



ISCHEMIC MITRAL REGURGITATION REPAIR: A NOVEL TECHNIQUE

Surgery

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ABSTRACT

A 53-year-old man who presented with chest pain and sudden onset dyspnea on exertion to emergency department. He was in NYHA Class IV and was shifted immediately to cardiac intensive care unit. Coronary angiogram was done was suggestive of blockage of proximal circumflex with normal left anterior descending artery & right coronary artery. Patient was intubated & decongestive measures were started. Pre-op trans-thoracic echocardiography could only reveal RWMA (regional wall motion abnormality) of infero-basal wall with severe MR. He was then referred for urgent surgery of coronary artery bypass grafting with mitral valve replacement. During Intra-op transesophageal echocardiography, it was evident that there was rupture of anterolateral papillary muscle, leading to severe MR. After taking patient on cardio-pulmonary bypass and after diastolic arrest of heart, on opening findings of transesophageal echocardiography were confirmed. On assessing the anatomy, repair was done, by direct pledgeted suture re-implantation of anterolateral papillary muscle to LV base. Repair was reinforced with 30mm Carpentier- Edwards ring annuloplasty. CABG was done in which reverse saphenous vein grafted onto obtuse marginal branch of circumflex. Post-op was uneventful. Review ECHO was done 1 week after the discharge which was suggestive of mild LV dysfunction, infero-posterior wall hypokinesia, trivial MR and was found to be in NYHA Class II.

KEYWORDS

Cardiac; Mitral; Repair

Introduction

Ischemic MR is a catastrophic complication of patients presenting to emergency with acute MI [1,2]. Ischemic MR acutely may be because of papillary muscle rupture, papillary muscle necrosis or due to regional wall motion abnormality. Ischemic MR occurs as an acute complication of MI, but its prevalence is uncertain in patients presenting with early in the course of MI with acute mitral regurgitation. Actual rupture is seen in only half of the cases. Papillary muscle rupture as a whole is less, as mostly there is rupture of heads of papillary muscle in two-thirds of the cases [1]. In 75% of the cases, there is a rupture of postero-medial papillary muscle, whereas in the rest of 25% of cases rupture of anterolateral papillary muscle is seen [3,4,5]. Austen reported the first successful surgical repair of papillary muscle rupture from Massachusetts General Hospital in 1965 [6]. Grigioni and colleagues have demonstrated that, there is a significant difference in 5 year survival of patients of MI presenting with or without MI [7].

Techniques for MV repair are varied and include posterior ring annuloplasty, pericardial patching and Gore- Tex artificial chords usage. Apart from it, several novel technique such as "Bow- Tie" by Umaña and co-workers have been described [8]. We describe over here a novel technique of MV repair. The patient was 53 years old male without any known comorbidity. He presented with sudden onset chest pain followed immediately by dyspnea on exertion. He presented to emergency in NYHA IV Class. On examination, there was a 3/6 holosystolic murmur at the apex and significant bilateral crepts. Immediately was shifted to CCU, intubated and started on decongestive therapy & dobutamine infusion at 5µg/kg/min. Coronary angiogram done revealed proximal blockage in circumflex with normal left anterior descending artery & right coronary artery. Echo revealed hypokinesia in infero-posterior wall, mild LV dysfunction & severe MR. He was then referred for coronary artery bypass grafting + mitral valve replacement.

Method

Pre-operatively trans-esophageal echocardiography was done, which was suggestive of type II Carpentier defect. There was rupture of anterolateral papillary muscle.



Fig 1. Trans esophageal echocardiography (TEE) shows freely moving anterolateral papillary muscle in LV in parasternal long axis view.

After median sternotomy and harvesting of LIMA, standard cardio-pulmonary bypass is started using 22Fr RMI arterial cannula and 28Fr angled venous cannula for SVC & 32Fr straight cannula for IVC. Antegrade root cardioplegia (Del Nido) was given. After diastolic arrest of heart, LA was opened & mitral valve was inspected. Annulus, valve leaflets, postero-medial papillary muscle with its accompanying chords were normal. There was a rupture of anterolateral papillary muscle from the base of the LV. The chordal mechanism of the anterolateral papillary muscle were normal. Decision was taken to repair the valve. The ruptured base of the anterolateral papillary muscle was freshened up. Using 3 5-0 pledgeted prolene sutures, which were passed through the base of the papillary muscle, it was reimplanted into LV base. The repair was reinforced with 30mm Carpentier-Edwards ring using interrupted sutures. Valve was tested with saline, with no evident leak. Operation is completed by fashioning anastomosis between reverse saphenous vein graft and obtuse marginal using 7-0 prolene suture.

Patient was shifted to intensive care unit on dobutamine and nitroglycerine infusion. Post-op course was uneventful and was extubated successfully after 7 hours. His hemodynamics remained stable and was maintaining saturation. He was shifted to ward on post op day-3 and was discharged in satisfactory condition on post op day6.

Post-operatively, he was reviewed back again after 1week. He was in

NYHA II. Echo was done which was suggestive of mild LV dysfunction, infero-posterior wall hypokinesia, trivial MR, no significant MS.

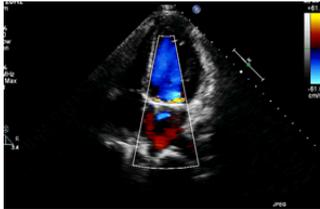


Fig 2. Apical 4-chamber view on trans-thoracic echocardiography, showing good co-aptation of leaflets with only trivial mitral regurgitation on color Doppler.

Discussion

Unlike the posteromedial papillary muscle, which is supplied by the posterior descending artery, the anterolateral papillary muscle has a dual blood supply, both from the left anterior descending and left circumflex arteries [9, 10, 11]. This phenomenon explains why rupture of the posteromedial papillary muscle is 6-12 times more common. Also, rupture of the anterolateral papillary muscle has usually been seen with anterolateral MI, rarely occurring in the along with inferior MI, as happened in this case [12].

Transthoracic echocardiography has a sensitivity of 65-85% for the diagnosis of papillary muscle rupture [13]. As seen in this case, transthoracic echocardiography was not informative about the cause of severe mitral regurgitation. Transesophageal echocardiography established the diagnosis and the cause for it. The treatment of choice for papillary muscle rupture is emergency surgical intervention. Though surgery involves significant operative mortality to the tune of 18%, but recent trends are suggestive of lower operative risk, particularly when combined with coronary artery bypass grafting (8.7%) [14]. On long-term follow-up, outcome of such patients is same as those presenting with MI, but without papillary muscle rupture [14]. These observations have emphasized the importance of a stute diagnosis and an aggressive therapeutic approach, in the form of surgery for patients suffering papillary muscle rupture after MI.

This case is unusual as a rupture of the anterolateral muscle in MI involving the inferoposterior walls was found and it was a primary surgical intervention in the form of MV repair and concomitant coronary artery bypass grafting. Unlike the studies of Park et al. [15] and Vieira et al. [16], where at first the culprit lesion was stented and later a downhill course of the patient was noted and was intervened for severe MR. The patient in this setting was addressed in the same setting for circumflex stenosis and MR. Park et al. [15], had done a postero-medial muscle re-implantation to the LV base. Fasol et al. [17] had reported a modified papillary muscle re-implantation technique, which involved reattaching the ruptured papillary muscle tip to a healthy area of the adjacent papillary muscle and additional sandwiched pericardial pledgeted PTFE sutures were used for reinforcing the repair. Here intra-op evaluation of the anatomy of the mitral valve revealed in total sloughing of antero-lateral muscle from its base. The base was freshened up and using 3 pledgeted prolene sutures antero-lateral papillary muscle was re-implanted to LV base. Using 30mm Carpentier- Edwards ring, the repair was stabilized. To validate, such methods for MV intervention require along term follow up.

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