

# Ringless Alfieri Mitral Valve Repair for Significant Ischemic Mitral Regurgitation with Coronary Artery Bypass Grafting

Alper Sami Kunt

Ozel Yasam Hastanesi, Cardiovascular Surgery Department, Antalya, Turkey

## ABSTRACT

**Background:** Ischemic mitral regurgitation (IMR) is associated with diminished survival prospects. Ringless edge-to-edge mitral valve repair is usually performed in association with coronary artery bypass grafting (CABG). In this report, we present our early results for ringless edge-to-edge repair and concomitant CABG.

**Methods:** Between January 2011 and June 2012, 17 patients underwent ringless edge-to-edge mitral valve repair. The cause was ischemic in all patients. A double-orifice repair was done in all patients. Complete coronary revascularization was routinely added in all cases.

**Results:** There were no hospital and late deaths. Low cardiac output developed in 5 patients (29.41%) and was treated with inotropic agents. Two of these patients required intra-aortic balloon pump support. Atrial fibrillation and ventricular arrhythmia developed in 5 (29.41%) of the patients, and all of them converted to sinus rhythm with antiarrhythmic agents. The mean (SD) stays in the intensive care unit and the hospital were  $2.83 \pm 1.29$  days and  $7.74 \pm 2.14$  days, respectively. As of the latest follow-up, all patients were in New York Heart Association class I or II. There was no recurrent mitral valve regurgitation or valve-related complications.

**Conclusions:** Alfieri mitral valve repair is associated with lower risks of mortality, postoperative stroke, and prolonged intensive care unit and hospital stays. Alfieri mitral valve repair and concomitant CABG surgery can be performed in patients with IMR.

## INTRODUCTION

Ischemic mitral regurgitation (IMR) is common and associated with poor outcomes [Chan 2011]. Approximately half of patients with IMR and recent acute coronary syndromes will develop associated heart failure [Trichon 2003]. Overall,

patients with IMR have a much worse long-term survival prospect and functional status than patients with coronary disease without IMR [Lamas 1997; Bursi 2005]. The management of IMR is complex and depends in part on the severity of the preoperative mitral regurgitation (MR). Vincent et al found that coronary artery bypass grafting (CABG) with mitral valve (MV) surgery may reduce postoperative MR and cardiac-related mortality, and they agreed that MR that is at least moderate to severe (grades 3 or 4) requires MV intervention [Chan 2011]. For most patients with MR, valve repair is desirable but may be technically challenging, particularly when complex jets accompany IMR [Bhudia 2004]. Alfieri and colleagues [Maisano 1998; Alfieri 2001] introduced a simple edge-to-edge suture approximation of the anterior and posterior mitral leaflets as a reproducible and effective technique for restoring valve competence; however, most of their patients had degenerative (myxomatous) disease [Alfieri 2001; Maisano 1998, 2000]. The purpose of the present investigation was to review our experience with ringless edge-to-edge MV repair in patients who underwent concomitant CABG surgery.

## MATERIALS AND METHODS

Preoperative clinical data are summarized in Table 1. Between January 2011 and June 2012, 17 patients underwent ringless edge-to-edge mitral repair. All patients were in New York Heart Association class III or IV. All of the patients were in sinus rhythm. All patients had a low left ventricular ejection fraction (mean  $\pm$  SD,  $33.30\% \pm 5.97\%$ ). Transthoracic echocardiography (TEE) was performed the day before the operation in all patients. MR was severe in all patients, and the cause was ischemic in all patients. The main mechanism of regurgitation included Carpentier classification 2, type a lesions in 2 patients, type b lesions in 14 patients, and type 3 lesions in 1 patient. Associated cardiac conditions included coronary artery disease (CAD) in all patients. The study protocol was approved by the institutional review committee of the Yasam Hospital. Patients gave informed consent.

## Surgical Procedure

The surgical approach to the MV was through a standard left atrial incision in all patients. A double-orifice

Received December 19, 2012; accepted June 10, 2013.

Correspondence: Assoc. Prof. Dr. Alper Sami Kunt, Ozel Yasam Hastanesi, Cardiovascular Surgery Department, 1486 Sokak Sirmiyali, Muratpasa, Antalya, Turkey; 902423108080; fax: 902423108070 (e-mail: [dralper@msn.com](mailto:dralper@msn.com)).

repair was performed in all patients. This procedure was an isolated, ringless central edge-to-edge suture. A 4-0 polypropylene continuous suture with pledgets was used for leaflet approximation in all cases. Valve competence was assessed via forced saline injection into the left ventricle during cardioplegic arrest. Water-testing data were therefore available for all patients. After discontinuation of cardiopulmonary bypass, valve function and anatomy were assessed by means of intraoperative TEE (data available for 12 patients).

Table 1. Preoperative Clinical Data\*

Male sex, n (%)	14 (82.35)
Female sex, n (%)	3 (17.64)
Age, y	58.53 ± 10.78
Diabetes, n (%)	4 (23.52)
Hypertension, n (%)	6 (35.29)
Ejection fraction, %	33.39 ± 5.97
NYHA class, n	
I-II	3 (17.64)
III-IV	14 (82.35)

\*Data are presented as the mean ± SD as indicated. NYHA indicates New York Heart Association.

### Statistical Analysis

Variables were expressed as the mean ± SD. A comparison of the echocardiographic evaluations and a multivariable analysis of factors associated with MR were made. A *P* value <.05 was considered statistically significant.

## RESULTS

All patients had symptomatic CAD, and 17.64% had experienced a myocardial infarction within 30 days of the operation. All patients had symptoms of heart failure of New York Heart Association class III or IV. The cause of MR in the majority of the patients who underwent edge-to-edge mitral repair was IMR. The postoperative clinical data are summarized in Table 2. There were no hospital or late deaths. Low cardiac output developed in 5 patients (29.41%) and was treated with inotropic agents; 2 of these patients required intra-aortic balloon pump support. Atrial fibrillation and ventricular arrhythmia developed in 5 patients (29.41%), and all were successfully converted to sinus rhythm with antiarrhythmic agents. The mean lengths of stays in the intensive care unit and hospital were 2.83 ± 1.29 days and 7.74 ± 2.14 days, respectively. The functional status and the left ventricular ejection fraction were improved in all patients. At the latest follow-up, all patients were in New York Heart Association class I or II, and the mean left ventricular ejection fraction was 43.31% ± 4.26%. There were no recurrent MR- or MV-related complications.

Table 2. Postoperative Clinical Data\*

	Patients, n (%)
CABG	17 (100)
Arrhythmia	5 (29.41)
Inotropic drug use	5 (29.41)
IABP use	2 (11.76)
Hospital mortality	0 (0)

\*CABG indicates coronary artery bypass grafting; IABP, intra-aortic balloon pump.

## DISCUSSION

The efficacy of adding MV repair to CABG has been well demonstrated by improvements in the New York Heart Association functional class and the left ventricular ejection fraction, and by decreases in the left ventricular end-diastolic diameter, left ventricular end-systolic diameter, pulmonary artery pressure, and left atrial size [Qiu 2010]. Their early results seem to be satisfactory, even when most of these patients were in congestive heart failure preoperatively. MV repair is superior to replacement for MR, because repair has a lower operative mortality, improved late survival, a reduced risk of endocarditis, fewer thromboembolic complications, and better preservation of ventricular function [Bhudia 2010]. The edge-to-edge technique was introduced into the surgical armamentarium of MV repair in 1991 and has been used progressively to restore mitral competence in the setting of degenerative, postendocarditis, and functional MR [De Bonis 2010]. Appropriate indications and awareness of the important technical aspects of the procedure are prerequisites for a good outcome. The free edges of the mitral leaflets have to be approximated in correspondence with the site of the regurgitant jet so that the MR is corrected without producing stenosis. The Alfieri edge-to-edge repair converts the MV orifice from a single inflow channel to a 2-orifice channel [De Bonis 2010]; however, similar to the congenital anatomic variant of the double-orifice valve, the valve leaflets in this kind of repair are adequately supported by chordae. The attraction of this technique is that the native valve is used. Consequently, many of the complications traditionally associated with replacing the native MV with a prosthetic mechanical valve, such as anticoagulant-related hemorrhage, thromboembolism, and increased risk of endocarditis, are minimized by preserving the native valve [Maisano 1998; Alfieri 2001; De Bonis 2010; Chan 2011]. Its efficacy and low complication rate have prompted the use of repair, even in patients with mild or no symptoms [De Bonis 2010]. Almost 20 years after its introduction, the edge-to-edge technique remains an effective and versatile method for treating MR. Our results show that all patients in the valve repair group were asymptomatic. Furthermore, none of the patients required reoperation for valve repair failure. This result indicates that the repairs were very durable at the intermediate-term follow-up. In addition, preservation of the native valve reduced infective, bleeding, thromboembolic, and reoperative complications.

In conclusion, this study was limited by the small number of patients, which did not permit an adequate statistical analysis. In addition, the follow-up of patients was only to the intermediate term. Nevertheless, we conclude that MV repair with the ringless edge-to-edge technique combined with CABG is useful in MR cases due to ischemia, with a lower risk of morbidity and with good early and midterm results. The technique was simple, safe, and reproducible. MVs that traditionally have been considered difficult to repair may be repaired with the edge-to-edge technique with good results, but long-term follow-up is required to evaluate the durability of this repair.

## REFERENCES

- Alfieri O, Maisano F, De Bonis M, et al. 2001. The double-orifice technique in mitral valve repair: a simple solution for complex problems. *J Thorac Cardiovasc Surg* 122:674-81.
- Bhudia SK, McCarthy PM, Smedira NG, Lam B-K, Rajeswaran J, Blackstone EH. 2004. Edge-to-edge (Alfieri) mitral repair: results in diverse clinical settings. *Ann Thorac Surg* 77:1598-606.
- Bursi F, Enriquez-Sarano M, Nkomo VT, et al. 2005. Heart failure and death after myocardial infarction in the community: the emerging role of mitral regurgitation. *Circulation* 111:295-301.
- Chan V, Ruel M, Mesana TG. 2011. Mitral valve replacement is a viable alternative to mitral valve repair for ischemic mitral regurgitation: a case-matched study. *Ann Thorac Surg* 92:1358-66.
- De Bonis M, Alfieri O. 2010. The edge-to-edge technique for mitral valve repair. 2010. *HSR Proc Intensive Care Cardiovasc Anesth* 2:7-17.
- Lamas GA, Mitchell GF, Flaker GC, et al. 1997. Clinical significance of mitral regurgitation after acute myocardial infarction. Survival and Ventricular Enlargement Investigators. *Circulation* 96:827-33.
- Maisano F, Schreuder JJ, Oppizzi M, Fiorani B, Fino C, Alfieri O. 2000. The double-orifice technique as a standardized approach to treat mitral regurgitation due to severe myxomatous disease: surgical technique. *Eur J Cardiothorac Surg* 17:201-5.
- Maisano F, Torracca L, Oppizzi M, et al. 1998. The edge-to-edge technique: a simplified method to correct mitral insufficiency. *Eur J Cardiothorac Surg* 13:240-6.
- Qiu Z, Chen X, Xu M, et al. 2010. Is mitral valve repair superior to replacement for chronic ischemic mitral regurgitation with left ventricular dysfunction? *J Cardiothorac Surg* 5:107.
- Trichon BH, Felker GM, Shaw LK, Cabell CH, O'Connor CM. 2003. Relation of frequency and severity of mitral regurgitation to survival among patients with left ventricular systolic dysfunction and heart failure. *Am J Cardiol* 91:538-43.