

What structural
abnormalities do occur
with the mitral valve in
HCM?

What Is the Best Surgical Treatment for Obstructive Hypertrophic Cardiomyopathy and Degenerative Mitral Regurgitation?

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Background. Many prefer mitral valve replacement (MVR) for patients with obstructive hypertrophic cardiomyopathy (HCM) and concomitant degenerative mitral regurgitation (MR). We reviewed our results of septal myectomy combined with mitral valve repair (MVrep) and MVR when these problems coexist.

Methods. Between 1990 and 2006, 32 patients (56% men; mean age, 60.7 ± 16.7 years) underwent extended septal myectomy for HCM with concomitant MVrep or MVR for degenerative MR (4% of myectomies and 3% of isolated MVrep during the same period). Preoperatively, 63% were in New York Heart Association (NYHA) functional class III/IV. Preoperative peak left ventricular outflow tract (LVOT) gradient was 63.7 ± 37.6 mm Hg. Systolic anterior motion (SAM) was present in 94%, with severe MR in 88%.

Results. Extended septal myectomy included concomitant MVrep in 28 (88%) or mechanical MVR in 4 (12%). MVrep included leaflet resection in 10 (36%), edge-to-edge stitch in 6 (21%), and leaflet plication in 8 (29%). An

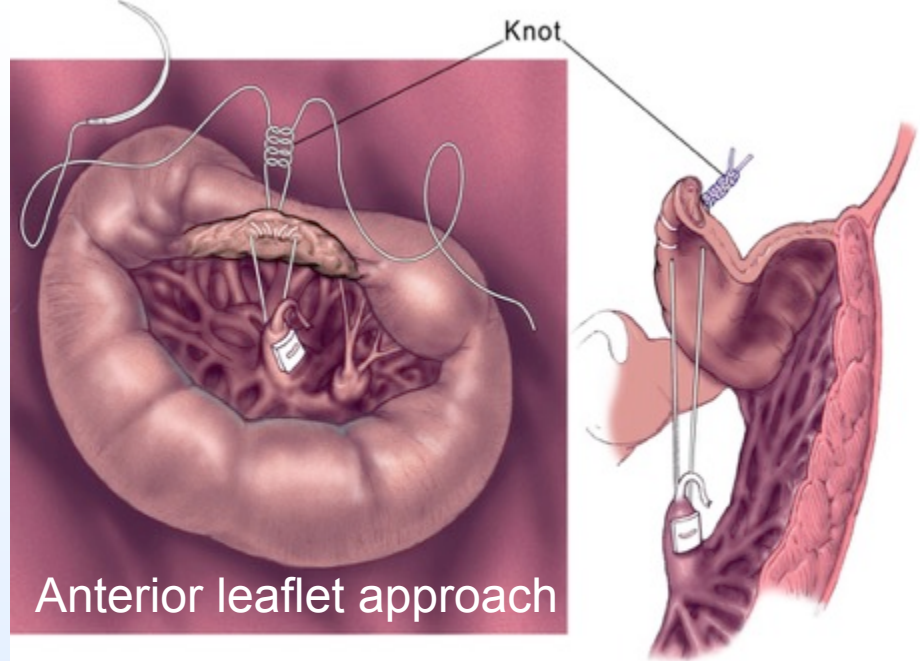
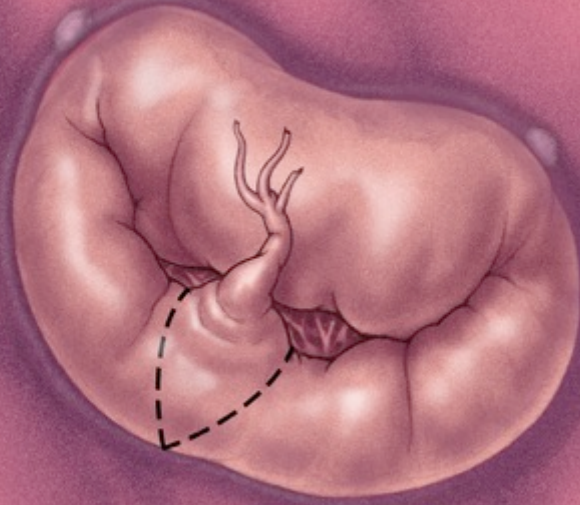
annuloplasty ring/band was used in 19 (68%) and commissural annuloplasty in 2 (7%). There was one early death (3%). At discharge, resting LVOT gradient was reduced to 10.2 ± 19.0 mm Hg ($p < 0.005$). Dismissal echocardiography in MVrep patients demonstrated chordal SAM in 6 (21%, $p < 0.005$). MR was absent or mild in 21 (75%) and moderate in 6 (21%; $p < 0.005$ vs preoperatively). At late follow-up, LVOT gradient was 2.5 ± 5.8 mm Hg, SAM resolved in all patients, and 2 had moderate MR; 24 (83%) were in NYHA class I/II ($p < 0.005$).

Conclusions. Concomitant MVrep with myectomy for HCM and degenerative MR can be performed with low early mortality with satisfactory relief of LVOT obstruction and MR. Most patients have significant relief of symptoms. MVR can be avoided in most patients with degenerative MR and HCM.

(Ann Thorac Surg 2009;88:727–32)

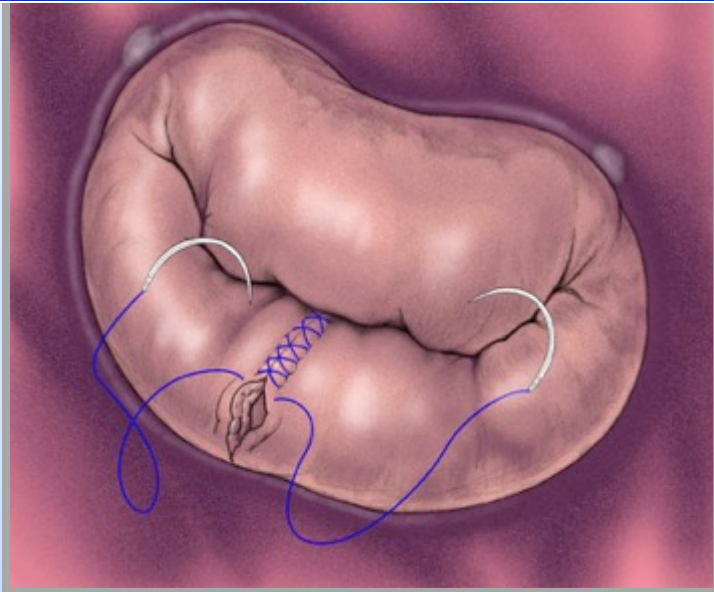
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Posterior leaflet approach

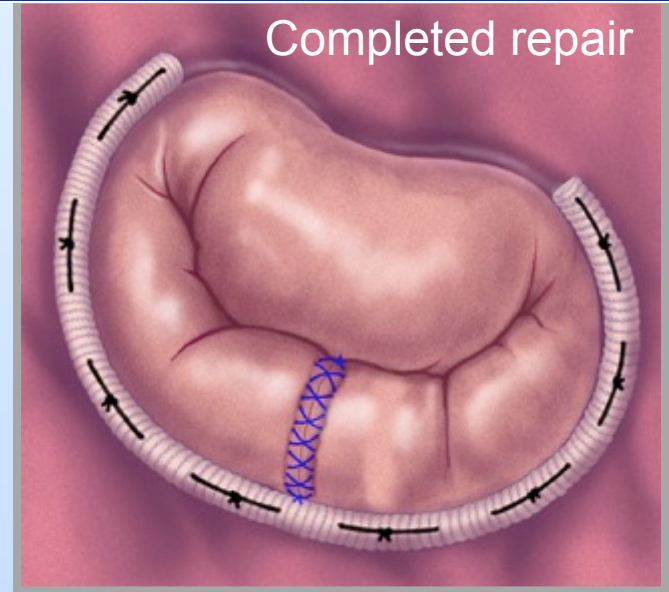


Anterior leaflet approach

No band or oversized band in HCM



Completed repair



Anomalous Papillary Muscles



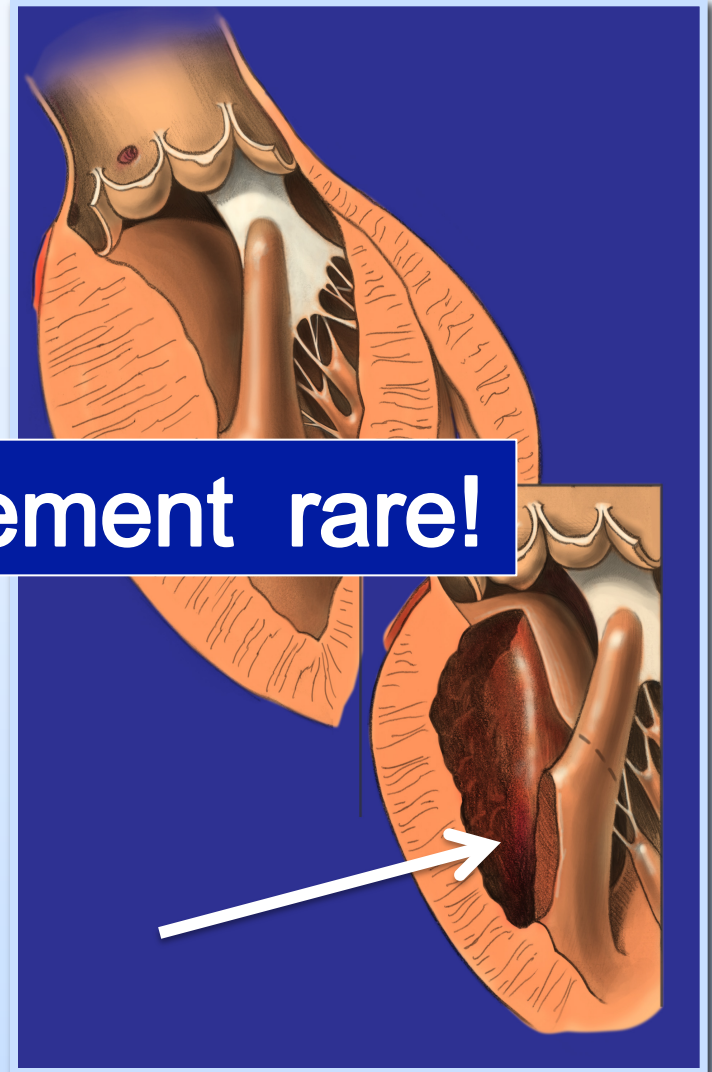
Klues, Roberts, Maron Circulation 1991

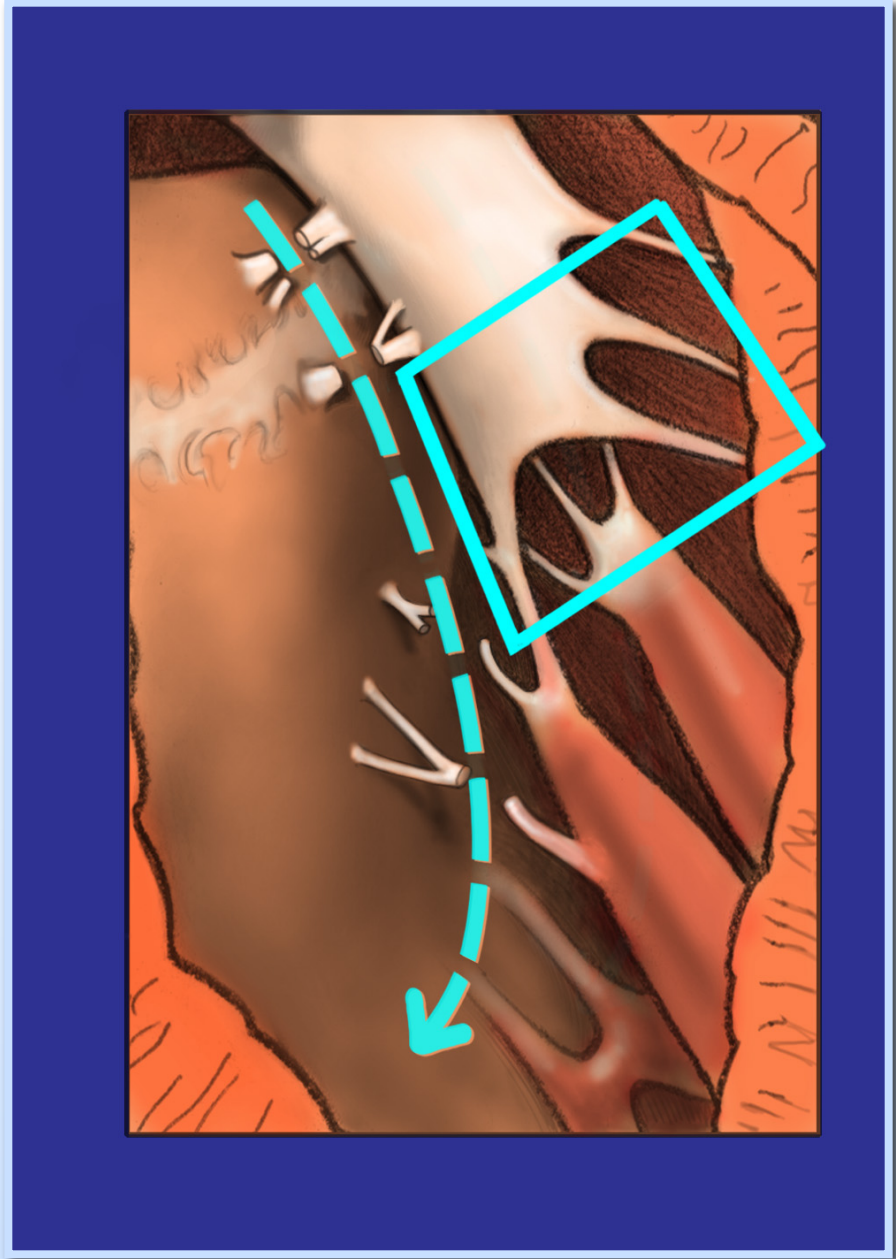
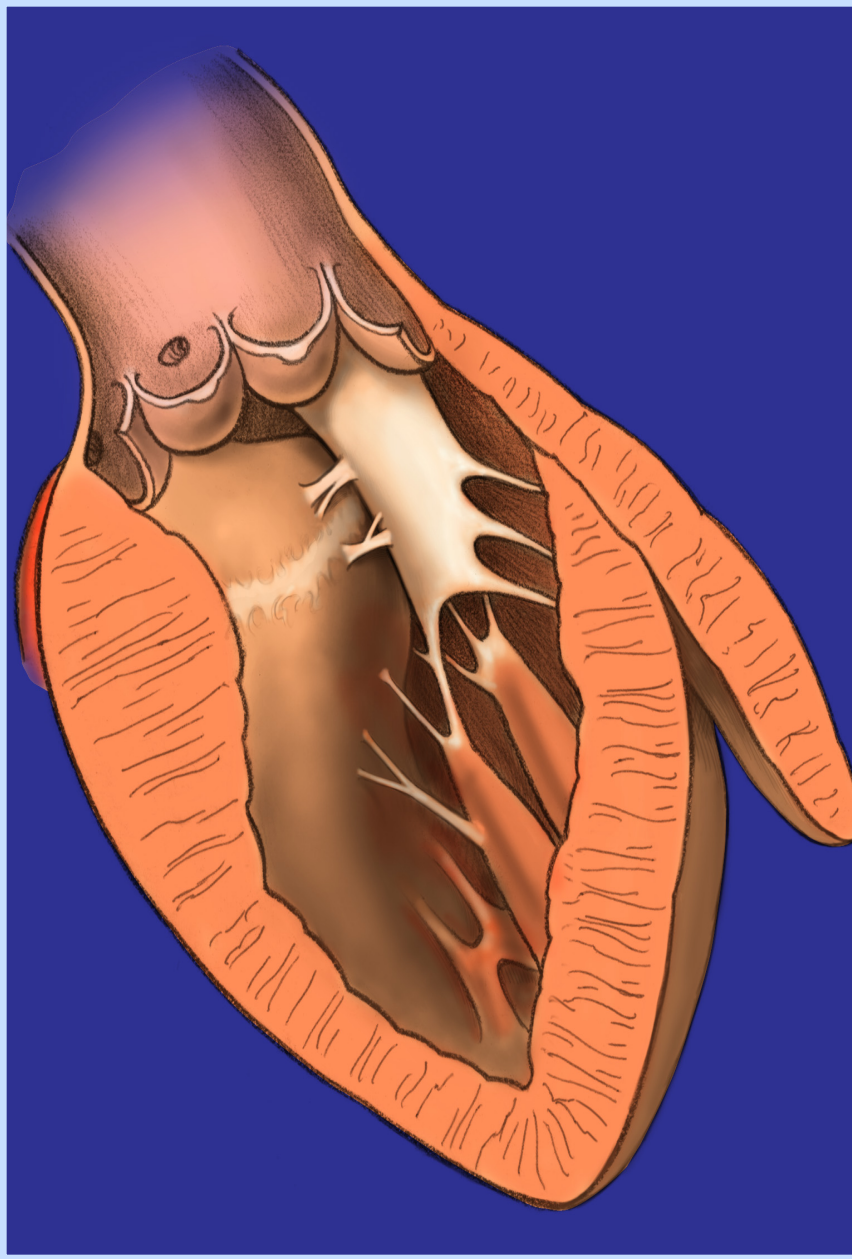
Anomalous Papillary Muscle

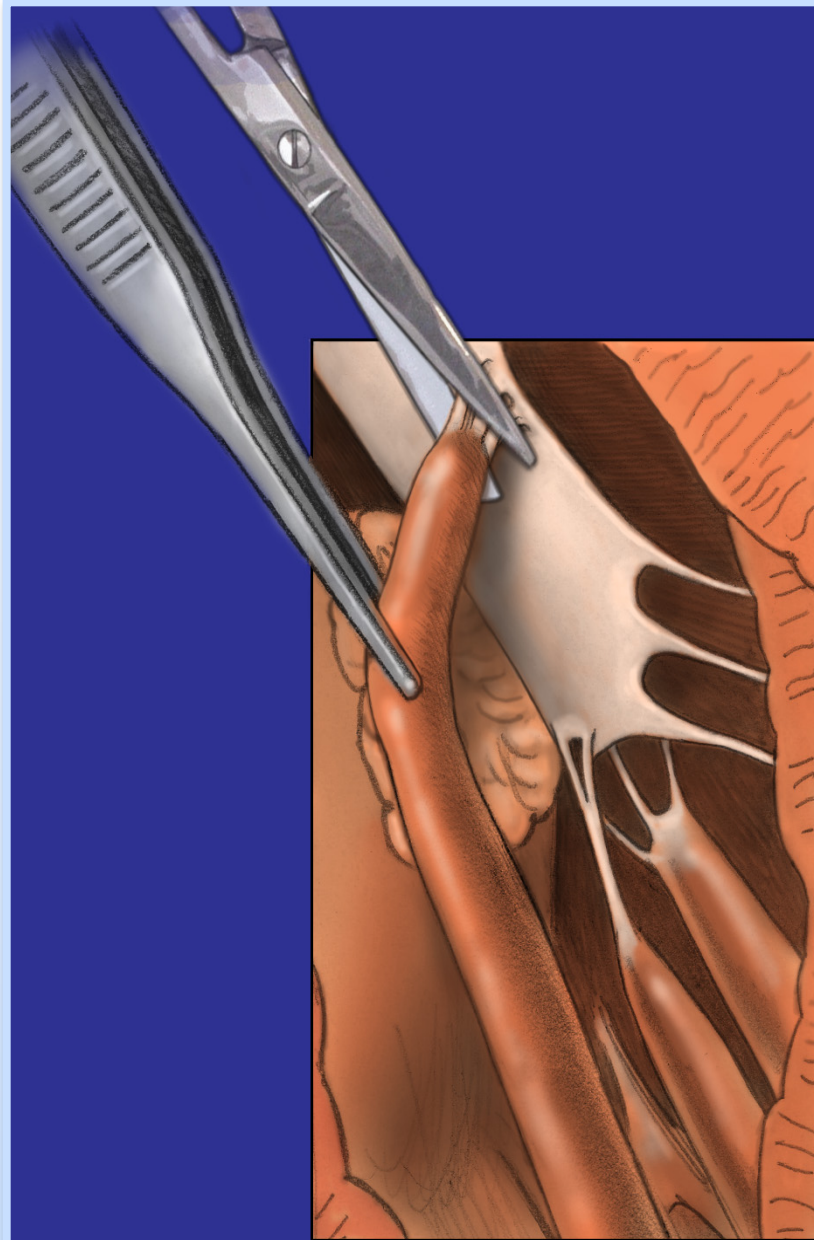
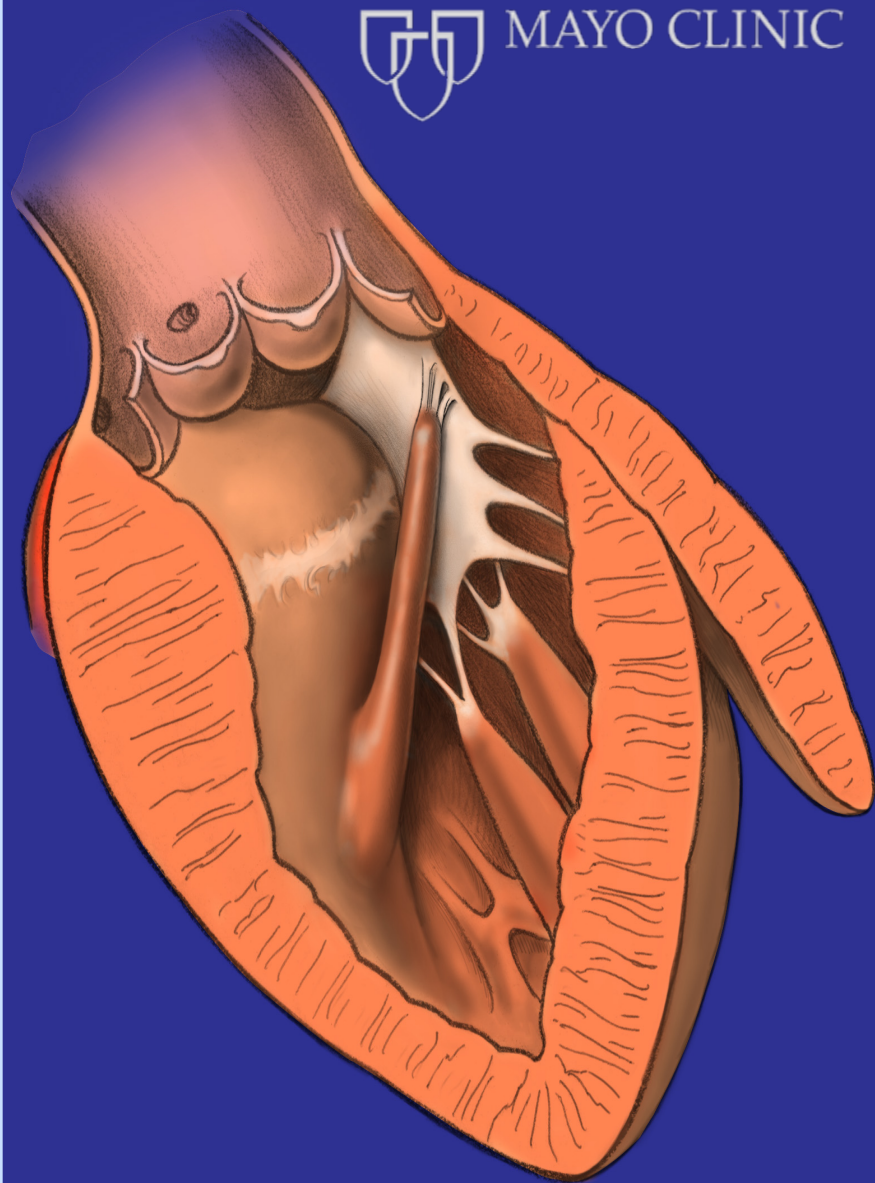
Direct Insertion into Mitral Leaflet

VIDEO

Need for MV replacement rare!







Characteristics and surgical outcomes of symptomatic patients with hypertrophic cardiomyopathy with abnormal papillary muscle morphology undergoing papillary muscle reorientation

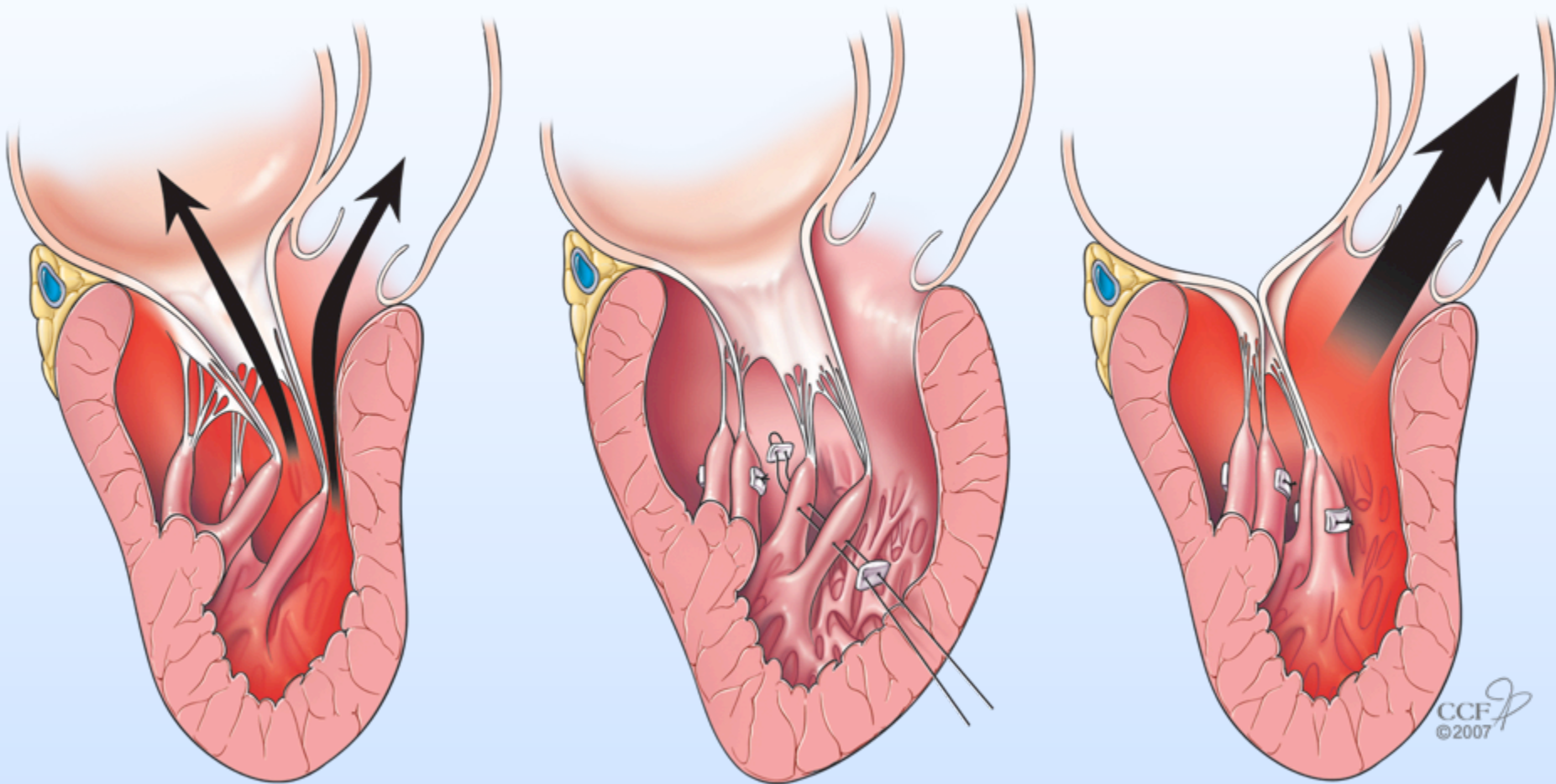
Deborah H. Kwon, MD,^a Nicholas G. Smedira, MD,^b Maran Thamilarasan, MD,^a Bruce W. Lytle, MD,^b Harry Lever, MD,^a and Milind Y. Desai, MD^a

Objective: In patients with hypertrophic cardiomyopathy with bifid hypermobile papillary muscles and a dynamic left ventricular outflow tract gradient, we performed surgical papillary muscle reorientation, fixing the mobile papillary muscle to the posterior left ventricle to reduce mobility. We report the outcomes of patients with hypertrophic cardiomyopathy undergoing surgical papillary muscle reorientation versus those of patients undergoing standard surgical procedures.

Methods: We studied 204 consecutive patients with hypertrophic cardiomyopathy undergoing surgical intervention (after consensus decision) for symptomatic left ventricular outflow tract gradient. Preoperative and postoperative maximal (resting/provocable) left ventricular outflow tract gradients were recorded by using echocardiographic analysis.

Results: The population was divided into 3 groups: (1) isolated myectomy (n = 143; age, 54 ± 14 years; 48% men), (2) myectomy plus mitral valve repair/replacement (n = 39; age, 54 ± 13 years; 54% men), and (3) papillary muscle reorientation with or without myectomy (n = 22; age, 50 ± 14 years; 59% men). The mean preoperative (103 ± 32 , 103 ± 32 , and 114 ± 36 mm Hg; $P = .3$) and predischage (15 ± 18 , 14 ± 14 , and 16 ± 21 mm Hg; $P = .9$) maximal left ventricular outflow tract gradients were similar. There were no deaths either in the hospital or at 30 days. At a median follow-up of 166 days (interquartile range, 74–343 days), 21 of 22 patients in group 3 were asymptomatic. One patient in group 3 had a symptomatic left ventricular outflow tract gradient (87 mm Hg) requiring mitral valve replacement.

Conclusions: In patients with hypertrophic cardiomyopathy with bifid hypermobile papillary muscles (even with a basal septal thickness <1.5 cm), papillary muscle reorientation reduces the symptomatic left ventricular outflow tract gradient. Long-term outcomes need to be ascertained. (J Thorac Cardiovasc Surg 2010;140:317-24)



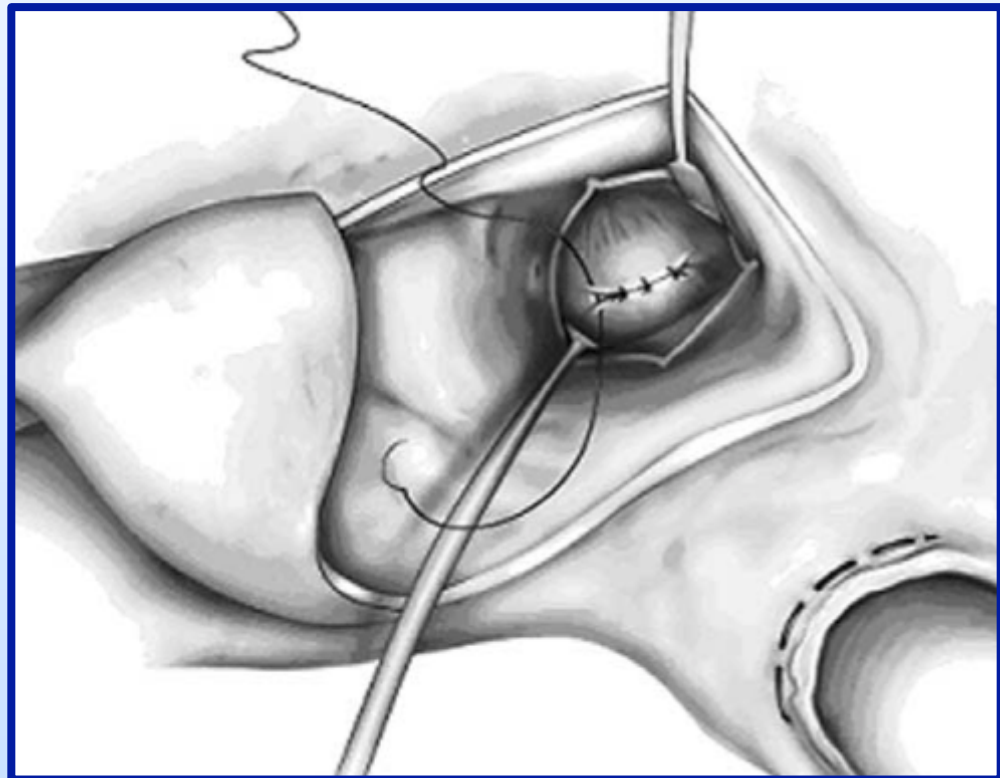
Smedira et al.

Beyond Extended Myectomy for Hypertrophic Cardiomyopathy: The Resection-Plication-Release (RPR) Repair

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When the anterior leaflet is too “long”...



Hypertrophic obstructive cardiomyopathy: the mitral valve could be the key

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Abstract

OBJECTIVES: As we strongly believe that treating the mitral valve abnormalities is a key feature of hypertrophic obstructive cardiomyopathy (HOCM), we have systematically corrected both the anterior and posterior leaflet (PL) size and geometry. We have analysed our immediate results and at mid-term follow-up.

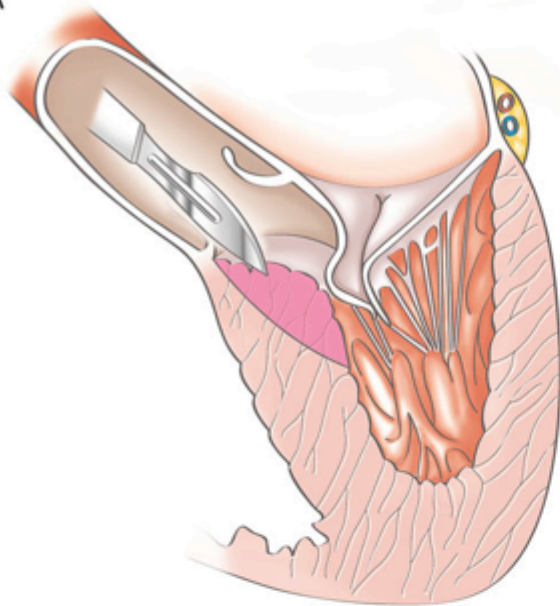
METHODS: From March 2010 until June 2015, 16 patients with HOCM underwent surgical correction of obstruction. The mean age was 51 years old (range, 32–72 years). All were symptomatic being New York Heart Association (NYHA) class 3 ($n = 4$) or 4 ($n = 12$). All had systolic anterior motion at echocardiogram with severe mitral regurgitation (MR). Intraventricular gradient preoperatively was 73.5 mmHg (range, 50–120 mmHg). All patients underwent a double-stage procedure: first septal resection through (i) the aortic valve and (ii) the detached anterior leaflet (AL) of the mitral valve and at second, mitral valve repair by (i) reducing PL height (leaflet resection or artificial neochordae) (ii) increasing AL height with pericardial patch.

RESULTS: There was no in-hospital or late death. All patients were Class 1 NYHA at latest follow-up. Control echocardiography showed no MR, mean rest intraventricular gradient was 15 mmHg (range, 9–18 mmHg).

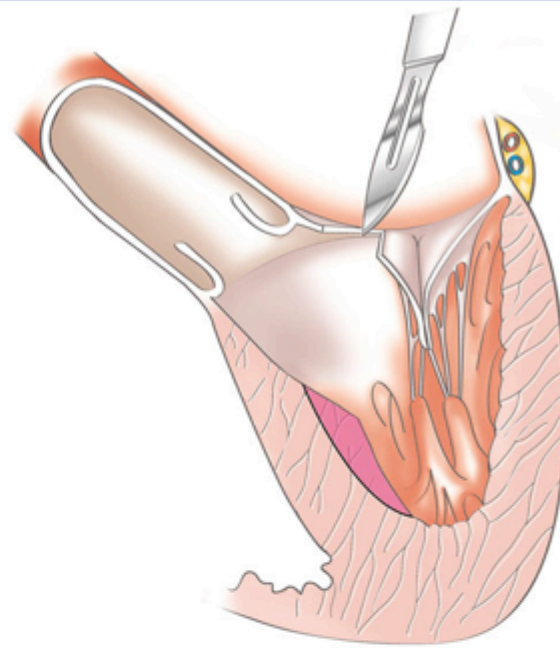
CONCLUSIONS: Our good mid-term results support the concept that HOCM is not only a septal disease and that the mitral valve pathology is a key component that should be addressed. For most patients, the ideal surgical treatment should consist in a two-step procedure. It is even necessary to be studied whether treating the mitral valve alone could not suffice.

Keywords: Hypertrophic obstructive cardiomyopathy • Mitral valve repair • Aortic approach • Mitral approach • Systolic anterior motion • Extensive myectomy

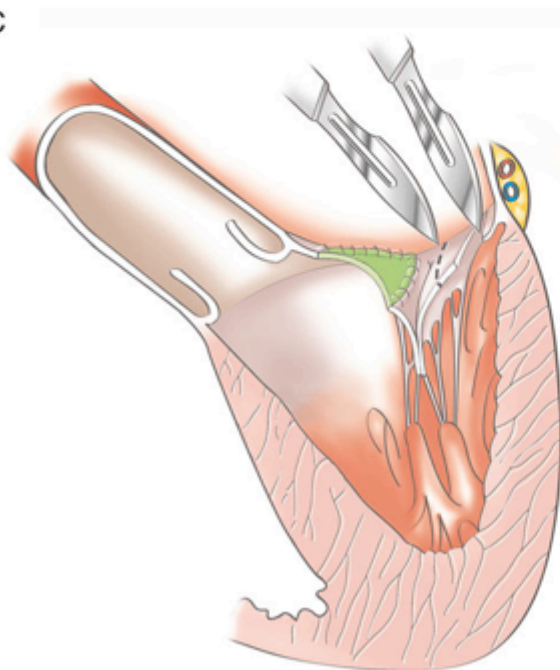
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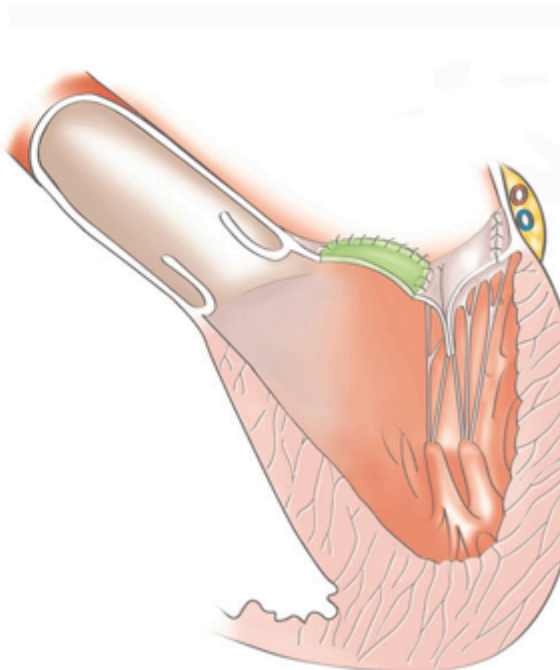
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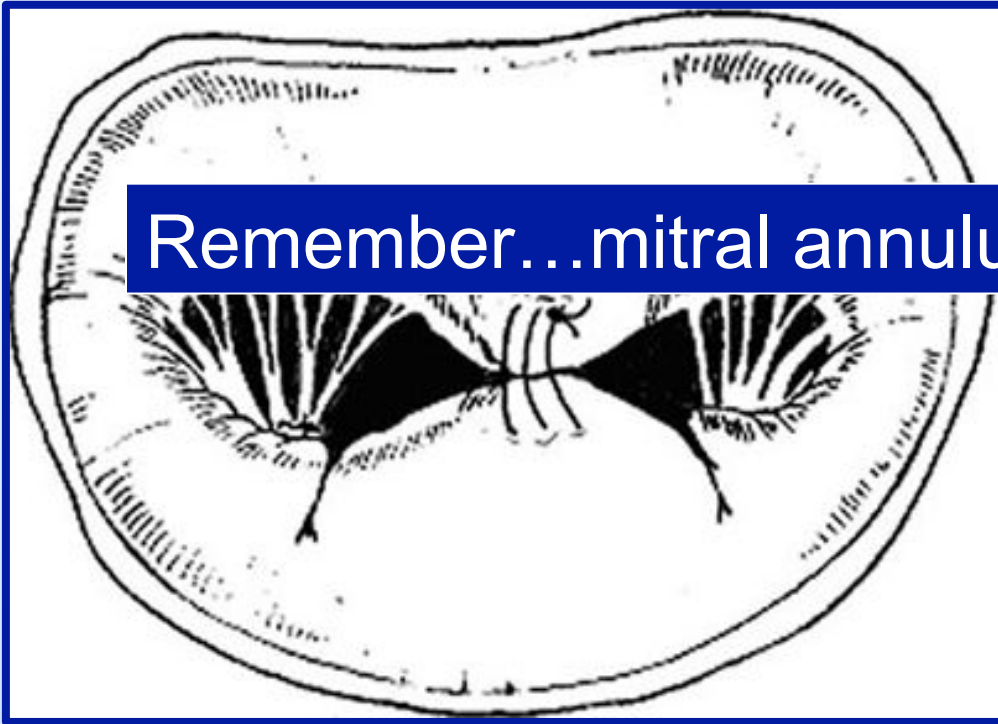
D



An Overlooked Tool to Address MR during Septal Myectomy for Obstructive HCM

AA Shah, D Glover, JG Gaca Duke University, Durham, NC

Presented at STS, Phoenix, January 2016



Remember...mitral annulus usually not dilated

Myectomy + MV repair

Trace MR

No residual LVOTO

Mitral MG = 5 mmHg

Alfieri Stitch or Edge-to-Edge repair

Myectomy and mitral repair through the left atrium in hypertrophic obstructive cardiomyopathy: The preferred approach for contemporary surgical candidates?

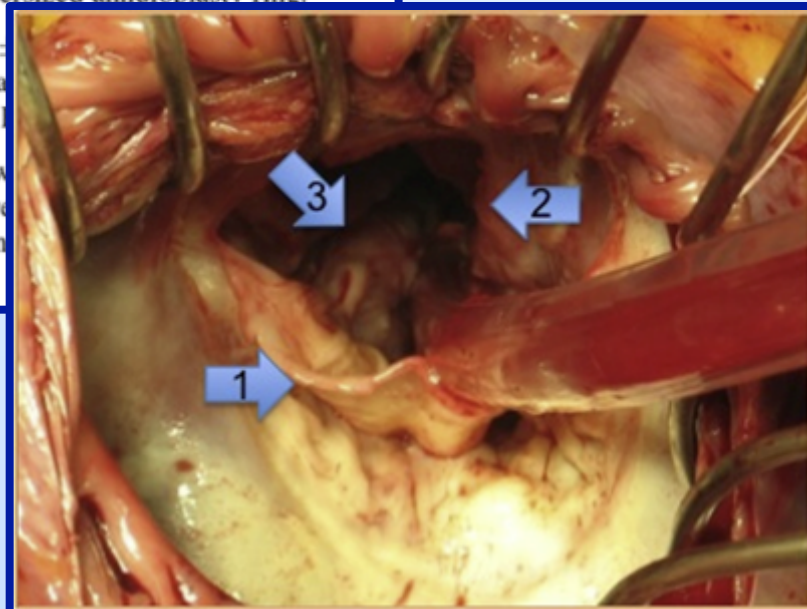
Herbert Gutermann, MD,^a Matteo Pettinari, MD,^a Christiaan Van Kerrebroeck, MD, PhD,^a Margot Vander Laenen, MD,^b Kim Engelen, MD,^b Tom Fret, MD,^b and Robert A. Dion, MD, PhD^a

Objective: Patients with hypertrophic obstructive cardiomyopathy due to diffuse hypertrophy extending to or below the papillary muscles are poor candidates for alcohol septal ablation and suboptimal candidates for transaortic septal myectomy. In addition, the outflow obstruction is often aggravated by an abnormal mitral valve and subvalvular apparatus.

Methods: We performed transatrial myectomy in 12 patients with diffuse hypertrophy, who were highly symptomatic despite maximal medical therapy. All had at least moderate mitral regurgitation and systolic anterior motion. The anterior mitral leaflet (AML) was detached from commissure to commissure, allowing an easy myectomy through this AML toward the base of the anterior papillary muscle, with mobility fully restored. The abnormal chordae from the septum to the anterior papillary muscle and AML were divided. The continuity of this AML was restored with augmentation using an autologous pericardial patch. The height of the posterior mitral leaflet was reduced and the repair completed using an oversized annuloplasty ring.

Results: The peak intraventricular gradients decreased spectacularly from 98.8 mmHg to 12.5 mmHg ($P < .001$), and the systolic anterior motion and mitral regurgitation disappeared. All other patients left the hospital in New York.

Conclusions: We believe that this technique is preferable for patients with hypertrophic obstructive cardiomyopathy and diffuse hypertrophy extending to the midportion of the left ventricle. The disappearance of outflow tract gradients and allows correction of the mitral valve abnormality. (J Thorac Surg 2014;147:1833-6)



Transaortic Chordal Cutting

Mitral Valve Repair for Obstructive Hypertrophic Cardiomyopathy With Mild Septal Hypertrophy

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ABSTRACT

BACKGROUND In severely symptomatic patients with obstructive hypertrophic cardiomyopathy (HCM) and mild septal hypertrophy, mitral valve (MV) abnormalities may play an important role in MV displacement into the left ventricular (LV) outflow tract. Therefore, isolated myectomy may not relieve outflow obstruction and symptoms, and MV replacement is often the surgical alternative.

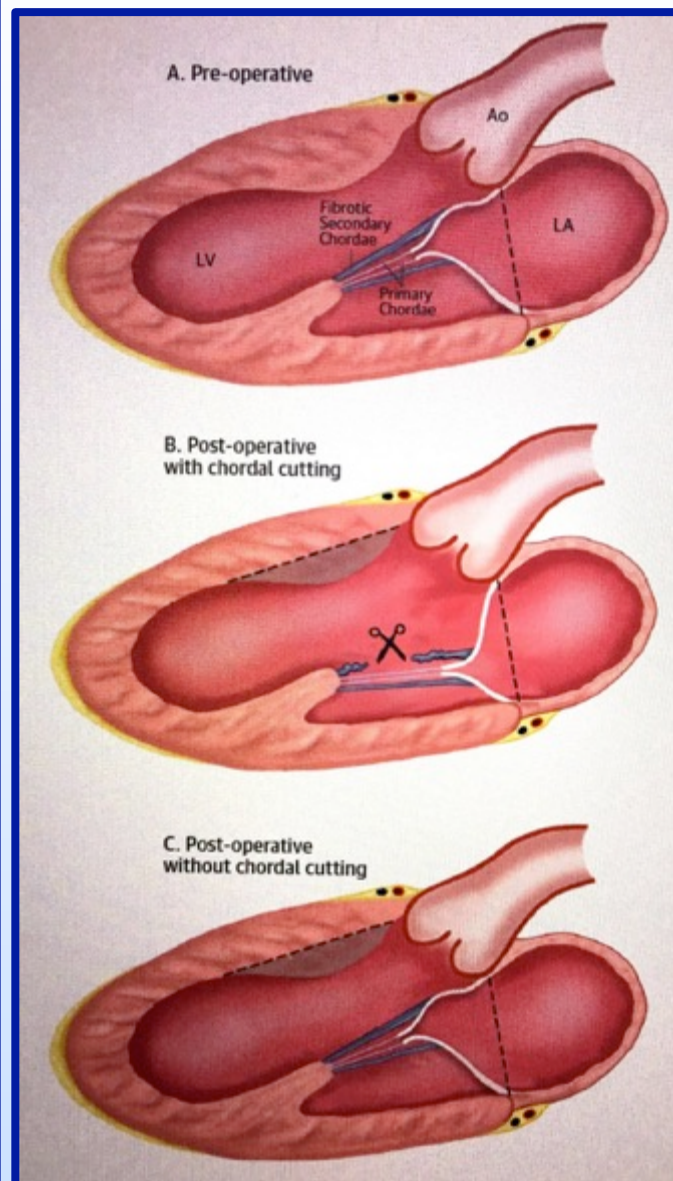
OBJECTIVES This study sought to assess the clinical and hemodynamic results of cutting thickened secondary MV chordae combined with a shallow septal muscular resection in severely symptomatic patients with obstructive HCM and mild septal hypertrophy.

METHODS Clinical features were compared before surgery and at most recent clinical evaluation in 39 consecutive patients with obstructive HCM.

RESULTS Over a 23 ± 2 months follow-up, New York Heart Association functional class decreased from 2.9 ± 0.5 pre-operatively to 1.1 ± 1.1 post-operatively ($p < 0.001$), with no patient in class III at most recent evaluation. The resting outflow gradient decreased from 82 ± 43 mm Hg to 9 ± 5 mm Hg ($p < 0.001$) and septal thickness decreased from 17 ± 1 mm to 14 ± 2 mm ($p < 0.001$). No patient had MV prolapse or flail and 1 had residual moderate-to-severe MV regurgitation at most recent evaluation. MV geometry before and after surgery was compared with that of 25 consecutive patients with similar clinical profile and septal thickness that underwent isolated myectomy. After adjustment for differences in pre-operative values between the groups, the post-operative anterior MV leaflet-annulus ratio was 17% greater and tenting area 24% smaller in patients with chordal cutting, indicating that MV apparatus had moved to a more normal posterior position within the LV cavity, preventing MV systolic displacement into the outflow tract and outflow obstruction.

CONCLUSIONS This procedure relieves heart failure symptoms, abolishes LV outflow gradient, and avoids MV replacement in patients with obstructive HCM and mild septal thickness. (J Am Coll Cardiol 2015;66:1687-96)

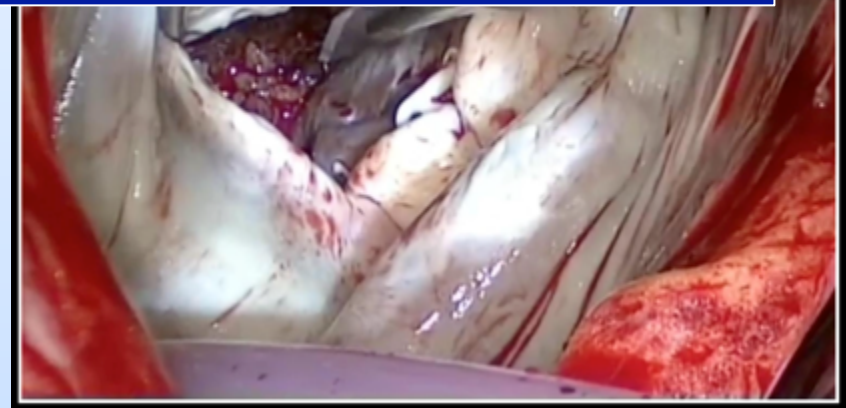
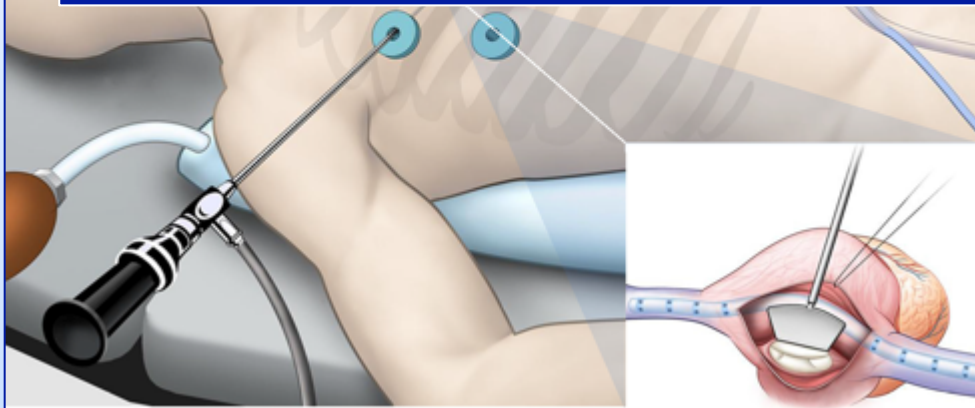
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Minimally Invasive Septal Myectomy for the Treatment of Hypertrophic Obstructive Cardiomyopathy and Intrinsic Mitral Valve Disease

Daniyar Sh. Gilmanov, MD, Stefano Bevilacqua, MD, Marco Solinas, MD, Matteo Ferrarini, MD, Enkel Kallushi, MD, Filippo Santarelli, MD, Pier Andrea Farneti, MD, and Mattia Glauber, MD

Be careful doing a myectomy...
minimally invasively or via thoracotomy



MitraClip Implantation as a New Treatment Strategy against Systolic Anterior Motion-induced Outflow Tract Obstruction in Hypertrophic Obstructive Cardiomyopathy

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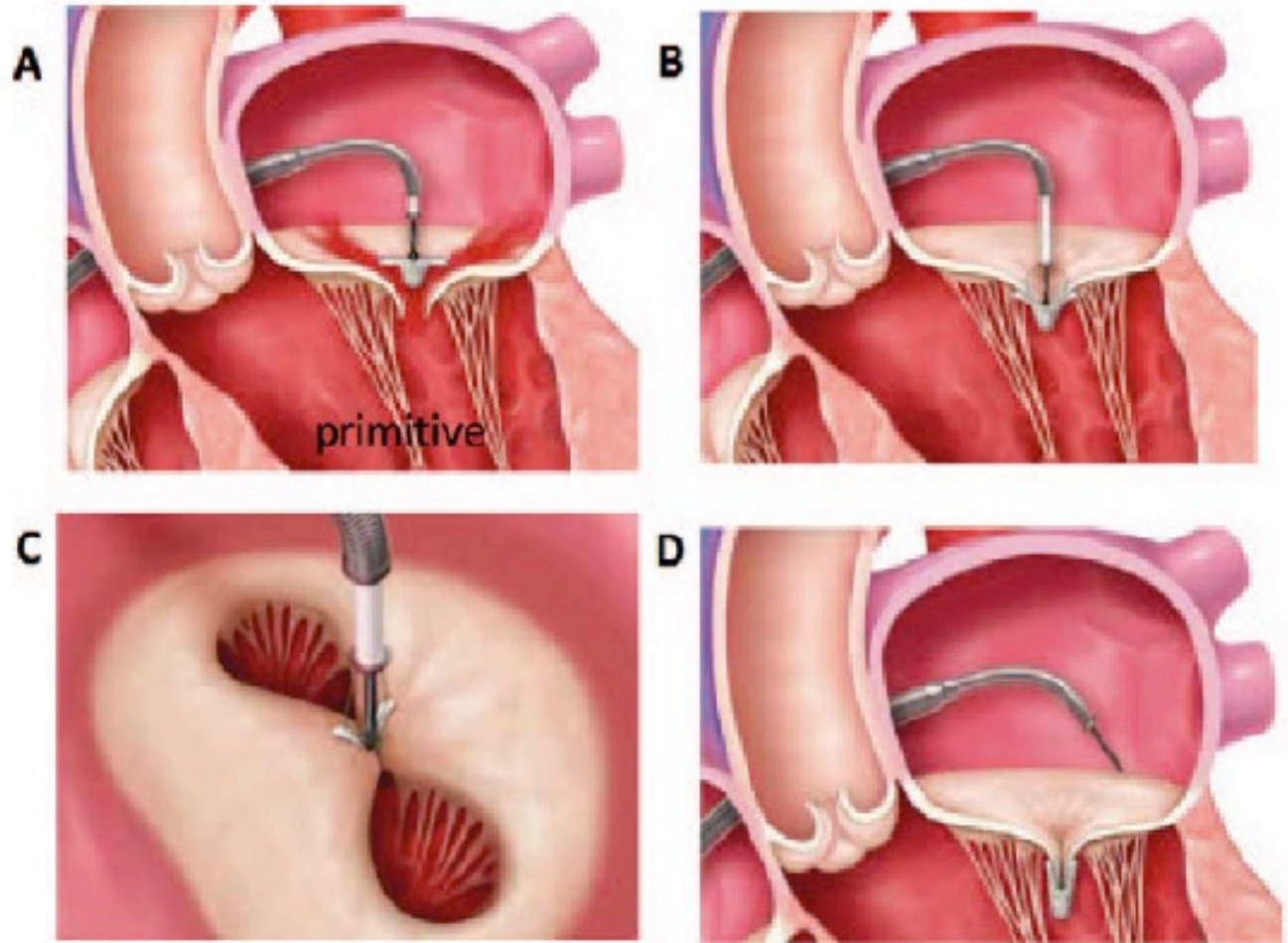
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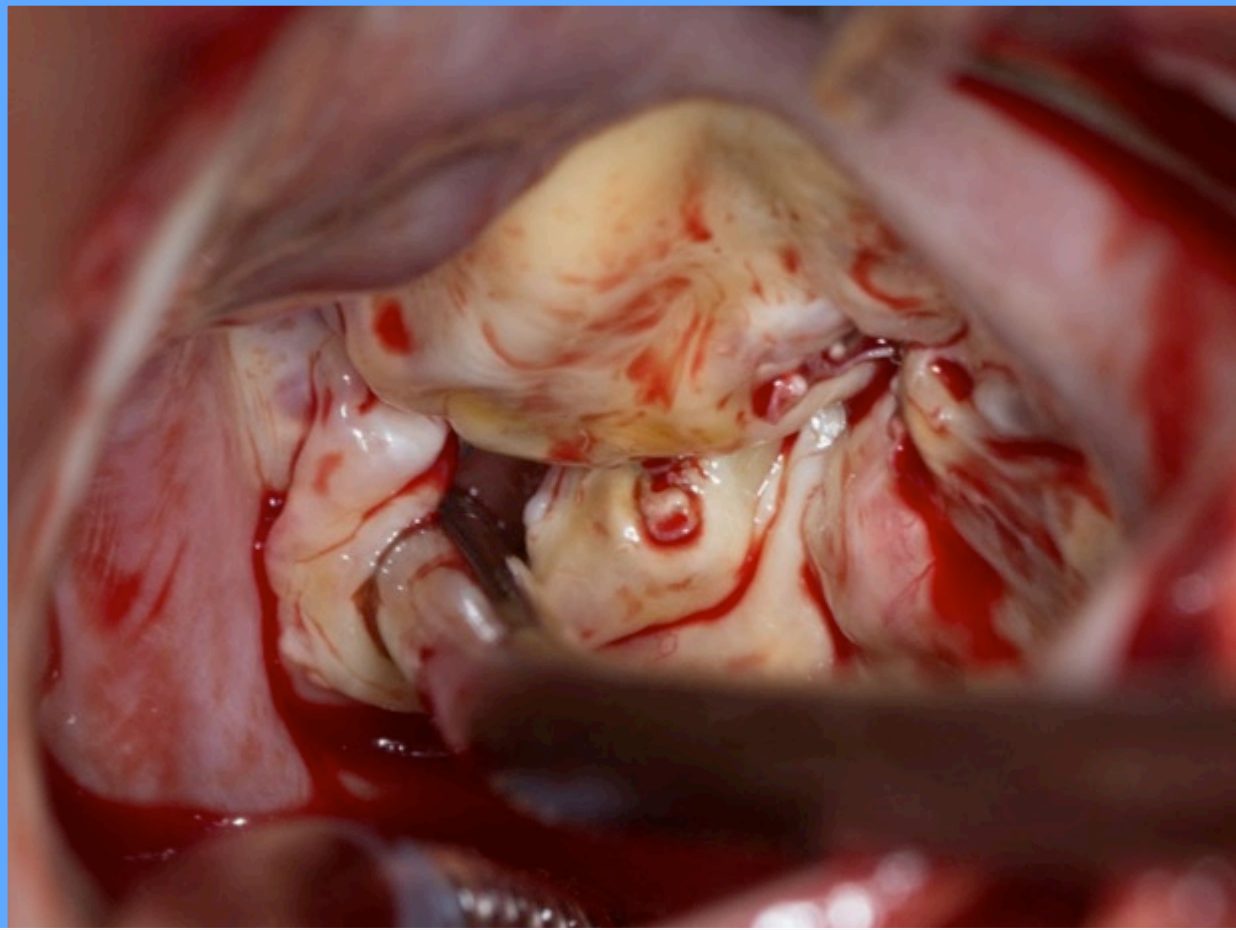
We report on catheter-based treatment of left ventricular outflow tract (LVOT) obstruction targeting primarily a systolic anterior motion of the anterior mitral leaflet in hypertrophic obstructive cardiomyopathy (HOCM). A patient was successfully treated with the MitraClip two years after septal myectomy in conjunction with mitral valve repair. The results prove the concept, that systolic anterior motion (SAM) is clearly involved in gradient formation and is more than an epiphenomenon in HOCM. Thus, SAM-induced subaortic obstruction might be a target for MitraClip implantation.

Keywords

Hypertrophic obstructive cardiomyopathy • Systolic anterior motion • MitraClip • Haemodynamics
• Outflow tract obstruction

Mitra-Clip





Mitra-Clip → firm, cardboard-like leaflets
...*makes MV repair nearly impossible*

So, Mitra-clip followed by surgery for failure...not a good strategy

Take Home Points

- HCM is a disease of the muscle
- Focus efforts on a good myectomy
- Structural mitral disease does occur
- But, leave the mitral valve alone most of the time

Hypertrophic Cardiomyopathy

Experience Matters

...so, pick your cardiologist & surgeon carefully