The Journal of
Thoracic and Cardiovascular Surgery

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*J Thorac Cardiovasc Surg* 2005;129:1173-1174

# Chordal cutting technique through aortotomy: A new approach to treat chronic ischemic mitral regurgitation

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The standard treatment for functional ischemic mitral regurgitation (MR) is revascularization and reduction annuloplasty. We report the first use of a modified technique to treat ischemic MR in a human by a tenting mechanism.

## Patient and Methods

A 77-year-old male patient with a history of chronic ischemic cardiomyopathy caused by an inferior myocardial infarct 1 year earlier was admitted to the emergency cardiac care unit after acute left ventricular failure and pulmonary edema. Echocardiography showed a poor left ventricular ejection fraction (30%) and moderate MR in addition to dyskinesia of the lateral myocardial wall. Interestingly, MR was found to be due to a restrictive mechanism with a tenting phenomenon of the anterior mitral valve leaflet. End-diastolic and end-systolic volumes were 107 and 76 mL/m$^2$, respectively (Figure 1, *A*).

Coronary angiography showed severe stenosis of the left anterior descending and circumflex arteries, with a subtotal occlusion of the distal right coronary artery.

A preoperative exercise treadmill echocardiography protocol was performed to evaluate the degree of the underlying mitral lesion. This revealed moderate ventricular dysfunction with global hypokinesia at rest. At maximal exercise the tenting mechanism worsened, causing severe MR, although it was mild at rest. No other anomalies were noted in the mitral valve.

The surgical plan was to create a left internal thoracic artery graft to the left anterior descending artery and a saphenous vein graft to the first obtuse marginal branch, in addition to mitral valvuloplasty using the chordal cutting technique previously described in an experimental animal study by Messas and associates.[1,2] However, our technique was different from the previously described method in that we used a small horizontal aortotomy, allowing good exposure of the anterior mitral valve with good access to the basal chordae. The procedures were performed through a median sternotomy using normothermic cardiopulmonary bypass and intermittent antegrade cardioplegia. A transesophageal echocardiogram performed perioperatively (Figure 1, *B*) showed no MR with normal movement of the mitral valve leaflets. The postoperative period was uneventful. An echocardiographic follow-up at 2 years demonstrated continued stability of the marginal chordae, the absence of MR at rest, and the same mild MR on exercise. Left ventricular ejection fraction remained unchanged. E-diastolic and end-systolic volumes were 98 and 70 mL/m$^2$, respectively (Figure 1, *C*).

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Received for publication Aug 26, 2004; revisions received Aug 30, 2004; accepted for publication Sept 3, 2004.

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J Thorac Cardiovasc Surg 2005;129:1173-4

0022-5223/$30.00



doi:10.1016/j.jtcvs.2004.09.010

## Discussion

The mechanisms by which ischemic MR develops are still controversial, but recent reports suggest that the adverse remodeling of the ischemic left ventricle, in terms of enlargement and assumption of a more spherical shape, could be the best explanation. Additionally, in this case, the patient had ventricular systolic dysfunction, thus decreasing the force available to close the leaflets in the setting of this distorted architecture of the mitral annulus.[3] Reducing annular size alone is often ineffective because of persistent leaflet tethering.[4]

An alternative technique, suggested by Messas and associates,[1,2] consisted of cutting the 2 basal chordae attached to the center of the anterior leaflet. In contrast with that technique, we used an aortotomy instead of the conventional left atriotomy, allowing confortable access to the anterior mitral valve leaflet. This has the advantage of avoiding a left atriotomy. The left atrium usually is small in ischemic MR and thus it is difficult to expose enough of the mitral valve through a left atriotomy. Through a conventional aortotomy, the anterior mitral leaflet was everted through the aortic annulus, and the 2 most centrally attached basal chordae were cut, leaving the valvuloventricular continuity largely intact. The chordal cutting procedure was brief, with a mean bypass time of 15 minutes.

Basal chordal cutting eliminated the angulation of the anterior leaflet, which assumed a more relaxed configuration closer to the annulus. The intact marginal chordae continue to prevent leaflet prolapse or failure and can, theoretically, continue to maintain left ventricular function through chordal continuity as a benefit of valve repair as opposed to replacement.[5]

Ischemic MR should be diagnosed promptly and evaluated carefully in patients with ischemic cardiomyopathy. Furthermore, chordal cutting through an aortotomy in case of anterior leaflet tenting is an effective surgical option for mitral valve repair. The long-term clinical outcome of this technique needs to be evaluated in larger clinical trials.

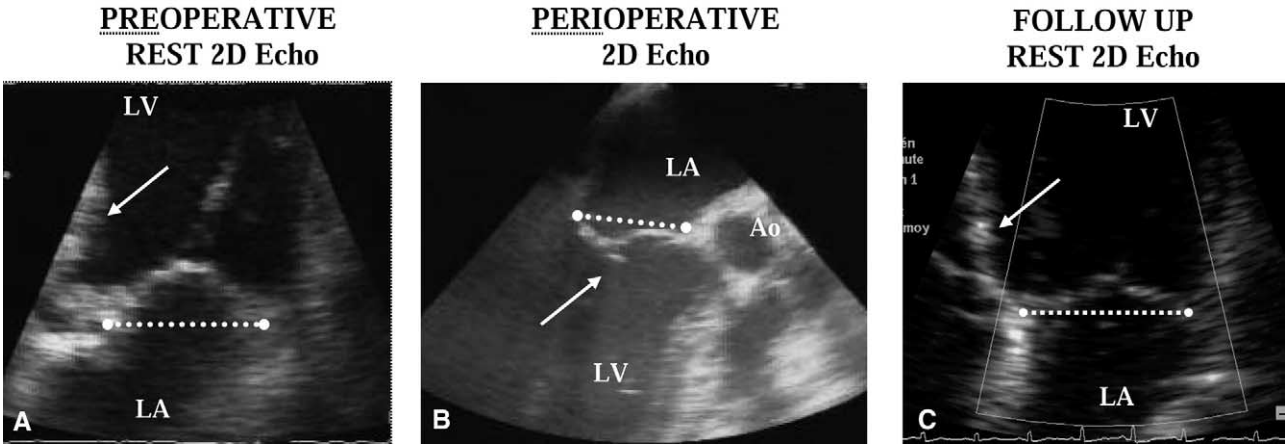


**Figure 1. A, Preoperative 2-dimensional echocardiographic analysis. Anterior leaflet angulation at the basal chord insertion, mild bulging of the ischemic inferior wall *(arrow)* with apical tenting relative to the annulus *(dashes),* and bent anterior leaflet base. B, Perioperative 2-dimensional echocardiographic analysis. Basal chordal cutting *(arrow)* and improved coaptation *(dashes).* C, Follow-up 2-dimensional echocardiographic analysis. Normal mitral coaptation at baseline without anterior leaflet bend despite important left ventricular dilatation *(arrow). LV,* Left ventricle. *LA,* left atrium.**

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