

Original Article

Repair of Atrial Septal Defect Using Pedicled Right Atrial Wall Flap — A Retrospective Observational Study of a Novel Surgical Technique in a Tertiary Care Hospital in Eastern India

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Introduction : In our institute, we have used the pedicled right atrial wall flap as an alternative to a free patch to close Atrial Septal Defect (ASD) in a series of patients. We hereby, report its results.

Methods : Between January, 2016 and September, 2018, 24 patients (mean age 25.2 ± 12.43 years; range 5 years to 51 years), underwent closure of ASD with pedicled right atrial wall flap. All the patients who underwent this procedure had ostium secundum type of ASD without any other Intra-cardiac anomaly.

Results : The intraoperative and postoperative period was uneventful in all the patients. The mean aortic cross-clamp (X-clamp) time was 13 ± 2.99 minutes (Mean \pm SD) and the mean duration for Cardiopulmonary Bypass (CPB) was 46.5 ± 10.23 minutes (Mean \pm SD). There was no mortality. All the patients were discharged either on 3rd or 4th postoperative day. The pre-discharge and latest follow-up Transthoracic Echocardiographic Evaluation was found satisfactory in all the patients. None of them revealed any residual shunt, peri-flap Thrombosis, Flap dehiscence or shrinkage, or Cardiac Dysfunction.

Conclusions : The Pedicled Right Atrial Wall Flap can be safely used as an alternative for pericardial patch for ASD closure. It is a novel technique with several advantages.

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Key words : Atrial septal defect, Ostium secundum, Pedicled right atrial wall flap repair.

Atrial Septal Defect (ASD) is one of the most common congenital Cardiac anomalies. Over time, there has been a lot of advancement in the procedure for ASD closure. This includes conventional Open-Heart Surgeries through Median Sternotomy or Minimally Invasive Approach or even device closure through Percutaneous Approach. Different materials are used as patch for closing the ASDs. Commonly autologous pericardial patch is used. But other materials such as Bovine Pericardium or synthetic materials such as Dacron are also used as patches for ASD closure. But none of these patches are not without complications. Patch related complications such as Patch Dehiscence, Peri-patch Thrombosis, Haemolysis, and infective Endocarditis has been reported. In our technique we have used a Pedicled flap of the Right Atrial Wall for closure of ASD. As the right atrial wall has the same consistency as that of the atrial septum, the repaired inter-atrial septum is of

Editor's Comment :

- Surgical closure of atrial septal defect can be safely done using a pedicled right atrial wall flap instead of the conventionally used materials like autologous pericardium or Dacron.
- This new technique has several advantages over the currently used techniques & has shown promising results.

homogenous consistency at the site of the defect. Moreover, with the right atrial flap being pedicled, it is living tissue which has the capacity for future growth and problems such as patch dehiscence or shrinkage does not occur. Since the inner surface of the atrial wall has a smooth endothelial cell lining, complications such as Thrombosis or Infective Endocarditis, are also less likely to occur. Our technique also helps in reducing the overall size of the grossly enlarged right atrium that occurs due to the ASD.

MATERIALS AND METHODS

All Patients presenting with ASD in the Out-patient Department (OPD) of Cardiothoracic & Vascular Surgery at IPGME&R and SSKM Hospital Kolkata, who had indications of Surgical closure and who were in Sinus Rhythm were selected for our new Surgical technique. We had excluded critically ill patients, those having symptoms of Advanced Heart Failure and haemodynamically unstable patients.

The study period was between January, 2016 and

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September, 2018. In our study we had twenty-four patients who presented with Ostium Secundum type of ASD, who underwent closure of the defect using our novel Pedicled Right Atrial Wall Flap technique. None of our patients had any other associated Intra-cardiac Anomaly. All the patients presented with shortness of breath on exertion. Two patients had mild to moderate Pulmonary Artery Hypertension. None of the patients had Congestive Heart Failure.

The parameters such as patients' age, gender, operative data such as X-clamp & CPB durations, postoperative details such as details of morbidity/mortality, duration of postoperative stay/ discharge from hospital and follow-up data such as duration of follow-up and details of any delayed postoperative complications like Arrhythmia, Patch Dehiscence, thrombosis etc. were studied. Ours was a retrospective observational study. Analysis of data was done using standard statistical analysis.

Operative Techniques : Through a median sternotomy approach, assessment of the Cardiac Anatomy was done. After aortic and direct bi-caval cannulation, standard normothermic total Cardiopulmonary Bypass (CPB) was established. The aorta was cross-clamped and myocardial protection was achieved with standard antegrade St Thomas-II blood cardioplegia and topical ice slush/ ice-cold saline. Thereafter the Right Atrium was opened through a small stab incision after adequately snugging the caeve. The Right Atrial incision was then extended in such a fashion, to create a pedicled flap. This was done by an oblique atriotomy incision parallel to and about 1 cm away from the Atrioventricular Groove and reaching upto 1cm from the Sondergaard's Groove and another incision extending vertically down (on surgeon's perspective), reaching up to 1 cm away from the Sondergaard's Groove (Inter-atrial Groove). The base of the flap which was parallel to and approximately 1 cm away from the Sondergaard's Groove was left intact, as its wide pedicle (Fig 1; Image A-D).

The size of the flap was roughly the size of the ASD. The flap was then sutured around the margins of the ASD using 4-0 or 5-0 polypropylene (depending on the

thickness of the Right Atrial Wall). The suturing was started from the postero-inferior end of the flap with the corresponding postero-inferior margin of the ASD, then continued forward and upward, all along the anterior margin of the defect & then finally backwards over the superior margin until the end of the flap-incision was sutured securely to the supero-posterior margin of the ASD. Prior to placing the suture knots, de-airing of the Left Atrium was done as per standard technique. Suturing of the posterior margin of the defect was not required as it remained enclosed within the wide pedicle of the flap (Fig 1; Image-E).

The Tricuspid Valve was assessed for presence of any regurgitation by infusing saline into the right ventricle. When satisfied, closure of the Atriotomy followed. The closure of the Right Atriotomy Incision was done by suturing the cut margins of the Right Atrial Wall with the Posterior Wall of the right atrium along the groove of Sondergaard. This technique not only helped in closing the Atriotomy but also reduced the size of the usually grossly enlarged Right Atrium in a heart with ASD. The Atriotomy was closed in a single layer, in continuous suturing technique using 4-0 or 5-0 polypropylene sutures. The same suture that was used for closing the ASD could be used for closing the Atriotomy after completion of knotting (Fig 1; Image-F).

After standard de-airing, the aorta was unclamped,

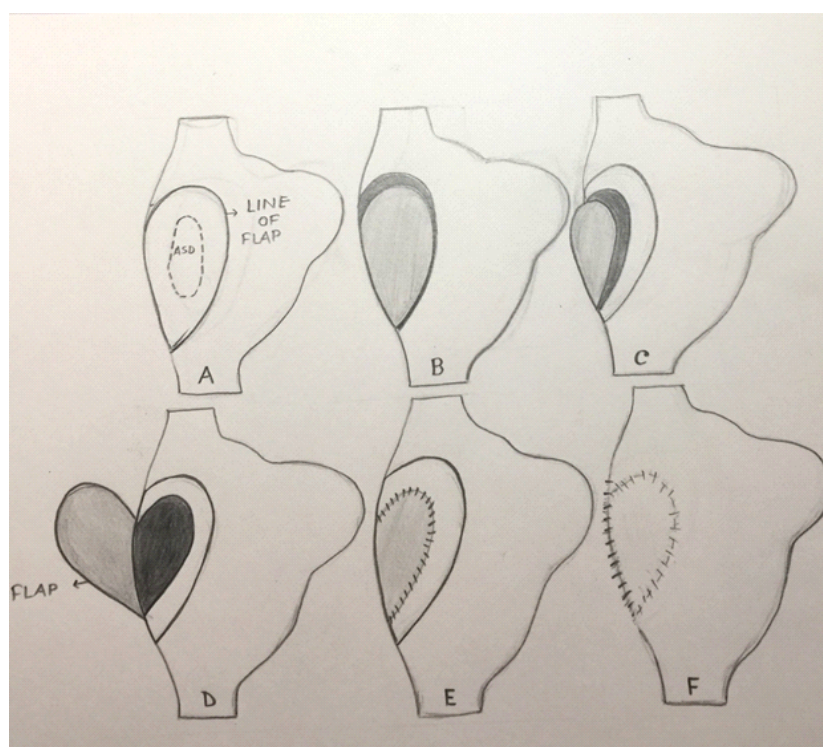


Fig 1

and the patient was weaned from CPB. Intraoperative assessment of the repair was done using Transoesophageal Echocardiography (TEE).

All the patients were re-assessed by Transthoracic Echocardiography prior to their discharge. The repair of the defect and the Cardiac functioning was found to be satisfactory in all the patients. All the patients were discharged either on the 3rd or 4th postoperative day, the mean was 3.7 ± 0.46 days (Mean \pm SD). All the patients received diuretics for 3 months after surgery. Two patients who presented with mild to moderate Pulmonary Arterial Hypertension (PAH) were prescribed sildenafil at the time of discharge. There was no mortality.

RESULTS AND ANALYSIS

All our patients were isolated cases of ostium secundum type of ASD without any other associated Cardiac anomaly. Two patients presented with mild to moderate PAH and none of them had features of Congenital Cardiac Failure. There were 7 male patients (29.16%) & 17 female patients (70.83%). The mean age was 25.2 ± 12.43 years (mean \pm SD) and range was 5 to 51 years. All our patients had an uneventful intraoperative period. The mean aortic cross-clamp time was 13 ± 2.99 minutes (Mean \pm SD) and the range was 8 minutes to 18 minutes. The mean duration for CPB was 46.5 ± 10.23 minutes (Mean \pm SD) and the range was 30 minutes to 65 minutes.

The postoperative period was also uneventful in all our patients. The patients were discharged on 3rd or 4th postoperative day; the mean was 3.7 ± 0.46 days (Mean \pm SD). We had no mortality. Prior to discharge, the surgical repair was reassessed using Transthoracic Echocardiogram in all the patients. The repair was found to be satisfactory in all the patients. There was no residual shunt, Peri-flap Thrombosis or Cardiac dysfunction in any of the patients.

Follow-Up: All the patients were followed up in Outpatient Department after 1 month, 3 months, 6 months and thereafter, yearly intervals. The patients were assessed clinically, and investigations such as Electrocardiograms, Chest X-ray & Echocardiograms were done in each follow up. The mean duration of follow-up was 27.66 ± 10 (Mean \pm SD) and it ranged between 13 months to 4 years. In 3 patients (12.5%) were followed up for 4 years or more, 11 (45.83%) were followed up for 2 years or more, and 10 (41.66%) were followed up for less than 2 years. Overall, we had a 100% follow-up and it was satisfactory in all patients.

All patients had Sinus Rhythm in ECG. The

Echocardiographic examination, which was done in all the patients, in their latest follow-up showed normal Cardiac functioning without any evidence of flap Dehiscence or shrinkage, neither was there any Thrombosis around the flap. The thickness of the flap at the repair site was like the rest of the Interatrial Septum. All were in New York Heart Association (NYHA) functional class-I and there were no Thromboembolic complications.

DISCUSSION

Talwar *et al*¹ had advocated that free right atrial wall was a suitable patch material to close large ASDs. They also concluded that the Right Atrium is generally large in these patients and obtaining a patch of Atrial wall is easy without compromising on the right Atrial volume. The advantages of using this patch have been the avoidance of prosthetic material, viability, absence of tissue reaction and ease of handling and elasticity^{2,3}. The endothelialized surface of the right Atrial patch, which is positioned toward the left atrium, may provide freedom from Thromboembolic complications.

Darcin *et al*³ concluded in their study that Autologous right atrial patch is an ideal material for ASD closure, especially in patients having a large right atrium. A complete coaptation was achieved because of the muscular nature of the right atrial tissue and its thickness, which is a closer match to the atrial septum than other materials.

CONCLUSION

It is evident from this study that the novel surgical technique of closure of ASD using a pedicled flap of the right atrial wall in an excellent alternative to the currently used surgical techniques. It had several advantages over the conventionally used patches such as pericardium or Dacron. The advantages included but not limited to, easy tissue handling and minimal tissue reaction, avoidance of thrombus formation around the patch, no evidence of patch dehiscence or new onset arrhythmia. On follow-up all our patients had excellent prognosis.

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