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Atrial septal defect repair; our early and mid-phase results

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ABSTRACT

Objective: Atrial septal defect is one of the most commonly encountered ngenita art seases in adults. The effect of age of the patient to the surgery is disputable. Th urpose of thi ort was to evaluate surgical repair in patients with ASD who are operated in our cli

Methods: Total 40 patients were subjected to surgical repair due to ASD Yuksek htisas Education and Research Hospital between February 2006 and April 2009. Twe seven he p ents were female and 13 were male, their ages differed between 8 and 71 and mea ge of the pa was 33.70±14.04.

Result: Operative mortality did not occur. Two of our patients h onary arterial disease in addition to ASD. ASD repair was performed together with coronary bypass surgery. ing of ASD resulted in an increase in left ventricular ejection fraction, and a decrease in pulmonary arte pressure and cardiothoracic ratio. Recovery in the functional capacity was observed st-surgery accord g to NYHA.

Conclusion: In this series, surgical results of the patie of various ages, with ASD closed were positive.

KEY WORDS: Atrial Septal Defect, Age, Surgical Repair. ult Conge al Heart Disease.

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INTRODUCTIO

Secundum atrial septal d ct (AS the third most common congenit cardiac pathology in adults, after bicuspid valve and mitral valve prolapse cons utes % of congenital heart diseases an is more fre ntly observed in women tha nen.[1] Although patients with ASD can only live up to 35-49 years with medical treatment, asymptomatic patients who live up to 80 years are also reported.[2] But long life is disputable in patients older than 45 years who are operated.[3] Although most of the ASD patients in their twenties are asymptomatic, a decrease in effort tolerance can occur in thirties and forties related to right heart deficiency and arrhythmia. It is beneficial to perform the procedure before these complications develop. Surgical treatment decreases pulmonary arterial pressure and prevents the development of right heart deficiency by removing pressure overload on right.

Although ASD can be closed with percutaneous transcatheter procedure, surgery may be required due to complications such as residual shunt, dislocation and vascular complications. Mortality of the surgery differs between 1-2% and post-surgery recurrence is below 2%.[4]

METHODS

Forty patients were operated in Van Yuksek Ihtisas Education Research Hospital, due to ASD

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between February 2006 and April 2009. After pre-surgery physical examination, routine check-ups and echocardiography evaluations of patients, right heart catheterization was performed. Coronary angiography was also performed to patients older than 50 years in order to determine whether they had coronary arterial disease. The ratio of pulmonary flow to systemic flow was higher than 1.5 in all the operated patients.

Perfusion was started by performing aortic and bicaval venous cannulation after median sternotomy. Following cross clamp, diastolic cardiac arrest was induced by administration of antegrade cardioplegia and myocardium was protected by repeating this every 20-25 minutes. Vent cannula was insertedthrough right superior pulmonary vein for left heart decompression. Right atriotomy was performed by tightening snares around caval cannula and applying moderate hypothermia (28-32°C). Pericardial patch was preferred in cases where patch was required.

Pericardium was used after it became rigid by soaking it for 20 minutes in specially prepared 0.6% glutaraldehyde solution. Patients were followed between 3 months and 2 years (Mean 15 mo[illegible]). Pre- and post-surgery New York Heart Associa[illegible] (NYHA) functional classification, cardiothora[illegible] rates and pulmonary arterial pressures wer[illegible] compared. Student t-test and chi-s[illegible]est were used for statistical analysis. P<[illegible]05 v[illegible]e was accepted as significant.

RESUL[illegible]

Twenty seven of ou[illegible]atients were [illegible]male and 13 were male, t[illegible]r [illegible]s were between 8 and 71 and mean ag[illegible] was 3[illegible]±14.04 (Table-I). Main complaints [illegible] our patient[illegible]ere difficulty in breathing, [illegible]nycardia and chest pain and there were n[illegible]ympt[illegible]s in three patients. Atrial fibrillation (AF[illegible] [illegible]resent [illegible] the ECG of two of our patients older t[illegible] 50 v[illegible]s. Pulmonary venous return[illegible]ly was p[illegible]t in three patients with sinu[illegible]enosu[illegible]ype defect. Coronary arterial disease was [illegible]cte[illegible]onary angiography of 58 and

Table-I: Patient distribution according to age groups.

Age group (years)	*No. of patients*	*Percentage*
8-15	4	10
16-20	6	15
21-30	5	12.5
31-40	8	[illegible]0
41-50	9	[illegible]2.5
50 and above	8	20

63 years old pati[illegible] ASD closure and coronary bypass was p[illegible]forme[illegible] the sa[illegible] session (LİMA-LAD) to b[illegible] The ratio [illegible]monary blood flow to syste[illegible]lood flow va[illegible] between 1.5 and 3.6 and m[illegible] si[illegible] ratio was 2.1± 0.5. The size of atrial septal defects v[illegible]d between 1.7 cm and 4.3 cm and m[illegible] defect size w[illegible].5±0.6 cm.

While the repair was performed with patch graft in 8 patients, primary repair was performed [illegible]32 patien[illegible] Also Devega or Kay annuloplasty w[illegible] perfor[illegible]d in three patients with advanced tricu[illegible]sufficiency. Total perfusion duration of patients varied between 28 and 75 minutes and [illegible] duration was 41.17±4.5 minutes; and cross-clamp durations varied between 14 and 58 minutes and mean duration was 23.78±10.3.

In post-operative period an increase in EF occurred in all of our patients. While pre-operative functional capacity mean class (NYHA) was 2.3±0.4,post-operative value was 1.3±0.5 and it was statistically significant (P<0.05). Significant recovery occurred in NHYA Functional capacity and pulmonary arterial pressure of our patients in post-operative period (P<0.05) (Table-II).

DISCUSSION

Although growth retardation in patients with atrial septal defect draws attention, their early childhood period generally passes without symptoms. But in medium and large defects, symptoms such as effort intolerance can start in

Table-II: Comparison of pre- and post-surgery functional capacity, pulmonary arterial pressure and cardiothoracic rate.

	Pre-operative value	*Post-operative value*
Mean NYHA Functional capacity	2.3±0.4	1.2±0.3
Mean pulmonary arterial pressure (mmHg)	49.75±14.12	34.2±10.9
Mean cardiothoracic rate (%)	68±6	54±4

childhood and become evident again in twenties; and other symptoms start in thirties. Cardiac insufficiency rarely encountered in infancy and early childhood is more frequent after the age of 45 years.[5] Deaths in patients with ASD result generally from right ventricular insufficiency or tachycardia. Left ventricular insufficiency can also develop related to right ventricular dysfunction and can be one of the causes for mortality. All ASD patients with a shunt ratio of 1.5 or over should be operated to prevent complications like pulmonary hypertension and right ventricular insufficiency related to volume overload.

Defects in interatrial septum are defined as primum or secundum depending on the region. Primum type defects are included in the present day in another anatomopathologic classification as incomplete atrioventricular canal defect.[6,7]

Whatever the anatomical localization of ASD may be in interatrial septum, its physiological effects originates from flow of blood from left atrium to right atrium. Relative compliances of two ventricles rather than the size of ASD are important on the size of shunt. Shunt is minimal during infancy because both ventricles are hypertrophicly and relatively noncompliant. As the compliance of right ventricle will be relatively more than the left ventricle with the child grows, shunt will grow towards right.

Increase of left to right shunt in patients with ASD results probably in an increase in right ventricular dysfunction and troponin level. Because right ventricular dysfunction and resultant subacute myocardial necrosis may develop in patients with ASD; even elderly ASD patients should be operated.[8] The prevalence of AF in ASD patients is strongly related to the level of mitral and tricuspid regurgitation.

Mitral regurgitation is more frequent in ostium primum type ASD patients. But it can also be found in ostium secundum and sinus venosus type defects. Mitral insufficiency increases in patients with ASD due to age related deterioration in geometry of left ventricle, shortening in chord, fibrosis and mitral annulus degeneration.[9]

The relationship between tricuspid insufficiency and ASD is not as strong as the relationship between mitral insufficiency and ASD. But in adult patients with ASD, this condition might not be seen. Moderate or serious tricuspid regurgitation may be found in one fourth of the patients. This can be related to abnormal leaflet structure or myxomatous degeneration. But it is most frequently related to annular dilatation or hemodynamic disorder of right ventricle. Mitral or tricuspid valve insufficiency should be repaired while ASD is closed in order to decrease development of late AF that might occur as a result of these.[9]

Pulmonary vascular disease develops at last in 20-25% of the children with ASD. If it doesn't develop until the age of 20, the probability of development later is lower. While right ventricular dysfunction and tricuspid insufficiency develops in elderly patients, degree of left to right shunt may decrease. But in some of the patients degree of left to right shunt may increase due to decrease in hypertension and left ventricular compliance.

Post-operative complication increase in patients with repaired ASD after the age of 50 years. Complications do not generally develop in ASD patients performed in children and young adults because chronic AF causes changes in atrial myocardium. Persistence of chronic AF post-surgery should not be regarded as a surprise as in two patients in our series.[11]

The prevalence of AF is related to advanced age, left atrial expansion and mitral and tricuspid insufficiency degree. Gender, anatomical type, defect size, pulmonary and systemic flow ratio, pulmonary arterial pressure, right ventricle size and ventricle systolic function do not have any relationship with late phase developed AF.[9]

Sinus venosus type ASDs forms 9% of all ASDs and frequently progress with the abnormal return of right pulmonary veins as in three patients in our series. Sinus venosus type ASD, together with other congenital heart diseases are seen more frequently and are differentiated by high pulmonary pressure and resistance. It is reported that closure of sinus venosus type ASDs with pericardial patch via lateral cavatomy decreases post-operative sinus node dysfunction and constriction of pulmonary vein and caval vein.[12]

Reasons that worsen the natural course and increase the risk of mortality in patients with ASD are congestive cardiac insufficiency caused by left ventricular dysfunction, recurrent pulmonary and paradoxical emboli, arrhythmia and recurrent pulmonary infections.[12] Pulmonary vascular disease ultimately causes shunt to reverse and hypoxia to develop. This reversal of shunt may be discontinuous depending on the tricuspid regurgitation and right ventricle function.

In ASD patients with large shunts, end-diastolic compliance of left ventricle tends to decrease. Volume increase in right ventricle due to shunt, destroys left ventricle dilatation. Shunt flow from

left atrium to right atrium is seen from mid systole to early diastole and during atrial contraction. Right ventricle volume increase might be higher than left ventricle volume increase during early diastole and atrial contraction.[13]

Left ventricle dysfunction in secundum type ASD patients is seen especially over age of 50 years. The reason of this is hypoplastic state of left ventricle due to filling deficiency and the decrease in compliance.[12]

Age for elective closure of ASD is 4-5 years; there isn't any benefit for operating earlier. But postponing the closure to advanced ages causes atrial arrhythmia due to irreversible changes caused by long term volume load on right atrium and right ventricle. IF ASD related cardiac insufficiency or pulmonary hypertension develops, operation is also required during infancy and early childhood. If cardiac insufficiency secondary to mitral valve insufficiency is present in primum type ASD patients, an earlier operation is required.[5]

As in our series surgical closure of ASD can be successfully performed at every age if irreversible changes do not develop in pulmonary vascular bed. Following surgery a clear recovery occ in the NYHA functional classification and a dis decrease occurs in pulmonary arterial pressure a cardiothoracic ratios.

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Authors Contribution:

SÖ, AÜY: Conceived, designed and did statistical analysis & editing of manuscript.
MTAÖ: Did data collection and manuscript writing.