HOCM & SURGERY

Alireza A. Ghavidel MD
Professor of Cardiac Suregry
Esfand 1397, Feb. 2019

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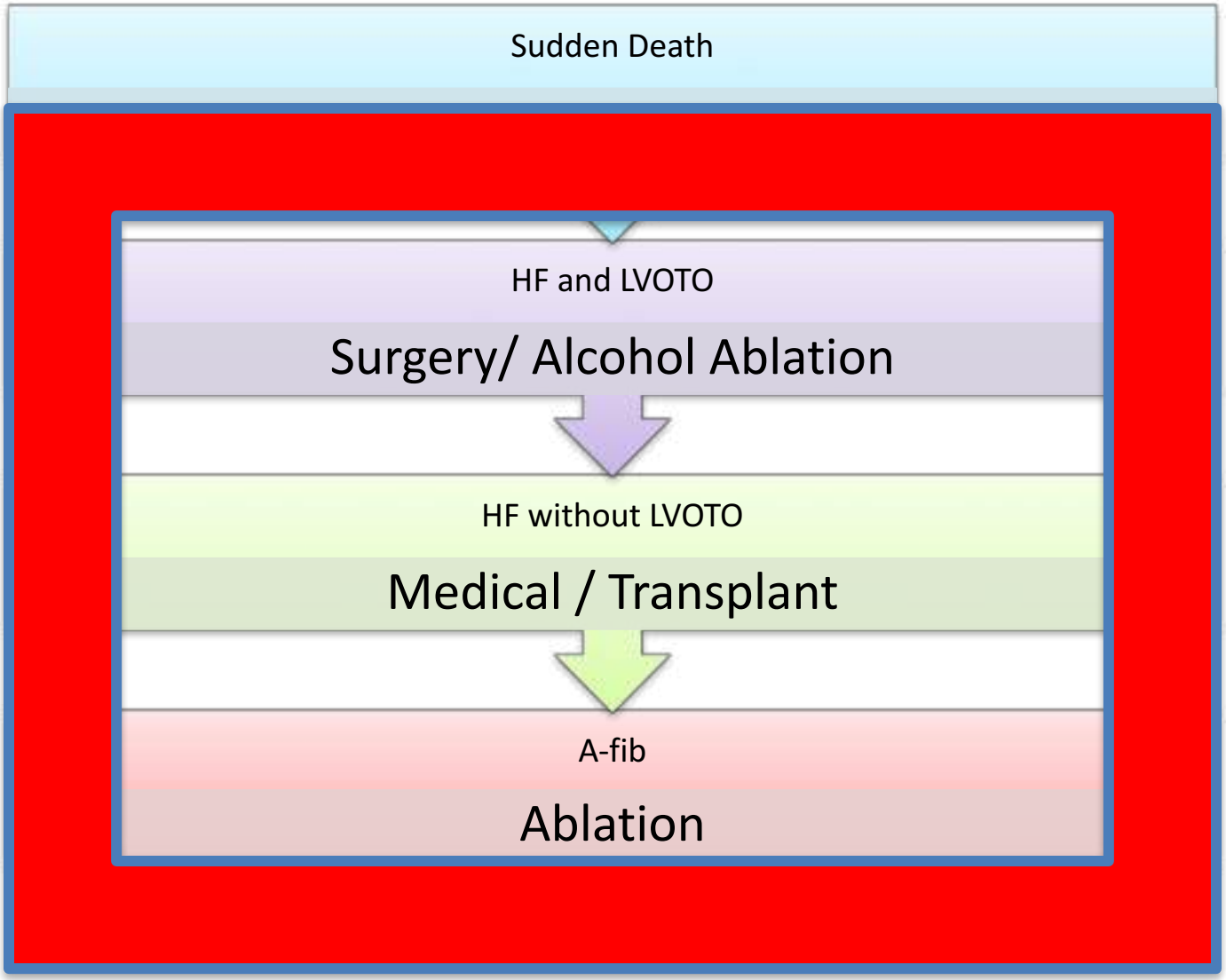
Conflict of interest : NO

Major disease pathways



Outlines

WHY?

WHEN?

HOW?

WHAT?

Indications

Technique

Myectomy vs ASA

Outcomes

1- Indications

2011 ACCF/AHA Guideline for the Diagnosis and Treatment of Hypertrophic Cardiomyopathy

2014 ESC Guidelines on diagnosis and management of hypertrophic cardiomyopathy

Surgical treatment for hypertrophic cardiomyopathy: a historical perspective

Dustin Hang, Anita Nguyen, Hartzell V. Schaff

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PRACTICE GUIDELINE

2011 ACCF/AHA Guideline for the Diagnosis and Treatment of Hypertrophic Cardiomyopathy

Asymptomatic Patients

CLASS

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atients with HCM with normal
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CLASS I

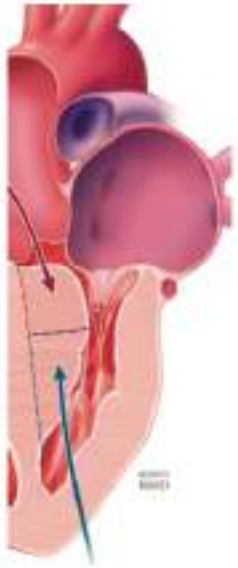
1. **Septal reduction therapy should be performed only by experienced operators* in the context of a comprehensive HCM clinical program and only for the treatment of eligible patients with severe drug-refractory symptoms and LVOT obstruction.† (272)** ***(Level of Evidence: C)***

*Experienced operators are defined as an individual operator with a cumulative case volume of at least 20 procedures or an individual operator who is working in a dedicated HCM program with a cumulative total of at least 50 procedures

a. Clinical: Severe dyspnea or chest pain (usually NYHA functional classes III or IV) or occasionally other exertional symptoms (such as syncope or near syncope) that interfere with everyday activity or quality of life despite optimal medical therapy.

b. Hemodynamic: Dynamic LVOT gradient at rest or with physiologic provocation ≥50 mm Hg associated with septal hypertrophy and SAM of the mitral valve.

c. Anatomic: Targeted anterior septal thickness sufficient to perform the procedure safely and effectively in the judgment of the individual operator.



Class
II A

1. Consultation with centers experienced in performing both surgical septal myectomy and alcohol septal ablation is reasonable when discussing treatment options for eligible patients with HCM with severe drug-refractory symptoms and LVOT obstruction. *(Level of Evidence: C)*

2. Surgical septal myectomy, when performed in experienced centers, can be beneficial and is the first consideration for the majority of eligible patients with HCM with severe drug-refractory symptoms and LVOT obstruction (61,62,155,273–275). *(Level of Evidence: B)*

3. Surgical septal myectomy, when performed at experienced centers, can be beneficial in symptomatic children with HCM and severe resting obstruction (>50 mm Hg) for whom standard medical therapy has failed (276). *(Level of Evidence: C)*

4. When surgery is contraindicated or the risk is considered unacceptable because of serious comorbidities or advanced age, alcohol septal ablation, when performed in experienced centers, can be beneficial in eligible adult patients with HCM with LVOT obstruction and severe drug-refractory symptoms (usually NYHA functional classes III or IV) (62,153,277–281). *(Level of Evidence: B)*

Class IIB

1. Alcohol septal ablation, when performed in experienced centers, may be considered as an alternative to surgical myectomy for eligible adult patients with HCM with severe drug-refractory symptoms and LVOT obstruction when, after a balanced and thorough discussion, the patient expresses a preference for septal ablation (153,273,278,280,281). *(Level of Evidence: B)*

2. The effectiveness of alcohol septal ablation is uncertain in patients with HCM with marked (i.e., >30 mm) septal hypertrophy, and therefore the procedure is generally discouraged in such patients. *(Level of Evidence: C)*

Class III
Harm

1. Septal reduction therapy should not be done for adult patients with HCM who are asymptomatic with normal exercise tolerance or whose symptoms are controlled or minimized on optimal medical therapy. *(Level of Evidence: C)*

2. Septal reduction therapy should not be done unless performed as part of a program dedicated to the longitudinal and multidisciplinary care of patients with HCM. *(Level of Evidence: C)*

3. Mitral valve replacement for relief of LVOT obstruction should not be performed in patients with HCM in whom septal reduction therapy is an option. *(Level of Evidence: C)*

4. Alcohol septal ablation should not be done in patients with HCM with concomitant disease that independently warrants surgical correction (e.g., coronary artery bypass grafting for CAD, mitral valve repair for ruptured chordae) in whom surgical myectomy can be performed as part of the operation. *(Level of Evidence: C)*

European Heart Journal (2014) **35**, 2733–2779
doi:10.1093/eurheartj/ehu284

ESC GUIDELINES

2014 ESC Guidelines on diagnosis and management of hypertrophic cardiomyopathy

The Task Force for the Diagnosis and Management of Hypertrophic Cardiomyopathy of the European Society of Cardiology (ESC)

Recommendations on septal reduction therapy

Recommendations	Class[a]	Level[b]	Ref.[c]
It is recommended that septal reduction therapies be performed by experienced operators, working as part of a multidisciplinary team expert in the management of HCM.	I	C	148,149
Septal reduction therapy to improve symptoms is recommended in patients with a resting or maximum provoked LVOT gradient of ≥50 mm Hg, who are in NYHA functional Class III–IV, despite maximum tolerated medical therapy.	I	B	311–314
Septal myectomy, rather than SAA, is recommended in patients with an indication for septal reduction therapy and other lesions requiring surgical intervention (e.g. mitral valve repair/replacement, papillary muscle intervention).	I	C	295

Septal reduction therapy should be considered in patients with recurrent exertional syncope caused by a resting or maximum provoked LVOTO gradient ≥50 mm Hg despite optimal medical therapy.	IIa	C	240,316
Mitral valve repair or replacement should be considered in symptomatic patients with a resting or maximum provoked LVOTO gradient ≥50 mm Hg and moderate-to-severe mitral regurgitation not caused by SAM of the mitral valve alone.	IIa	C	291–294
Mitral valve repair or replacement may be considered in patients with a resting or maximum provoked LVOTO gradient ≥50 mm Hg and a maximum septal thickness ≤16 mm at the point of the mitral leaflet–septal contact or when there is moderate-to-severe mitral regurgitation following isolated myectomy.	IIb	C	296,317

Class II

Recommendations on cardiac transplantation

Recommendations	Class[a]	Level[b]	Ref.[c]
Orthotopic cardiac transplantation should be considered in eligible patients who have an LVEF <50% and NYHA functional Class III–IV symptoms despite optimal medical therapy or intractable ventricular arrhythmia.	IIa	B	340,341,343,344
Orthotopic cardiac transplantation may be considered in eligible patients with normal LVEF (≥50%) and severe drug refractory symptoms (NYHA functional Class III–IV) caused by diastolic dysfunction.	IIb	B	340,341,343,344

HF = heart failure; LVEF = left ventricular ejection fraction; NYHA = New York Heart Association.
[a]Class of recommendation.
[b]Level of evidence.
[c]Reference(s) supporting recommendations.

Recommendations on left ventricular assist devices

Recommendations	Class[a]	Level[b]	Ref.[c]
Continuous axial flow LVAD therapy may be considered in selected patients with end-stage HF despite optimal pharmacological and device treatment, who are otherwise suitable for heart transplantation, to improve symptoms, and reduce the risk of HF hospitalization from worsening HF and premature death while awaiting a transplant.	IIb	C	346

HF = heart failure; LVAD = left ventricular assist device.
[a]Class of recommendation.
[b]Level of evidence.
[c]Reference(s) supporting recommendations.

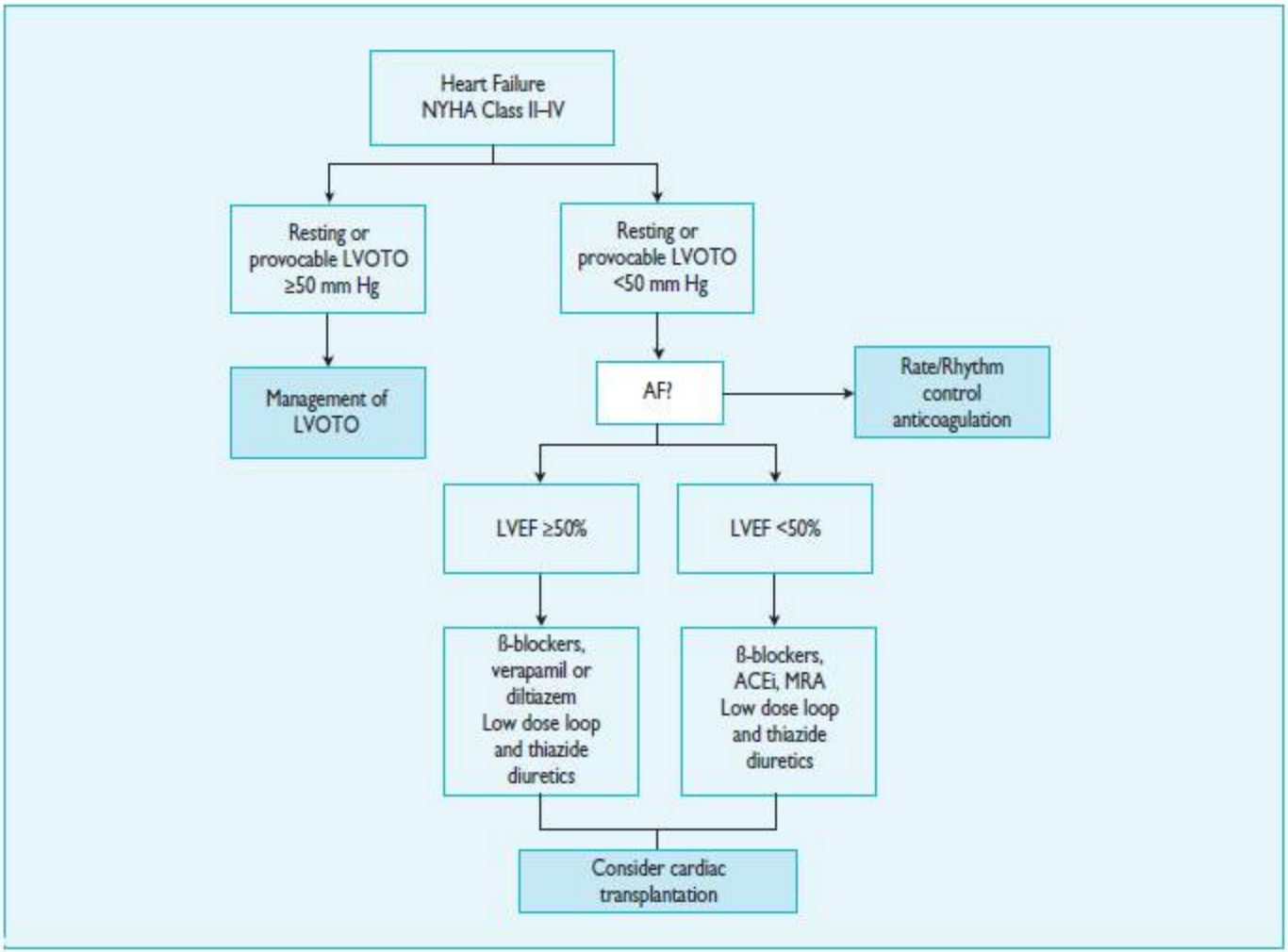


Figure 6 Algorithm for the treatment of heart failure in hypertrophic cardiomyopathy. ACEi = angiotensin converting enzyme inhibitor; AF = atrial fibrillation; LVEF = left ventricular ejection fraction; LVOTO = left ventricular outflow tract obstruction; MRA = mineralocorticoid receptor antagonist; NYHA = New York Heart Association.

EXPERT OPINION

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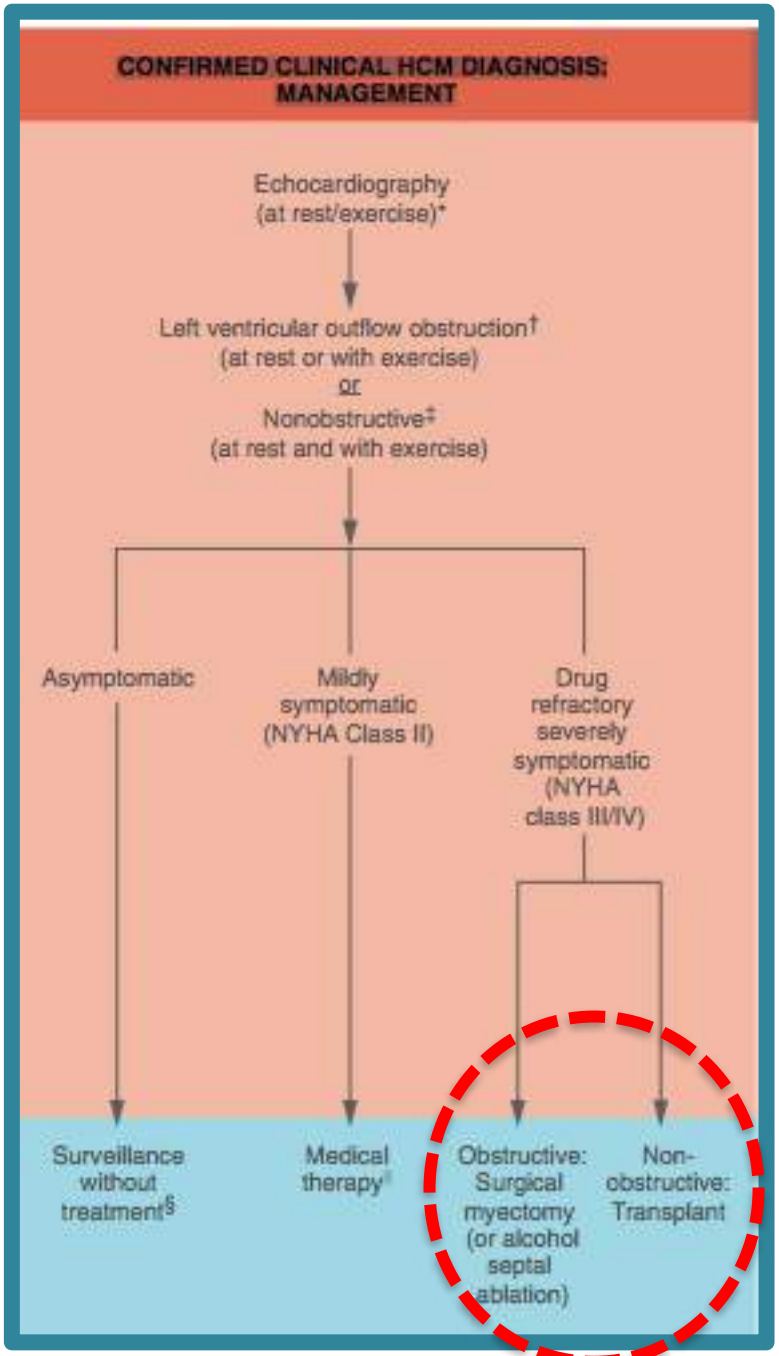
THE PRESENT AND FUTURE

STATE-OF-THE-ART REVIEW

Hypertrophic Cardiomyopathy

Present and Future, With Translation Into Contemporary Cardiovascular Medicine

Barry J. Maron, MD,* Steve R. Ommen, MD,† Christopher Semsarian, MBBS, PhD,‡ Paolo Spirito, MD,§ Iacopo Olivotto, MD,‖ Martin S. Maron, MD¶



Surgical treatment for hypertrophic cardiomyopathy: a historical perspective

Dustin Hang, Anita Nguyen, Hartzell V. Schaff

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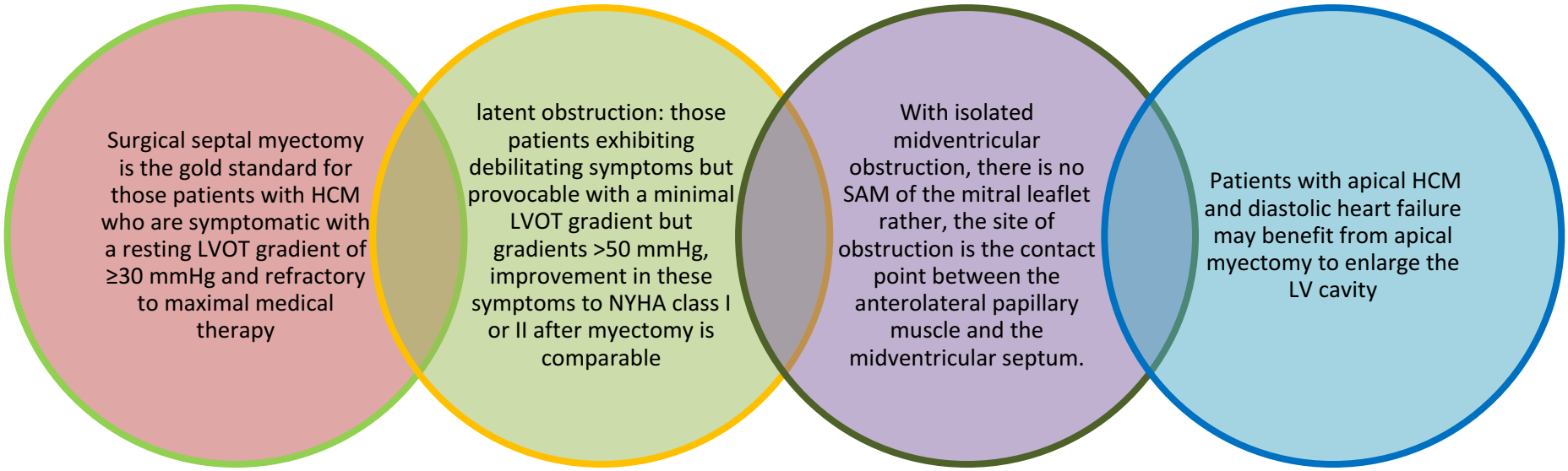
Ann Cardiothorac Surg 2017;6(4):318-328



2- Surgical technique

How it begins?

In 1957, Brock described cases of muscular subaortic stenosis (contact lesion)

A year later, Teare reported an autopsy series of eight young patients who died suddenly and were found to have "asymmetrical hypertrophy of the heart"

Goodwin *et al.* were the first to describe surgical management by Cleland in London, UK, on November 26th, 1958

Cleland then described his surgical experience with six more patients who had an operation from 1960 to 1962

In 1959 and 1960, Kirklin and Ellis of the Mayo Clinic operated on two patients using a combined transaortic and transventricular approach

How it begins?

Morrow in 1960. “sphincter-like contraction ring in the outflow tract”

At Toronto General Hospital, surgical management of four patients was reported in 1963

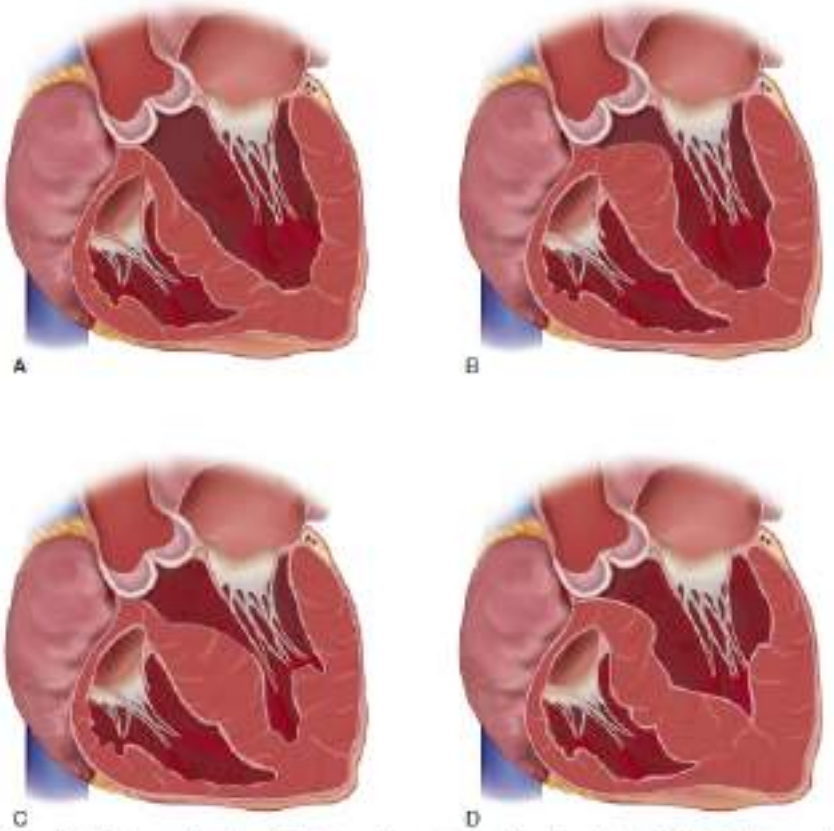
1964, he and his team had performed 5 ventriculomyotomy & 5 ventriculomyotomy with a partial resection of the hypertrophied muscle.

1975, Morrow *et al.* had operated on a total of 83 patients, using the parallel incisions

Different Surgical Approaches

- Trans-aortic
- Trans-ventricular
- Transatrial, transmitral in a highly selective subgroup
- Transatrial approach for small children

Different Surgical Approaches



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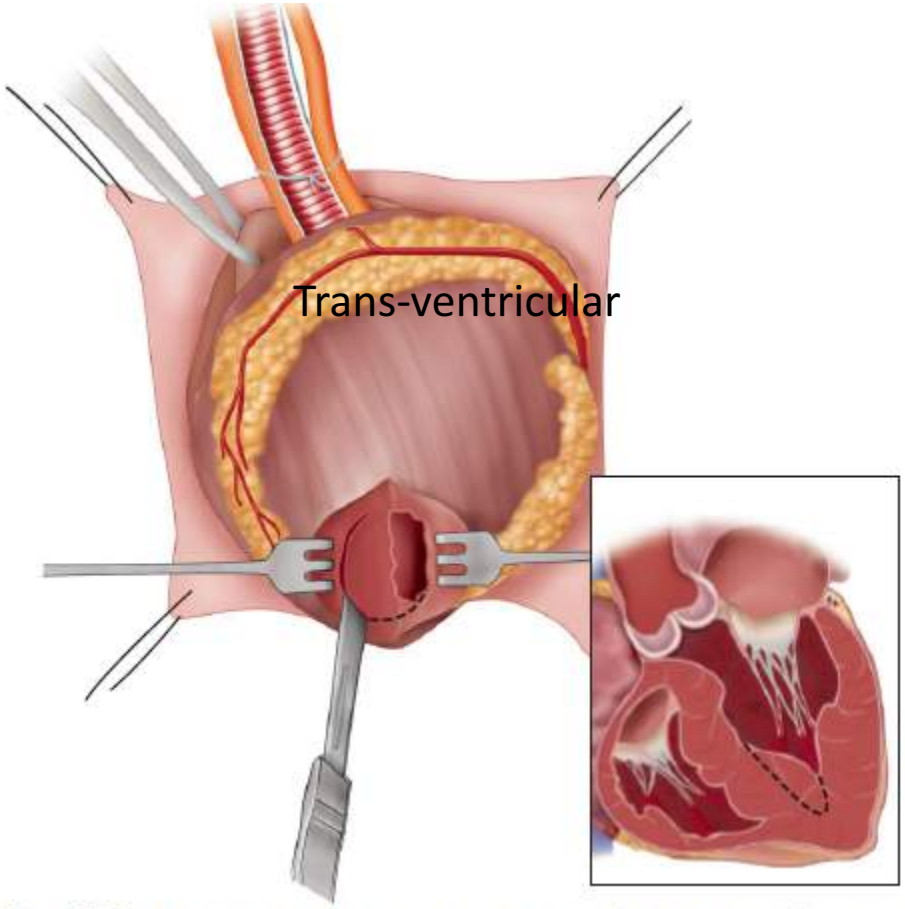
Trans-ventricular



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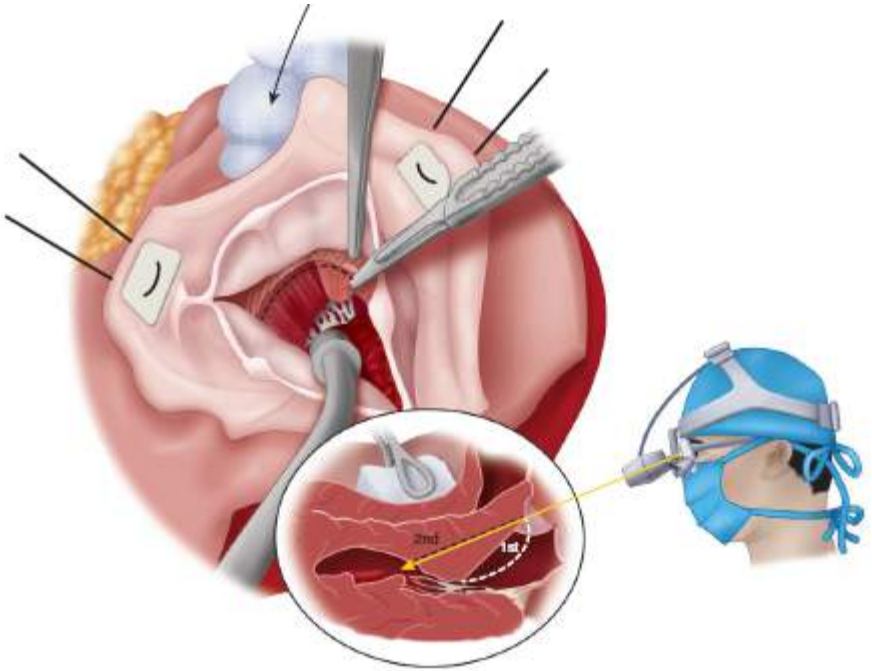
Trans-Aortic Approach



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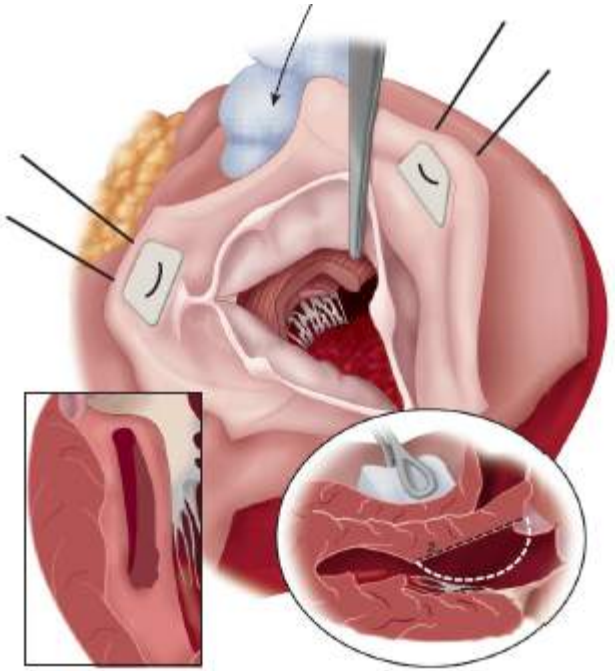

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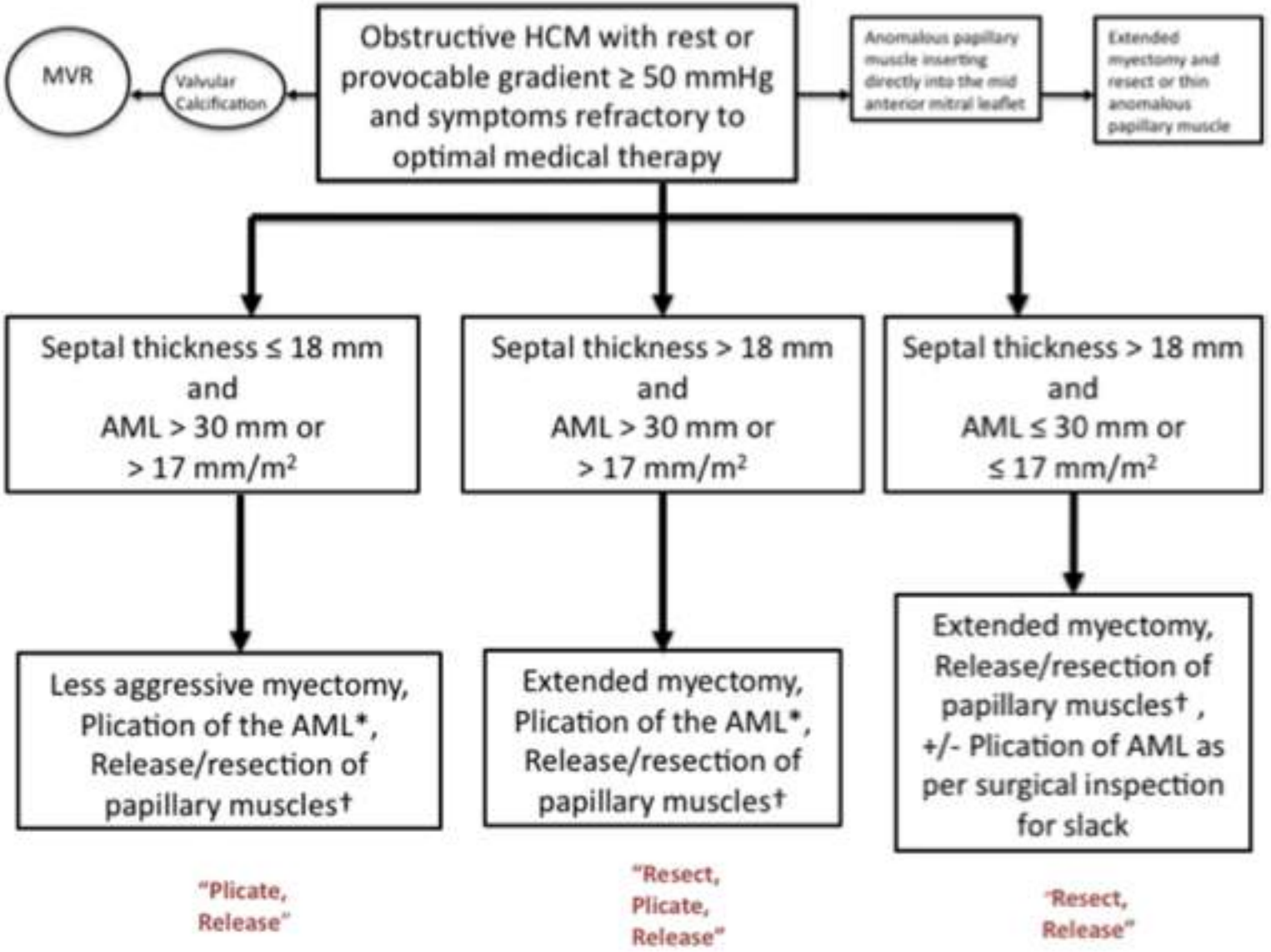
Masters of Cardiothoracic Surgery

The surgical management of obstructive hypertrophic cardiomyopathy: the RPR procedure—resection, plication, release

Daniel G. Swistel, Mark V. Sherrid

Department of Cardiothoracic Surgery and the Division of Cardiology, New York University School of Medicine, NYU/Langone Medical Center, New York, NY, USA

Ann Cardiothorac Surg 2017;6(4):423-425


MVR
Valvular Calcification
Obstructive HCM with rest or provocable gradient ≥ 50 mmHg and symptoms refractory to optimal medical therapy
Anomalous papillary muscle inserting directly into the mid anterior mitral leaflet
Extended myectomy and resect or thin anomalous papillary muscle
Septal thickness ≤ 18 mm and AML > 30 mm or > 17 mm/m²
Septal thickness > 18 mm and AML > 30 mm or > 17 mm/m²
Septal thickness > 18 mm and AML ≤ 30 mm or ≤ 17 mm/m²
Less aggressive myectomy, Plication of the AML*, Release/resection of papillary muscles†
Extended myectomy, Plication of the AML*, Release/resection of papillary muscles†
Extended myectomy, Release/resection of papillary muscles† , +/- Plication of AML as per surgical inspection for slack
"Plicate, Release"
"Resect, Plicate, Release"
"Resect, Release"

Technical Challenges

1- How should I Protect the Myocardium?

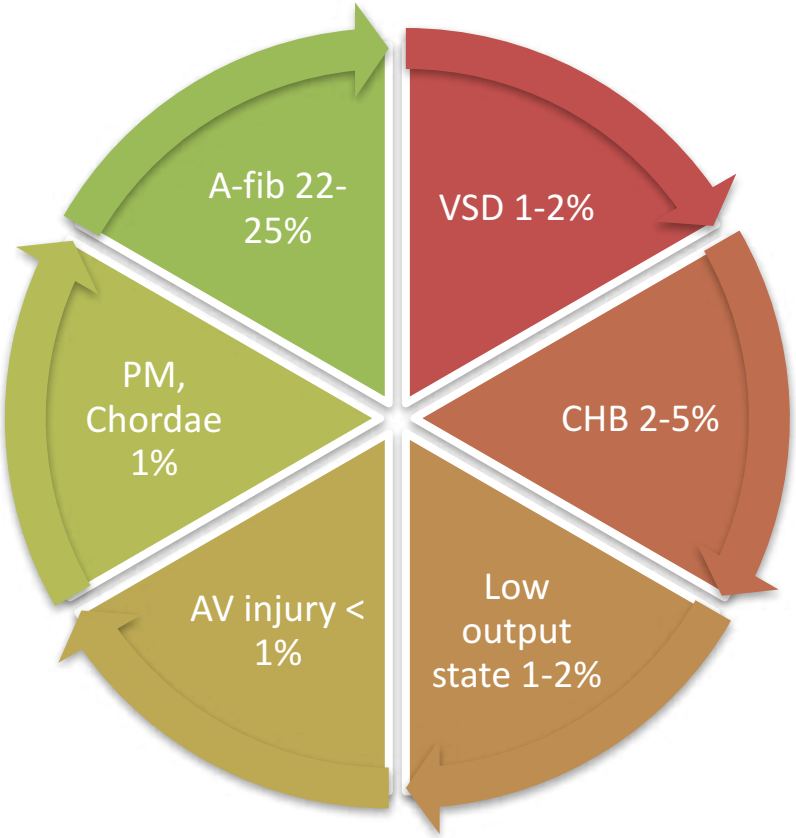
2- How much muscle should be resected?

3- How should I deal with patient's MR?

4-How should I deal with patient's Muscle bridge?

5- How can I assess my work?

What are the potential surgical complications?



How should I manage the residual pathologies?

LVOTO

- **Inadequate Myomectomy**
- Depth of septal excision is less

SAM/MR

- **Inadequate Myomectomy**
- **Intrinsic mitral pathology**
- **Iatrogenic MR**

A ratio of anterior mitral leaflet length to LVOT diameter more than 2.0 was found to be associated with obstruction

Ann Cardiothorac Surg 2017;6(4):318-328

Post operative management?

Enough Volume

Adequate afterload

Avoid vasodilators

Treat A-fib

Start beta blocker immediately

Surgical Benefit

Symptomatic

Survival

Sudden Cardiac death

Benefits

- Immediate reduction in the LVOT gradient with a gradient at rest of less than 10 mm Hg,
- Reduction in mitral regurgitation,
- Reduction in myocardial oxygen demand,
- Reduction in ventricular/atrial wall stress,
- Improvement both objectively and subjectively in exercise tolerance.

Long term follow-up of surgical treatment of hypertrophic obstructive cardiomyopathy (HOCM): the role of concomitant cardiac procedures☆

Kazutomo Minami*, Dietmar Boethig, Hajo Woltersdorf, Dirk Seifert, Reiner Körfer

Department of Thoracic and Cardiovascular Surgery, Heart Center NRW, University of Bochum, Georgstr. 11, 325 43 Bad Oeynhausen, Germany

Received 25 October 2001; received in revised form 5 April 2002; accepted 17 April 2002

In hospital mortality

1.6%

5 & 10 year Survival

93% & 87% Isolated Myectomy

88% & 80% Concomitant procedure

Slight Advantage of Surgical Myectomy vs Medical Therapy in Prevention of Sudden Cardiac Death

No evidence medical therapy or alcohol ablation prevents sudden death.

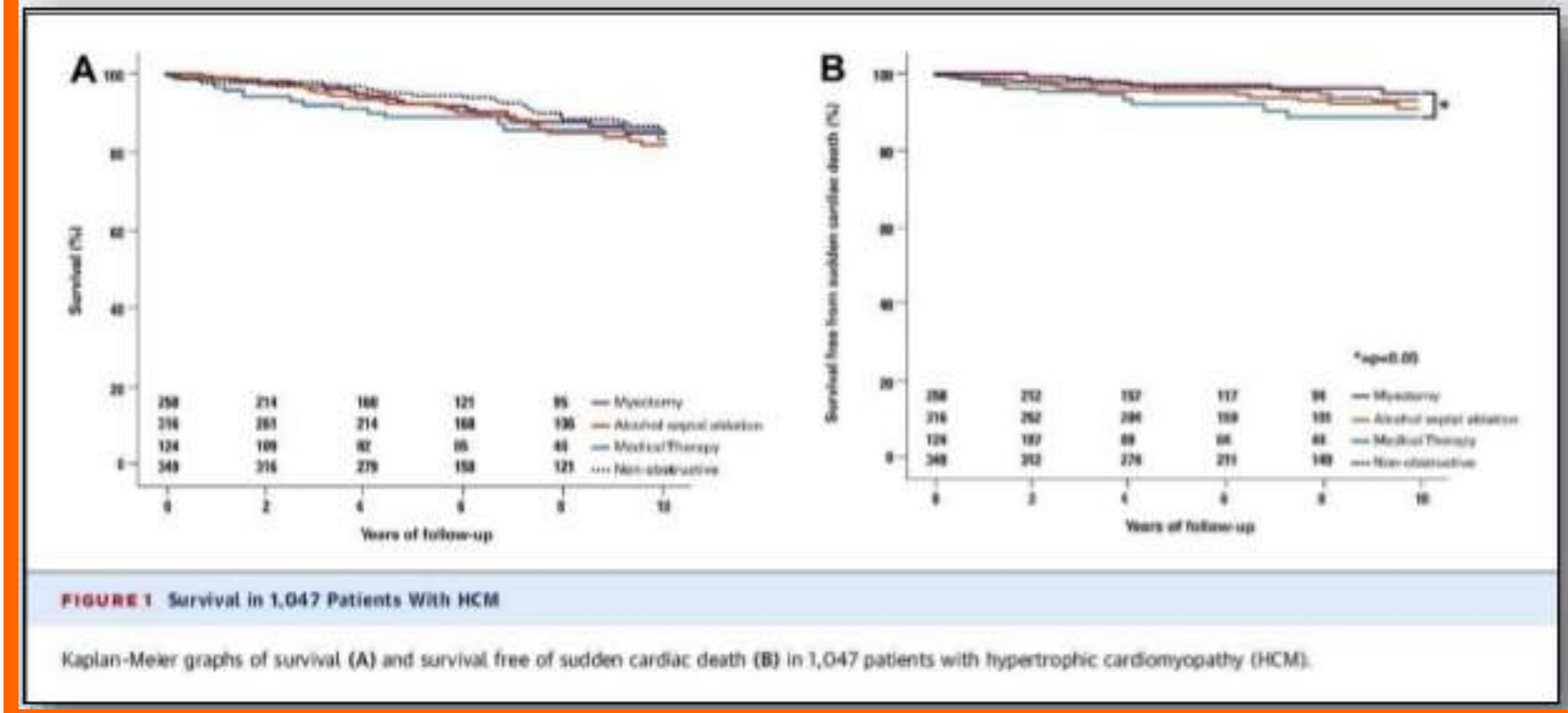


FIGURE 1 Survival in 1,047 Patients With HCM

Kaplan-Meier graphs of survival **(A)** and survival free of sudden cardiac death **(B)** in 1,047 patients with hypertrophic cardiomyopathy (HCM).

ACC.18

885
JACC March 20, 2018
Volume 71, Issue 11

Heart Failure and Cardiomyopathies

SURGICAL MANAGEMENT OF NONOBSTRUCTIVE HYPERTROPHIC CARDIOMYOPATHY: CLINICAL OUTCOME OF MYECTOMY IN 94 PATIENTS WITH APICAL HCM

94 symptomatic patients with diastolic dysfunction and ApHCM

There were 18 (19%) late deaths, and the overall estimated 1, 3 and 5-year survivals were 95%, 85% and 79%; survival in our early practice was comparable to our later experience. At mean follow-up of 4.3±4.2 years, 35 of 56 patients (63%) reported symptomatic improvement/resolution of dyspnea. During follow-up, 2 patients (2%) underwent cardiac transplantation, and 1 (1%) LVAD implantation for heart failure.

Apical myectomy is a surgical technique that is beneficial in severely symptomatic ApHCM patients with diastolic dysfunction. Early risk of the procedure is acceptably low, ventricular dimensions are augmented, and over 60% of patients maintain clinical improvement with resolution of symptoms at early follow-up.

Alcohol Septal Ablation (ASA)

Alternative septal reduction therapy

Factors that influence the decision to proceed with alcohol ablation include advanced age, Concomitant pathology, significant comorbidity that increases surgical risk, or the strong desire of patients to avoid open-heart surgery.

Alcohol ablation reduces LV outflow gradient (and symptoms) by creating a large basal ventricular septal infarction (10% of the LV wall, 30% of the septum, on average) by infusion of absolute alcohol into a major septal perforator coronary artery.

In contrast, myectomy requires resection of a small amount of muscle from the basal septum, but without intramyocardial scarring.

Anadolu Kardiyol Derg 2006: 6 Özel Sayı 2; 27-30
Anatol J Cardiol 2006: 6 Suppl 2; 27-30

Harry M. Lever
Selection of HCM patients for myectomy or septal ablation

Myomectomy vs ASA

Procedural mortality, low in experienced myectomy programs, is similar for both interventions when performed at HCM centers

Surgery providing better symptom and gradient relief in <65 years of age. Surgery also provides the opportunity to address complex LV morphologic abnormalities

Comparable survival between ASA and surgical myectomy, without an increased risk of sudden death; however, the re-intervention rate for ASA was significantly higher.

Sorajja P, Ommen SR, Holmes DR Jr, et al. Circulation 2012;126:2374-80.

Five-fold increase in the incidence of cardiac death and arrhythmic complications after ASA as compared to myectomy.

Cate FJ, Soliman OI, Michels M, et al. Circ Heart Fail 2010;3:362-9.

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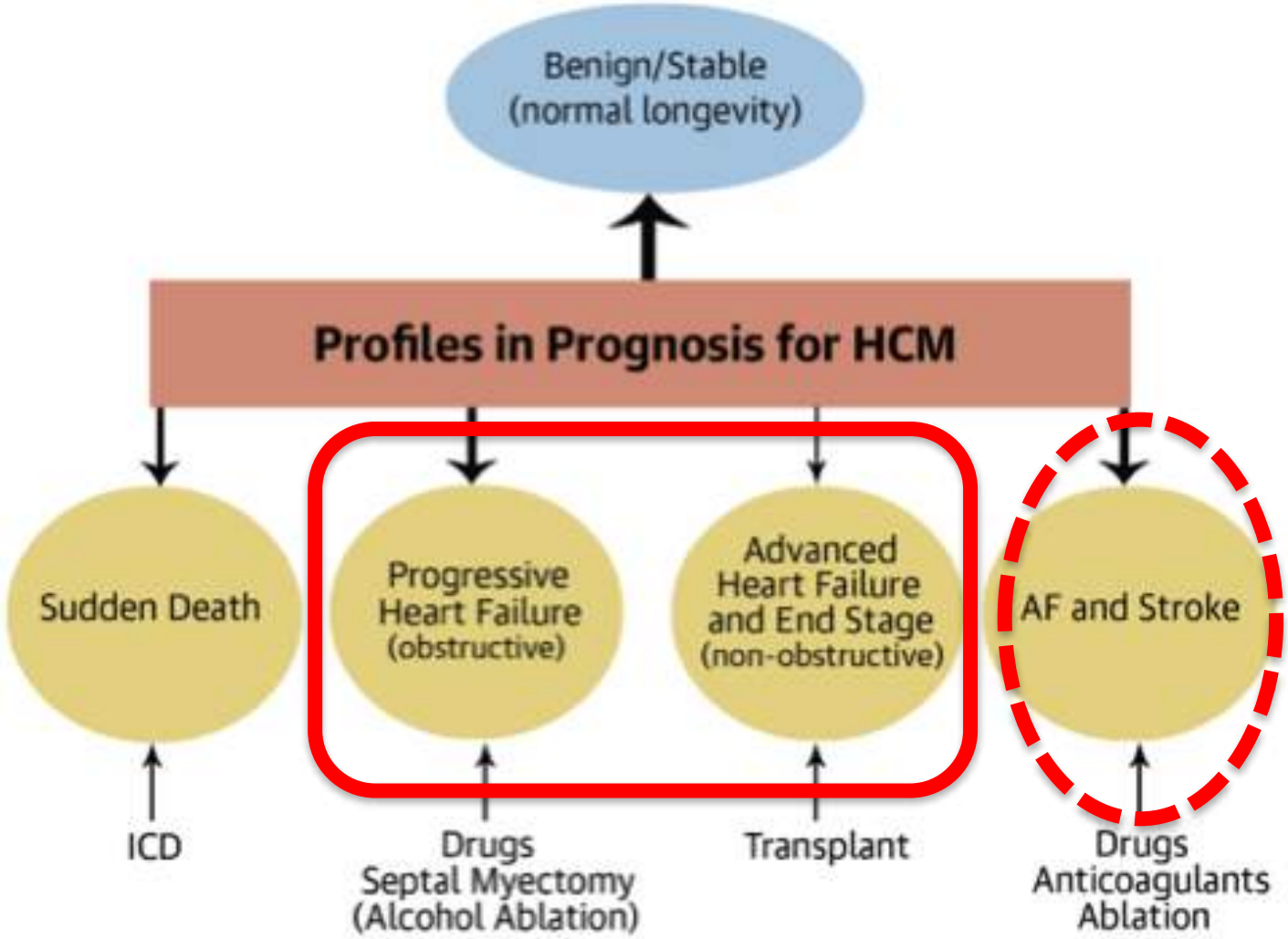
THE PRESENT AND FUTURE

STATE-OF-THE-ART REVIEW

Hypertrophic Cardiomyopathy

Present and Future, With Translation Into Contemporary Cardiovascular Medicine

Barry J. Maron, MD,* Steve R. Ommen, MD,† Christopher Semsarian, MBBS, PHD,‡ Paolo Spirito, MD,§ Iacopo Olivotto, MD,‖ Martin S. Maron, MD¶



Surgical Af Ablation

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doi:10.1016/j.jacc.2009.09.047

HYPERTROPHIC CARDIOMYOPATHY

Updated Meta-Analysis of Septal Alcohol Ablation Versus Myectomy for Hypertrophic Cardiomyopathy

Shikhar Agarwal, MD, MPH,* E. Murat Tuzcu, MD,† Milind Y. Desai, MD,†
Nicholas Smedira, MD,‡ Harry M. Lever, MD,† Bruce W. Lytle, MD,‡ Samir R. Kapadia, MD,†
Cleveland, Ohio

12 non randomized studies

Table 4 Pooled Effect Estimates for Outcomes Comparing SA With SM

Characteristic	Pooled Studies (Ref. #s)	Estimate Used	Fixed/Random Effects	Heterogeneity Estimate		Pooled Estimate	95% Confidence Interval	p Value
				I^2 (%)	p Value			
Short-term mortality	(7-13,16,17)	RD	Fixed	0	0.95	0.01	−0.01 to 0.03	0.35
Long-term mortality	(8-13,16)	RD	Random	75	<0.01	0.02	−0.05 to 0.09	0.55*
LBBB	(11,13,15)	OR	Random	94	<0.01	0.22	0.002 to 13.28	0.48*
RBBB	(8,10,16)	OR	Fixed	26	0.26	56.33	11.59 to 273.88	<0.001
Pacemaker implantation	(7,8,10,11,13,15,17)	OR	Fixed	41	0.12	2.57	1.68 to 3.93	<0.001
Ventricular arrhythmias	(7,8,10,13)	OR	Fixed	52	0.10	1.34	0.54 to 3.32	0.52
Re-interventions	(8,9,11)	OR	Fixed	0	0.78	2.37	0.54 to 10.51	0.26
MR	(8,9,11)	OR	Fixed	0	0.39	1.44	0.59 to 3.52	0.49
Post-intervention NYHA class	(8-11,14,17)	SMD	Random	62	0.02	0.30	−0.03 to 0.63	0.08
Post-intervention change in NYHA class	(10,11,14,17)	SMD	Fixed	0	0.67	−0.27	−0.54 to 0.01	0.06
Post-intervention LVOTG	(8-11,13,14,17)	SMD	Random	61	0.02	0.45	0.13 to 0.77	<0.01*
Post-intervention change in LVOTG	(8-11,13,14,17)	SMD	Fixed	0	0.91	−0.09	−0.28 to 0.10	0.35
Post-intervention IVS	(8,10,14,17)	SMD	Random	58	0.07	−0.01	−0.41 to 0.38	0.95
Post-intervention IVS reduction	(8,10,14)	SMD	Fixed	30	0.23	−0.07	−0.32 to 0.18	0.59
LVEDD	(8,10,11,14,17)	SMD	Fixed	0	0.52	0.15	−0.09 to 0.38	0.22
LVESD	(8,10,11,17)	SMD	Random	96	<0.001	0.39	−0.99 to 1.76	0.58*
LVEF	(8,10,14)	SMD	Fixed	0.1	0.37	0.13	−0.15 to 0.40	0.37
LA size	(10,14,17)	SMD	Fixed	0	1.0	−0.12	−0.43 to 0.18	0.43

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THE PRESENT AND FUTURE

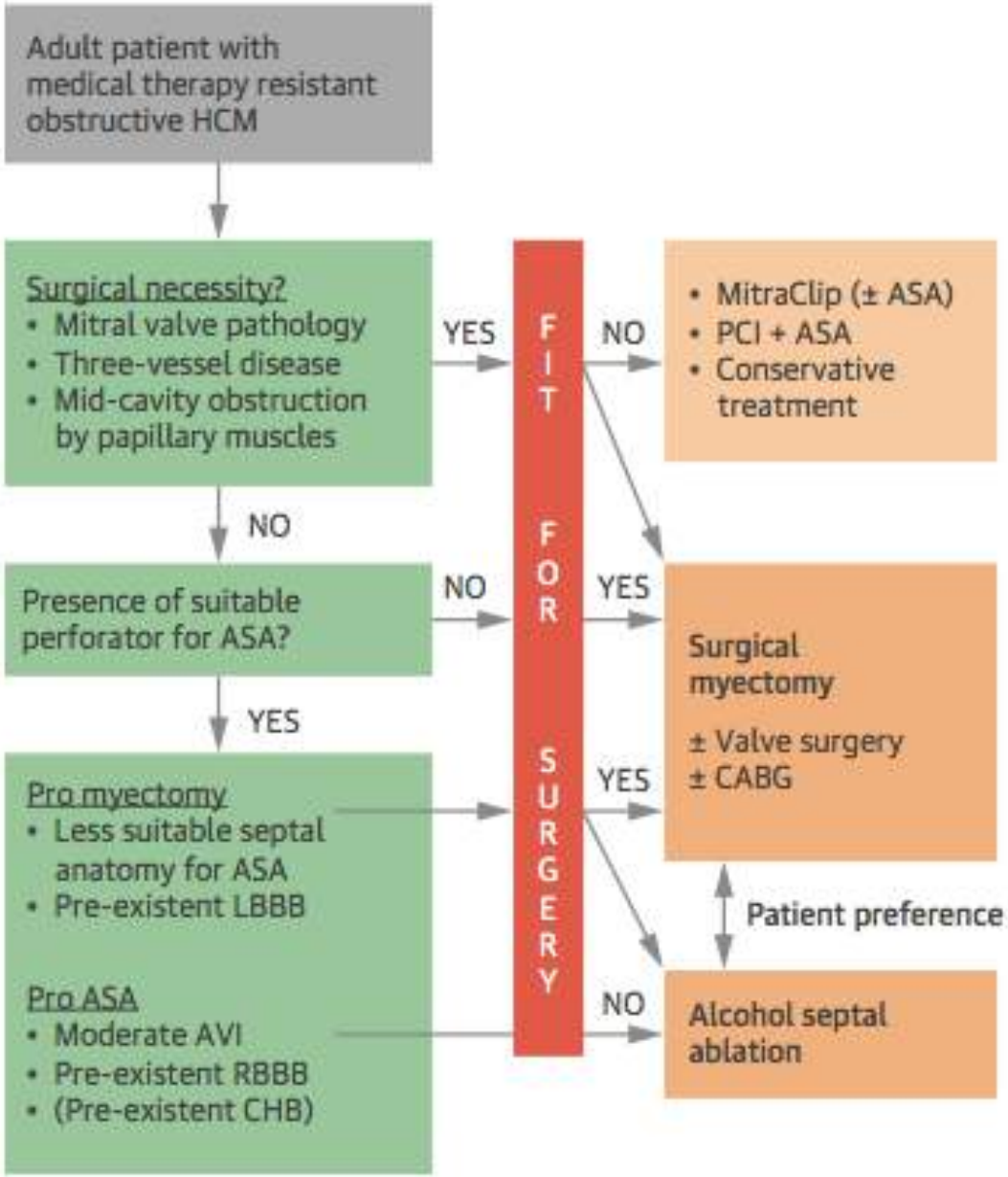
REVIEW TOPIC OF THE WEEK: POINT

Alcohol Septal Ablation for Obstructive Hypertrophic Cardiomyopathy

A Word of Endorsement

Max Liebregts, MD,[a] Pieter A. Vriesendorp, MD, PhD,[b] Jurrien M. ten Berg, MD, PhD[a]

FIGURE 1 **Decision Tree for Patients With Obstructive HCM and Complicating Patient Factors**



JACC: HEART FAILURE
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http://dx.doi.org/10.1016/j.jchf.2015.06.011

A Systematic Review and Meta-Analysis of Long-Term Outcomes After Septal Reduction Therapy in Patients With Hypertrophic Cardiomyopathy

Max Liebregts, MD,* Pieter A. Vriesendorp, MD,† Bakhtawar K. Mahmoodi, MD, PhD, MPH,*
Arend F.L. Schinkel, MD, PhD,† Michelle Michels, MD, PhD,† Jurriën M. ten Berg, MD, PhD*

16 SM & 11 ASA Cohorts

Long-term mortality and (aborted) SCD rates after ASA and myectomy are similarly low.

Patients who undergo ASA have more than twice the risk of permanent pacemaker implantation and a 5 times higher risk of the need for additional septal reduction therapy compared with those who undergo myectomy.

Interactive CardioVascular and Thoracic Surgery 24 (2017) 951–961
doi:10.1093/icvts/ivx001 Advance Access publication 28 February 2017

BEST EVIDENCE TOPIC

Cite this article as: Poon SS, Field M, Gupta D, Cameron D. Surgical septal myectomy or alcohol septal ablation: which approach offers better outcomes for patients with hypertrophic obstructive cardiomyopathy? Interact CardioVasc Thorac Surg 2017;24:951–61.

Surgical septal myectomy or alcohol septal ablation: which approach offers better outcomes for patients with hypertrophic obstructive cardiomyopathy?

Shi Sum Poon[a,*] Mark Field[a], Dhiraj Gupta[b] and Duke Cameron[c]

16 observational & 1 meta-analysis

The post-procedural and late mortality rates between the 2 groups are consistently low and comparable in carefully selected patients. Nonetheless, ASA is associated with the increased likelihood of complications such as PPM, early sustained-VT and VF, and

re-intervention.

advantage

Surgery	ASA
No scar remains/ less risk for ventricular arrhythmia.	Less pain/infection
Concomitant procedure	low incidence of post ablation
Need for PPM is less than 3%	Less hospital stay
Relief of the gradient is immediate and usually permanent	

Harry M. Lever

Cleveland Clinic, Cleveland, Ohio, USA

DISADVANTAGE

Surgery

- risk is higher in the elderly patients
- A-fib is higher
- recovery is longer

ASA

- less reduction in LVOT gradient
- Incidence of permanent pacemaker insertion is 10-23%.
- Unpredictable infarct size
- Higher incidence of VT
- Coronary dissection/Tamponade


VIDEO
CLIPS


PLAY