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How-to-do-it

A modified 'single patch' technique for complete atrioventricular septal defect correction

Edvin Prifti[a,b,*], Massimo Bonacchi[b], Marzia Leacche[b], Vittorio Vanini[a]

[a]*Department of Pediatric Cardiac Surgery, 'G. Pasquinucci' Hospital, CREAS-IFC-CNR, Via Aurelia Sud, 54100, Massa, Italy*
[b]*Department of Cardiac Surgery, Careggi Hospital, University of Florence, Florence, Italy*

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Abstract

We propose a modified single-patch technique consisting in plication of the patch on the left side, which then is sutured with the free edge of the left atrioventricular valve. The proposed technique offers all the advantages of the single-patch technique and at the same time provides additional tissue for reconstructing appropriately the left atrioventricular valve in cases with leaflet tissue deficiency such as severely dysplastic valve, double orifice left atrioventricular valve. This modification augments the left atrioventricular valve tissue appropriately to the orifice size, promotes leftward displacement and improved coaptation with the mural leaflet. © 2002 Elsevier Science B.V. All rights reserved.

Keywords: Complete atrioventricular septal defect; Left atrioventricular regurgitation; Leaflet augmentation

1. Introduction

Long-term outcome of complete atrioventricular septal defect (AVSD) are well documented [1,2]. Left atrioventricular valve (LAVV) regurgitation remains the most important complications following AVSD correction, ranging from 3 to 18% [2]. The creation of a competent LAVV is a cornerstone in successful AVSD surgical repair. The one-patch technique for AVSD correction was firstly described by Rastelli et al. in 1968 [3]. This technique involves the common leaflets valve division and their suspension to a single patch used to close the atrial and ventricular defects. The combination of the one-patch technique with the cleft closure was associated with excellent long-term outcome [4]. However, this technique is associated with a higher incidence of LAVV regurgitation caused by the dehiscence of valve suture line especially in cases when valvular tissue is deficient such as severely dysplastic LAVV, double orifice LAVV, etc. We propose a simple modification, which permits a successful application of the one-patch technique even in these difficult anatomical presentation.

1.1. Surgical technique

A midline longitudinal sternotomy is performed. A generous pericardial patch is excised, stretched on a sheet of plastic, bathed in 0.6% of glutaraldehyde and rinsed in saline. Cardiopulmonary bypass with bicaval cannulation is instituted, and the aorta is cross-clamped when the perfusate reached 24°C. The myocardial protection is achieved by multidose cold crystalloid cardioplegia (every 25 min, 15/20 cc/kg). A right atriotomy parallel to the right atrioventricular grove is performed. The common atrioventricular valve is exposed and the anatomy is carefully assessed. Incisions are made in the superior and inferior valve leaflets to the annulus separating the valve into left and right atrioventricular components. Maximal tissue is preserved for LAVV reconstruction by making these incisions along the right ventricular aspect of the ventricular septal defect crest. The leaflets' edges are aligned with stay sutures Then the pericardial patch is sutured to the ventricular septum, beginning close to the annular attachment of the inferior leaflet. The running suture (4- or 5-Polypropylene) is reinforced inferiorly with a pericardial strip. Once the suture is brought to the annulus, the patch is turned at right angle towards the LAVV and vertically plicated, normally for 6–8 mm (depending on surgeon's preference and LAVV tissue deficiency for an acceptable leaflets' coaptation), creating a double 'valvular' patch parallel to the LAVV plane(Fig. 1A-right). Both sides of the plicated patch's component were attached to each other with a running 6.0-Polypropylene mattress suture(Fig. 1A-left). The free edge of the

* Corresponding author. Tel.: +39-685-300-548; fax: +39-585-493-616.
E-mail address: edvinprifti@hotmail.com (E. Prifti).

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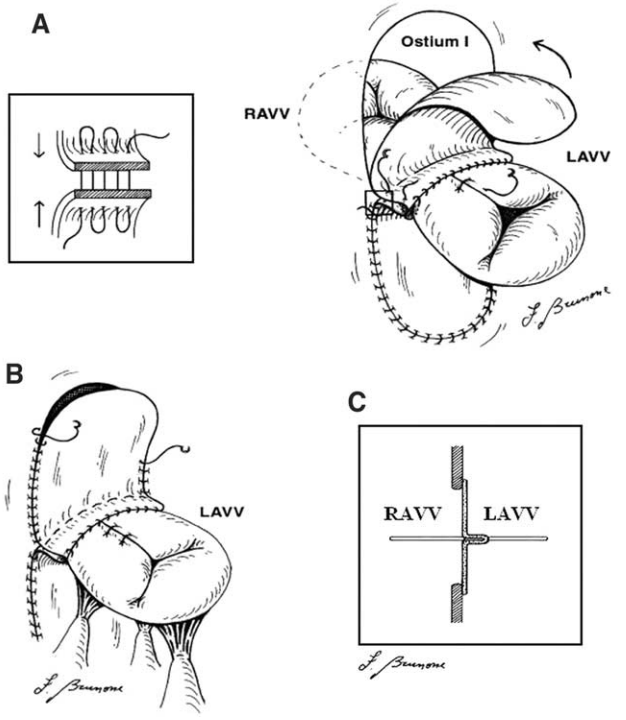

Fig. 1. Modified single patch surgical technique. (A) The patch plication towards the left atrioventricular valve, using a mattres suture, creating a double valvular patch parallel to the valvular plane. (B) The free edge of the left atrioventricular valve sutured to the plicated patch component. (C) The right atrioventricular is attached in the same line with the left atrioventricular valve. Legend: LAVV, left atrioventricular valve; and RAVV, right atrioventricular valve.

LAVV is sutured to the plicated patch component using interrupted sutures passing through both patch's sides (Fig. 1B). Then, the cleft is closed using interrupted sutures. The right atrioventricular valve is attached in the same line with the LAVV (Fig. 1C). Then the pericardial patch is sutured around the atrial defect, staying initially inferior and lateral to the lateral edge of the coronary sinus and the back medially just below the anterior lip of the coronary sinus avoiding the injury of the conduction system. The coronary sinus drains into the right atrium.

This technique was employed successfully in two patients, 2 and 4 months old. Both of them presented double orifice LAVV and valvular tissue deficiency. In the second case we performed a partial cleft closure. Both patients survived and postoperative course was uneventful. The first patient presented mild LAVV regurgitation at 10 months and the second patient presented a minimal LAVV regurgitation at 5 months after correction.

2. Comments

Different studies have identified a series of risk factors for LAVV regurgitation after AVSD correction such as double-orifice LAVV [1,5], displastic valve tissue [6], incomplete cleft closure [4] and single patch technique [2]. During the last 10 years in almost 160 patients undergoing surgery for complete AVSD we have had a 6% reoperation due LAVV regurgitation. All patients underwent one-patch technique. Such a technique offers a series of advantages such as a better exposure and visualisation of the ventricular septal defect and subvalvular apparatus, less sutures close to the valvular plane, shorter cardiopulmonary and aortic cross clamping times than the two-patch technique. However, the employment of this technique requires the division of the common valve leaflets. When common leaflets are divided and then sewn-back onto a single patch, 3–4 mm of leaflet tissue is used up [7]. This situation is important in small infants in whom the sacrificed valve tissue comprises a greater proportion of the whole. According to our experience, the deficiency of valvular tissue predisposed a reduction of the mobile valve area due to incorporation of leaflet tissue in the suture line which were placed under tension. This induced a high incidence of suture dehiscence and as consequence, important postoperative LAVV. One of the solution might be the augmentation of the leaflet tissue. Recently Porier et al. [6] presented an interesting leaflet augmentation technique, consisting in inferior leaflet division from the annulus and the interposition in the created defect of a pericardial patch, employed successfully in patients with postoperative LAVV regurgitation. Najm et al. [5] proposed another modification of the two-patch technique, using the free-edge of the ventricular patch for increasing the area of the LAVV. Vilcox et al. [8] reported a modified single-patch technique consisting in suturing the common atrioventricular valve to the ventricular septum to close the ventricular component. Such a technique offers the possibility to save the valvular tissue that is normally sacrificed when the leaflets are reattached to the patch. However this technique can not be employed in cases with large ventricular septal defect.

The proposed technique offers the advantages of the single-patch technique. This modification provides additional tissue for reconstructing appropriately the LAVV in cases with leaflet tissue deficiency, promotes leftward displacement and improved coaptation with the mural leaflet. The addition of the pericardial patch allows tension-free closure of the cleft. This technique appears to render the valve competent even without additional cleft closure. It also provides a native continuity with the interatrial and ventricular patch, which might increase the solidity of the whole structure, reducing the risk for late dehiscence between the LAVV tissue and pericardial patch. However, larger series of patients and longer follow-up are required for an appropriate evaluation of this technique.

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