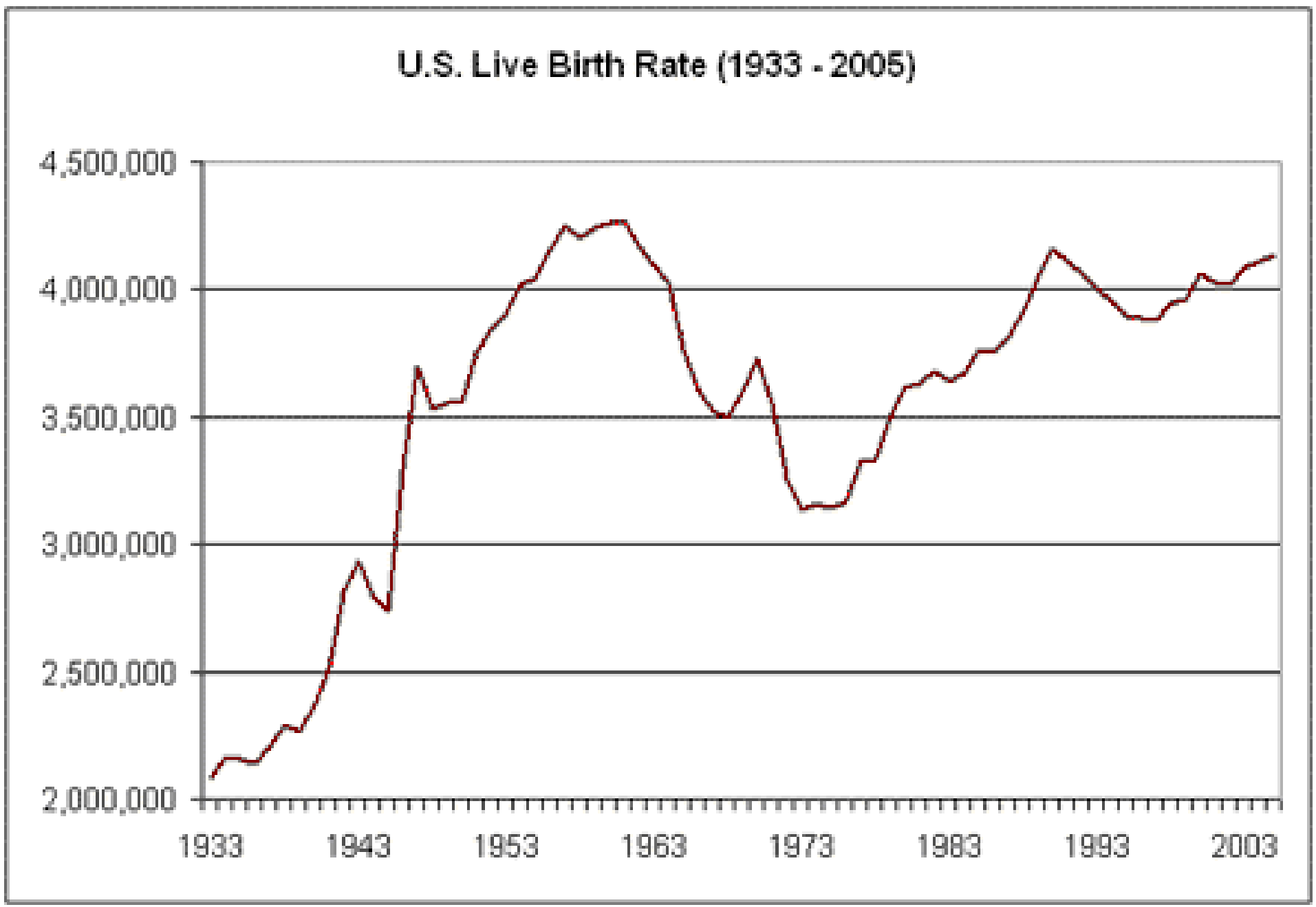
Update on Indications for Valvular Heart Disease Intervention

Chris C. Cook, MD
Assistant Professor of Cardiac Surgery
University of Pittsburgh Medical Center

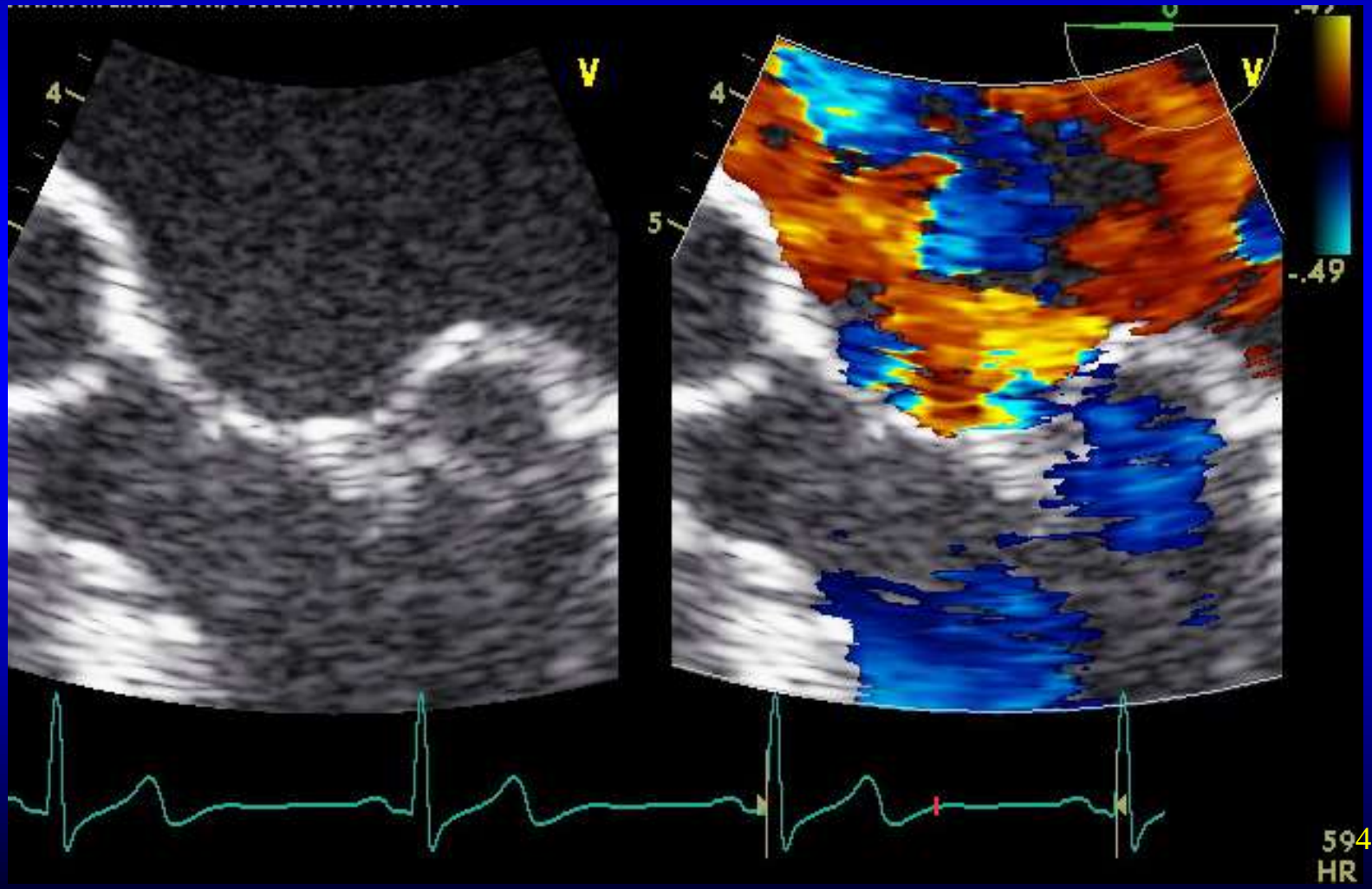


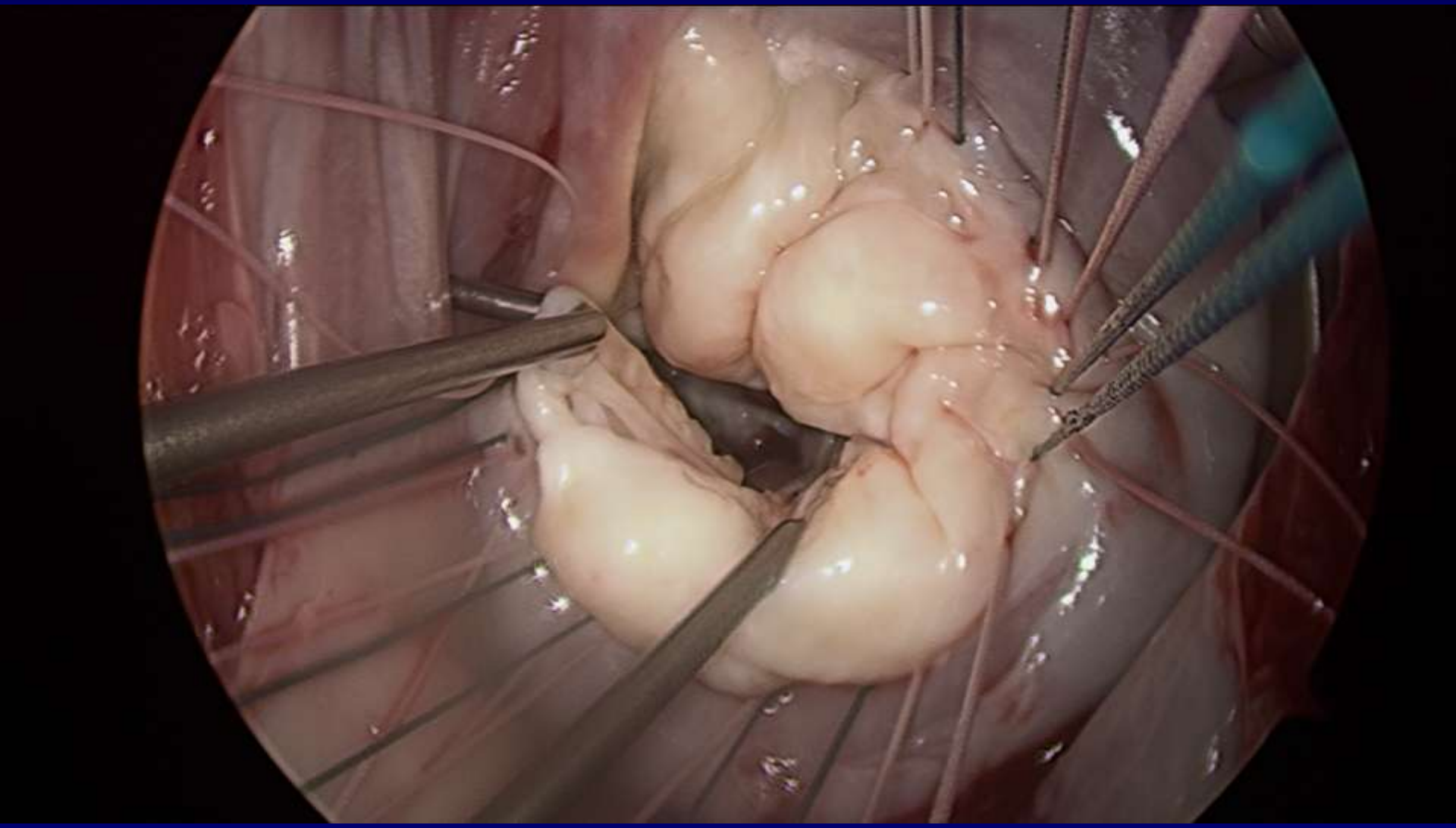
Source: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics

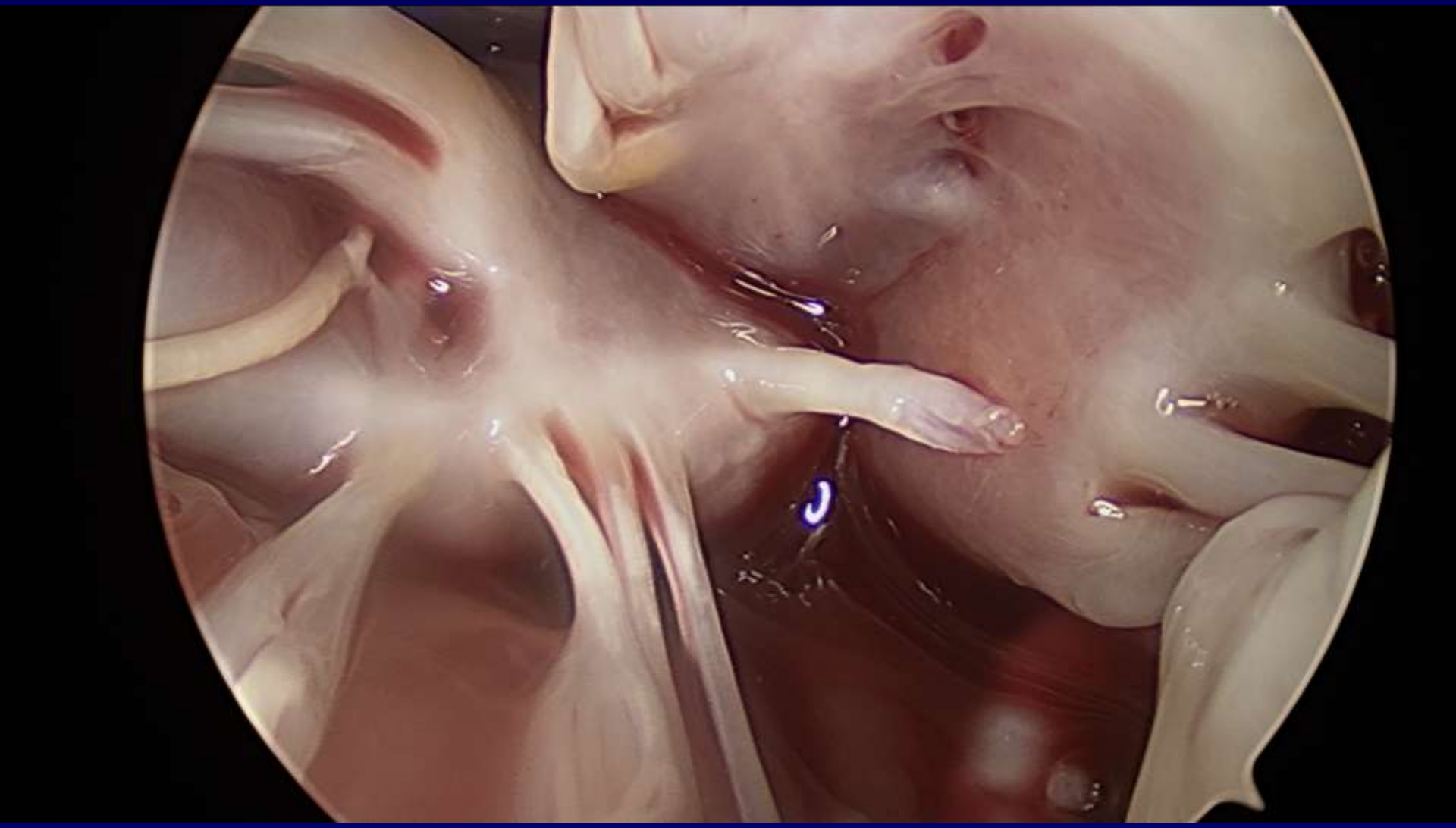
Objectives

- Review changing indications
  - Mitral regurgitation
  - Ischemic MR
  - Tricuspid regurgitation
- Minimally invasive cardiac surgery

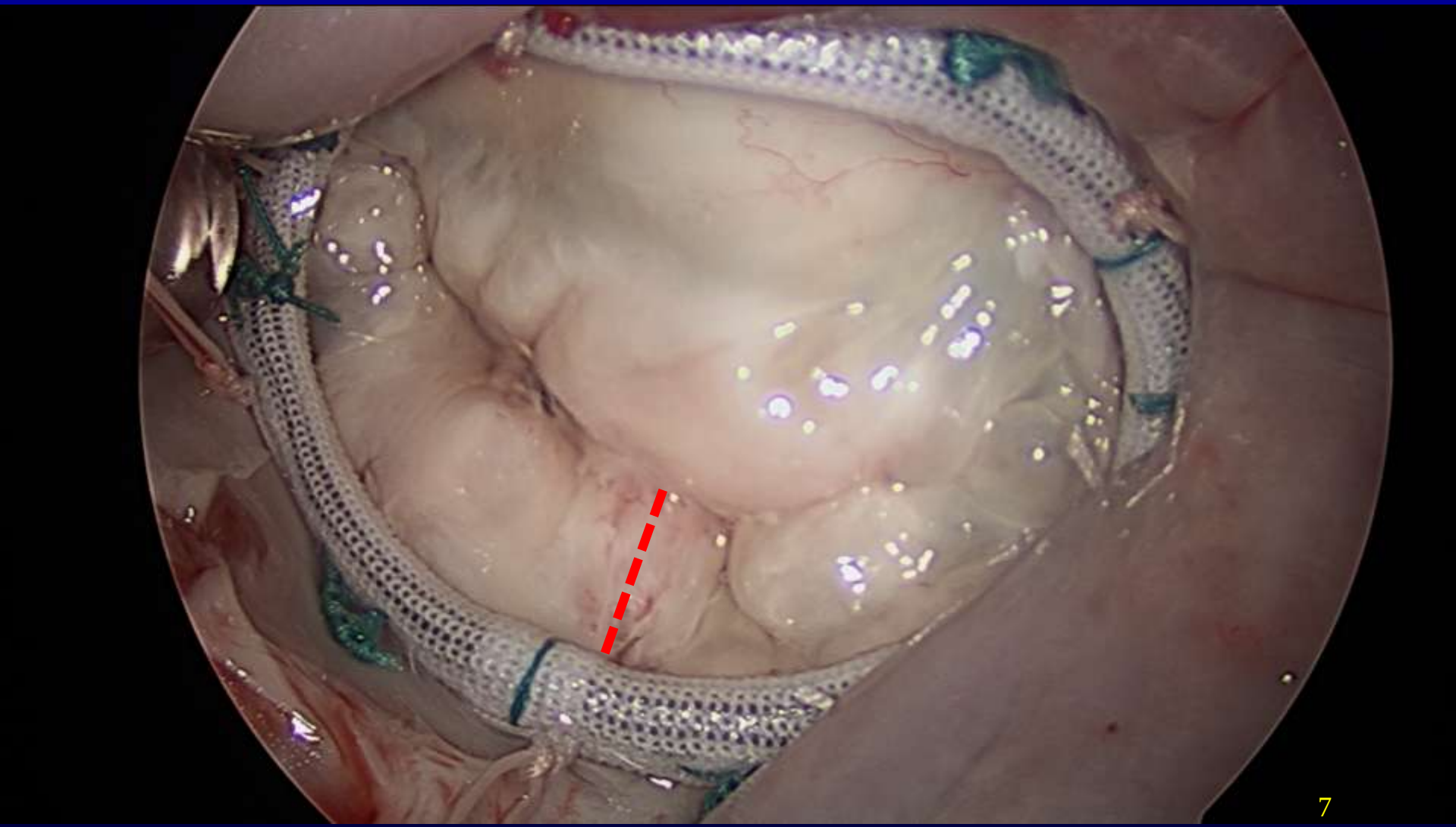
63 yo attorney, mild SOB during cardio workout, nl LV, nl cors, Severe MR







Repair: P2 resection, chordal transfer from P2 to A2, 32mm ring



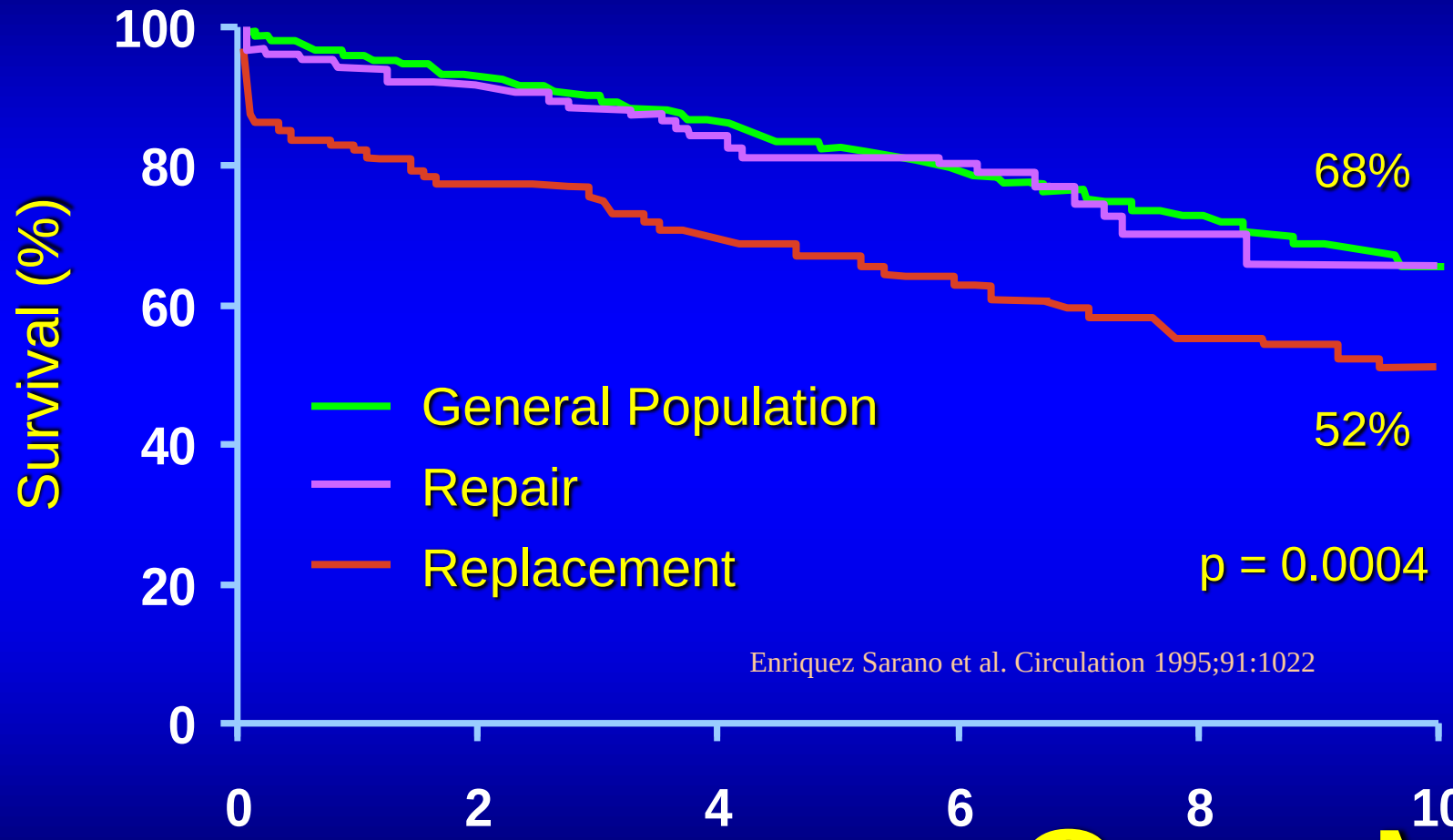
Find MR, Fix MR : But why?

Mitral Valve Repair – 2015

- Preserved LV function
- No anti-coagulation
- Freedom from re-op
- Low early and late mortality

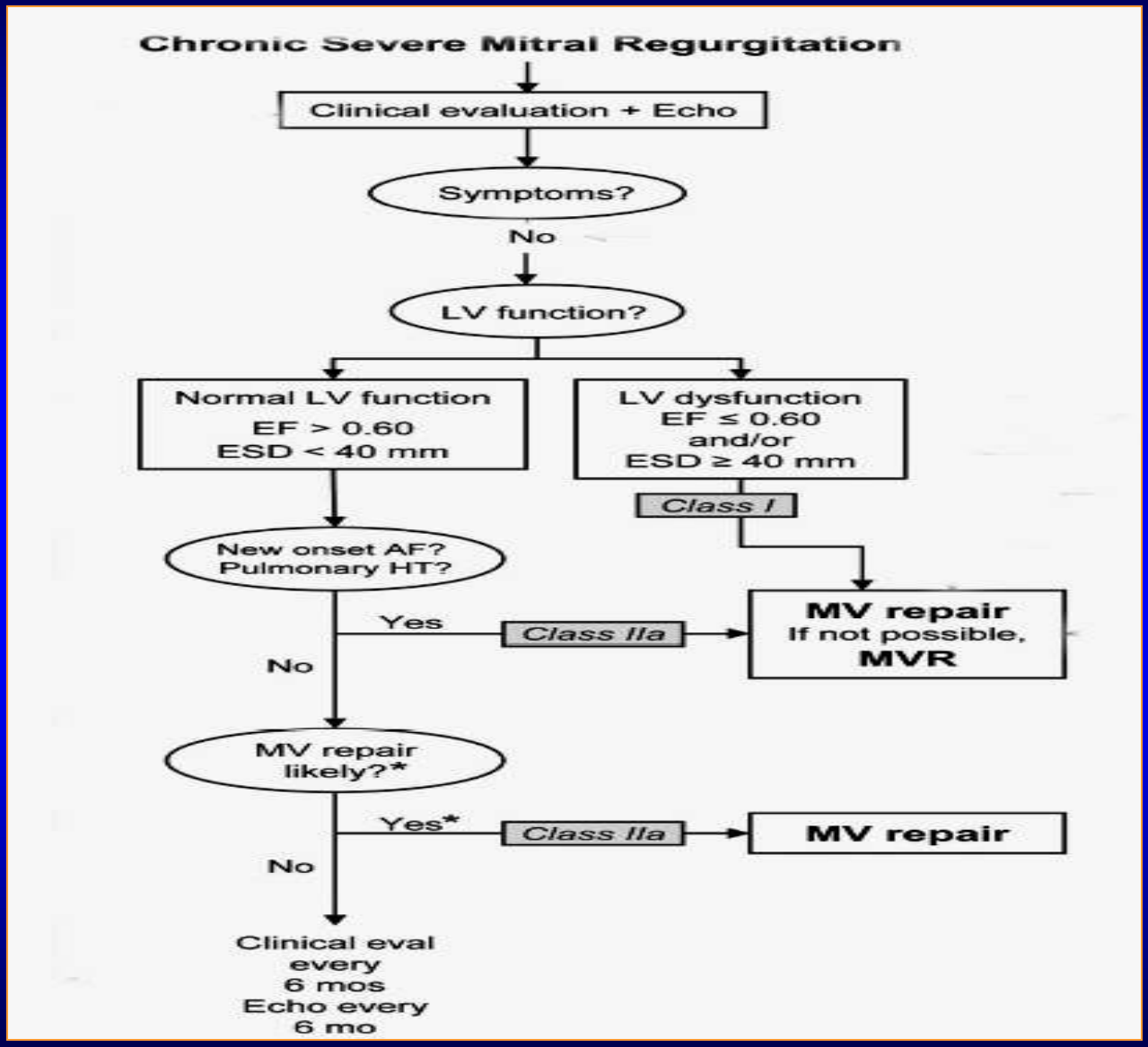
"cure" mitral disease!

Repair MR!

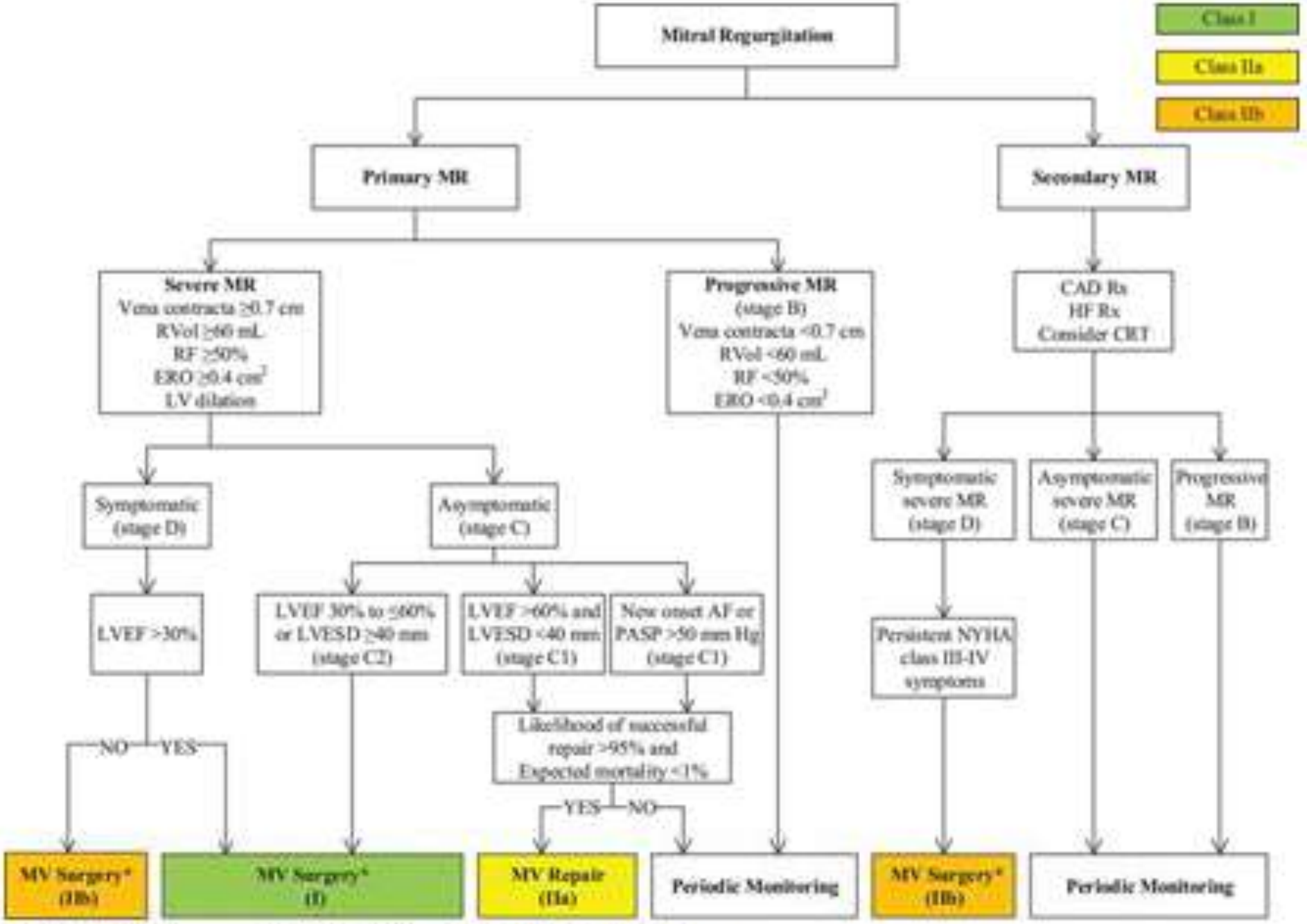


Cure MR!

ACC/AHA referral guidelines: 2006-2013



Bonow et al. Circulation 2006; 114 (5): e84-231.



Rick A. Nishimura et al. Circulation. 2014;129:e521-e643

Severe MR without symptoms does not exist !

Effect of mitral valve repair on exercise tolerance in asymptomatic patients with organic mitral regurgitation

Juraj Madaric, MD,[a] Patrick Watripont, MD
Marc Vanderheyden, MD,[a] Frank Van Praet,
and Bernard De Bruyne, MD, PhD[a] *Aalst,*

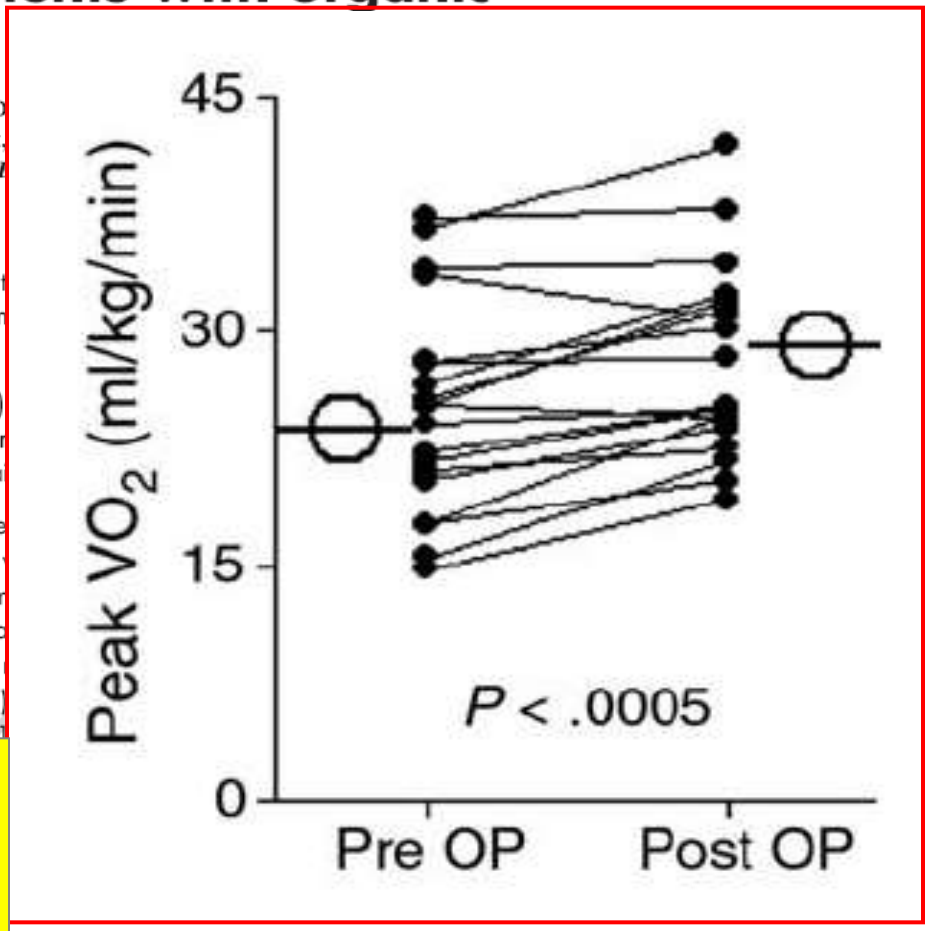
Background The aim of the study was
video-assisted mitral valve repair for organic m

Methods Twenty-six patients (age 54 ± 1
regurgitant orifice [ERO] of 0.73 ± 0.35 cm^2)
underwent exercise echocardiography and car
uncomplicated video-assisted mitral valve repa

Results During exercise, left ventricular eje
did not change significantly. Four months after
peak oxygen uptake (O_2max 23 ± 6-25 ± 7 m
beat, $P < .005$) as well as in maximal workloa
symptoms (New York Heart Association class I,
24 ± 7-27 ± 7 mL · kg^{-1} · min^{-1}, $P < .001$)
induced contractile reserve ($r = 0.72$, $P <$ .000
rest ($r = 0.$

Conclus
successful r
function an

n =19
LVEF > 60%
NYHA class I



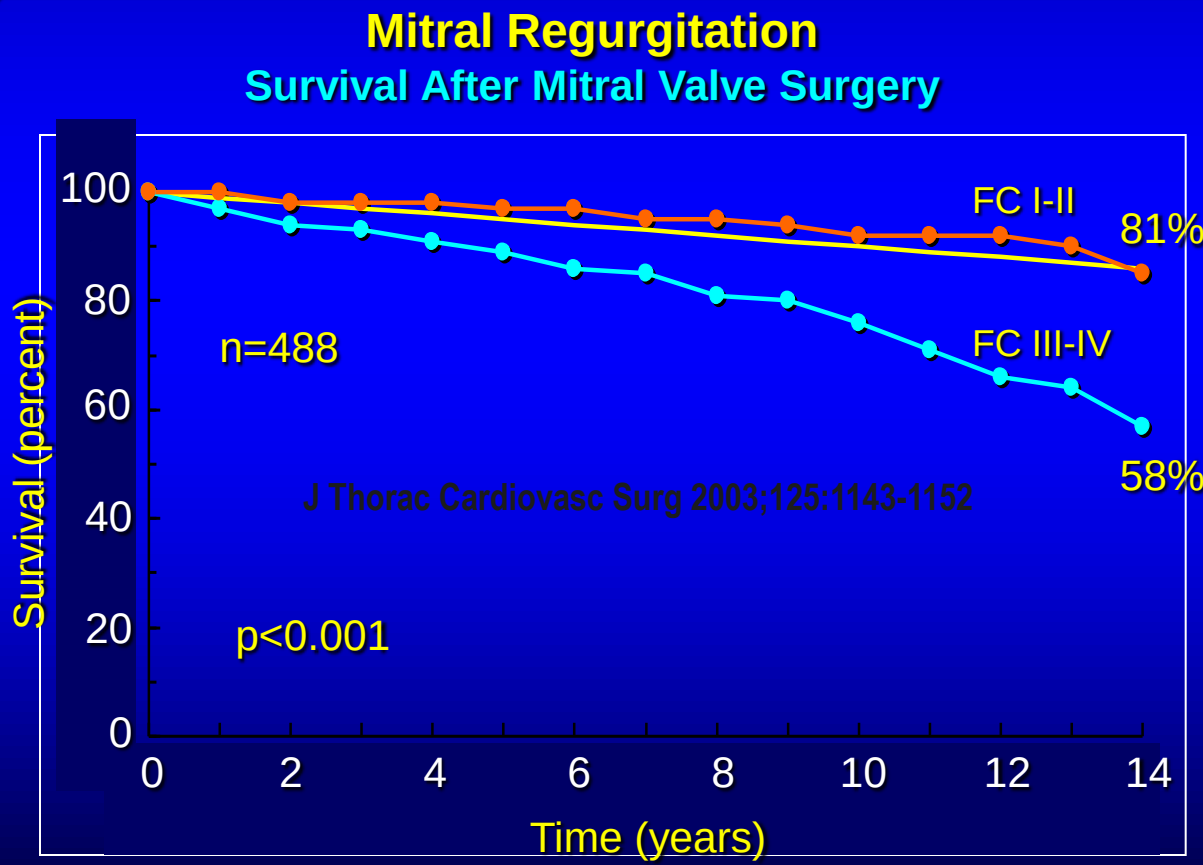
Madaric et al. Am Heart J 2007;154:180

Late outcomes of mitral valve repair for floppy valves: Implications for asymptomatic patients

Tirone E. David, MD
Joan Ivanov, PhD
Susan Armstrong, MSc
Harry Rakowski, MD

Wait for CHF ?
symptoms ?

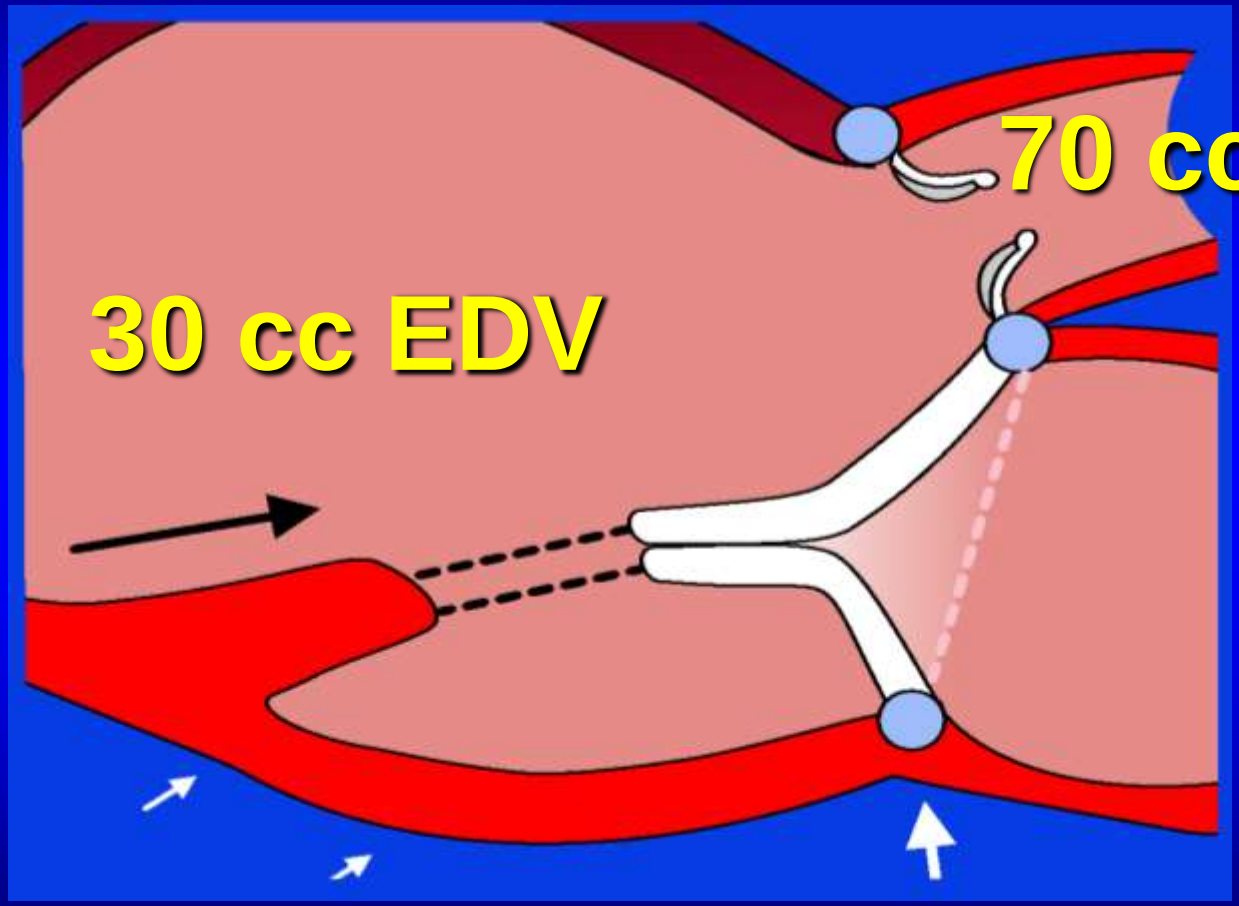
Bad !



David et al, *J Thorac Cardiovasc Surg* 2003;126:1143-1152

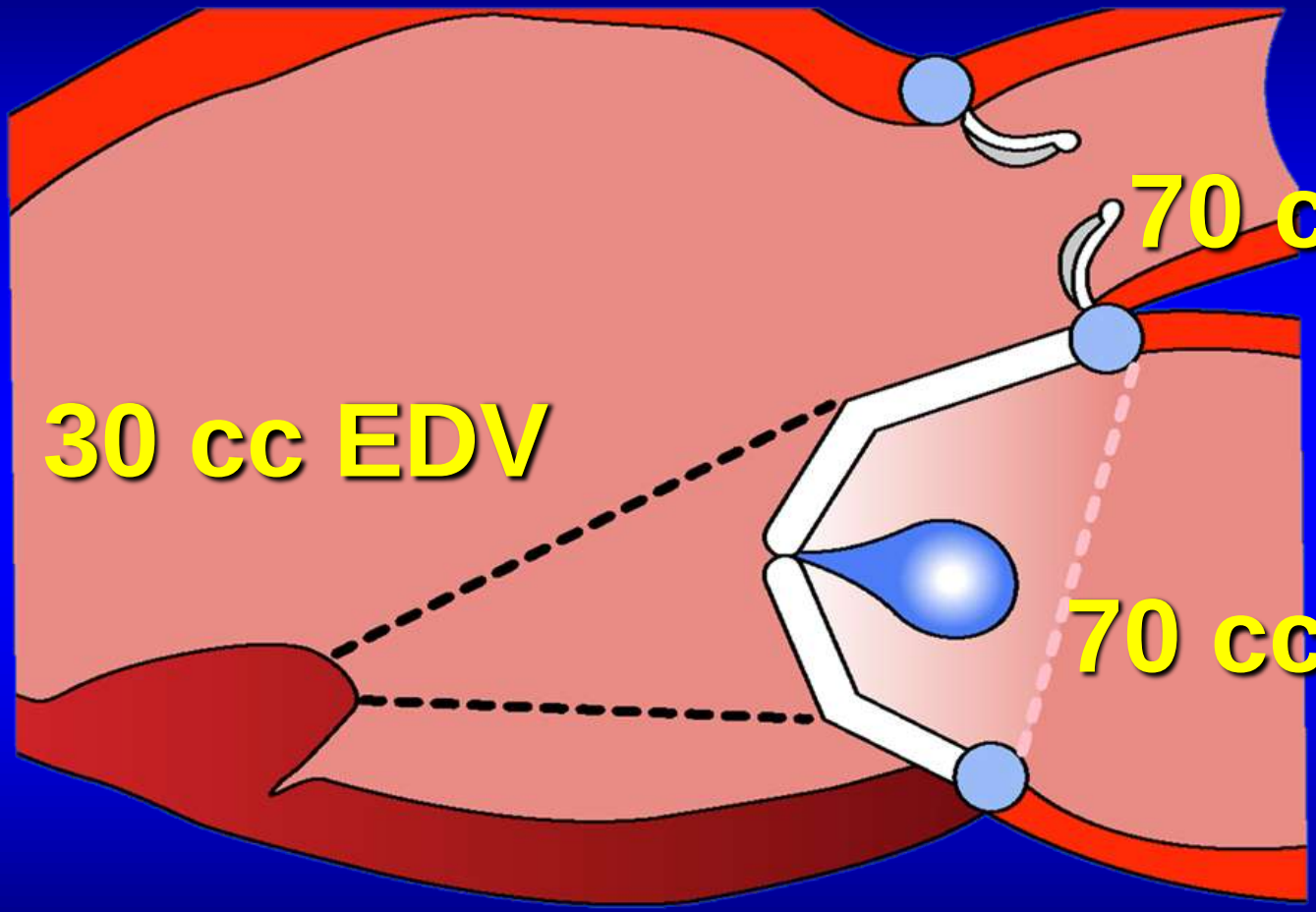
Wait until EF falls ?

Normal EF – No MR



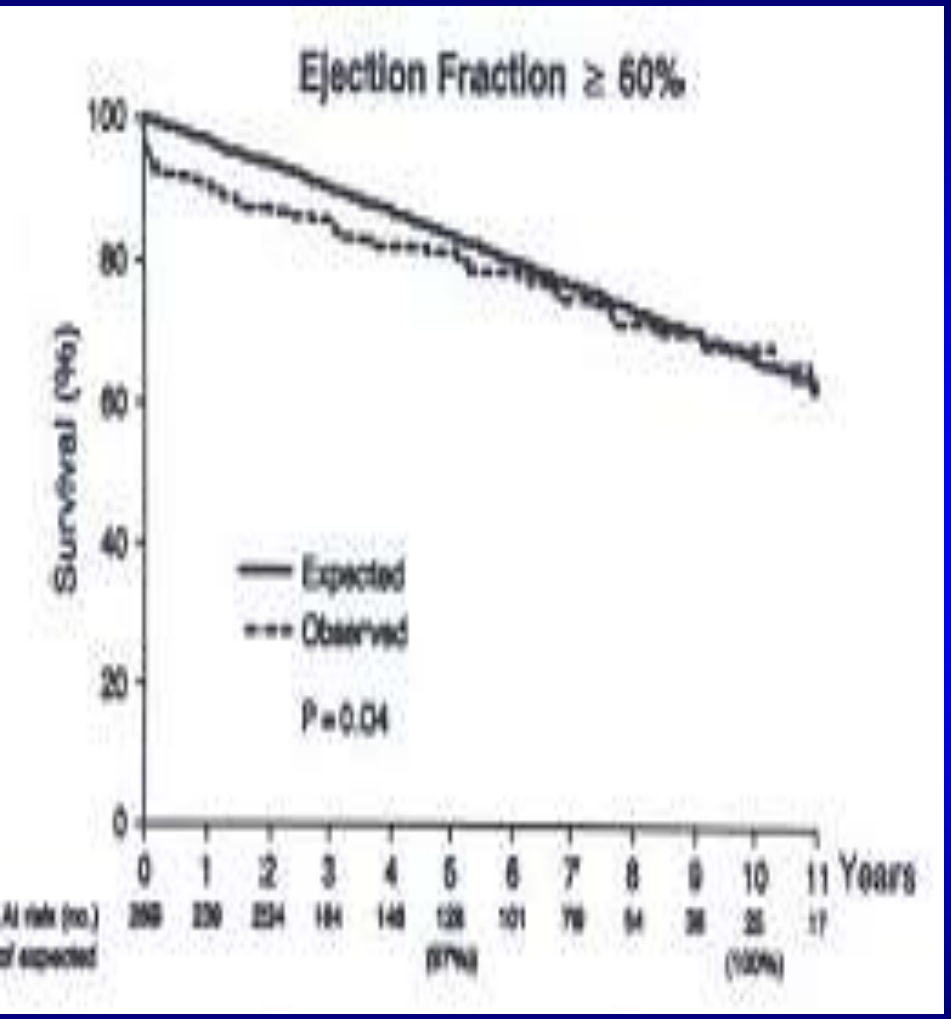
70cc SV / 70cc SV + 30 cc EDV (70/100) = **EF 70 %**

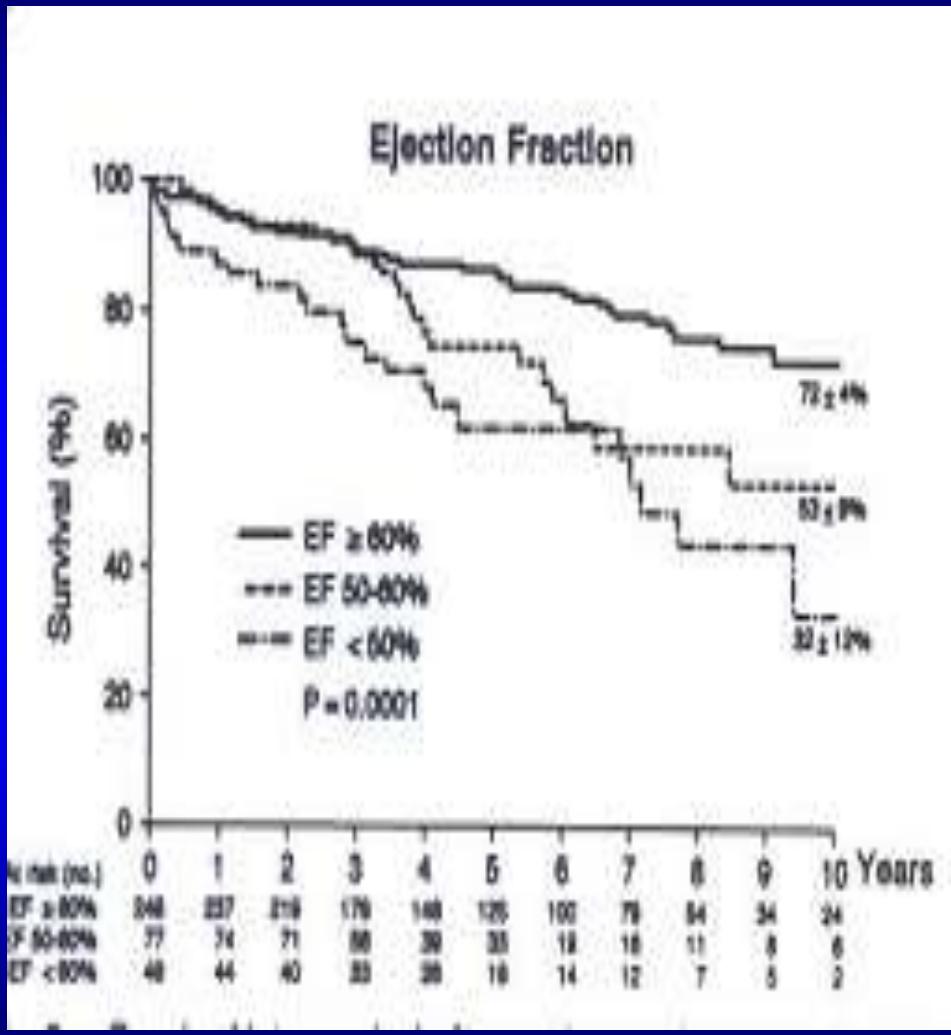
Normal EF – Severe MR



70cc SV +70cc RV/ 70cc SV + 7- cc RV+30 cc EDV (140/170) = **EF 84 %**

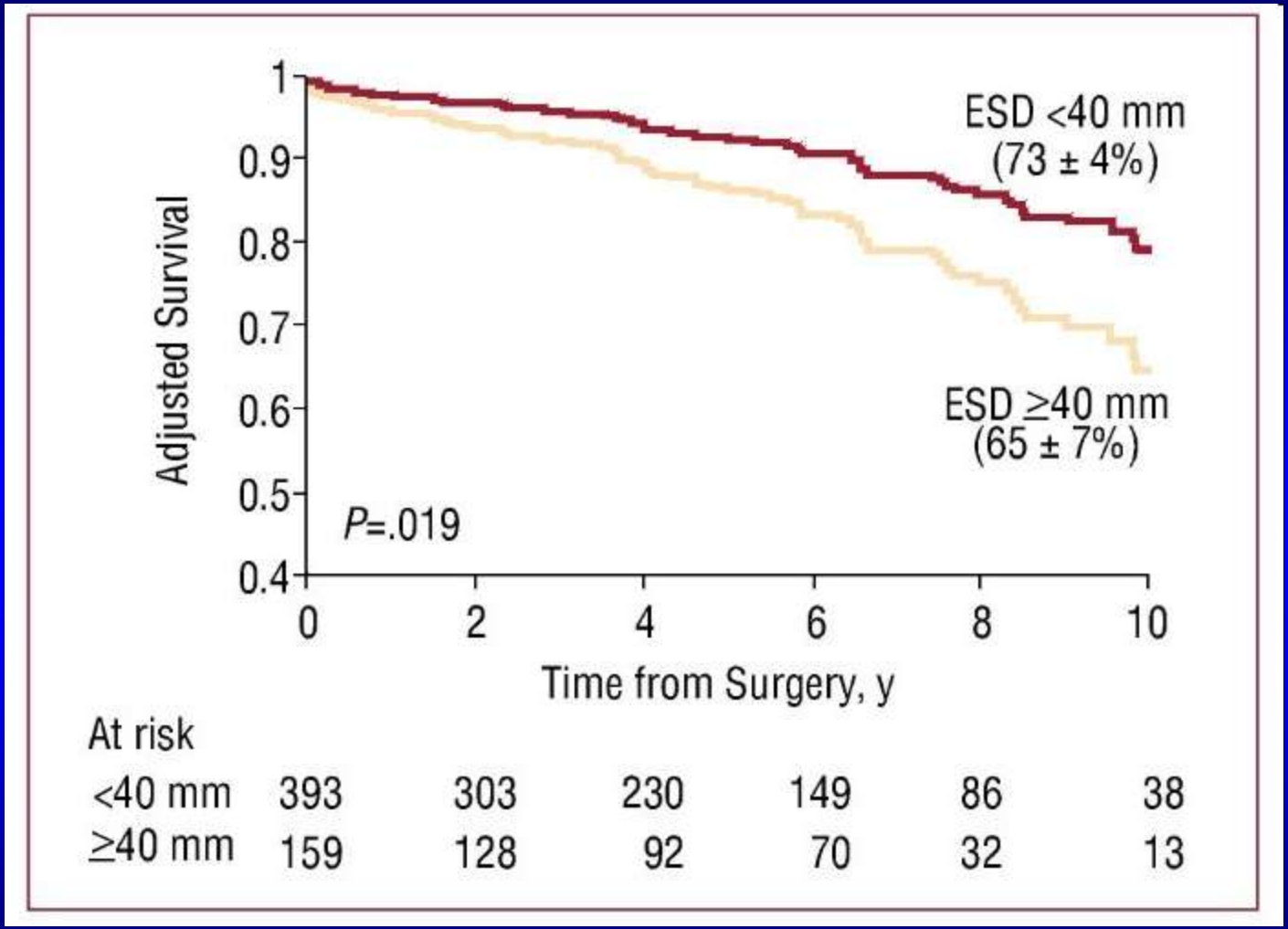
Wait until EF falls – Bad !





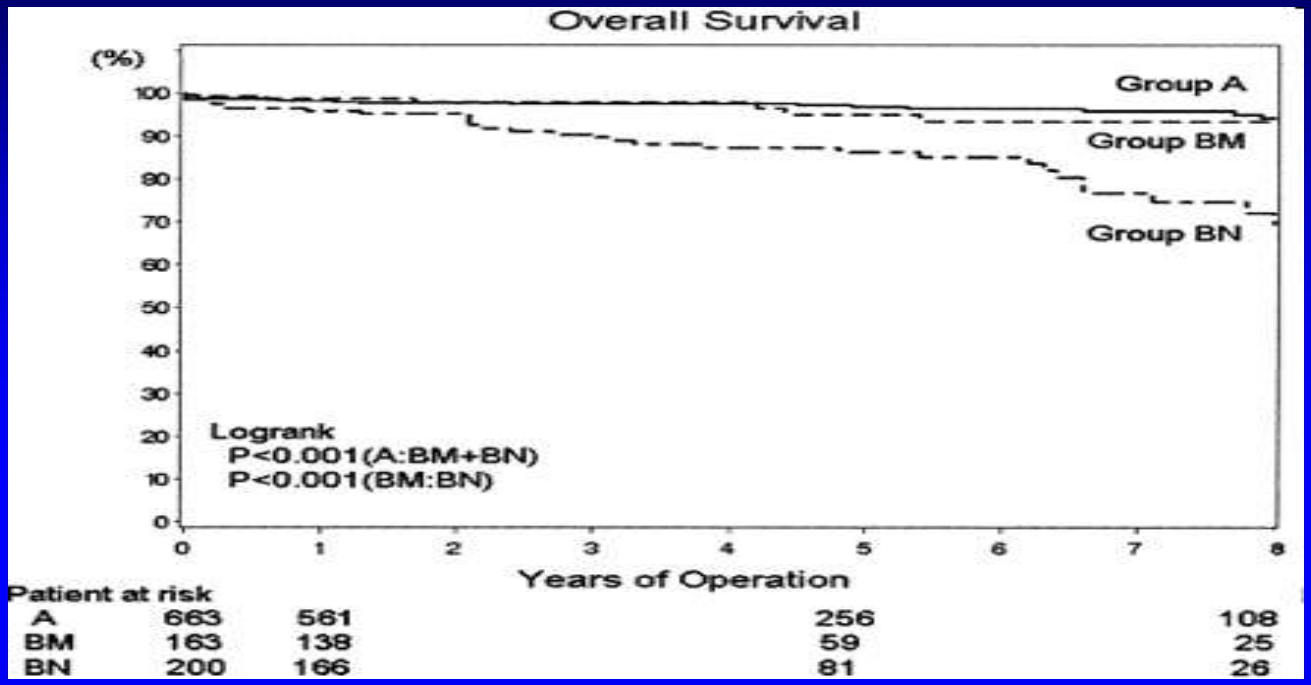
Enriquez-Sarano et al. Circ 1994:90:830-837

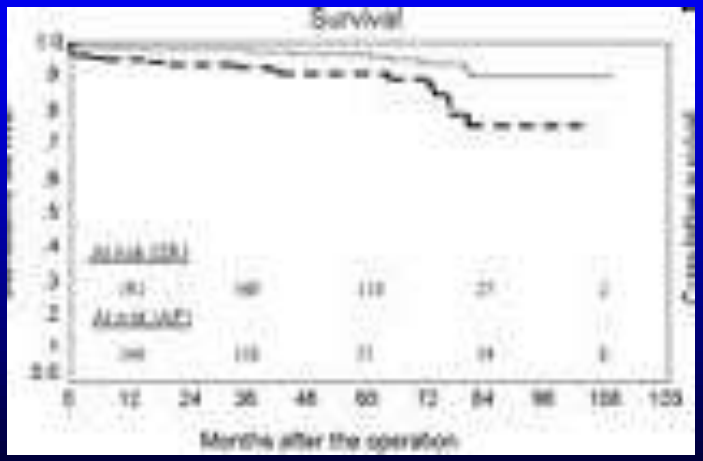
Wait until LV dilates – Bad !



Enriquez-Sarano et al. Rev Card 2010

Wait until A Fib – Bad !

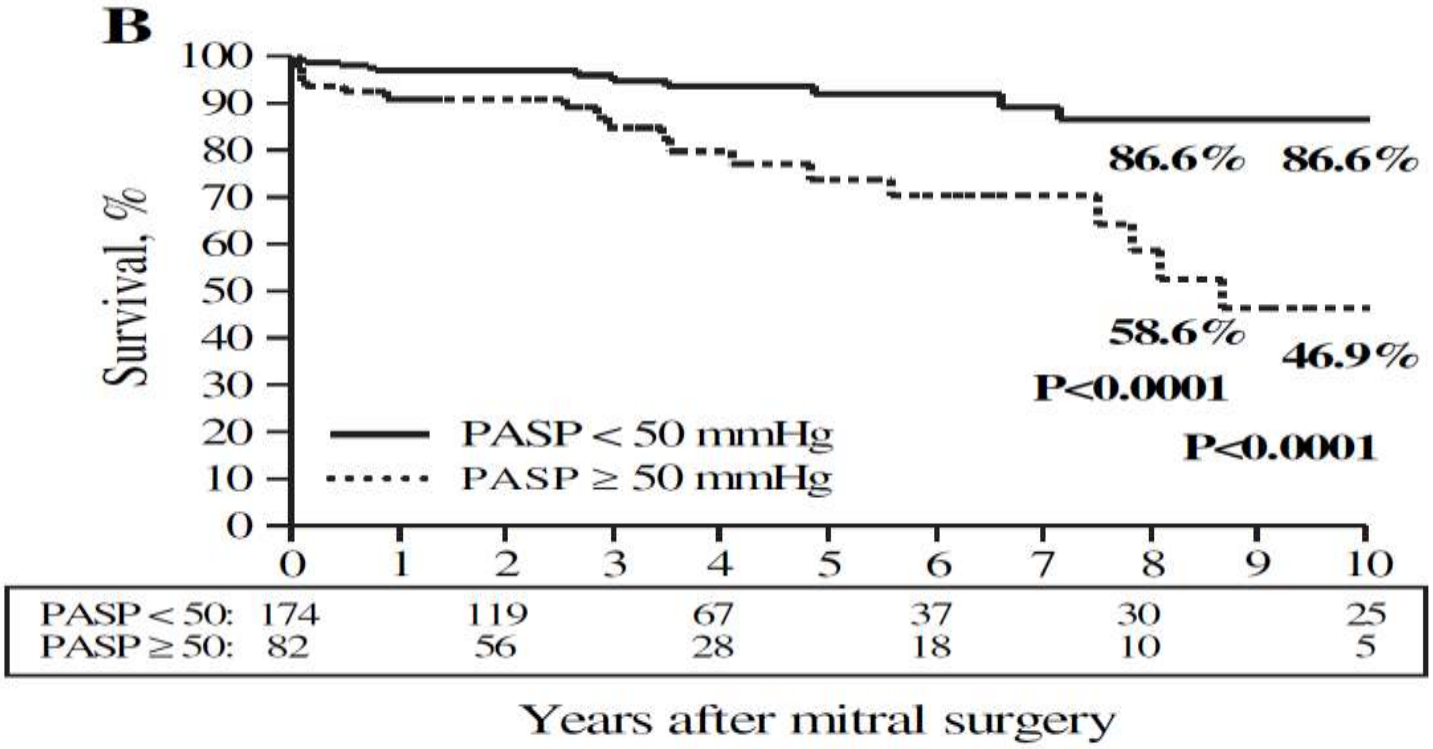




Bando et al. JTCVS 2005

Theirry et al. EJCVS 2006

Wait until PAP rises – Bad !



Echocardiography predictors and prognostic value of pulmonary artery systolic pressure in chronic organic mitral regurgitation

Thierry Le Tourneau, Marjorie Richardson, Francis Juthier, Thomas Modine, Georges Fayad, Anne-Sophie Polge, Pierre-Vladimir Ennezat, Christophe Bauters, André Vincentelli, Ghislaine Deklunder

ACC/AHA guidelines: prior to 2014

Mitral valve repair, wait until:

Symptoms …. ***BAD***

if "no" symptoms, wait until:

A Fib

Pulm HTN

Increase LV size

Fall in EF%

….***also BAD !***

Mitral Repair Guidelines

“Watchful Waiting”

(by 2013 guidelines)

“takes years from patients lives, these are guidelines to die by, not to live by !”

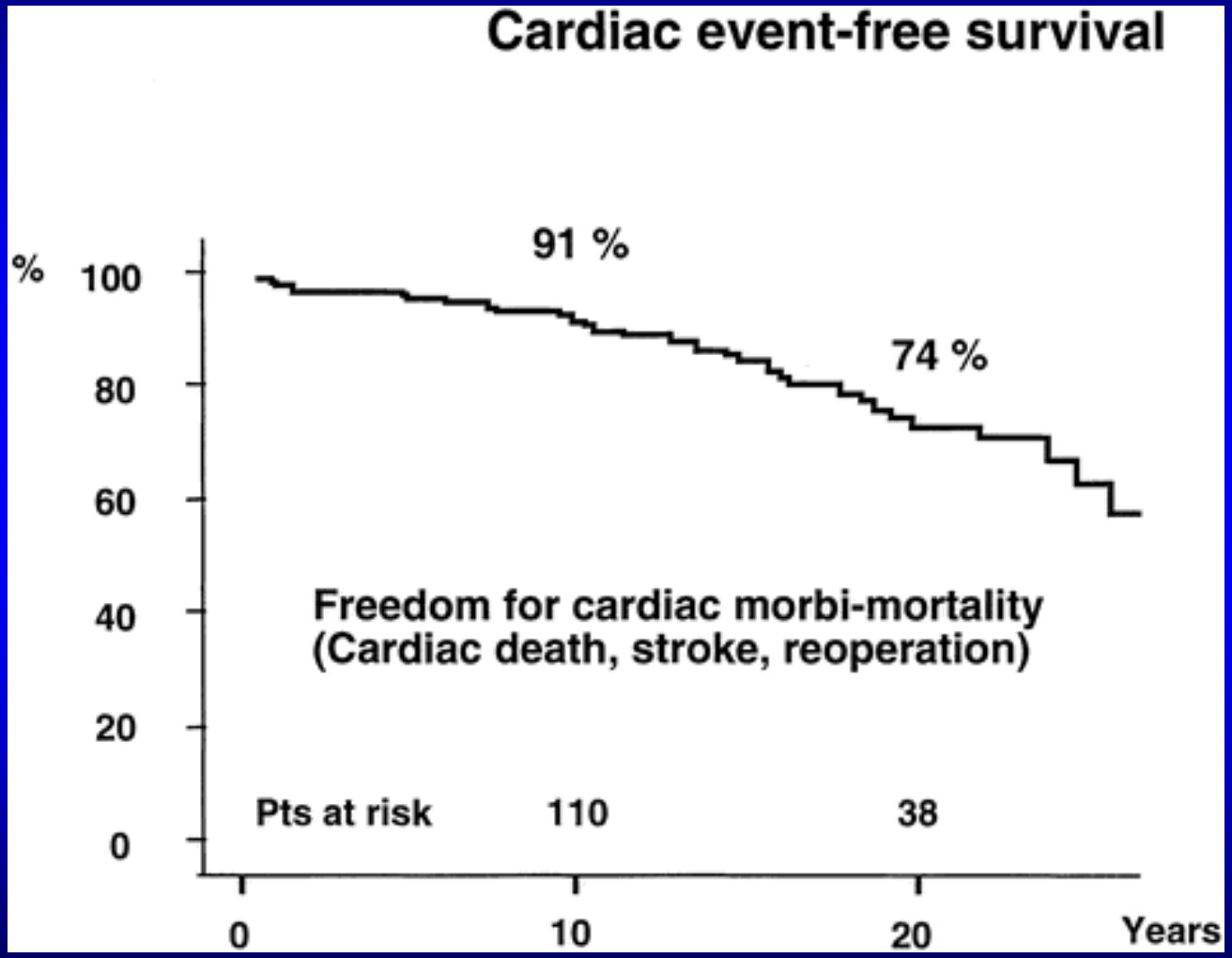
Why are we waiting ?

Overall 10 year survival –
50% med tx vs
<u>86% - early repair</u>

Montant - Annals of Thoracic Surgery, 2009

268 propensity matched assx pts- severe MR

Durability of Mitral Valve Repair



Braunberger E. et.al. Circulation. 2001;104[suppl I]:I-8-I-11.

ACC/AHA guidelines: 2013

Early mitral valve surgery –

Indications include:

"if repair possible…

if experienced repair centers…

if experienced repair surgeons…

if high likelihood of repair"…

…Iffy and Unpredictable ?

Why are we waiting ?

Have we even been following the 2013 guidelines ?

…even though they are lame !!

NO ! 2-30%

Mitral regurgitation: Determinants of referral for cardiac surgery by Canadian cardiologists

Karine Toledano MD, Lawrence G Rudski MD, Thao Huynh MD, François Béïque MD, John Sampalis MD, Jean-François Morin MD

University or community cardiology practice and surgical referral in patients with moderate to severe mitral regurgitation

Referral criteria evaluated	Overall, n (%)	Community, n (%)	University, n (%)	ACC/AHA guidelines
Asymptomatic (referral threshold)				
EF > 60%	2 (0.9)	1 (1.6)	1 (0.8)	No surgery
EF 50%–60%	123 (57.2)	37 (57.8)	64 (55.2)	Surgery, class I
EF 40%–49%	68 (31.6)	20 (31.2)	40 (34.5)	Surgery, class I
EF < 40%	6 (2.8)	3 (4.7)	3 (2.6)	Surgery, class I
Symptoms regardless of EF	16 (7.4)	3 (4.7)	8 (6.9)	Surgery, class I
NYHA II (referral threshold)				
EF > 60%	32 (15.5)	12 (20.0)	15 (13.6)	Surgery, class I
EF 50%–60%	11.5 (55.8)	33 (55.0)	64 (58.2)	Surgery, class I
EF 40%–49%	43 (20.9)	11 (18.3)	25 (22.7)	Surgery, class I
EF < 40%	3 (1.5)	1 (1.7)	1 (0.9)	Surgery, class I
Further symptoms	13 (6.3)	3 (5.0)	5 (4.5)	Surgery, class I
New-onset AF	94 (32.9)	24 (30.8)	54 (34.4)	Surgery, class IIa

Toledano et al. Can J Cardiol 2007; 23 (3): 209-14

USA Mitral referral rate – 50% !

Table 4 Prevalence of Indications for Surgical Intervention for Chronic Severe Mitral Regurgitation in Patients With Organic Mitral Regurgitation Based on the 1998 ACC/AHA Guidelines*

	All Patients	Operated	Unoperated	p Value
n	112	59	53	
Symptoms	53 (47%)	29 (49%)	24 (45%)	0.68
LVIDS ≥45 mm	11 (10%)	5 (8%)	6 (11%)	0.61
LVEF ≤60%	50 (45%)	26 (44%)	24 (45%)	0.90
Atrial fibrillation	26 (23%)	14 (24%)	12 (23%)	0.89
RVSP >50 mm Hg	25 (22%)	9 (15%)	16 (30%)	0.06
Any indication	96 (86%)	57 (97%)	39 (74%)	<0.0001

Table 5 Rationale by Which Mitral Valve Surgery Was Not Performed in 53 Unoperated Patients With Organic MR

Rationale	n	Death	Cardiac Death	Interval to Cardiac Death (days)
Asymptomatic	9 (17%)	1	0	—
Stable LVEF, stable chambers	17 (32%)	3	3	186, 839, 855
MR improved on subsequent echocardiogram	6 (11%)	1	1	213
Comorbidities/risk	10 (19%)	7*	4	3, 5, 26, 43
Patient refused	4 (%)	2	2	3, 32
Died before planned evaluation	1 (%)	1	1	5
MR unrecognized	4 (%)	1†	0	—
MR ignored	2 (%)	1	1	232

33% mortality @ 1 yr

Failure of Guideline Adherence for Intervention in Patients With Severe Mitral Regurgitation
David S. Bach, et al JACC Vol. 54, No. 9, 2009

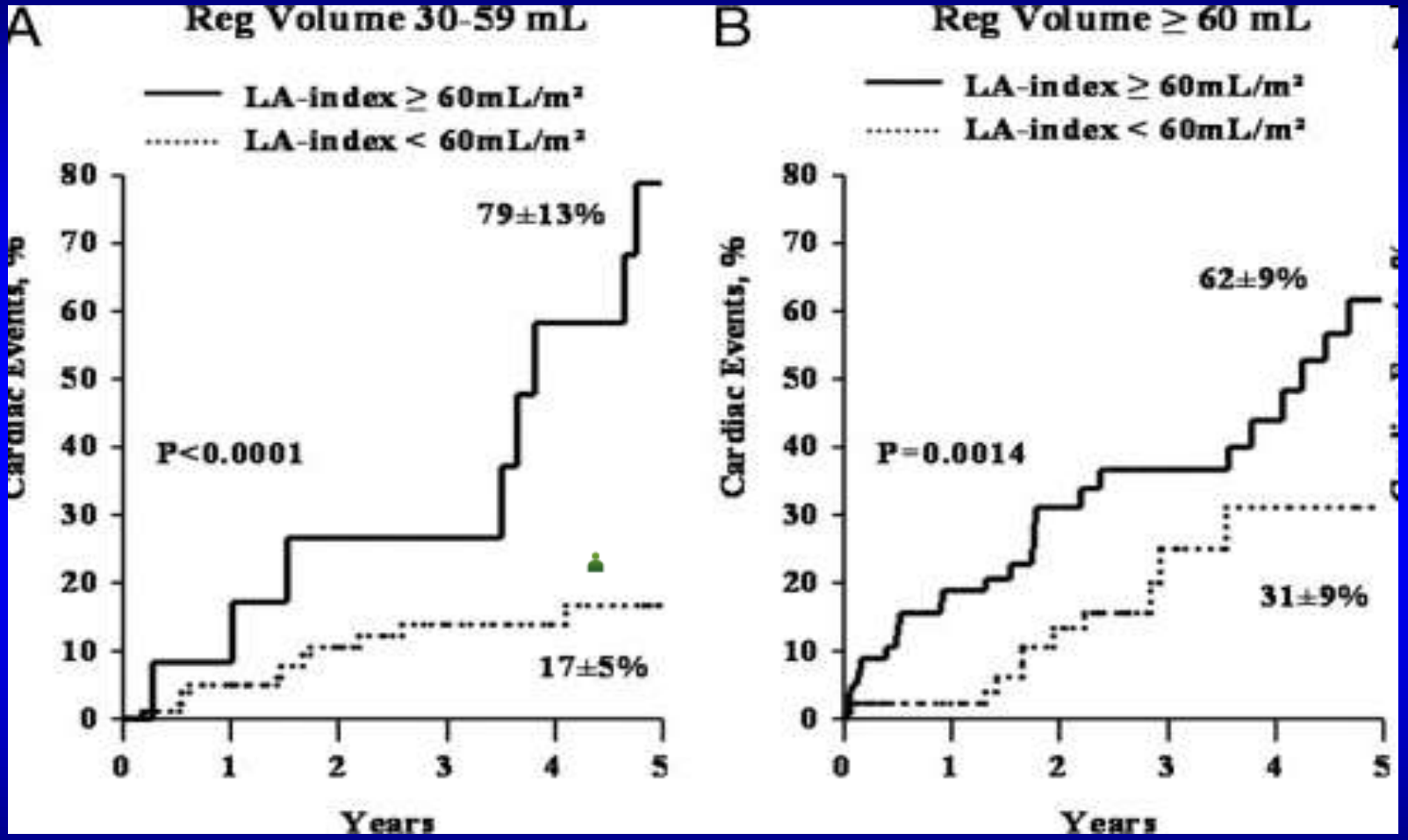
Why are we waiting ?

25% of moderate MR patients dropped LV function…

without ever being detected as severe !!

LA size

mod MR *severe MR*

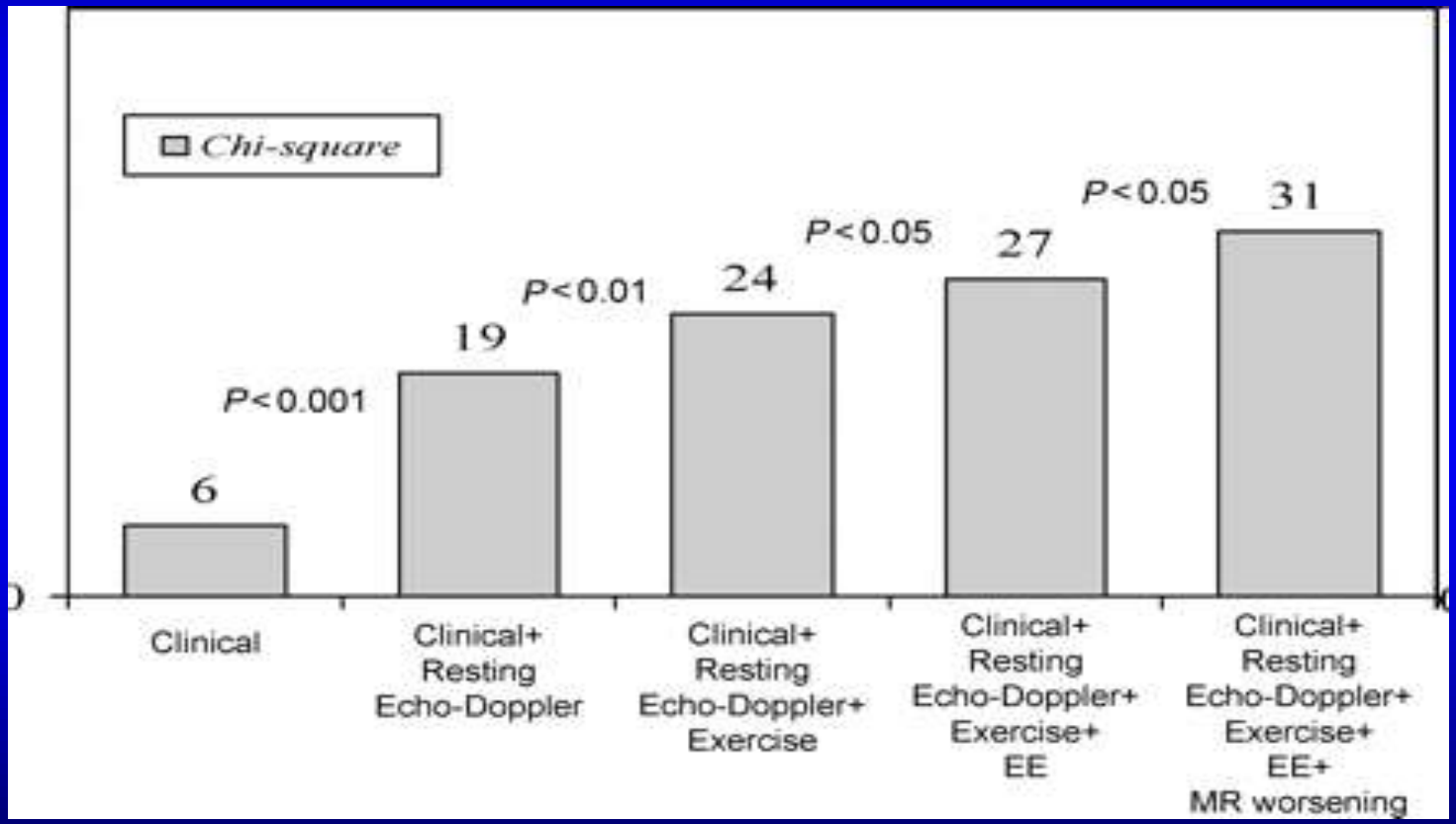


Impact of Left Atrial Volume on Clinical Outcome in Organic Mitral Regurgitation

- Tourneau et al, JACC 2012

Exercise Testing

With exercise : any Increased MR, AF , PHTN or Drop in LV status



Prognostic Value of Exercise Testing in Organic Mitral Regurgitation
•EHJ 2012

Mitral Repair Guidelines - 2014

Any Sx or AF or PHTN !

Earlier Surgery :

- ***EF < 65%***
- ***ESD > 35 mm***
- ***Any Flail***
- ***LA size***
- ***Moderate MR***
- ***Exercise Testing***

ISCHEMIC MR

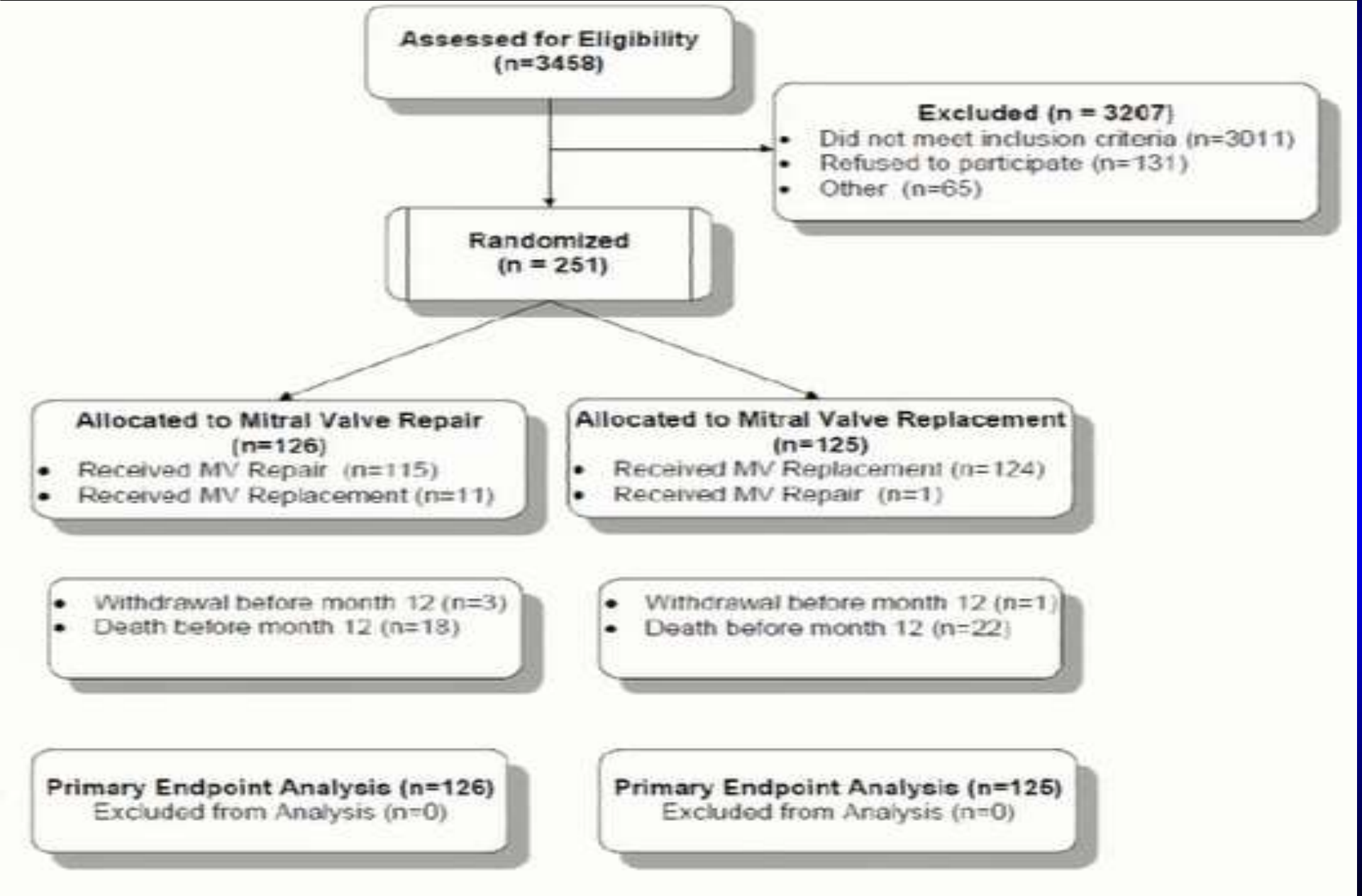
Trade off?

- Which is more important to long-term survival?

- Operative Mortality vs. MR Recurrence

Mitral-valve repair versus replacement for severe ischemic mitral regurgitation.

Acker MA, Parides MK, Perrault LP, Moskowitz AJ, Gelijns AC, Voisine P, Smith PK, Hung JW, Blackstone EH, Puskas JD, Argenziano M, Gammie JS, Mack M, Ascheim DD, Bagiella E, Moquete EG, Ferguson TB, Horvath KA, Geller NL, Miller MA, Woo YJ, D'Alessandro DA, Ailawadi G, Dagenais F, Gardner TJ, O'Gara PT, Michler RE, Kron IL; CTSN.



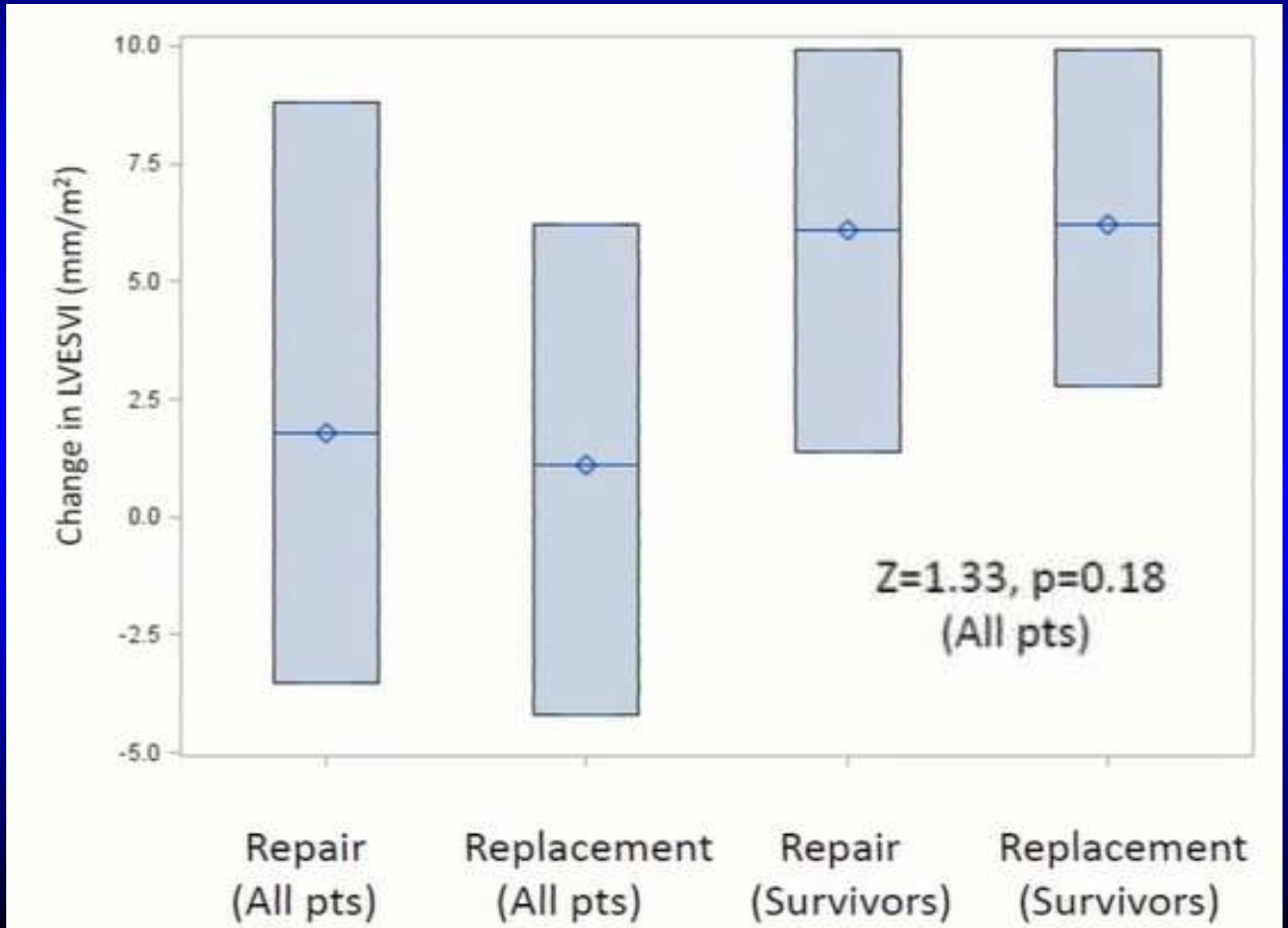
Primary Endpoint

- Degree of LV reverse remodeling
  - Assessed by LV end systolic volume index by TTE at 12 months postop

- Powered (90%) to detect an improvement of 15mL/m2 from repair to replacement in LVESVI

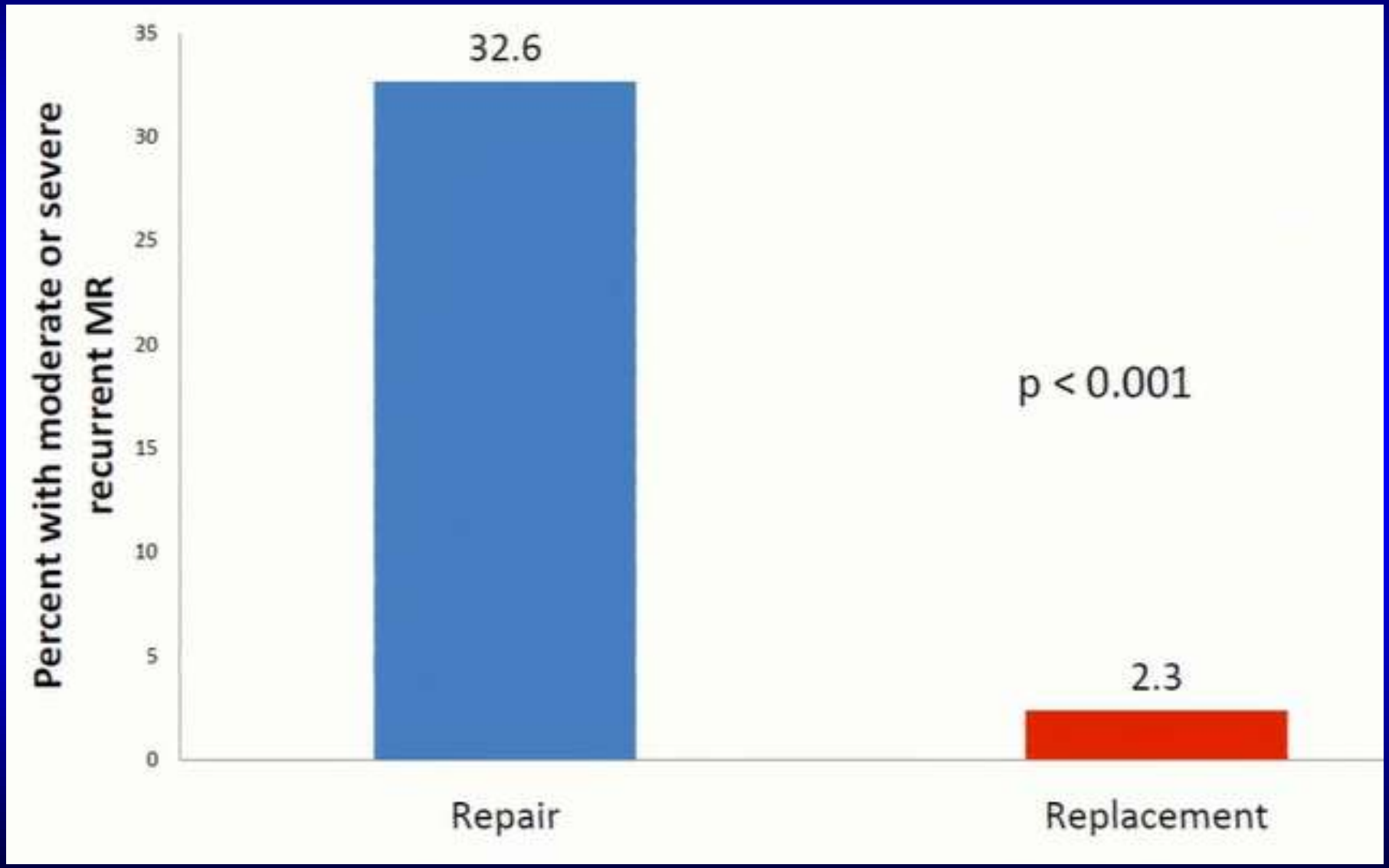
Median change in LVESVI

Median with 95% CI for change in LVESVI from baseline to 1yr

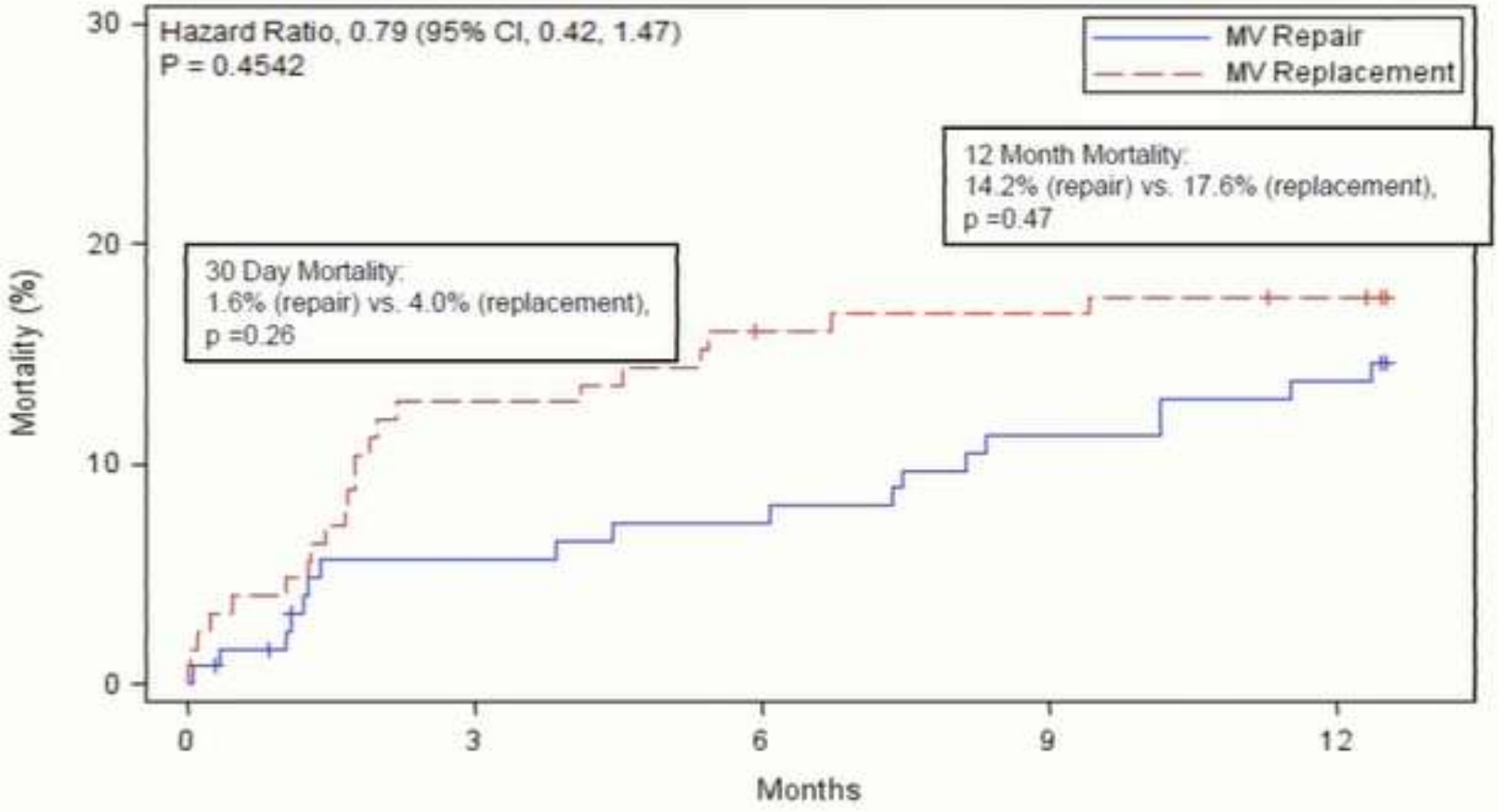


Recurrent MR @ 1 year

Moderate or severe recurrent MR



Mortality

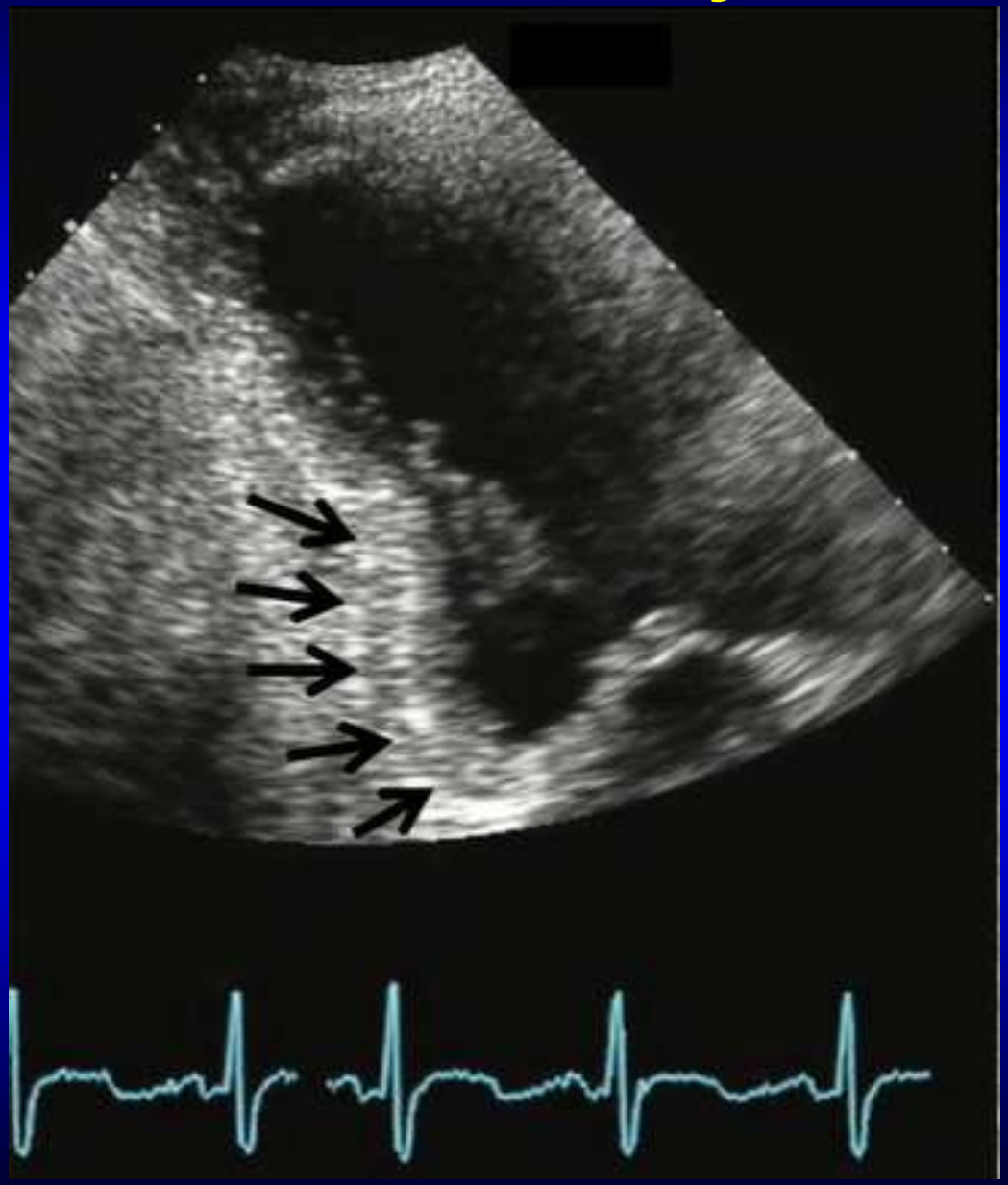


MV Repair	126	116	114	109	106
MV Replacement	125	109	104	103	101

Further Subgroup Analysis

- If you had a repair and you did not recur, the survival was better than if you repaired and recurred or replaced
- How do you predict this?
- Who made up the subgroup that most often recurred?

Basal Aneurysm



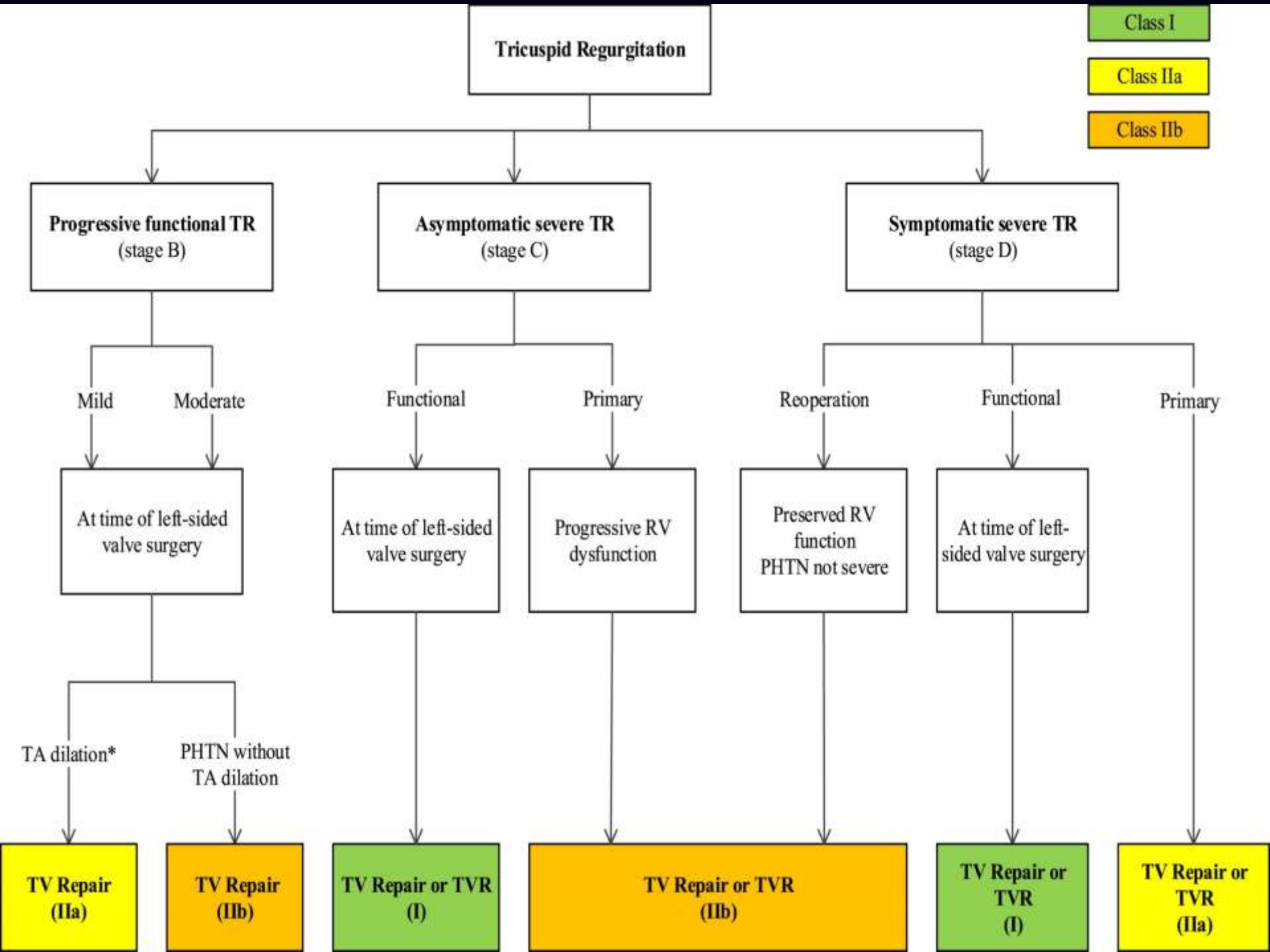
Tricuspid Valve
“the forgotten valve”

OK, if we find MR, we will fix MR !
But repair TR, or ignore it ?

Is TR important?

When/how to fix TR

What lessons have we learned?


Tricuspid Regurgitation
Class I
Class IIa
Class IIb
Progressive functional TR
(stage B)
Asymptomatic severe TR
(stage C)
Symptomatic severe TR
(stage D)
Mild
Moderate
Functional
Primary
Reoperation
Functional
Primary
At time of left-sided valve surgery
At time of left-sided valve surgery
Progressive RV dysfunction
Preserved RV function PHTN not severe
At time of left-sided valve surgery
TA dilation*
PHTN without TA dilation
TV Repair (IIa)
TV Repair (IIb)
TV Repair or TVR (I)
TV Repair or TVR (IIb)
TV Repair or TVR (I)
TV Repair or TVR (IIa)

Clinical Presentation of TR

Decreased CO

Fatigue, decreased exercise tolerance

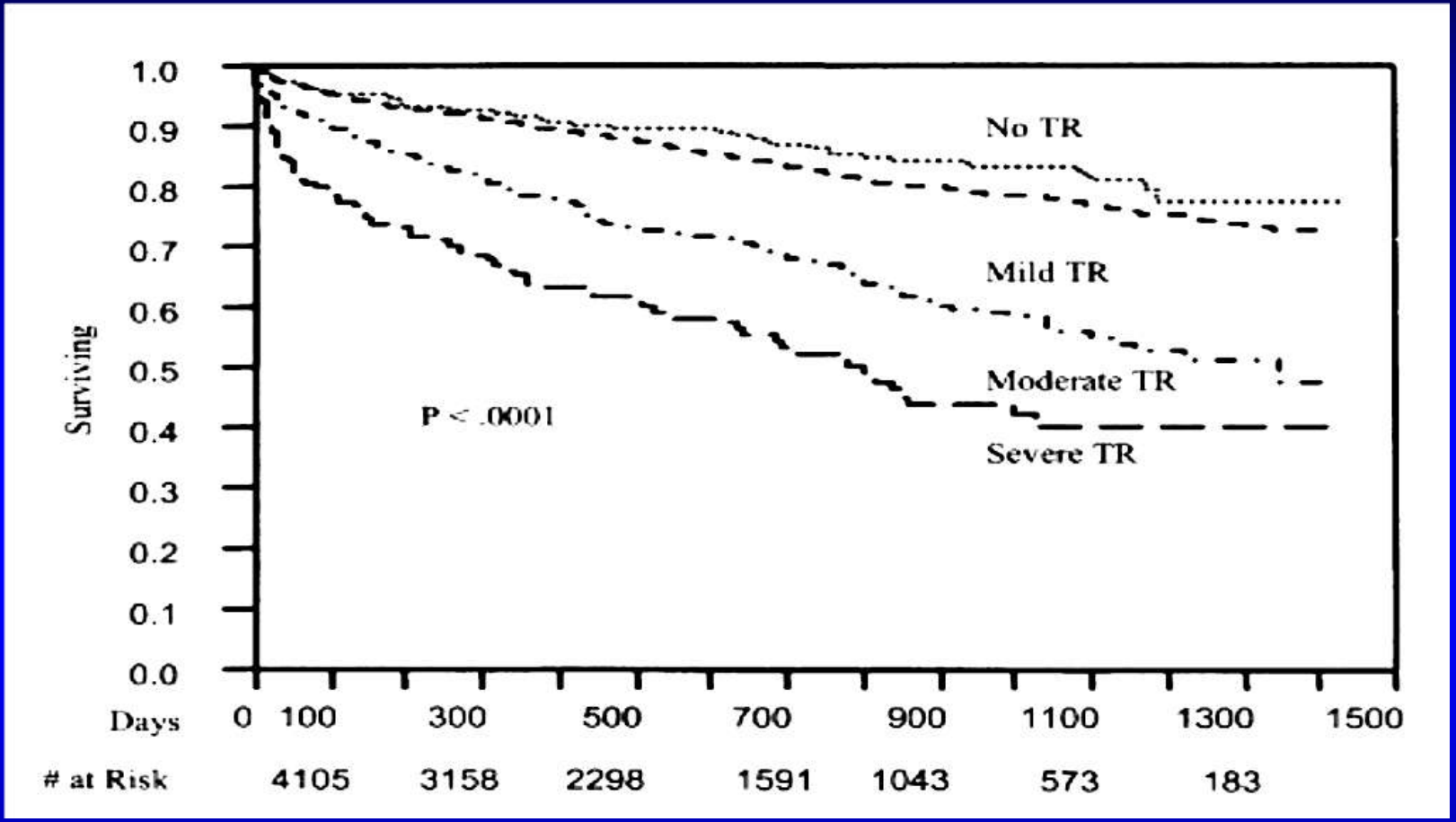
"Right-sided" Heart Failure

Ascites, edema, decreased appetite, abdominal fullness

...Patients feel terrible

Valve repair for functional tricuspid valve regurgitation: anatomical and surgical considerations
Rogers JH, Bolling SF Semin Thorac Cardiovasc Surg. 2010 ;22(1):84-9

…*and they die!* TR Increases Mortality !



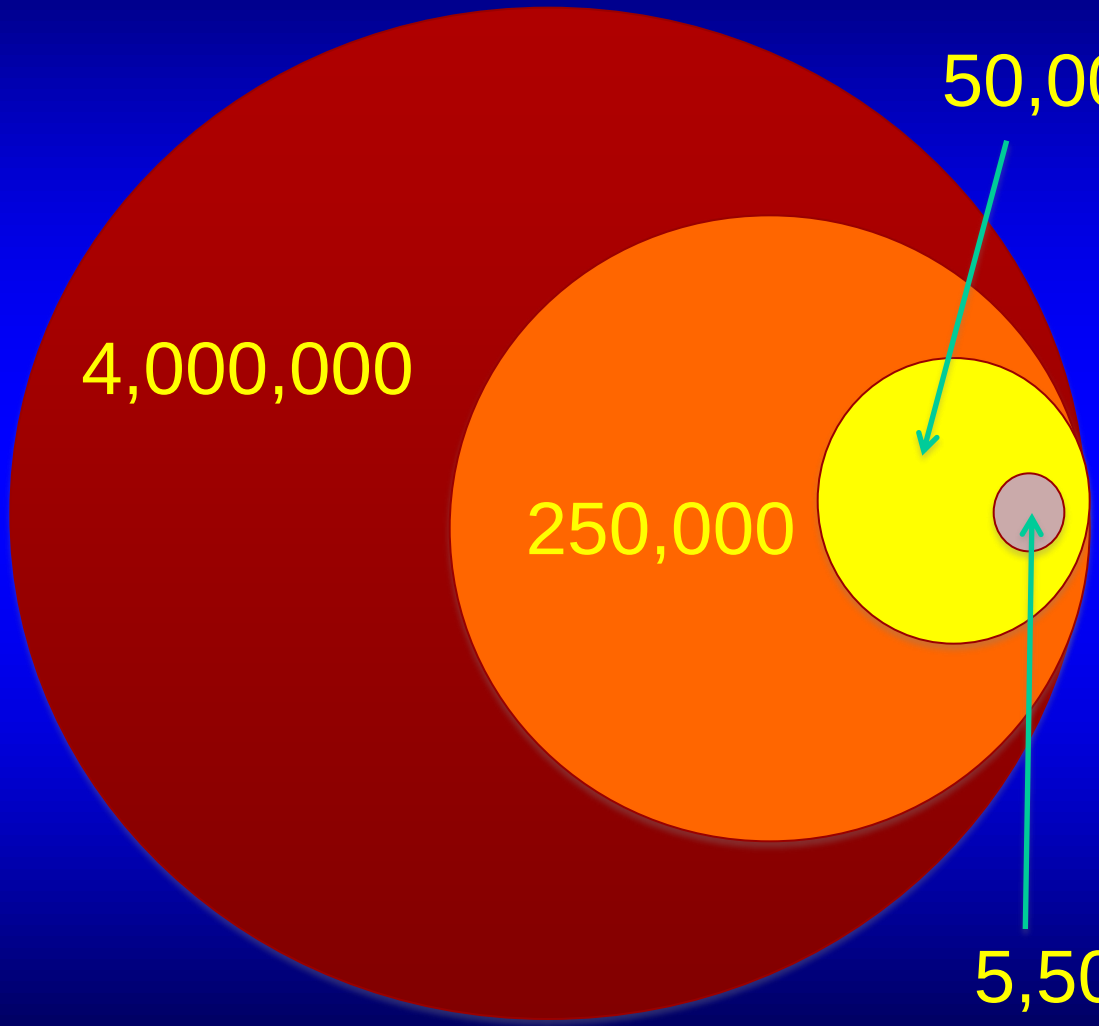
5223 subjects : Mod-Sev TR increased mortality

independent of PASP, LVEF, IVC size, RV size/ function.

Nath. JACC 2004;43:405.

TR is Currently Ignored !!

STS Database 2009



MR + TR

Annual New MR

Annual MR Surgeries

Annual TR Surgeries

TR Lessons : Look for it pre-op !!

Frater (JTCVS 122:2001)

Functional TR – dynamic and responds to anesthesia…

"4+ TR, as the patient enters the OR - can become mild"

TR does not go away by itself !!

5589 *MVr only cases* (McCarthy, ATS 2004)

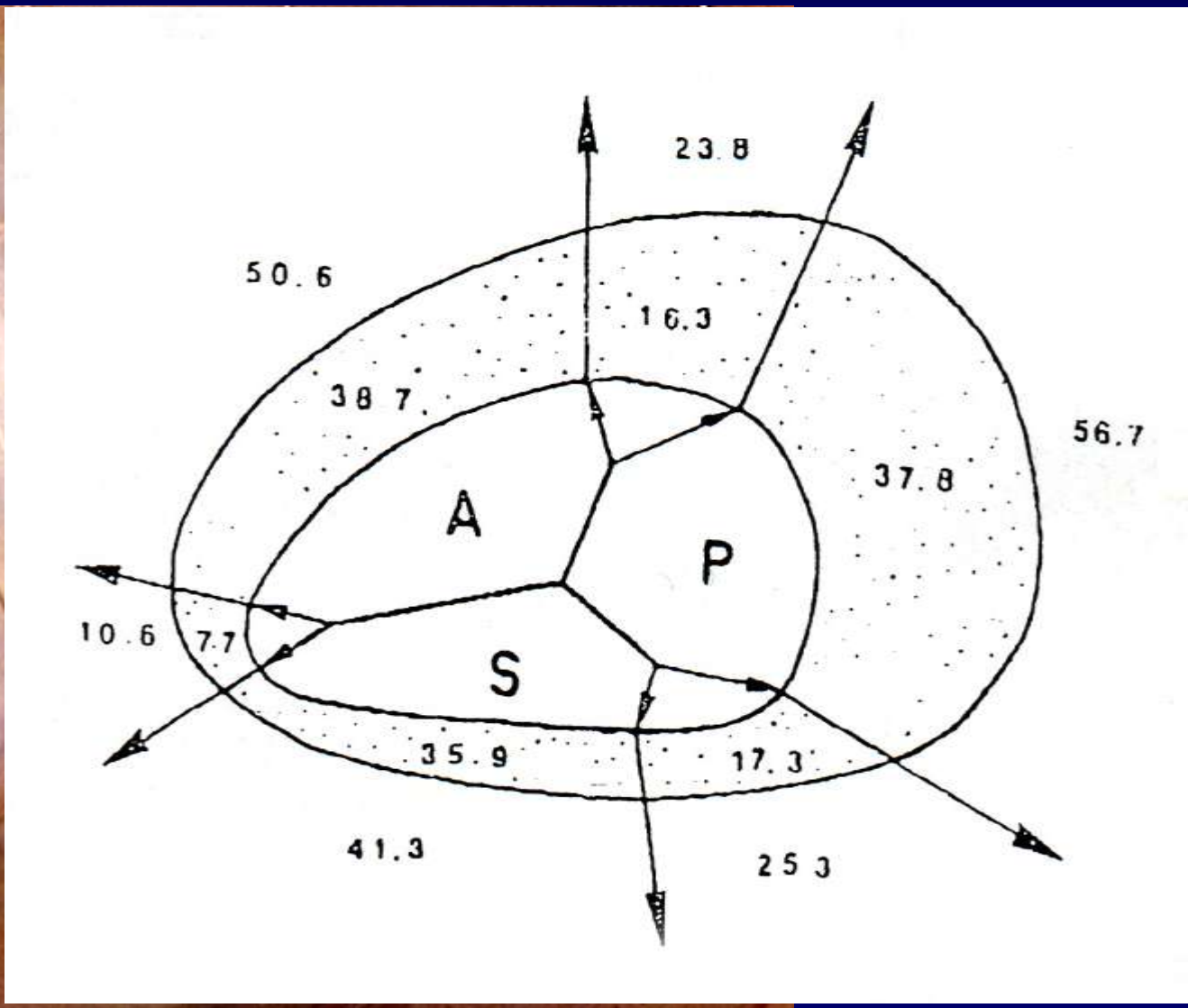
Preop 16% had 3/4+ TR

Discharge (MVR without TVr)
9%, or > ½ still had 3/4+ TR

FU - 62% had residual severe TR !!!…

TR does not *just go away* !

Anatomy of Functional TR



Annular, RA, RV and *LV* geometry changes of TR

Carpentier. JTCVS 1974;67:53.

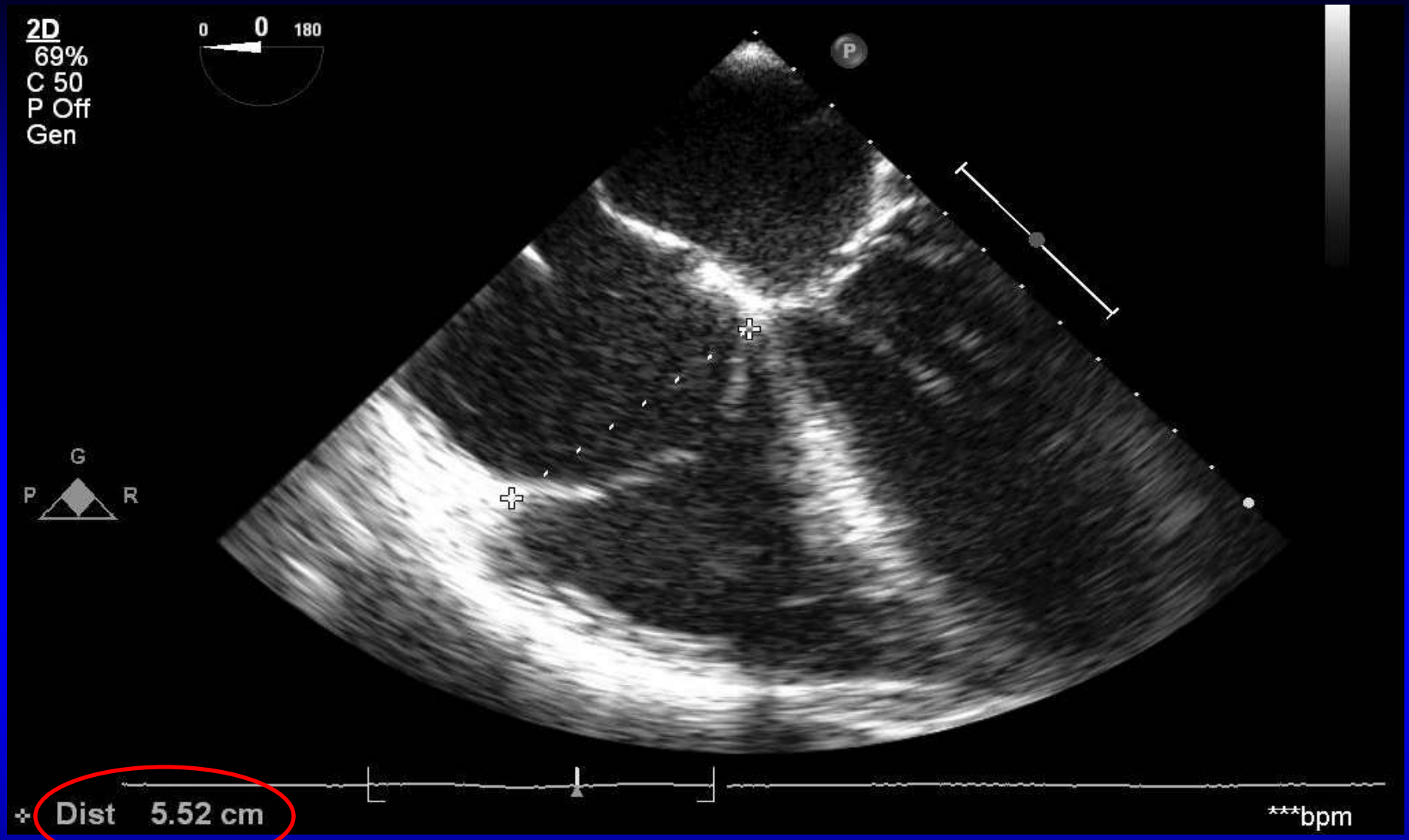
TR – do it now, not later !!

Bernal (JTCVS 130:2005)

Patients left with post-op TR, when returned for redo TVr

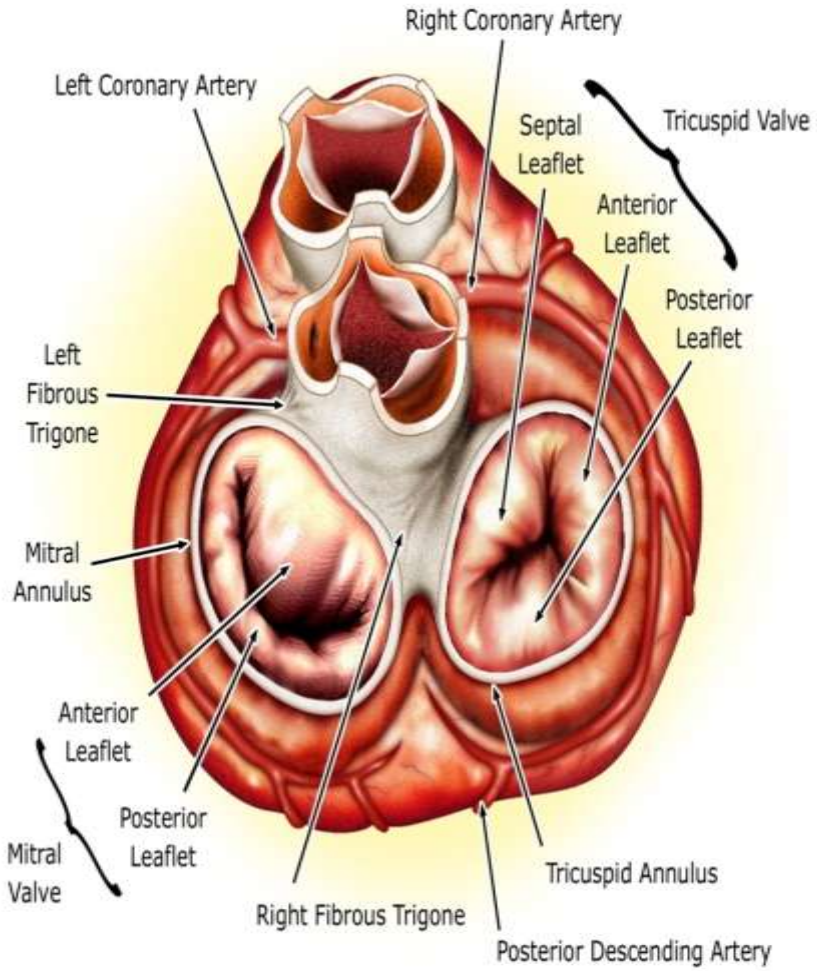
30 day mortality was 35%!

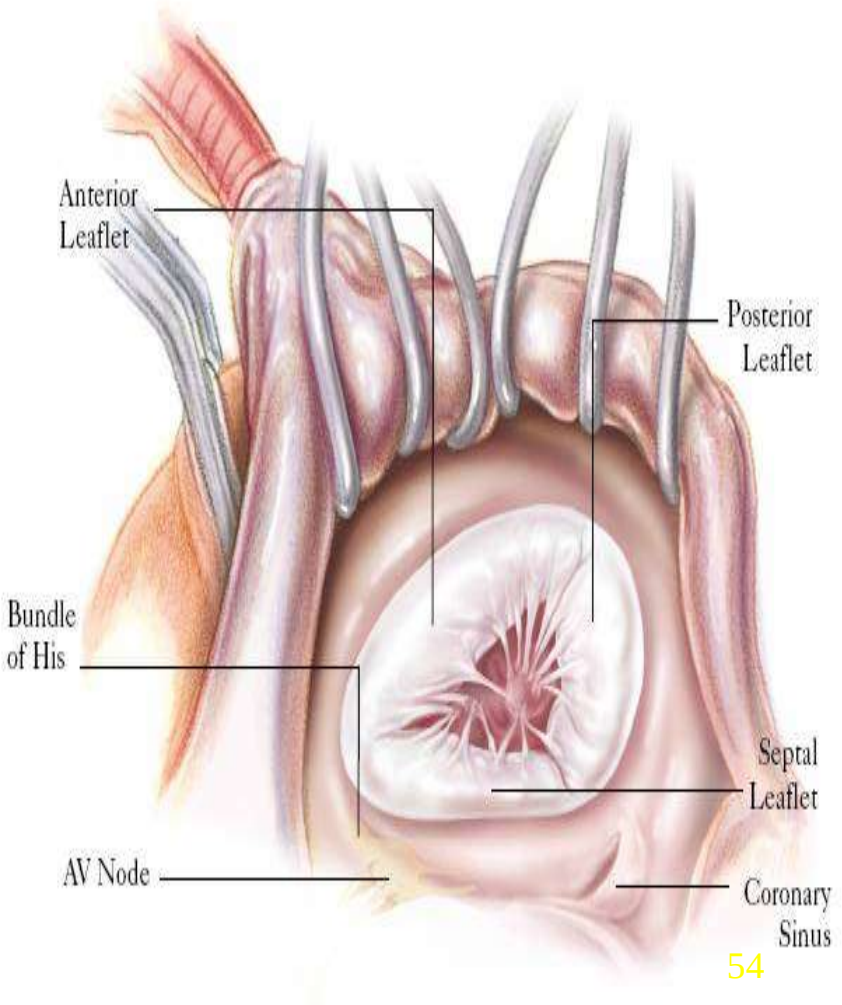
Highest op mortality in STS!!



Ignore TR at the patients peril !

TR Lessons - Tricuspid Anatomy





TV ring risks

AV Node injury

Dehiscence

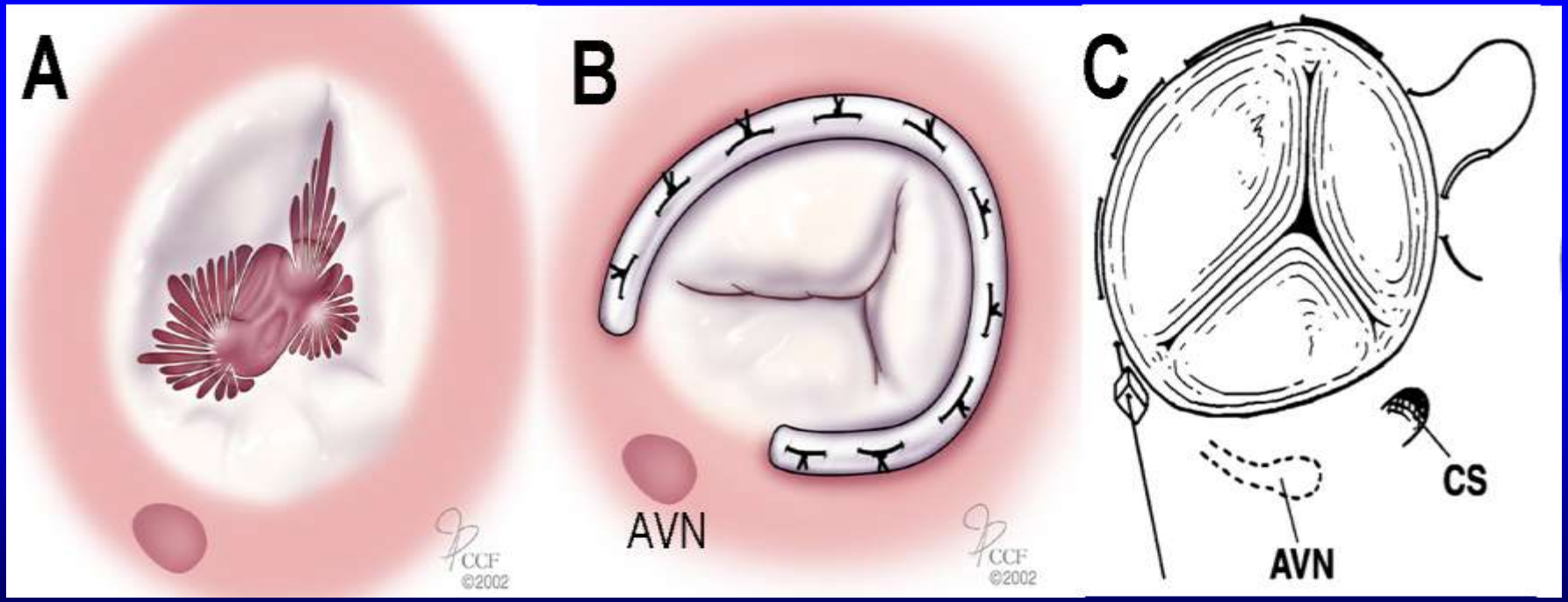
Hemolysis

Endocarditis

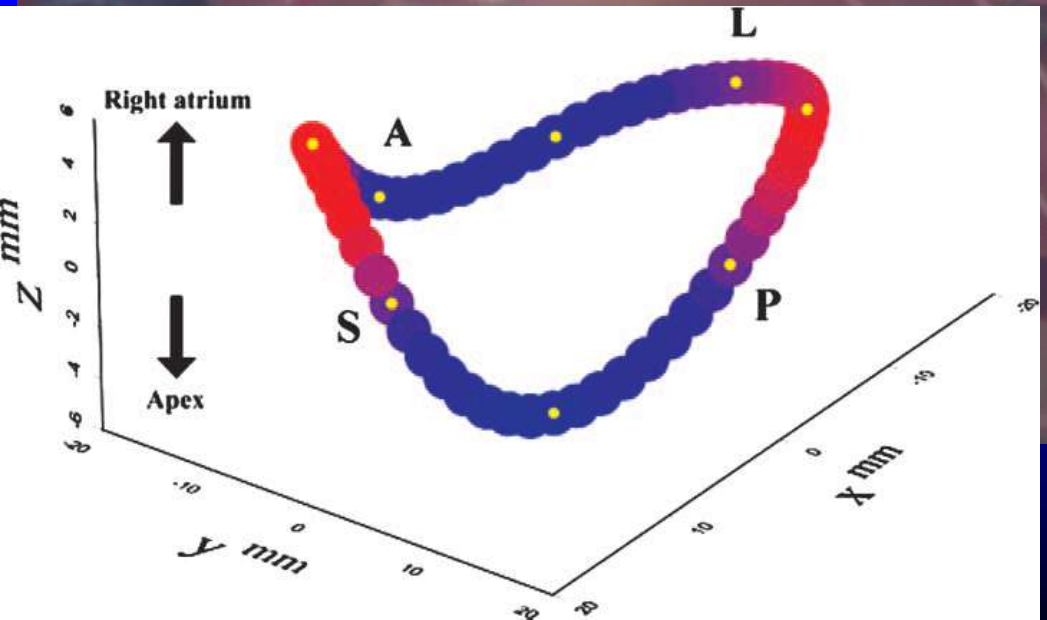
Don’t ignore TR : Repair Lessons for Functional TR

Annuloplasty Rings

DeVega



DeVega. Rev Esp Cardiol 1972;25:6.


L
Right atrium
A
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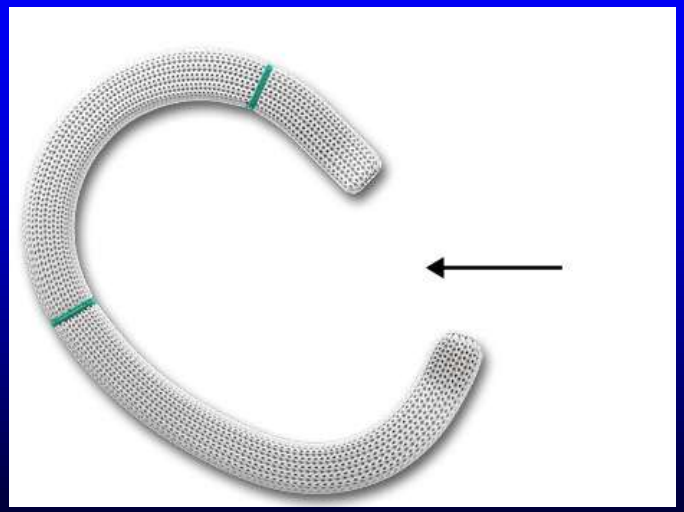
Apex
Z mm
y mm
X mm



Ignore or repair TR Lessons :

TR not important…	NO
Not much TR around….	NO
Repair Mitral , TR goes away …	NO
Don’t know how to…	NO
Add operative mortality to do a TVr…	NO
RV will die…	NO
Will get TS…..	NO

TR : NO, Don’t Ignore it….

Tricuspid Regurgitation

JUST DO IT!!

The Surgeon's Perspective

Concept of Operative Window

Symptoms, Patient's age, Comorbidities, Life Expectancy, Type of valve, Patient's Compliance, etc.

Minimally Invasive Cardiac Surgery

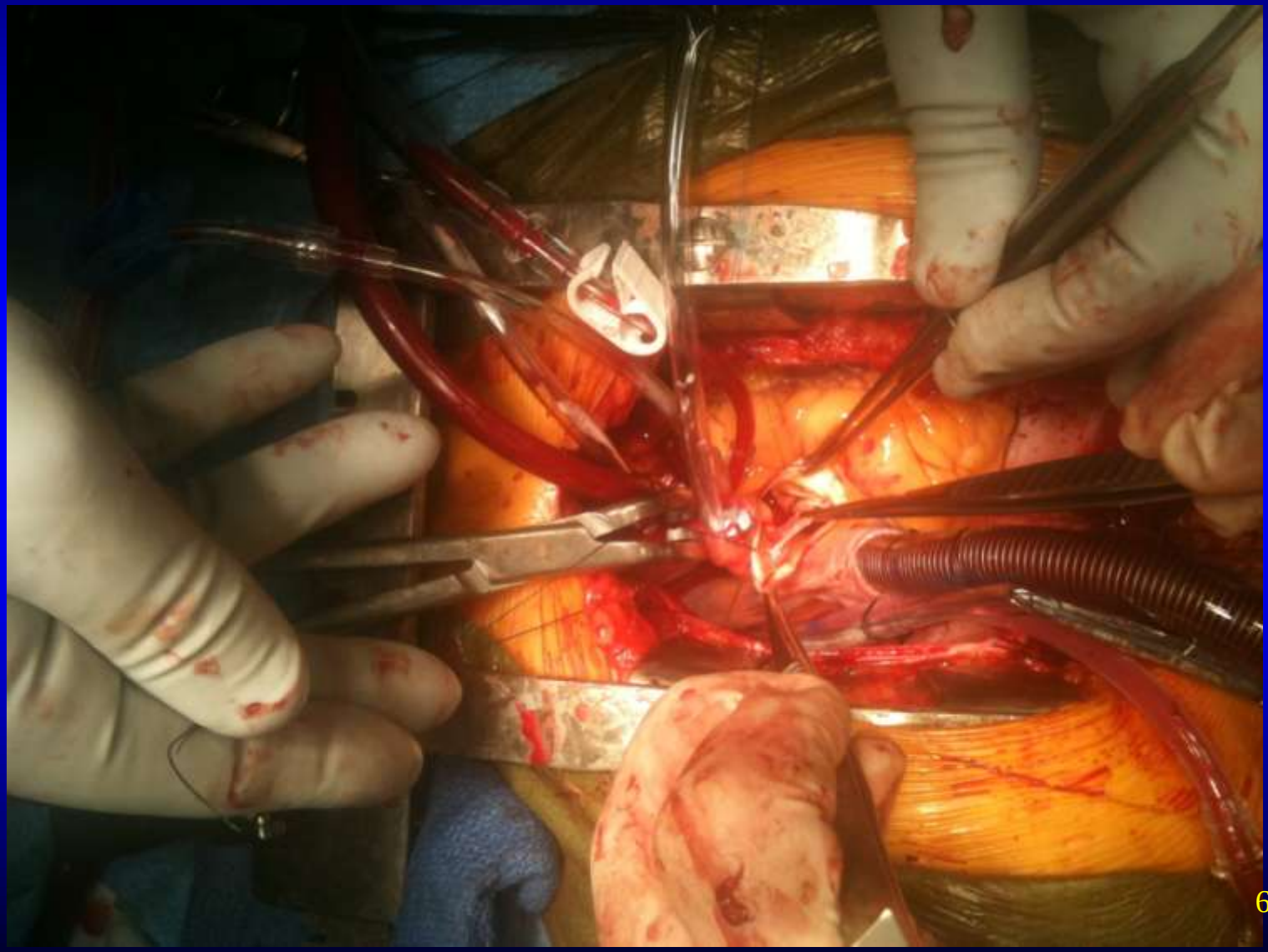
“Minimally Invasive” vs “Standard”

- Concept of “Invasiveness”:

1. Sternotomy / chest scar
2. XClamp time / Time on CPB
3. Postop Pain / Time to full recovery
4. Need for repeated procedures

- Pros and Cons of each
- What type of Patients are the best candidates

“Standard” Operation: Sternotomy, CPB, Cardioplegia



Pros and Cons of “Standard”

- Well known, simple setup
- Better access and control
- Only option for extensive procedures
- Usually less time on CPB

- Less satisfactory cosmetic results
- Hurts a *little* more but for *much* longer
- Possibility of sternal non-union or infection

Path towards less invasive

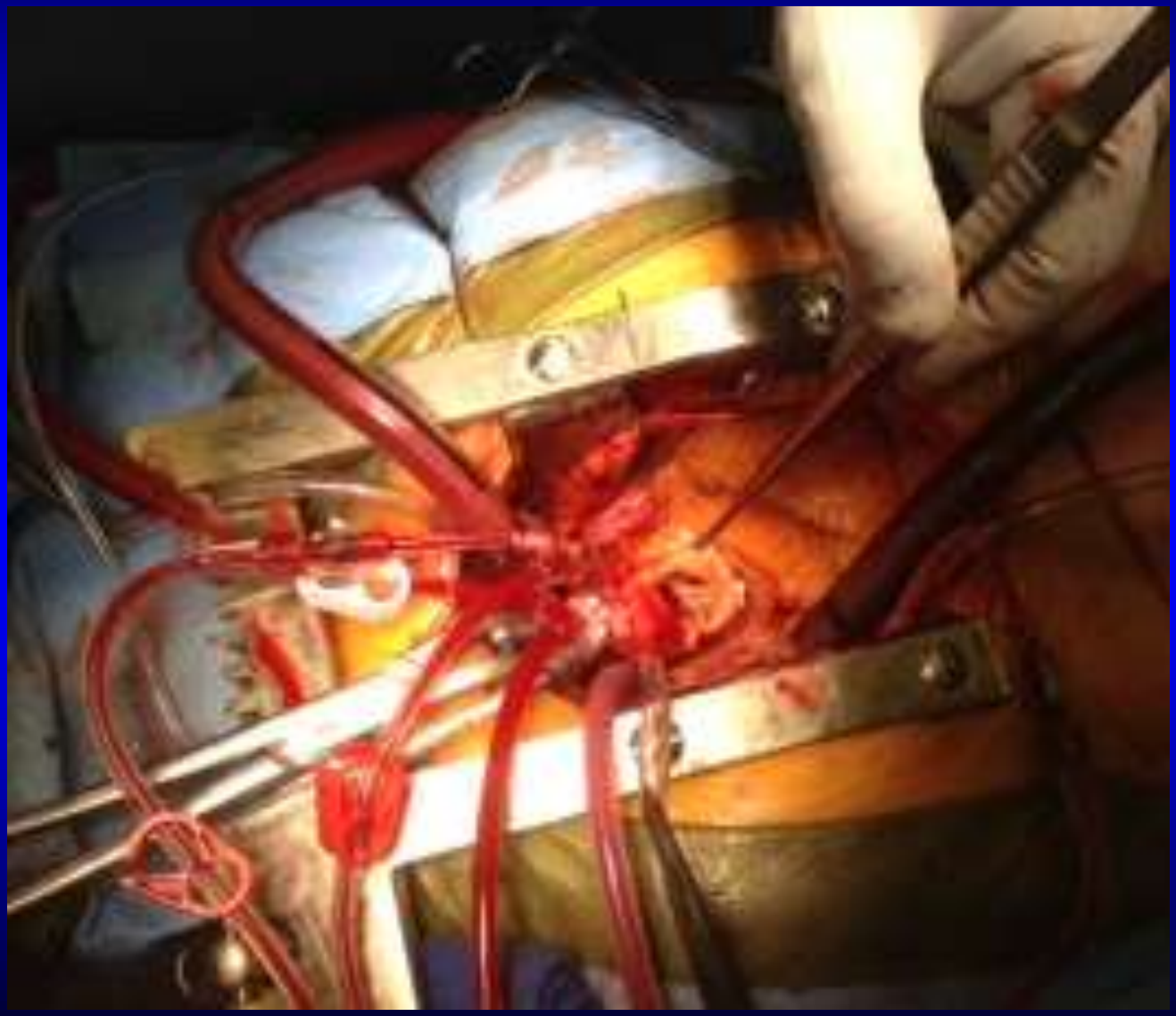
ON-PUMP

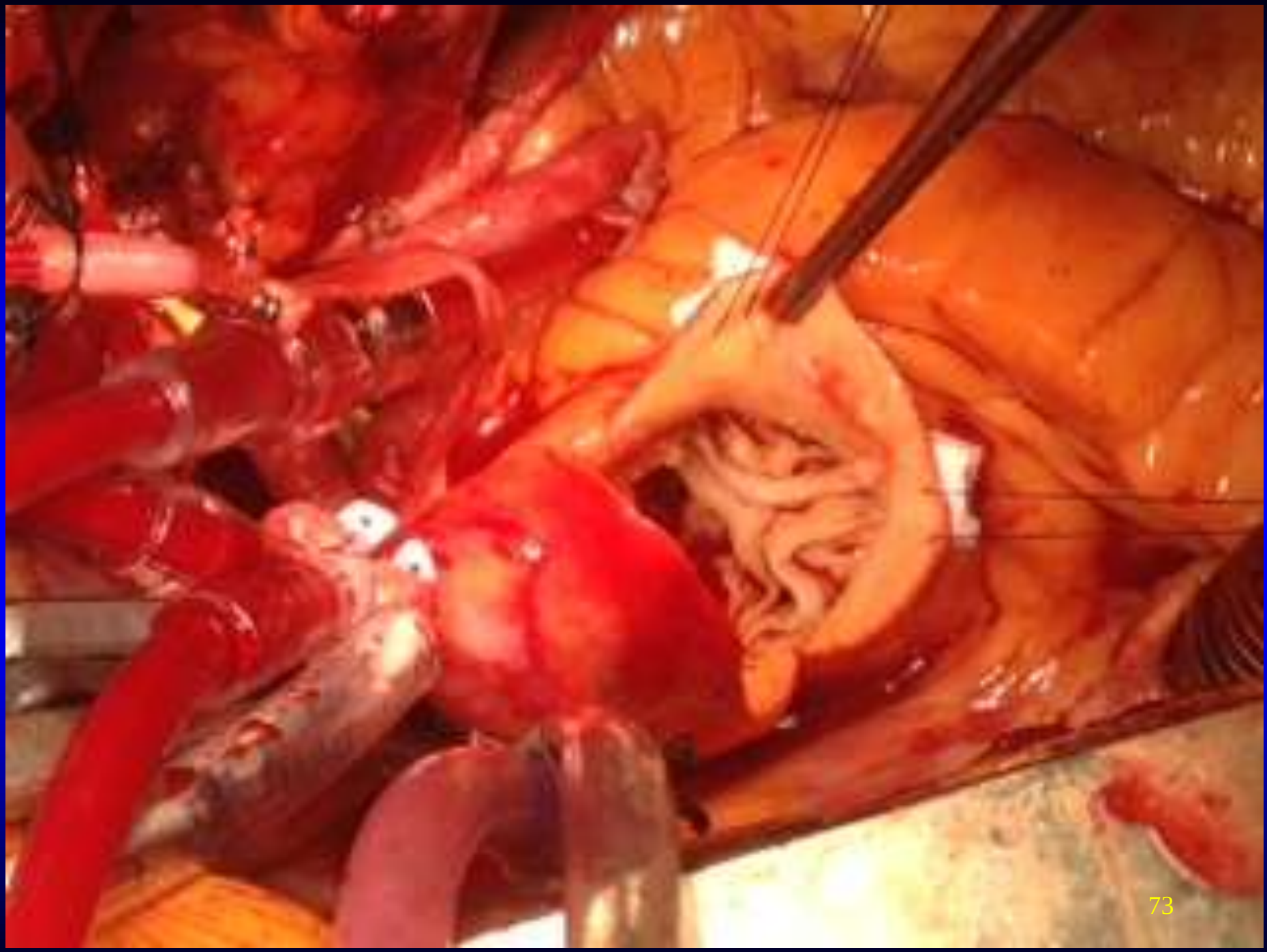
- Mini-Sternotomies
- Mini-Thoracotomies
- Totally endoscopic (Robotic)

OFF-PUMP

- Transfemoral/Transapical (“Catheter” valves)
- New technologies

Standard AVR





Conclusions

- MR is a “curable” disease and should be managed with changing indications in mind
- MV replacement is now accepted as a treatment for IMR in certain cases and should be strongly considered if:
  - Basal dyskinetic segment
  - Significant chord tethering seen

Conclusions

- Untreated TR can lead to unacceptably higher rates of M&M and should be treated at the time of other cardiac operations
- MICS affords more rapid return to normal activity but enthusiasm must be tempered with the known excellent outcomes achieved with standard surgery

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- Nishimura, R. A., et al. (2014). "2014 AHA/ACC Guideline for the Management of Patients With Valvular Heart Disease: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines." Circulation **129**(23): e521-643.

Thank you!!!

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Circulation. 1995 Feb 15;91(4):1022-8.

Valve repair improves the outcome of surgery for mitral regurgitation. A multivariate analysis.

Enriquez-Sarano M[1], Schaff HV, Orszulak TA, Tajik AJ, Bailey KR, Frye RL.

Author information

Abstract

BACKGROUND: Mitral valve repair has been suggested as providing a better postoperative outcome than valve replacement for mitral regurgitation, but this impression has been obscured by differences in baseline characteristics and has not been confirmed in multivariate analyses.

METHODS AND RESULTS: The outcomes in 195 patients with valve repair and 214 with replacement for organic mitral regurgitation were compared using multivariate analysis. All patients had preoperative echocardiographic assessment of left ventricular function. Before surgery, patients with valve repair were less symptomatic than those with replacement (42% in New York Heart Association functional class I or II versus 24%, respectively; P = .001), had less atrial fibrillation (41% versus 53%; P = .017), and had a better ejection fraction (63 +/- 9% versus 60 +/- 12%, P = .016). After valve repair, compared with valve replacement, overall survival at 10 years was 68 +/- 6% versus 52 +/- 4% (P = .0004), overall operative mortality was 2.6% versus 10.3% (P = .002), operative mortality in patients under age 75 was 1.3% versus 5.7% (P = .036), and late survival (in operative survivors) at 10 years was 69 +/- 6% versus 58 +/- 5% (P = .018). Late survival after valve repair was not different from expected survival. After surgery, ejection fraction decreased significantly in both groups but was higher after valve repair (P = .001). Multivariate analysis indicated an independent beneficial effect of valve repair on overall survival (hazard ratio, 0.39; P = .00001), operative mortality (odds ratio, 0.27; P = .026), late survival (hazard ratio, 0.44; P = .001), and postoperative ejection fraction (P = .001).

CONCLUSIONS: Valve repair significantly improves postoperative outcome in patients with mitral regurgitation and should be the preferred mode of surgical correction. The low operative mortality is an incentive for early surgery before ventricular dysfunction occurs.

N Engl J Med. 2014 Jan 2;370(1):23-32. doi: 10.1056/NEJMoa1312808. Epub 2013 Nov 18.

Mitral-valve repair versus replacement for severe ischemic mitral regurgitation.

Acker MA, Parides MK, Perrault LP, Moskowitz AJ, Gelijns AC, Voisine P, Smith PK, Hung JW, Blackstone EH, Puskas JD, Argenziano M, Gammie JS, Mack M, Ascheim DD, Bagiella E, Moquete EG, Ferguson TB, Horvath KA, Geller NL, Miller MA, Woo YJ, D'Alessandro DA, Ailawadi G, Dagenais F, Gardner TJ, O'Gara PT, Michler RE, Kron IL; CTSN.

Collaborators (198)

Abstract

BACKGROUND: Ischemic mitral regurgitation is associated with a substantial risk of death. Practice guidelines recommend surgery for patients with a severe form of this condition but acknowledge that the supporting evidence for repair or replacement is limited.

METHODS: We randomly assigned 251 patients with severe ischemic mitral regurgitation to undergo either mitral-valve repair or chordal-sparing replacement in order to evaluate efficacy and safety. The primary end point was the left ventricular end-systolic volume index (LVESVI) at 12 months, as assessed with the use of a Wilcoxon rank-sum test in which deaths were categorized below the lowest LVESVI rank.

RESULTS: At 12 months, the mean LVESVI among surviving patients was 54.6±25.0 ml per square meter of body-surface area in the repair group and 60.7±31.5 ml per square meter in the replacement group (mean change from baseline, -6.6 and -6.8 ml per square meter, respectively). The rate of death was 14.3% in the repair group and 17.6% in the replacement group (hazard ratio with repair, 0.79; 95% confidence interval, 0.42 to 1.47; P=0.45 by the log-rank test). There was no significant between-group difference in LVESVI after adjustment for death (z score, 1.33; P=0.18). The rate of moderate or severe recurrence of mitral regurgitation at 12 months was higher in the repair group than in the replacement group (32.6% vs. 2.3%, P<0.001). There were no significant between-group differences in the rate of a composite of major adverse cardiac or cerebrovascular events, in functional status, or in quality of life at 12 months.

CONCLUSIONS: We observed no significant difference in left ventricular reverse remodeling or survival at 12 months between patients who underwent mitral-valve repair and those who underwent mitral-valve replacement. Replacement provided a more durable correction of mitral regurgitation, but there was no significant between-group difference in clinical outcomes. (Funded by the National Institutes of Health and the Canadian Institutes of Health; ClinicalTrials.gov number, NCT00807040.).

Circulation. 2014 Jun 10;129(23):e521-643. doi: 10.1161/CIR.0000000000000031. Epub 2014 Mar 3.

2014 AHA/ACC Guideline for the Management of Patients With Valvular Heart Disease: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines.

Nishimura RA, Otto CM, Bonow RO, Carabello BA, Erwin JP 3rd, Guyton RA, O'Gara PT, Ruiz CE, Skubas NJ, Sorajja P, Sundt TM 3rd, Thomas JD; ACC/AHA Task Force Members.