
New ideas - Valves

Intraoperative saline injection leak test – a simple method to assess mitral valve repair when a simultaneous aortotomy does not allow pressurization of the left ventricle

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Abstract

We describe a simple, safe and reliable intraoperative saline injection leak test for accomplishing and testing the efficacy of mitral valve repair when a simultaneous aortotomy is present.

Keywords: Mitral valve repair; Leak test; Aortotomy

1. Introduction

Intraoperative assessment of a competency of the repaired mitral valve before closure of the atrium is an important step in accomplishing successful mitral valve repair. Saline test injection into the left ventricle under pressure is the most popular and reliable method to evaluate the repaired mitral valve. However, in patients requiring repair of an aortic valve simultaneously, the saline test becomes unreliable because the ascending aorta is open. We describe a simple and reliable intraoperative saline injection leak test for mitral valve repair when a simultaneous aortotomy is present.

2. Technique

In our practice, all combined valve procedures are performed through a median sternotomy with transesophageal echocardiography routinely used for pre- and postrepair evaluation of the mitral valve. Standard cardiopulmonary bypass is instituted with bicaval venous cannulation and ascending aortic return, and left heart venting via the right upper pulmonary vein. In cases with competent aortic valve, the left atrium is incised first on the interatrial groove, extending posteriorly beneath both caval veins under ventricular fibrillation, mitral valve analysis is performed carefully. In cases with moderate to severe aortic insufficiency, the aorta is cross-clamped promptly and cardioplegia is infused directly within the coronary ostia following an oblique aortotomy. If the aortic valve is severely calcified, careful resection of the aortic valve is performed prior to mitral valve repair in order to obtain good visualization of the mitral valve. The mitral valve is then repaired using various techniques according to the lesions. After repair of the mitral valve, the competency is evaluated using saline injection leak while simultaneously occluding the left ventricular outflow tract with a balloon catheter (20 Fr Foley catheter) inserted through the aortotomy (Fig. 1a,b). After confirmation of a satisfactory mitral repair, the aortic valve is replaced.

3. Results

From December 1991 to December 2006, twenty-four patients with mitral regurgitation in association with aortic valve disease underwent mitral valve repair and concomitant aortic valve replacement. The group comprised twelve men and twelve women whose mean age was 60.3 years (26–88 years). Twenty-three patients required aortic valve replacement with a mechanical prosthesis and one open aortic valvuloplasty. The etiology of mitral lesions and the repair techniques utilized are summarized in Table 1.

Operation time, cardiopulmonary bypass time, and aortic cross-clamp time were 241±61, 114±17.7, and 78±14.4 min, respectively. All patients were weaned easily from cardiopulmonary bypass without the need for mitral repair revision. No discrepancy was found between the findings of the intraoperative leak test performed with the technique described herein and post-bypass echocardiogram. Pre-discharge echocardiogram disclosed no significant mitral regurgitation in any of the patients included in the series. There were no major morbidities and no mortalities.

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4. Discussion

There has been some controversy surrounding patients with combined aortic and mitral valve disease. The durability and outcome of combined aortic valve replacement and mitral valve repair vs. double valve replacement remain to be determined. However, recent reports described the superiority of mitral valve repair especially in cases with degenerative aortic and mitral valve disease [1].

When attempting mitral valve repair, intraoperative assessment of the competency of the mitral valve before closure of the atrium is important. Saline injection pressurization of the left ventricle and infusion of cardioplegic solution within the aortic root (the latter in the presence of at least mild aortic regurgitation and in the absence of an aortotomy) are considered to be the most common and reliable techniques used to inspect the repaired valve [2, 3]. However, this becomes very difficult in cases requiring simultaneous repair of an aortic valve, since the aorta is opened. To our knowledge, no reliable alternative has been previously described.

Occlusion of the ascending aorta below the incision line by simple clamp is considered to be difficult and hazardous, and potentially injures the surrounding tissues. Repairing the mitral valve after completion of the aortic valve procedure and closure of the aortotomy is rather difficult due to poor visibility and limitation of the working space, especially around the antero-lateral commissure when the aortic prosthesis has already been seated. The additional retraction can also potentially damage the aorta just around the site where the prosthesis is inserted. The saline injection leak test described here is a simple, safe and reliable method for accomplishing and testing the efficacy of mitral valve repair when, by necessity, the aortic root is open.

References


ICVTS on-line discussion A

Title: Great Idea

Authors: Mohamed Fahmy Ibrahim, PSHC, King Fahd Medical City, Riyadh 11525, Saudi Arabia; Amal A. Refaat

DOI: 10.1510/icvts.2007.158808A

Comment: I congratulate the authors for this simple but reproducible technique to test the competency of mitral valve repair during mitral and aortic valve surgery [1]. I also believe that a saline injection leak test also helps in de-airing the left ventricle after the repair and just before closing the aortotomy.

Reference


ICVTS on-line discussion B

Title: LV injection testing for MV repair in simultaneous aortotomy setting

Author: Nasser F. Abou’Seada, University of Ain-Shams, Faculty of Medicine, #6-Geem-MGWRA 8, May 15 City, Cairo 11426, Egypt

DOI: 10.1510/icvts.2007.158808B

Comment: I've read with much interest the article by Nakajima et al. about an intraoperative saline injection leak test [1].

The extent and the nature of the aortotomy incision were not exactly delineated or defined in the series of patients presented. Was the aortotomy carried down deep into the non-coronary sinus as it is the case of aortic valve procedures? In such a case, the aorta would not be able to hold the Foley’s catheter balloon in place, especially during pressurization of the LV with saline injection.

Also, was the Foley’s balloon inserted into the LVOT beneath the aortic ‘annulus’? Pressurizing the LV in such a case would necessarily push the balloon against the continuation of the aortic curtain into the AML, in fact pushing the AML towards the central mitral valve orifice, some sort of a passive posterior advancement of the AML.
I query what would such effects of altering the aortic ‘annulus’ configuration – during testing – pushing the AML laterally, and producing ‘confounded’ results of test competency, thus greatly undermining its validity. Especially in cases where such a configuration of the aortic root is not likely to be maintained during subsequent aortic valve procedures – aortic valve repair for example.

Reference