Surgical Myectomy is the Best Treatment for Symptomatic Obstructive HCM

(For Most Patients)

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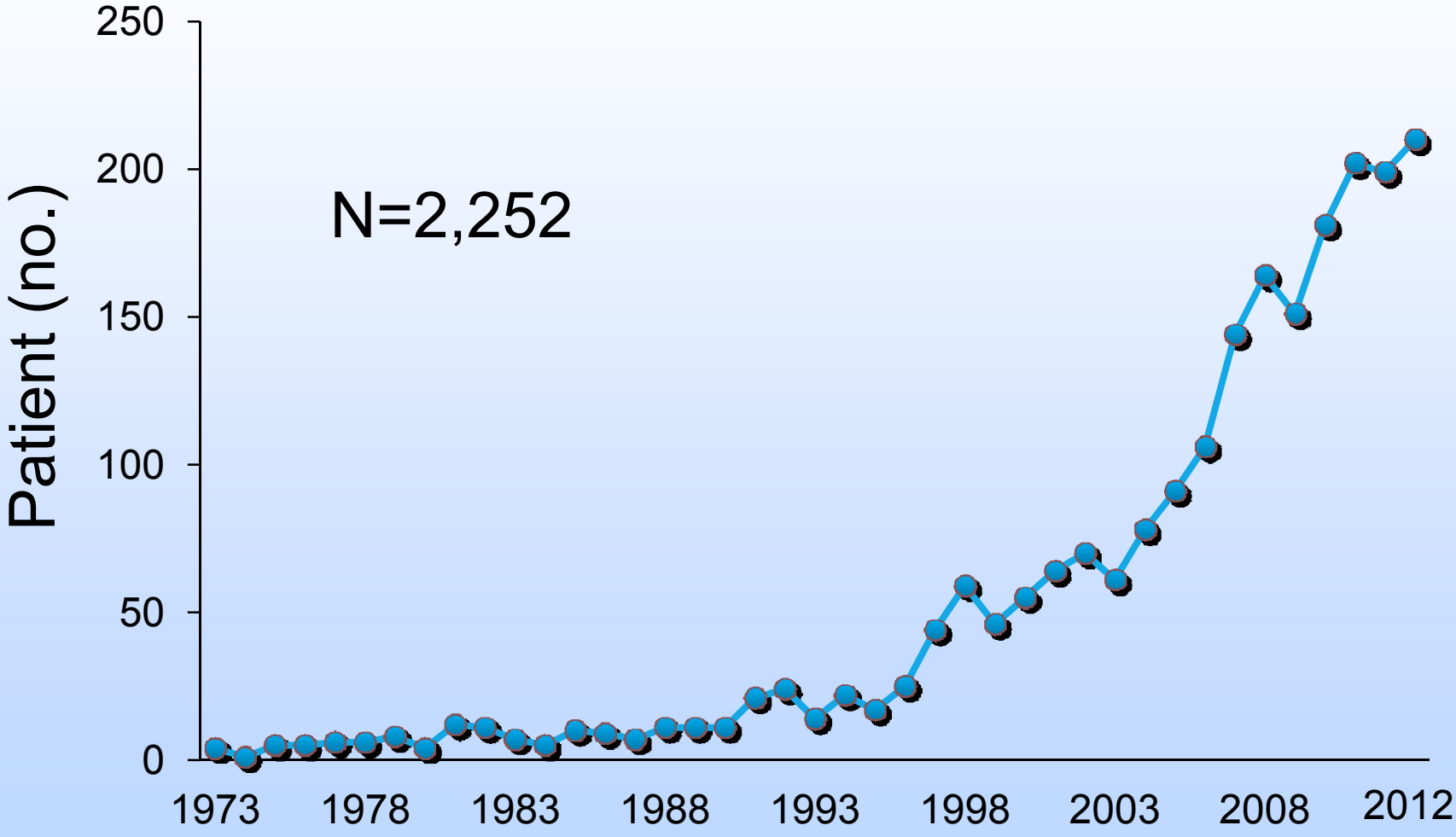
Jerusalem
April 23, 2013

The Leviev Heart Center

Outcome of Myectomy for HCM
Mayo Clinic

- Operative mortality 0.8%
- Gradient reduction 67 → 3 mm Hg
- Postop NYHA 1-2 94%

Myectomy for HCM
Mayo Clinic 1973-2012



Sheba MC Experience

- 77 pts with HOCM and MR underwent Septal Myectomy from 12/2004 till 12/2012.
- LVOT obstruction: Mean rest 56 ± 37mmHg and 80 ± 39 mmHg in valsalva.
- Mean Age: 61 ± 15 y
- Gender: 47 % M, 53% F
- Mean NYHA FC: 2.4 ± 0.8

Patients (CONT)

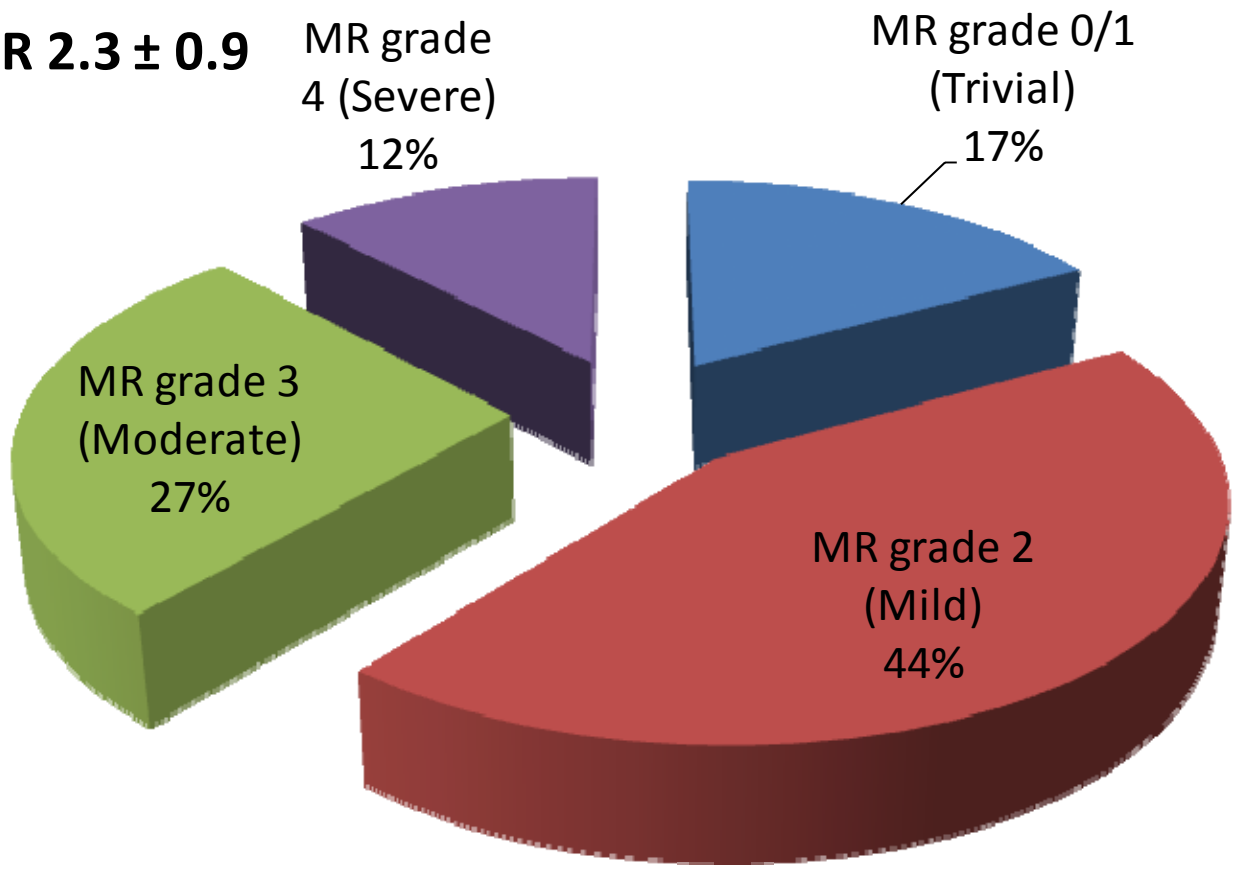
- Concomitant procedures

Any Procedure	45(60%)
AVR/AVre	27(35%)
MVR/MVr	15(19%)
CABG	12(16%)
Maze	8(10%)
Aorta	1(1%)

- Redo Operation : 8 (10%)

Pre-operative MR

Mean MR 2.3 ± 0.9



Relationship between LVOT gradient and degree of MR (Pre Op.)

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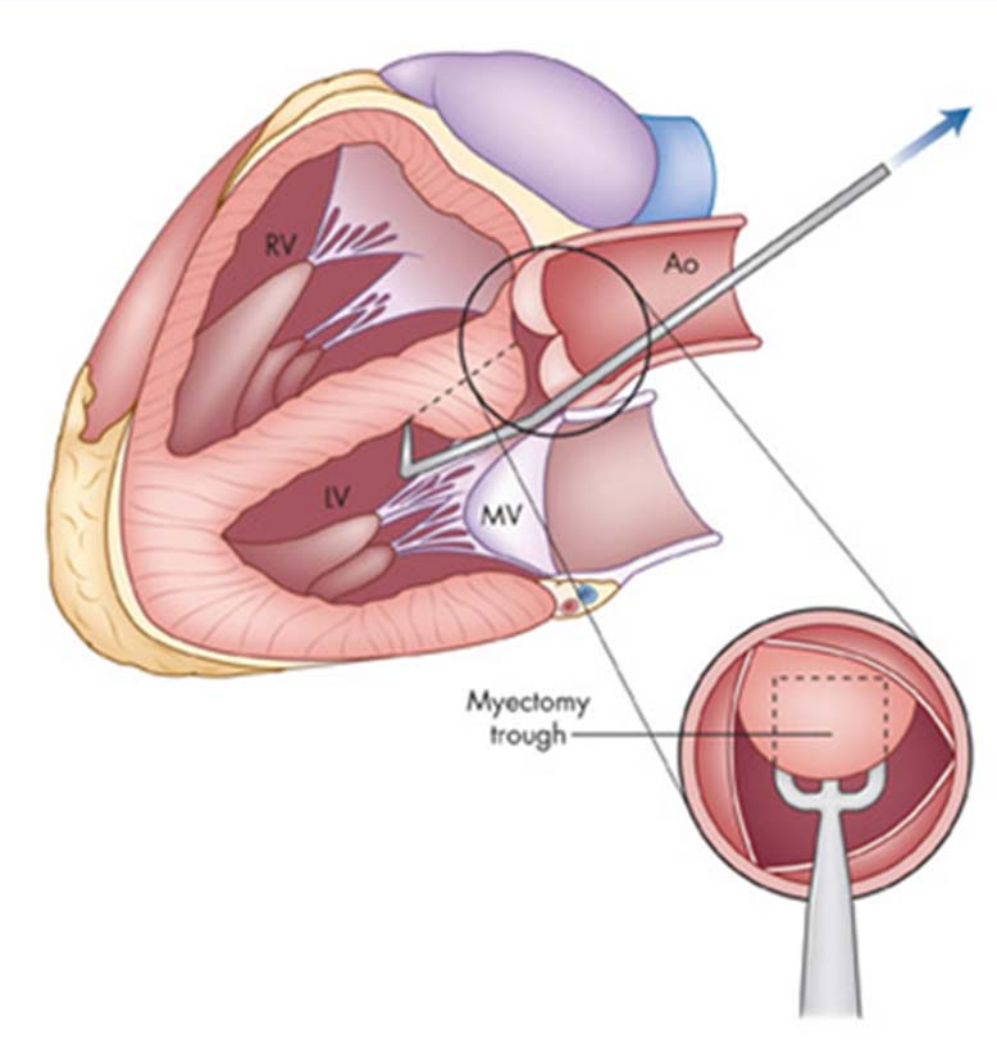
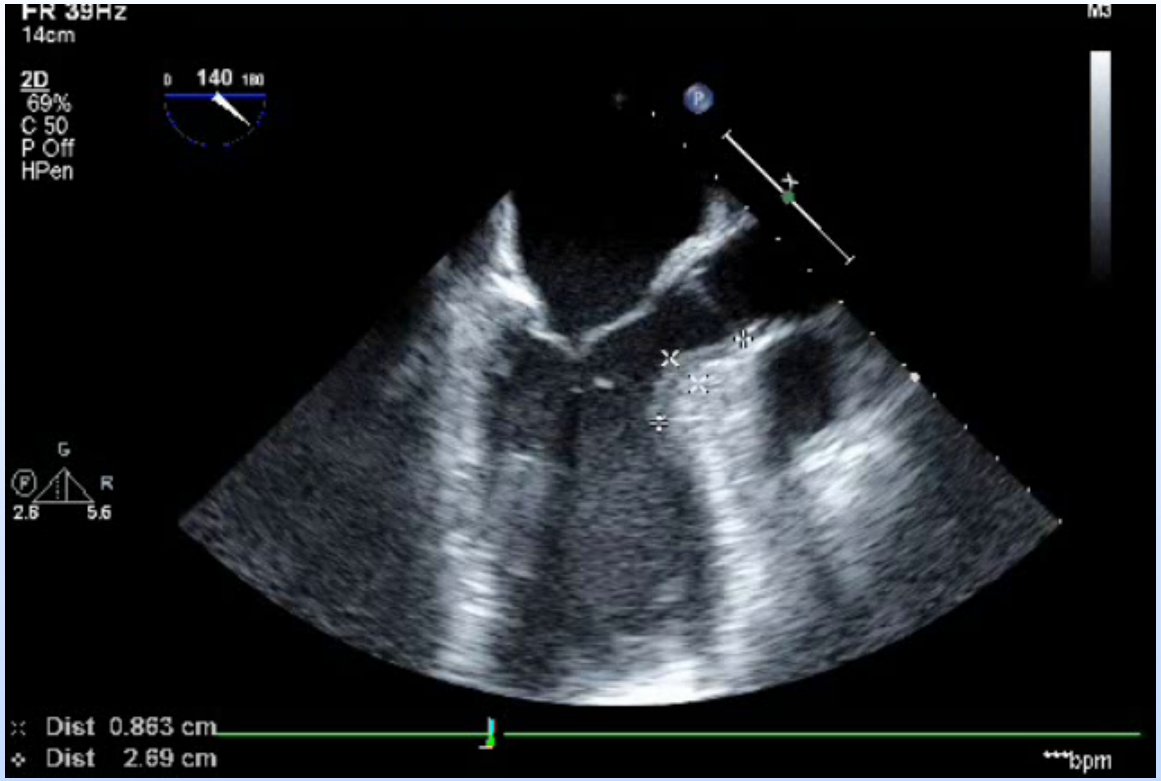
Trans-aortic septal myectomy





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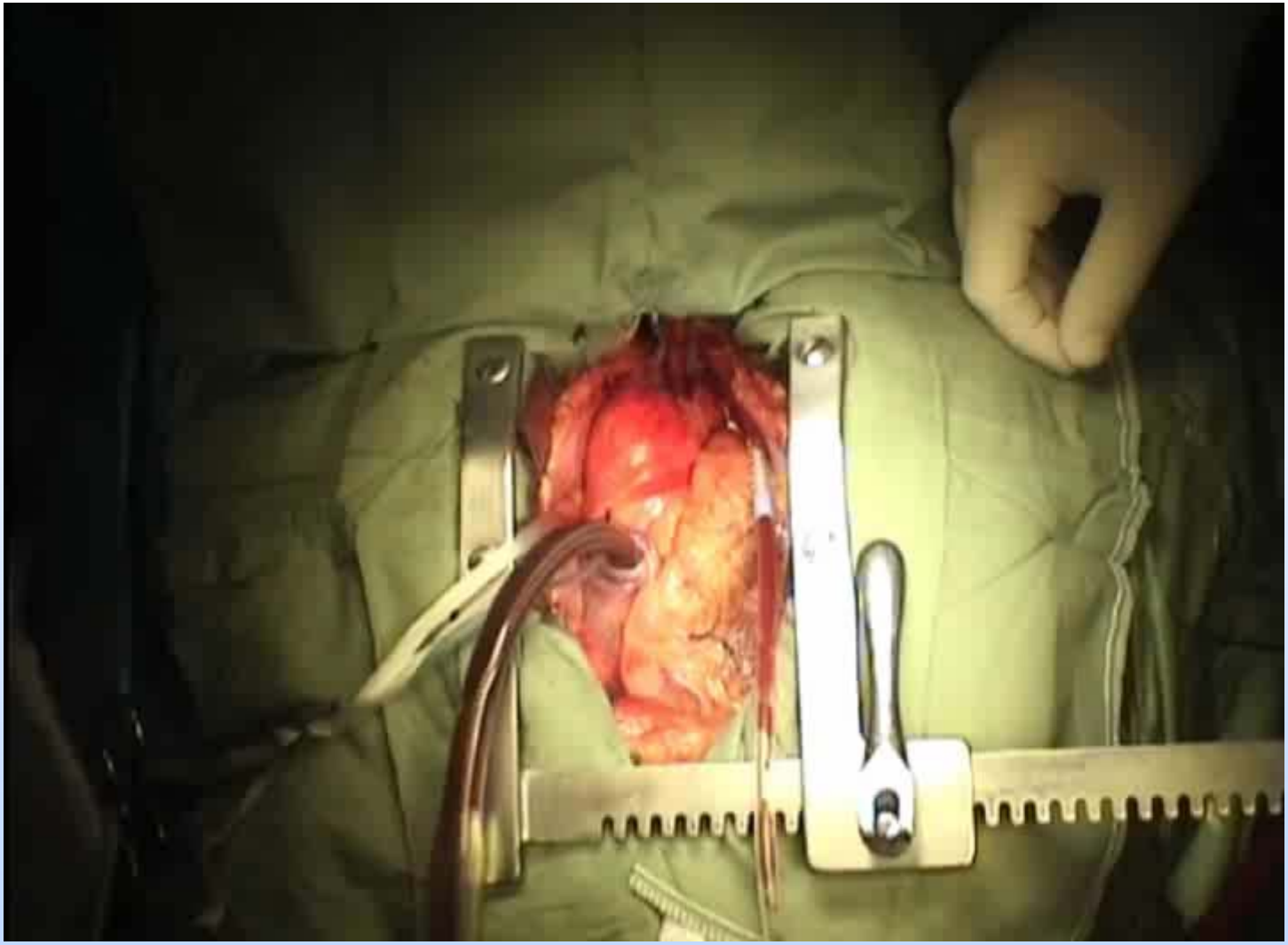
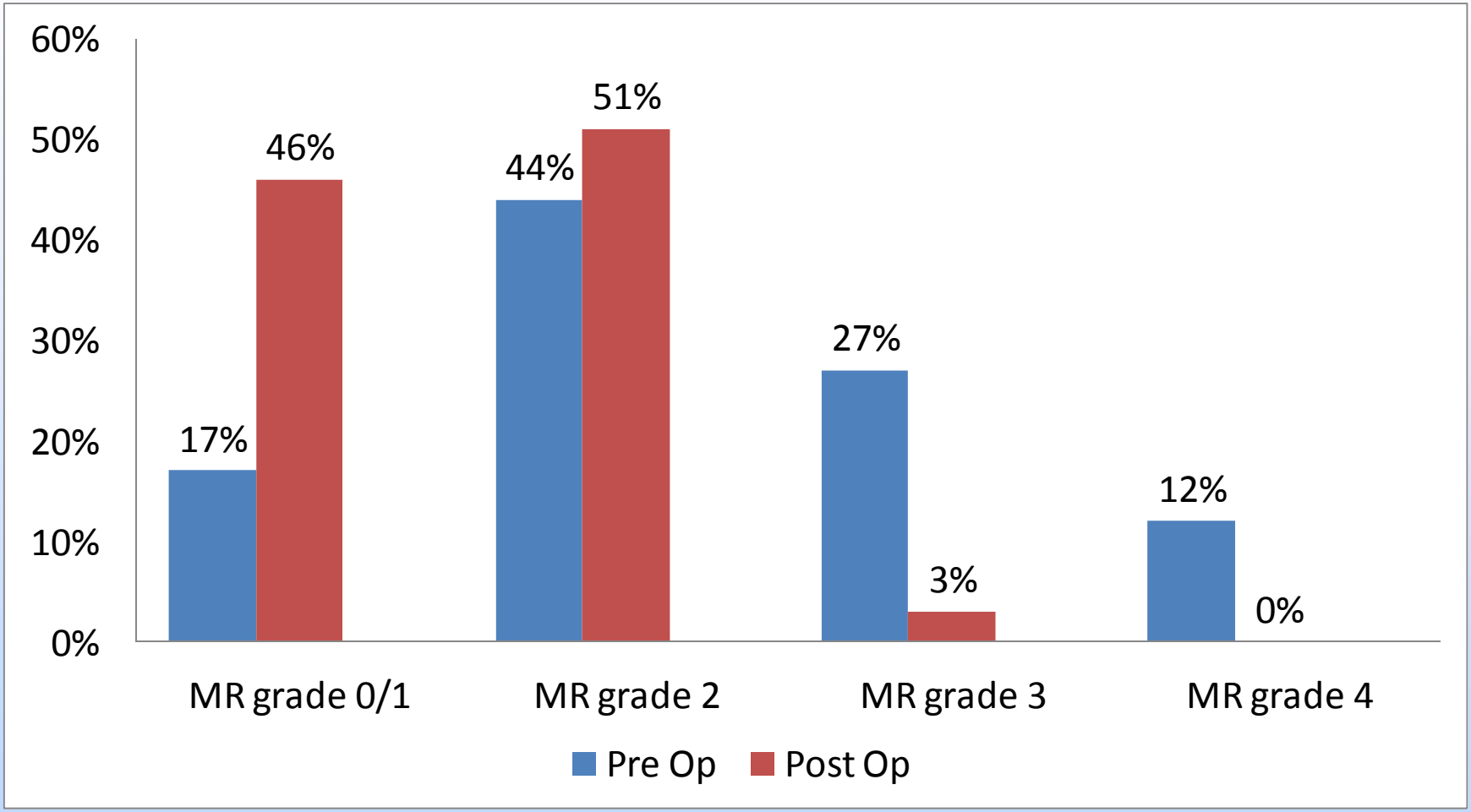


Early Results

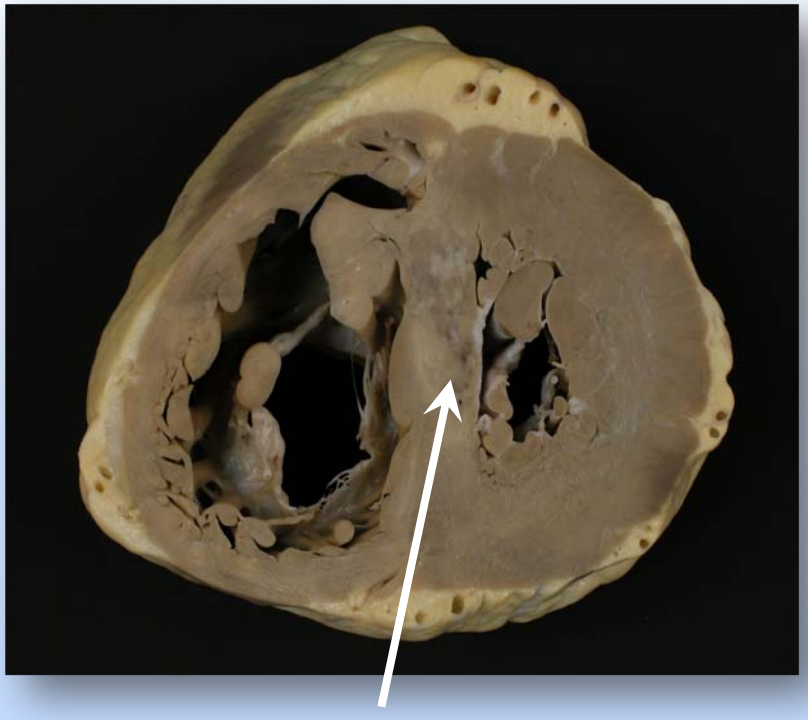
- Mortality : 0 (0%)
- CVA : 0 (0%)
- Pacemaker : 8 (10%)
- Length of Stay : 7 ± 5 days

Late Echo


60%
50%
40%
30%
20%
10%
0%
17%
46%
44%
51%
27%
3%
12%
0%
MR grade 0/1
MR grade 2
MR grade 3
MR grade 4
Pre Op
Post Op

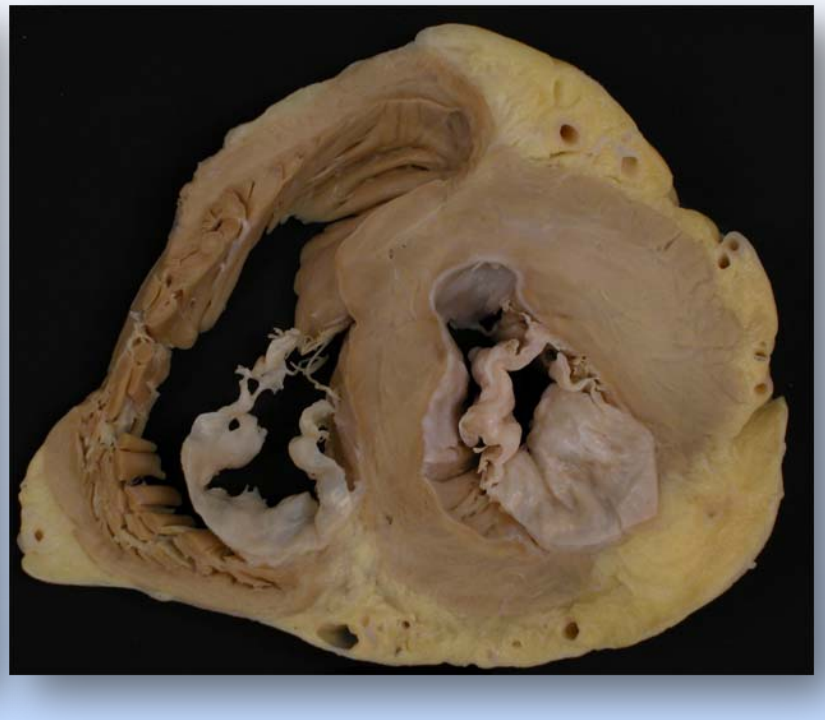
Septal Scarring

Post-Ablation



Septal scar

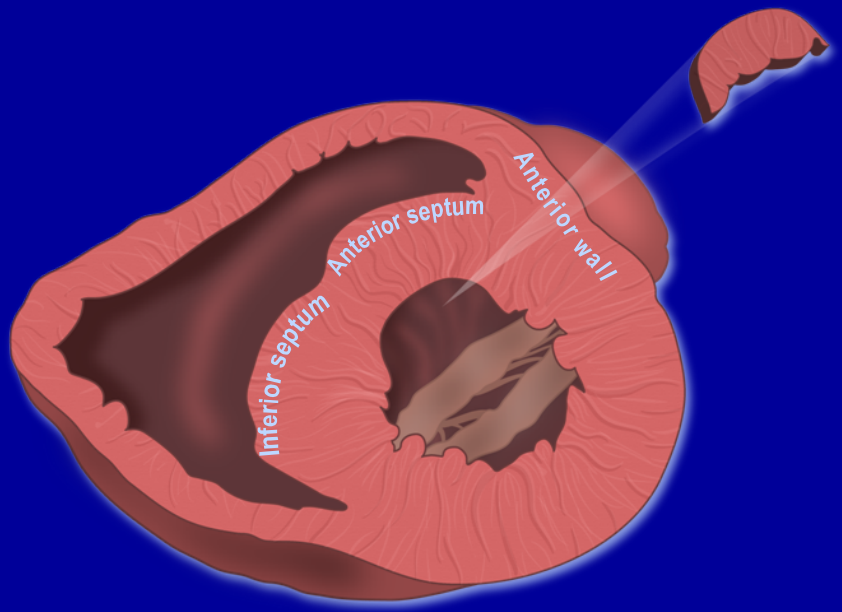
Post-Myectomy



No scar

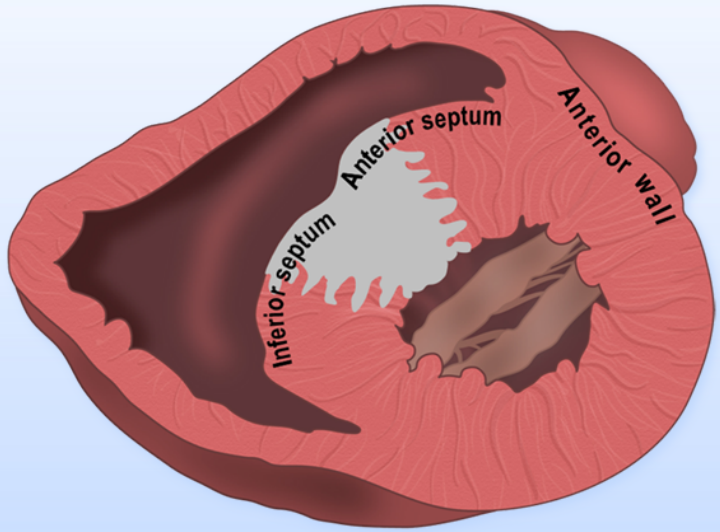
Septal Myectomy versus Septal Infarction
MRI Study

Surgical septal myectomy –
34 patients



Resected tissue
2.7±1.4% of LV mass
Range 0.8-5.9

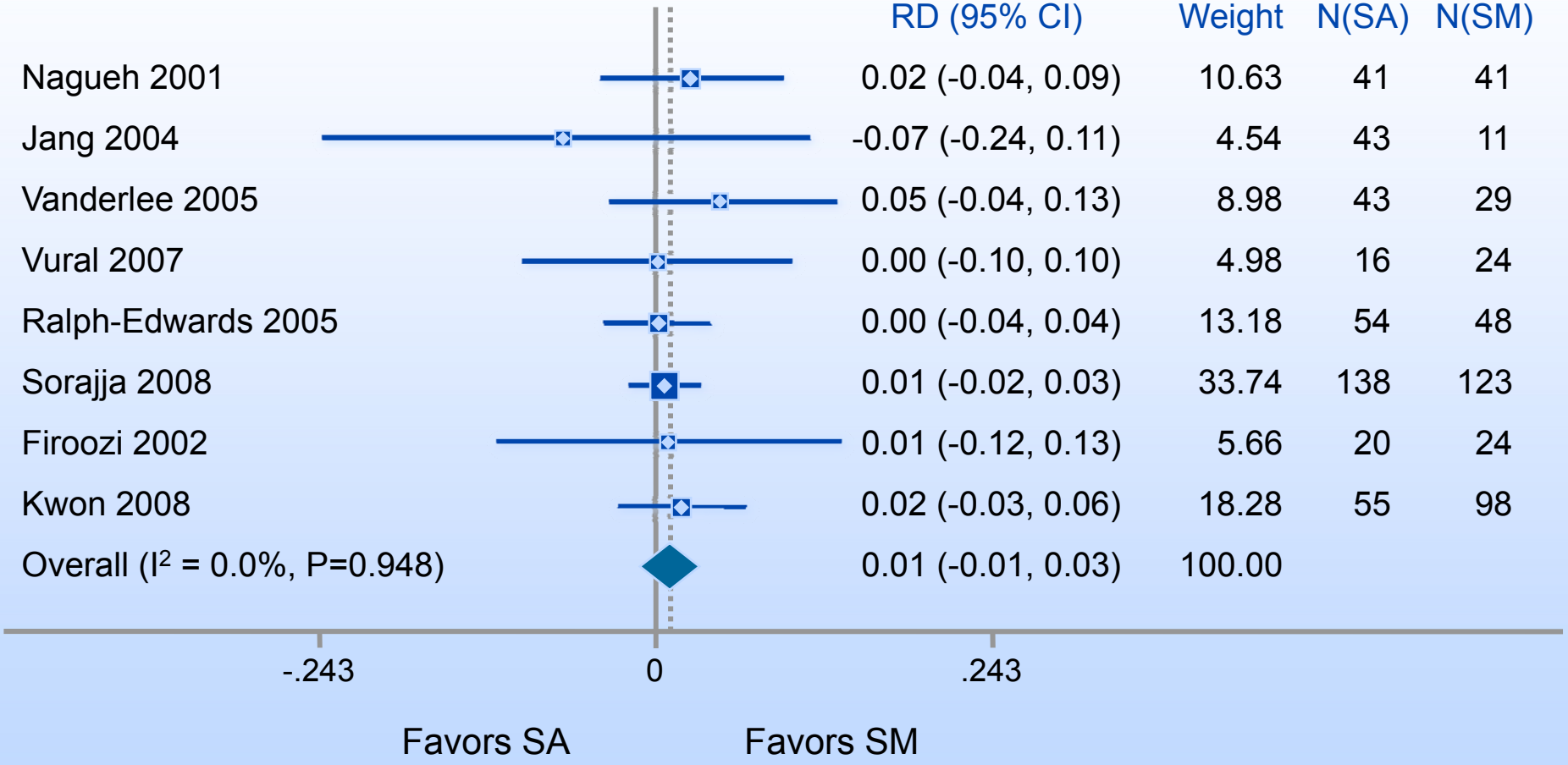
Alcohol septal ablation –
45 patients



Infarcted tissue
8±3% of LV mass
Range 3.6-13.6

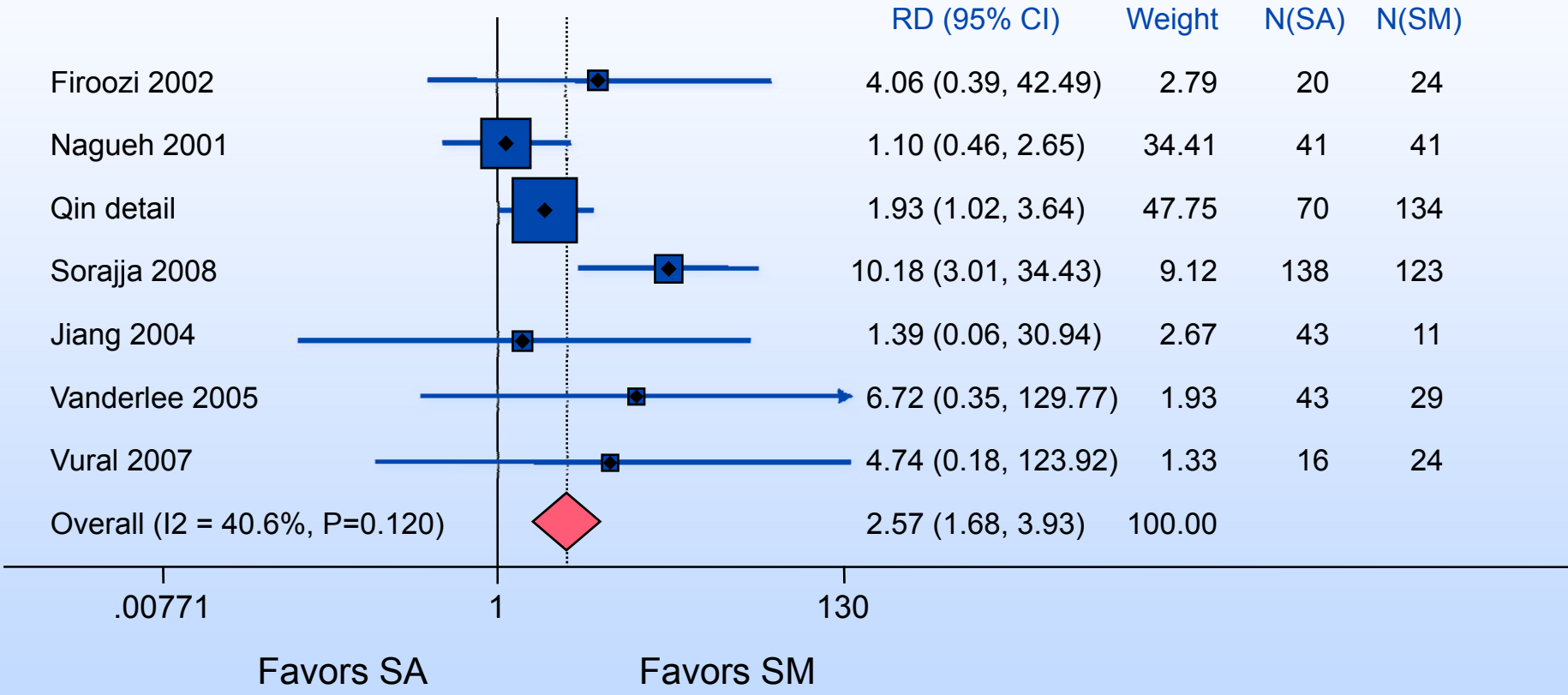
Valeti, JACC 2007

Short-Term Mortality



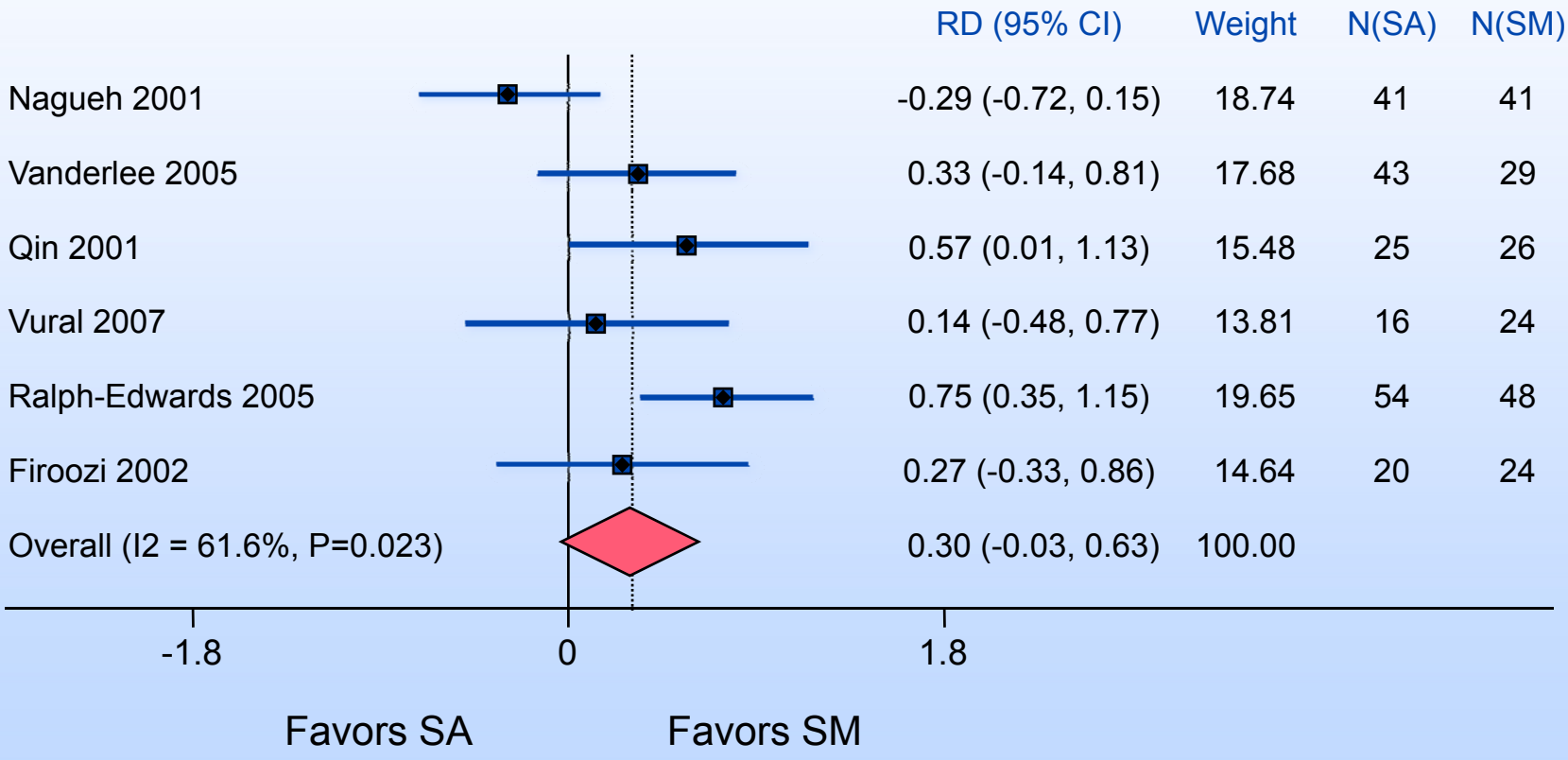
Agarwal et al: JACC 55:823, 2010

Post-Intervention Pacemaker Implantation



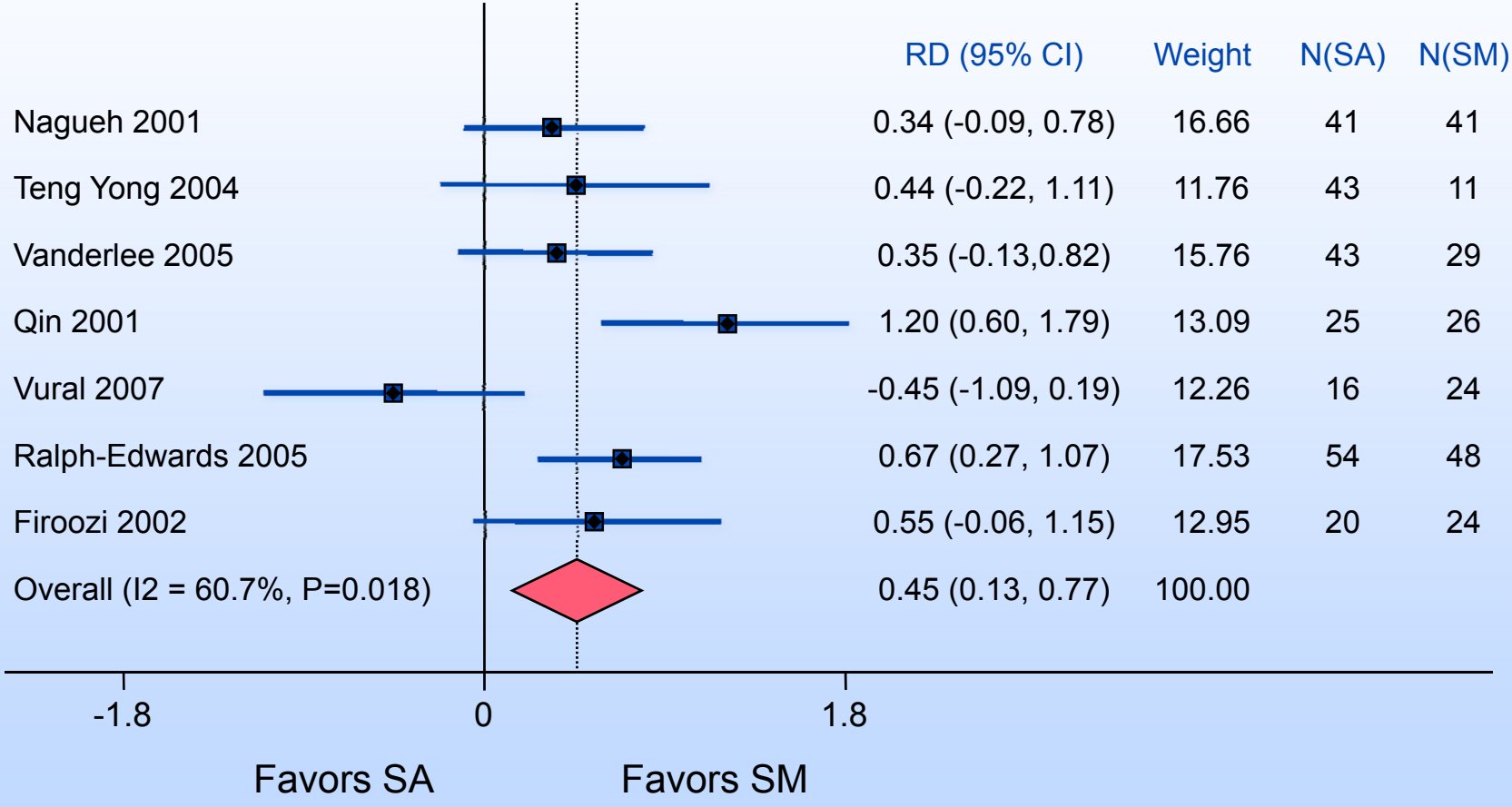
Agarwal et al: JACC 55:823, 2010

Post-Procedure Mean NYHA



Agarwal et al: JACC 55:823, 2010

Post-Procedure Left Ventricular Outflow Tract Gradient



Agarwal et al: JACC 55:823, 2010

Ventricular Arrhythmia Following Alcohol Septal Ablation for Obstructive Hypertrophic Cardiomyopathy

Peter A. Noseworthy, MD[a], Michael A. Rosenberg, MD[b], Michael A. Fifer, MD[a], Igor F. Palacios, MD[a], Patricia A. Lowry, NP[a], Jeremy N. Ruskin, MD[c], Danita M. Sanborn, MD[a], Michael H. Picard, MD[a], Gus J. Vlahakes, MD[d], Theofanie Mela, MD[c], and Saumya Das, MD, PhD[c,*]

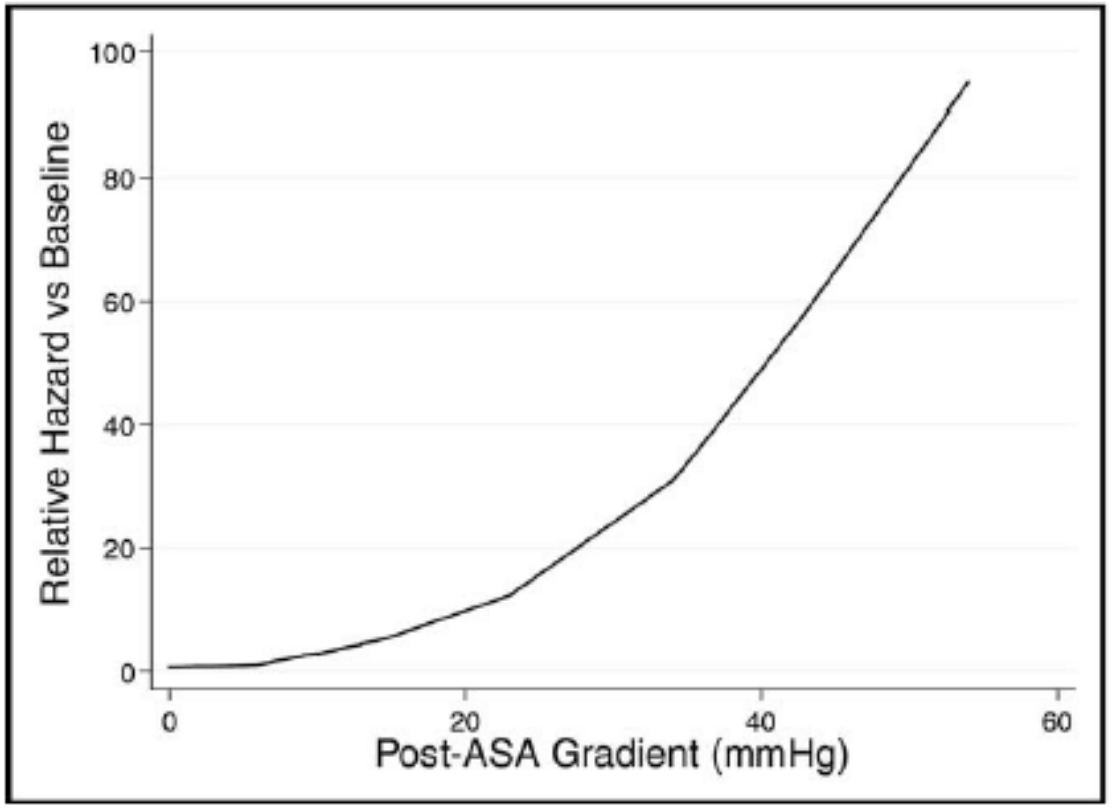
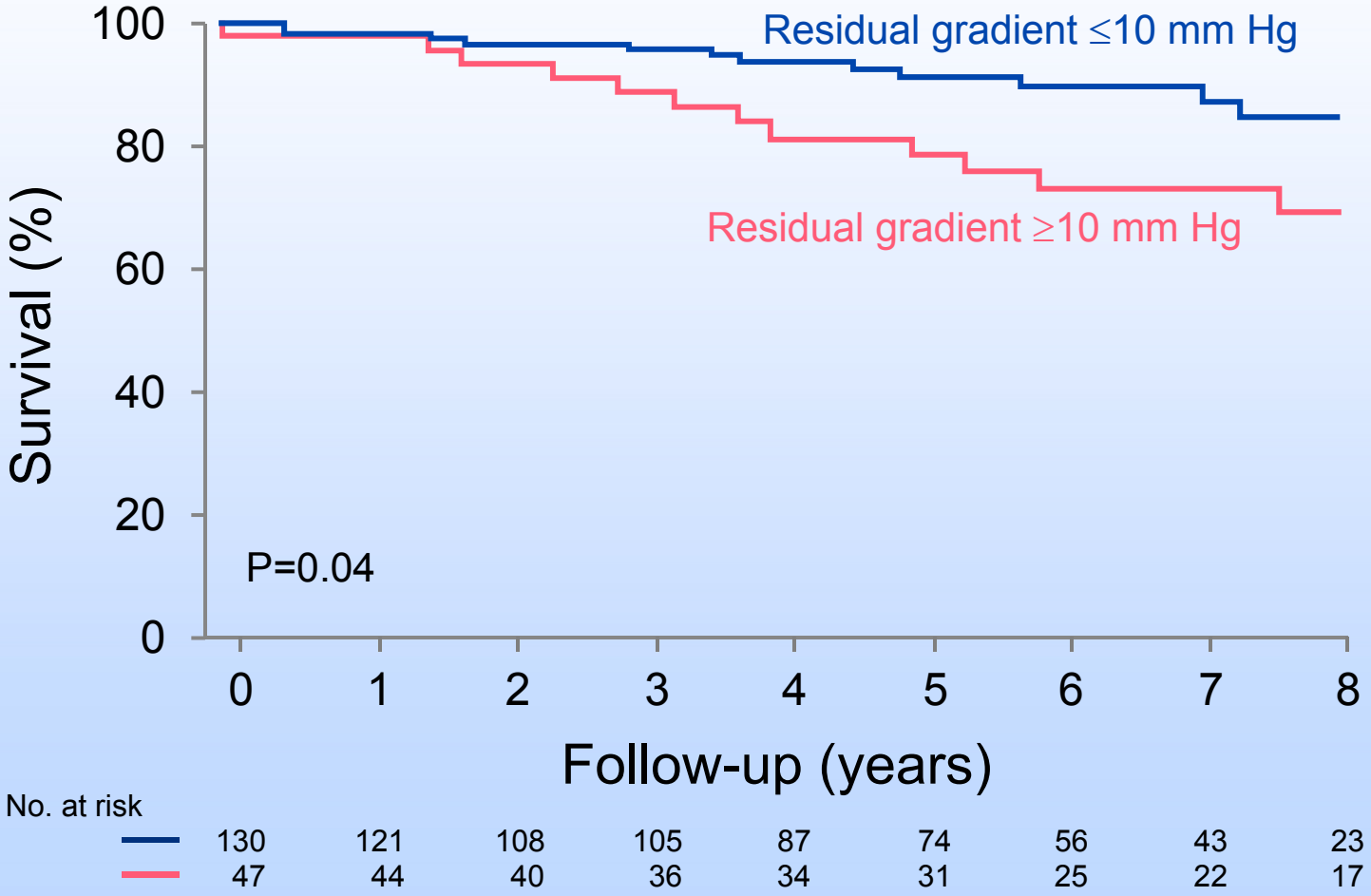


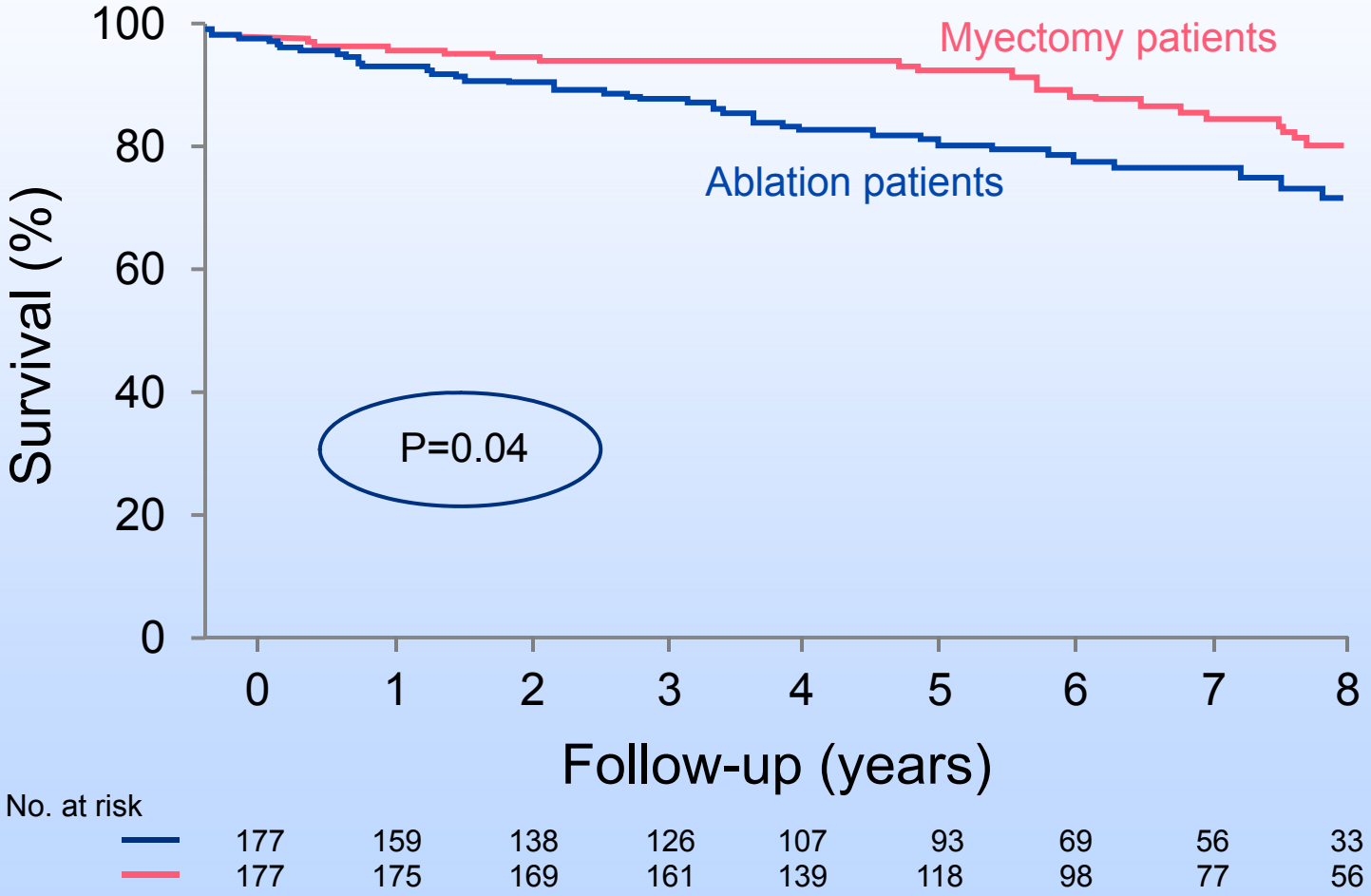
Figure 2. Risk of VT, cardiac arrest, or appropriate ICD therapy increased as post-ASA gradient increased. Created using Lowness smoothing from Cox regression model incorporating post-ASA gradient.

Residual LVOT Gradient After Septal Ablation and Survival Free of All-Cause Mortality



Sorajja et al: Circ 126:2374, 2012

Survival-Free of Death or Need for Additional Septal Reduction Therapy ; Septal Ablation in Comparison Matched Population of Surgical Myectomy



Sorajja et al: Circ 126:2374, 2012

Predictors of All-Cause Mortality

	Univariate risk ratio	P	Multivariate risk ratio*	P
Age (per year)	1.54 (1.51-1.57)	<0.0001	1.09 (1.03-1.15)	0.004
Male	1.82 (1.11-2.94)	0.01	0.51 (0.24-1.08)	0.07
Hypertension	1.54 (0.95-2.50)	0.07		
Atrial fibrillation	2.04 (1.15-3.70)	0.01		
CAD	1.96 (0.87-4.35)	0.09		
ESD (per mm increase)	1.09 (1.00-1.19)	0.03		
EDD (per mm increase)	1.06 (1.00-1.12)	0.03		
Postablation LVOT gradient (per 5 mm Hg increase)	1.10 (1.03-1.17)	0.002	1.04 (1.01-1.07)	0.004
β-blocker therapy	1.53 (0.92-2.52)	0.09		

*Only age, male sex and postablation LVOT gradient included in final multivariate model

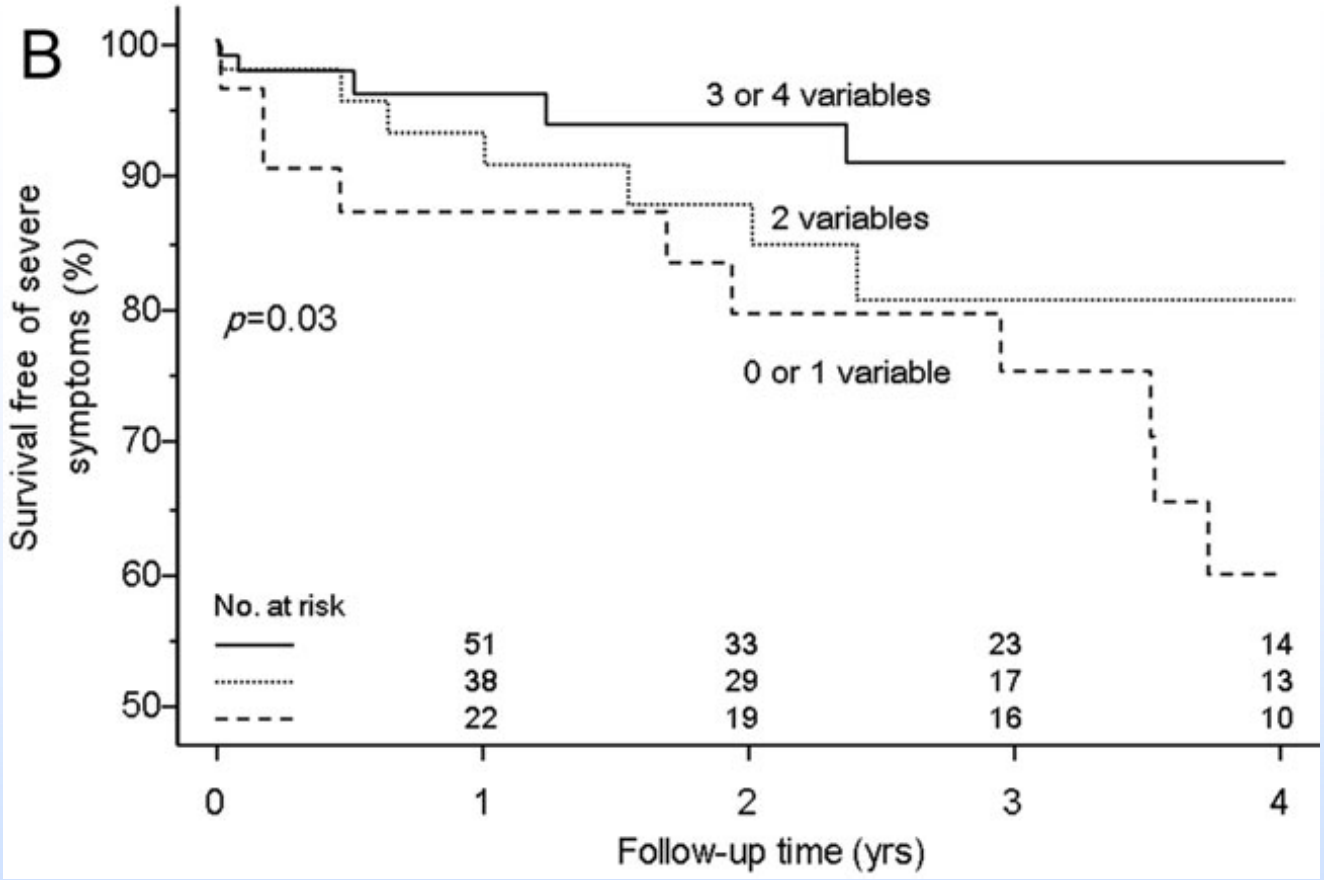
Sorajja et al: Circ 126:2374, 2012

Univariate and Multivariate Predictors of Hemodynamic Success

	Univariate			Multivariate		
	RR	**95% CI**	**P**	**RR**	**95% CI**	**P**
Age	1.84	0.91-3.72	0.08	1.03	1.00-1.07	0.02
LVOT gradient						
Resting	0.96	0.95-0.98	<0.0001	0.96	0.94-0.97	<0.0001
Provocable	0.97	0.95-0.99	0.002	–		
Septal thickness						
Maximal	0.93	0.86-0.99	0.03	–		
1 cm proximal to SAM	0.83	0.74-0.92	0.003	–		
At SAM-septal contact	0.87	0.79-0.95	0.002	0.85	0.75-0.96	0.009
C-septum distance	1.07	0.98-1.17	0.04	–		
LAD ref diam	0.62	0.41-0.94	0.02	0.96	0.94-0.97	0.05
Case no. <51	0.31	0.15-0.64	0.001	0.39	0.15-1.00	0.04

Hemodynamic success was defined as post-procedural resting gradient of <10 mm Hg and >80% reduction in provocable gradient

Sorajja et al: Catheterization and CV Interventions 81:E58, 2013



Favorable variables:

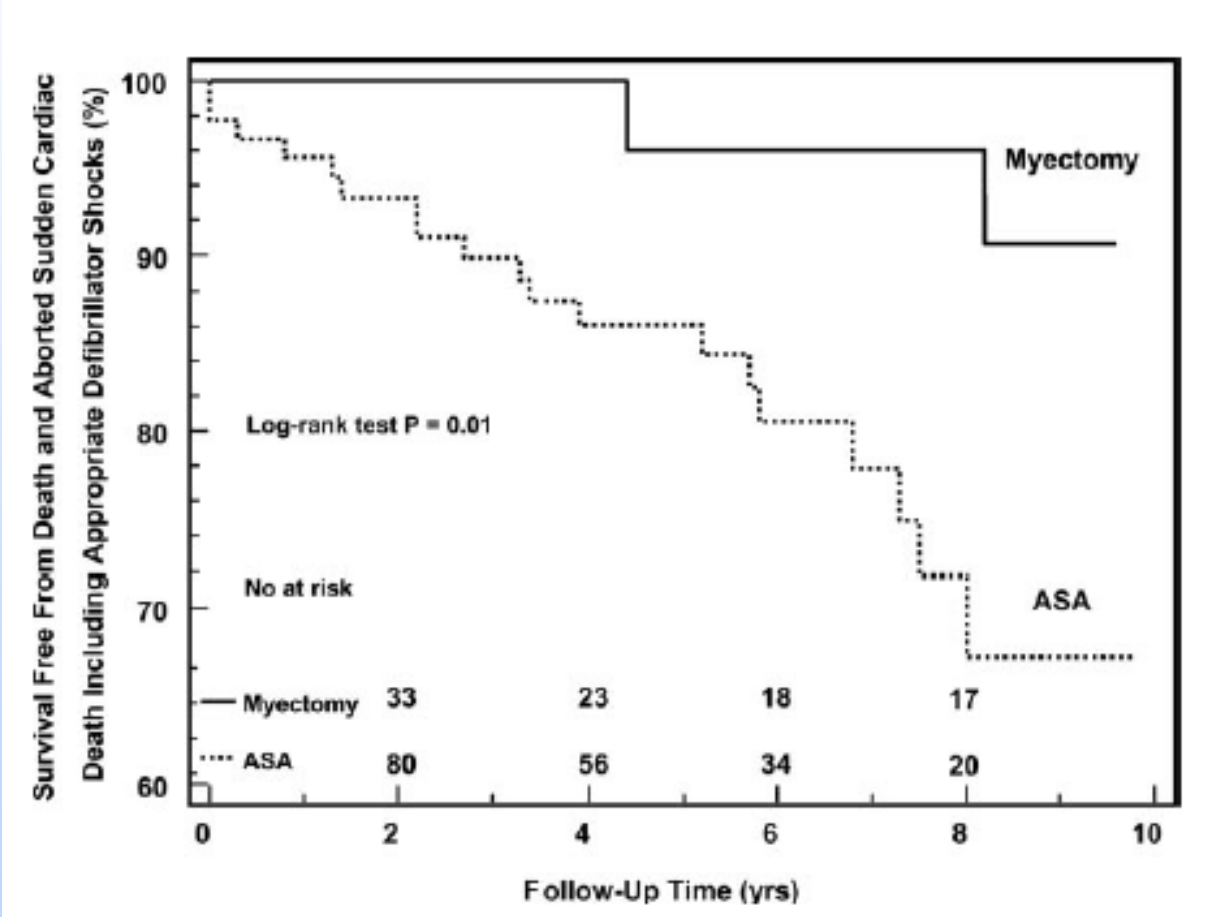
- age≥65y
- LVOT grad ≤ 100mmhg
- LAD<4.0mm
- Basal septum≤18mm
- Case no > 50 patients

Sorajja et al: Catheterization and CV Interventions 81:E58, 2013

Long-Term Outcome of Alcohol Septal Ablation in Patients With Obstructive Hypertrophic Cardiomyopathy

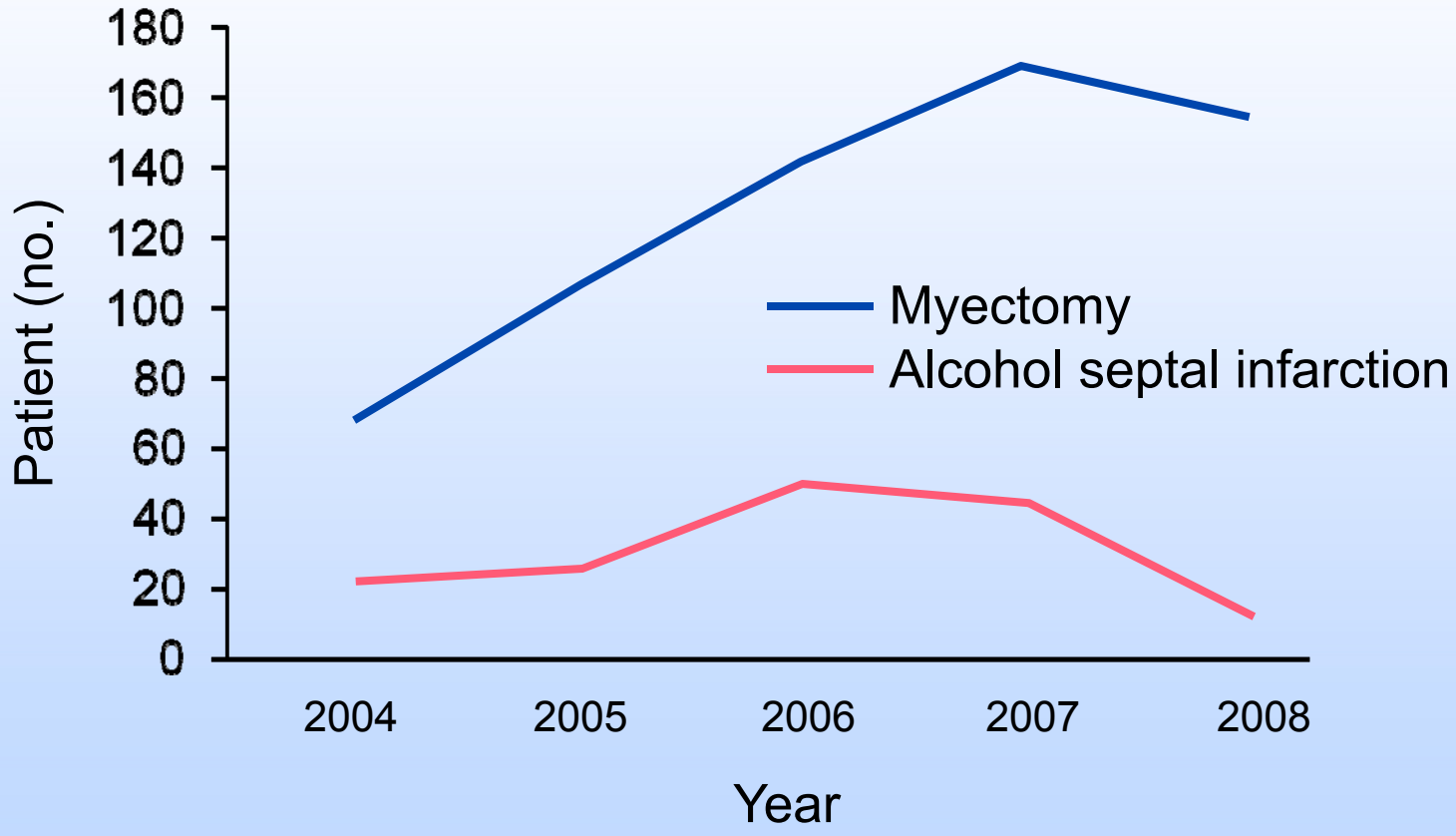
A Word of Caution

Folkert J. ten Cate, MD, PhD; Osama I.I. Soliman, MD, PhD; Michelle Michels, MD;
Dominic A.M.J. Theuns, PhD; Peter L. de Jong, MD;
Marcel L. Geleijnse, MD, PhD; Patrick W. Serruys, MD, PhD



(*Circ Heart Fail.* 2010;3:362-369.)

Septal Reduction – Mayo Clinic



Septal Myectomy versus Septal Infarction
Conclusions

- Low early mortality with either procedure
- More reliable relief of gradient with myectomy
- Less collateral myocardial injury
  - Fewer A-V conduction problems, young pt
  - Arrhythmias ?
- Fewer anatomic limitations
- Repair of associated problems

Thank You!

Outcome of Surgical Myectomy After Unsuccessful Alcohol Septal Ablation for the Treatment of Patients With Hypertrophic Obstructive Cardiomyopathy

Sherif F. Nagueh, MD, FACC,* John M. Buergler, MD, FACC,* Miguel A. Quinones, MD, FACC,* William H. Spencer III, MD, FACC,† Gerald M. Lawrie, MD, FACC*

Houston, Texas; and Charleston, South Carolina

The medical records of 375 patients who underwent alcohol ablation at our institution were reviewed. Twenty patients (5.3%, mean age 53 ± 18 years, 17 women) subsequently needed surgical myectomy. The New York Heart Association (NYHA) functional class, angina class, exercise duration, left ventricular outflow tract (LVOT) gradient, ejection fraction, and septal thickness were tabulated. The anatomy and distribution of the septal perforator arteries were examined.

Myectomy can be successfully performed after failed alcohol ablation, but with a higher incidence of heart block than in cases where only surgery is performed. Otherwise, alcohol ablation does not appear to adversely affect surgical outcome. (J Am Coll Cardiol 2007;50:795–8)

Advantages of Septal Myectomy

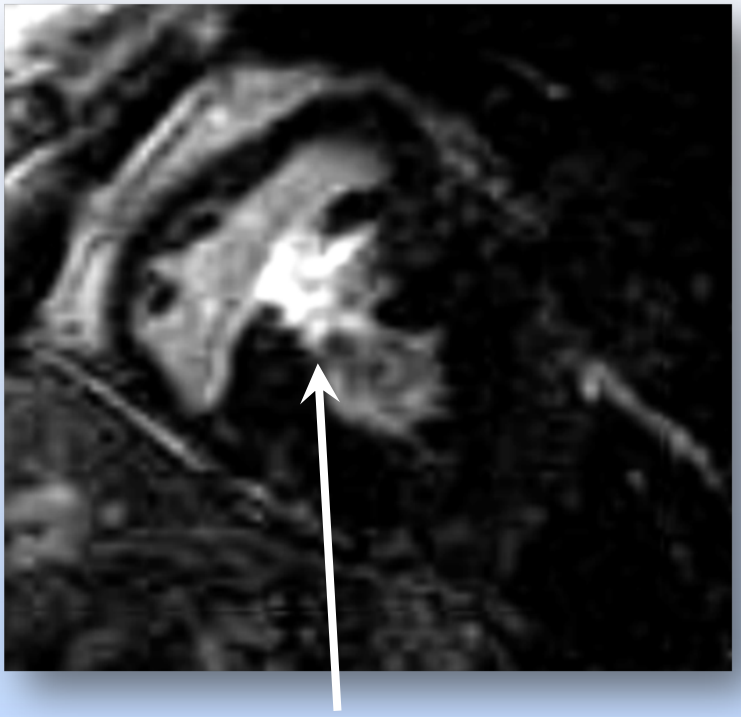
- Higher success rate
- Sustained ‘immediate’ relief of LVOT obstruction
- Long-term durability of benefit
- Lower rate of PPM, fewer late arrhythmias?
- Address other obstruction or lesions

Advantages of Alcohol Septal Ablation

- Patient satisfaction
  - Pain
  - Recovery time
- Impact of older age and comorbidities on surgical risk
- Lower cost

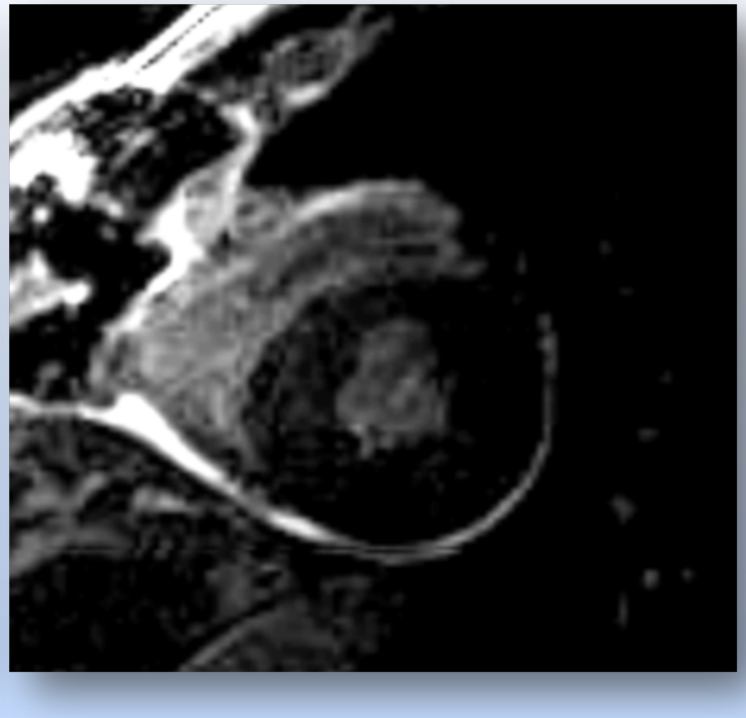
The Ablation Scar

Post-Ablation



Septal scar

Post-Myectomy



No scar

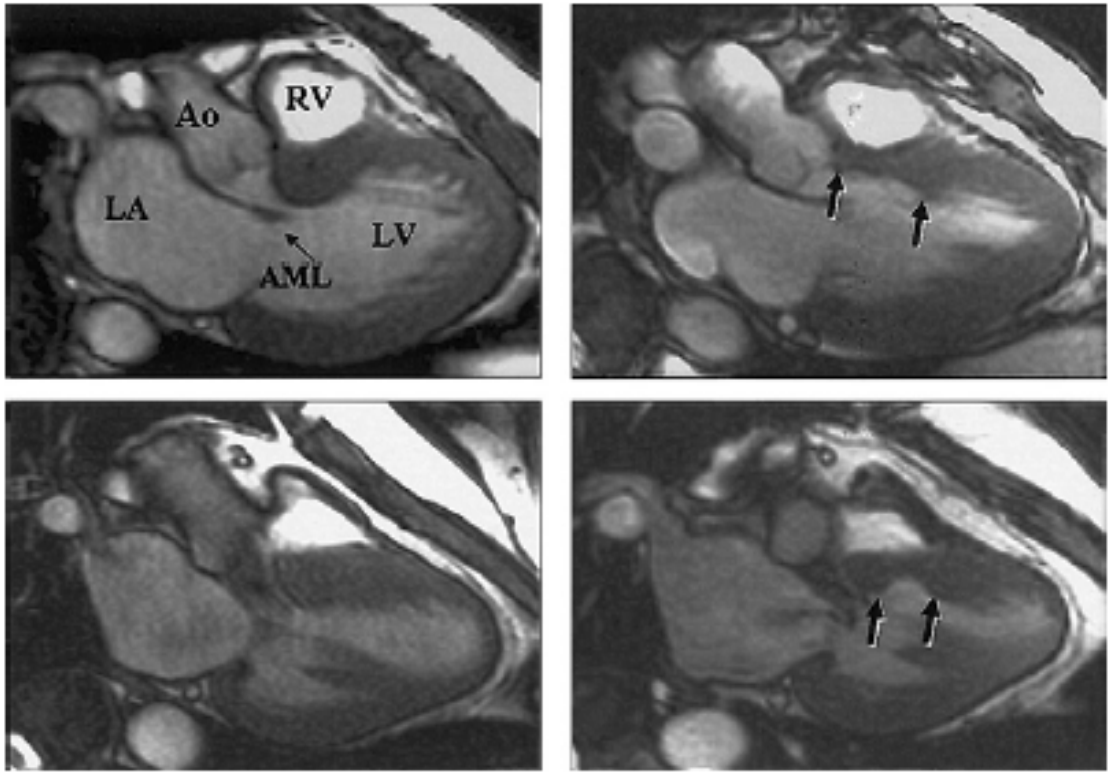
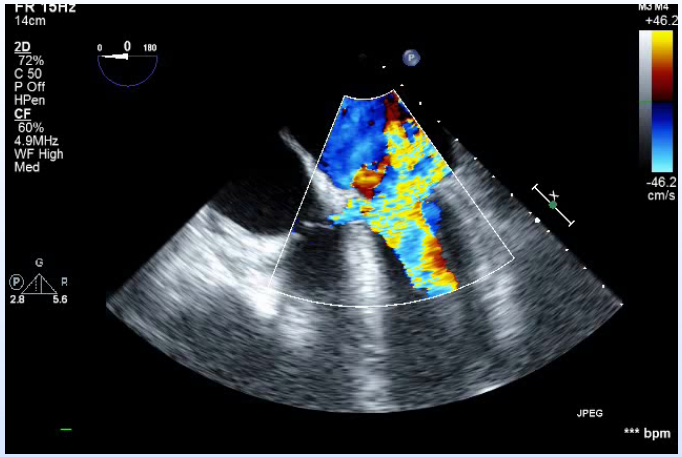
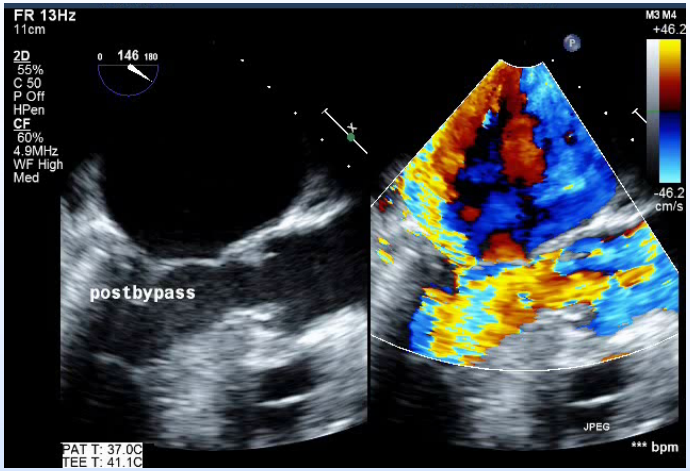


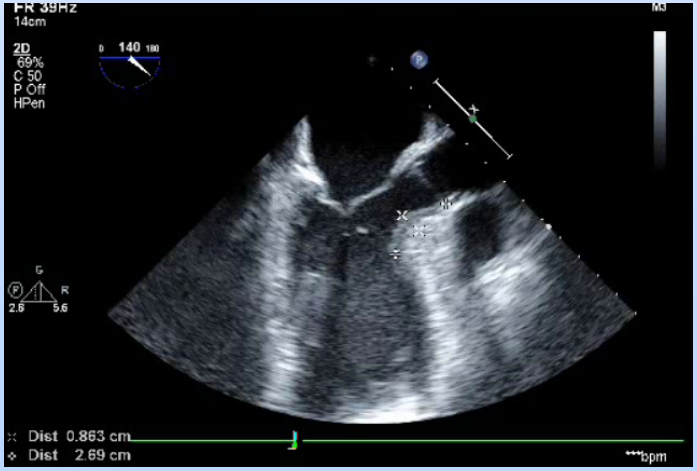
Figure 5 **CMR Image After Septal Myectomy Versus Septal Ablation**

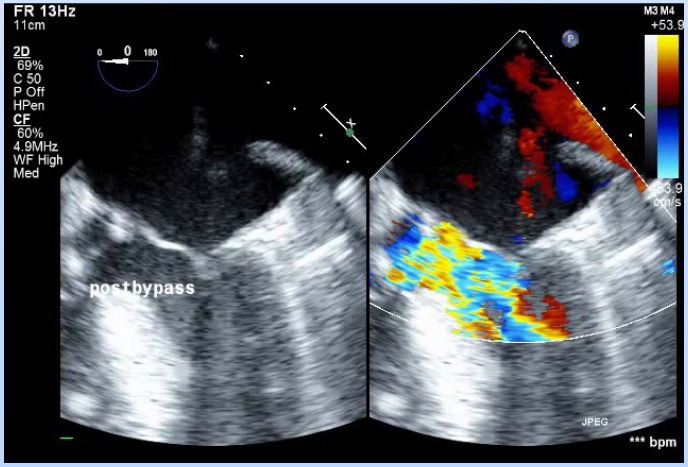
Top panels show long-axis cardiovascular magnetic resonance (CMR) imaging views before **(left)** and after **(right)** septal myectomy. The portion of basal septum evident in this plane, projecting into the left ventricular (LV) outflow tract, has been resected at myectomy **(arrows)**. **Bottom panels** show long-axis views before **(left)** and 5 months after **(right)** septal ablation. The ablation has spared the most proximal portion of basal septum at the level of systolic anterior motion and mitral valve-septal contact, involving only the more distal septum below this level of obstruction **(arrows)**. AML = anterior mitral leaflets; Ao = aorta; LA = left atrium; RV = right ventricle.

Case Presentation
Pre op TTE



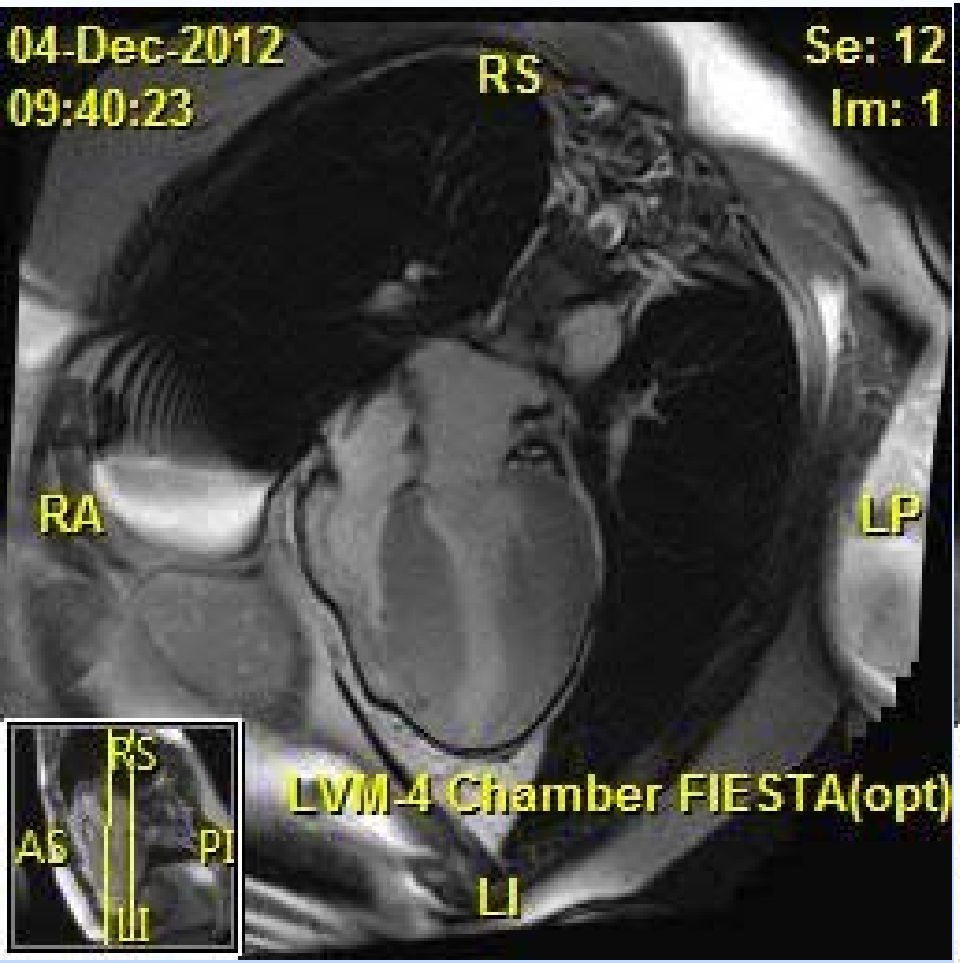


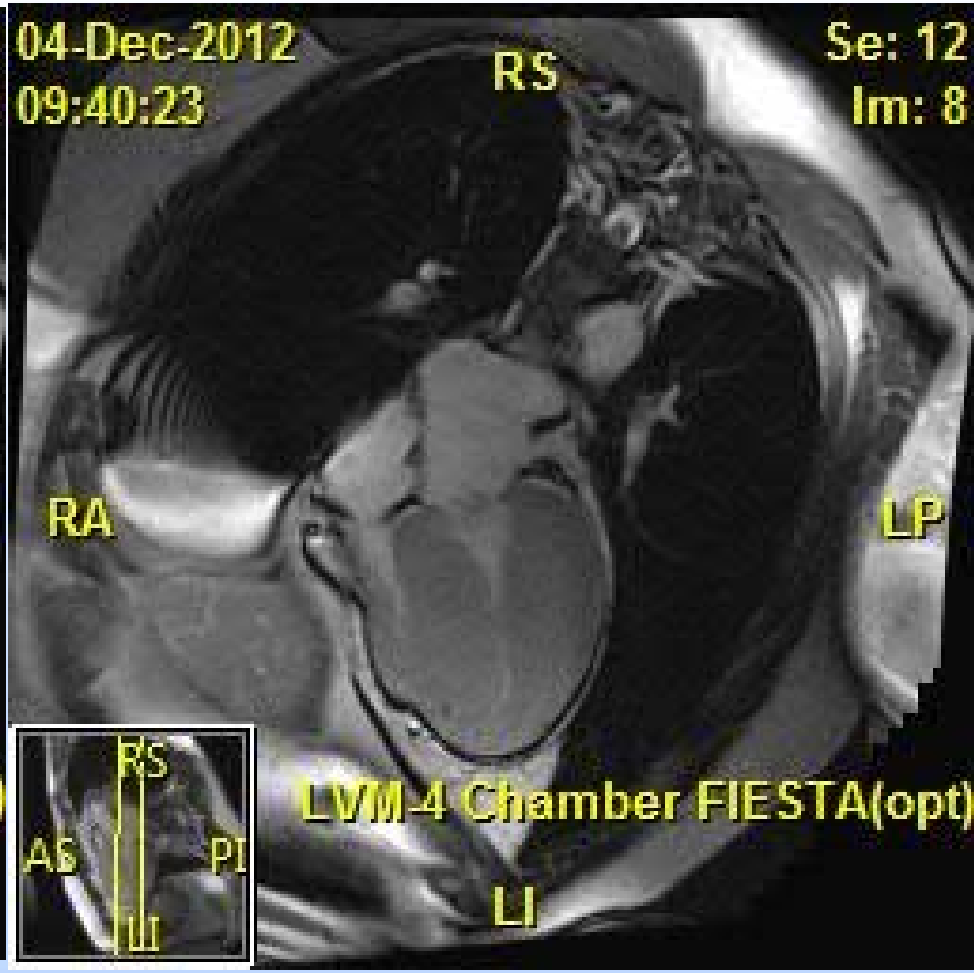


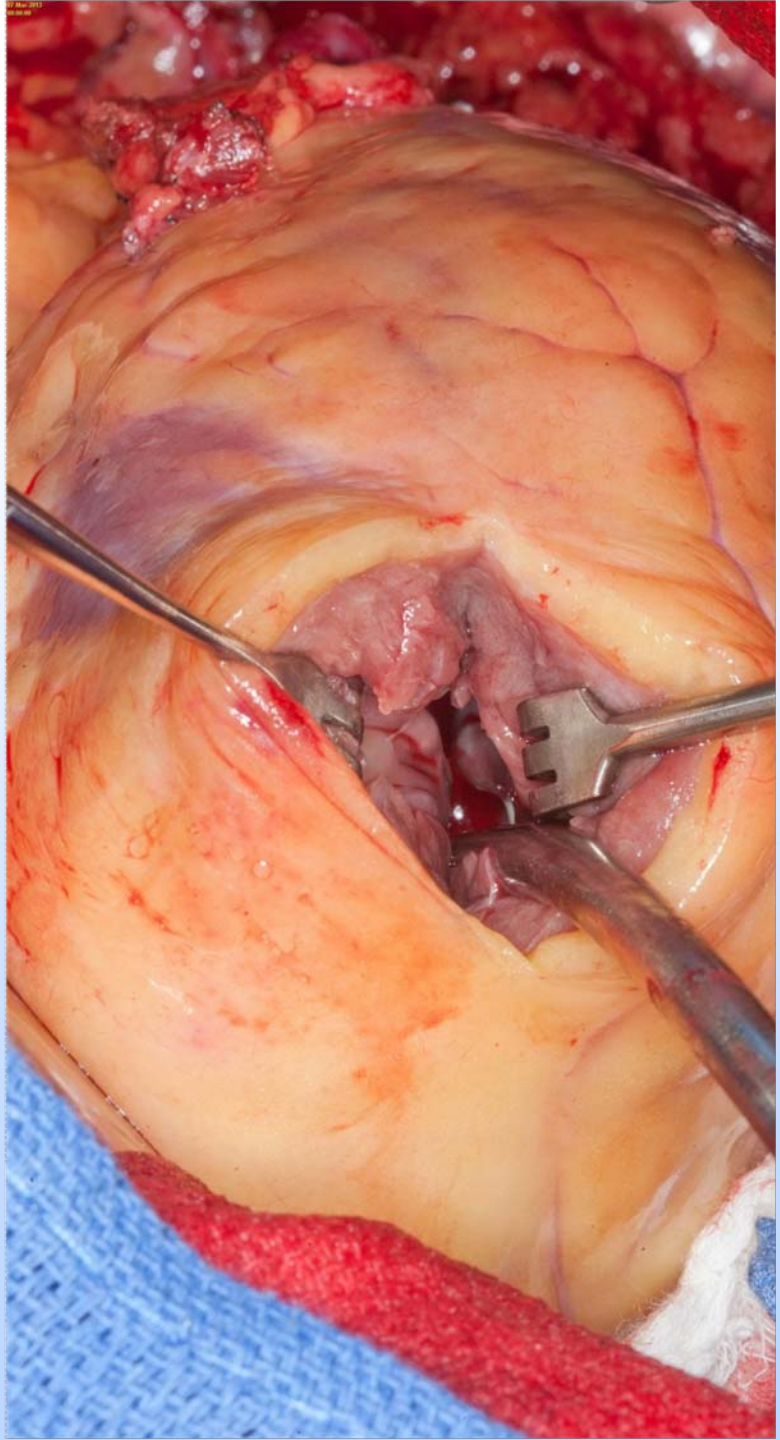


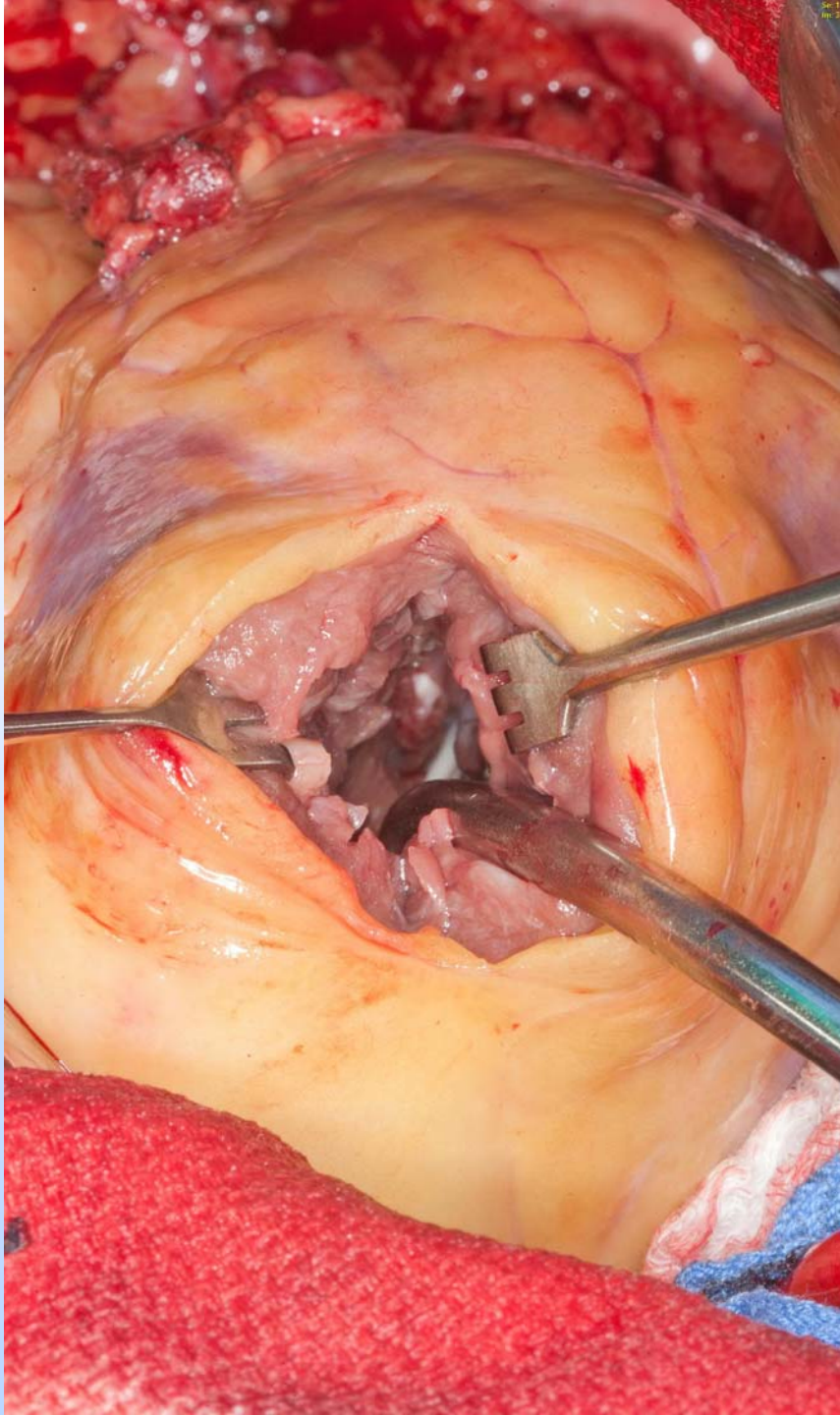
57 y/o male with HCM

No Subaortic Obstruction










CM
1
2
3
4
5
6
7
8
9
10

Relationship between LVOT gradient and degree of MR (Pre Op.)

MR grade	Rest	P value	Valsalva	P value
MR grade 0/1 Trivial	40±28	0.567	54±24	0.015
MR grade 2 Mild	55± 44		71±34	
MR grade 3 Moderate	64±37		105±46	
MR grade 4 Severe	66±17		113±20	

Late Results

- FU Duration : 26 ± 23 months, 100% complete.
- Mean NYHA FC: 1.9 ± 0.8.
- Late Deaths : 4
  - 3 non-cardiac
  - 1 cardiac

- Total Major Complications : 8 (10%)
  - Arrhythmia : 8 (10%)
  - CVA : 4 (5%)
  - MI : 0(0%)
  - TIA : 0(0%)
  - Pacemaker : 0(0%)

Relationship Between Residual LVOT Gradient and Degree of MR

MR grade	Rest	P value	Valsalva	P value
MR grade 0-1 Trivial	12 ±5	0.257	21 ± 30	0.340
MR grade 2-4 Mild - severe	2 ± 3		3 ± 6	

Meta-Analyses of Septal Reduction Therapies for Obstructive Hypertrophic Cardiomyopathy

Comparative Rates of Overall Mortality and Sudden Cardiac Death After Treatment

Robert A. Leonardi, MD; Evan P. Kransdorf, MD, PhD;
David L. Simel, MD, MHS; Andrew Wang, MD

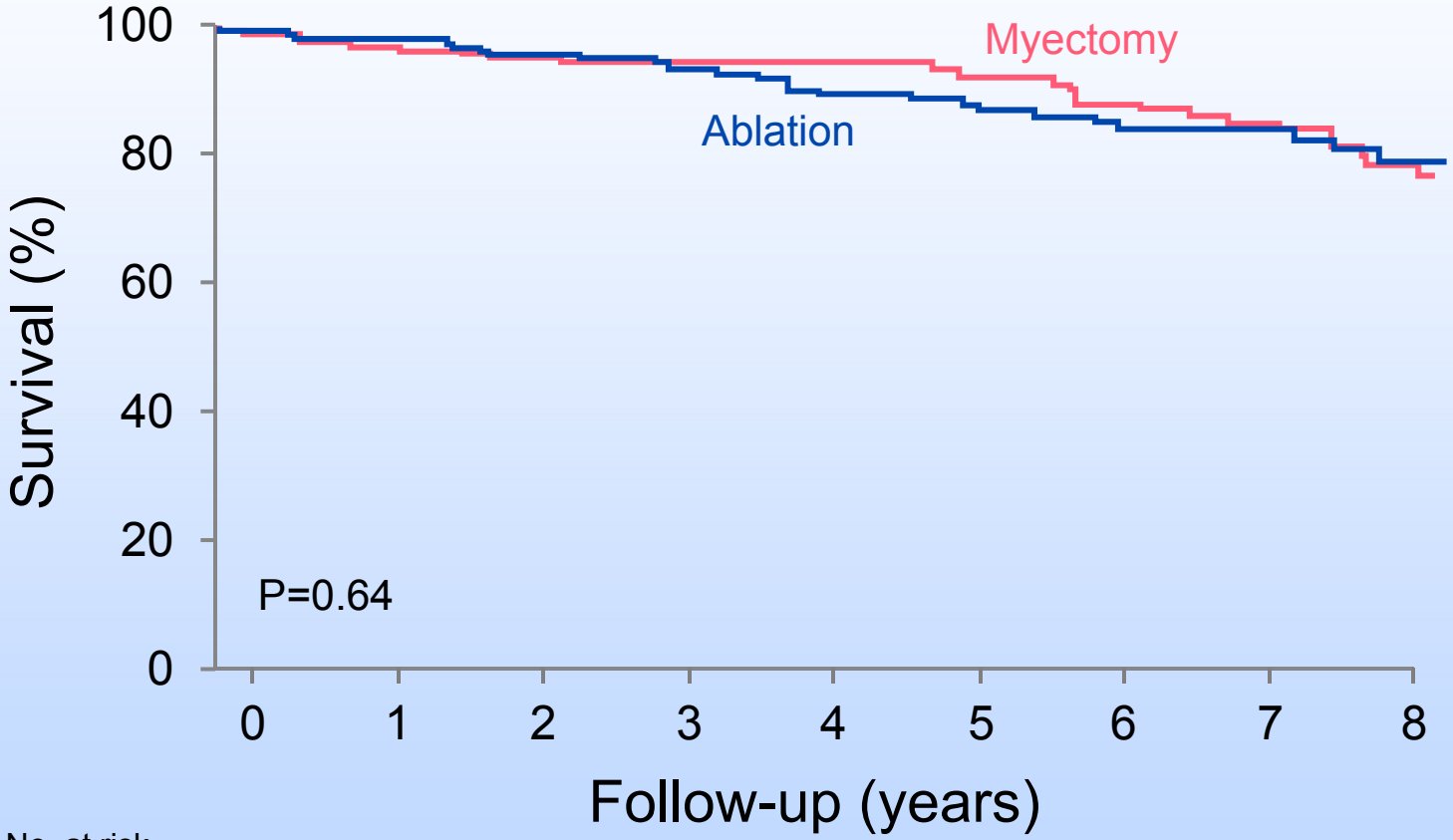
Background—Septal reduction for obstructive hypertrophic cardiomyopathy may be performed by surgical myectomy or alcohol septal ablation (ASA). Unlike surgical myectomy, ASA creates an intramyocardial scar that may potentiate the risk of ventricular arrhythmias and sudden cardiac death (SCD).

Methods and Results—Systematic reviews for ASA and surgical myectomy were performed. Study selection and data extraction were completed independently by 2 investigators. Comparative data analyses were completed using a random effects model and regression analysis. Kappa statistics for agreement on initial study inclusion were high for both ASA (0.78; 95% CI, 0.68 to 0.88) and surgical myectomy studies (0.95; 95% CI, 0.84 to 1.0). Nineteen ASA studies (2207 patients) and 8 surgical myectomy studies (1887 patients) were included. Median follow-up was shorter for ASA than for myectomy studies (51 versus 1266 patient-years; $P<0.001$). For ASA and surgical myectomy, unadjusted rates (events/patient-years) of all-cause mortality (0.021 versus 0.018, respectively; $P=0.37$) and SCD (0.004 versus 0.003, respectively; $P=0.36$) were similar. Patients treated with ASA were older (weighted mean, 55 versus 44 years; $P<0.001$) and had less septal hypertrophy (weighted mean, 21 versus 23 mm; $P<0.001$) compared with those treated with myectomy. After adjustment for available baseline characteristics, odds ratios for treatment effect on all-cause mortality and SCD were 0.28 (95% CI, 0.16 to 0.46) and 0.32 (95% CI, 0.11 to 0.97), respectively, favoring ASA.

Conclusions—Rates of all-cause mortality and SCD after both ASA and surgical myectomy were similarly low. Adjusted for baseline characteristics, the odds ratios for treatment effect on all-cause mortality and SCD were lower in ASA cohorts compared with surgical myectomy cohorts. (***Circ Cardiovasc Interv.*** **2010;3:97-104.**)

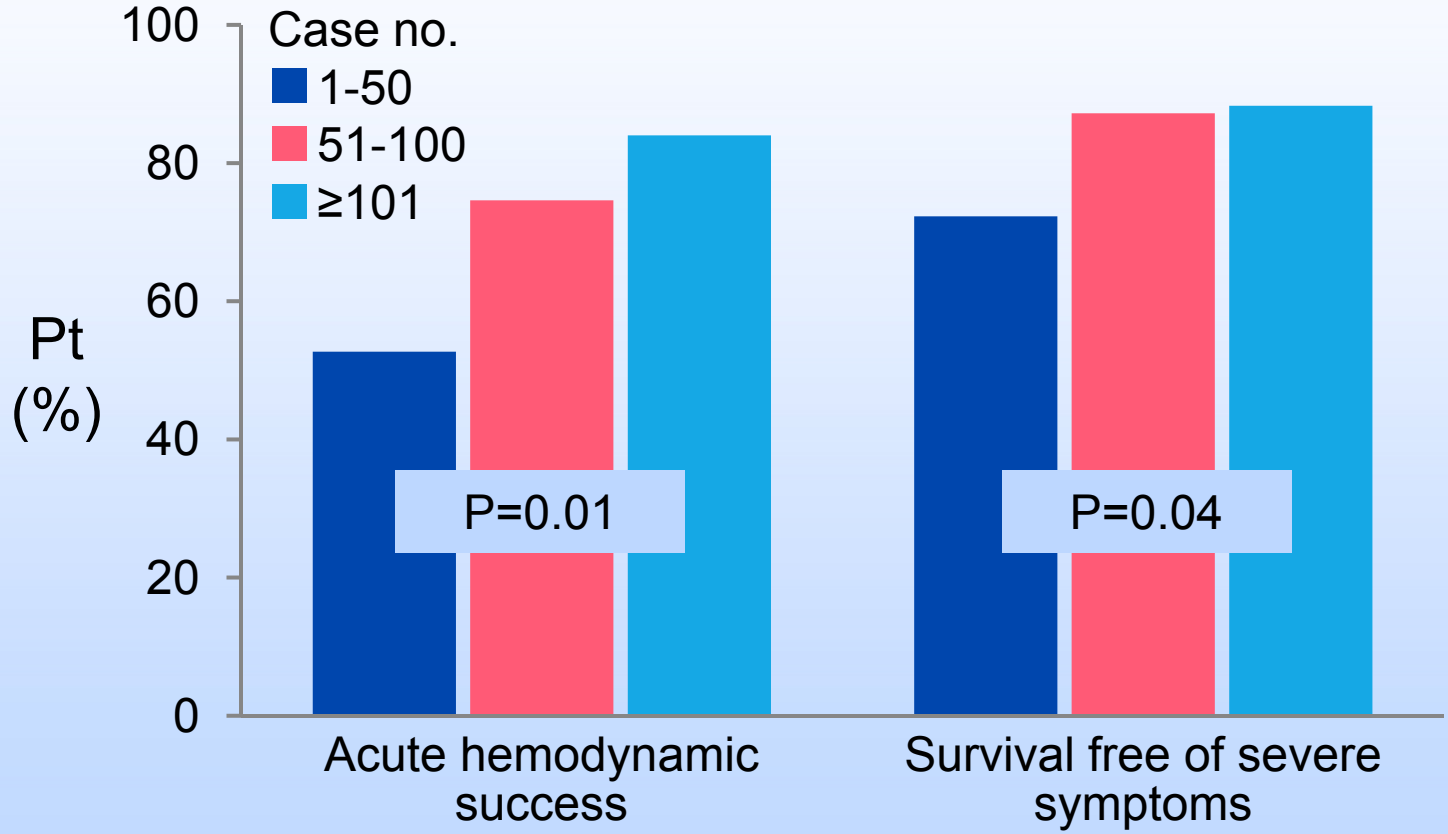
Key Words: hypertrophic cardiomyopathy ■ septal ablation ■ myectomy ■ meta-analysis

Survival-Free of All-Cause Mortality for Patients with Septal Ablation in Comparison with Age- and Sex-Matched Population of Patients Who Underwent Surgical Myectomy



Sorajja et al: Circ 126:2374, 2012

Case Volume and Clinical Outcome



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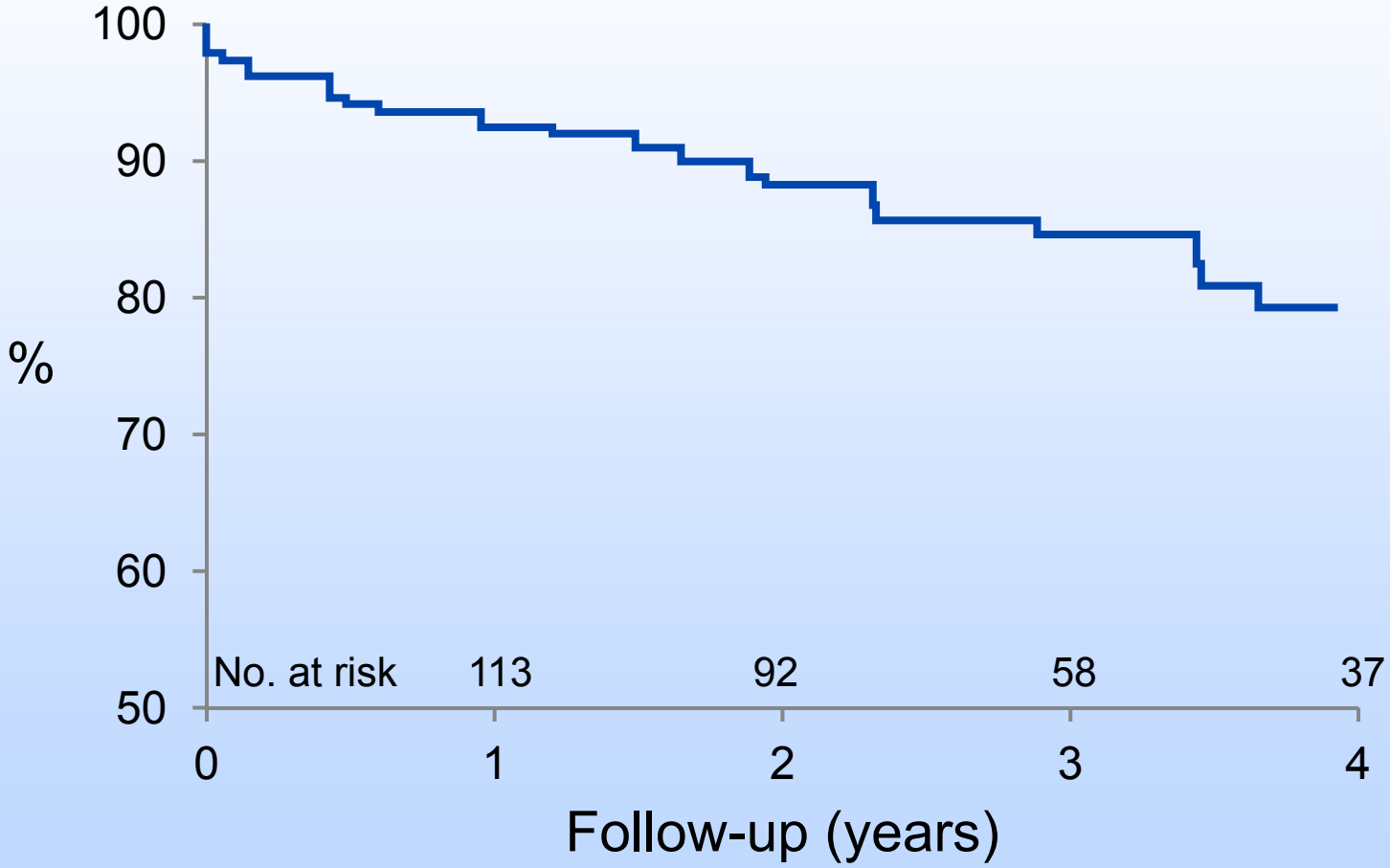
Survival-Free of Severe Symptoms in Overall Population (linearly related to hemodynamic success)



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