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ORIGINAL ARTICLE

Single patch technique versus double patch technique in repair of complete atrioventricular septal defect

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KEYWORDS

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Abstract *Methods:* This retrospective study included 145 consecutive patients who underwent complete atrioventricular (CAVSD) repair between January 2002 and January 2012. Peri-operative data were analyzed. Ninety-two patients had a two-patch technique (group A); 53 patients had a single-patch technique (group B).

Results: Mean age was 13.17 ± 4.94 months (group A) versus 5.15 ± 1.52 months (group B), ($p < 0.001$). Mean weight was 9.87 ± 5.53 versus 5.23 ± 2.12 kg ($p < 0.001$). Down syndrome was present in 82 (90.2%) in group A and 48 (90.5%) in group B ($p = 0.315$). Aortic cross-clamp times in group A was 135.3 ± 19.6 min and group B 107.7 ± 21.4 min ($p < 0.0001$). Cardiopulmonary bypass times were shorter in group B (132.2 ± 24.3 min) than group A (159.42 ± 31.4 min)

Abbreviations: ASD, atrial septal defect; ASD II, secundum atrial septal defect; AV, atrioventricular; CAVSD, complete atrioventricular septal defect; CPB, cardiopulmonary bypass; ECMO, extracorporeal membrane oxygenation; ICU, intensive care unit; IVC, inferior vena cava; LAVV, left atrioventricular valve; LVOT, left ventricular outflow tract; NPO, nothing per oral; PA, pulmonary artery; PDA, patent ductus arteriosus; PPM, permanent pacemaker; SVC, superior vena cava; TAPVC, total anomalous pulmonary venous connection; TPN, total parental nutrition; VSD, ventricular septal defect

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with p value < 0.001. Chylothorax, post operative bleeding, ICU stay and hospital length were not significant. Reoperation for left atrioventricular valve insufficiency occurred in 5 patients (5.4%) in group A, one of them needed valve replacement and 3 patients (5.7%) in group B. Permanent pacemaker was required for postoperative heart block in 3 patients (3.3%) in group A and 2 patients (3.8%) in group B ($p = 0.623$). Hospital mortality was seen in 6 patients (6.5%) in group A and 3 patients (5.7%) in group B ($p = 0.606$).

Conclusions: Single-patch technique can be performed with the same results like the two patch technique with a significantly shorter aortic cross clamp and bypass time.

1. Introduction

The first successful repair of complete atrioventricular septal defect (CAVSD) was reported by Lillehei and colleagues in 1955.[1] The single-patch technique was described by Maloney and associates[2] in 1962 and was recently reviewed by Hanley and coauthors.[3] In 1976, Trusler[4] introduced the two-patch technique with a prosthetic patch for the ventricular septal defect, a pericardial patch for the atrial septal defect, and suture closure of the mitral "cleft". The two-patch technique was reviewed in 1990.[5,6] The objective of this study was to assess the outcome of complete atrioventricular septal defect repair comparing single-patch technique to the two-patch technique.

2. Patients and methods

Between January, 2002 and January, 2012, 145 infants with a complete atrioventricular septal defect underwent intracardiac repair, these patients were divided into two groups, group (A) included patients who underwent the two-patch technique ($n = 92$) and group (B) included patients who underwent single-patch technique ($n = 53$). These patients were not randomized; rather, each case was managed according to the individual surgeon's preference. The study was approved by the Institutional Review Board (IRB) of the King Faisal specialist hospital and research center – Jeddah (KFSHRC-J) as a retrospective chart analysis; individual consent for the study was waived.

The mean age at the time of surgery was significantly more in group A. In these patients the mean age was 13.17 ± 4.94 months, while in group B it was 5.15 ± 1.52 months ($p < 0.001$). The mean weight of the patients undergoing the two-patch technique was slightly higher than those having the single-patch, 9.87 ± 5.53 versus 5.23 ± 2.12 kg ($p < 0.001$). Down's syndrome was present in 82 (90.2%) in group (A) and 48 (90.5%) in group (B), Table 1.

Table 1 Demographic data.

Variable	Group A ($n = 92$)	Group B ($n = 53$)	P value
Age (months)	13.17 ± 4.94	5.15 ± 1.52	$p < 0.001$
Sex (female)	50 (54.3%)	28 (52.8%)	NS
Weight (kilograms)	9.87 ± 5.53	5.23 ± 2.12	$p < 0.001$
Down's syndrome	82 (90.2%)	48 (90.5%)	NS
Previous PA band	4 (4.3%)	4 (7.5%)	NS

PA: pulmonary artery.

2.1. Operative technique

All cases were performed with cardiopulmonary bypass, moderate hypothermia, aortic cross-clamp, and cold blood cardioplegia. There were no major changes in the perfusion protocol in this time period. All operations were done through median sternotomy, with bicaval cannulation. Valve exposure was obtained through a right atriotomy parallel to the right atrioventricular (AV) groove, extending from the right atrial auricle to the level of the entrance of the inferior vena cava. In those patients with two patch technique cold saline solution was used to fill the ventricular chambers and float the AV valve tissue into a closed position to establish the line of coaptation of the common AV valve to identify the proper line of division into right and left parts of these components. The distance from the AV valve level to the crest of the interventricular septum was assessed with care in order to reconstruct the AV valves at the appropriate height to prevent subaortic stenosis. The ventricular septal defect (VSD) was closed by sewing in a semioval Gore-Tex patch onto the right side of the defect with continuous double armed 5-0 Prolene (Johnson and Johnson). At the AV level, the superior bridging leaflet and the inferior bridging were included in the running suture line and sewn to the upper ridge of the VSD patch, ensuring adequate coaptation at the meeting point of the superior and inferior leaflets on both the right and the left sides. Closure of the atrial septal defect (ASD) was performed with a running prolene suture to fix an autologous pericardial patch, starting at the superior bridging leaflet following the hinge point level of the leaflet and continuing onto the previous suture line at the AV level of the VSD patch. At this stage, suturing at the left atrioventricular valve (LAVV) circumference at the septal level was completed and valve final testing was performed. LAVV was assessed for the presence or the absence of dysplasia and thickening of the valvular tissue, analysis of the subvalvular apparatus, presence of two papillary muscles, interpapillary distance, size of the mural leaflet, presence of severe preoperative LAVV regurge. Using horizontal interrupted Prolene sutures, the left-sided cleft was completely closed. Valve competence was repeatedly tested with saline injection through the valve orifice. If considered indicated, commissuroplasty was applied. The closure of the ASD was then completed by further sewing in the pericardial patch. From the commissure between the right mural leaflet and the inferior bridging leaflet, the patch followed the right atrial wall to the bottom of the coronary sinus in order to avoid the AV nodal area with preservation of coronary sinus drainage to the right atrium.[7] From this point on, the border of the ASD was followed superiorly