

# Anterior Mitral Leaflet Repair in Hypertrophic Obstructive Cardiomyopathy: A Tailored Approach under Transesophageal Echocardiographic Guidance

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## Abstract

Hypertrophic obstructive cardiomyopathy (HOCM) is the most common inherited cardiovascular disease, which causes significant involvement of mitral valve in the pathogenesis of left ventricular outflow tract (LVOT) obstruction. A 37-year-old man, a diagnosed case of HOCM, reported to us with complaints of angina and difficulty in breathing. His preoperative echocardiography revealed a predominant LVOT obstruction which caused a resting gradient of 50 mmHg. It was associated with the presence of systolic anterior motion (SAM) and posteriorly directed moderately severe regurgitation jet. Plication of anterior mitral leaflet (AML) was done through transaortic approach while performing septal myectomy. Plicating AML through transaorta was tailored under transesophageal echocardiographic guidance where the height of AML was reduced by 1 cm. As a result, postoperative SAM was significantly reduced. The approach of plicating AML through transaorta became technically simpler with the help of transesophageal echocardiography.

**Keywords:** Anterior mitral leaflet plication, hypertrophic obstructive cardiomyopathy, septal myectomy

## INTRODUCTION

Hypertrophic obstructive cardiomyopathy (HOCM) is the most common inherited cardiovascular disease with substantial genetic and phenotypic heterogeneity, with a prevalence of 0.2%.<sup>[1]</sup> Most commonly, HOCM is defined as asymmetric hypertrophy of the septum with more involvement of subaortic area or lateral wall, but it can involve middle or apical segments also. Left ventricular outflow tract (LVOT) obstruction is caused by interventricular muscle contraction, which in turn leads to the Venturi effect that causes systolic anterior motion (SAM) of anterior mitral leaflet (AML). Mitral leaflet abnormalities associated with HOCM include long anterior and posterior leaflet,<sup>[2]</sup> decreased mobility of posterior leaflet, short post coaptation, and septal distance.<sup>[3]</sup> AML is longer and highly mobile which causes coaptation gap as posterior leaflet<sup>[4]</sup> is unable to keep up with the mobility of AML. This mechanism, in turn, causes posteriorly directed mitral regurgitation in mid and late systole. Shah *et al.*,<sup>[5]</sup> reported that the posterior mitral leaflet coapted with midportion of AML in patients with HOCM with SAM, leaving the distal residual anterior leaflet tip in LV cavity during systole. Patients with

an AML length of 33 mm<sup>[6]</sup> or more benefit from horizontal plication procedure. We report a case where plication of AML reduced SAM significantly.

## CASE REPORT

A 37-year-old man, a diagnosed case of HOCM, referred to us with complaints of angina on exertion (Grade 2) and difficulty in breathing (Grade 2) for the past 6 months. His past medical history did not involve any other comorbidities. His routine investigations were within normal limits. His Holter monitoring revealed a maximum heart rate of 96/min (sinus rhythm) and a minimum heart rate of 50/min (sinus rhythm). No sinus pause, supraventricular tachycardia, or ventricular tachycardia was noted during the study [Figure 1]. The patient was taking tablet Norpace (sodium channel blocker) 100 mg

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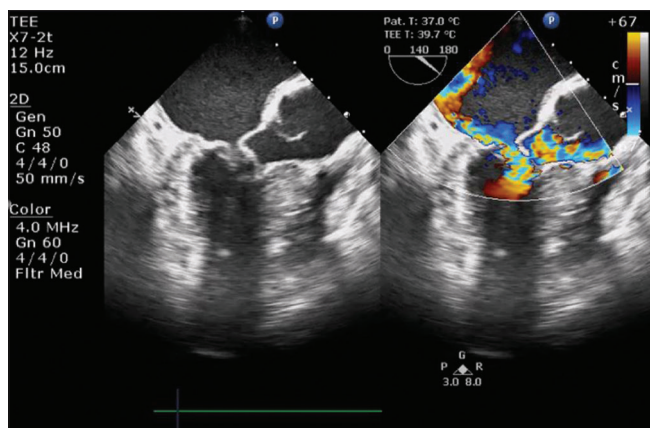
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**Figure 1:** Preoperative echocardiography

OD for the last 1 month. On preoperative transthoracic echocardiography, it was diagnosed that a predominant LVOT obstruction with a maximal septal thickness of 22–24 mm caused a resting gradient of 50 mmHg at the heart rate of 63/min. Mitral valve had elongated leaflets with AML length of 30 mm, with the presence of SAM and posteriorly directed regurgitation jet.

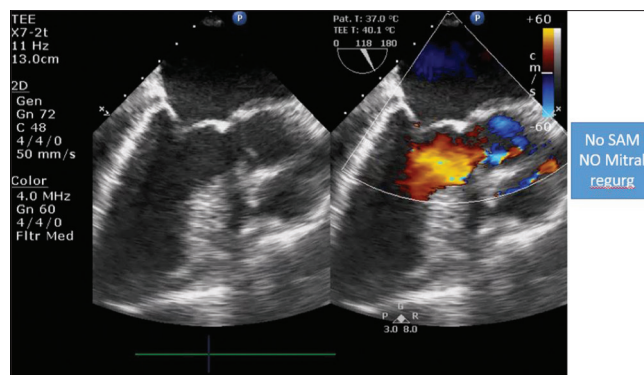
On the day of surgery, after routine induction, the findings of transthoracic echocardiography were confirmed with the use of transesophageal echocardiography (TEE).

TEE findings were LVOT obstruction with proximal segment thickness of maximum 17 mm with a gradient of 97 mmHg at the heart rate of 80/min. AML length was 33.8 mm and PML length was 13 mm. There was a moderate mitral regurgitation jet which was posteriorly directed.

AML plication was done through transaortic approach while doing septal myectomy. Through the transaortic root, after retracting the aortic leaflets using 6-0 Prolene stay sutures, septal myectomy was performed completely, to relieve LVOT obstruction. After this, AML was inspected and found to be long with increased height. Two horizontal buttress sutures were taken at the base of AML just below the subaortic curtain. These two horizontal pledgeted sutures (5 mm on each side) were taken at the base of AML just opposite to A2. Hence, the length of AML was reduced almost by 1 cm. Aortic closure was performed using 4-0 Prolene continuous sutures. The patient came off bypass with minimal support of noradrenaline 0.02 µg/kg/min.

Postoperative TEE showed no SAM, LVOT gradient of 12 mmHg, and no mitral regurgitation with competent aortic valve [Figure 2]. Proximal segment thickness was 13 mm, length of AML was approximately 21 mm, and length of PML was 13 mm with coaptation height 0.9 mm.

The patient was extubated within 6 h and was shifted from the Intensive Care Unit within 36 h. He was discharged from the hospital on the 5<sup>th</sup> postoperative day.



**Figure 2:** Postoperative echocardiography

## DISCUSSION

Mitral valve repair is feasible in 50%–60% of these HOCM patients using combined reparative technique.<sup>[6]</sup> Plication of the anterior leaflet of the mitral valve with myectomy was first proposed by Intosh *et al.*<sup>[7]</sup> It was performed in those patients who were at risk for unstable hemodynamics as a result of mitral valve pathology (increased mobility, size, or length of AML with respect to LVOT), which can lead to systolic motion of AML. Repair of mitral valve in HOCM patients to relieve SAM is controversial where the selection of patients may be important. Plication of elongated AML not only reduces length of the leaflet but also gives stiffness to the leaflet,<sup>[8]</sup> which may prevent SAM. TEE guides surgeon to assess the length in step by step, so it has become an integral part of the surgery. There are different commonly described techniques available to reduce the length of AML such as AML resection, sliding leaflet, or Alfieri edge-to-edge repair, but our case describes a method where elongation was reduced by plication of AML through transaortic approach. Balaram *et al.*<sup>[8]</sup> described the technique of “Resection–Plication–Release” to deal with the height of AML.

In our case, predictors of SAM in TEE were AML length >3.2 cm,<sup>[6]</sup> C-sept <2.5 cm, small LVOT (16 mm), and AML/LVOT >2.<sup>[2]</sup> Preoperative assessment helped us to tailor precisely the length of AML.

The length of AML was reduced almost 1 cm by taking two horizontal buttress sutures at the base of AML just below the subaortic curtain which eliminated systolic anterior motion. The use of TEE helped surgeons to find the procedure more simple.

## CONCLUSION

AML plication in HOCM patients through transaorta is a technically safe procedure when guided by TEE. It helps us not only to compare pre- and postoperative data but to find out complications<sup>[4]</sup> at all, if associated. Traditional approach of placating AML through left atrium adds another incision which triggers postoperative arrhythmia. Hence, the use of transaortic route helps major way to reduce arrhythmia. TEE has become an integral part in cardiac surgery, as in almost all cases, it has a diagnostic value.

### Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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### Conflicts of interest

There are no conflicts of interest.

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