

EFFECT OF AGE ON INCIDENCE OF ATRIAL FIBRILLATION AFTER SURGICAL CLOSURE OF ATRIAL SEPTAL DEFECT TYPE II IN ADULTS

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Contribution

RT conceived, designed and did statistical analysis. AK and AN did data collection. AK did review and final approval of manuscript. All authors contributed equally.

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ABSTRACT

Objective: To determine the effect of age on incidence of atrial fibrillation (AF) after surgical closure of atrial septal defect type II (ASD type II) in adults.

Methodology: It was a cross-sectional, study conducted from 1st May 2013 to 31st October 2015 at Department of Cardiac Surgery and Anesthesiology, National Institute of Cardiovascular Diseases (NICVD), Karachi. Adult patients of both genders between the age of 19 to 50 years who underwent isolated surgical patch closure of ASD type II were included in the study. They were divided into two groups according to their age; in group I the patients' ages ranged from 19-34 years and in group II the patients' ages ranged from 35-50 years. The effect of age on the occurrence of postoperative atrial fibrillation was analyzed.

Results: The study included 86 patients who underwent surgical patch closure of ASD type II. There were 47 patients (55%) in the age range of 19-34 years in group I and 39 patients (45%) in the age range of 35-50 years in group II. In Group I none of the patient had preoperative or postoperative AF. In group II three patients - a 45 year old male, 49 and 50 years old females developed AF postoperatively. There was a significant difference in the occurrence of postoperative AF between the two groups ($p < 0.05$).

Conclusion: Increasing age was a risk factor for occurrence of postoperative atrial fibrillation in patients who underwent ASD type II surgical patch closure.

Key Words: Atrial septal defect type II, Surgical patch closure, Atrial fibrillation,

INTRODUCTION

Atrial septal defect (ASD) is a non-cyanotic congenital heart defect with incidence of 10-15%.¹ ASD is usually diagnosed at adulthood and presents with exertional dyspnea or fatigue, then patients may develop atrial fibrillation (AF), right heart failure, paradoxical embolus or transient ischemic attack, and cyanosis.³ This defect may progress to cardiac failure following the onset of pulmonary hypertension, arrhythmias, respiratory infections.

AF is one of the common complications of an ASD. A large study from Ontario, demonstrated the prevalence of AF was 19% in adults with ASD. The incidence of AF is related to age and continues to increase with age which is associated with the long-standing haemodynamic derangements due to left-to-right shunting causing atrial stretch, right ventricular dilatation, elevated pulmonary arterial pressure and atrioventricular valve regurgitation. The resultant atrial electrical remodeling with increased dispersion of atrial refractoriness may predispose to AF. However, patches and sutures in surgically closed ASD may also play role in development of AF. ASD closure can be performed surgically or percutaneously with minimal morbidity. Cardiopulmonary bypass has been utilized during the surgical closure of ASD since 1953.⁴⁻⁸ Surgery is recommended even in middle aged and elderly patients with significant left to right shunts. Surgical options for ASD closure are patch versus primary closure. Early surgical repair showed good long-term outcome compared to less favorable results especially if surgery is done after 40 years of age.⁹ A study performed in patients older than 40 years documented morbidity but not mortality after surgical ASD closure. However, some small studies documented improvement in symptoms in patients older than 60 years after surgical closure of ASD. Therefore, the benefits of closure in adults, especially in advanced age, remained uncertain.^{10,11} To determine the effect of increasing age on incidence of AF after surgical closure of ASD type II we conducted this retrospective study in our local population.

METHODOLOGY

It was a cross-sectional, descriptive, retrospective study conducted from 1st May 2013 to 31st October 2015 at Department of Cardiac Surgery and Anesthesiology, National Institute of Cardiovascular Diseases (NICVD), Karachi. Patients were divided into two groups according to their age.

Those with co-existing valvular or other congenital heart diseases, anomalous pulmonary venous return, coronary artery disease, ejection fraction less than 50%, systemic hypertension, chronic obstructive pulmonary disease, diabetes mellitus, renal disease and cerebrovascular disease (stroke/TIA) were excluded. The effect of increasing age on the occurrence of postoperative atrial fibrillation in

patients with age between 19 to 50 years who underwent surgical patch closure of ASD Type II was analyzed. Data including demographic factors, peri-operative findings were retrospectively collected and analyzed using SPSS version 16.0.

Informed consent was obtained for ASD Type II surgical patch closure for all patients. Detailed history, physical examination and investigations including echocardiography were done in all patients. Preoperatively 12 lead ECG was done in all patients to document the presence or absence of atrial fibrillation. Surgical closure of ASD Type II was performed under general anesthesia with invasive and non-invasive monitoring. Trans-esophageal echocardiography (TEE) was done after induction of anesthesia. ASD Type II was surgically closed using standard (bicaval and aortic cannulation) cardiopulmonary bypass and antegrade blood cardioplegia was used. Autologous pericardial patch with continuous stitches was used for closure of ASD type II. After closure of ASD Type II, TEE was done to confirm absence of any residual ASD. Patients were weaned off cardiopulmonary bypass (CPB) smoothly and haemostasis was then secured. Following surgery patients were shifted to the intensive care unit. All patients were extubated on same day. Postoperatively 12 lead ECG was done for three consecutive days to document the presence or absence of atrial fibrillation. Patients were shifted to the surgical ward and were then discharged from surgical ward after doing echocardiography. Frequencies and percentages were used to present qualitative data which included gender, risk factors, ECG finding and mean and standard deviations were calculated. Significant p value was set for $p < 0.05$.

RESULTS

About 86 patients including 31 (36%) male and 55 (64%) female were included in the study. They were divided into two groups according to the age. There were 47 (55%) patients in the age range of 19-34 years in group I, and 39 (45%) patients aged 35-50 years in group II. None of our patients in both groups had hypertension, chronic obstructive pulmonary disease, ejection fraction less than 50%, diabetes mellitus or renal failure (Table I).

In both group I and group II no patient had preoperative atrial fibrillation. Patients in group I and group II had preoperative moderate pulmonary artery hypertension. The mean pulmonary artery pressure before surgery was 42.3 mmHg (range: 41-46 mmHg) in group I and 46.1 mmHg (range: 45-53 mmHg) in group II. All patients in both groups had large sized (> 30 mm) ASD Type II defects which were closed with an autologous pericardial patch. None of our patients had anomalous pulmonary venous return. Intraoperative transesophageal echocardiography and postoperative trans-thoracic echocardiography documented no residual ASDs. There was no in hospital death in our study. Postoperatively in group II three (7.69%) of our patients

developed atrial fibrillation which included a 45 year old male, and 49 and 50 years old females (Table 2). In group I, no patient had preoperative or postoperative AF. There was a significant difference in the occurrence of postoperative AF

between the two groups ($p < 0.05$). The mean postoperative ICU stay was 1.5 ± 0.5 days for group I and 2 ± 1 days for group II. Postoperative hospital stay was 4 ± 1 days for group I and 5 ± 1 days for group II.

Table 1: Baseline Variables of Study Population (n=86)

Variables	Group I (19-34 years) 47 patients (55%)	Group II (35-50 years) 39 patients (45%)
Pulmonary Artery Hypertension	Moderate	Moderate
Ejection Fraction	Greater than 50%	Greater than 50%
Chronic Obstructive Pulmonary artery Disease	Absent	Absent
Diabetes Mellitus	Absent	Absent
Chronic Renal Failure	Absent	Absent

Table 2: Preoperative and Postoperative AF in Study Population (n=86)

ASD-II	Pre-operative AF		Post-operative AF	
	Present	Absent	Present	Absent
Group I	00	47	00	47
Group II	00	39	03	36
Total	00	86	03	83

DISCUSSION

Atrial septal defect is a common congenital heart defect, with prevalence of 1.6 per 1000 live births and a 97% probability of survival into adulthood.^{12,13} ASD type II constitutes about 75% of these defects, has a female predominance of approximately 2:1.¹⁴ In our study there were 31 (36%) male and 55 (64%) female patients.

Advances in surgical technology over the last quarter century have resulted in better patient outcomes following surgical closure of ASD type II. Surgical repair is the standard treatment modality for the closure of secundum ASD.^{4,15} For ASD type II repair pericardial or synthetic patch is preferred over a direct closure. They can be treated early in life, but usually remain asymptomatic till adulthood and most will then become symptomatic from the third or fourth decade. Supraventricular tachycardia (SVTs) is a common first clinical manifestation of an ASD type II in patients over 40 years.¹¹ Eventually, right-sided heart failure can develop, often with elevated pulmonary arterial pressure (PAP).¹⁶⁻¹⁸ In patients with ASD the incidence of AF is 15-40% in the 30-35 year old patients.¹⁹ In our study in group I (19-34 years old) no patient had preoperative or postoperative AF. In group II (35-50 years old) no patients had preoperative AF but three (7.69%) patients developed postoperative AF. In our study, ASD was closed with pericardial patch in all patients. Atrial fibrillation is a cause of morbidity in adults with an atrial septal defect. The risk of atrial fibrillation in adults with atrial septal defect is related to the age at the time of surgical repair

and the pulmonary arterial pressure. In un-operated adults, the estimated incidence of AF is approximately 10% under the age of 40, rising to at least 20% with increased age.¹⁷ To reduce the morbidity associated with AF, the timely closure of atrial septal defect is suggested.²⁰ In our study, the incidence of postoperative atrial fibrillation was higher in group II (35-50 years) compared to group I (19-34 years) as three patients in group II develop AF whose ages were 45, 49 and 50 years. Our study is supported by other studies which showed that the incidence of AF is higher in the older age group so, surgery should be done at a younger age prior to development of structural changes in the myocardium or pulmonary vasculature.¹⁸ Studies showed significant morbidity and mortality if surgical ASD closure done at advanced age. The incidence of AF one of the major causes of morbidity in patients with ASD is closely related to age.²¹ Among patients who underwent closure in childhood or early adolescence, AF is rare during long-term follow-up. Those with a history of SVT or PAH and those treated later in life, especially at ages over 40 years, remain at increased risk of developing postoperative AF. After surgery, AF occurs more frequently in patients older than 40 years at the time of intervention.²¹⁻²⁶ Surgical ASD closure in pediatric patients has good postoperative outcomes. However, although surgical closure of ASD type II is recommended in adult or elderly patients, they are at an increased risk for developing postoperative atrial fibrillation.^{9-11,24,28} In the longest follow-up studies of the surgical patients, freedom from AF is good for those whose ASD was repaired at a young age. On the other

hand, the risk of AF is much higher for older patients, especially those undergoing closure over the age of 40 years. In our study we found no residual shunts and there was no mortality; similar results being demonstrated in other studies.^{7,8,20-23,24-32} Postoperative follow-up should include ECG surveillance for SVTs (AF), and echocardiographic assessment of residual shunts, right ventricular size and function and pulmonary artery pressure. The etiology of persistent or new-onset atrial arrhythmias following surgical repair of ASD in adults is the extent of residual right atrial dilatation and surgical scars (from the ASD repair) in the right atrial free wall.^{33,34} Indexed right atrial area remains increased after ASD repairs in adults and the decrease in right atrial area is inversely proportional to the patient's age at the time of the ASD closure.^{35,36} Following ASD closure, there is a rapid decrease in right ventricular and right atrial volumes, but this improvement is not universal.^{37,38} Cardiac geometric reverse remodeling is reduced in older patients.³⁰ Our study has a limitation that our results are based on early postoperative outcomes.

CONCLUSION

Thus it was concluded that increasing age was a risk factor for occurrence of postoperative atrial fibrillation in patients who underwent ASD type II surgical patch closure.

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