Cardiochirurgia ed interventistica a confronto
in scenari "difficili"

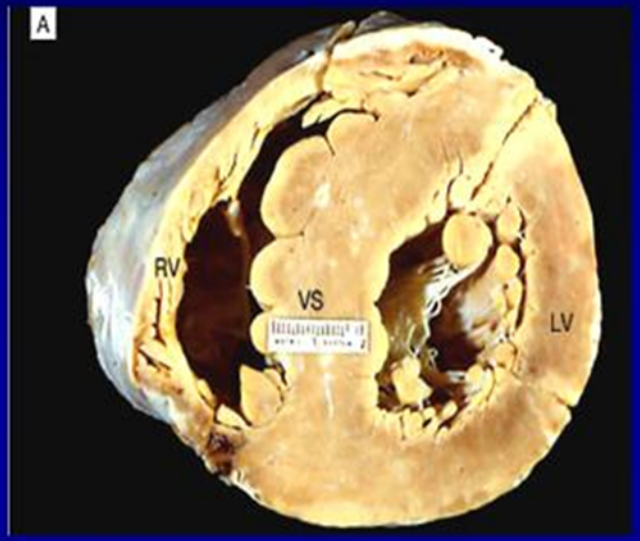
Alcoolizzazione percutanea o septectomia chirurgica nella miocardiopatia ipertrofica del setto?

Il punto di vista del cardiologo interventista

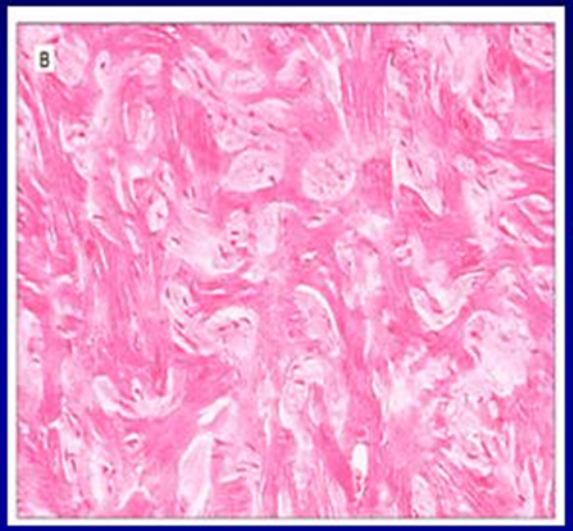
Daniela Trabattoni, FESC, FACC
U.O. Cardiologia Invasiva 1
Centro Cardiologico Monzino
Milano

Myocardial Changes in HOCM

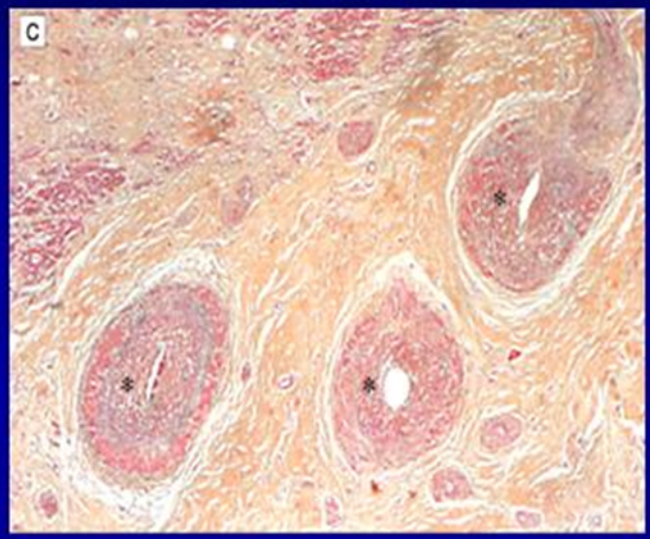
Morphologic Features for Sudden Death



Disproportionate thickening of the ventricular septum (VS) with respect to left ventricular (LV) free wall; gross heart specimen from a 13-yr old.



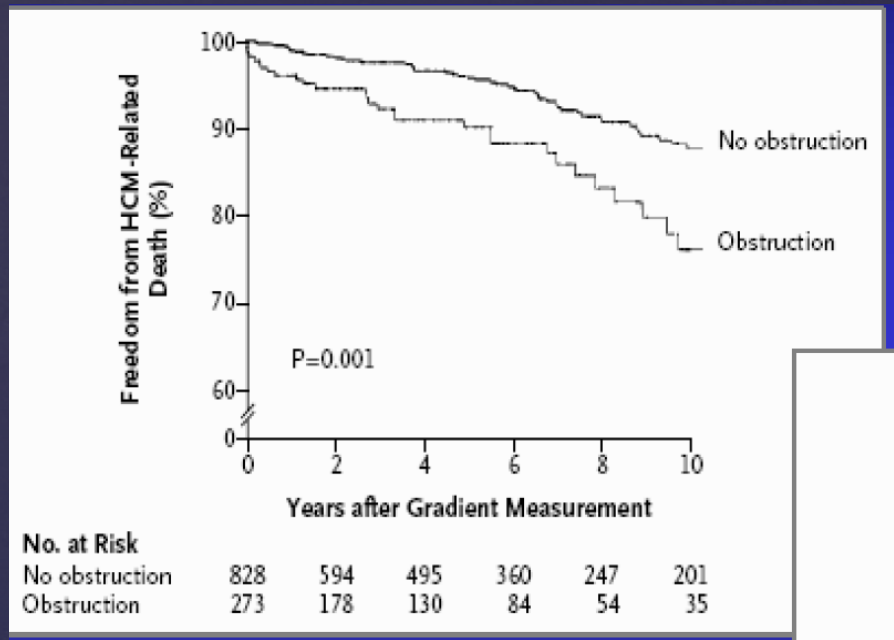
Marked disarray of cardiac muscle cells in the disproportionately thickened VS forming typical disorganized architecture of HOCM



LV myocardium showing several abnormal intramural coronary arteries with markedly thickened walls and narrowed lumen, dispersed

Maron et al. JAMA 2002;287:1308

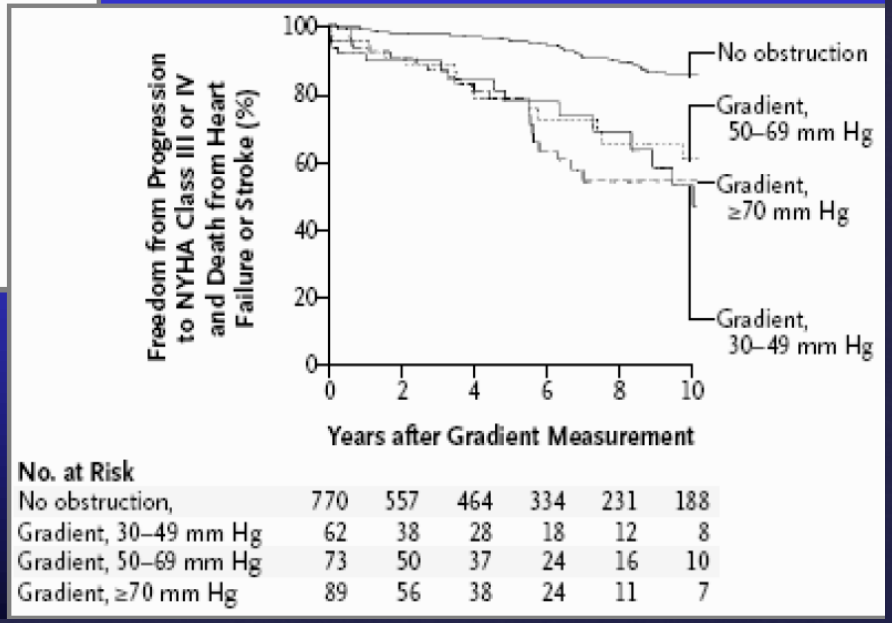
Implications of LV Outflow Tract Obstruction



No. at Risk						
No obstruction	828	594	495	360	247	201
Obstruction	273	178	130	84	54	35

1,101 consecutive pts with HCM (outflow gradient ≥ 30 mm Hg)

Variable	Death from Any Cause	
	Relative Risk (95% CI)	P Value
Left ventricular outflow obstruction (≥30 mm Hg)	1.6 (1.1–2.2)	0.02
NYHA class II, III, or IV at entry	1.5 (1.1–2.1)	0.02
Paroxysmal or chronic atrial fibrillation	1.4 (1.0–1.9)	0.04
Maximal left ventricular thickness ≥30 mm	1.6 (1.1–2.4)	0.01



No. at Risk						
No obstruction,	770	557	464	334	231	188
Gradient, 30–49 mm Hg	62	38	28	18	12	8
Gradient, 50–69 mm Hg	73	50	37	24	16	10
Gradient, ≥70 mm Hg	89	56	38	24	11	7

Maron MS. NEJM, 2003; 348:295-303

HOCM Management

Patients with HOCM and resting or inducible LVOT gradients and drug-refractory symptoms may be candidates for an invasive procedure for mechanical relief of the obstruction

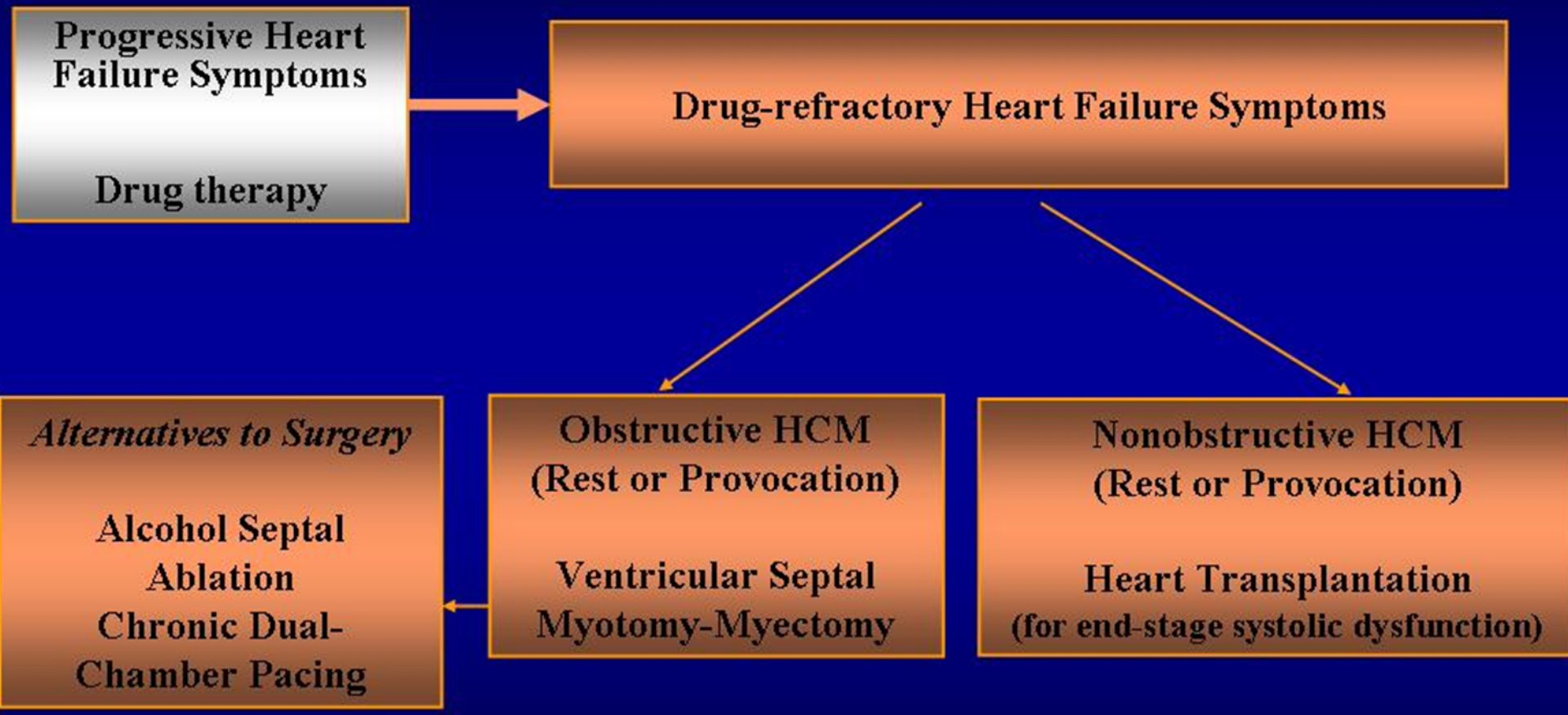
In the 1960s, surgical septal myectomy was developed by Marrow and colleagues as well as Kirklin and colleagues

- Surgical myectomy is the gold standard treatment for relief of LVOTO in patients with HOCM

In 1994, alcohol septal ablation was developed as a less invasive method to relieve LVOTO

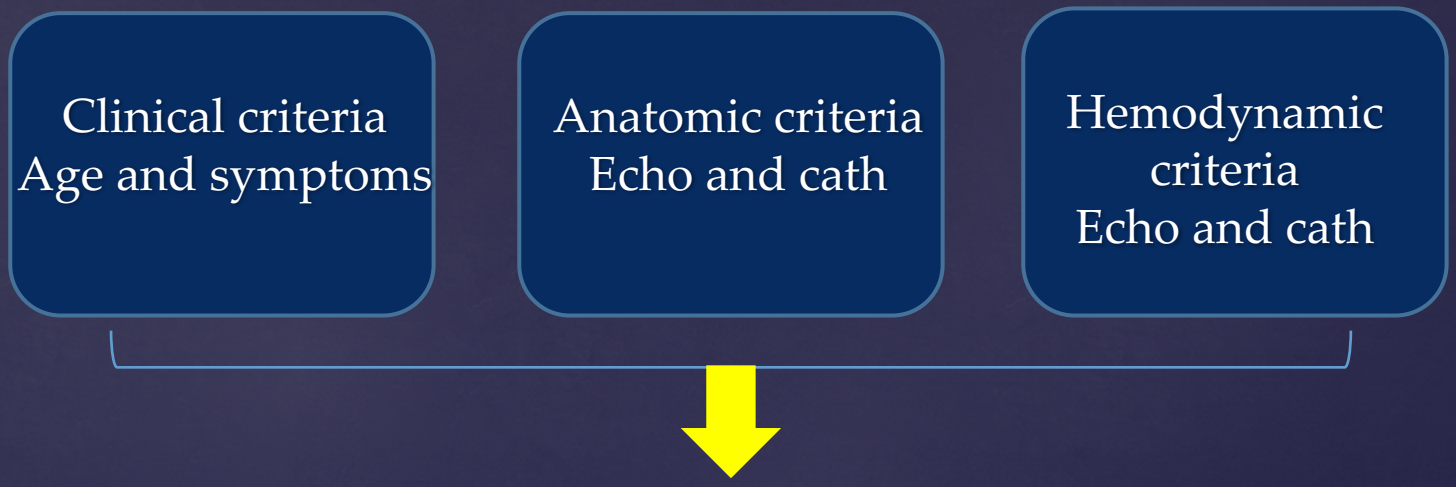
Currently, alcohol septal ablation procedures have outnumbered surgical myectomy by 15-20x

Primary Treatment Strategies for Subgroups within the HCM Clinical Spectrum



Maron B. JAMA 2002;287:1308

Patient Selection



MUST Meet all three criteria

Success is tied to how well criteria are met

Indications for ASA (Clinical)

Inclusion Criteria

1. **Patients' clinical characteristics:**

a) Severe symptoms (eg, NYHA class 3-4 heart failure, CCS class 3-4 angina pectoris, or recurrent presyncope or syncope) despite optimal drug therapy

b) Mild or moderate symptoms but with recurrent presyncope or syncope, or clinical decompensation due to recurrent paroxysmal atrial fibrillation

c) Symptoms deemed to be primarily due to outflow tract obstruction or consequences of chronic outflow tract obstruction.

d) Life expectancy > 1y, and absence of comorbidity that severely and independently limits functional status, or that limits any improvement that would be achieved by relief of outflow tract obstruction (i.e. severe dementia, nonambulatory patient)

Current Card Rep 2014

Indications for ASA (Anatomic/Physiologic)

Inclusion Criteria

1. **Anatomic/physiologic characteristics:**

a) Subaortic gradient of at least 50 mmHg (by Doppler echocardiogram: at baseline or with provocation) despite optimal medical therapy

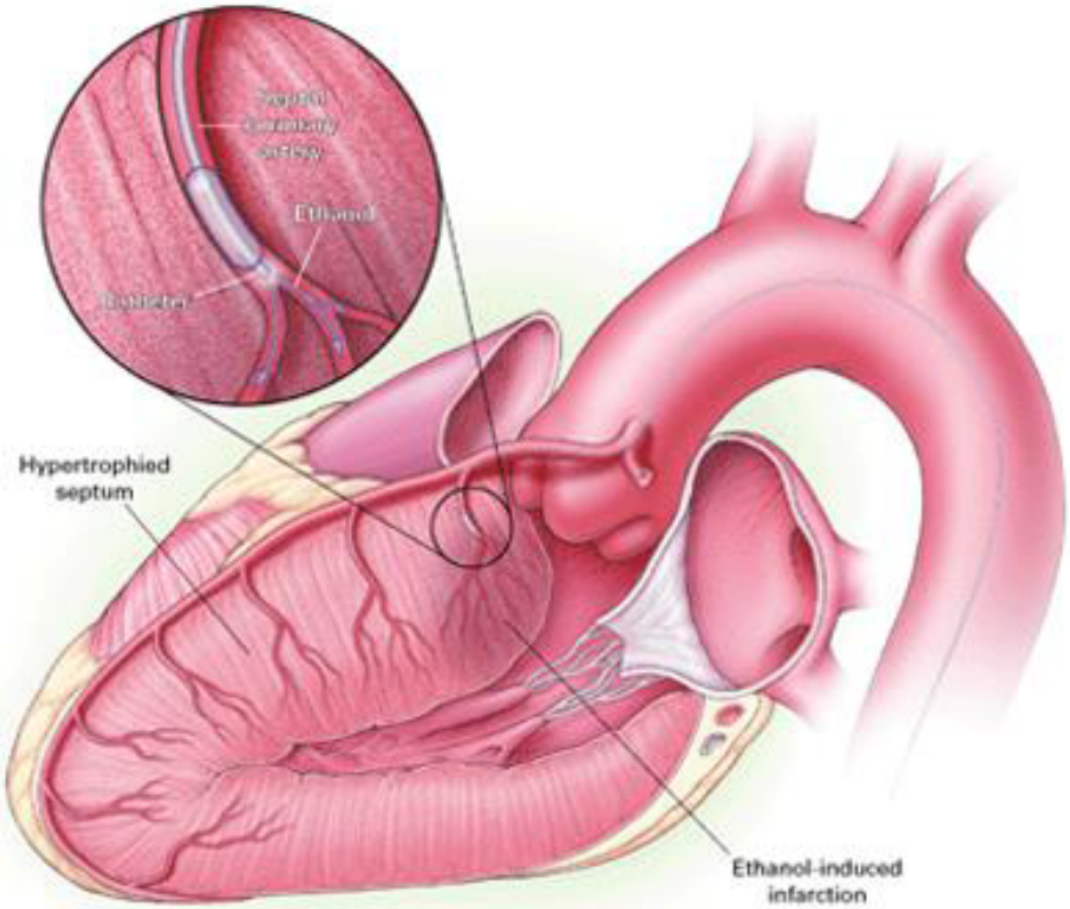
b) Subaortic obstruction is due to systolic anterior motion of the mitral valve leaflet or associated structures

c) One of more septal perforators likely to serve the target myocardium contributing to LV outflow tract obstruction

a) Septum at region of obstruction is 15 mm thickness

Current Card Rep 2014

Alcohol Septal Ablation



Contraindications to ASA

Exclusion Criteria

1. **Anatomic/physiologic characteristics:**

a) Gradient due to severe abnormalities of the mitral valve or associated valvular apparatus, or abnormal membranes in the outflow tract or above the valve (subvalvular or supravalvular membranes)

b) Mid-ventricular obstruction due to severe concentric hypertrophy, with no contribution of the mitral valve

c) Severe coronary disease that independently warrants coronary artery bypass grafting

d) Severe valvular aortic stenosis (or other valvular pathology) that would independently warrant surgical corection

e) Septal mass at region of obstruction > 30 mm thickness

Current Card Rep 2014

Relative Contraindications to ASA

a) Young patients with HOCM

b) LBBB or wide QRS --→ HIGHER risk of HB and PPM

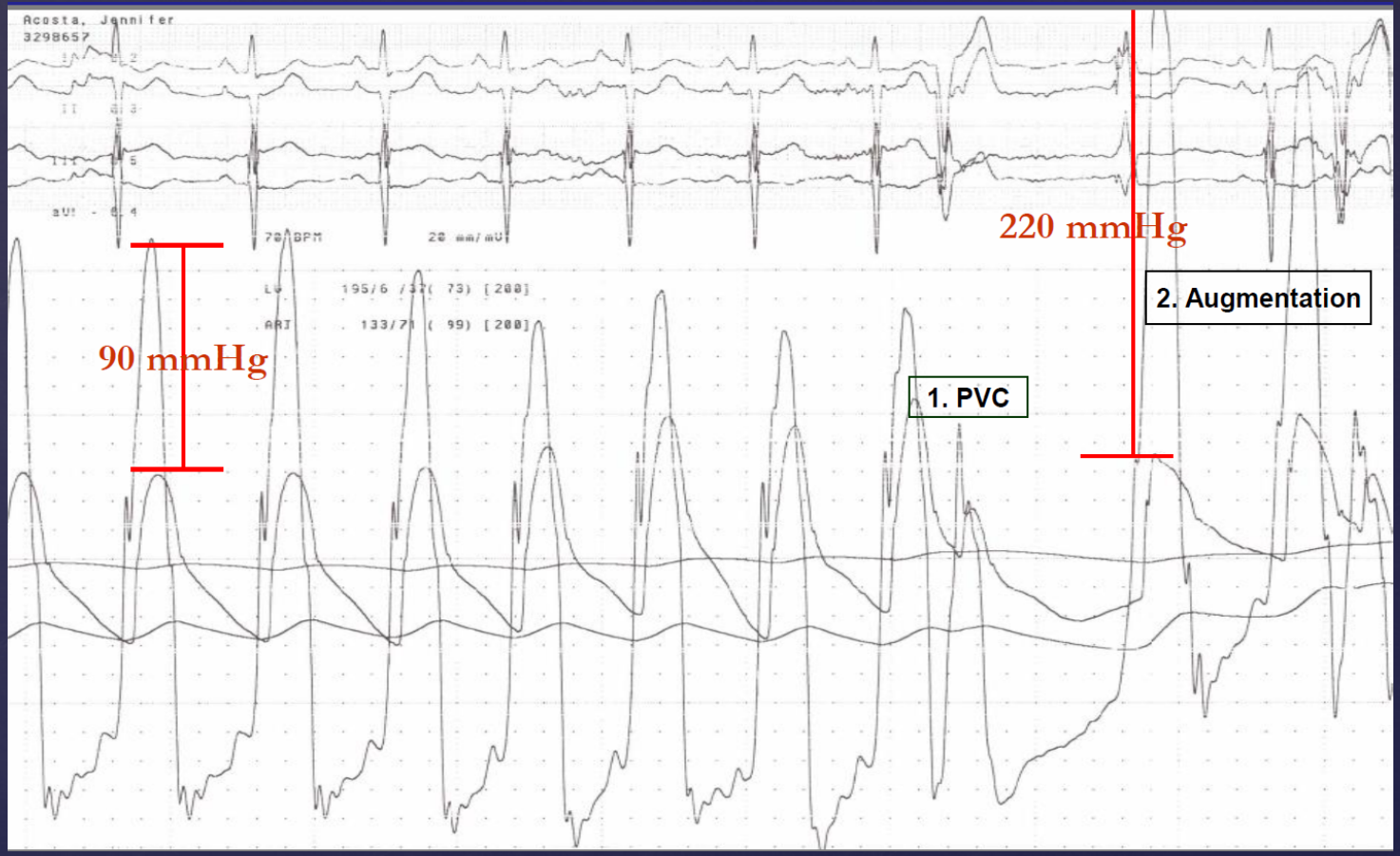
c) Septal thickness < 15 mm --→ HIGHER risk of VSD

d) Severe hypertrophy (Thickness > 24 mm) or high resting gradient (> 100 mmHg)

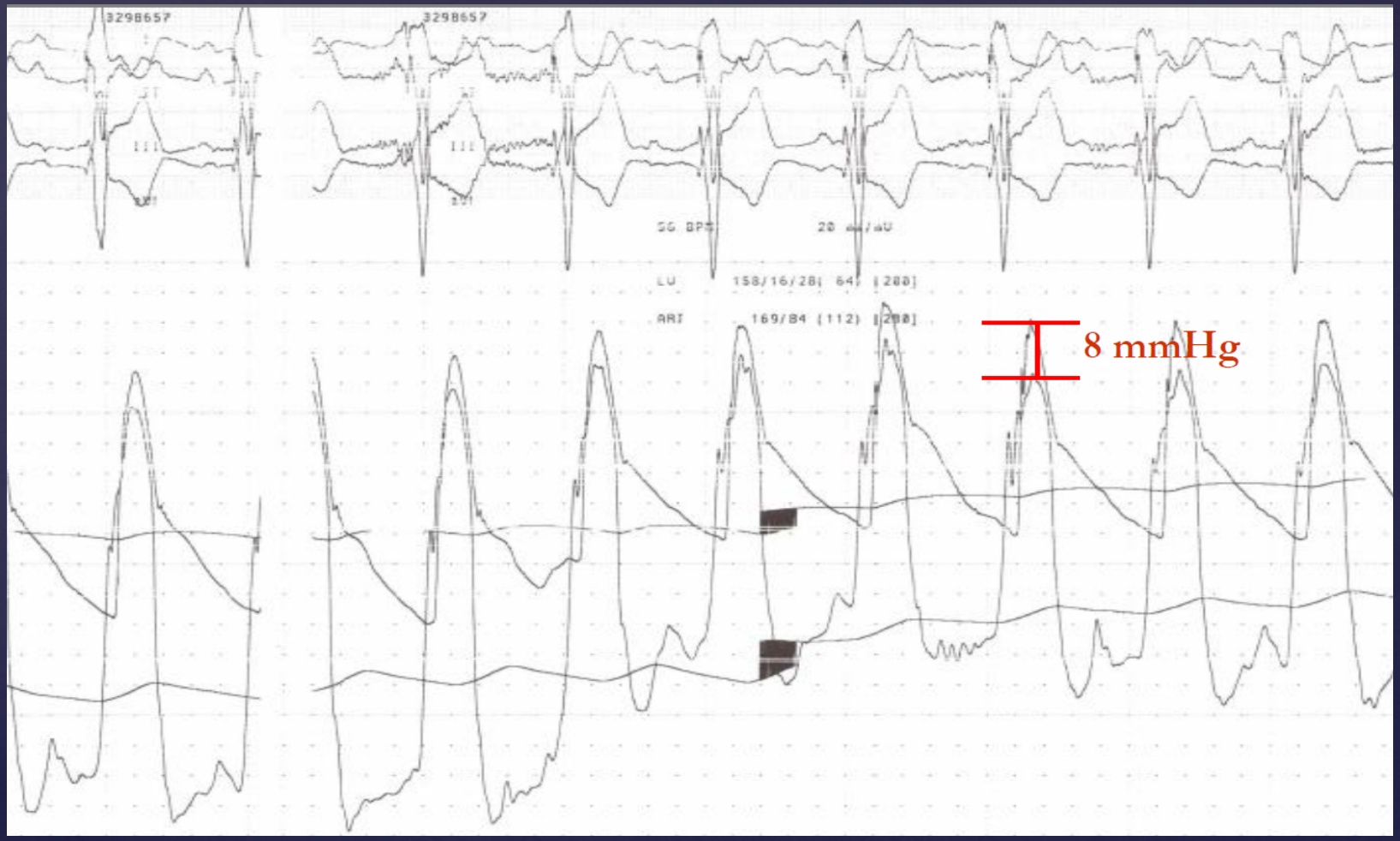
e) Concomitant cardiac disease

Sorajja et al. Circ Cardiovasc Interv 2013; 6:586-591

Hemodynamics
Pre Alcohol Septal Ablation



Hemodynamics
Post Alcohol Septal Ablation



WINTHROP
Institute for Heart Care

Alcohol Septal Ablation for the Treatment of Hypertrophic Obstructive Cardiomyopathy

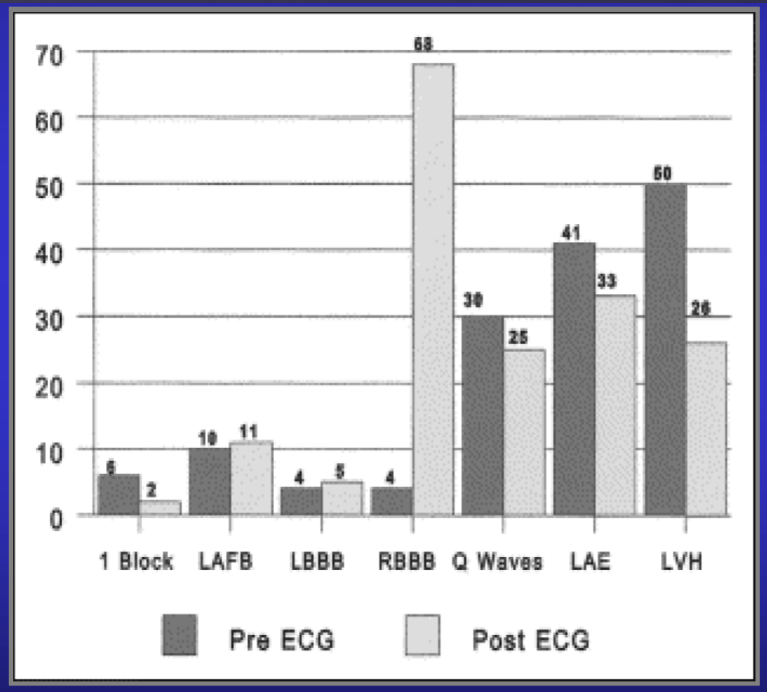
A Multicenter North American Registry

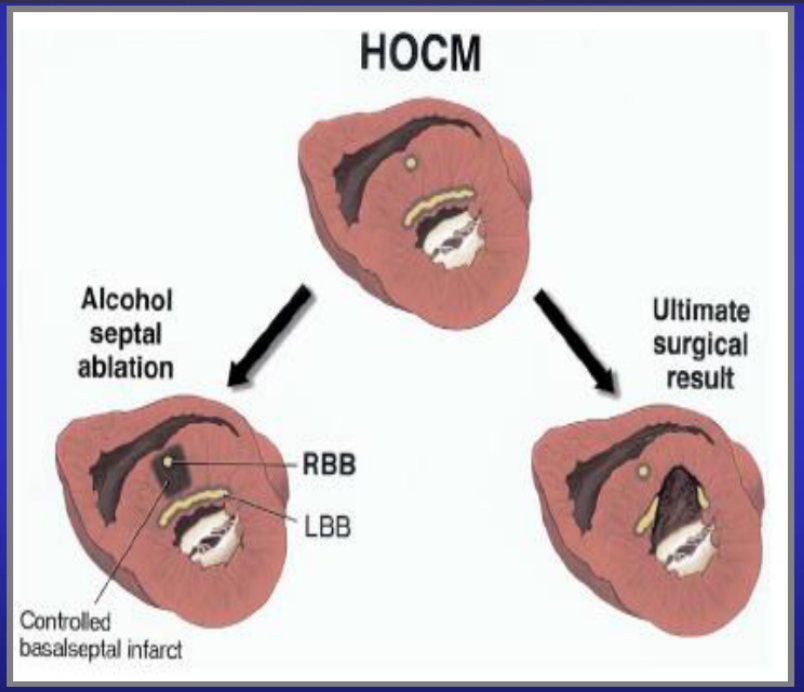
Table 2 Procedure-Related Complications

Arterial access	
Arteriovenous fistula	2
Femoral artery pseudoaneurysm	2
Groin hematoma	2
Retroperitoneal hemorrhage	1
Left anterior descending artery dissection	8
Cardiac tamponade	4
Ventricular septal defect	1
Acute pulmonary edema	2
Cerebrovascular accident	2
Arrhythmias	
Ventricular fibrillation/ventricular tachycardia	14
Nonsustained ventricular tachycardia	6
High-grade atrioventricular block	78
Transient atrial fibrillation/supraventricular tachycardia	6

(J Am Coll Cardiol 2011;58:2322–8)

Conduction Disease
Pre and Post-Alcohol Ablation ECGs





Talreja DR. JACC 2004;44:2329

Runquist LH. AJC 2002;90:1020

Complete Heart Block

- 261 consecutive pts
- 37 had PPM/AICD before ASA
- 14% (31/224) developed CHB and required PPM post-ASA
- 30 pts developed CHB in-hospital, 1 pt came back with CHB in 1 wk

	Odds Ratio	95% CI	p Value
LBBB	39	3.6–416	0.002
>2 septals injected	4.6	1.3–16	0.016
Bolus injection of ethanol	51	3.5–735	0.004
First-degree AV block	14	3–69	0.001
Female gender	4.3	1.3–15	0.02

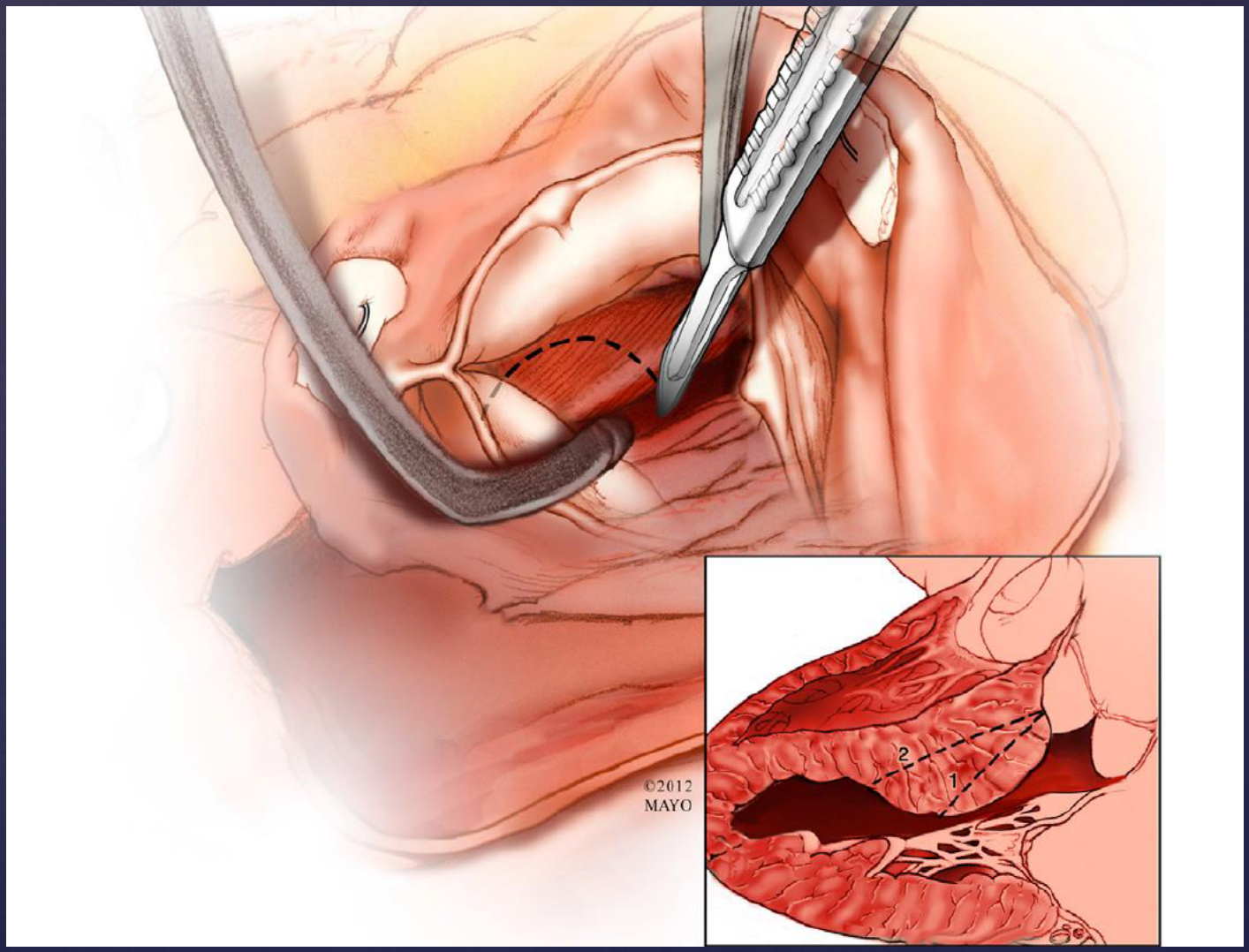
Multivariate predictors of PPM placement after ASA

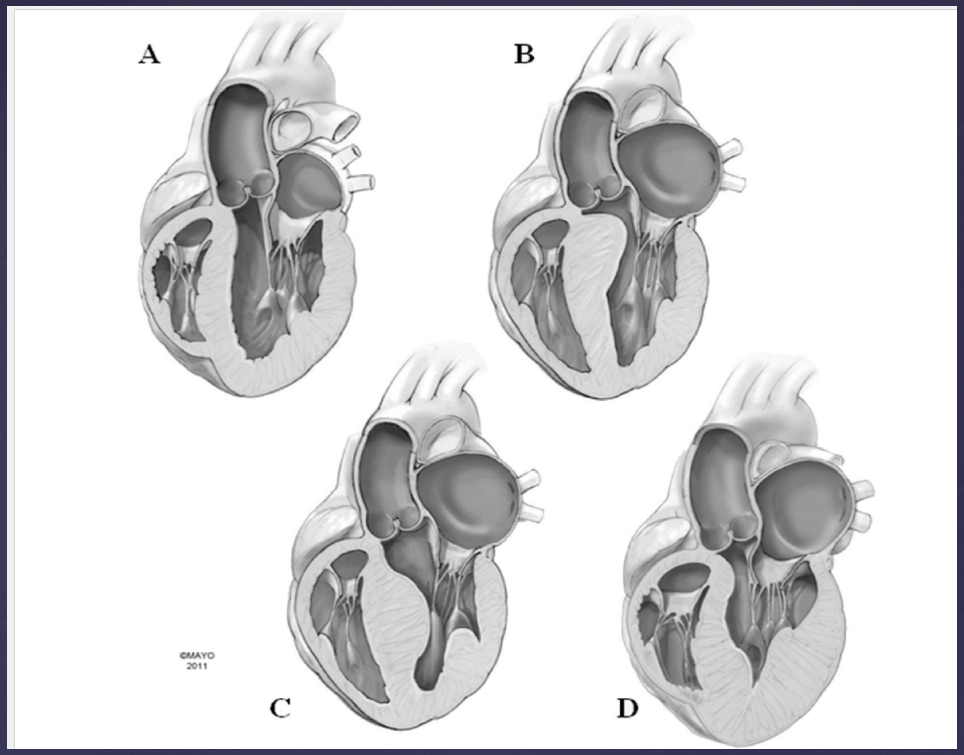
	PPM n = 31	No PPM n = 193	p Value
NYHA class improvement	1.76 ± 0.63	1.47 ± 0.74	0.09
IVS reduction	0.82 ± 0.67	0.56 ± 0.54	0.063
% IVS reduction	37 ± 20	27 ± 26	0.003
Rest LVOTG reduction	56 ± 42	40 ± 37	0.07
Increase in exercise duration(s)	68 ± 149	102 ± 138	0.35

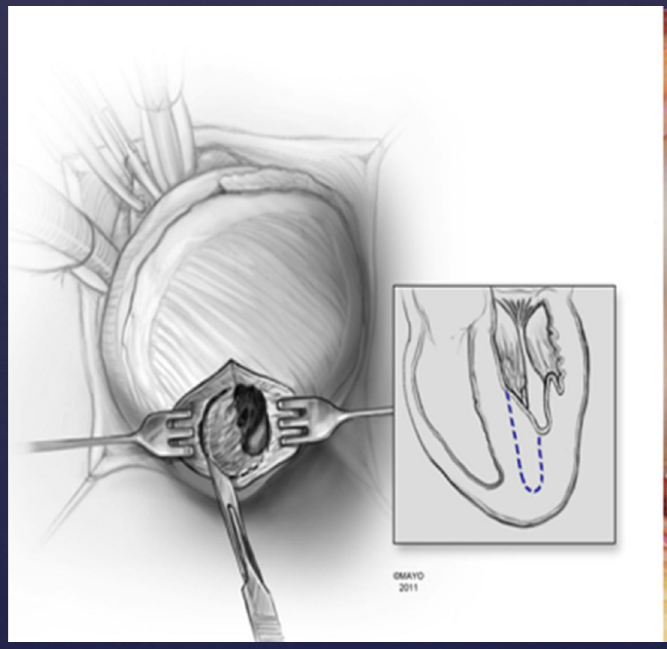
Clinical and echocardiographic outcome of pts who required PPM vs. those who did not require PPM

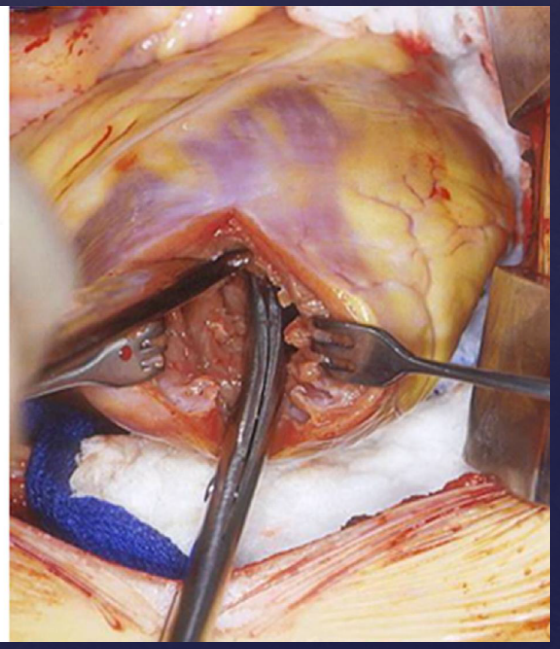
Chang SM. JACC 2003;42:296

SURGICAL MYECTOMY

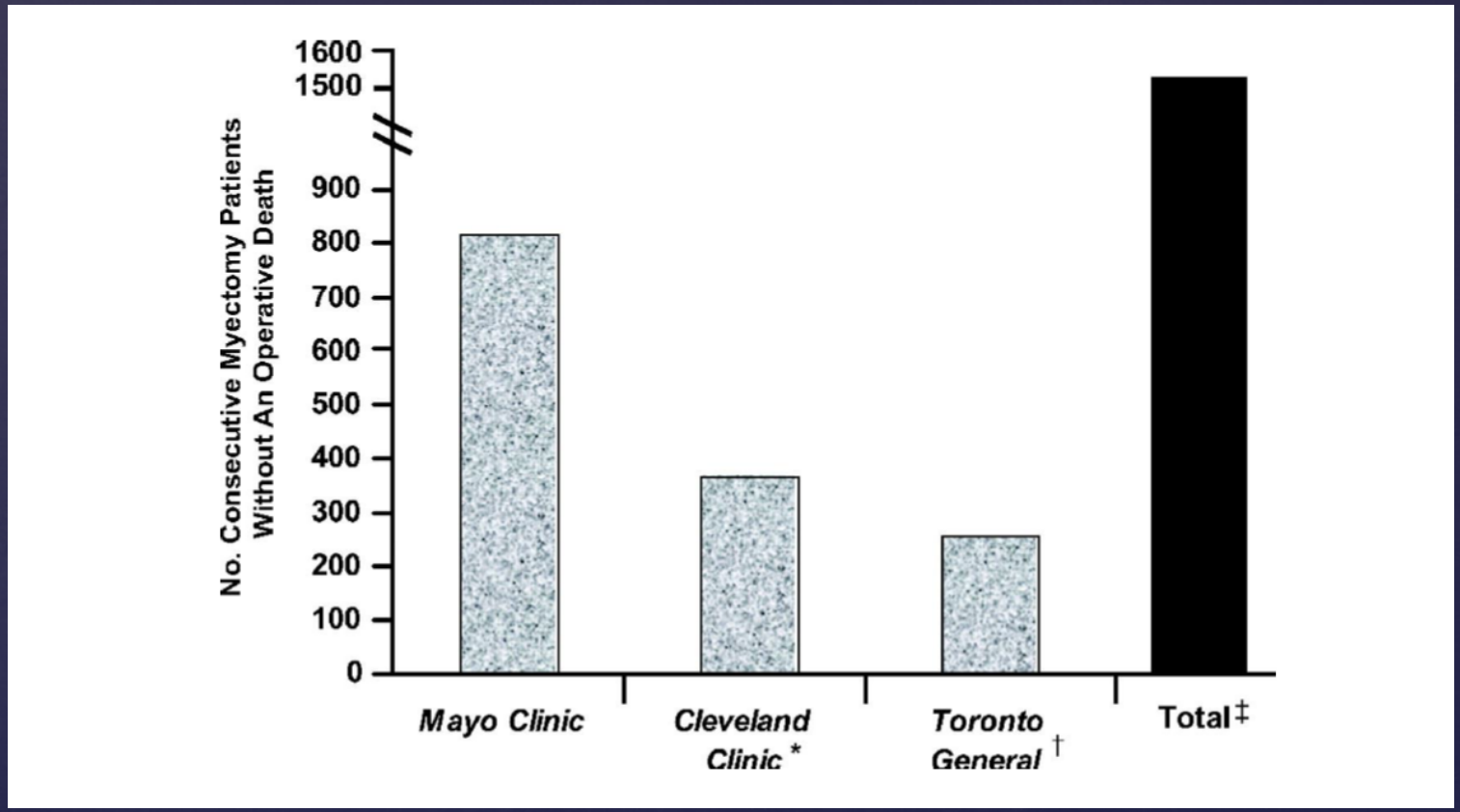



A
B
C
D
©MAYO
2011


©MAYO
2011



In High-Volume Centers Surgical Myectomy is a Very Low Risk Procedure



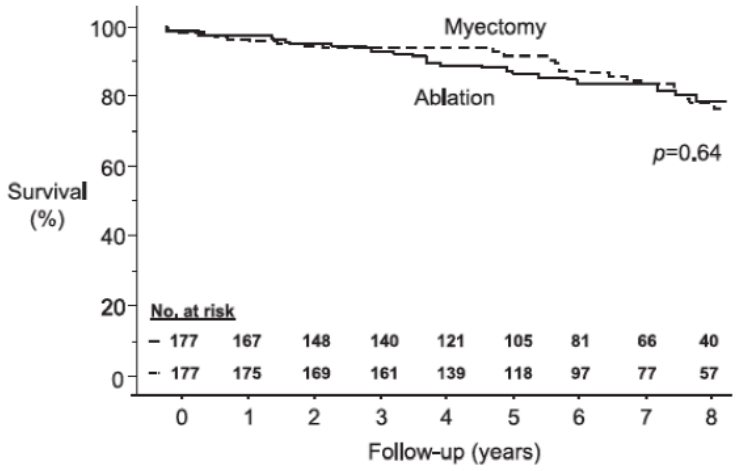
Maron et al. Circuylatioin, 2007; 116:196-206

Arrhythmia/Electrophysiology

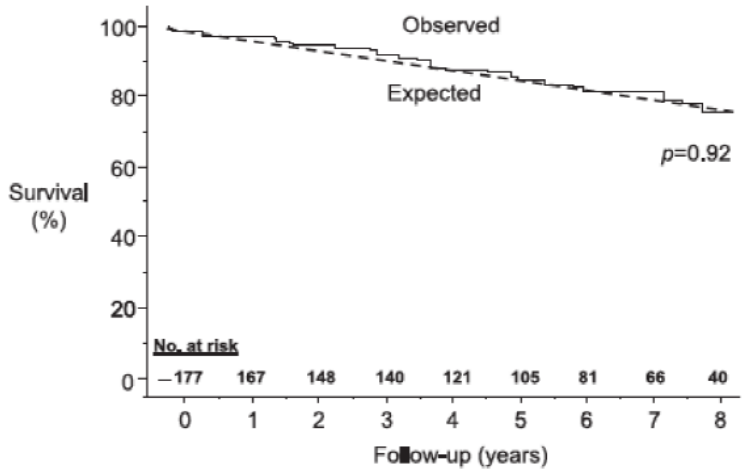
Survival After Alcohol Septal Ablation for Obstructive Hypertrophic Cardiomyopathy

Paul Sorajja, MD; Steve R. Ommen, MD; David R. Holmes, Jr, MD; Joseph A. Dearani, MD; Charanjit S. Rihal, MD; Bernard J. Gersh, MB, ChBDPhil; Ryan J. Lennon, MS; Rick A. Nishimura, MD

Survival for Myectomy and Ablation were not different



Survival After Alcohol Septal Ablation vs Septal Myectomy



Survival After Alcohol Septal Ablation vs General Population

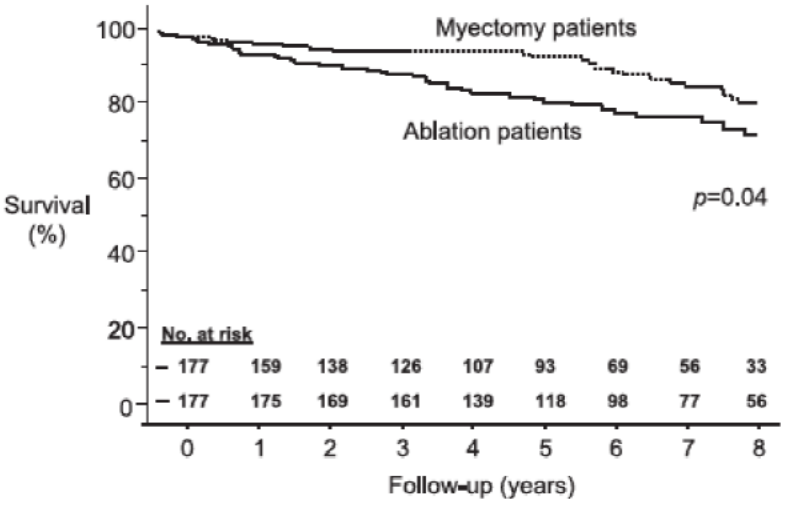
Sorajja et al. Circulation 2012; 126:2374-2380

Arrhythmia/Electrophysiology

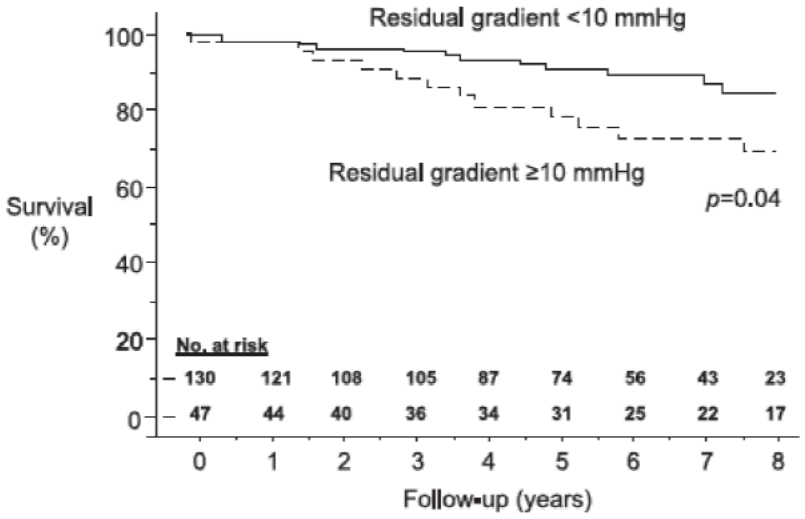
Survival After Alcohol Septal Ablation for Obstructive Hypertrophic Cardiomyopathy

Paul Sorajja, MD; Steve R. Ommen, MD; David R. Holmes, Jr, MD; Joseph A. Dearani, MD; Charanjit S. Rihal, MD; Bernard J. Gersh, MB, ChBDPhil; Ryan J. Lennon, MS; Rick A. Nishimura, MD

Myectomy was associated with lower residual gradient and need for repeat intervention



Survival Free of Reintervention
Myectomy vs Alcohol Septal Ablation



Survival Free of All-Cause Mortality After Alcohol Septal Ablation, Related To Residual LVOT Gradient

Sorajja et al. Circulation 2012; 126:2374-2380

Arrhythmia/Electrophysiology

Survival After Alcohol Septal Ablation for Obstructive Hypertrophic Cardiomyopathy

Paul Sorajja, MD; Steve R. Ommen, MD; David R. Holmes, Jr, MD; Joseph A. Dearani, MD; Charanjit S. Rihal, MD; Bernard J. Gersh, MB, ChBDPhil; Ryan J. Lennon, MS; Rick A. Nishimura, MD

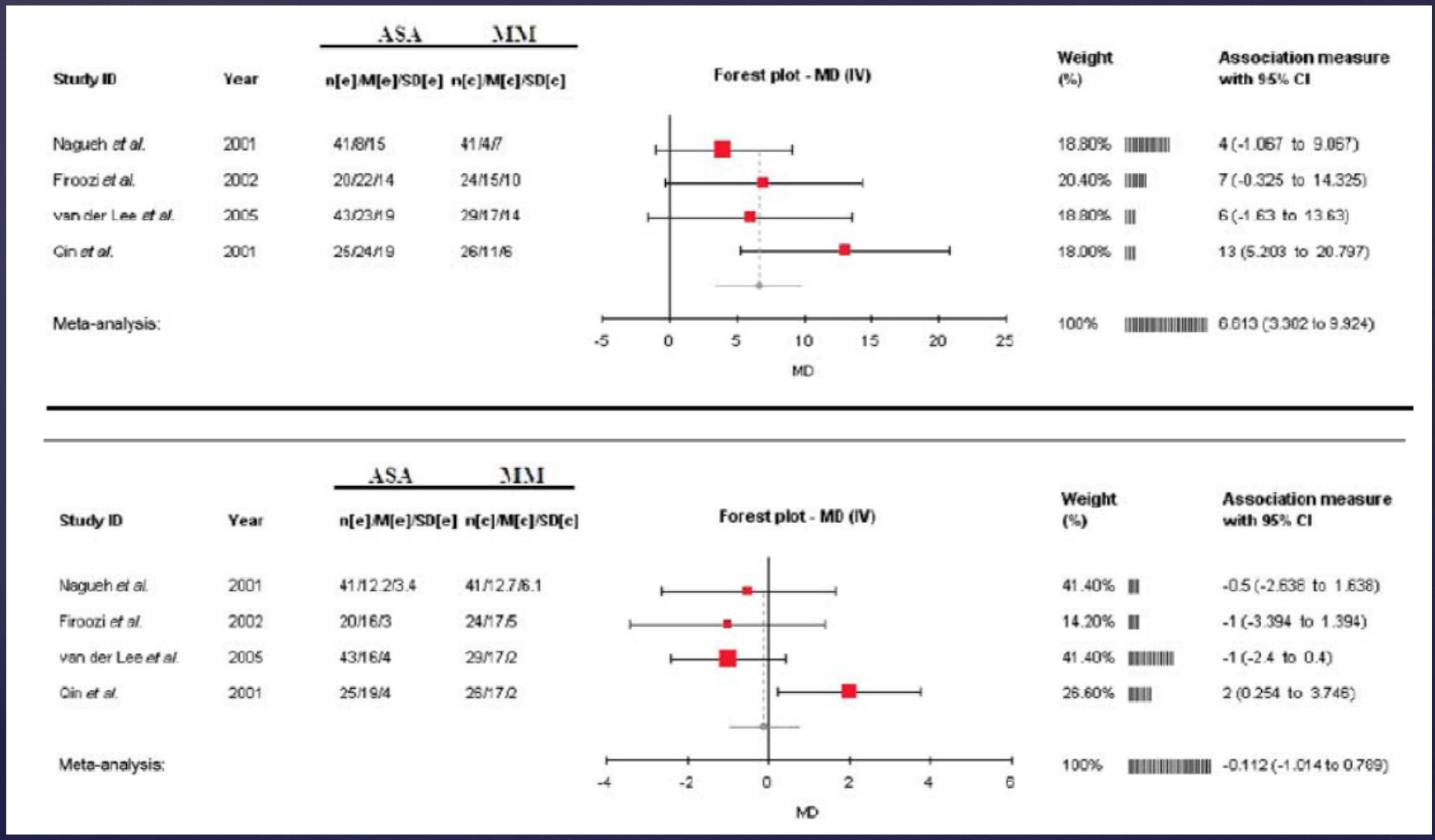
Predictors of need for repeat intervention post-ablation

	Univariate Risk Ratio	*P*	Multivariate Risk Ratio	*P*
Age	1.01 (0.99–1.03)	0.13	1.02 (1.00–1.04)	0.06
Male sex	0.68 (0.46–0.99)	0.04	0.74 (0.44–1.24)	0.25
Atrial fibrillation	1.89 (1.12–3.13)	0.01	1.97 (1.12–3.46)	0.02
Hypertension	1.62 (1.04–2.50)	0.009		
End-systolic diameter	1.05 (1.00–1.10)	0.05		
Post-ablation LVOT gradient	1.08 (1.03–1.14)	0.003	1.08 (1.03–1.14)	0.002
β-blocker therapy	1.52 (0.88–4.55)	0.08		

Only age, male sex, and postablation LVOT gradient were included in the final multivariate model. LVOT indicates left ventricular outflow tract.

Sorajja et al. Circulation 2012; 126:2374-2380

Myectomy is Associated with Lower LVOT Gradients Despite Similar Septal Thickness



Alam et al. Eur Heart J 2009; 30:1080-1087

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

(2010) Meta-analysis of 19 studies comparing ablation (n=2207) and surgical myectomy (n=1887)

Meta-Analysis: Comparable Mortality and SCD

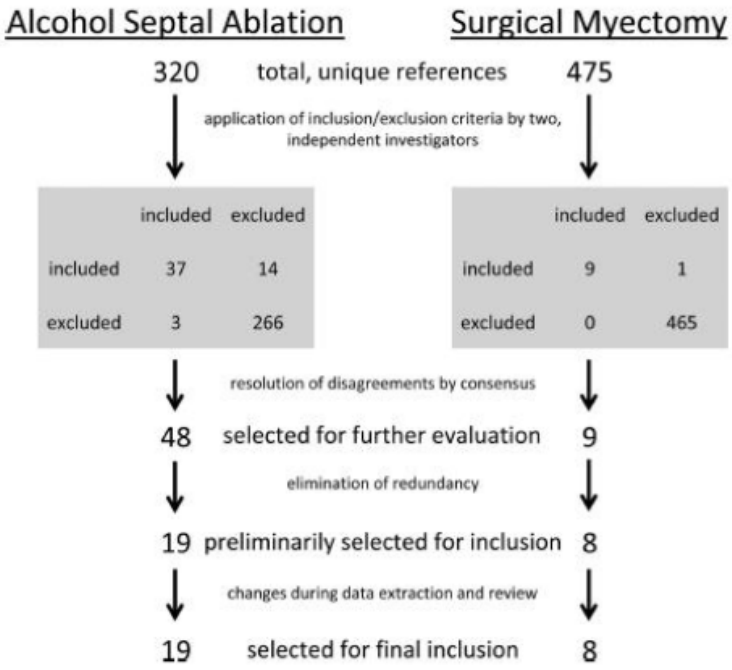


Table 5. Primary Outcomes: All-Cause Mortality and SCD Rates

	Surgical Myectomy % per Patient-Year, Weighted Mean (95% CI)	ASA % per Patient-Year, Weighted Mean (95% CI)	*P*
All-cause mortality rate	1.8 (1.2–2.6)	2.1 (1.7–2.7)	0.37
SCD rate	0.3 (0.2–0.6)	0.4 (0.3–0.6)	0.36

Leonardi et al. Circ Cardiovasc Interv, 2010; 3(2):97-104

Higher Residual Gradient and Heart Block with Septal Ablation

	Surgical Myectomy, Median (IQR)	ASA, Median (IQR)
NYHA functional class	1.6 (1.5–1.7)	1.5 (1.3–1.7)
LVOT gradient, mm Hg	3 (2–6)	22 (15–23)
Septal wall thickness, mm	17 (17–19)	16 (15–17)
New permanent pacemaker, %	5 (3–9)	11 (8–15)
Patients with an ICD, %	4 (3–4)	5 (4–8)

IQR indicates interquartile range.

Leonardi et al. Circ Cardiovasc Interv, 2010; 3(2):97-104

What Do the Guidelines Say?

2011 ACCF/AHA guideline for the diagnosis and treatment of hypertrophic cardiomyopathy

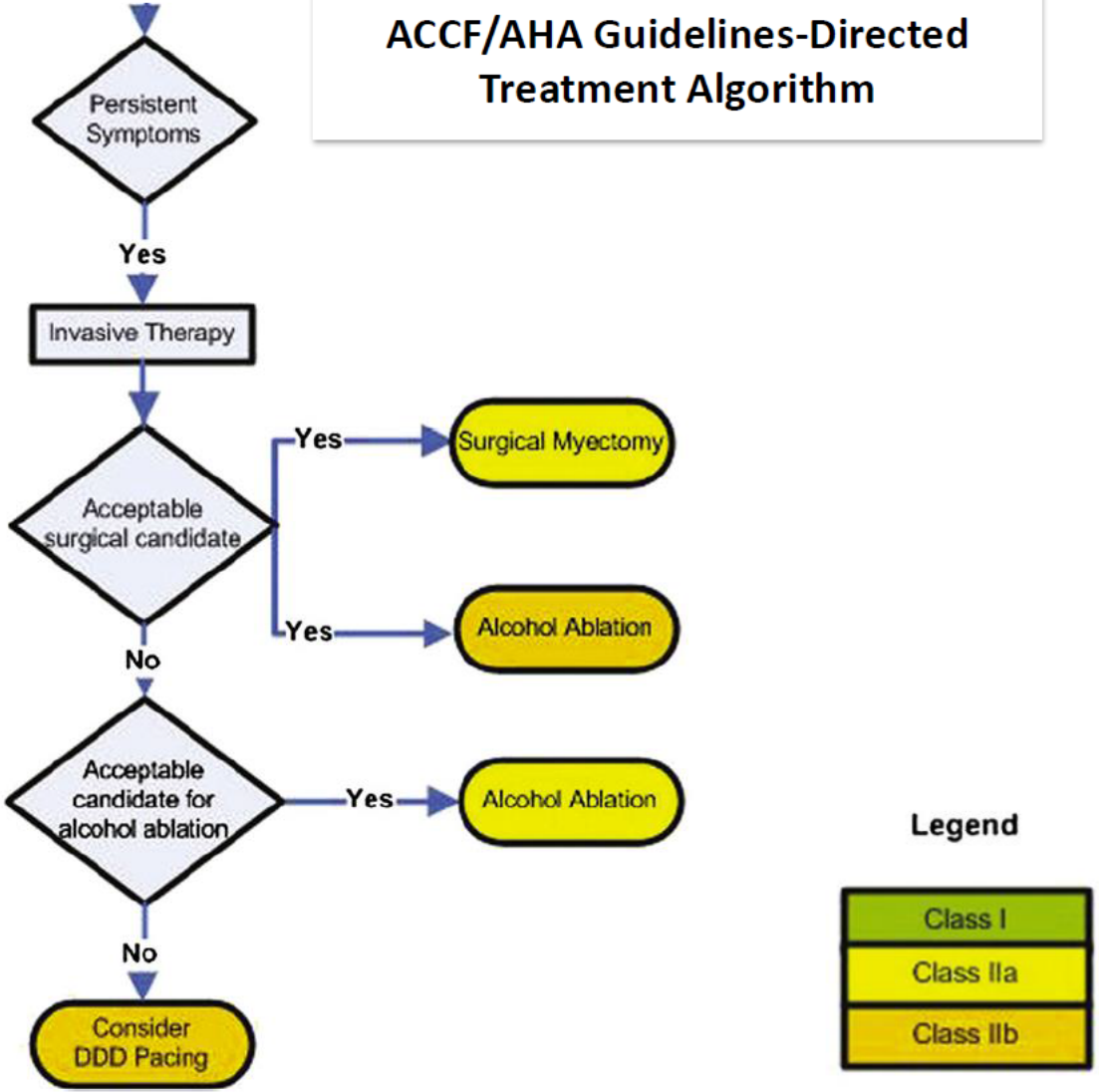
A report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines

Developed in Collaboration With The American Association for Thoracic Surgery, American Society of Echocardiography, American Society of Nuclear Cardiology, Heart Failure Society of America, Heart Rhythm Society, Society for Cardiovascular Angiography and Interventions, and Society of Thoracic Surgeons

« Surgical septal myectomy ……is the first consideration for the majority of eligible patients with HCM»

«.. When surgery is contraindicated, or the risk is considered unacceptable… alcohol septal ablation … can be beneficial in eligible adult patients with HCM»

ACCF/AHA Guidelines-Directed Treatment Algorithm



SUMMARY

Septal ablation and surgical myectomy have both been shown to provide clinical benefit in patients with HOCM

However, surgical myectomy is still the gold standard procedure and associated with higher procedural success and may have lower operative morbidity and mortality

Septal ablation should be reserved for non-operative or high risk patients with appropriate septal anatomy

Both surgical and interventional procedures should be performed in high-volume, expert centers