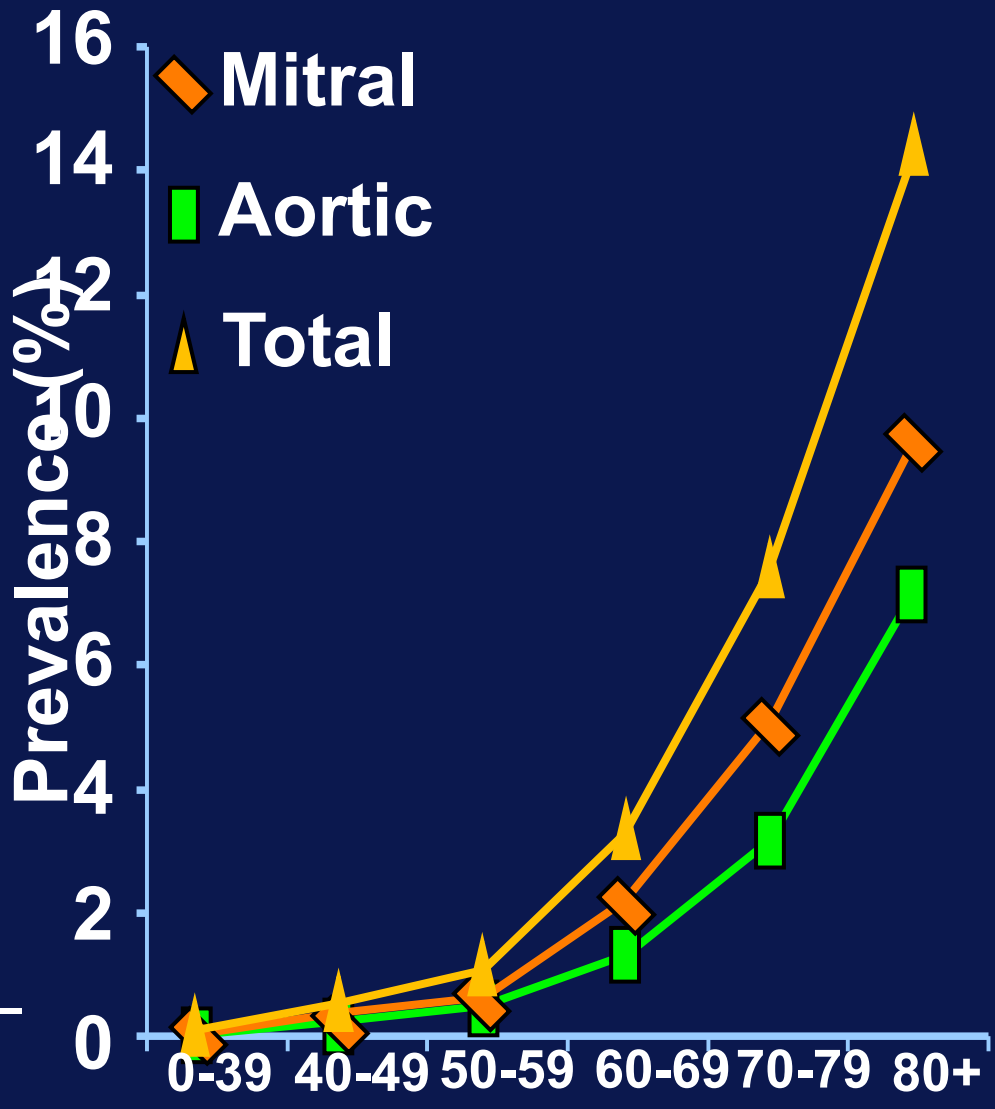


Prevalence of Valve Diseases

Population-NIH series



Olmsted County



Burden of valvular heart diseases: a population-based study

Vuyisile T Nkomo, Julius M Gardin, Thomas N Skelton, John S Gottdiener, Christopher G Scott, Maurice Enriquez-Sarano

Background Valvular heart diseases are not usually regarded as a major public-health problem. Our aim was to assess their prevalence and effect on overall survival in the general population.

Methods We pooled population-based studies to obtain data for 11 911 randomly selected adults from the general population who had been assessed prospectively with echocardiography. We also analysed data from a community study of 16 501 adults who had been assessed by clinically indicated echocardiography.

Lancet 2006; 368: 1005–11

Published Online August 18, 2006 DOI:10.1016/S0140-6736(06)69208-8

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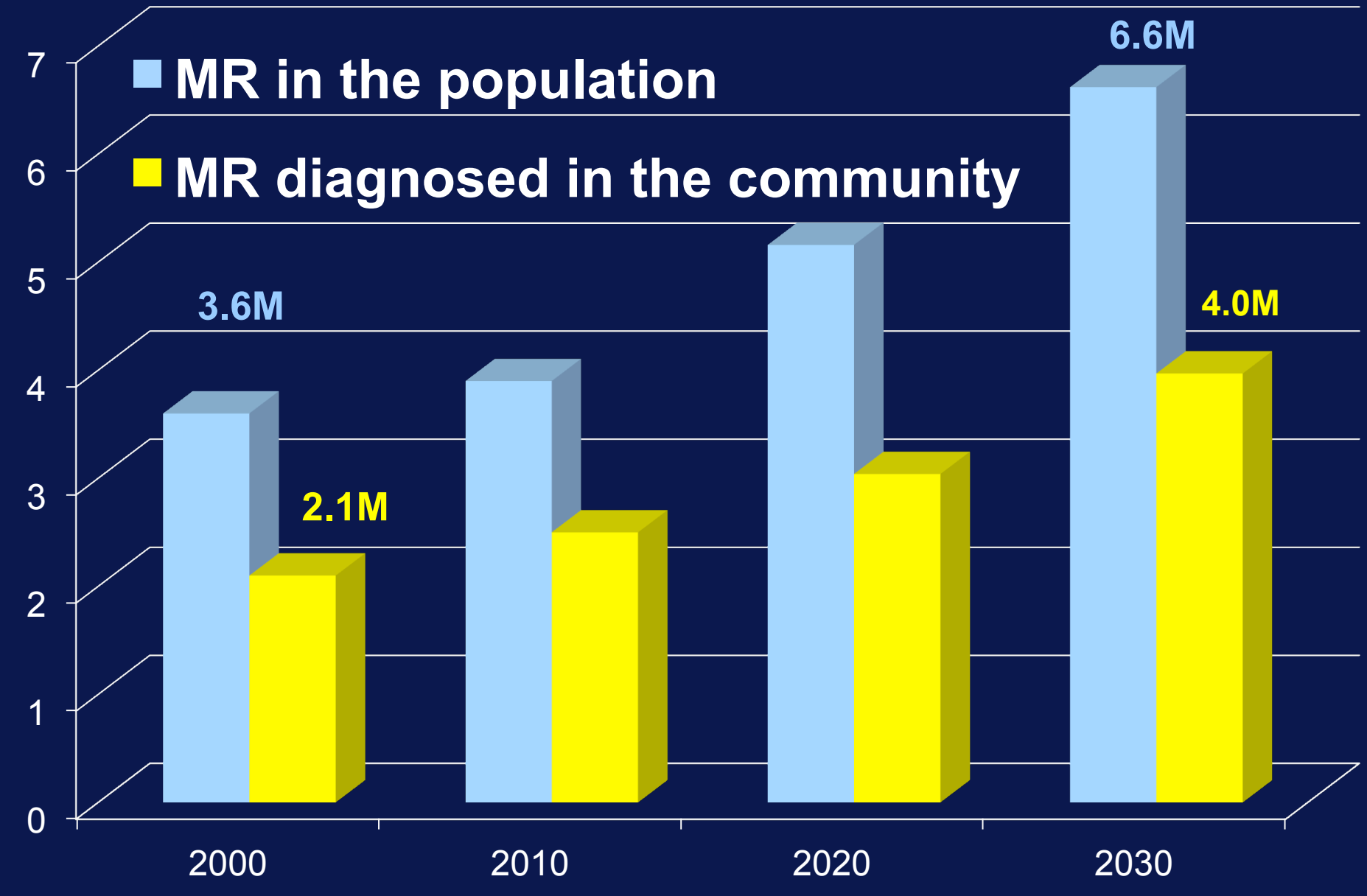
Population

	Age (years)					p value for trend	Frequency adjusted to 2000 US adult population
	18–44	45–54	55–64	65–74	≥75		
Participants (n)	4351	696	1240	3879	1745	..	209 128 094
Male, n (%)	1959 (45%)	258 (37%)	415 (33%)	1586 (41%)	826 (47%)	..	100 994 367 (48%)
Mitral regurgitation (n=449)	23, 0·5% (0·3–0·8)	1, 0·1% (0–0·8)	12, 1·0% (0·5–1·8)	250, 6·4% (5·7–7·3)	163, 9·3% (8·1–10·9)	<0·0001	1·7% (1·5–1·9)
Mitral stenosis (n=15)	0, 0% (0–0·1)	1, 0·1% (0–0·8)	3, 0·2% (0·1–0·7)	7, 0·2% (0·1–0·4)	4, 0·2% (0·1–0·6)	0·006	0·1% (0·02–0·2)
Aortic regurgitation (n=90)	10, 0·2% (0·1–0·4)	1, 0·1% (0–0·8)	8, 0·7% (0·3–1·3)	37, 1·0% (0·7–1·3)	34, 2·0% (1·4–2·7)	<0·0001	0·5% (0·3–0·6)
Aortic stenosis (n=102)	1, 0·02% (0–0·1)	1, 0·1% (0–0·8)	2, 0·2% (0·6–1·9)	50, 1·3% (1·0–1·7)	48, 2·8% (2·1–3·7)	<0·0001	0·4% (0·3–0·5)

Community

	Age (years)					p value for trend
	18–44	45–54	55–64	65–74	≥75	
Residents, n	49 957	16 306	10 241	6686	6663	..
Residents examined, n (% men)	4310 (38%)	2737 (48%)	2847 (53%)	2798 (53%)	3851 (41%)	..
Mitral regurgitation (n=874)	57, 0·1% (0·1–0·2)	62, 0·4% (0·3–0·5)	93, 0·9% (0·7–1·1)	186, 2·8% (2·4–3·3)	476, 7·1% (6·5–7·8)	<0·0001
Mitral stenosis (n=33)	5, 0·01% (0–0·02)	3, 0·02% (0–0·05)	3, 0·03% (0·01–0·1)	8, 0·1% (0·05–0·2)	14, 0·2% (0·1–0·4)	<0·0001
Aortic regurgitation (n=282)	55, 0·1% (0·08–0·1)	38, 0·2% (0·2–0·3)	33, 0·3% (0·2–0·5)	41, 0·6% (0·4–0·8)	115, 1·7% (1·4–2·1)	<0·0001
Aortic stenosis (n=547)	51, 0·1% (0·08–0·1)	35, 0·2% (0·2–0·3)	57, 0·6% (0·4–0·7)	96, 1·4% (1·2–1·8)	308, 4·6% (4·1–5·2)	<0·0001

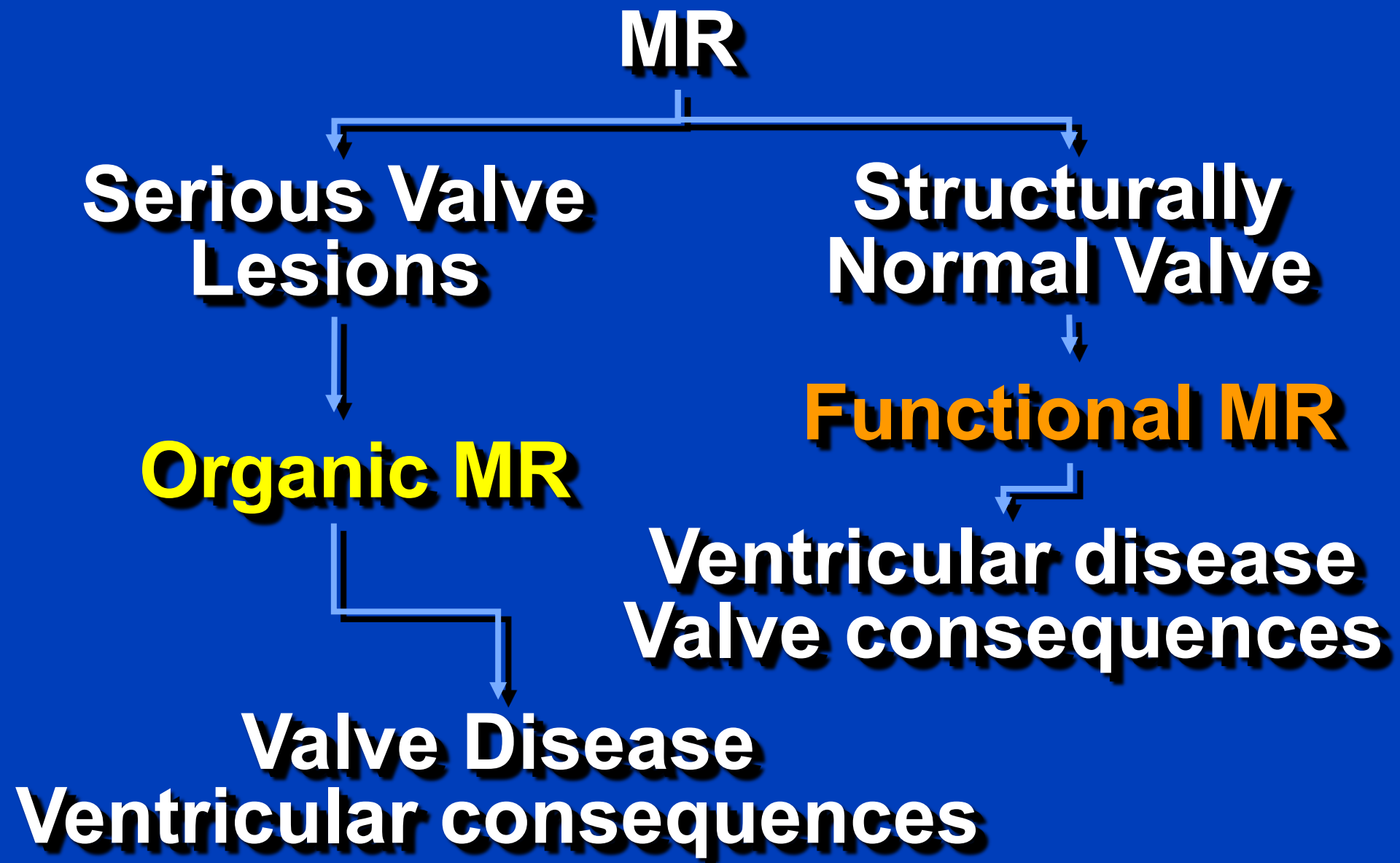
MR in the Adult Population

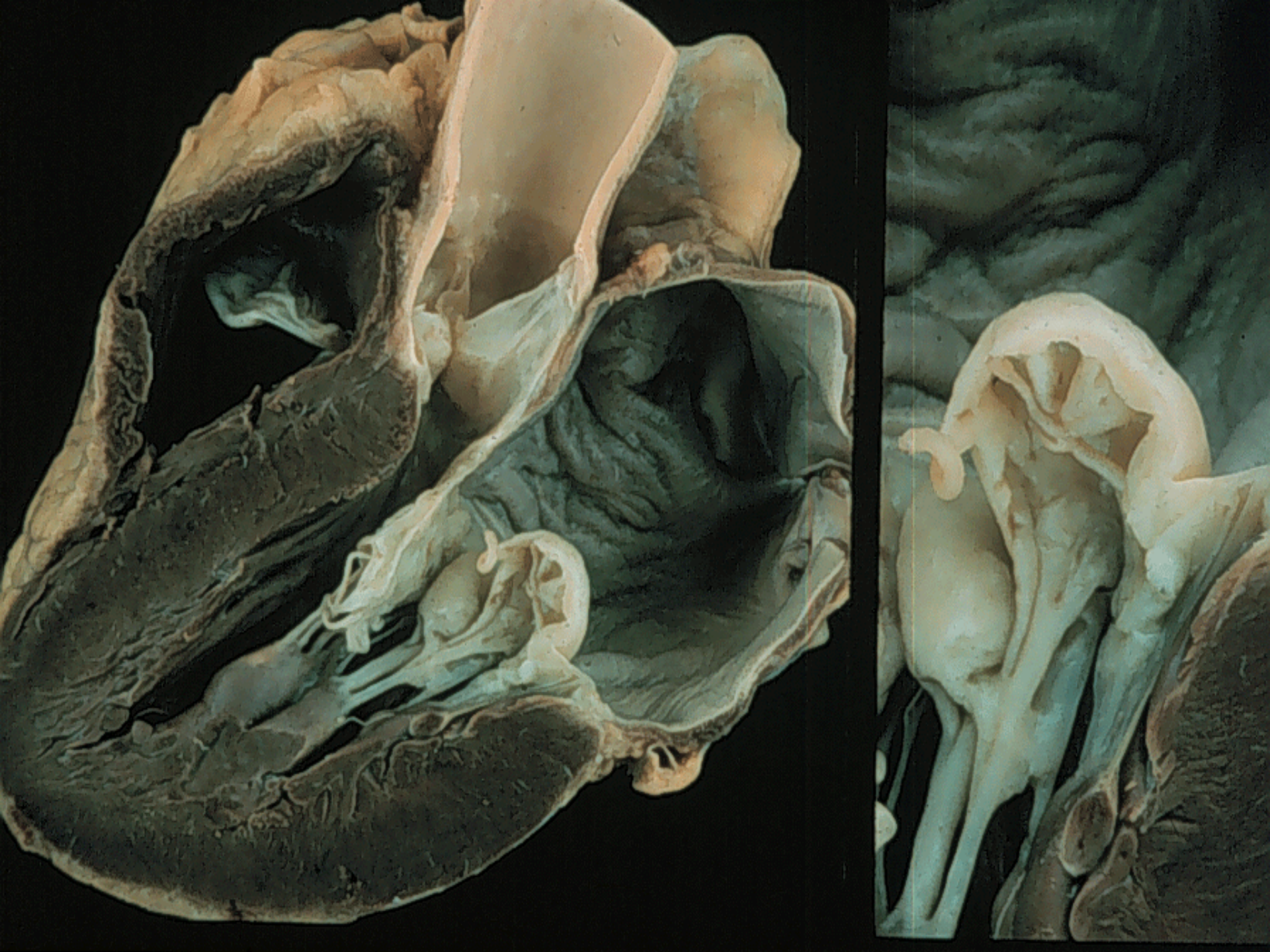


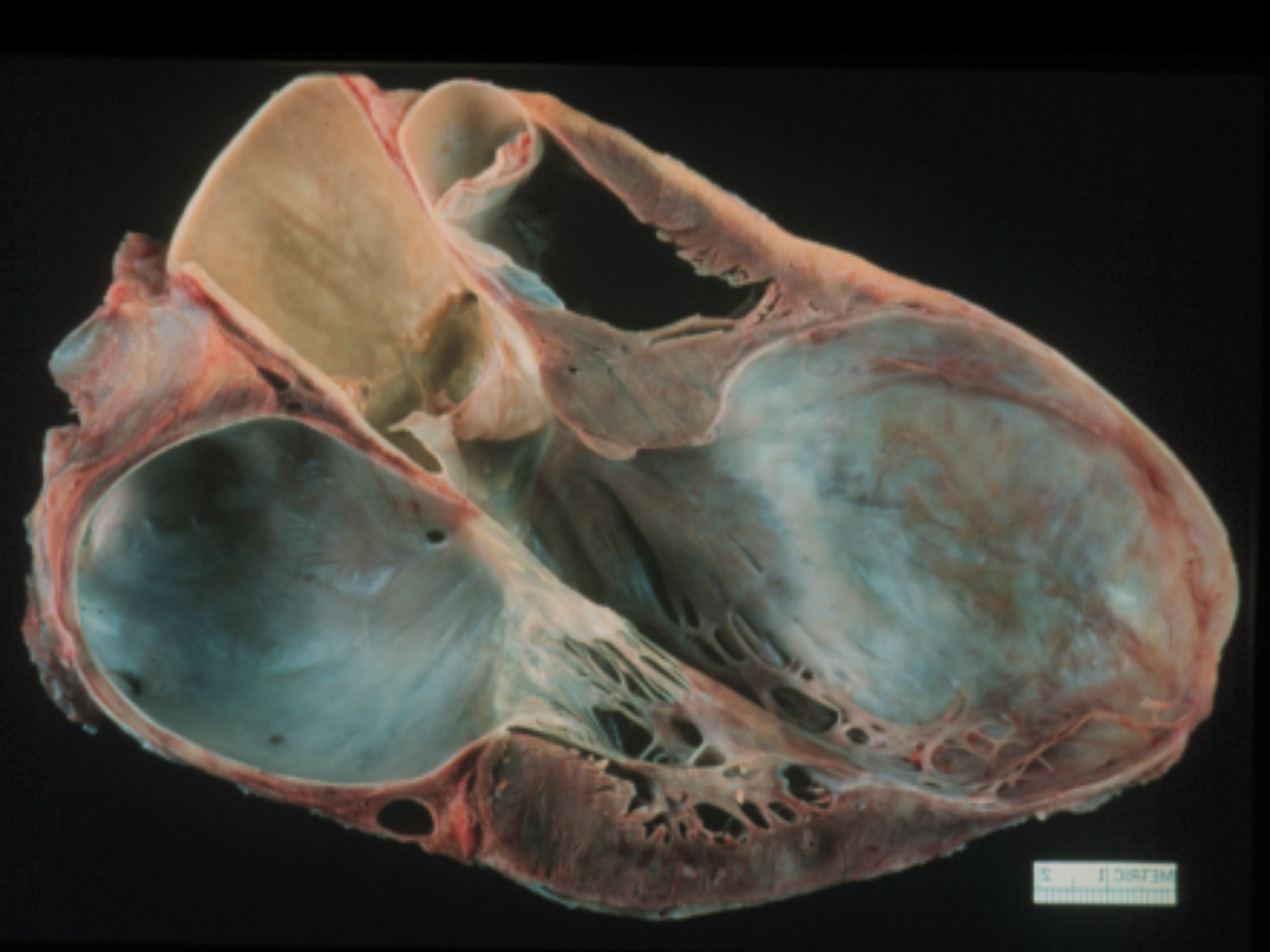
What is the first task in patients with MR ?

Recognize the difference Functional/ OrganicMR

Mitral Regurgitation

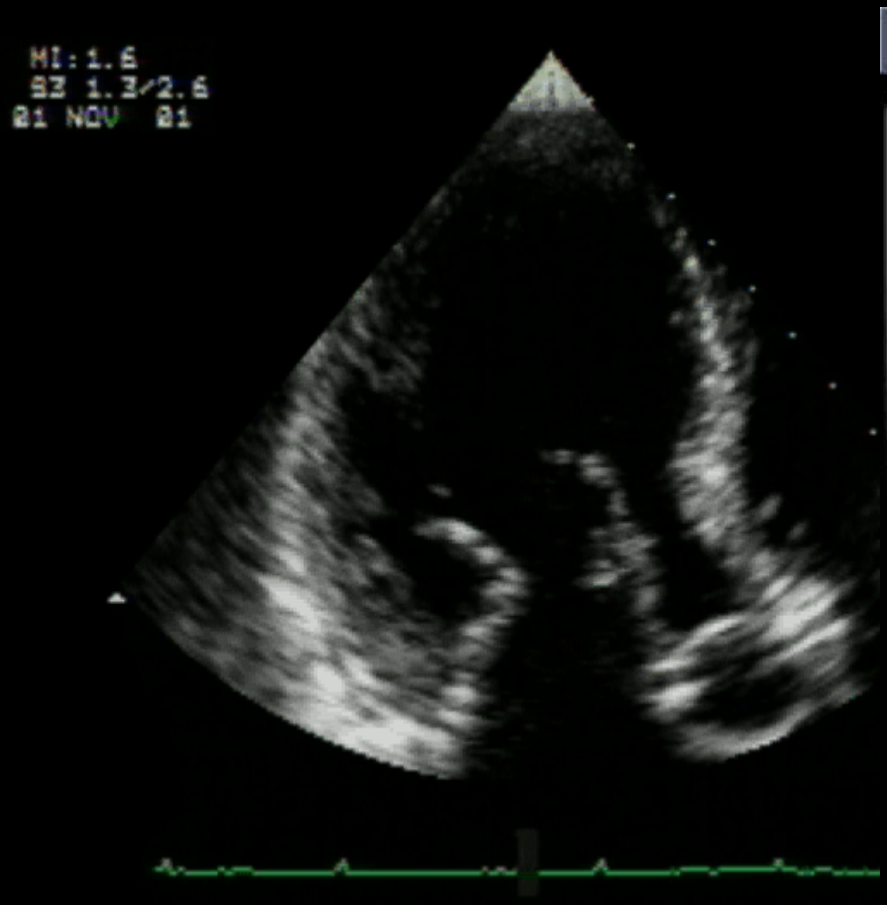


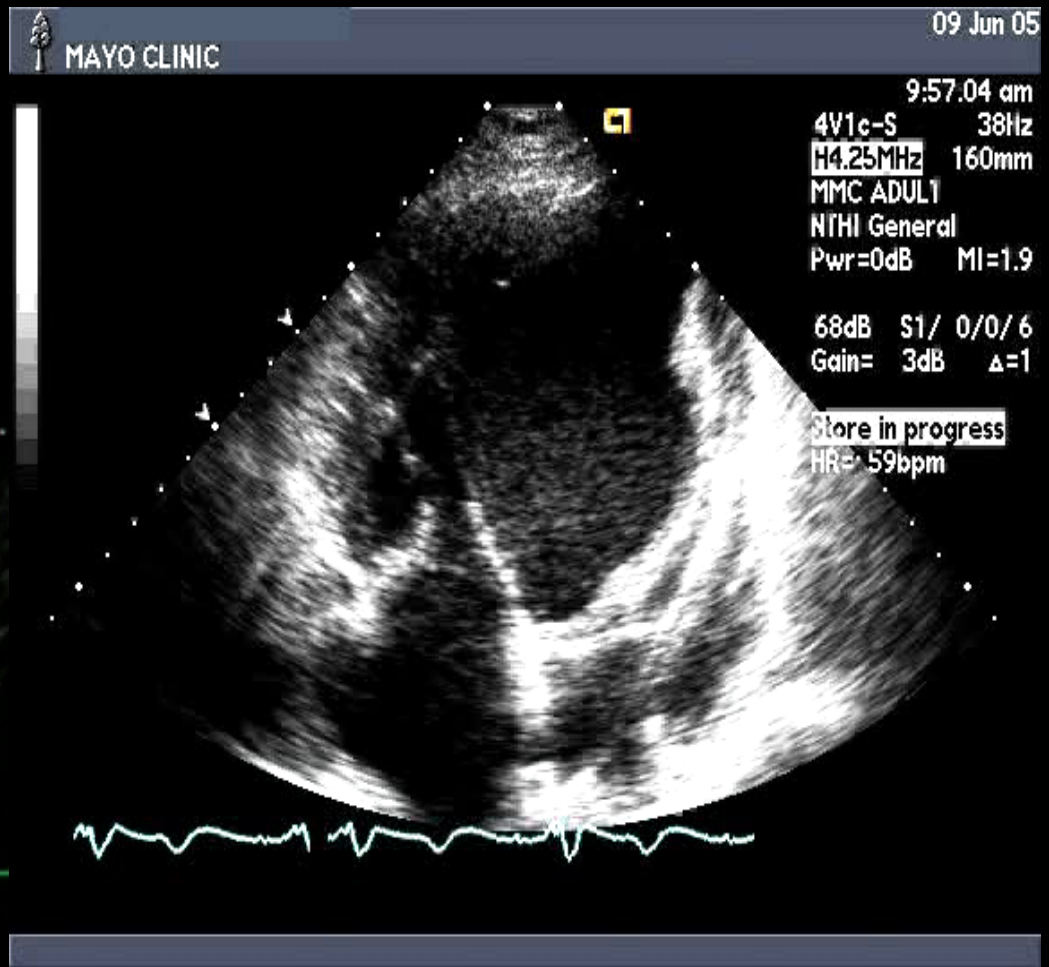


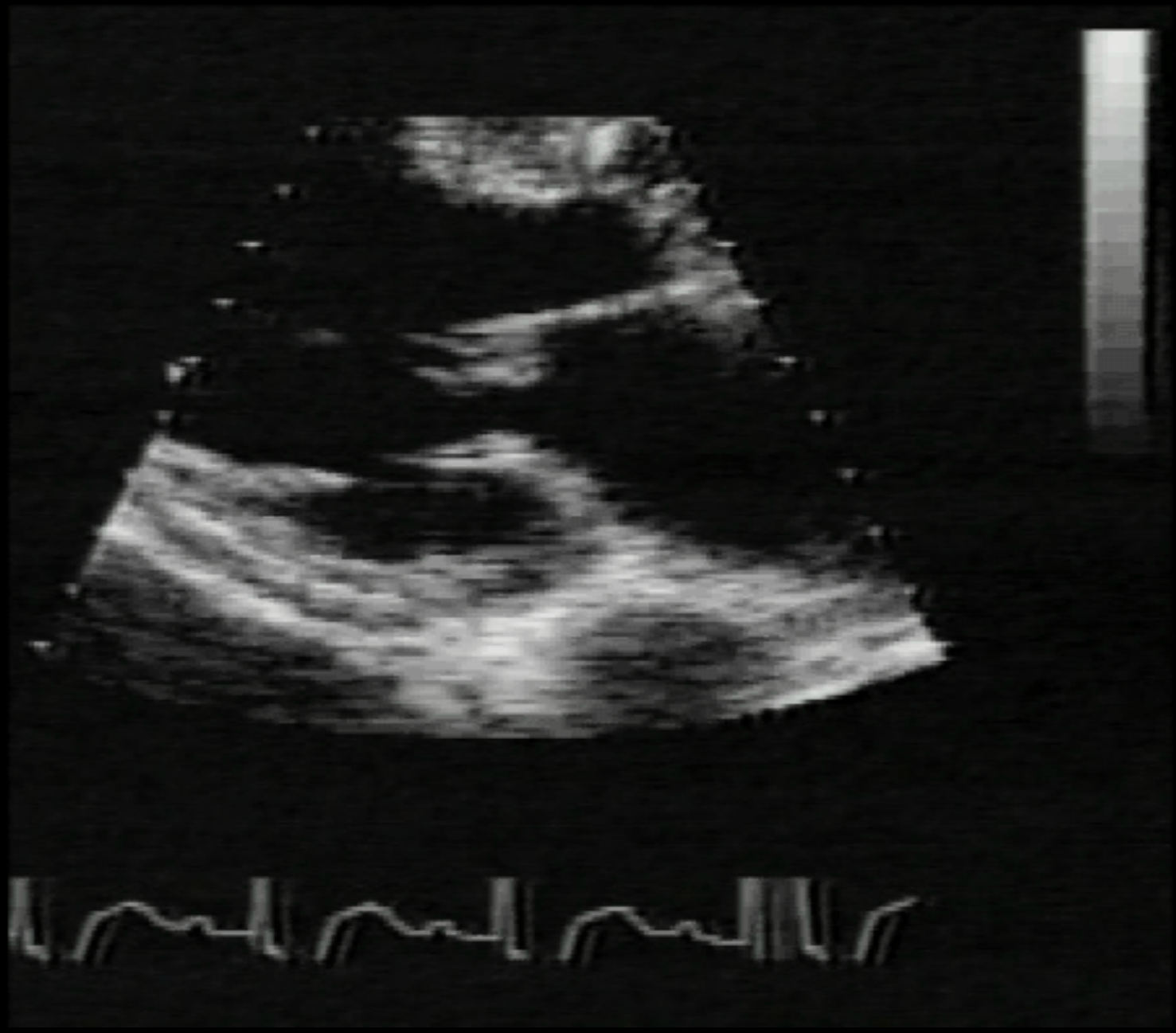


MR Assessment

which disease?







Mitral Regurgitation

Patients with enlarged LV (≥60 mm)

	Organic MR	Ischemic MR
RVol, mL	104±41	26±16
RF, %	58±12	29±14
ERO, mm2	71±32	19±13
EF, %	65±9	29±8

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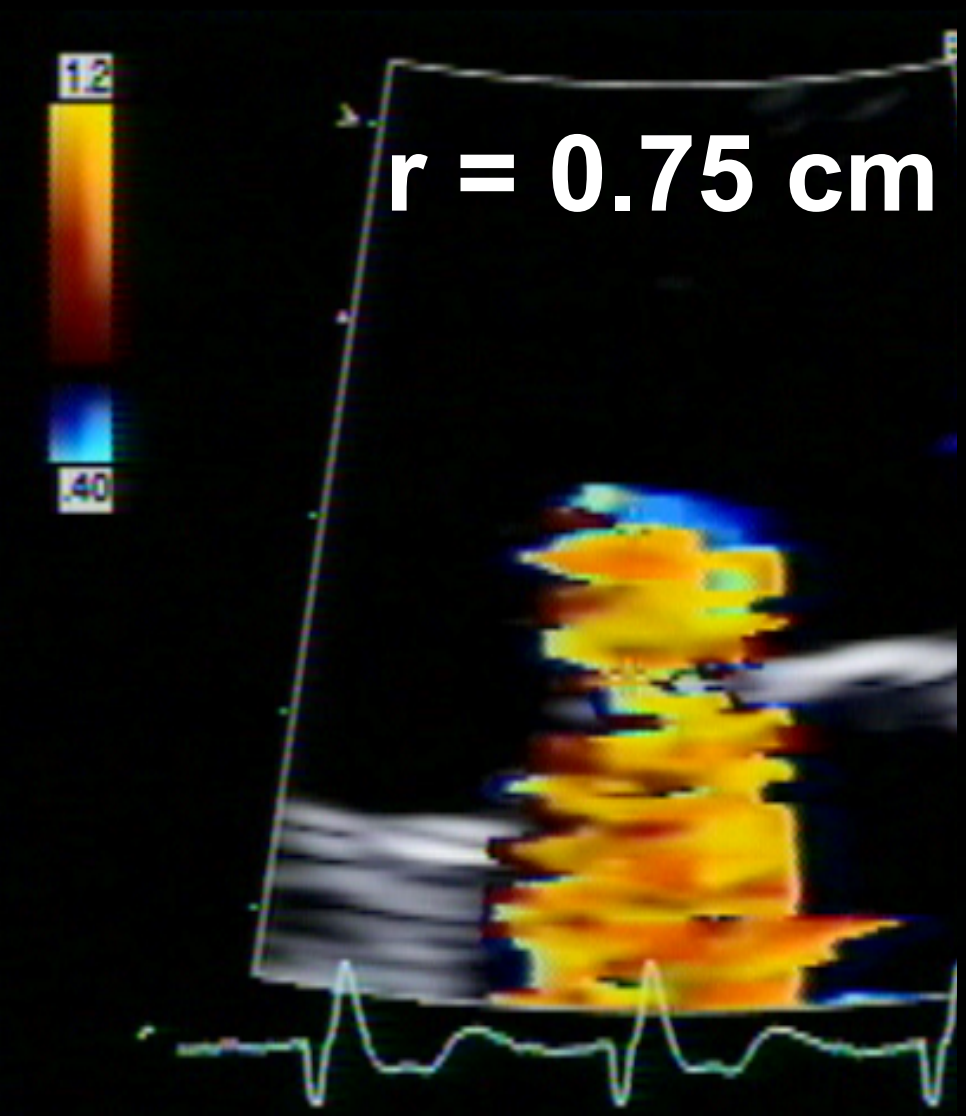
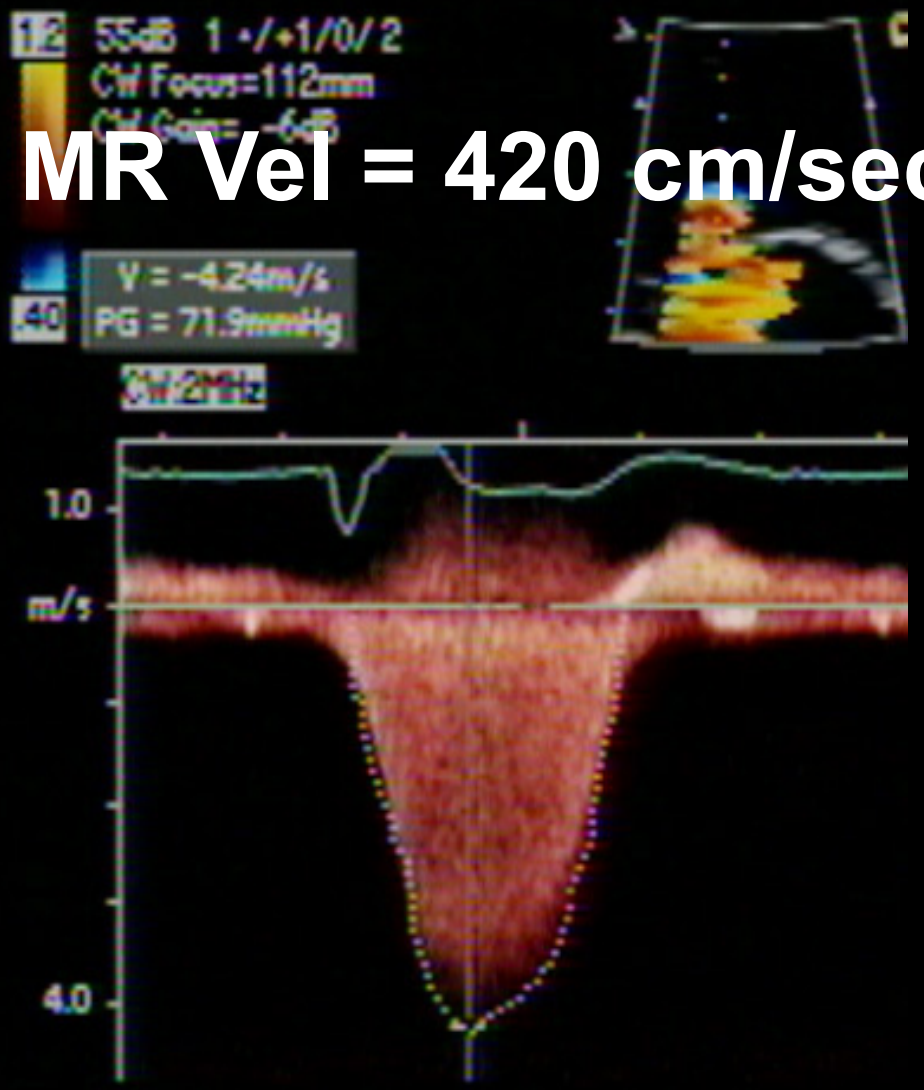
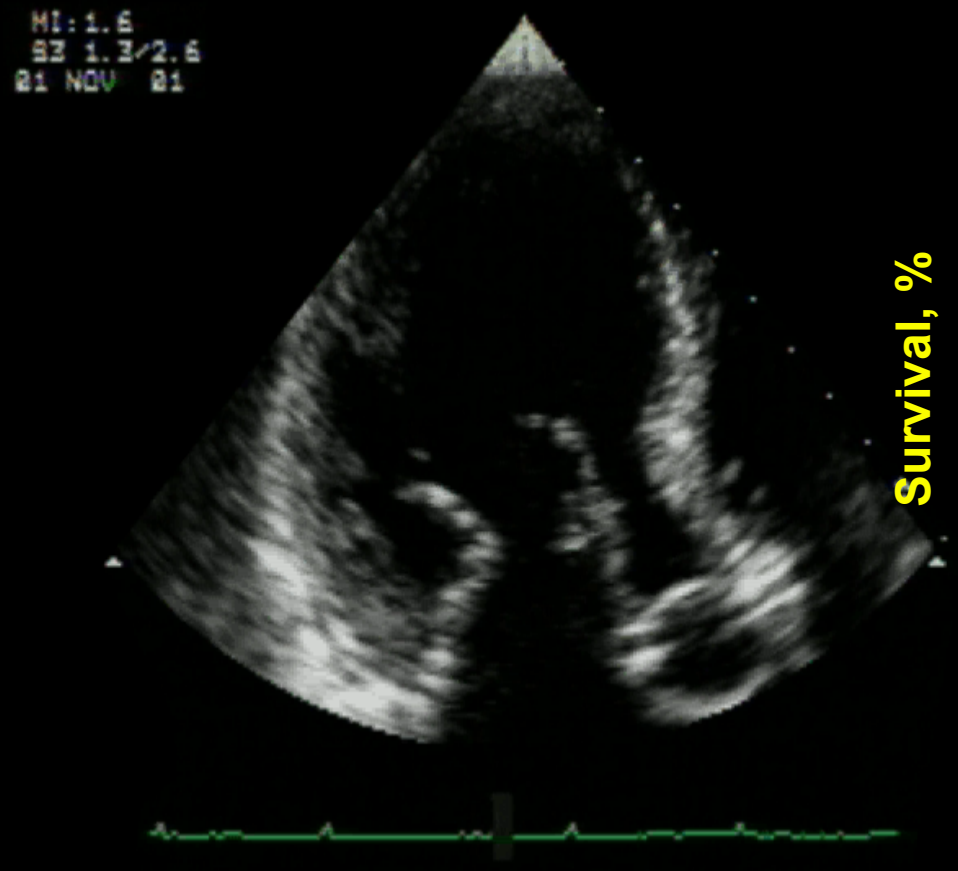
Functional MR-Quantitation

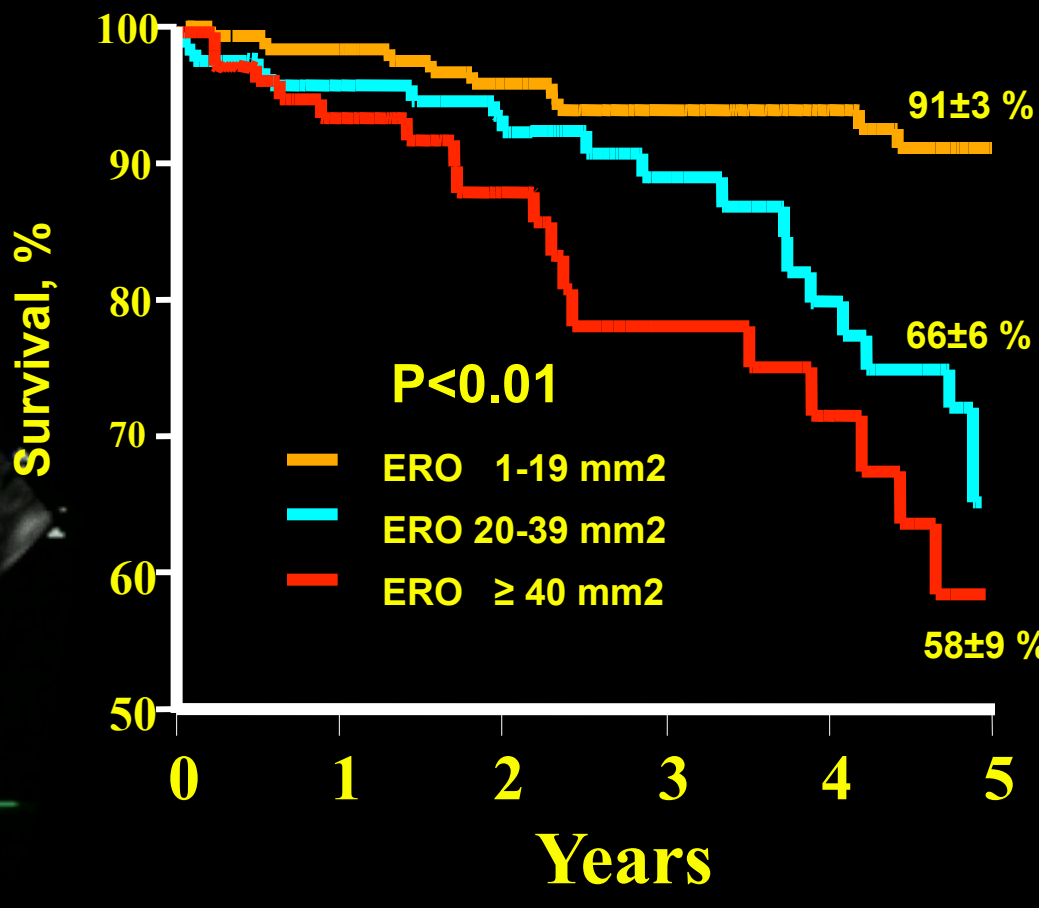
ERO = 0.34 cm2 RVol = 46 mL



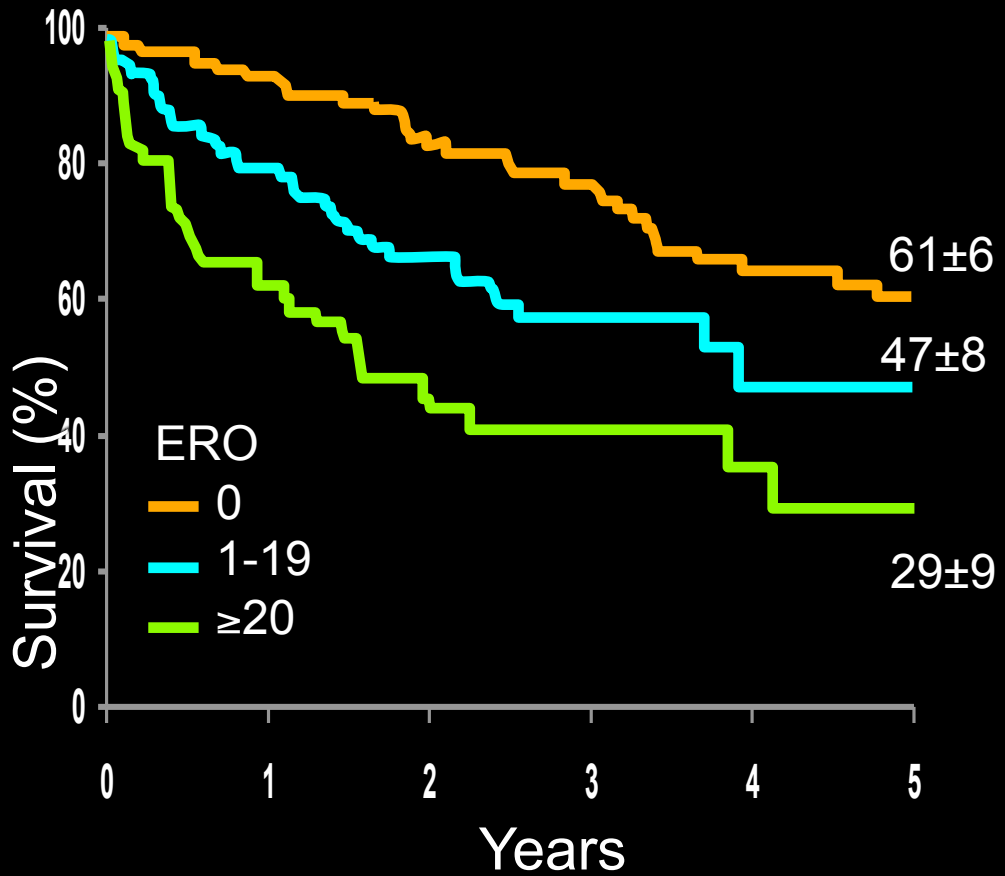


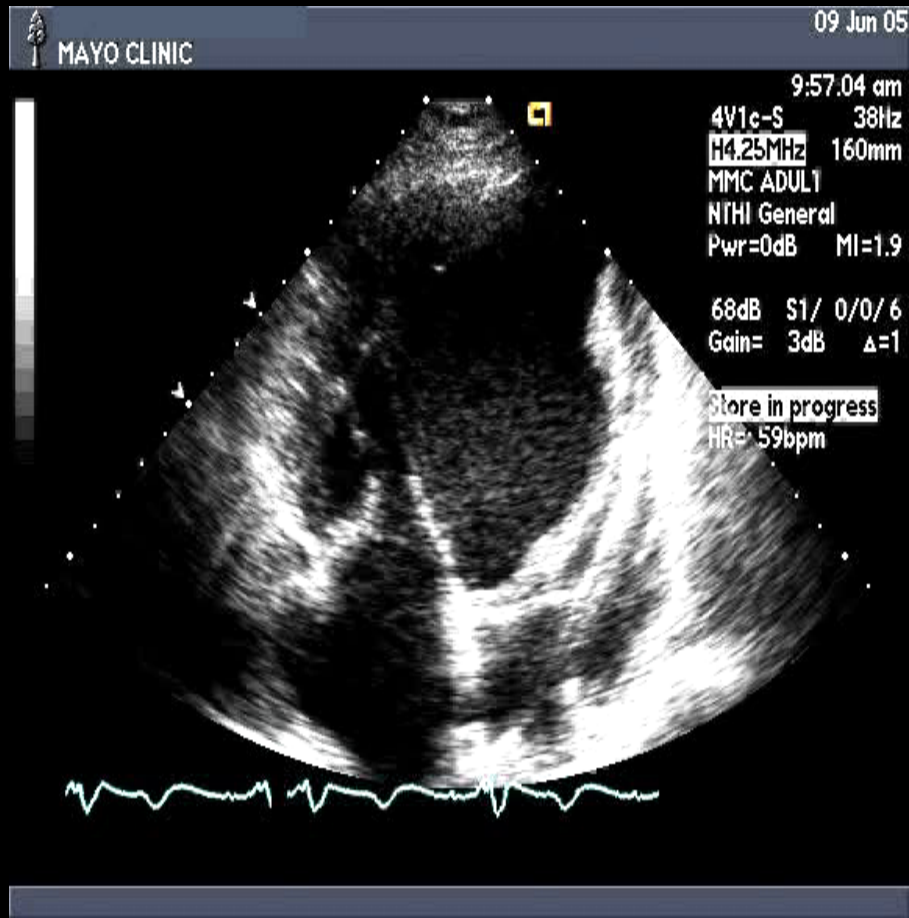
MR Assessment
which disease?





MR Assessment
which disease?





FMR Management

FMR is a low-volume, poor outcome MR, which has its own grading scale

What to do ?

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Mitral-Valve Repair versus Replacement

Table 2. Clinical End Points, Serious Adverse Events, and Hospitalizations at 30 Days and 1 Year.

	30 Days			1 Year		
	Repair Group (N=126)	Replacement Group (N=125)	P Value	Repair Group (N=126)	Replacement Group (N=125)	P Value
	no. of patients (%)			*no. of patients (%)*		
Clinical end point						
Death	2 (1.6)	5 (4.0)	0.26	18 (14.3)	22 (17.6)	0.47
Stroke	3 (2.4)	4 (3.2)	0.72	6 (4.8)	5 (4.0)	0.77
Worsening in NYHA class of 1	10 (7.9)	10 (8.0)	0.99	6 (4.8)	6 (4.8)	0.99
Rehospitalization for heart failure	3 (2.4)	7 (5.6)	0.22	17 (13.5)	14 (11.2)	0.58
Mitral-valve reoperation	1 (0.8)	0	1.0	3 (2.4)	0	0.25
Composite major adverse event*	19 (15.1)	24 (19.2)	0.39	41 (32.5)	42 (33.6)	0.86
	no. of events (rate/100 patient-yr)			*no. of events (rate/100 patient-yr)*		

Coronary Artery Bypass Surgery With or Without Mitral Valve Annuloplasty in Moderate Functional Ischemic Mitral Regurgitation

Final Results of the Randomized Ischemic Mitral Evaluation (RIME) Trial

K.M. John Chan, FRCS CTh; Prakash P. Punjabi, FRCS CTh; Marcus Flather, MD, FRCP; Riccardo Wage, DCR (R); Karen Symmonds, DCR (R); Isabelle Roussin, MD; Shelley Rahman-Haley, MD, FRCP; Dudley J. Pennell, MD, FRCP; Philip J. Kilner, MD, PhD; Gilles D. Dreyfus, MD; John R. Pepper, MChir, FRCS; for the RIME Investigators

Patients with CAD referred to CABG with moderate MR with EF >30%, NYHA I-III

Randomized 1/1 to CABG alone or CABG + Mitral repair

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Variable	CABG (n=39)	CABG+MVR (n=34)
Age, y	70.4±7.9	70.9±10.5
Female sex, n (%)	10 (26)	9 (26)
Body mass index	27.4±5.0	25.3±6.4
Medical history, n (%)		
Atrial fibrillation	4 (10)	2 (6)
Previous myocardial infarction	28 (72)	25 (74)
Previous stroke	1 (3)	2 (6)
Peripheral vascular disease	5 (13)	4 (12)
Hypertension	23 (59)	17 (50)
Diabetic on treatment	15 (38)	12 (35)
Chronic pulmonary disease	1 (3)	2 (6)
NYHA class, n (%)		
I	1 (3)	1 (3)
II	25 (64)	22 (65)
III	13 (33)	11 (32)
Mitral regurgitation*		
Effective regurgitant orifice area, cm^2	0.18±0.10	0.21±0.09
Regurgitant volume, mL/beat	30.3±13.8	35.5±13.3
Vena contracta width, cm	0.4±0.1	0.4±0.1
Tricuspid regurgitation,* n (%)		
None	18 (46)	12 (36)
Mild	18 (46)	18 (52)
Moderate	3 (8)	4 (12)
Left ventricle*		
LVESD, mm	43.3±9.5	45.7±7.4
LVEDD, mm	56.5±12.0	56.5±12.6
Ejection fraction, %	40.3±16.1	40.0±17.3

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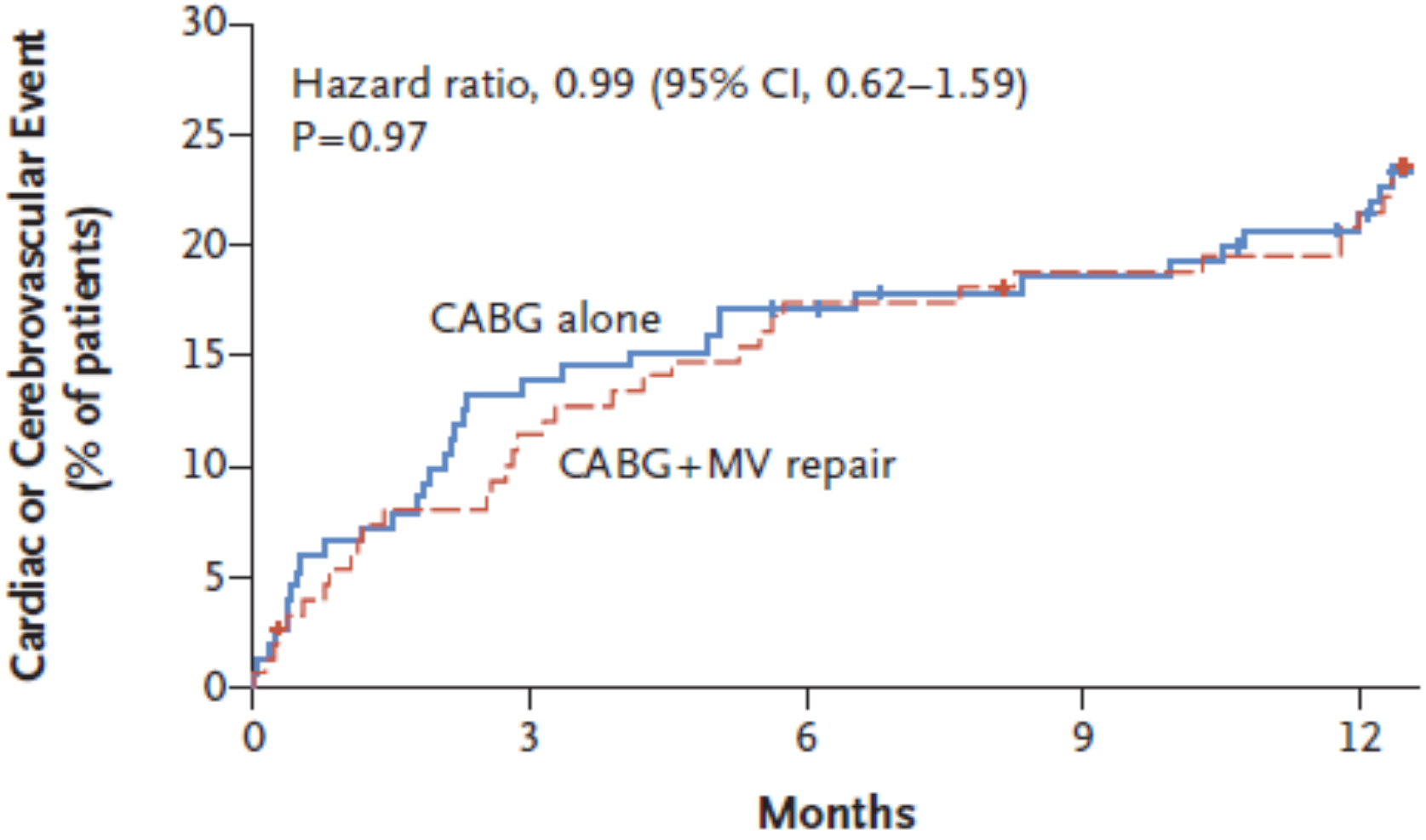
Results

Table 3. Study End Points at 1 Year

	CABG (n=32)			CABG+MVR (n=27)			
End Points	Baseline	1 Year	Δ	Baseline	1 Year	Δ	*P* Value*
Primary end point							
Peak VO_2, ml/kg/min	15.1±3.3	15.9±2.5	0.8±2.9	14.8±3.2	18.1±2.9	3.3±2.3	<0.001
Secondary end points							
LV ESVI, ml/m^2†	71.8±16.1	67.4±20.4	−4.4±17.4	78.4±26.5	56.2±14.9	−22.2±25.6	0.002
MR volume, ml/beat†	31.9±14.8	22.7±14.6	−9.2±19.1	35.4±24.0	7.2±3.5	−28.2±24.6	0.001
BNP (pg/ml)	681.4±197.3	286.7±132.0	−394.7±213.6	748.1±158.3	190.7±117.8	−557.4±182.9	0.003

ORIGINAL ARTICLE



The COAPT trial

Truly FMR: EF:20-50%, Structurally Normal valve, Quantified FMR, Low-risk Intervention

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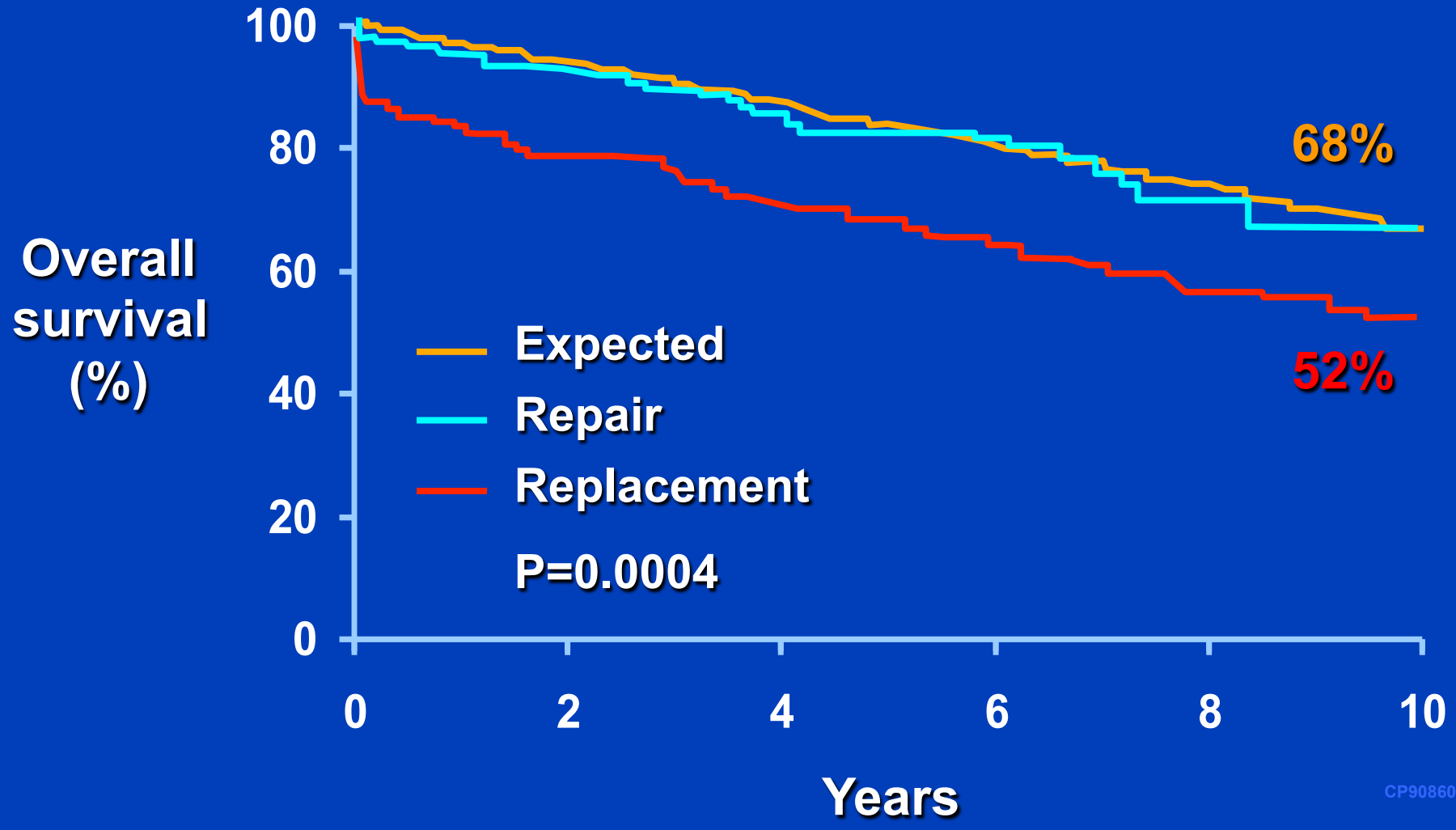
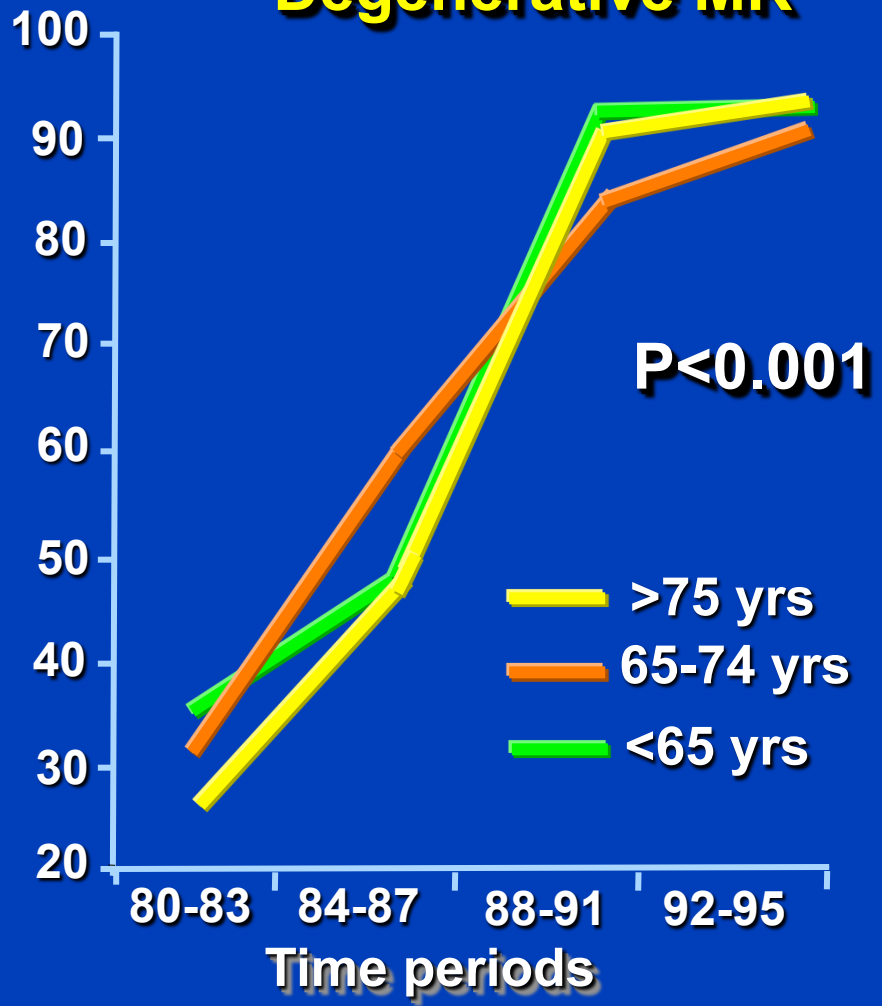
Organic MR

MR: Mitral Valve Repair

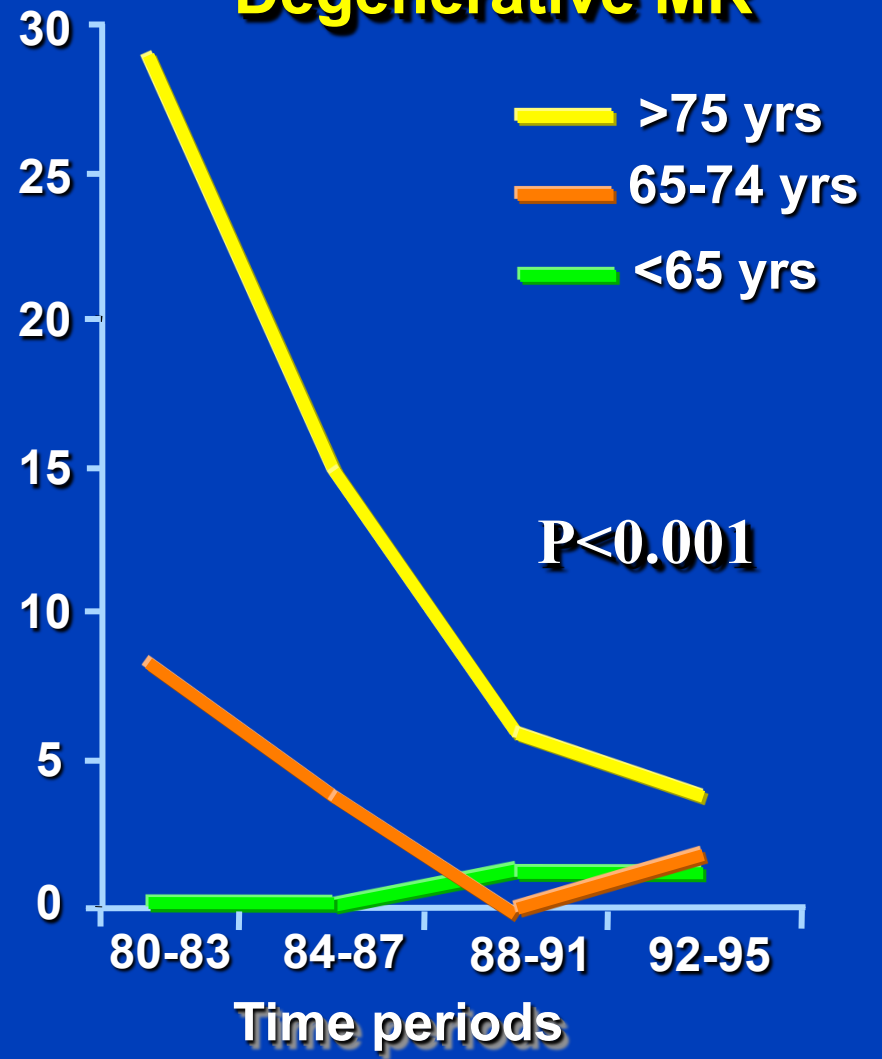


MR Surgery in the Elderly

Feasibility of Valve Repair



Operative Mortality

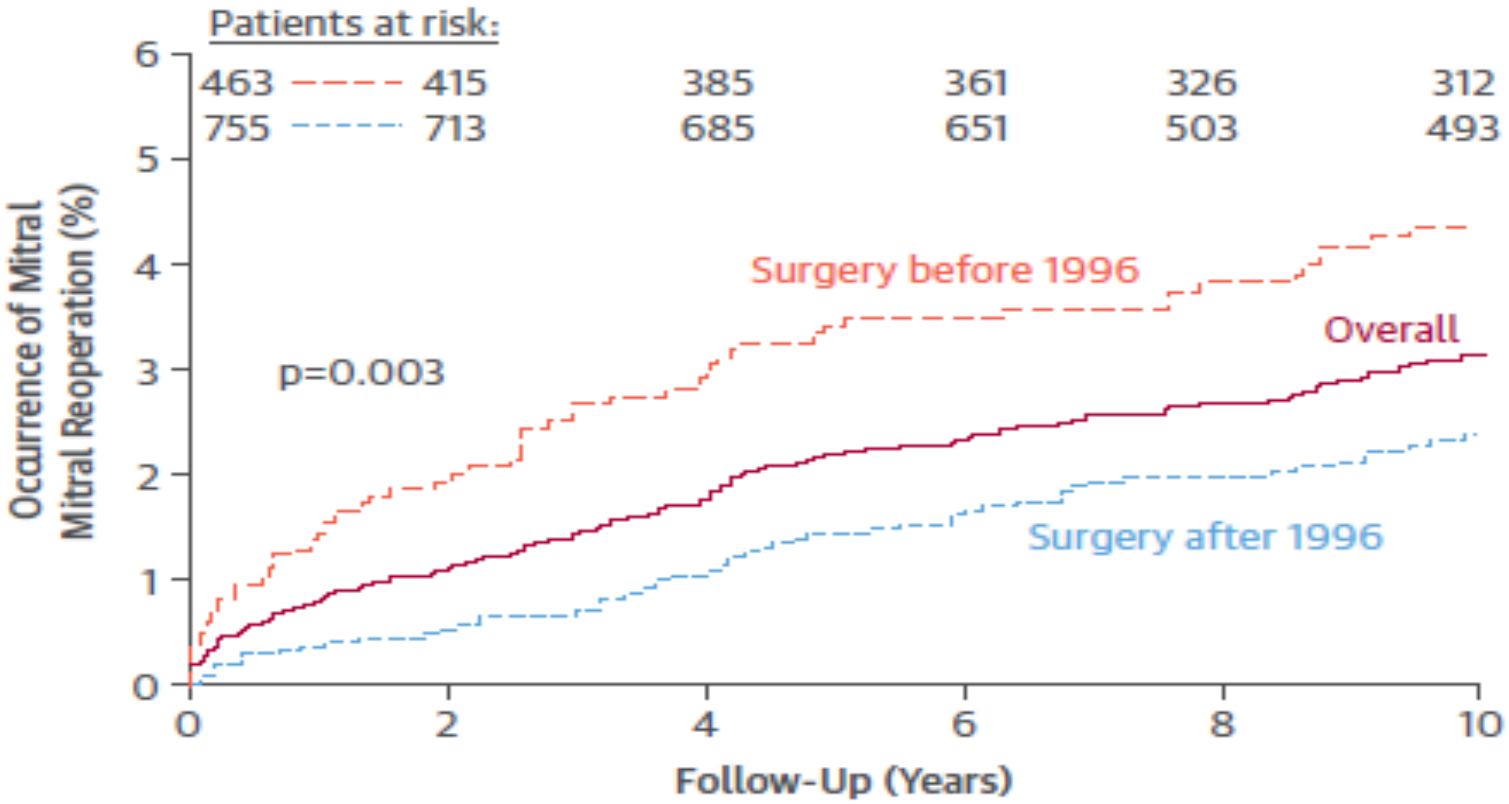


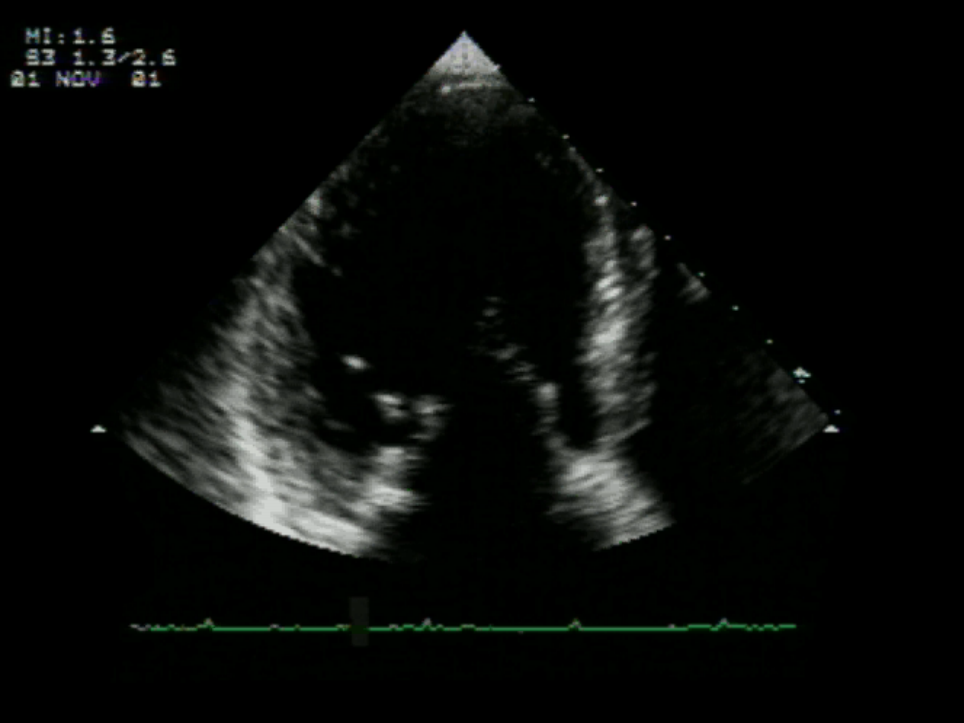
Effect of Recurrent Mitral Regurgitation Following Degenerative Mitral Valve Repair

Long-Term Analysis of Competing Outcomes

Rakesh M. Suri, MD, DPhil,[a] Marie-Annick Clavel, DVM, PhD,[b,c] Hartzell V. Schaff, MD,[a] Hector I. Michelena, MD,[b] Marianne Huebner, PhD,[d] Rick A. Nishimura, MD,[b] Maurice Enriquez-Sarano, MD[d]

FIGURE 4 Incidence of Mitral Valve Reoperation According to Study Period

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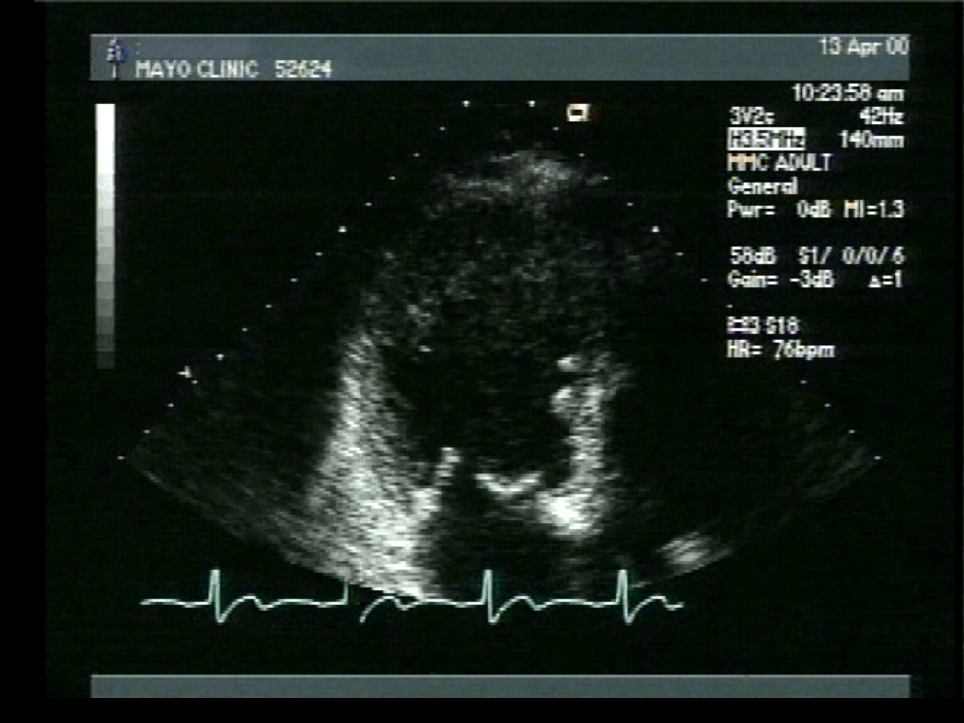
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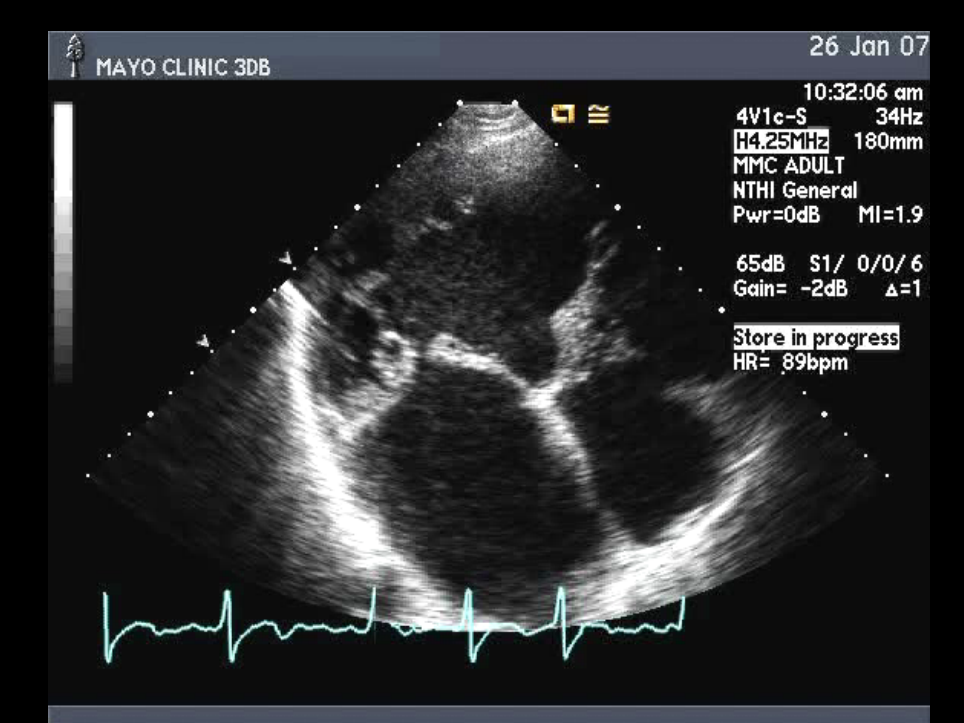
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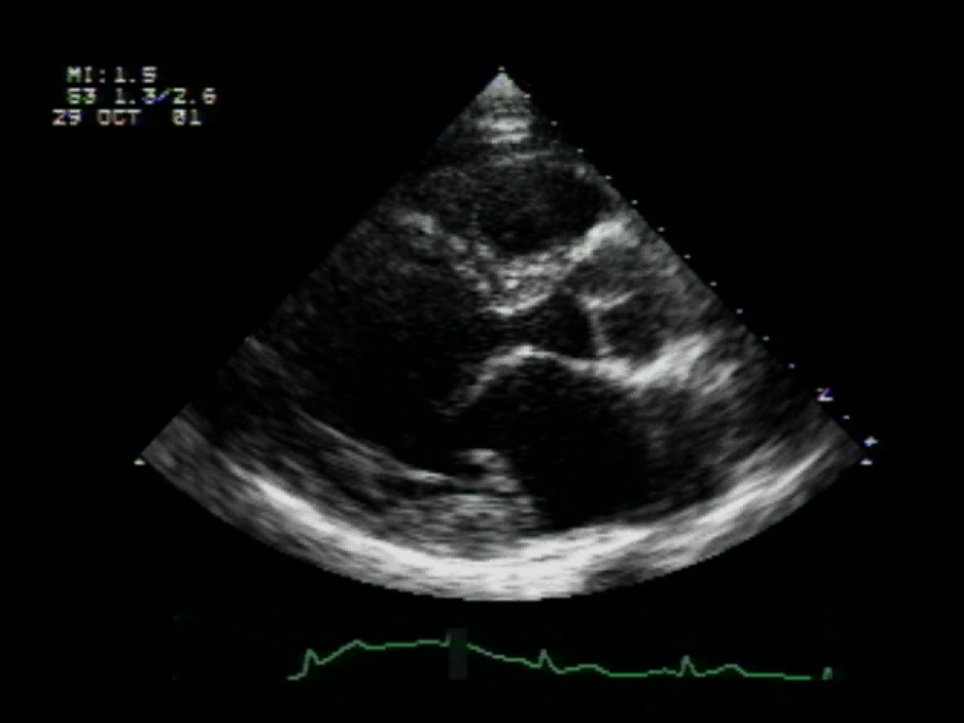
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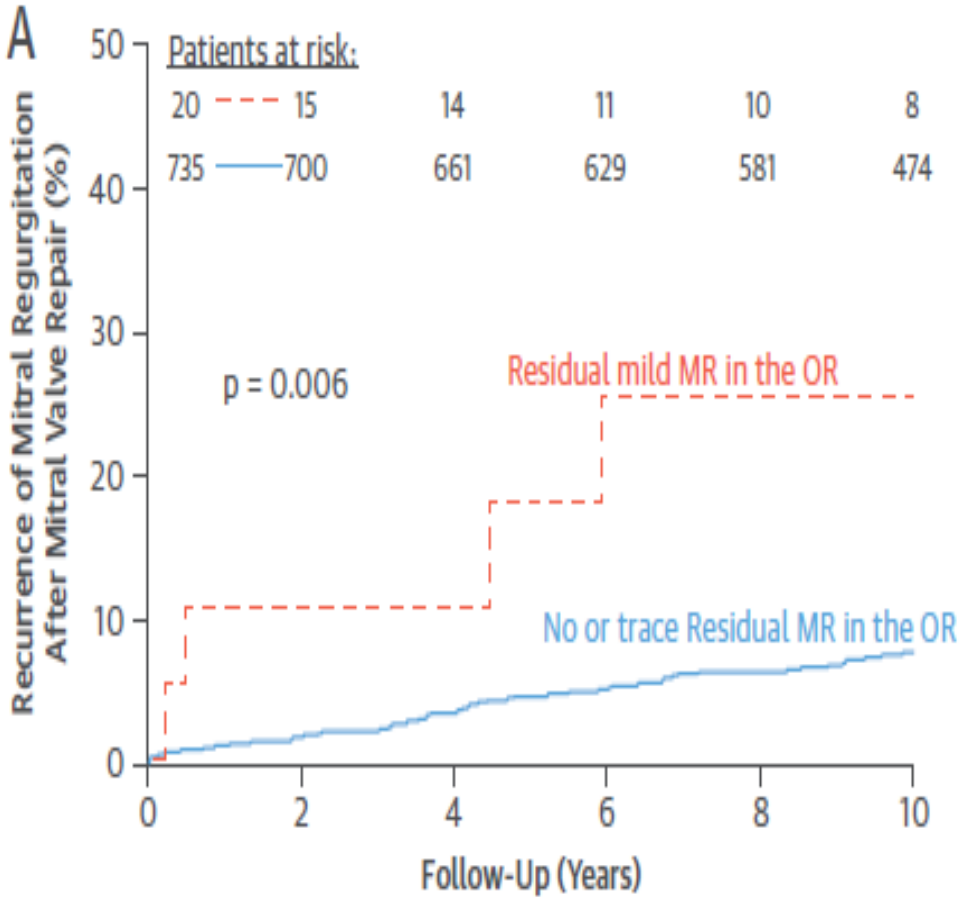

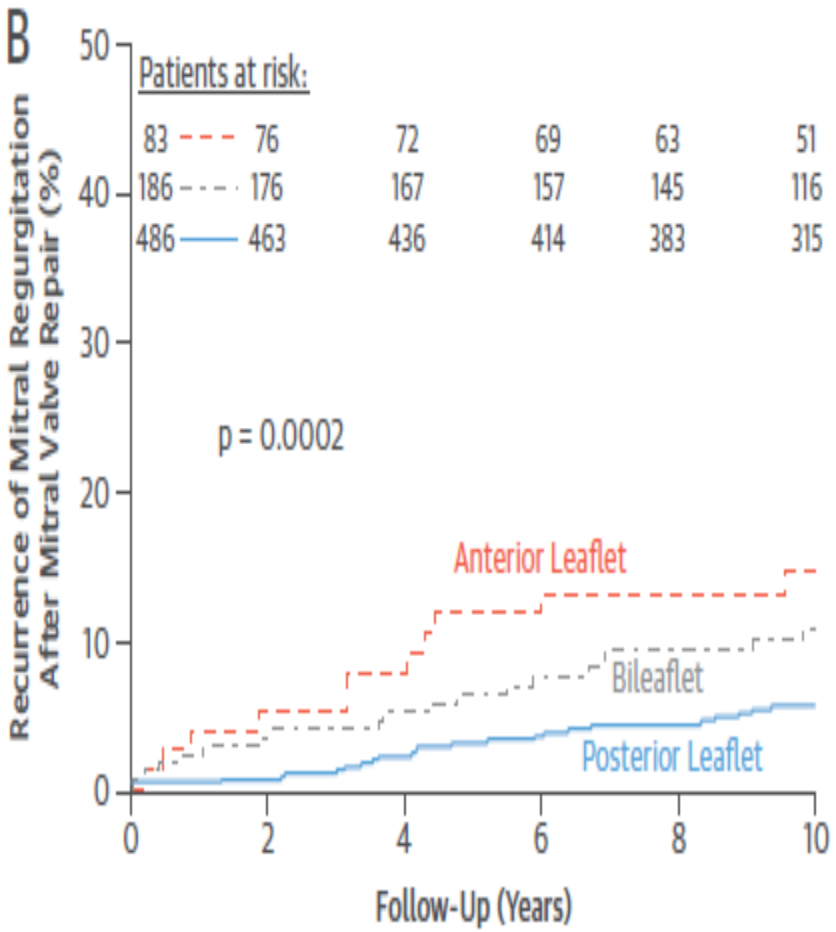

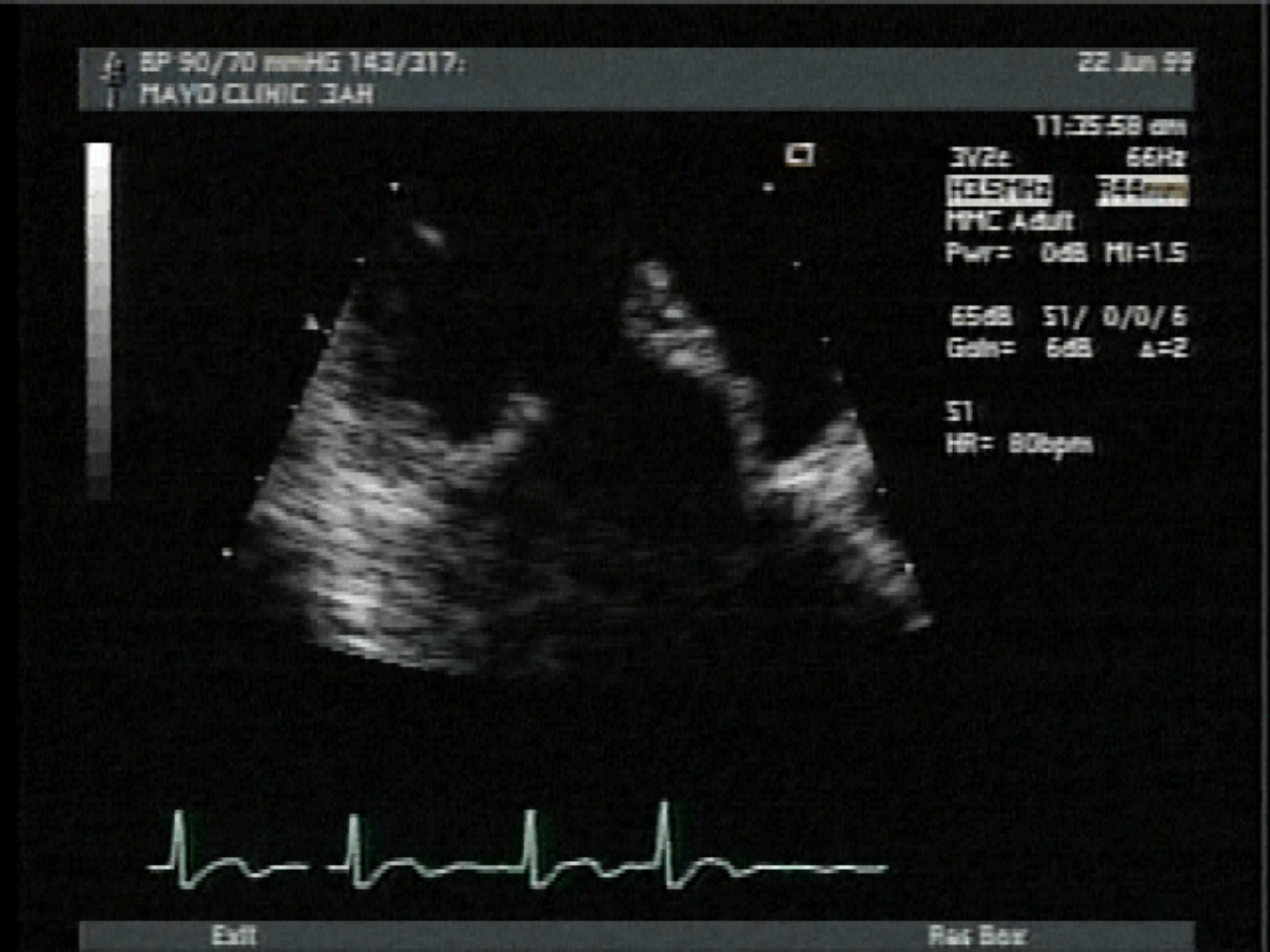
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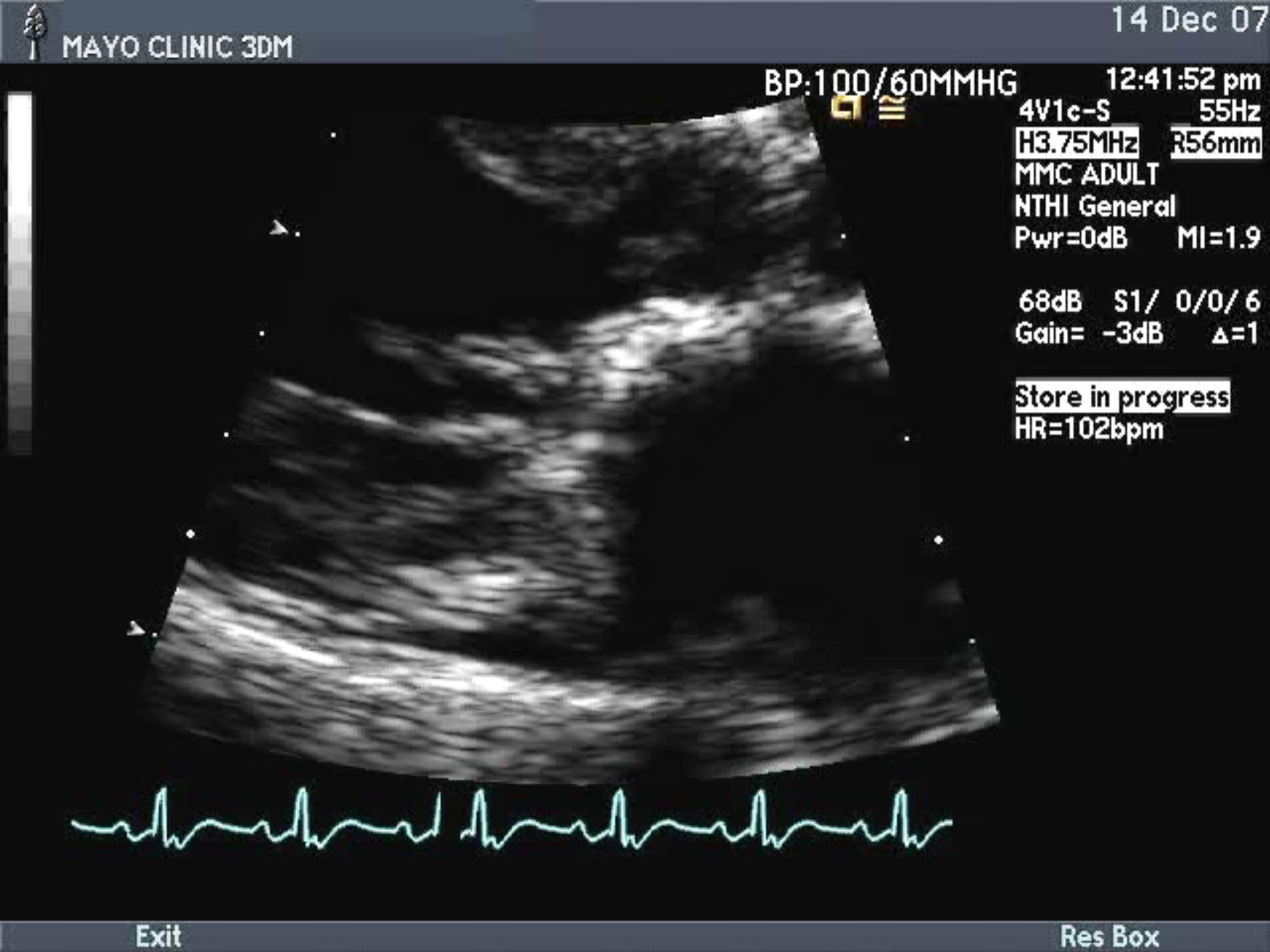
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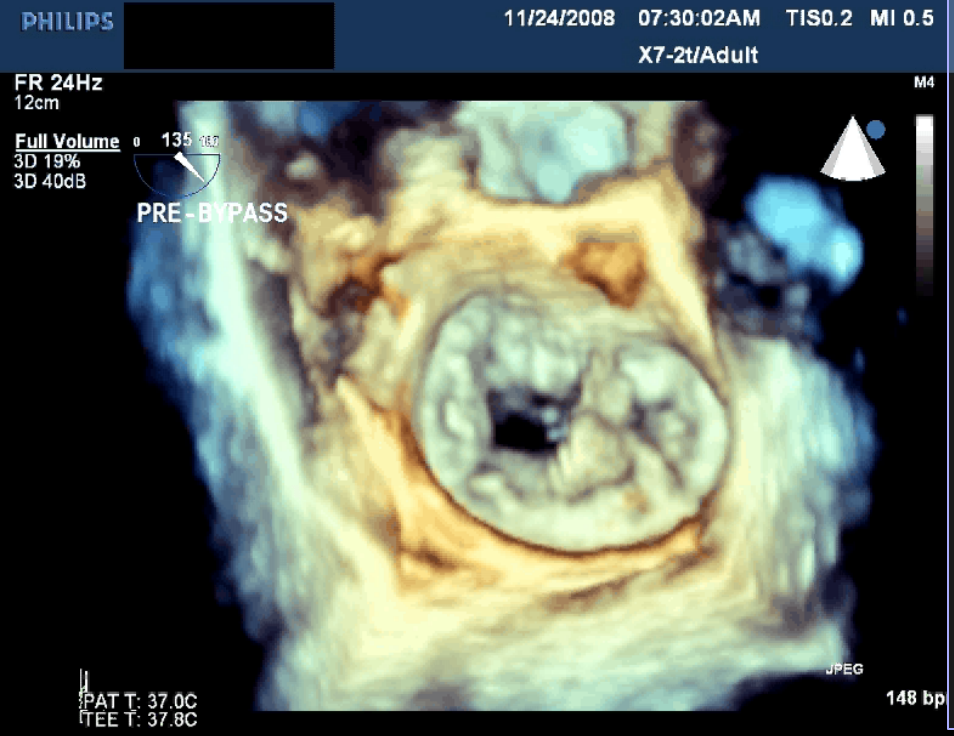
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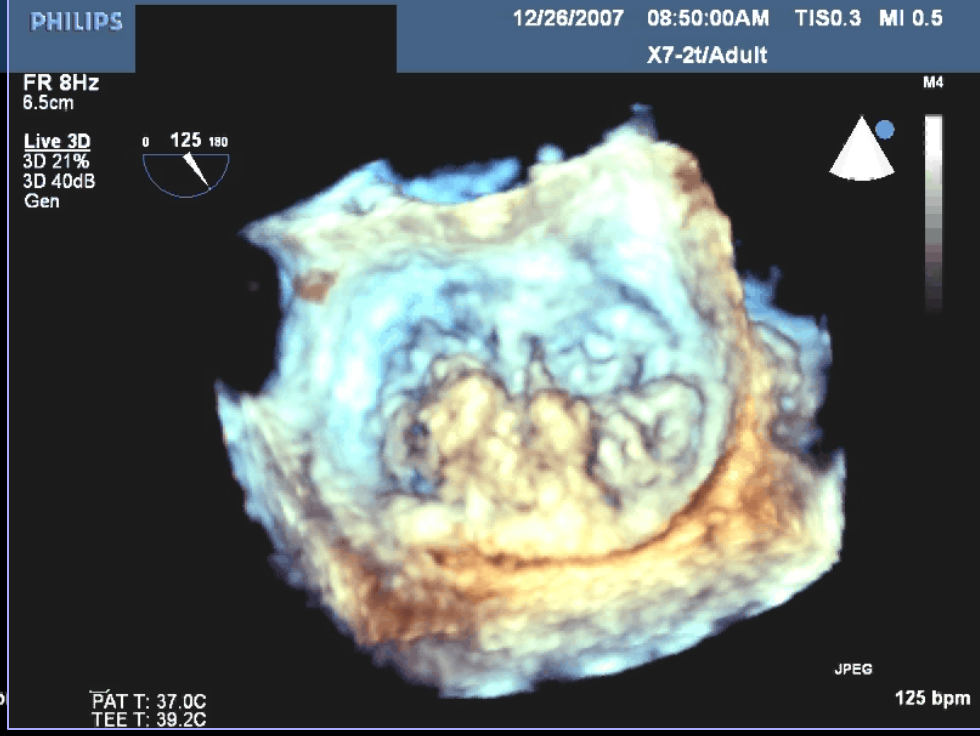
PRE-BYPASS
JPEG
148 bp
PAT T: 37.0C
TEE T: 37.8C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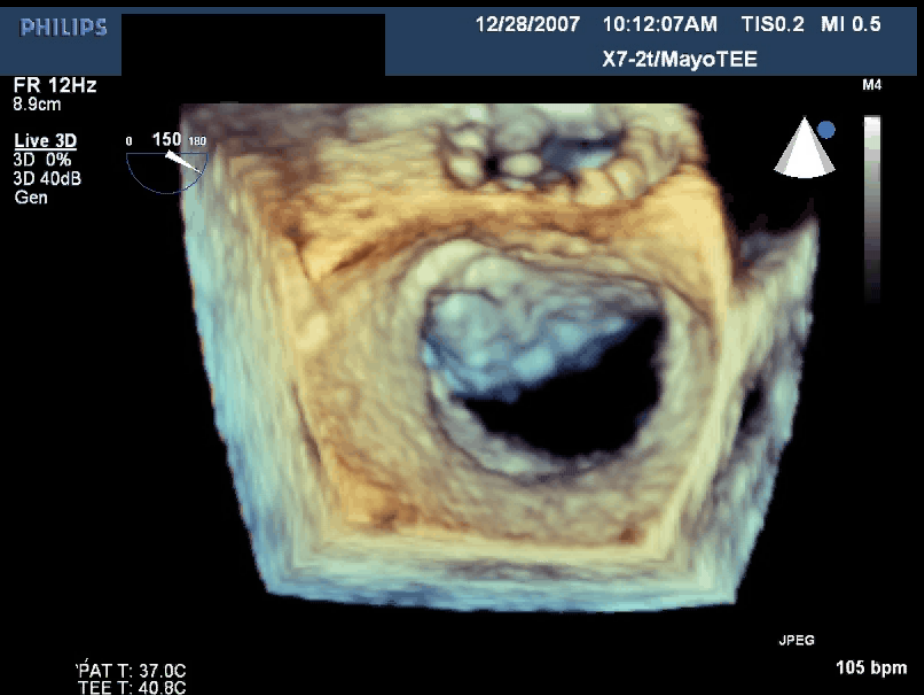
X7-2t/Adult
FR 8Hz
6.5cm
M4
Live 3D
3D 21%
3D 40dB
Gen
125
JPEG
125 bpm
PAT T: 37.0C
TEE T: 39.2C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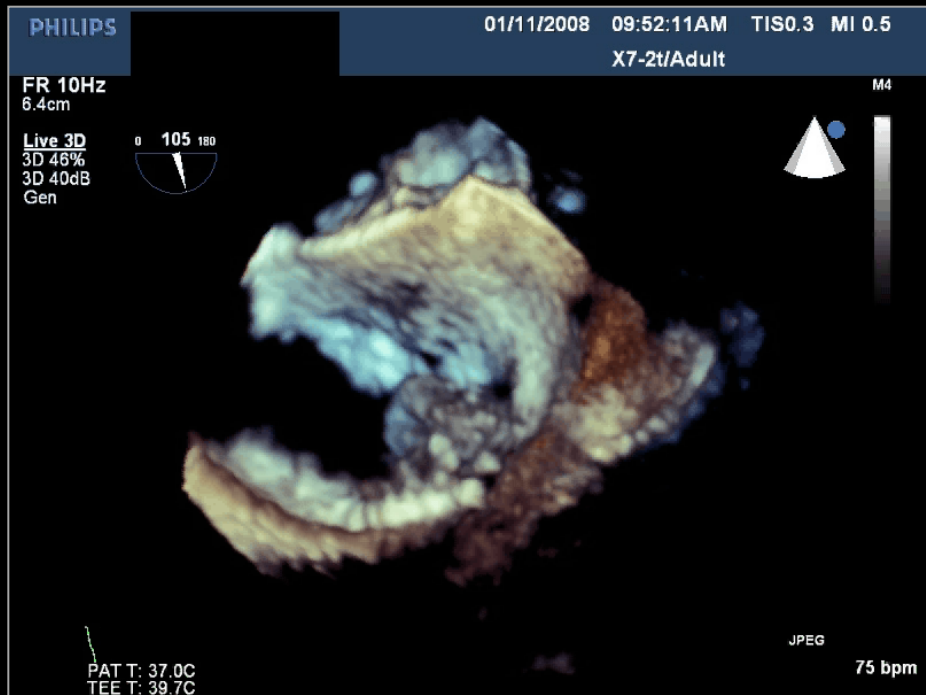
TEE T: 40.8C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01/11/2008 09:52:11AM TIS0.3 MI 0.5
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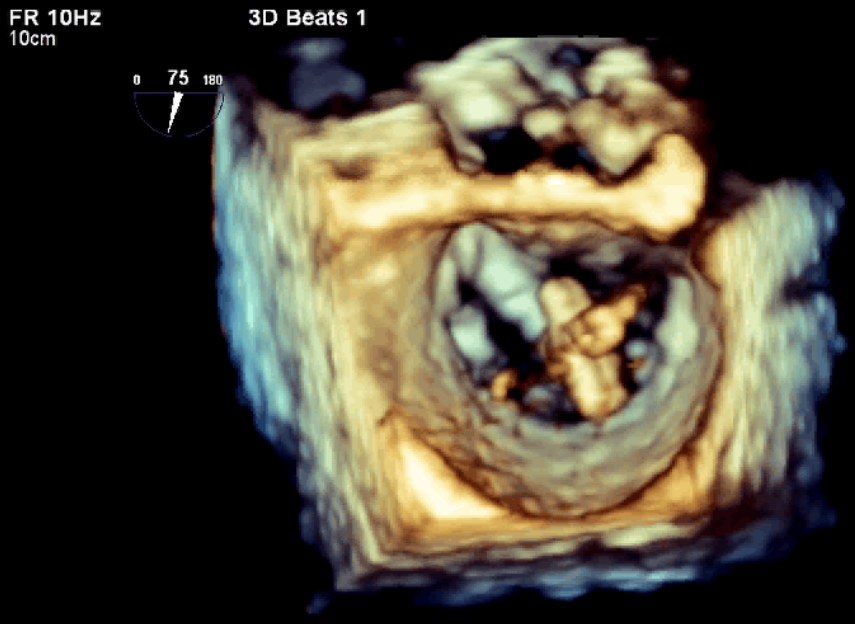
M4
Live 3D
3D 46%
3D 40dB
Gen
105
JPEG
75 bpm
PAT T: 37.0C
TEE T: 39.7C

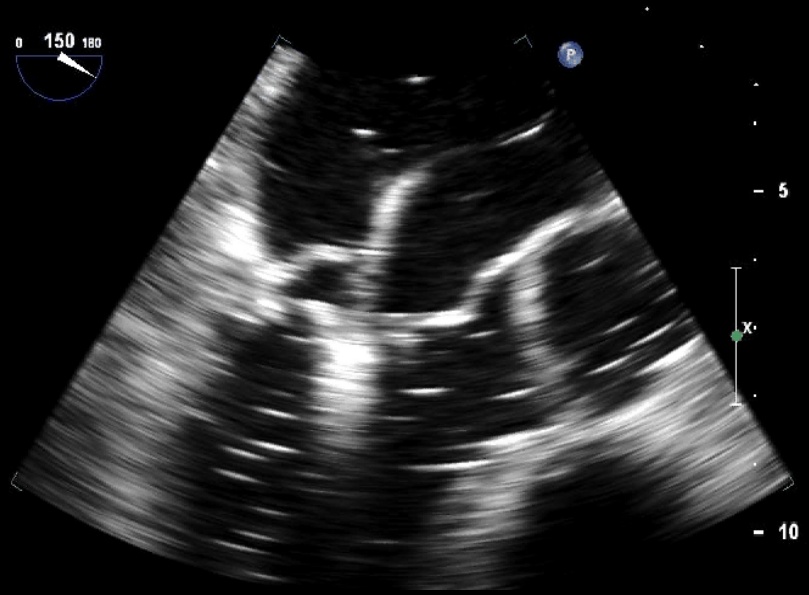
Mitral Regu n

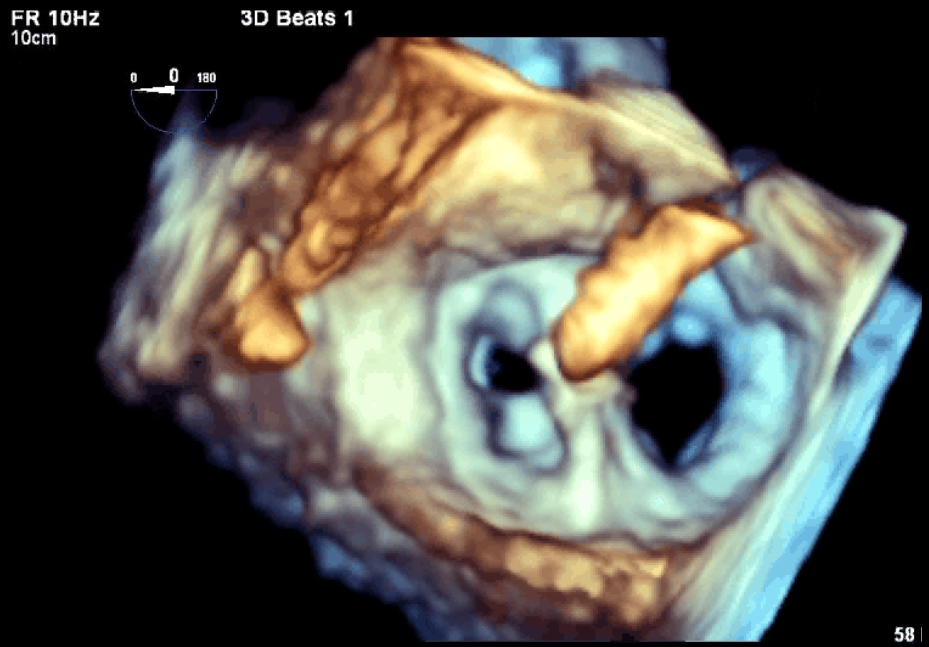
We know how to identify mitral lesions and valve reparability

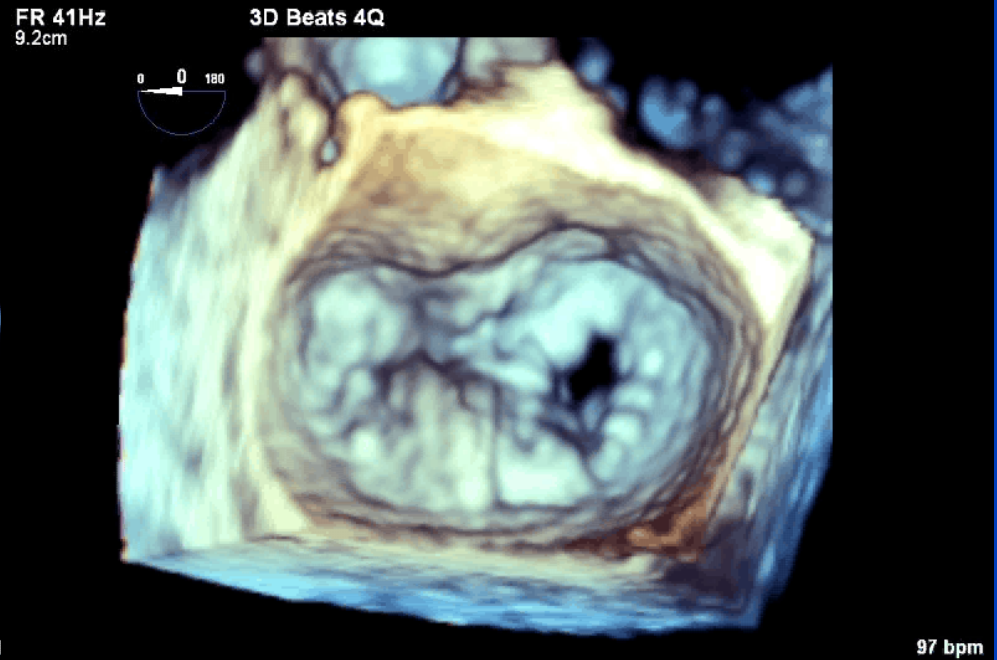
Am I too tough with 3D Echo ?

ities

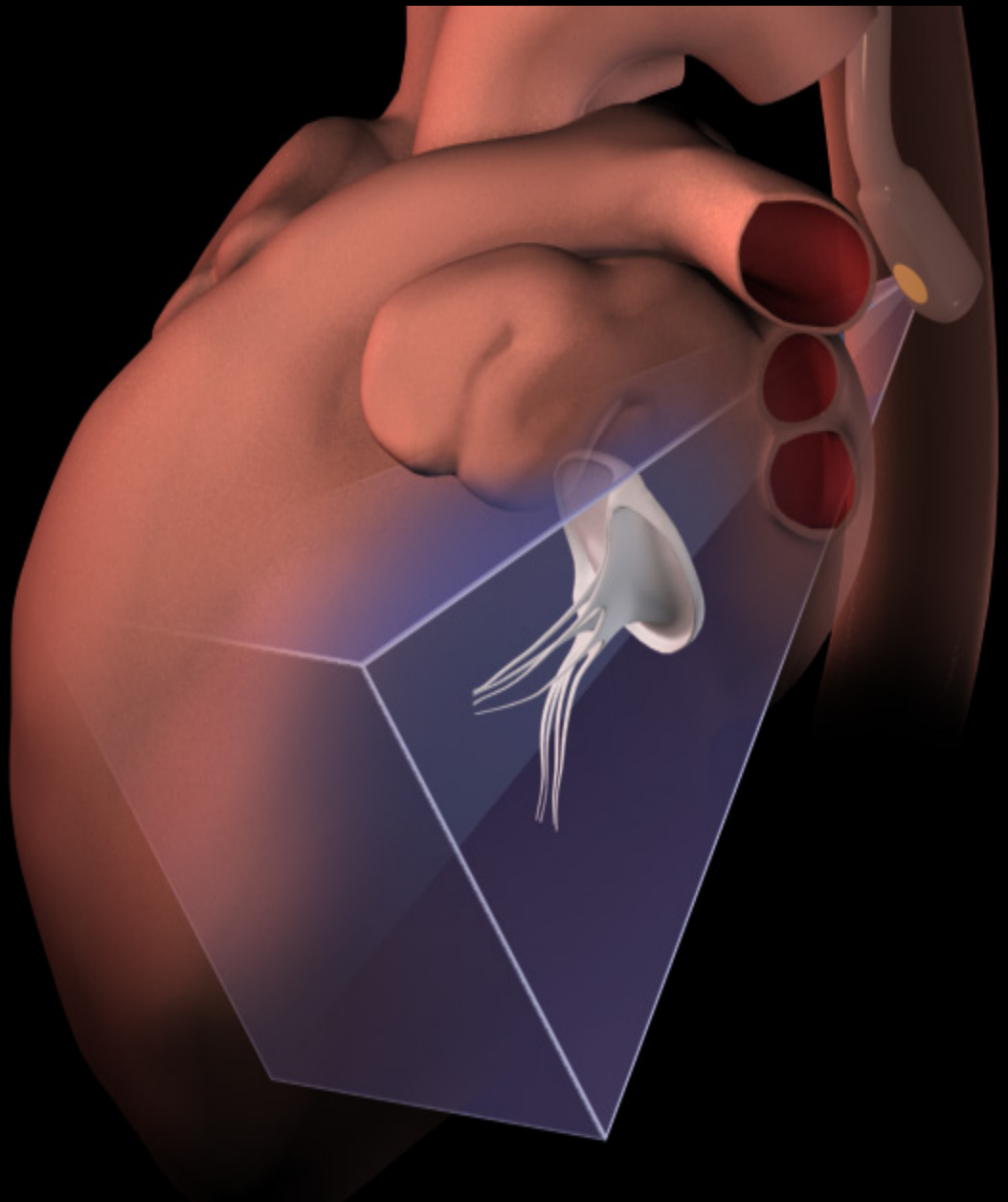

FR 10Hz
10cm
3D Beats 1
0 75 180


0 150 180
5
10


FR 10Hz
10cm
3D Beats 1
0 0 180
58

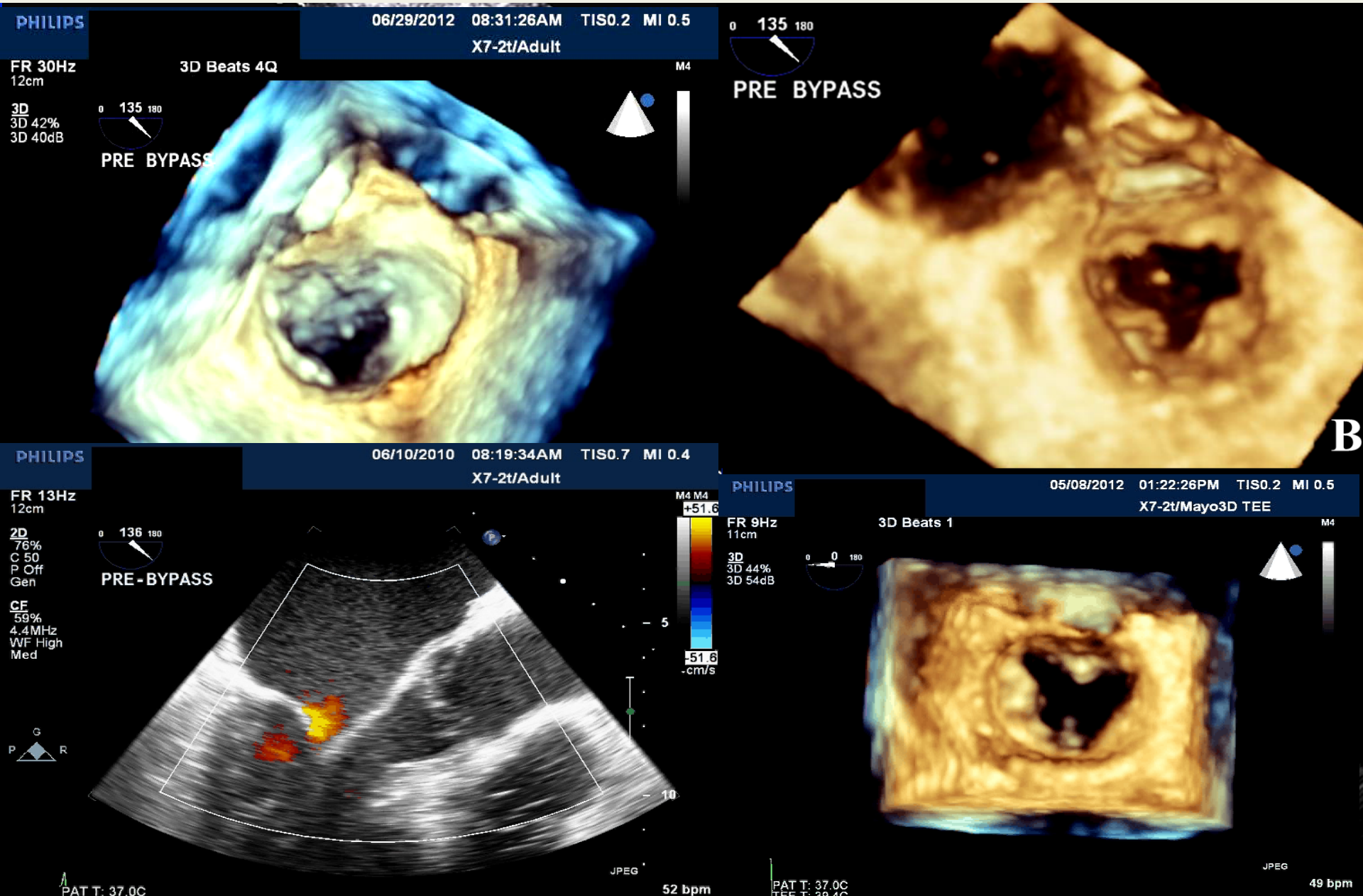

FR 41Hz
9.2cm
3D Beats 4Q
0 0 180
97 bpm

3D Echo allows complete insonation of the Mitral Valve

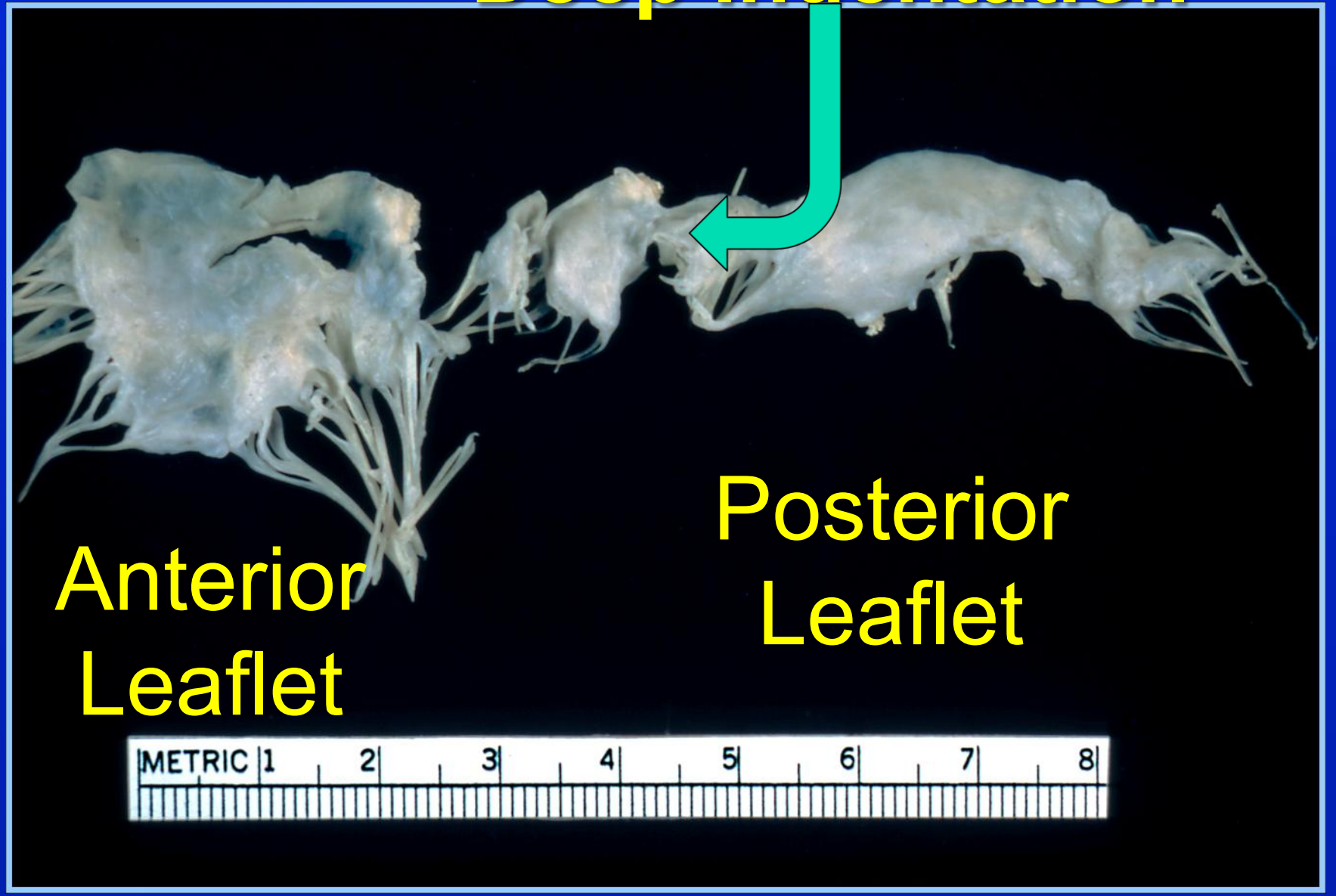


Cleft posterior mitral leaflet resembling a tri-leaflet mitral valve: a novel phenotypic association with hypertrophic cardiomyopathy

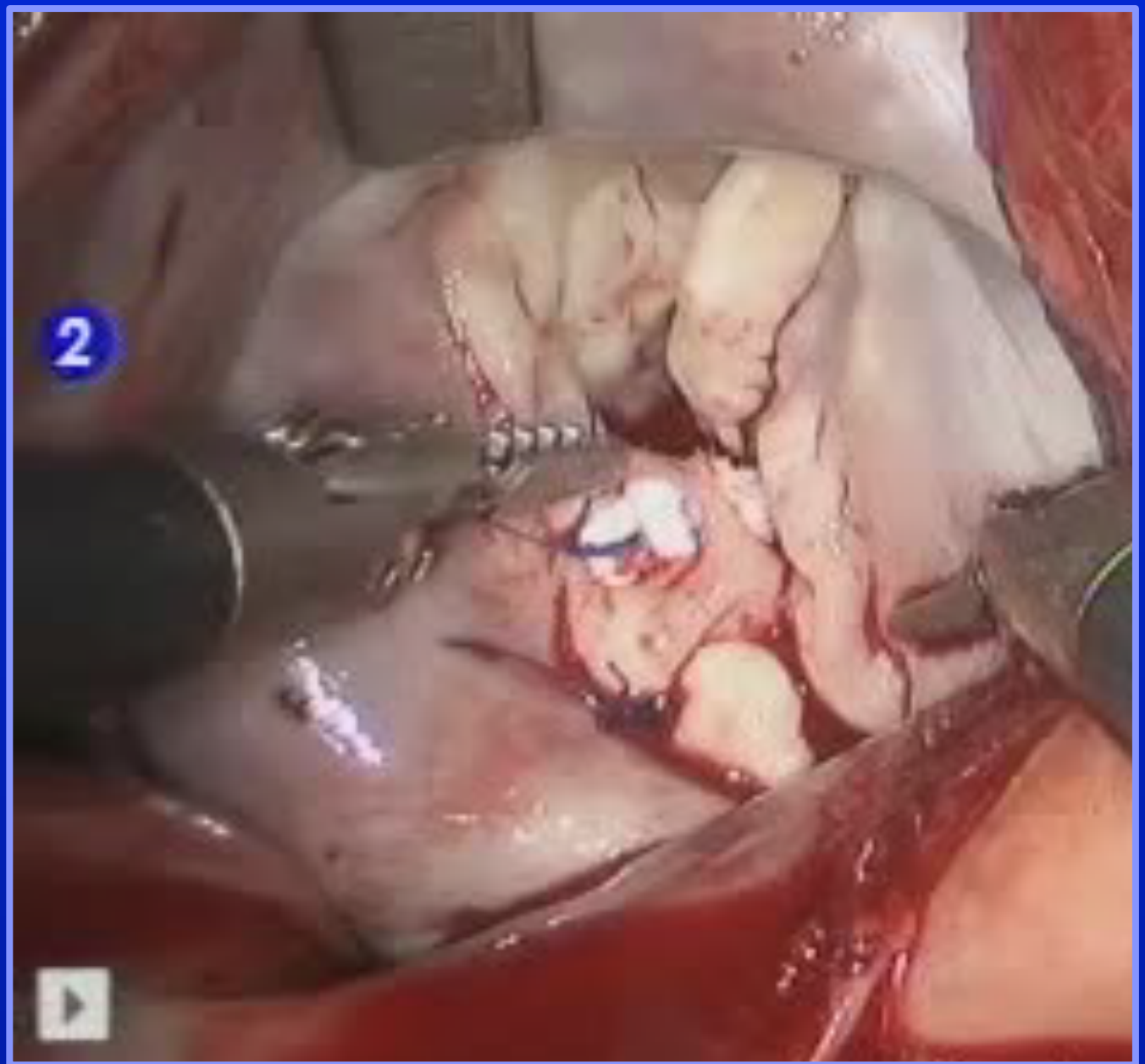
Hayan Jouni[1†], Steven L. Driver[2†], Maurice Enriquez-Sarano[1], and Hector I. Michelena[1*]

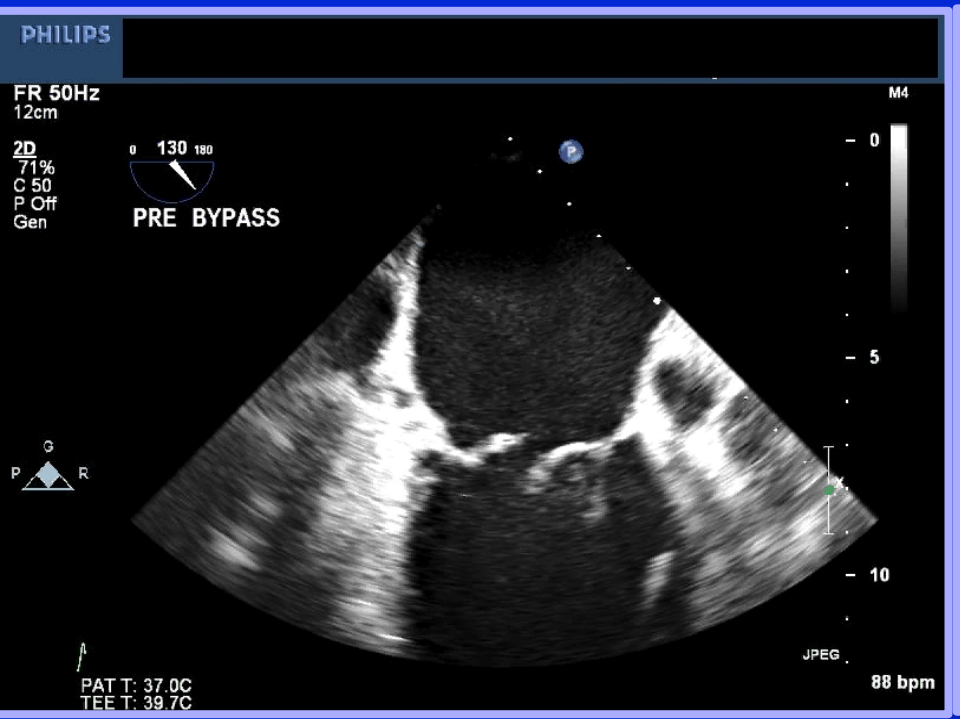


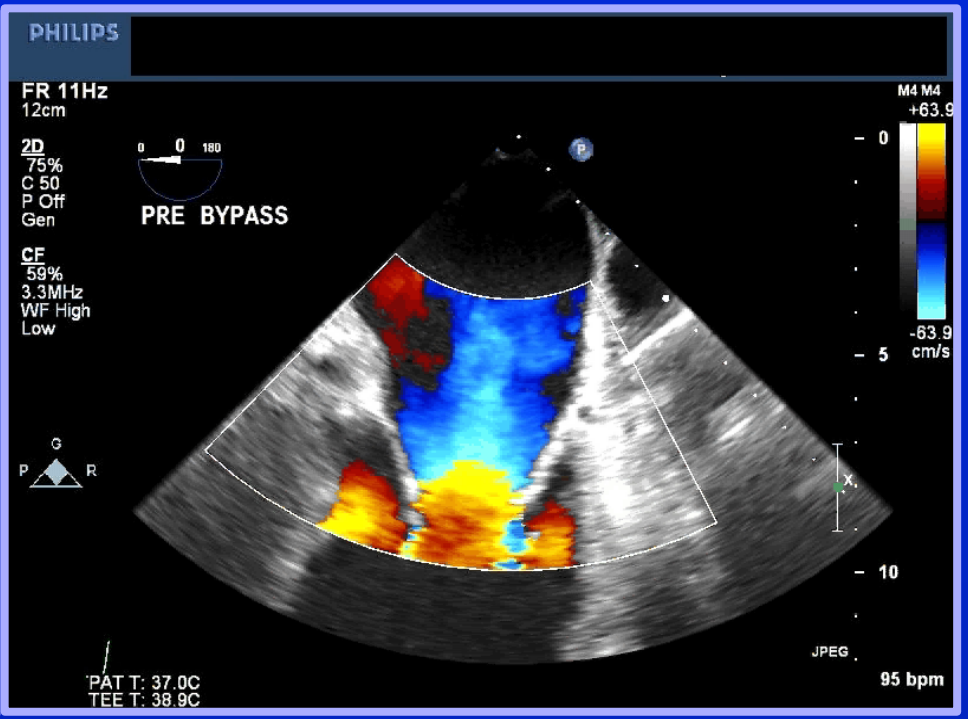
Deep Indentation

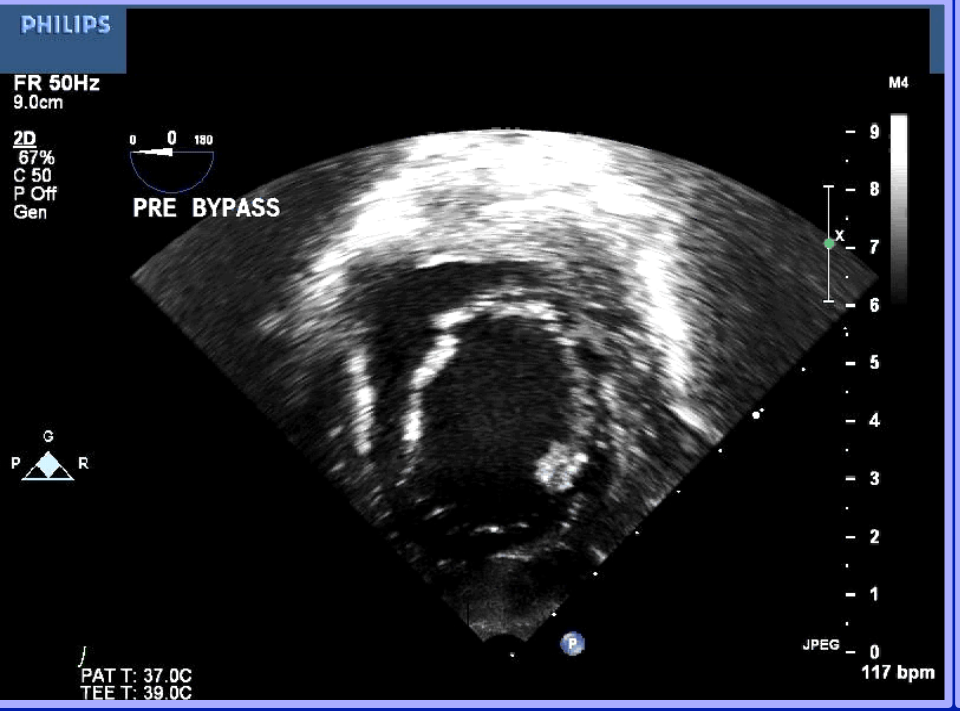


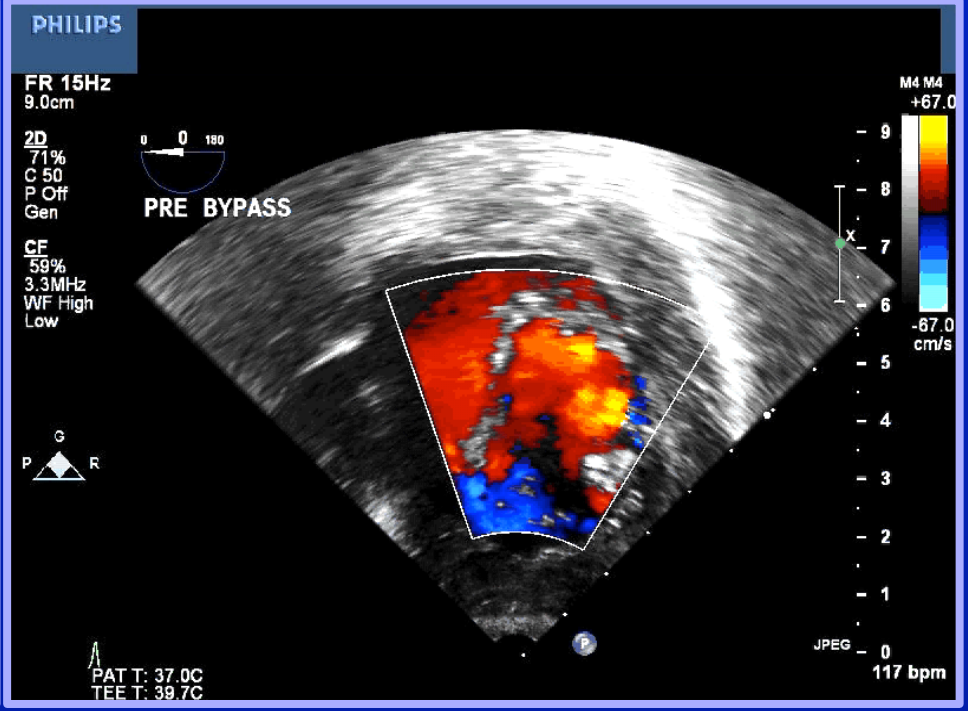
Cleft-Like Indentations



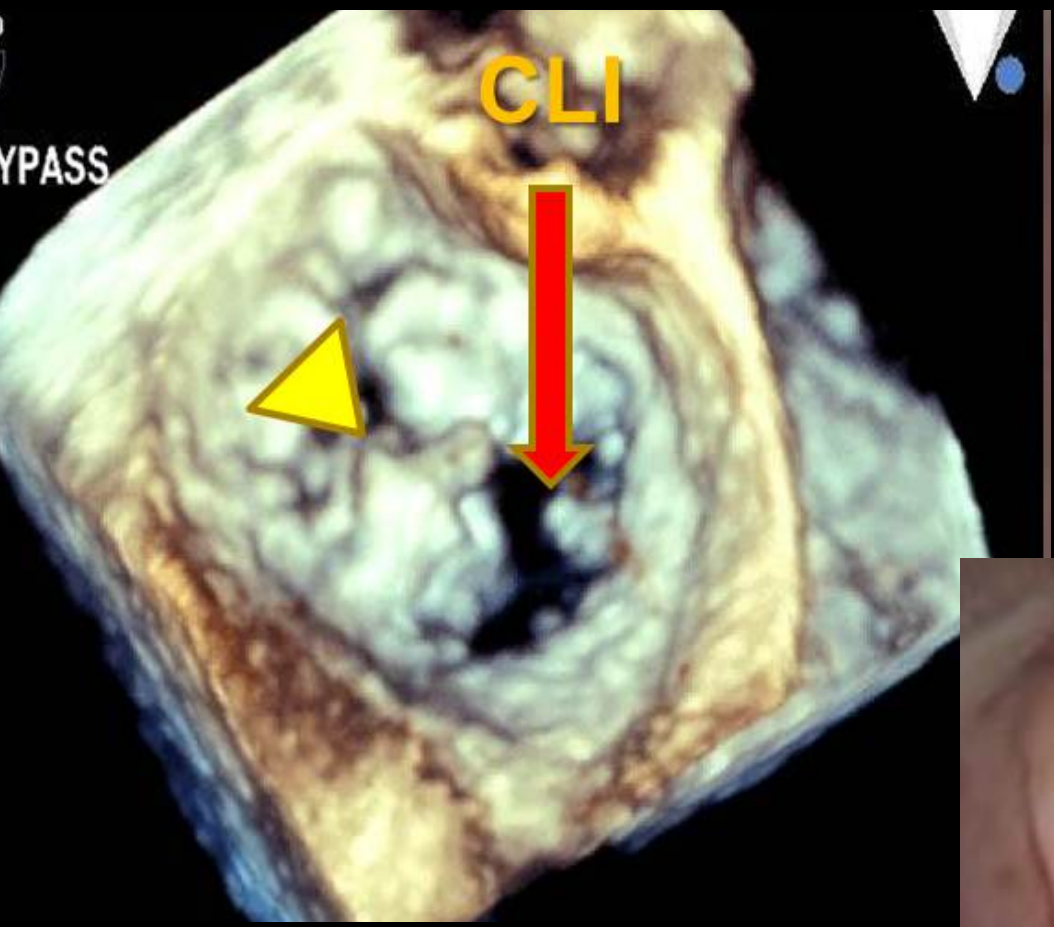

PHILIPS
FR 50Hz
12cm
2D
71%
C 50
P Off
Gen
PRE BYPASS
M4
PAT T: 37.0C
TEE T: 39.7C
JPEG
88 bpm

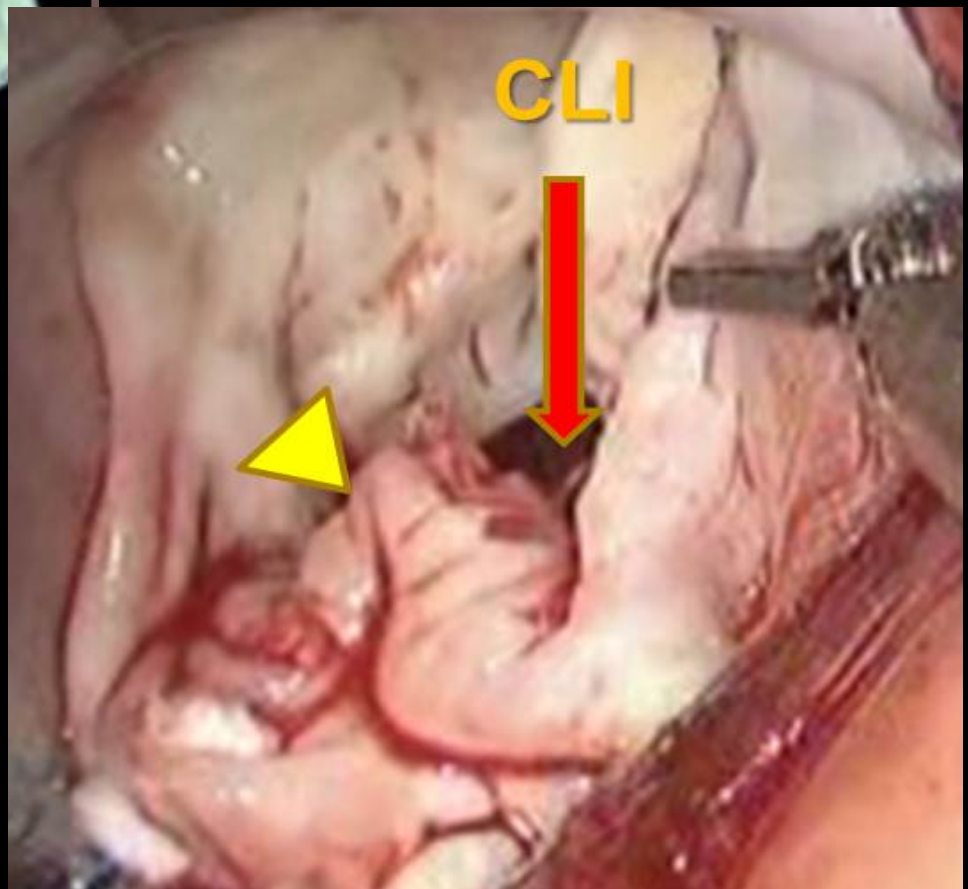

PHILIPS
FR 11Hz
12cm
2D
75%
C 50
P Off
Gen
CF
59%
3.3MHz
WF High
Low
PRE BYPASS
M4 M4
+63.9
-63.9
cm/s
PAT T: 37.0C
TEE T: 38.9C
JPEG
95 bpm


PHILIPS
FR 50Hz
9.0cm
2D
67%
C 50
P Off
Gen
PRE BYPASS
M4
PAT T: 37.0C
TEE T: 39.0C
JPEG
117 bpm


PHILIPS
FR 15Hz
9.0cm
2D
71%
C 50
P Off
Gen
CF
59%
3.3MHz
WF High
Low
PRE BYPASS
M4 M4
+67.0
-67.0
cm/s
PAT T: 37.0C
TEE T: 39.7C
JPEG
117 bpm

Cleft-Like Indentations



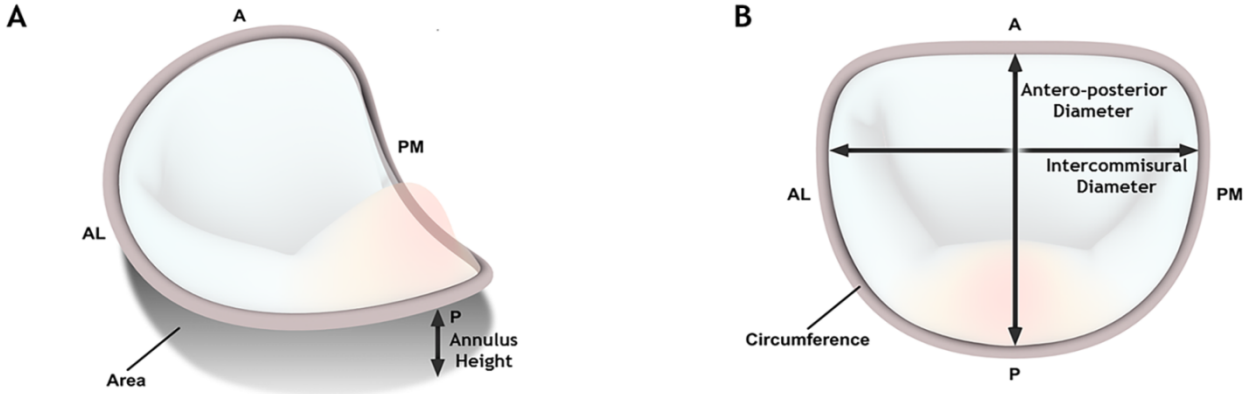


ORIGINAL ARTICLE

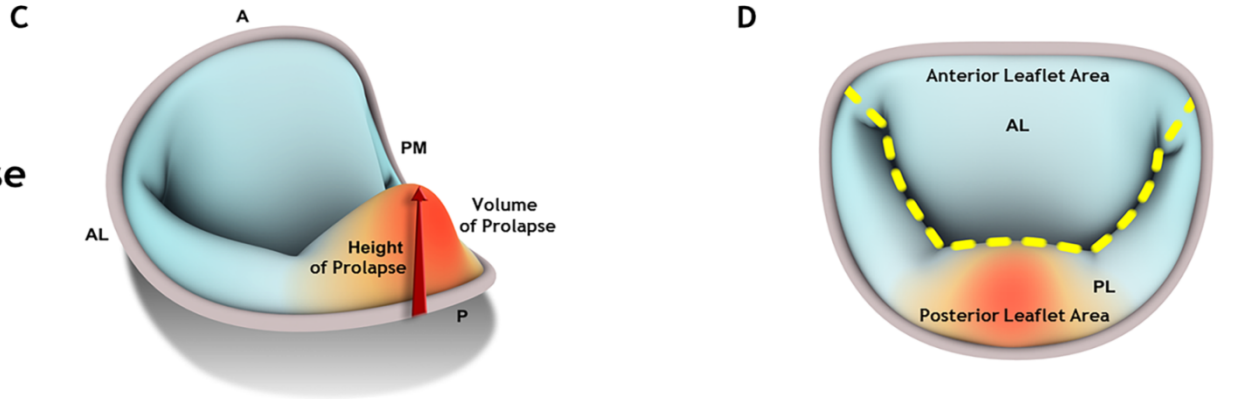
Cleft-like indentations in myxomatous mitral valves by three-dimensional echocardiographic imaging

Francesca Mantovani,[1,2] Marie-Annick Clavel,[1] Ori Vatury,[1] Rakesh M Suri,[1] Sunil V Mankad,[1] Joseph Malouf,[1] Hector I Michelena,[1] Sonia Jain,[1] Luigi Paolo Badano,[3] Maurice Enriquez-Sarano[1]

Annulus Measurements

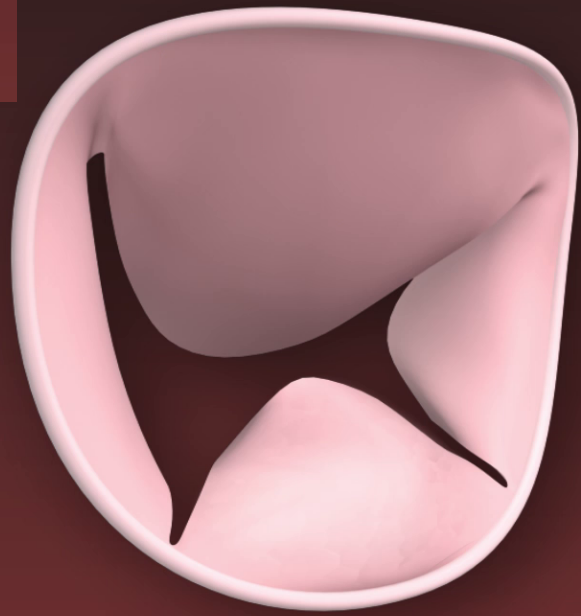


Leaflets and Prolpase Measurements



Multi-segment Prolapse
+
Excess tissue
=
No CLI

Single-segment Prolapse
+
Tissue Paucity
=
Often CLI



3D echo in MR

1-An essential clinical tool during percutaneous interventions and surgical repair

2-A unique physiologic tool to understand MV diseases and balance valve respect vs. resect

3-But not the main instrument for clinical decision making

How do we conduct Clinical Decision making ?

CONTROVERSIES IN CARDIOVASCULAR MEDICINE

Is early surgery recommended for mitral regurgitation?

Early Surgery Is Recommended for Mitral Regurgitation

Maurice Enriquez-Sarano, MD; Thoralf M. Sundt III, MD

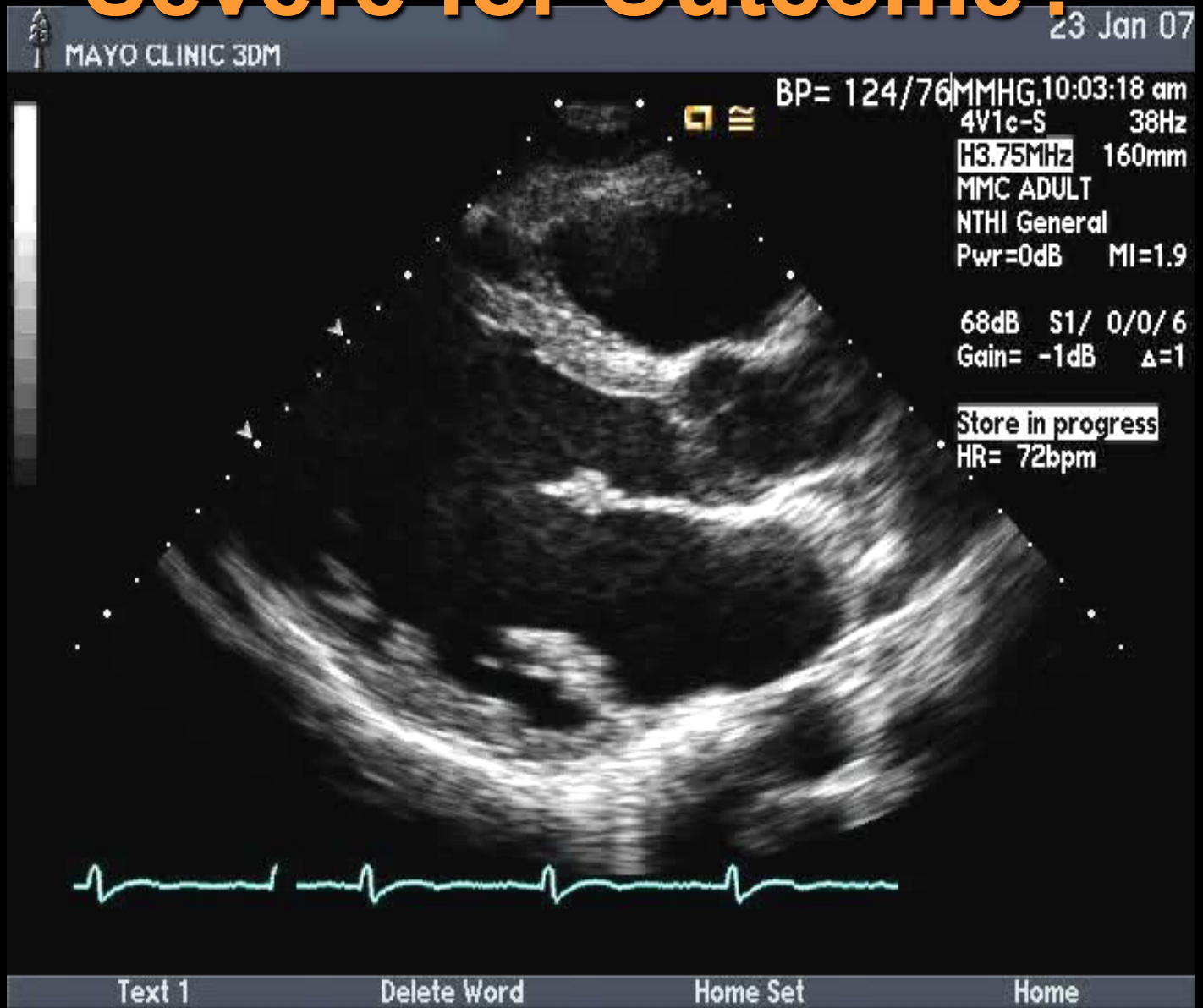
Primum Non Nocere

The Case for Watchful Waiting in Asymptomatic "Severe" Degenerative Mitral Regurgitation

Linda D. Gillam, MD; Allan Schwartz, MD

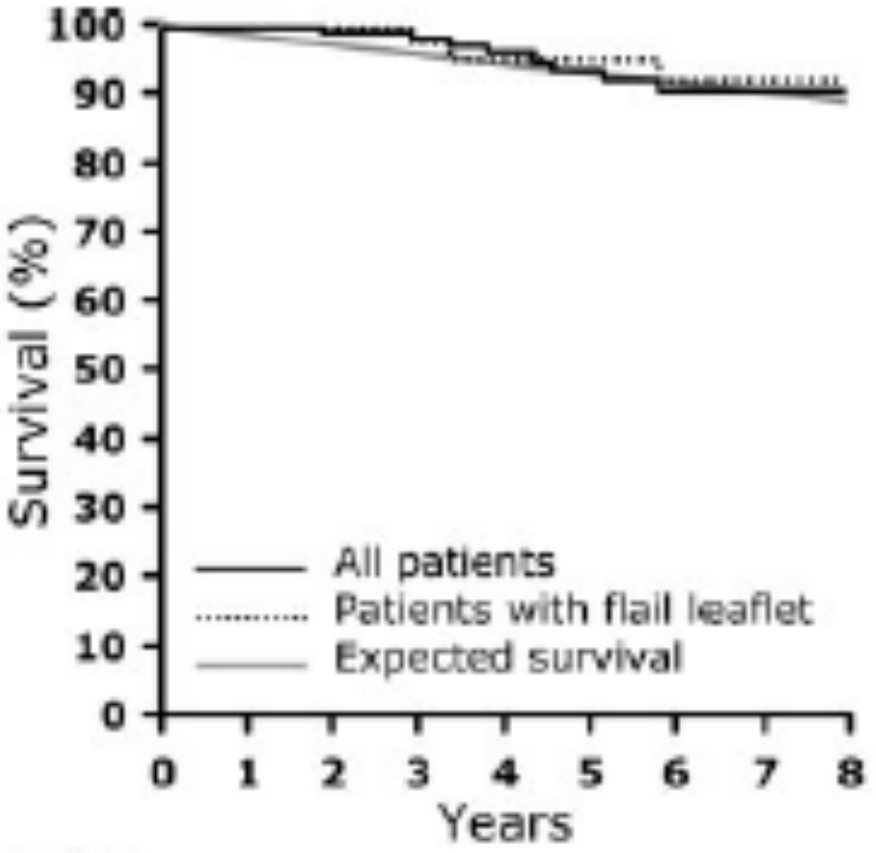
Circulation 2010

Is Voluminous Organic MR Severe for Outcome?



Outcome of Watchful Waiting in Asymptomatic Severe Mitral Regurgitation

Raphael Rosenhek, MD; Florian Rader, MD; Ursula Klaar, MD; Harald Gabriel, MD; Marcel Krejc, PhD; Daniel Kalbeck, PhD; Michael Schemper, PhD; Gerald Maurer, MD; Helmut Baumgartner, MD



Circulation, 2006;113:2228

Organic MR

Flail Leaflets

Asymptomatic MR

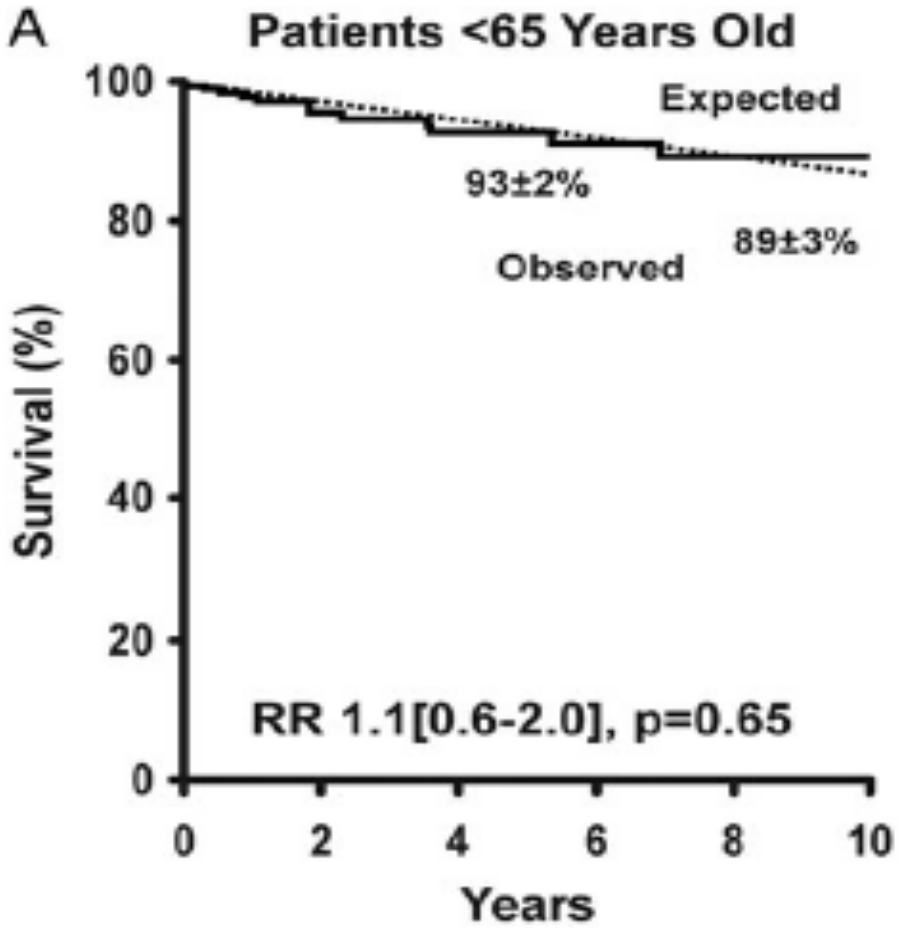
Baseline Characteristics

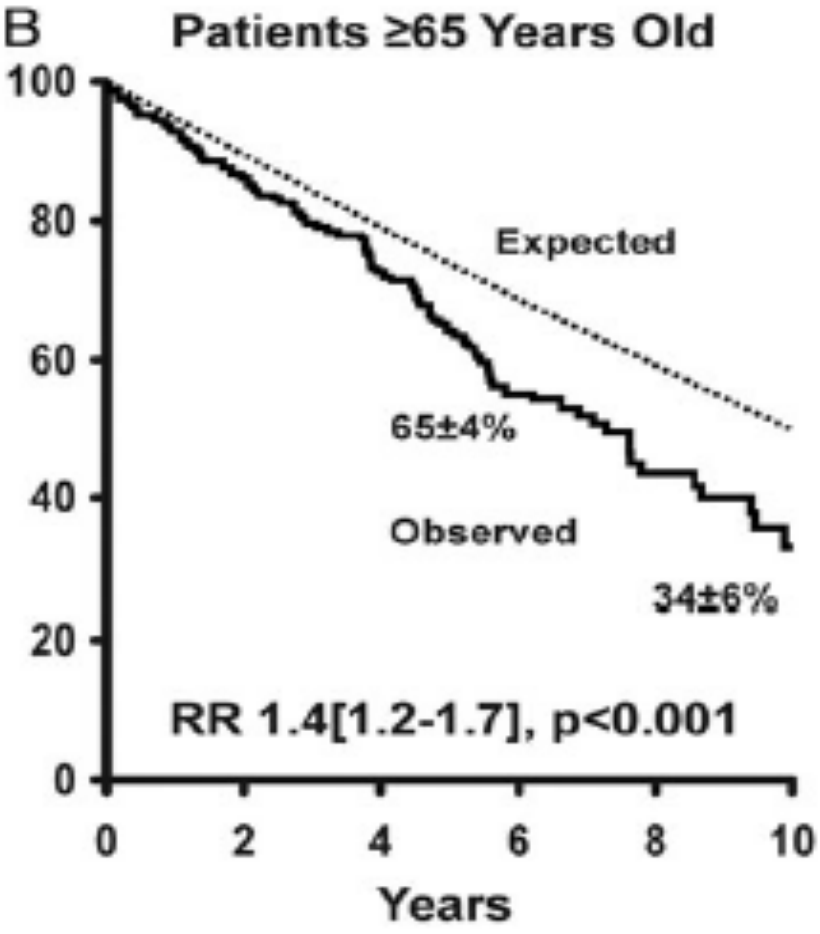
Study	Age
Ling, Flail	66±13
MES, MR	63±14
Mohty, Surg MVP	65±13
Rosenhek, MR	56±14

What is the impact of enrolling too young patients ?

Impact of ageing on presentation and outcome of mitral regurgitation due to flail leaflet: a multicentre international study

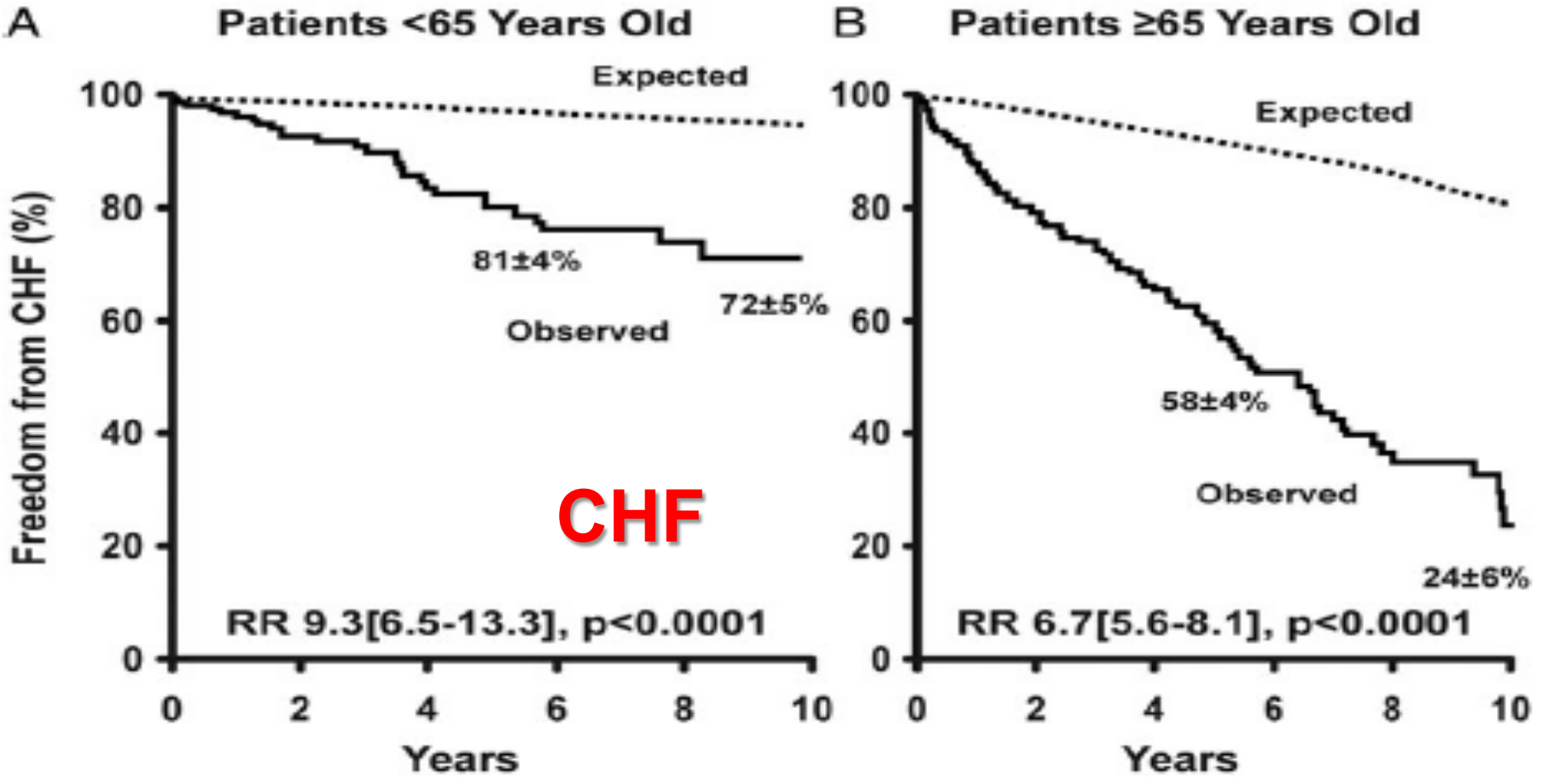
Jean-François Avierinos[1]*, Christophe Tribouilloy[2], Francesco Grigioni[3], Rakesh Suri[4], Andrea Barbieri[5], Hector I. Michelena[4], Teresa Ionico[3], Dan Rusinaru[2], Sébastien Ansaldi[1], Gilbert Habib[1], Catherine Szymanski[2], Roch Giorgi[6], Douglas W. Mahoney[4], and Maurice Enriquez-Sarano[4], on Behalf of the Mitral

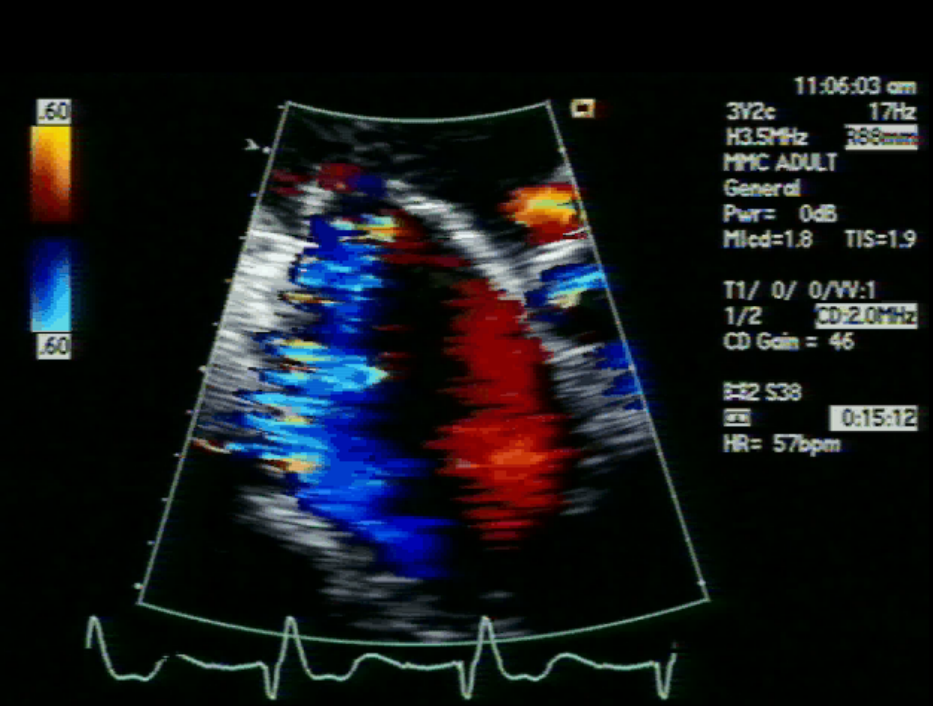


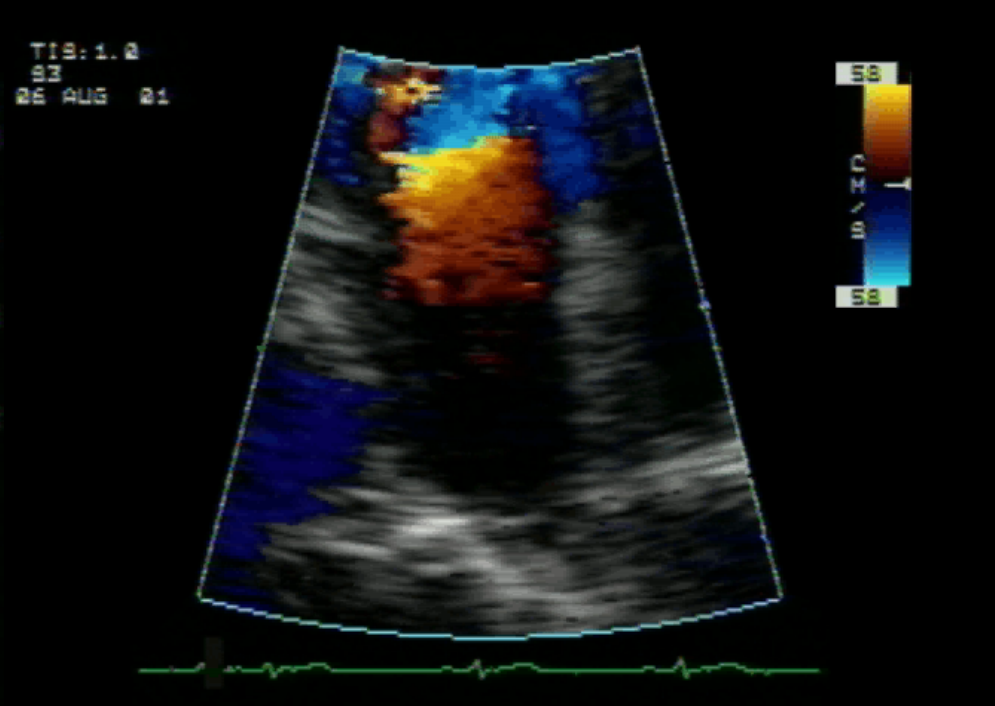


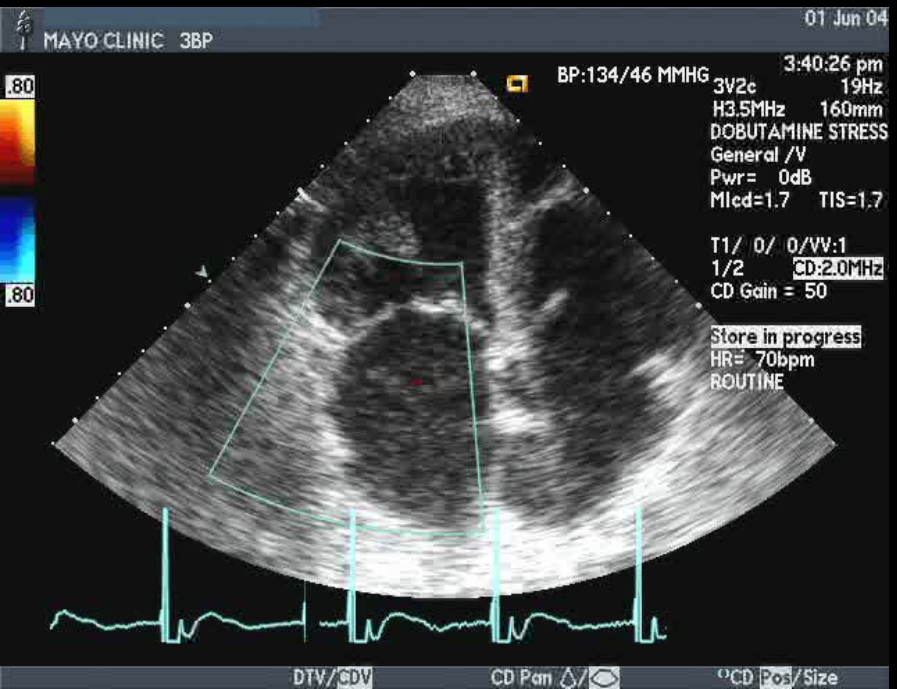
Impact of ageing on presentation and outcome of mitral regurgitation due to flail leaflet: a multicentre international study

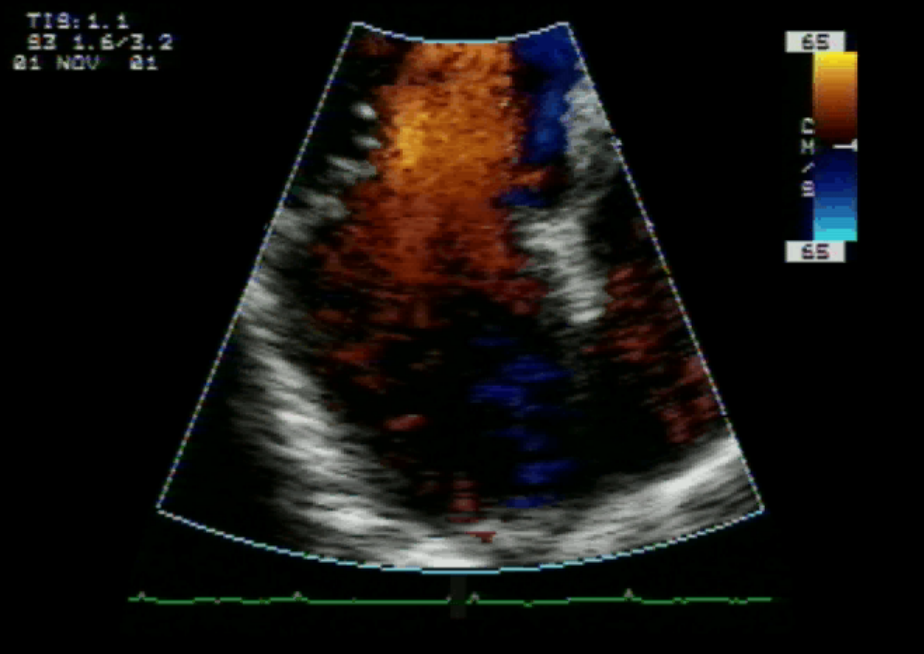
Jean-François Avierinos[1]*, Christophe Tribouilloy[2], Francesco Grigioni[3], Rakesh Suri[4], Andrea Barbieri[5], Hector I. Michelena[4], Teresa Ionico[3], Dan Rusinaru[2], Sébastien Ansaldi[1], Gilbert Habib[1], Catherine Szymanski[2], Roch Giorgi[6], Douglas W. Mahoney[4], and Maurice Enriquez-Sarano[4], on Behalf of the Mitral



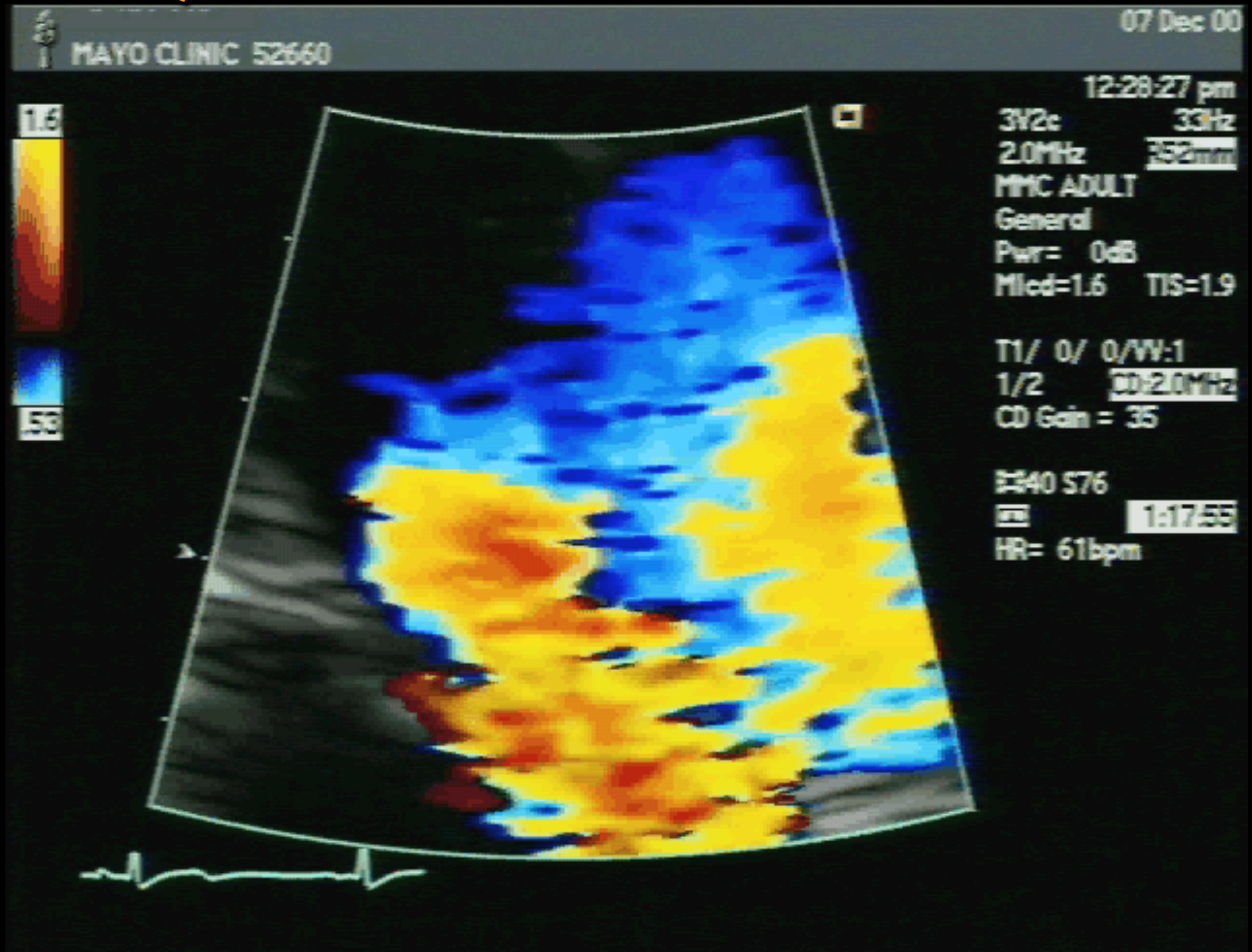

.60
.60
11:06:03 cm
3V2c 17Hz
H3.5MHz 388mm
MMC ADULT
General
Pwr= 0dB
MIcd=1.8 TIS=1.9
T1/ 0/ 0/VV:1
1/2 CD:2.0MHz
CD Gain = 46
0:15:12
HR= 57bpm


TIS: 1.2
58
58

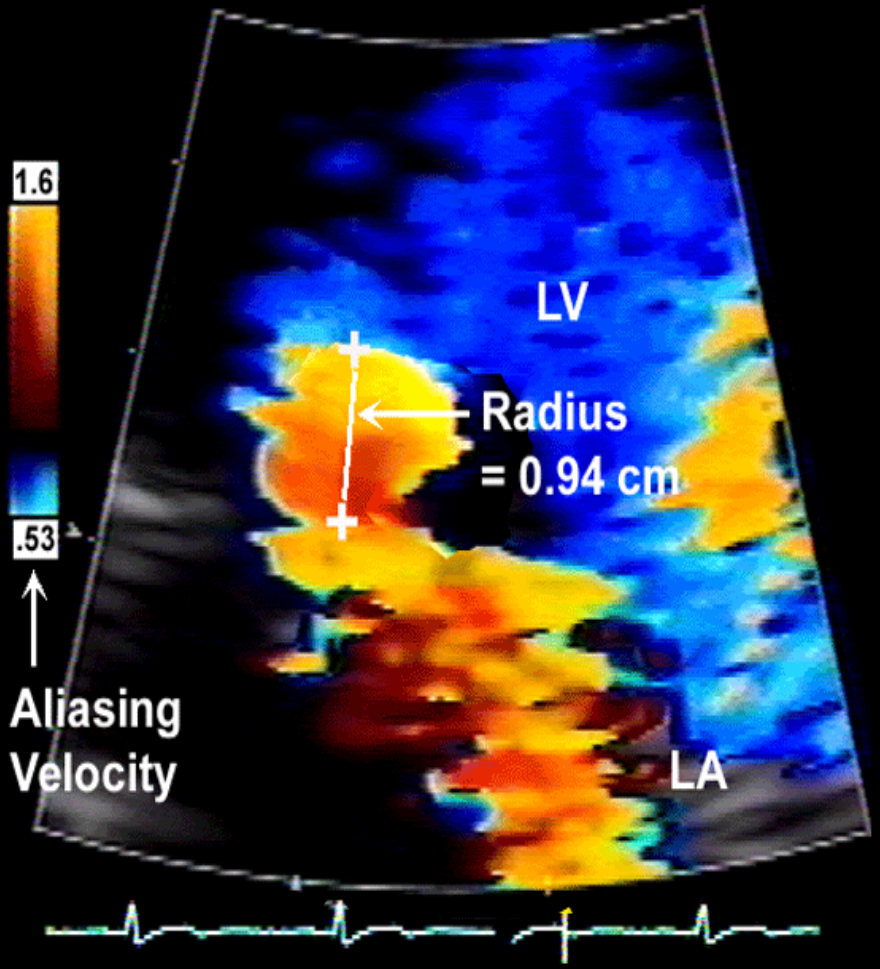

MAYO CLINIC 3BP
01 Jun 04
.80
.80
BP:134/46 MMHG
3:40:26 pm
3V2c 19Hz
H3.5MHz 160mm
DOBUTAMINE STRESS
General /V
Pwr= 0dB
MIcd=1.7 TIS=1.7
T1/ 0/ 0/VV:1
1/2 CD:2.0MHz
CD Gain = 50
Store in progress
HR= 70bpm
ROUTINE
DTV/CDV
CD Pan
CD Pos/Size

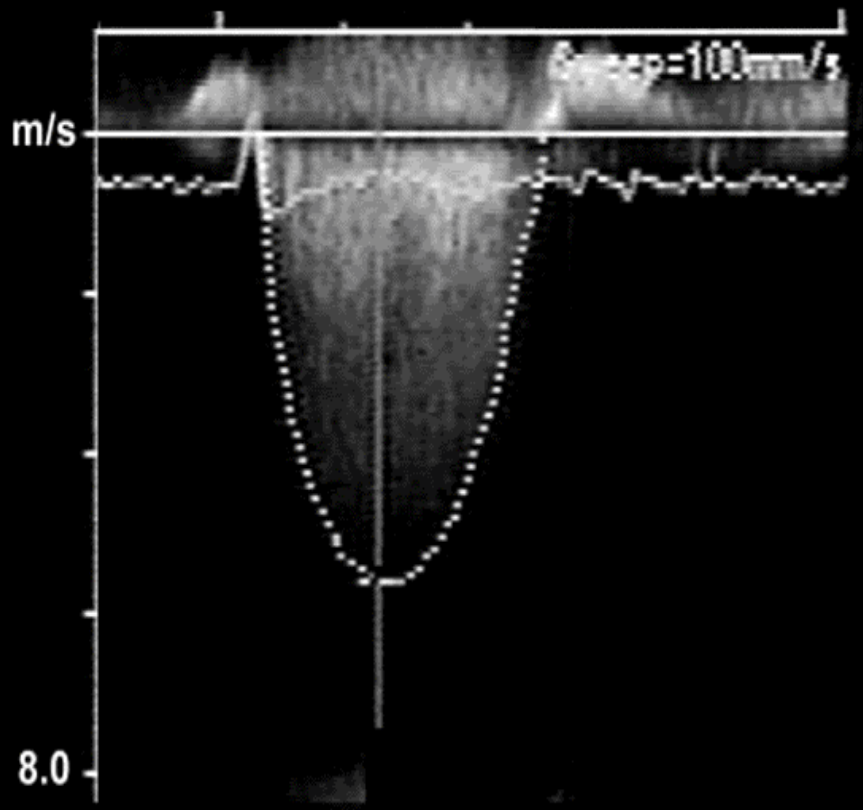

TIS: 1.1
65
65

Quantitation of MR



ERO Calculation





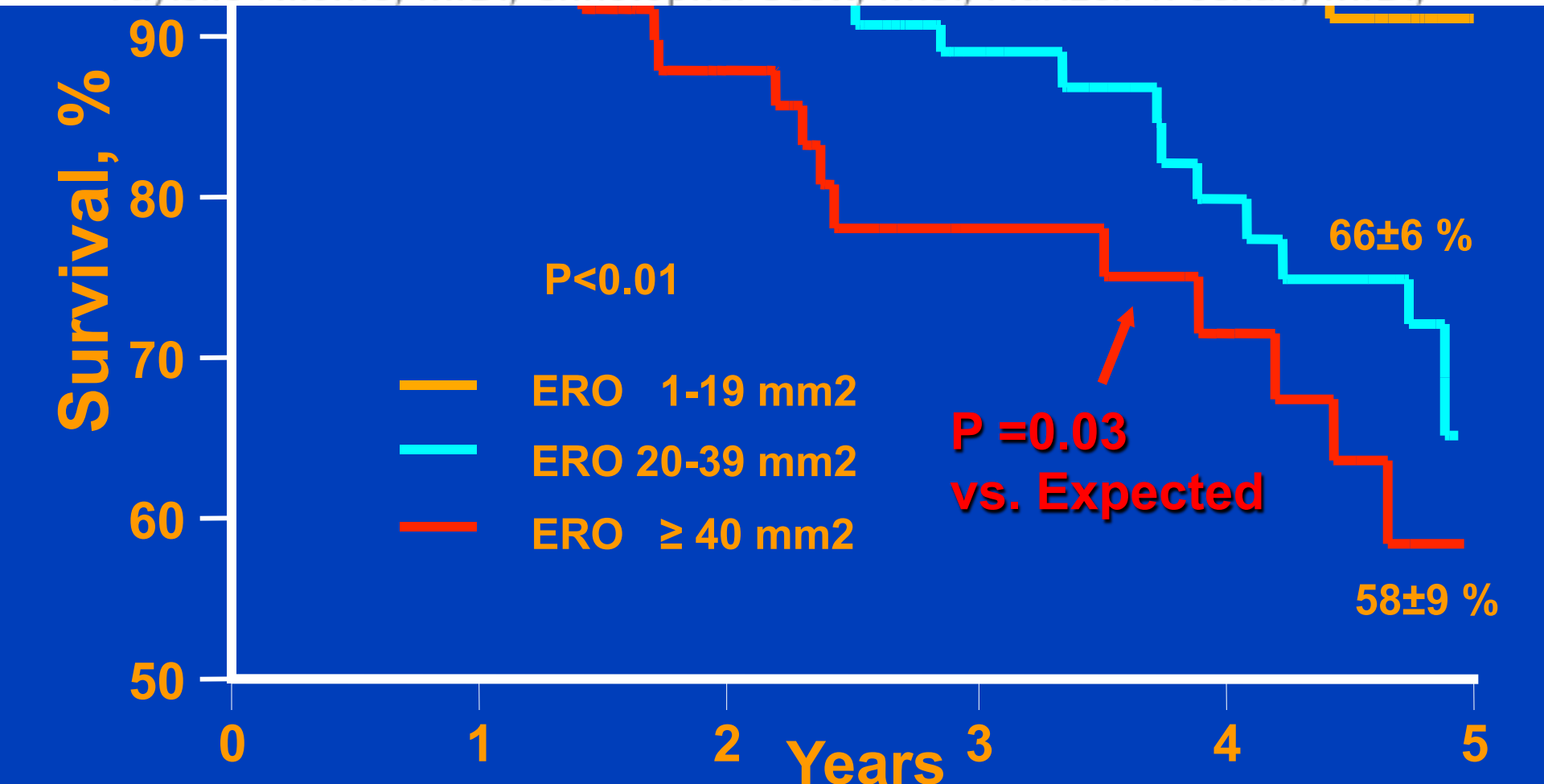
Flow = 294 mL/sec. MR velocity = 557 cm/sec.

ERO = flow/velocity = .53 cm^2 or 53 mm^2

EL064.16.025A-22B

Quantitative Determinants of the Outcome of Asymptomatic Mitral Regurgitation

Maurice Enriquez-Sarano, M.D., Jean-François Avierinos, M.D.,
David Messika-Zeitoun, M.D., Delphine Detaint, M.D., Maryann Capps, R.D.C.S.,
Vuyisile Nkomo, M.D., Christopher Scott, M.S., Hartzell V. Schaff, M.D.,



Comparison of Early Surgery Versus Conventional Treatment in Asymptomatic Severe Mitral Regurgitation

Duk-Hyun Kang, MD, PhD; Jeong Hoon Kim, MD; Ji Hye Rim, MD; Mi-Jeong Kim, MD; Sung-Cheol Yun, PhD; Jong-Min Song, MD, PhD; Hyun Song, MD, PhD; Kee-Joon Choi, MD, PhD; Jae-Kwan Song, MD, PhD; Jae-Won Lee, MD, PhD

Background—The optimal timing of surgical intervention in asymptomatic patients with severe mitral regurgitation is unclear. We therefore compared the long-term results of early surgery with a conventional treatment strategy.

Methods and Results—From 1996 to 2005, 447 consecutive asymptomatic patients (253 men, age 50±15 years) with severe degenerative mitral regurgitation and preserved left ventricular function were evaluated prospectively. The end point was defined as the composite of operative mortality, cardiac death, repeat mitral valve surgery, and urgent admission due to congestive heart failure during follow-up. Early surgery was performed on 161 patients (operated group), and the conventional treatment strategy was used for 286 patients (conventional treatment group). There were no significant differences between the 2 groups in terms of age, gender, euroSCORE (European System for Cardiac Operative Risk Evaluation), or ejection fraction. During a median follow-up of 1988 days, there were 2 repeat surgeries and no cardiac deaths or operative mortality in the operated group compared with 12 cardiac deaths, 1 repeat surgery, and 23 admissions for congestive heart failure in the conventional treatment group. The estimated actuarial 7-year cardiac mortality rate was 0% in the operated group and 5±2% in the conventional treatment group (P=0.008). In propensity score–matched pairs, the estimated actuarial 7-year event-free survival rate was significantly higher in the operated than in the conventional treatment group (99±1% versus 85±4%, P=0.007). In the conventional treatment group, baseline grade of pulmonary hypertension (hazard ratio 1.87, 95% CI 1.22 to 2.87, P=0.003), age (hazard ratio 1.02, 95% CI 1.01 to 1.04, P=0.005), and effective regurgitant orifice area (hazard ratio 2.06, 95% CI 1.11 to 3.82, P=0.02) were independent variables that predicted late development of surgical indications or congestive heart failure on Cox multivariate analysis.

Conclusions—Compared with conservative management, the strategy of early surgery was associated with an improved long-term event rate by decreasing cardiac mortality and congestive heart failure hospitalization more effectively in patients with severe degenerative mitral regurgitation. Early surgery may therefore further improve clinical outcomes in asymptomatic severe mitral regurgitation with preserved left ventricular systolic function and a high likelihood of mitral valve repair. (***Circulation***. **2009;119:797-804.**)

ERO Predictor Of Outcome

Primum non-Nocere ?

1-Voluminous MR is Severe

2-Large ERO is a marker of poor clinical outcome

Mitral Regurgitation: The guidelines

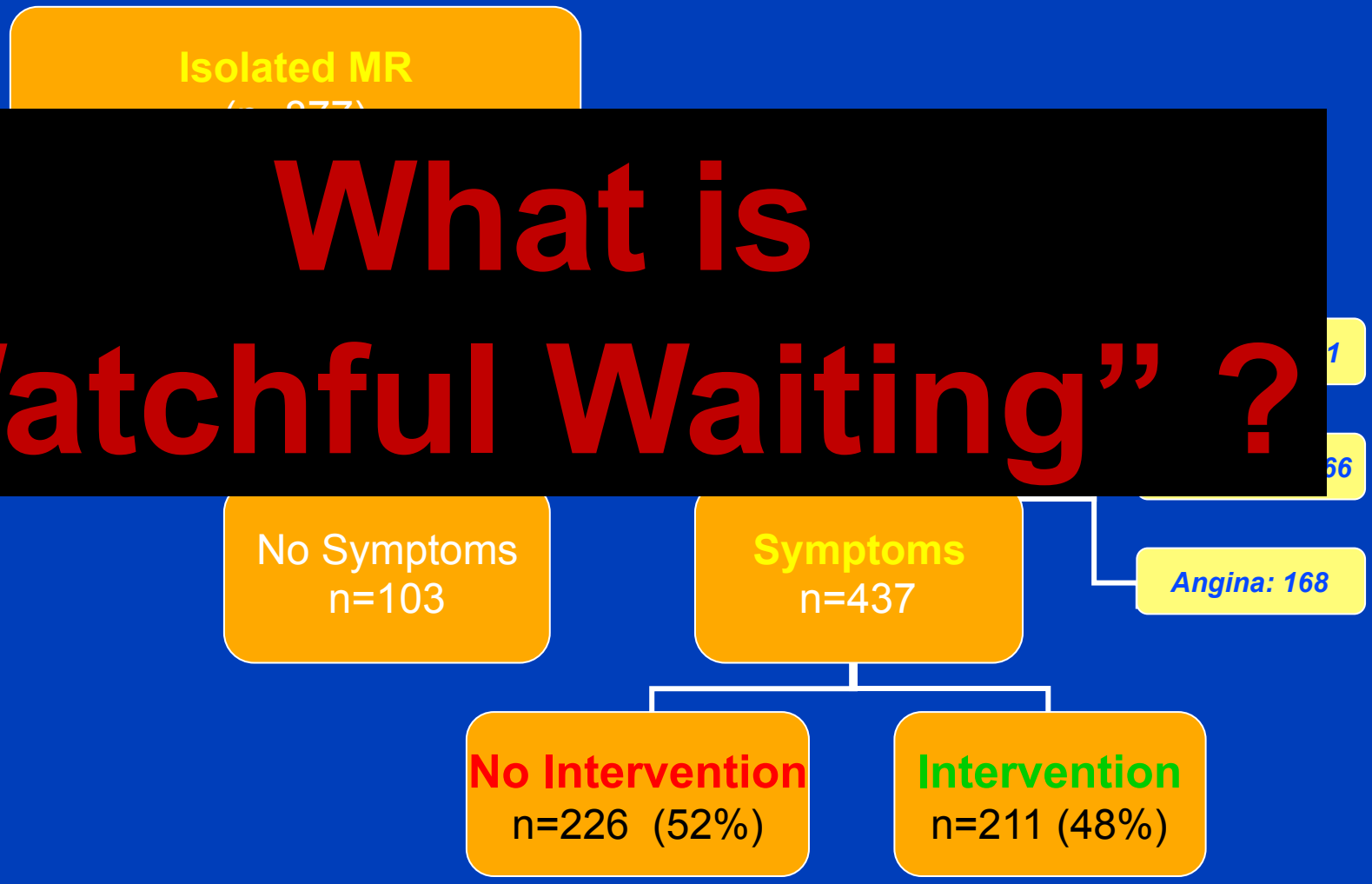
CLASS I

1. Mitral valve surgery is recommended for symptomatic patients with chronic severe primary MR (stage D) and LVEF greater than 30% (156,179). *(Level of Evidence: B)*
2. Mitral valve surgery is recommended for asymptomatic patients with chronic severe primary MR and LV dysfunction (LVEF 30% to 60% and/or LVESD ≥40 mm, stage C2) (150–153,180–182). *(Level of Evidence: B)*
3. Mitral valve repair is recommended in preference to mitral valve replacement (MVR) when surgical treatment is indicated for patients with chronic severe primary MR limited to the posterior leaflet (155,183–198). *(Level of Evidence: B)*
4. Mitral valve repair is recommended in preference to MVR when surgical treatment is indicated for patients with chronic severe primary MR involving the anterior leaflet or both leaflets when a successful and durable repair can be accomplished (195–197,199–203). *(Level of Evidence: B)*
5. Concomitant mitral valve repair or MVR is indicated in patients with chronic severe primary MR undergoing cardiac surgery for other indications (204). *(Level of Evidence: B)*

Mitral Regurgitation

What is the problem with waiting for Symptoms to operate ?

Severe Symptomatic MR
The EuroHeart Survey

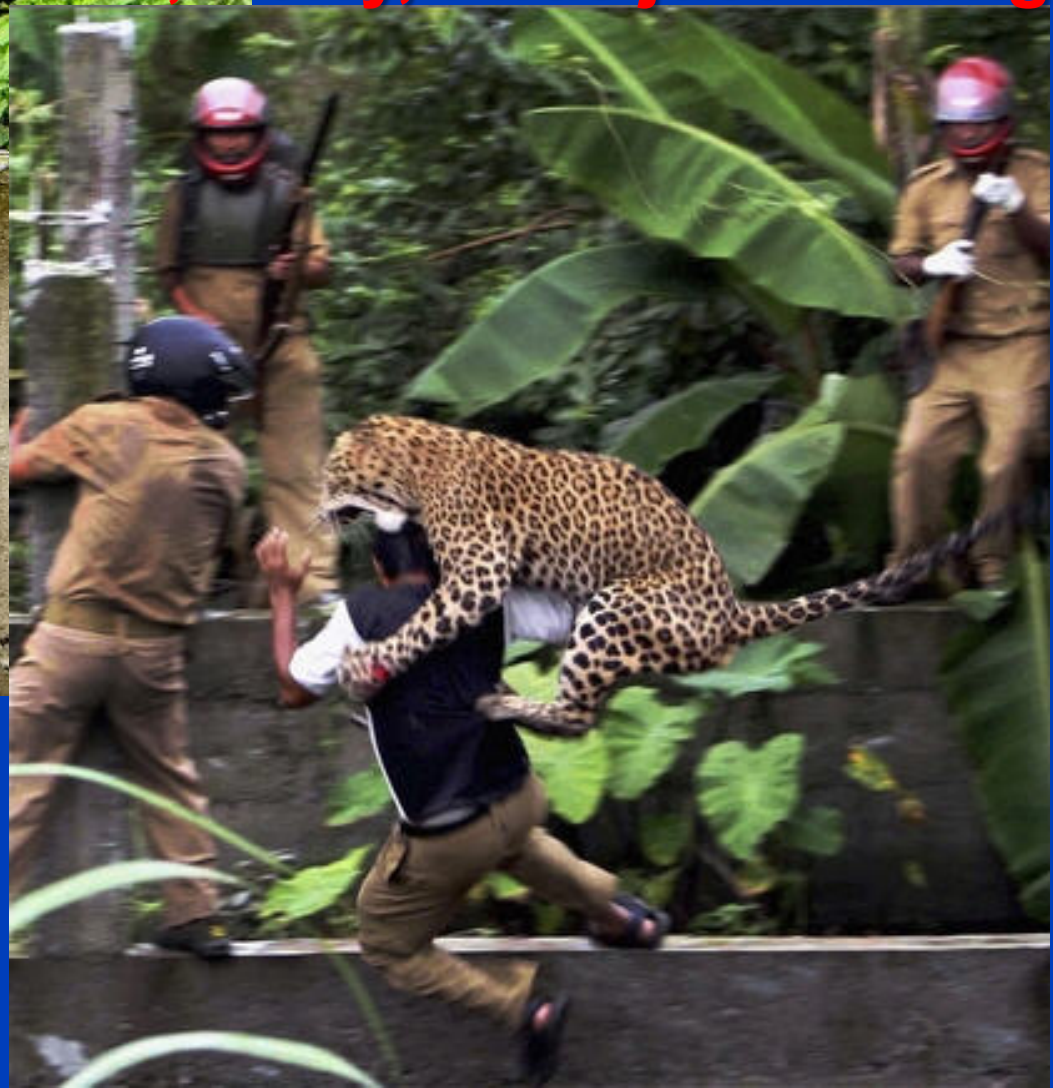


Mirabel M et al *Eur Heart J.* 2007;28(11):1358-1365.

What is “watchful waiting” ?

Go on, I am watching !

Uh oh, Sorry, I was just waiting



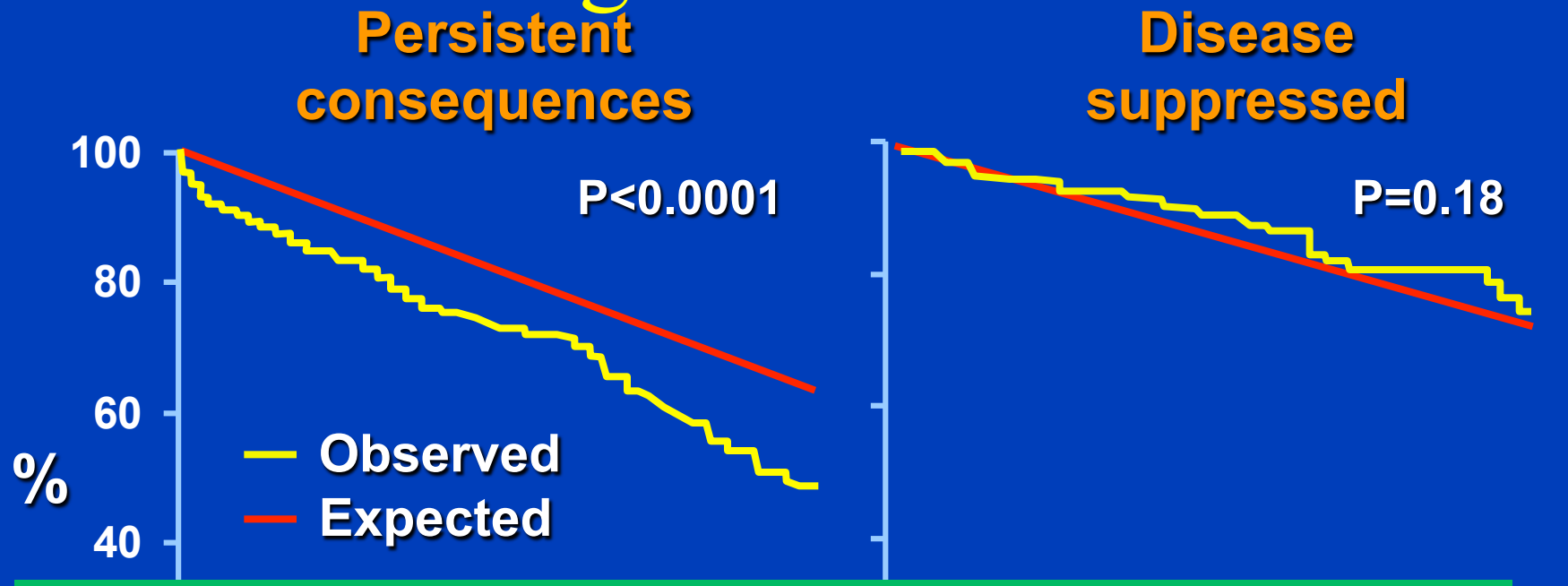
Should Patients With Severe Degenerative Mitral Regurgitation Delay Surgery Until Symptoms Develop?

A. Marc Gillinov, MD, Tomislav Mihaljevic, MD, Eugene H. Blackstone, MD, Kristopher George, MD, Lars G. Svensson, MD, Edward R. Nowicki, MD, MS, Joseph F. Sabik III, MD, Penny L. Houghtaling, MS, and Brian Griffin, MD

Waiting for symptoms is causing excess mortality even after surgery

MR Postop. Outcome

Long-term Survival



Operating on patients with no or minimal symptoms restores life expectancy

Mitral Regurgitation

Overt LV Dysfunction

EF <60%

What is the problem with waiting for EF<60% to operate ?

Long-Term Mortality Associated With Left Ventricular Dysfunction in Mitral Regurgitation Due to Flail Leaflets

A Multicenter Analysis

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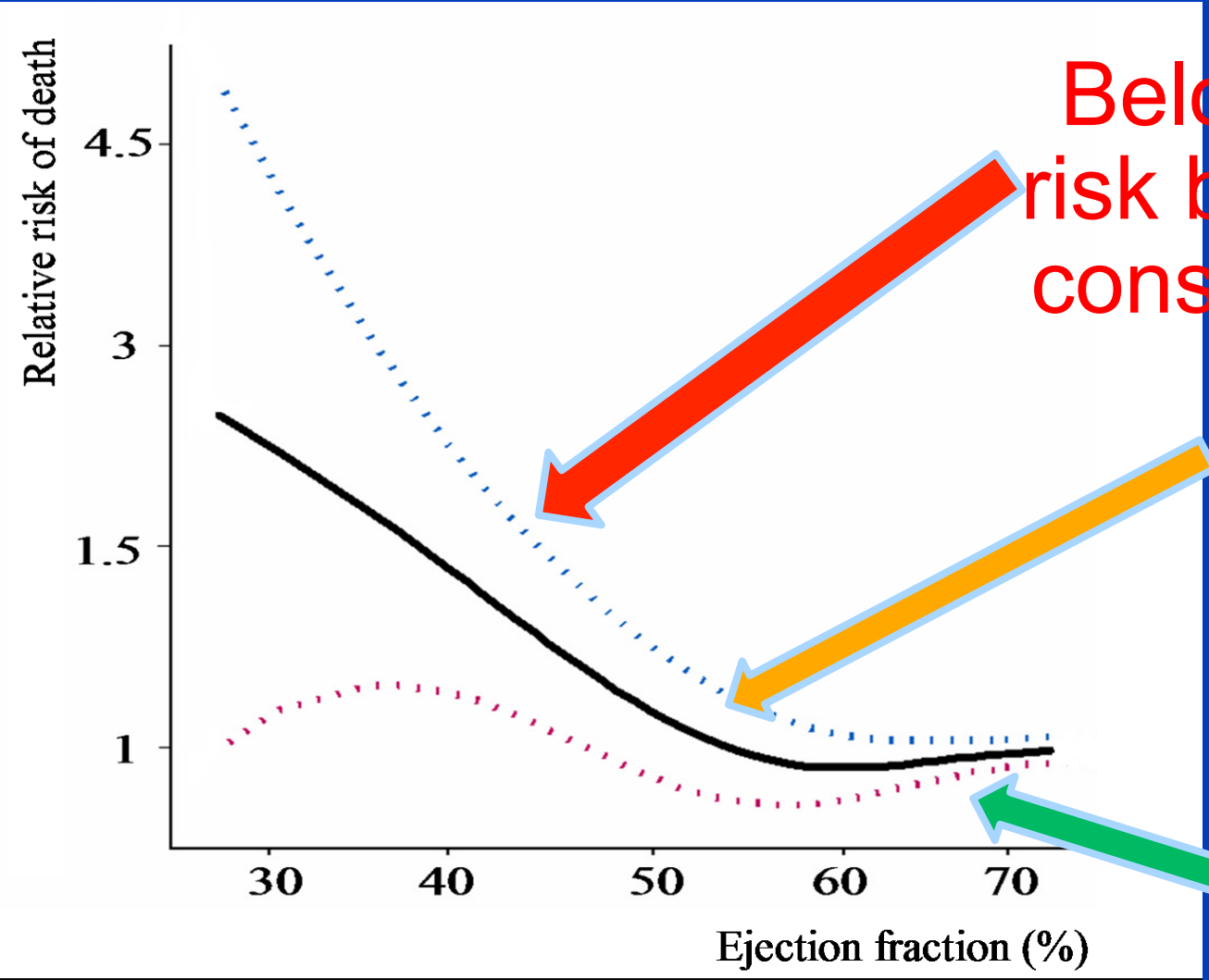
Background—Ejection fraction (EF) as a marker of left ventricular (LV) dysfunction and the appropriate thresholds for diagnosing severe or mild/moderate LV dysfunction in mitral regurgitation are doubted and poorly followed in clinical practice. We aimed at assessing the role of EF in a large registry of organic mitral regurgitation to objectively establish thresholds for various degrees of LV dysfunction and to analyze whether mitral surgery remains beneficial in those subsets of patients.

Methods and Results—We investigated the relation between EF and mortality in 1875 patients with mitral regurgitation due to flail leaflets in sinus rhythm (65±13 years; median EF, 66% [60%–71%]) enrolled in the Mitral Regurgitation International Database (MIDA) registry. With EF <60%, mortality after diagnosis increased precipitously under medical management (adjusted hazard ratio [HR], 1.59 [1.19–2.12]) and during the entire follow-up (adjusted HR, 1.51 [1.22–1.87]). Severe LV dysfunction, if defined by EF <30%, would affect a minuscule number of patients (0.3%). Conversely, EF <45% was more frequent (2.9%) and was associated with considerable mortality under medical management (adjusted HR, 2.43 [1.50–3.95]) and during the entire follow-up (adjusted HR, 2.46 [1.67–3.61]). The group with EF of 45% to 60% represented a large proportion of patients (23%), exhibited rarely overt symptoms, and had higher mortality compared with EF >60%. Above 60%, no EF threshold further determined survival. The benefit of surgery remained considerable in the groups with EF <45% (adjusted HR, 0.28 [0.17–0.56]) and with EF of 45% to 60% (adjusted HR, 0.34 [0.21–0.64]).

Conclusions—EF is valuable in defining presence and severity of LV dysfunction in organic mitral regurgitation. Patients with EF <45% have severe LV dysfunction, catastrophic outcome under medical management, and should not be denied surgery. Although there is no survival gain with EF ranges >60%, with EF dropping <60%, mortality increases precipitously and prompt surgical referral is critical to outcome. **(*Circ Cardiovasc Imaging*. 2014;7:363-370.)**

MR: LV Dysfunction

The MIDA Study

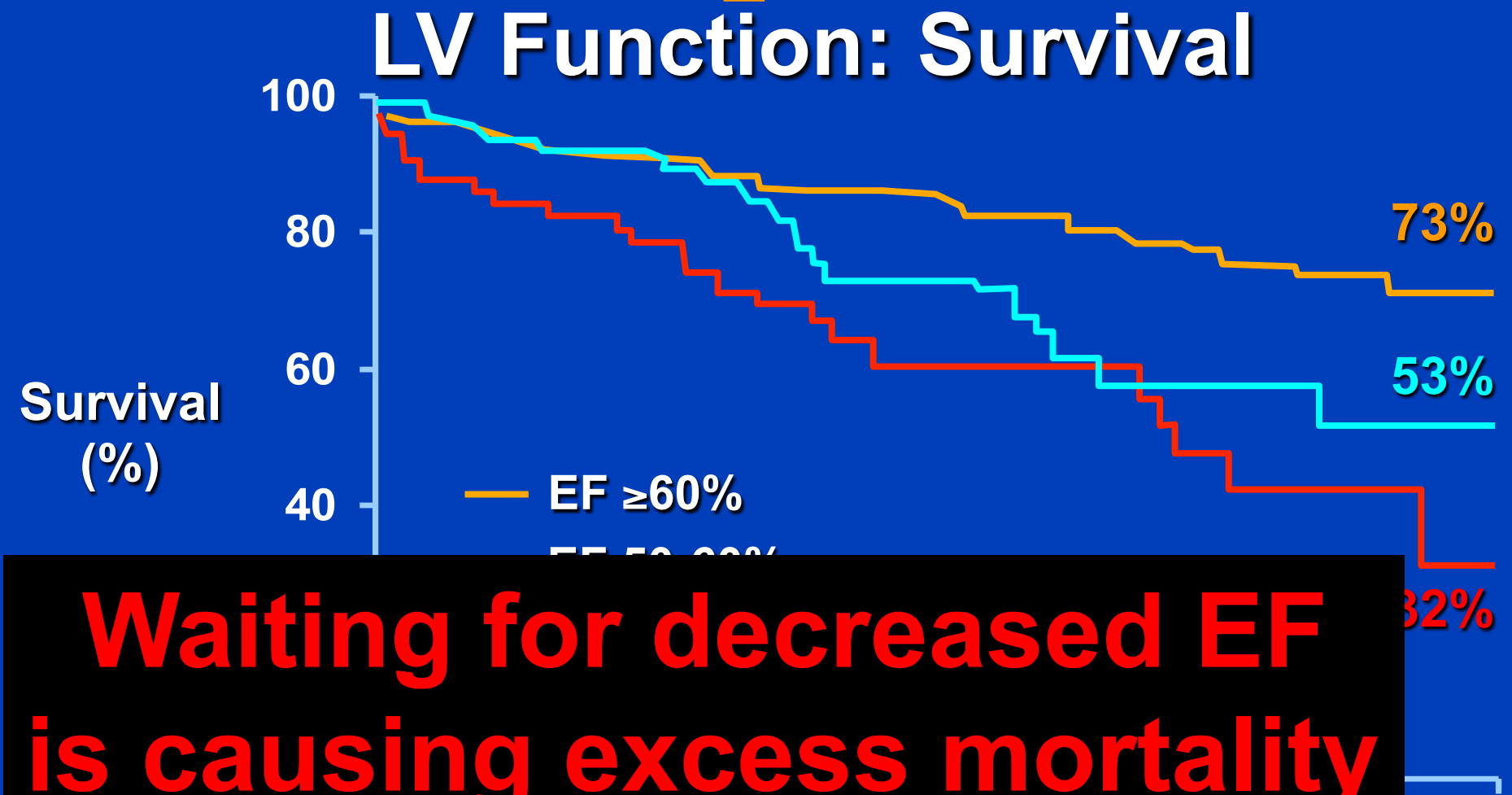


Below 45% risk becomes considerable

Below 60% risk grows precipitously

Above 60% Risk not decreased

MR Postop. Outcome



Waiting for decreased EF is causing excess mortality even after surgery

Mitral Regurgitation

Overt LV Dysfunction

LVS ≥ 40-45 mm

What is the problem with waiting for LV ESD >40 mm to operate ?

CME

Survival Implication of Left Ventricular End-Systolic Diameter in Mitral Regurgitation Due to Flail Leaflets

A Long-Term Follow-Up Multicenter Study

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on behalf of the MIDA Investigators

Amiens and Marseille, France; Bologna and Modena, Italy; and Rochester, Minnesota

Objectives This study analyzed the association of left ventricular end-systolic diameter (LVESD) with survival after diagnosis in organic mitral regurgitation (MR) due to flail leaflets.

Background LVESD is a marker of left ventricular function in patients with organic MR but its association to survival after diagnosis is unknown.

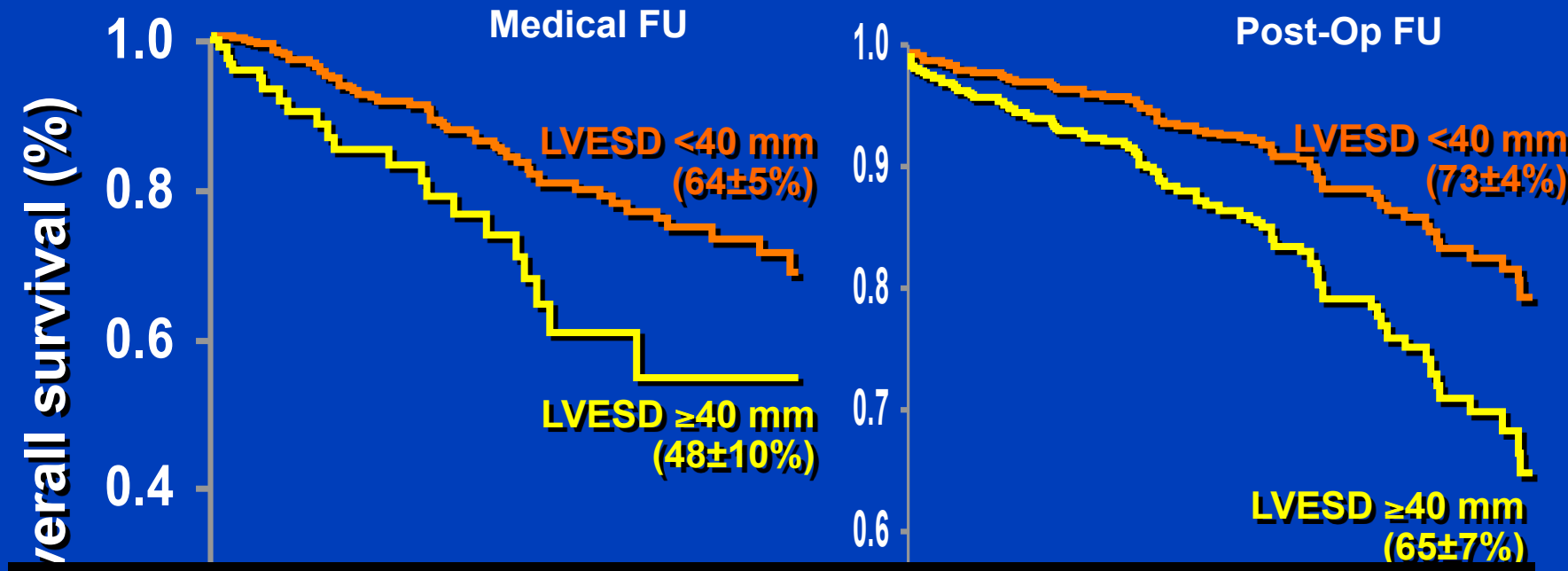
Methods The MIDA (Mitral Regurgitation International Database) registry is a multicenter registry of echocardiographically diagnosed organic MR due to flail leaflets. We enrolled 739 patients with MR due to flail leaflets (age 65 ± 12 years; ejection fraction: 65 ± 10%) in whom LVESD was measured (36 ± 7 mm).

Results Under conservative management, 10-year survival and survival free of cardiac death were higher with LVESD <40 mm versus ≥40 mm (64 ± 5% vs. 48 ± 10%; $p < 0.001$, and 73 ± 5% vs. 63 ± 10%; $p = 0.001$). LVESD ≥40 mm independently predicted overall mortality (hazard ratio [HR]: 1.95, 95% confidence interval [CI]: 1.01 to 3.83) and cardiac mortality (HR: 3.09, 95% CI: 1.35 to 7.09) under conservative management. Mortality risk increased linearly with LVESD >40 mm (HR: 1.15, 95% CI: 1.04 to 1.27 per 1-mm increment). During the entire follow-up (including post-surgical), LVESD ≥40 mm independently predicted overall mortality (HR: 1.86, 95% CI: 1.24 to 2.80) and cardiac mortality (HR: 2.14, 95% CI: 1.29 to 3.56), due to persistence of excess mortality in patients with LVESD ≥40 mm after surgery (HR: 1.86, 95% CI: 1.11 to 3.15 for overall death, and HR: 1.81, 95% CI: 1.05 to 3.54 for cardiac death).

Conclusions In MR due to flail leaflets, LVESD ≥40 mm is independently associated with increased mortality under medical management but also after mitral surgery. These findings support prompt surgical rescue in patients with LVESD ≥40 mm but also suggest that best preservation of survival is achieved in patients operated before LVESD reaches 40 mm. (J Am Coll Cardiol 2009;54:1961–8) © 2009 by the American College of Cardiology Foundation

MR due to Flail Leaflets

Long-term survival according to LV-ESD



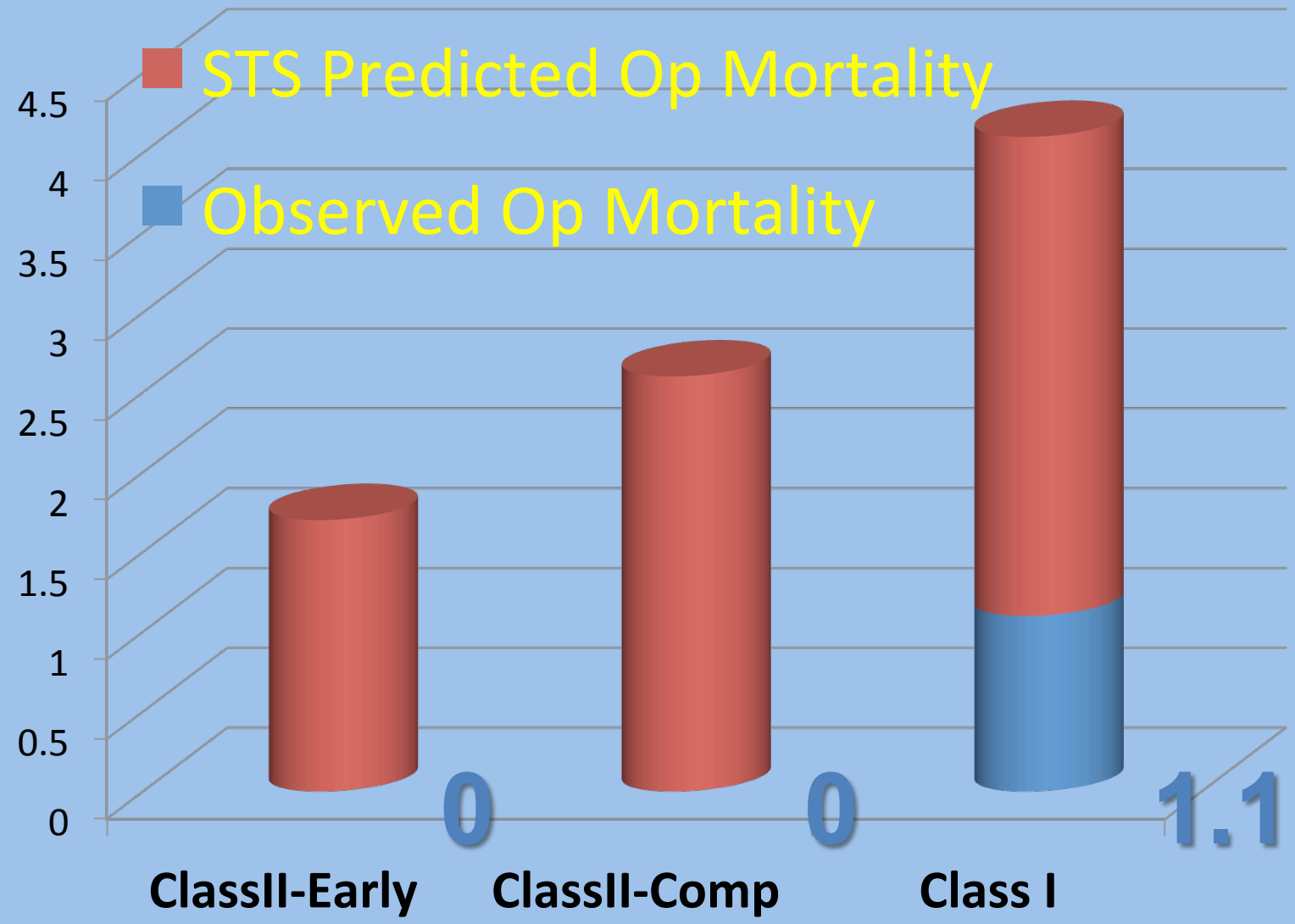
Waiting for LVS ≥40 mm is causing excess mortality even after surgery

330972-1

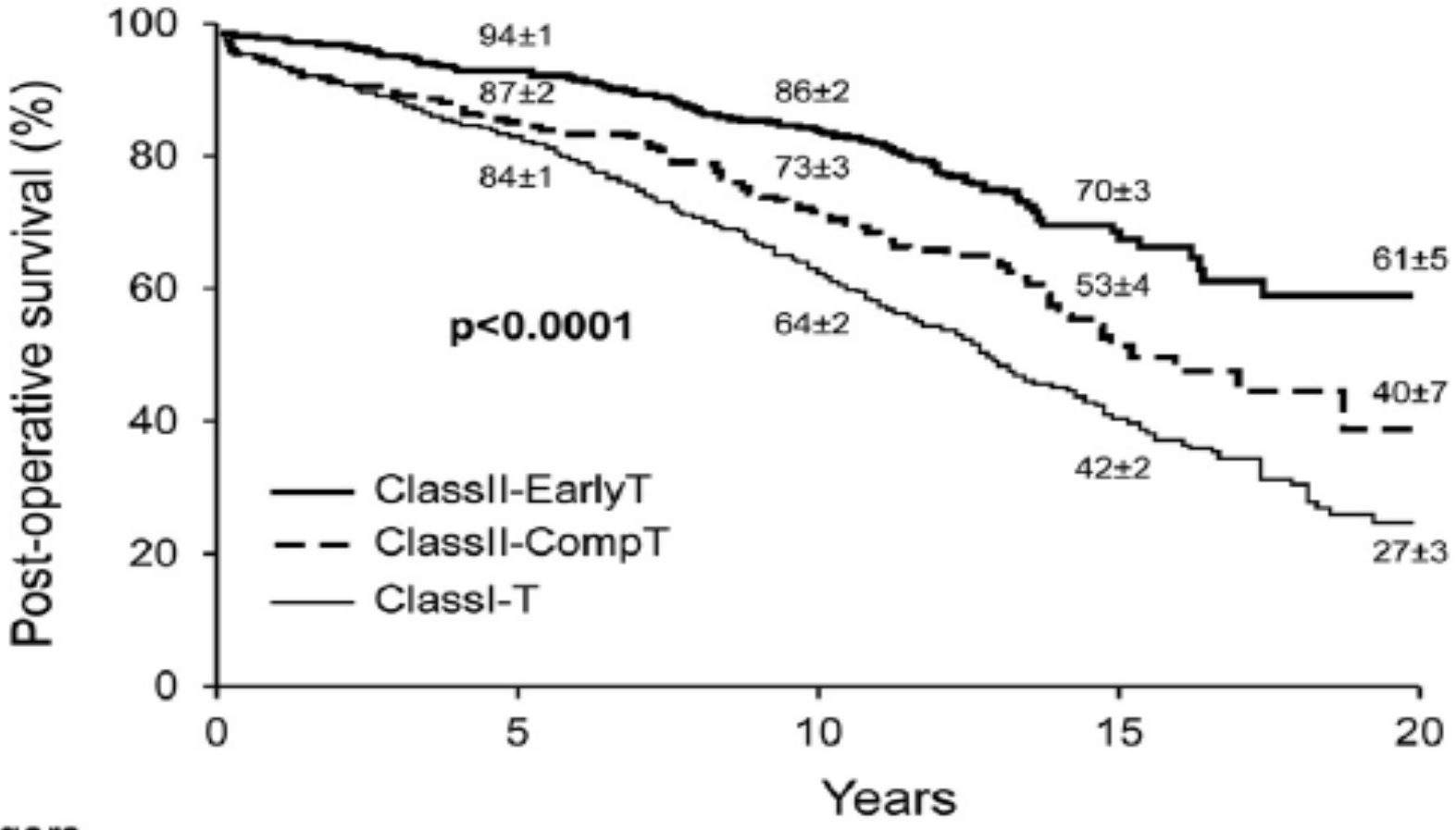
Most data regarding the outcome implications of mitral surgical indications are based on patients operated in the 1980s with a high proportion of valve replacement

Is it true that waiting for guideline-based indications leads to poor outcomes in the repair era?

Operative Mortality



Long-term survival



Triggers					
ClassII-EarlyT	523	488	403	68	6
ClassII-CompT	195	168	127	38	3
ClassI-T	794	664	461	135	13

Mitral Regurgitation

Surgical Treatment ?

MR

Symptoms
LV Dysfunction
AF/PHTN

Rescue Surgery
Relieves pts but poor outcome

Early Surgery

Restorative Surgery
No relief but restores life expectancy

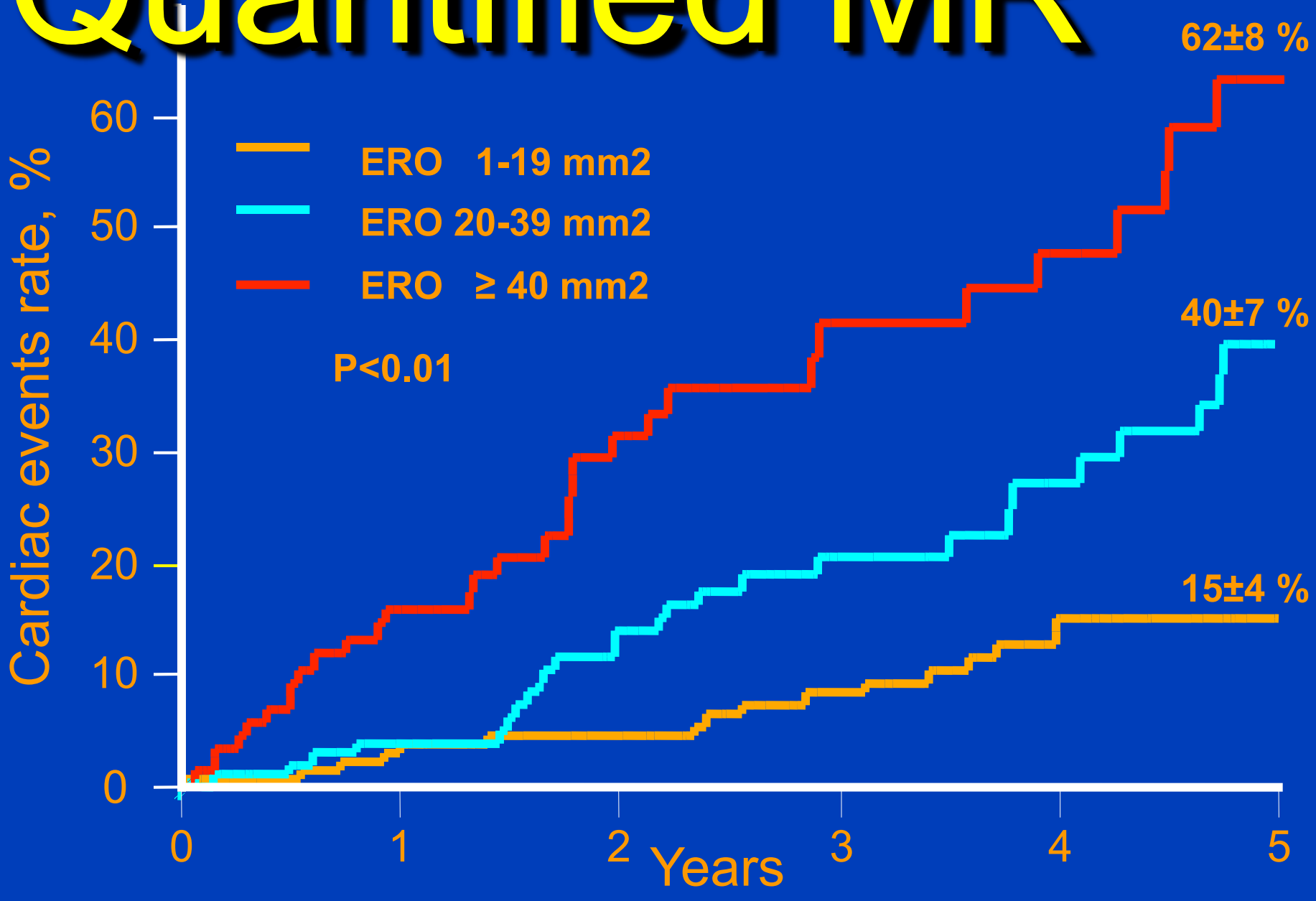
We should do:

- MR Rescue Surgery when we have to

- MR Early Surgery with objective risk-markers

1-MR Severity

Quantified MR



Mitral Regurgitation

Grading of Severity

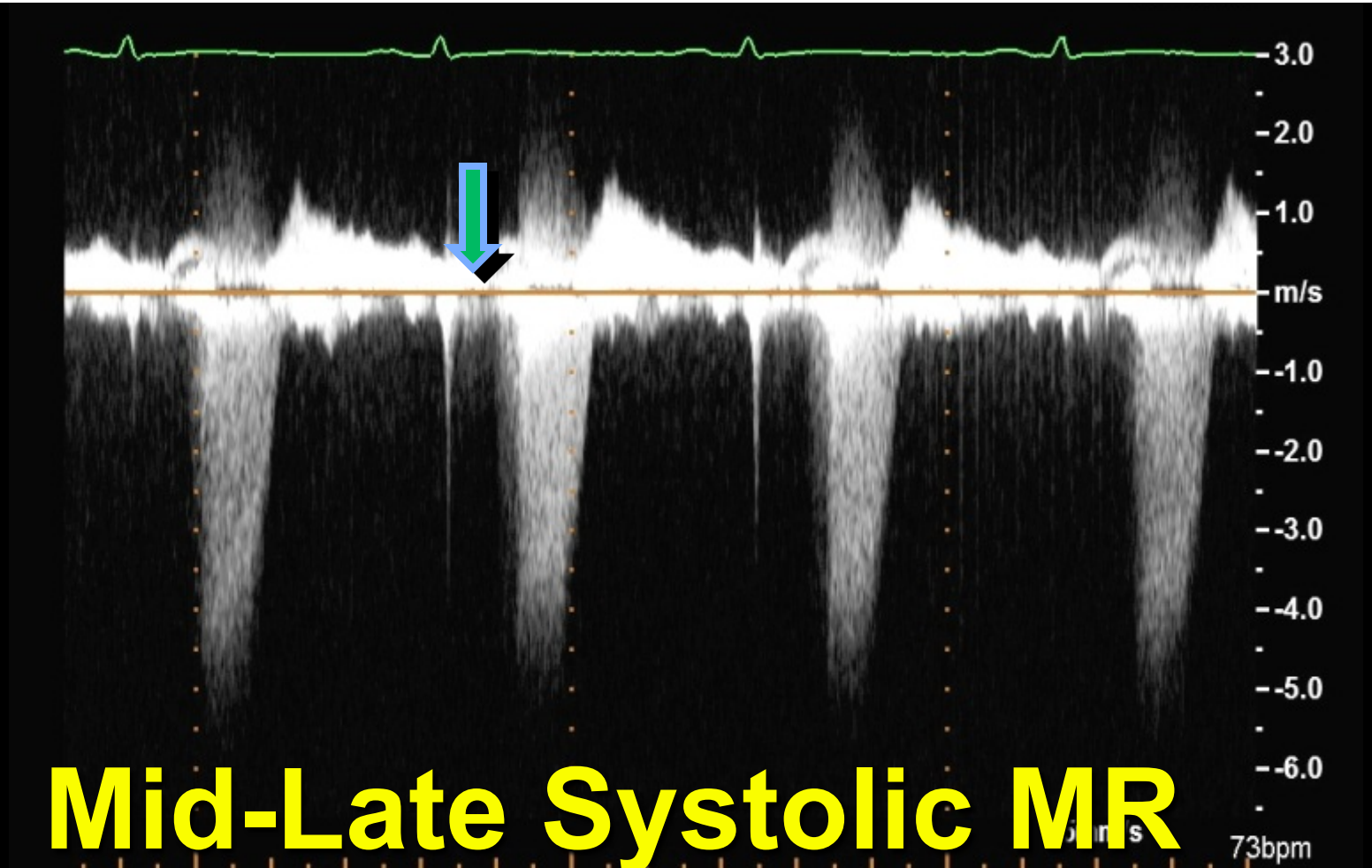
ASE Grade		RVol (mL)	ERO (mm^2)
Mild	Grade I	<30	<20
Moderate	Grade II	30-44	20-29
Moderate	Grade III	45-59	30-39
Severe	Grade IV	≥60	≥40

Excess risk with ERO≥0.40 cm2 is relieved by surgical repair

Mitral Valve Prolapse With Mid-Late Systolic Mitral Regurgitation

Pitfalls of Evaluation and Clinical Outcome Compared With Holosystolic Regurgitation

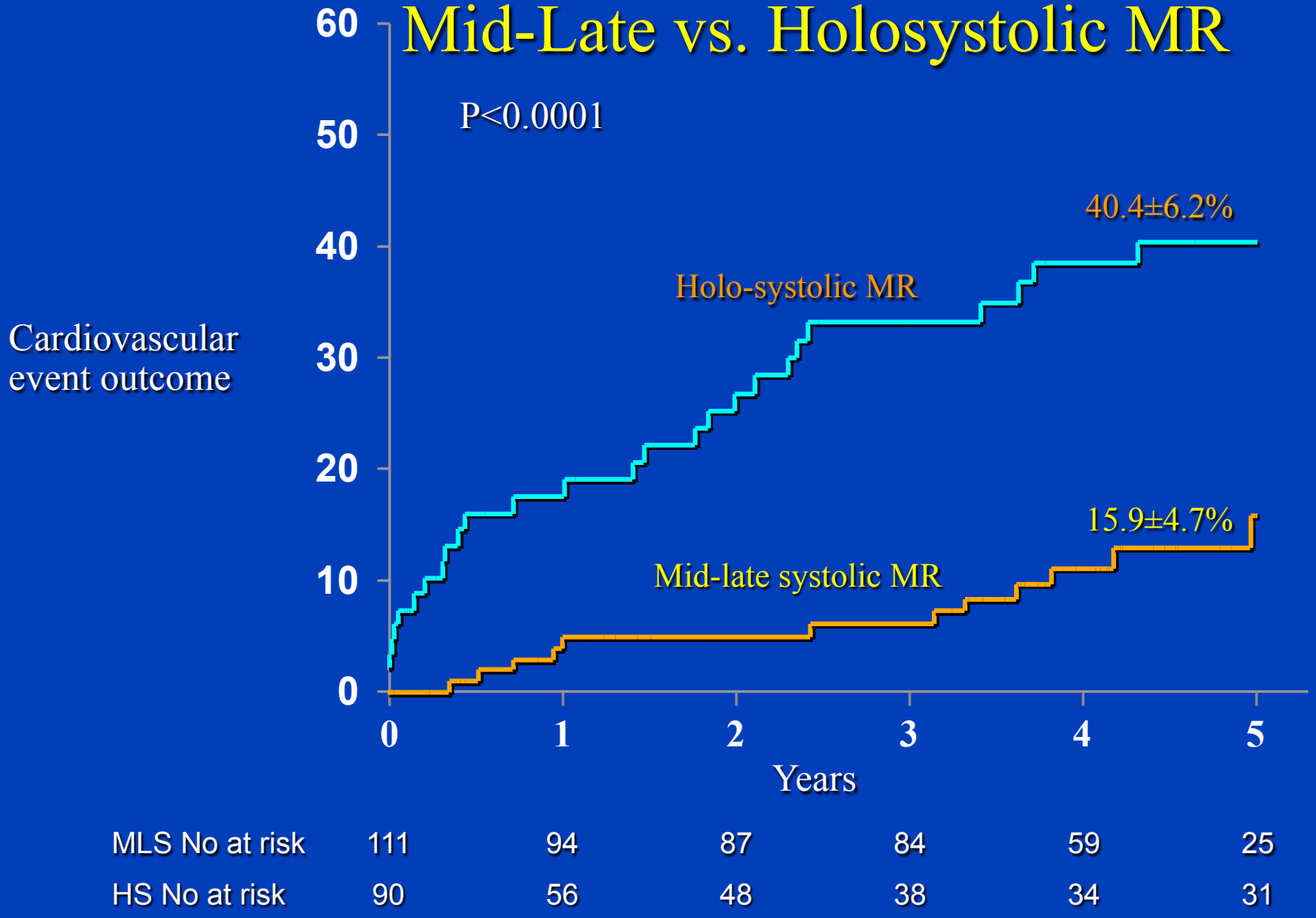
Yan Topilsky, MD; Hector Michelena, MD; Valentina Bichara, MD; Joseph Maalouf, MD; Douglas W. Mahoney, MS; Maurice Enriquez-Sarano, MD



Mid-Late Systolic MR

Clinical Outcome

Mid-Late vs. Holosystolic MR

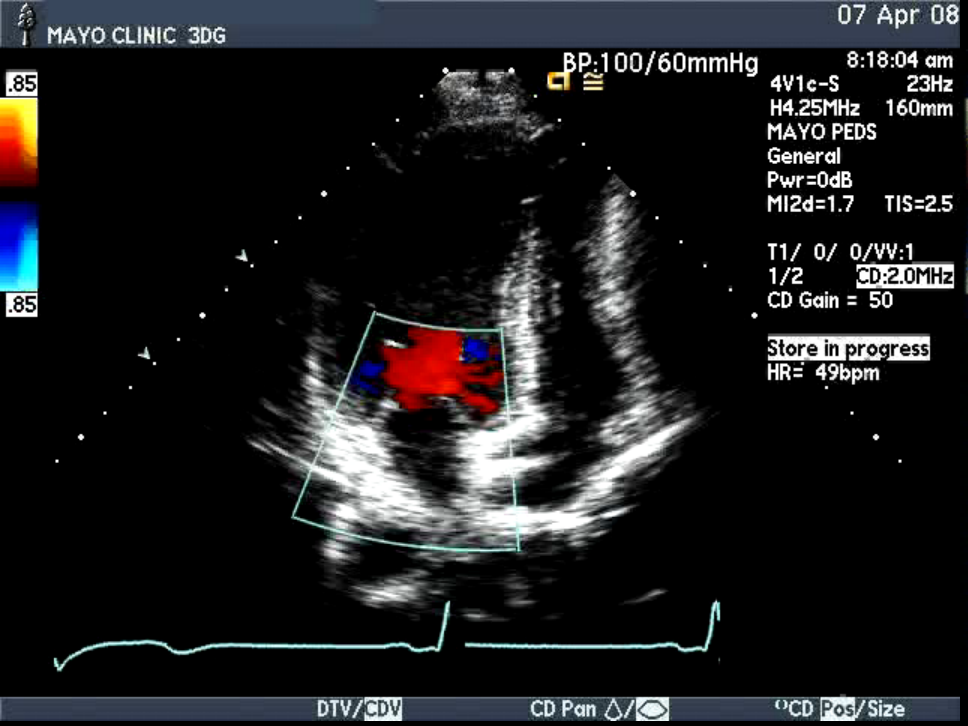


MLS No at risk	111	94	87	84	59	25
HS No at risk	90	56	48	38	34	31

We should do:

- MR Rescue Surgery when we have to
- MR Early Surgery with objective risk-markers

2-Left Atrium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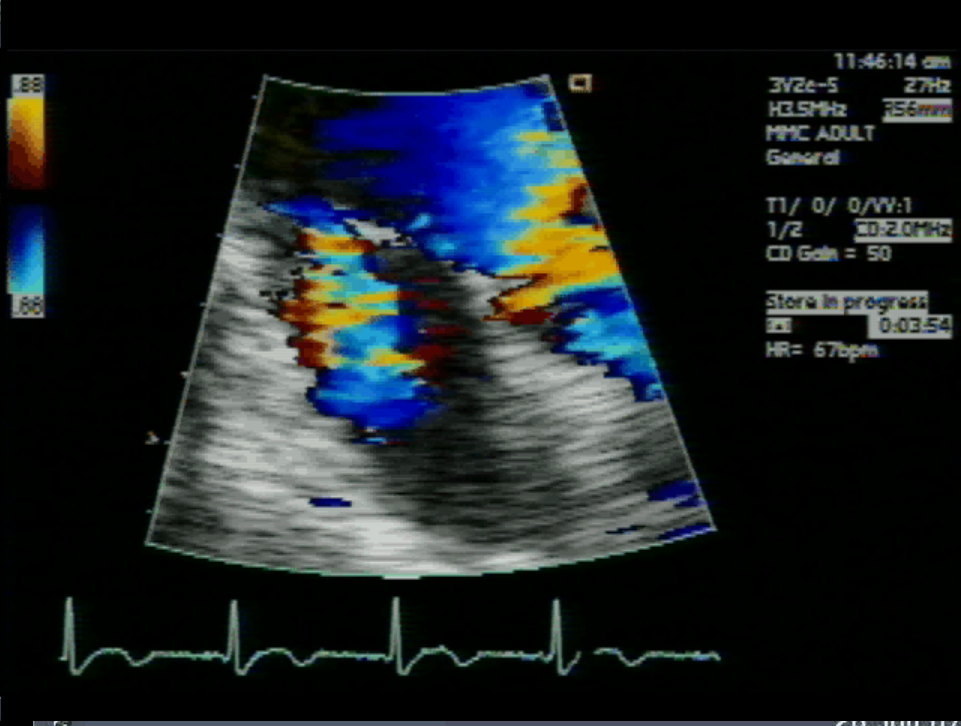
H4.25MHz 160mm
MAYO PEDS
General
Pwr=0dB
MI2d=1.7 TIS=2.5
T1/ 0/ 0/VV:1
1/2 CD:2.0MHz
CD Gain = 50
Store in progress
HR= 49bpm
.85
.85
DTV/CDV
CD Pan
CD Pos/Size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3V2c-S 27Hz
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General
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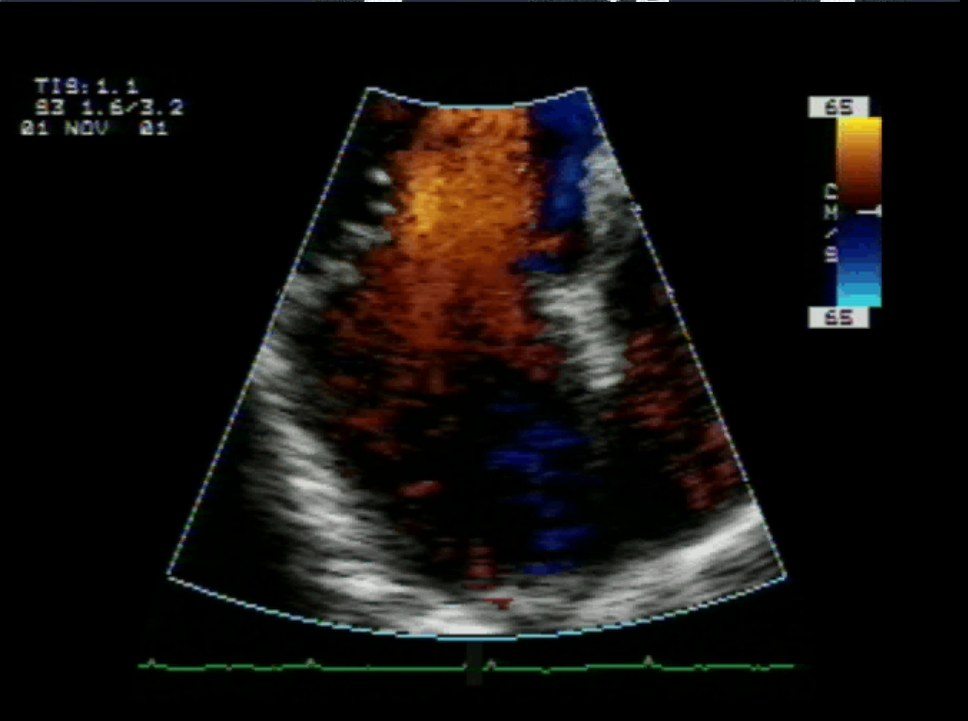
HR= 67bpm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@1 NOV @1
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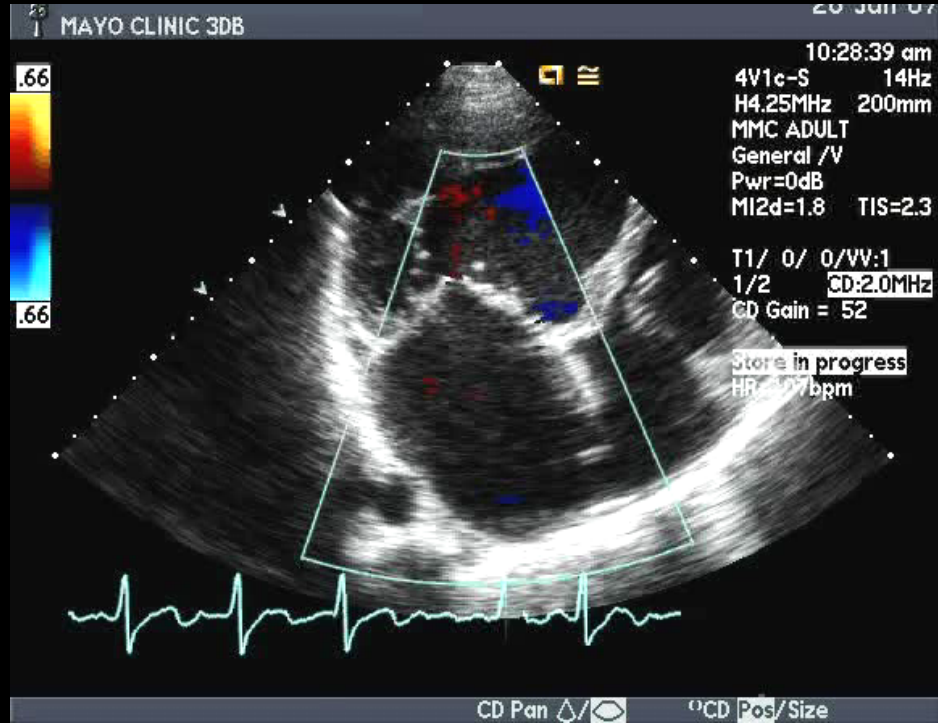
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4V1c-S 14Hz
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General /V
Pwr=0dB
MI2d=1.8 TIS=2.3
T1/ 0/ 0/VV:1
1/2 CD:2.0MHz
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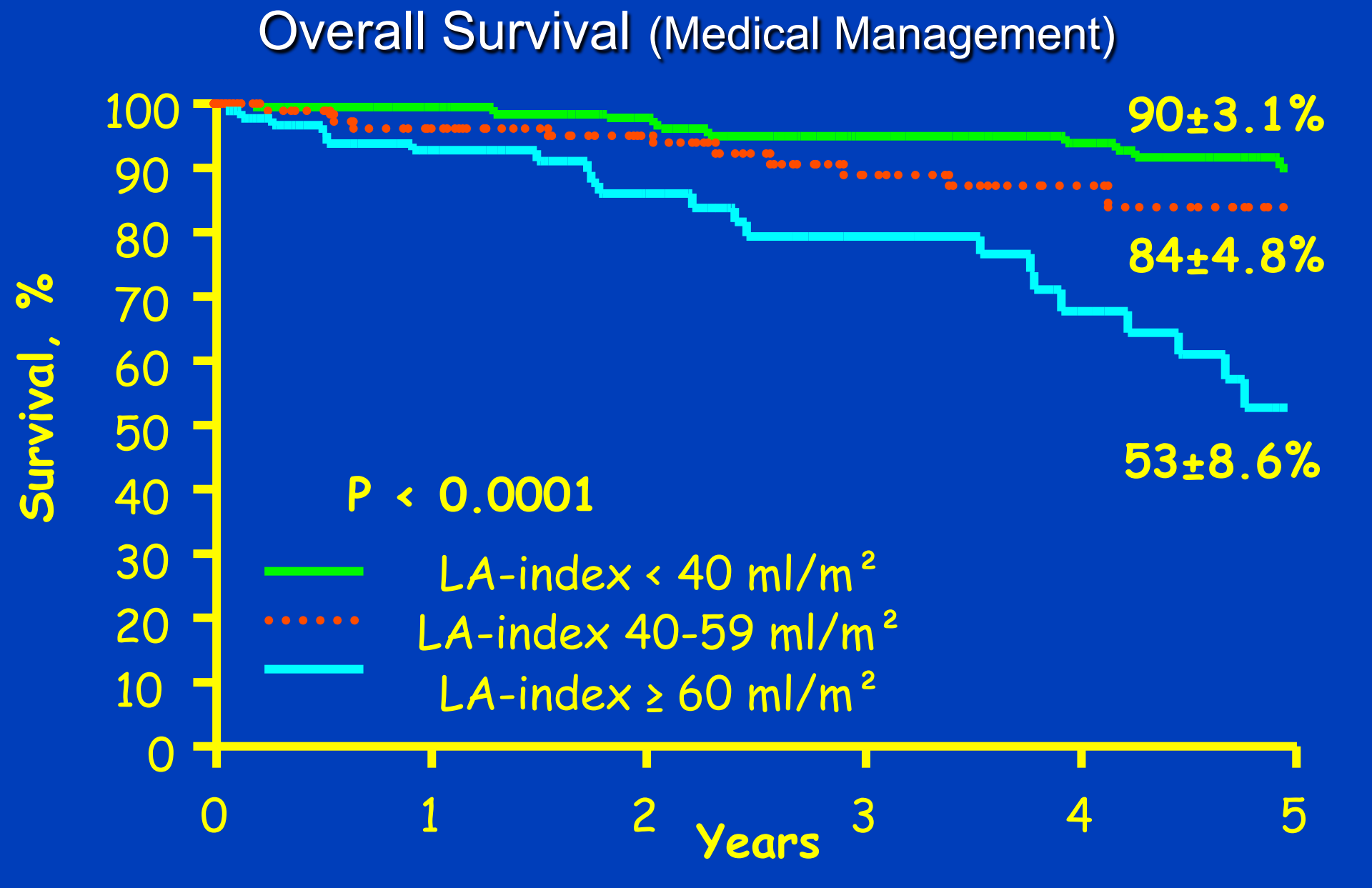
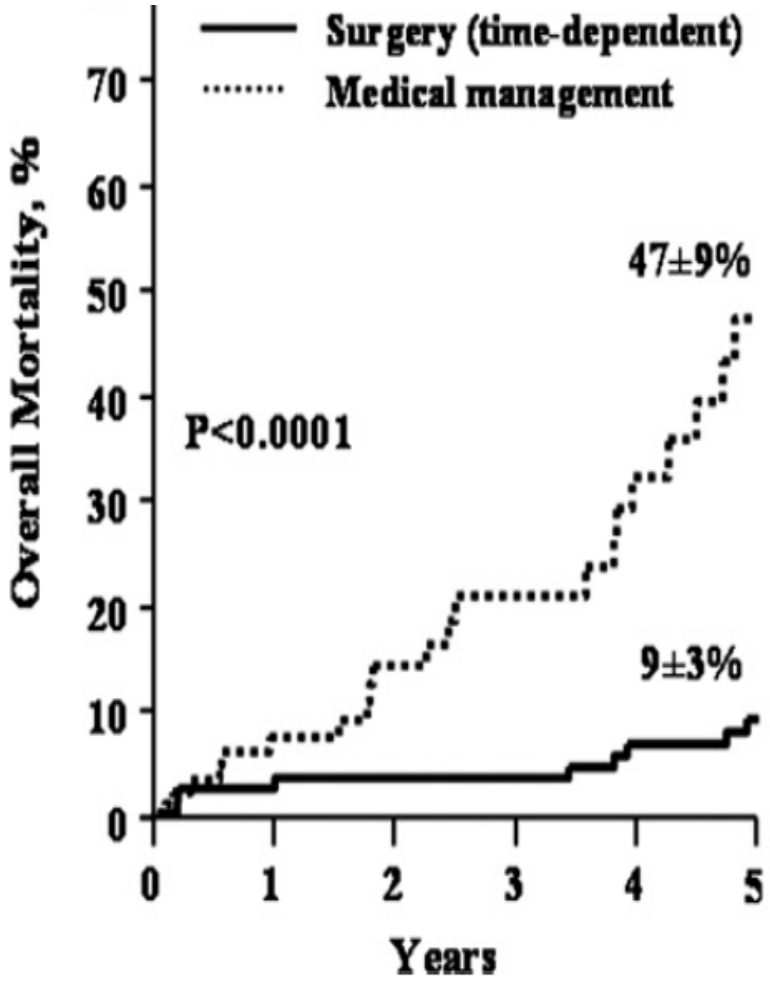
Left Atrium in MR

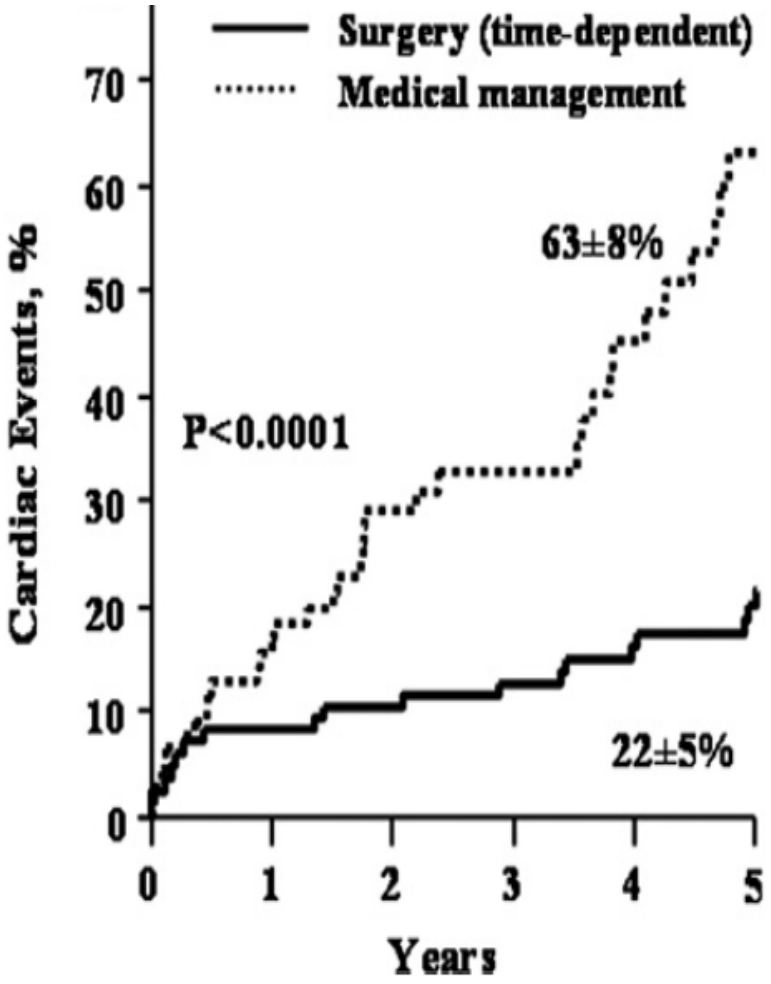


Surgery Eliminates the risk associated with markedly enlarged LA (≥60 mL/m2)

Mortality



Cardiac Events



Outcome in Patients With Markedly Enlarged LA Compared Between Surgical and Medical Management

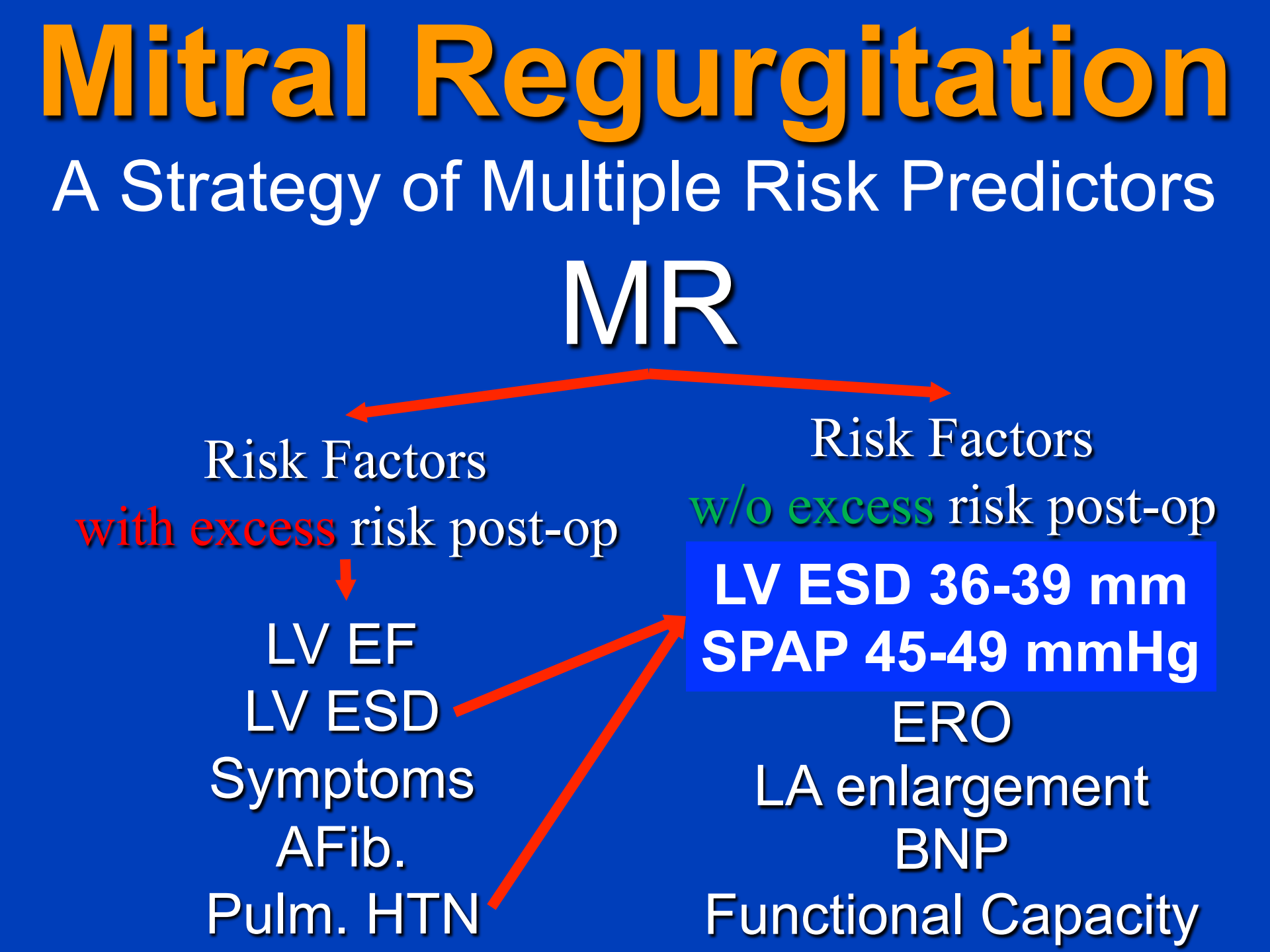
MR Evaluation

3-Other predictors?

- SPAP
- BNP
- Ex testing

Mitral Regurgitation

A Strategy of Multiple Risk Predictors



MR Management

Early Surgery beneficial ?

Asymptomatic MR

*Offer **Early Surgery** to asymptomatic MR patients in Advanced repair centers:*

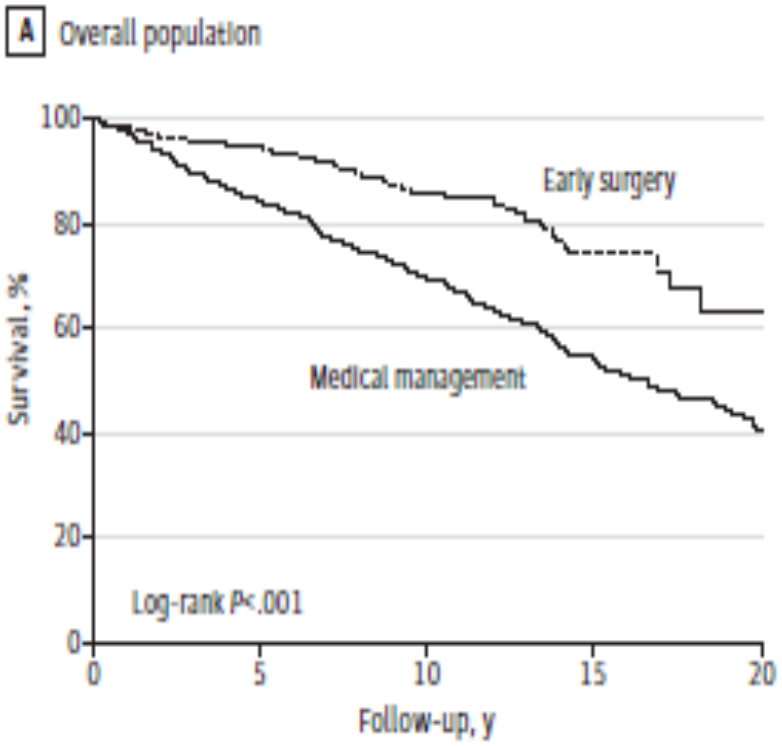
- *Low risk*
- *Excellent Doppler-Echo*
- *High repair rates*
- *High repair quality*

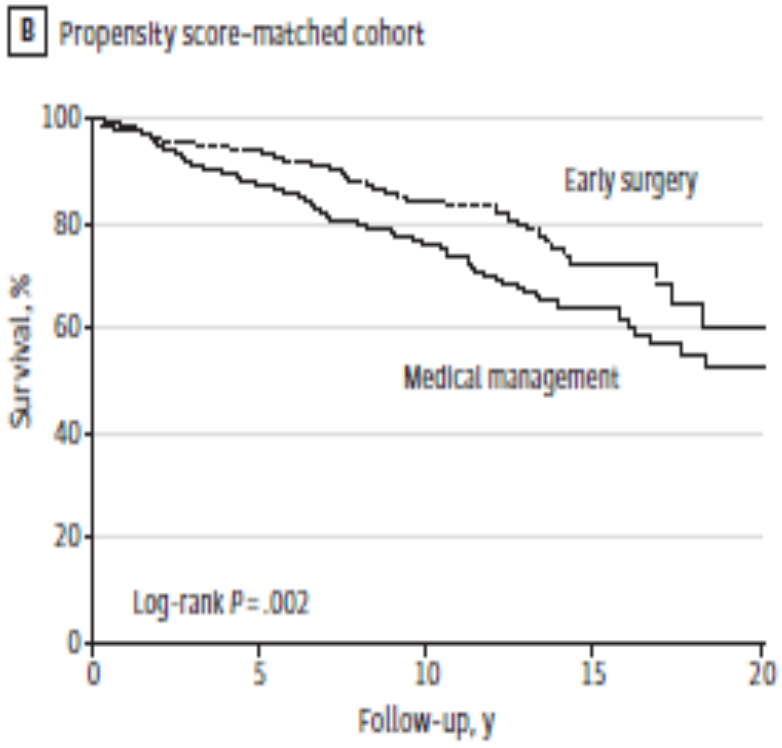
MR due to Flail leaflets: Early surgery candidates

No Heart failure symptoms, EF≥60, LVS<40mm

RR 0.55 0.52

Figure 1. Survival After Diagnosis of Mitral Regurgitation Due to Flail Mitral Leaflet According to Initial Treatment Strategy





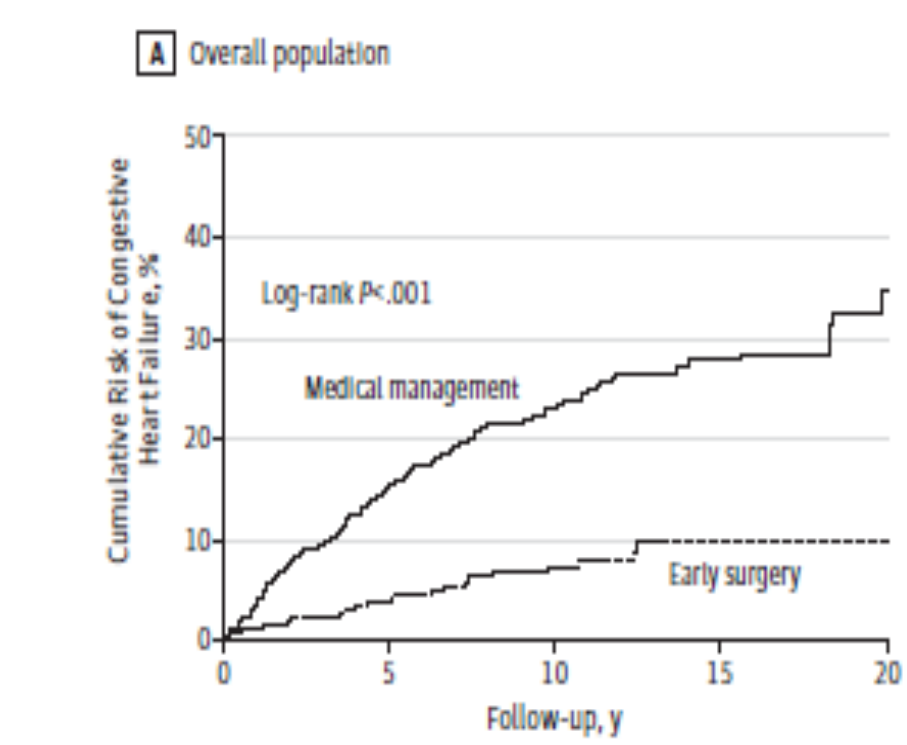
No. at risk					
Medical management	575	477	296	126	42
Early surgery	446	412	203	41	10
	324	276	157	53	8
	324	295	160	35	10

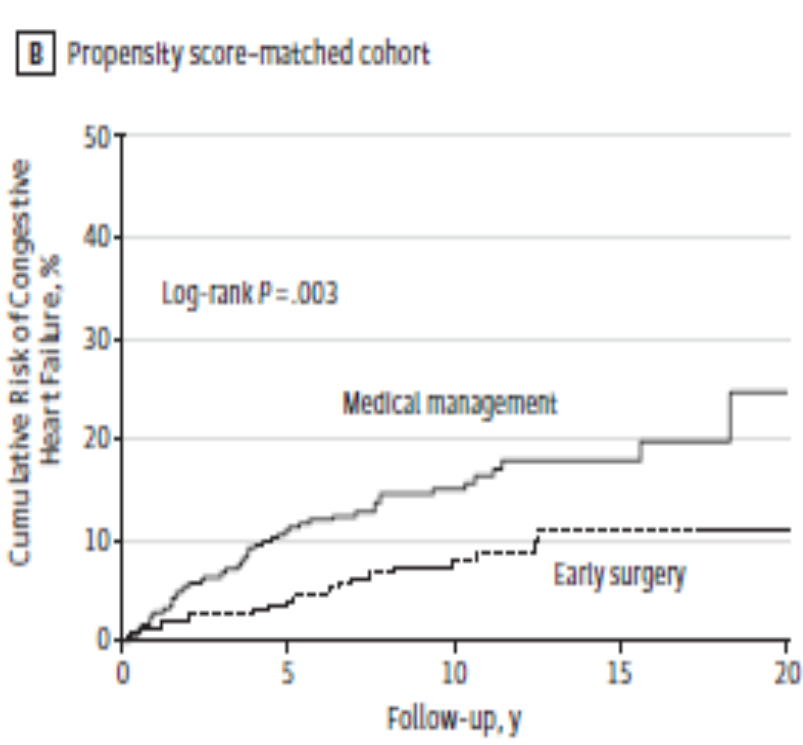
MR due to Flail leaflets: Early surgery candidates

No Heart failure symptoms, EF≥60, LVS<40mm

RR 0.29 0.44

Figure 2. Heart Failure Incidence After Diagnosis of Mitral Regurgitation Due to Flail Mitral Leaflet According to Initial Treatment Strategy





No. at risk					
Medical management	575	419	249	100	27
Early surgery	446	399	189	37	9
	324	253	142	48	3
	324	289	149	31	9

Long-term heart failure risk following early surgery vs initial medical management overall (A) and in the propensity score–matched cohort (B).

Organic MR

MR Evaluation

No Risk-Factor

HF Symptoms
LV Dysfunction
AF
PHTN

- *LA ≥ 60 mL/m2*
- *LVS 36-39 mm*
- *SPAP 45-49 mmHg*
- *BNP activation*
- *Reduced FC*
- *ERO ≥ 40 mm2*

Surgery Delayed
FU frequent

Rescue Surgery

Early Surgery

MR Evaluation for therapeutic strategy

- Comprehensive assessment of lesions
- Comprehensive LV, hemodynamic and LA assessment: direct MR consequences
-BNP and exercise testing: Physiologic MR consequences
- MR Quantitation should be the rule: It defines superiorly severity, outcome and strategy for surgery/intervention

Mitral Regurgitation

Which of these circumstances does not represent a high-risk MR:

-MVP with MR and LA volume 60 mL/m2

-MVP with mid-late systolic MR and ERO 60 mm2

-Bileaflet prolapse with regurgitant volume 60 mL

-MVP-MR with end-systolic LV dimension 42 mm

-MVP holosystolic MR and EF 56%

Mitral Regurgitation

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THANK
YOU