Original Article

Repair of Atrial Septal Defect Through a Right Anterolateral Thoracotomy: A Cosmetic and Safe Approach

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Abstract

Background: The operation for atrial septal defect (ASD) is considered a low risk procedure; the cosmetic result has become an important feature. For this reason the anterolateral thoracotomy is frequently used for closure of ASD. However, difficulty in aortic and caval cannulations to establish cardiopulmonary bypass (CPB) makes it rather awkward for some surgeons.

Methods: We reviewed the short term results of a consecutive series of 17 patients in whom the atrial septal defect was closed through a right anterolateral thoracotomy.

Results: The average cardiopulmonary bypass time was 36 minutes (range 22 to 53 minutes), with mean aortic cross clamp time of 21 minutes (range 12 to 44 minutes). There was no preoperative or late mortality. The majority of patients are pleased with their cosmetic results. There were no other late complications. The mean age at operation was 27 years (range 4 to 53 years), and the mean body weight was 51 kg (range 14 to 155 kg). All the repaired defects were secondum type ASD.

Conclusion: Atrial septal defect can be safely repaired through a right anterior thoracotomy approach, with cosmetic results of avoiding median sternotomy.


Keywords: Atrial Septal Defect ● Right Anterolateral Thoracotomy ● Open Heart Surgery

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Introduction

Currently, closure of atrial septal defect has become a routine and safe procedure that is often performed in young, asymptomatic patients. Nowadays the cosmetic results of this operation have become an important feature, especially for female patients. Surgical approaches for this operation include median sternotomy, the lower ministernotomy, transxiphoid approach without sternotomy and right thoracotomy. A right anterolateral thoracotomy approach has gained acceptance owing to its cosmetic superiority with acceptable exposure and safety. However due to difficulty in aortic and caval cannulations some surgeons are reluctant to use this incision. We believe that this approach is safe and adds no extra-risk to the operation. In this study, we reviewed the short term results of a consecutive series of 17 patients in whom the ASD was closed through a right anterolateral thoracotomy.

Methods

Between 2007 and 2008, 17 patients underwent ASD closure through a right anterolateral thoracotomy approach. The mean age at operation was 27 years (4 to 53 years), and the mean body weight was 51kg (14 to 155 kg). All repaired Defects were secondum type ASD. Follow up was available in all patients through outpatient clinics. The patient was placed in the supine position with about 30° elevation of the right side. The anterior or anterolateral thoracotomy was created by a curvilinear incision underneath the inferior border of the pectoralis major muscle at the inframammary fold. The incision was made from 2 to 3 cm medial to the sternum and then extended superiorly towards the anterior axillary line. The chest was then entered through the fourth intercostal space. The pericardium was opened longitudinally 1cm anterior to the phrenic nerve. Pericardial stay sutures were put on traction. The two top pericardial traction stitches were sutured to the costal cartilages to elevate the aorta into the operative field. Two row of pursestring sutures were put around the aorta using 3/0 ethibond sutures, then the aortomy was made and cannulation performed. After bicaval cannulation and cardioplegic cannula insertion in the asending aorta and passing the tapes around the superior and inferior vena cavae cardiopulmonary bypass is instituted and maintained with mild hypothermia (32°C to 33°C). After infusion of cardioplegia solution, the right atrium (RA) was opened. Atrial septal defect was closed with a patch or direct suture depending on the size of the defect. After the atriotomy is closed caval snares are removed and deairing is done using an aortic needle vent. Cardiopulmonary bypass was discontinued and all cannulas were removed. After placement of the pericardial and pleural drains the thoracotomy wound was closed in a routine fashion with a subcuticular continuous suture for the skin layer. No patient required blood products during or after the operation.

Results

The average bypass timed was 35 minutes (22 to 53 minutes) with an average clamp time of 21 minutes (12 to 44 minutes). Mean postoperative bleeding was 281cc (15-630cc). There was no operative or late mortality. There was no in-hospital morbidity except for a case of subcutaneous emphysema that was managed conservatively. During the follow-up period there were no readmissions to hospital. The standard 12-lead electrocardiogram showed no abnormality. Echocardiographic study showed that there were no patients with residual ASD. There were no patients who had a complication of thoracic asymmetry. The majority of patients were pleased with their cosmetic results. There were no other late complications.

Discussion

The median sternotomy is the standard approach for most intracardiac operations. However an unsightly midline scar can cause psychological distress in young female patients. Principally for cosmetic reasons alternative operative approaches have been developed with better aesthetic results. Komai and associates described a lower small midline skin incision with minimal sternotomy approach. Barbero-marzial and associates recommended a transxiphonid approach without sternotomy approach without sternotomy for ASD closure. Both groups reported that all patients had a favorable outcome, but the restrictive exposure of the heart
through the small incision turns a simple and safe operation into a technically difficult procedure that entails potential risks such as injury to the great vessels and air embolism. Moreover the long term fate of skin scar formation and protrusion of the sternum which was retracted strongly during operation are unknown. Anterolateral thoracotomy is one of the most frequently used incisions for closure of ASD in young female patients. This approach yields excellent visualization and cosmesis for adult female patients. However it is very difficult to determine an adequate skin incision in prepubertal patients because the quantum of the breast growth in individuals cannot be predicted exactly. Therefore anterolateral thoracotomy skin incision frequently crosses the future breast line which may cause breast and pectoral muscle maldevelopment. Decreased nipple sensitivity and permanent anesthesia of the lower part of the right breast have also been reported. Grinda and associates and massetti and associates recommended delaying the operation until puberty to avoid a too high incision on the breast with the potential risk of mammary atrophy. We have used the anterolateral thoracotomy as a procedure of choice for ASD closure in this series of patients. Surgical access to the ascending aorta and the venae cavae was adequate and none of the patients required femoral cannulation. Although electrical fibrillation is possible we prefer cardioplegic arrest with aortic clamping, because of it’s well established safety. Our technique may be slightly more difficult than standard midsternotomy. One step in this operation is the complete and careful release of air from the left heart cavities. After the ASD is closed, an aortic needle vent is opened to remove air from the aortic root. No cerebral or myocardial infarction caused by air embolism were observed in our series. The anterolateral thoracotomy approach has potential risks of pain and breast malformation compared with median sternotomy. We presume that the incidence of postoperative pain is Low in the younger patients, and that the pain can be controlled with low dose analgesics. None of our patients had intractable pain after the operation. There were no patients who had complication of breast asymmetry, although we need longer follow up to confirm this. In summary, we have used the anterolateral thoracotomy as the procedure of choice for ASD closure with excellent long-term results. Anterolateral thoracotomy can be used in all female patients, irrespective of their age, with careful curvilinear incision at the inframammary fold because this approach offers the benefit of a total absence of sternotomy and scarring in the anterior chest wall.

**Conclusion**

Atrial septal defect can be safely repaired through a right anterior thoracotomy approach, with cosmetic results of avoiding median sternotomy.

**References**