Right Anterolateral Thoracotomy as an Alternative to Median Sternotomy for Repair of Atrial Septal Defect: A Cosmetic Approach for Female Patients

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Abstract

Background- Atrial septal defect (ASD) operation is a safe and low-risk procedure. Cosmetic results have been an important issue, so right anterolateral thoracotomy (RALT) approach has been used for repair. However, in RALT, the skin incision usually crosses the future breast line, which may cause breast mal-development.

Method- We reviewed the long-term results of a consecutive series of 406 patients from 1997- 2005 in whom the ASD was closed through a RALT or median sternotomy (MS) incision. 190 patients were male and 216 were female, with a mean age of 8.2±3.9 years. Defects repaired included 383 ASD secundum (ASD 2º) and 23 ASD sinus venosus type (ASD-SV). In 316 patients (77.8%), the defect was closed through MS, and 90 patients (22.2%) underwent RALT for repair.

Result- The mean cardiopulmonary bypass time (CPB time) was 37.0±10 min. for MS vs. 40±11 min. for RALT (p=0.9, NS). Intubation time after operation was 9.0±5 hrs for MS and 8.1 ±7.1 hr in RALT (p=0.8, NS). Postoperative drainage was 119mL (range, 0-1100mL) for MS and 94mL (range, 0-500mL) in RALT (p=0.1, NS). Postoperative pleural/pericardial effusion and pneumothorax occurred in 2.1% of patients in MS and 6.6% in RALT group (p= 0.001). There was no operative or late mortality, morbidity or breast mal-development in the long-term follow-up (range, 6 m -10 y, mean 4 yrs).

Conclusion- RALT is a safe and effective alternative approach to MS incision for ASD closure ***(Iranian Heart Journal 2008; 9 (1): 29-33).***

Key words: atrial septal defect ■ right anterolateral thoracotomy ■ cardiac surgery ■ median sternotomy

Mtrial septal defect (ASD), comprises 7% of all congenital heart diseases and is more frequent in females (M:F, 2:1). If uncorrected, this defect may cause pulmonary hypertension, heart failure and arrhythmia. Surgical closure of ASD has been performed successfully since 1952 and in the current era, operation is associated with low risk.

Median sternotomy (MS) incision, though remaining as the standard approach for ASD closure, leaves a cosmetically undesirable scar, especially in young females.

The cosmetic and psychological implication of a MS scar must be considered as a possible factor of morbidity.

An alternative method of surgical repair is via a right anterolateral thoracotomy (RALT) incision, which is not easily visible if placed under the submammary crease.

In this study, we reviewed the long-term results of a consecutive series of 406 patients in whom the ASD was closed through a RALT or MS incision.

Methods

From March 1997 to March 2005, 406 patients admitted in the pediatric ward underwent ASD closure through MS (316 patients, 77.8%) or RALT (90 patients, 22.2%). All children and adolescents (<18

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years) with ASD secundum (ASD-2º) and without concomitant cardiac lesions, except for 23 patients who had a sinus-venosus type ASD (ASD-SV) with partial anomalous pulmonary venous connection (PAPVC) who underwent closure, were included in the study.

In RALT, the patient was placed in a 45˚ right-side up supine position and then a submammary RALT incision was performed. In MS, the classic midline sternotomy approach was utilized. In both groups, mild hypothermic cardiopulmonary bypass was instituted with the use of aortic and bicaval cannulation and during a short period of aortic cross-clamp time, the defect was closed through a transatrial approach with continuous suture technique with or without using a pericardial or synthetic patch.

Data of patients including perioperative events and follow-up complications such as arrhythmias and breast mal-development were recorded from the medical files. Statistical analysis was done using SPSS-11 and compared with the Pearson chi-square test. P values less than 0.05 were considered significant.

Results

190 patients (46.8%) were male and 216 patients (53.2%) were female. 90 patients (22.2%) underwent RALT and 316 patients (77.8%) were repaired via MS incision. In 383 patients (94.3%), the defect was ASD-2° and in the remainder (5.7%) it was ASD-SV.

The mean age at operation was 8±3.9 yrs. for MS vs. 9.1±3.8 yrs. in RALT (p: 0.9) groups. Mean surgery weight was 23.0±11.4 kg in MS and 27.1±13.6 kg for RALT (p: 0.01). Mean cardiopulmonary bypass time (CPB time) was 37±10min for MS and 40±11 in RALT (p: 0.9). Intubation time after operation was 9.0±5 hr for MS and 8±7 hr in RALT (p: 0.8). Four patients were extubated on the operation table (3 patients with MS and the other with RALT incisions, all with ASD-2°).

Postoperative drainage was 119cc (range: 0-1100cc) for MS and 94cc (range: 0-500cc) in RALT (p: 0.1). Mean ICU stay after operation was 3 days (range: 1-7) in MS and 3 (range: 2-9) for RALT (p: 0.1) groups.

Postoperative pleural/pericardial effusion or pneumothorax occurred in 2.1% in MS and 6.6% in RALT groups (p: 0.001, Table I). Effusion was surgically drained; one patient used aspirin and the others resolved spontaneously.

Table I. Postoperative pleural/ pericardial effusion or pneumothorax in incision types

Arrhythmia	Incision types		Total
	Mid sternotomy	Lateral Thoracotomy	
Junction count			
No.	6	3	9
%	1.9%	3.3%	2.2%
Normal rhythm			
No.	306	87	393
%	96.8%	96.7%	96.8%
Complete heart block			
No.	2	-	2
%	6%		5%
PAC			
No.	2	-	2
%	6%		5%
Total			
No.	316	90	406
%	100.0%	100.0%	100.0%

Postoperative arrhythmia and complete heart block (CHB) was seen in 3.1% with MS and 3.3% in RALT groups (p: 0.9, Table I). Arrhythmia converted to sinus rhythm in one week, but heart block did not and pacemaker implantation was needed.

	Incision types		
	Mid sternotomy	Lateral Thoracotomy	Total
Pleural effusion			
No.	3	3	6
%	.9%	3.3%	1.5%
Pericardial effusion			
No.	2	1	3
%	6%	1.1%	7%
No effusion			
No.	309	84	393
%	97.8%	93.3%	96.8%
Pneumothorax			
No.	2	2	4
%	6%	2.2%	1.0%
Total			
No.	316	90	406
%	100.0%	100.0%	100.0%

Graft types and blood group are shown in Table II. One patient in MS group suffered from wound cellulitis postoperatively, which was treated medically.

Table II. Postoperative arrhythmia or complete heart block with incision type

No patient complained of breast mal-development or scar formation in postoperative clinic visits.

Fig. A; 10-year-old female 1 month after ASD closure via RALT

Fig. B; a 14-year-male 10 years after ASD repair through MS

Discussion

Since 1952, MS has been the standard approach for ASD repair because surgeons are comfortable with the view and exposure to cardiac structures obtained via an MS incision.

Technological advances have led to decreased mortality and morbidity, so Komai[1] described a lower small midline incision with mini-sternotomy and Barbero-Marcial recommended a transxyphoid approach without sternotomy. Restrictive exposure of the heart through the small incision leads to a technically difficult procedure that entails potential risks such as injury to the great arteries and air emboli.[1] However, an unsightly midline scar can cause psychological distress in young patients, especially female patients; as a result, for cosmetic reasons, alternative operative approaches have been developed.

RALT yields excellent visualization, adequate exposure for bicaval and aorta cannulation and good cosmesis for the patient. The different types of ASD-2º including those with associated PAPVC are accessible by RALT. Partial atrioventricular defect (primum type ASD) should not be excluded as a type of repair suitable through an RALT, but associated abnormalities on the right or left outflow tract , ventricular septal defect (VSD) or left superior vena cava (LSVC) drainage in the left atrium contraindicate this approach.

RALT skin incision may cross the future breast line, cause breast and pectoral muscle mal-development in 7.4% of operated patients[3,10,15] or phrenic nerve damage.[17] But in most studies, there was no significant breast deformity and phrenic palsy in long-term follow-up.[2-6] Our study showed that postoperative drainage, mechanical ventilation, ICU stay and mean CPB times were similar in MS and RALT groups, similar to other studies.[3-8] Arrhythmia and complete heart block incidences were 2.5-13% in various studies[5,7,9,11-14] and 3.2% in our study.

Residual ASD is reported in 10-16% of patients,[3] but was zero in this study.
Postoperative pleural or pericardial effusion and pneumothorax were higher in RALT than MS group, but incidences were fewer (3.2%) than those reported (20-30%) in other studies.[2,3] The intraoperative complication was zero in our study, as was the case in others.[2-10]

Conclusion

RALT is proven to be safe, effective and cosmetic. No significant and important differences in morbidity were recorded between MS and RALT. We considered RALT as a good approach for ASD closure in patients, especially females. Nevertheless, future follow-up is recommended to ensure normal breast development in the pre-adolescent patient.

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