

Original Research Article

Thoracic approaches in atrial septal defect closure a comparative study

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ABSTRACT

Background: Atrial septal defects (ASD) are one of the most common cardiac malformations. Being asymptomatic, diagnosis is not always made in childhood and may be delayed to adolescence or adulthood. The incidence of ASD in female is twice that of male, so greater emphasis has been placed on the cosmetic results of the operation.

Methods: In this study, we retrospectively compare results 100 patients of ASD closure through a right anterolateral thoracotomy incision and median sternotomy incision. Between August 2011 to August 2016, out of total 100 patients with ostium secundum ASD, 50 patients operated by right anterolateral thoracotomy have mean age 16.74 yrs, mean weight 28.77 kg, mean Height 122.06 cm and 50 patients with midline sternotomy have mean age 17.07 year, mean weight 29.24 kg, mean height 122.20cm.

Results: There was no mortality in both groups. Per operatively mean operating time, mean CPB time, mean cross clamp time in thoracotomy was 130.08±8.16min, 48.68±5.10min, 29.70±4.21 min while in sternotomy was 121.34±8.30 min, 45.62±4.10 min, 28.28±2.82 min respectively. When compared, there is significant increased duration in operating and CPB time in thoracotomy while cross clamp time was non-significant. Mean duration of ICU and Hospital stay in thoracotomy group was 1.78±0.58days and 6.74±1.77 days when compared to sternotomy group in which it was 2.40±0.495 days and 7.66±1.40 days which is significantly less when compared. Postoperatively and in follow up thoracotomy group have better cosmesis when compared.

Conclusions: Surgical treatment of ostium secundum ASD using right anterolateral thoracotomy approach has low operative risk better cosmetic results and patient satisfaction.

Keywords: Anterolateral thoracotomy, Atrial septal defect, Sternotomy

INTRODUCTION

Atrial septal defects (ASD) are one of the most common cardiac malformations. Being asymptomatic, diagnosis is not always made in childhood and may be delayed to adolescence or adulthood. The incidence of ASD in female is twice that of male, so greater emphasis has been placed on the cosmetic results of the operation.¹ As the increased pulmonary blood flow may lead to development of pulmonary arterial hypertension, closure of large ASD is generally recommended. Various transcatheter closure techniques have been developed, but their use is restricted to selected cases. Thus, surgical

closure remains the treatment of choice. It is usually performed using cardiopulmonary bypass (CPB) by a sternal approach. The cosmetic and psychological implications of a median sternotomy must now be considered as a possible factor for morbidity. Due to success of percutaneous closure technique, surgeons must be able to propose an operation that can provide a cosmetically satisfying result while maintaining optimal surgical security. Currently focus is on the cosmetic results of surgical interventions. Limited right anterolateral thoracotomy is an alternative approach with regard to cosmetic aspects and good postoperative outcome.^{2-4,7,9,11} The right anterolateral thoracotomy is

well sited for access to both Atria. With this technique, several aspects must be emphasized to perform the operation safely and expeditiously.^{5,8} Our study reviews retrospectively the cosmetic and postoperative outcome of a consecutive series of 100 patients in whom ASD was closed through a right sub mammary approach and sternotomy approach.

METHODS

It was a retrospective study, conducted from August 2011 to August 2016, total 100 patients of ostium secundum ASD underwent patch closure, 50 patients via sternotomy surgical approach and 50 patients via right anterolateral thoracotomy approach, at Vardhman Mahavir Medical College and Safdarjung Hospital, New Delhi, India. The medical records were reviewed to evaluate clinical presentation, pathophysiologic findings, surgical treatment, hospital morbidity and mortality. Patients in sternotomy group includes 28 male and 22 females with mean age 17.07 year, mean weight 29.24 kg, mean height 122.20 cm and patients in thoracotomy group includes 18 male and 32 females with mean age 16.74 year, mean weight 28.77 kg, mean Height 122.06 cm.

The operation was performed by the same team of surgeons. Preoperative diagnosis included ASD of secundum type, confirmed by transthoracic echocardiography. Detail data of both the groups has been drawn per operative data which includes cross clamp time, CPB Time, Operating Time. Post operatively ICU Stay, Hospital stay, complications, mortality and follow up to six months. The breast volume and symmetry in female patients, character of scar was evaluated visually; functional anomalies (numbness, neuralgia) were carefully researched in the interview. The questionnaire focused on the patient's evaluation of the aesthetic result and psychological influences. A summary of questions are:

- Subjective impression regarding volume and symmetry of breasts in female patients.
- Happiness with the scar when clothing is removed.
- Satisfaction or dissatisfaction with the operation.
- Evaluation of cosmetic result.

All questions were asked and answers were graded, satisfied with all questions were graded as excellent cosmesis, with two questions as good cosmesis and with one as fair cosmesis.

Operative technique

After anaesthetic induction and stabilization, the patients were positioned for anterolateral thoracotomy with the right side elevated by 30 degrees. The right groin was usually prepared and draped for potential femoral cannulation. The skin incision was made along the right inframammary groove between the parasternal and midaxillary lines. It is usually not necessary to divide the

lattismus dorsi muscle. The breast and pectoralis major muscle were dissected en bloc from the chest wall, which was entered in the fourth intercostal space. Electrocautery was used with caution and was limited to sources of bleeding. The lung was retracted posteriorly, the right lobe of thymus was dissected and the pericardium was then opened. Pericardial stay sutures were taken and put on traction to elevate the mediastinal structures in the operative field.

After heparin administration sutures were taken in the ascending aorta and aortic cannulation done using elongated aortic cannula was accomplished in all cases. After bicaval cannulation cardiopulmonary bypass instituted with mild hypothermia. Umbilical tapes passed under superior and inferior vena cavae. The aortic cross clamping was done with straight aortic cross clamp. Antegrade root cardioplegia was given. The right atrium was opened using the standard oblique incision. In all patients, the ostium secundum ASD was closed with Dacron patch (4-0, prolene). After the closure of ASD, deairing done with root vent on. RA incision was closed in two layers with prolene 4-0. Patient gradually weaned off from bypass. After haemostasis achieved mediastinal and pleural drains were put and pericardium was closed. Ribs were approximated with ethibond and wound closed in layers with Vicryl 2-0. skin closed with Nylon 2-0.

Operative data and in hospital morbidity for all patients were reported. In the post-operative period and on follow up, patients were evaluated by cardiologist for ASD closure, participant confidentiality was protected.

RESULTS

Both thoracotomy and sternotomy group were found to be equivocal in respect to sex, age, weight and height when compared statistically (Table 1).

Table 1: Sternotomy versus thoracotomy in male and female.

	Male	Female
Sternotomy	28	22
Thoracotomy	18	32

There was no mortality in both the groups. Per operatively mean operating time, mean CPB time, mean cross clamp time in thoracotomy was 130.08±8.16 min, 48.68±5.10min, 29.70±4.21 min while in sternotomy was 121.34±8.30min, 45.62±4.10min, 28.28±2.82 min respectively (Table 2).

Table 2: Mean operating time in sternotomy versus thoracotomy.

	Mean operating time
Sternotomy	121.34±8.30min
Thoracotomy	130.08±8.16 min

When compared it shows there is significant increased duration in operating and CPB time in thoracotomy while cross clamp time was seems to be non-significant. There were complications intra operatively in two of the patients with thoracotomy group that is injury to IVC while passing umbilical tape under IVC, injury to left atrial appendage.



Figure 1: Right anterolateral thoracotomy closure in ASD.



Figure 2: Scar after removal of stitches.

Allergic reaction to protamine while in sternotomy group. Post operatively there were no significant difference in ventilatory support and inotropes required in both the groups. Presence of wound discharge on third post-operative day in seven patients in thoracotomy group and in five patients in sternotomy group which was not significant when compared.

Mean duration of ICU and Hospital stay in thoracotomy group was 1.78 ± 0.58 days and 6.74 ± 1.77 days when compared to sternotomy group in which it was 2.40 ± 0.495 days and 7.66 ± 1.40 days which is significantly less when compared. Postoperatively all the patient underwent echocardiography by cardiologist which shows no residual ASD and in follow up

thoracotomy group found to have significant better cosmesis when compared.

DISCUSSION

Operative closure of ASD has been performed successfully since 1952.³ Studies show that many years after operation, most patients consider them healthy and are free from any medical or operative interventions. ASD closure is now considered a safe and high benefit procedure, more attention is dedicated to the aesthetic results of the operation. Median sternotomy remains the standard approach used by most surgeons as there is no doubt that midline sternotomy is most common, convenient and safe approach, as it provides better exposure to the cardiac surgeon but the residual scar, prolonged morbidity and more hospital stay create a psychological displeasure.

There was no mortality in both the groups we studied. Per operatively mean operating time, mean CPB time, mean cross clamp time in thoracotomy was 130.08 ± 8.16 min, 48.68 ± 5.10 min, 29.70 ± 4.21 min while in sternotomy was 121.34 ± 8.30 min, 45.62 ± 4.10 min, 28.28 ± 2.82 min respectively. when compared it shows there is significant increased duration in operating and CPB time in thoracotomy while cross clamp time was seems to be non significant, similar study done by Juan-Miguel et al which shows no significant difference in operating time, CPB Time, hospital and ICU stay in thoracotomy group when compared to sternotomy group but shows better cosmesis in thoracotomy which is similar to present study.¹¹ This shows that total operating time and CPB time can be decreased with expertise in anterolateral thoracotomy.

Dabritz S et al shows in their study that Limited right anterolateral thoracotomy has a high cosmetic acceptance and was proven to be safe and effective for closure of any kind of atrial septal defects. Therefore, it is recommended as standard approach for atrial septal defects especially in female patients.⁴ The study was limited to female patients only but in present study we had selected both the sexes randomly and results come to be similar for both male and females.

Massimo et al studied the outcome after operation for atrial septal defect Through a right anterolateral thoracotomy.³ They concluded in their study that the major indication for this approach rather than median sternotomy was cosmetic reasons, while in our study, it shows also significantly decrease in morbidity along with better cosmesis post operatively.

An unsightly scar in the middle of the thorax may cause psychological disturbance, especially in young female patients. They describe that the traditional operation via median sternotomy helps in healing the cardiac pathology but it gives frustration because of a long midline scar that is why they described the right anterolateral thoracotomy

approach for ASD is a better alternative because of the limited extension of the scar.

Liu YL et al studied that the right lateral thoracotomy incision is a safe and effective alternative to a median sternotomy for correction of cardiac defects in children as they seen the advantages of this approach compared with median sternotomy are less injury, maintenance of the continuity and the integrity of the bony thorax.⁷ The scar is less visible; hence, the cosmetic result can meet patient expectations. Their procedure is consistent with the idea of minimal invasive surgery. Their study is limited to children in comparison to our study which includes both sexes with all age groups.

Grinda JM et al studied that the ALT approach allows satisfactory cosmetic treatment of differing types of ASD with the utmost security which is similar to results produced in our study.¹

CONCLUSION

Surgical treatment of ostium secundum ASD using right anterolateral thoracotomy approach has an acceptably low operative risk and good post-operative outcome in terms of decreased morbidity (ICU and hospital stay) and better cosmetic results.

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Ethical approval: The study was approved by the institutional ethics committee

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