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Original Article

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Atrial Septal Defect (ASD) and Associated Cardiovascular Disorders in Patients Undergoing Surgical Repair

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Abstract

Background: Congenital heart diseases (CHD) are one of the most common developmental errors in humans. Objectives: The purpose of the present study was to see the frequencies of various types of atrial septal defect (ASD) and associated cardiovascular disorders in patients undergoing surgical repair. **Methodology:** This cross-sectional descriptive study was conducted on patients undergoing surgical repair at the National Institute of Cardiovascular Diseases (NICVD) and National Heart Foundation and Research Institute (NHF&RI) in Dhaka during the period of July, 2010 to June, 2011. Patients presented with ASD at any age of both sexes were selected as study population. Diagnoses were revealed with echocardiography and confirmed preoperatively by registered cardiac surgeons. **Results:** The morphological types of ASD were Ostium secundum type in 96% cases and sinus venosus type in 4% cases. Atrial septal defects were either small or larger defects associated with pulmonary hypertension in 38(76%) cases, varying degree of tricuspid regurgitation was seen in 33(66%) patients and dilated pulmonary artery was noted in 24(48%) cases. Ventricular septal defect in 4(8%) cases, tricuspid atresia in 2(4%) cases and mitral valve prolapse in 6(12%) cases were also observed. **Conclusions:** Ostium secundum type of ASD is found to be the commonest type of ASD. (J Shaheed Suhrawardy Med Coll, 2015;7(1):18-21)

Keywords: Atrial septal defect, Cardiovascular disorders, Echocardiography, Ostium secundum, Sinus venosus, Pulmonary hypertension, Tricuspid regurgitation, Tricuspid atresia, Ventricular septal defect, Mitral valve prolapse

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Introduction

Congenital heart disease is a gross structural abnormality of the heart or great vessels that is actually or potentially of functional significance[1]. The incidence of CHD is estimated at 8 to 10 per 1000 live births based on studies carried out in different centres worldwide[1]. ASD is a hole of variable size in almost any location in the interatrial septum[2]. ASD is one of the most common congenital heart defects in adults[3-4]. In Bangladesh, among the hospitalized children with CHD, the largest share is occupied by left to right shunt anomalies (70%). Among them, ASD is the second most common; left to right shunt anomalies of the children is also common among the admitted patients in CHD hospital. The incidence of ASD among CHD in the live born is 7.4%[5]. A study was carried out in the Combined Military Hospital (CMH) in Dhaka, Bangladesh, over a period of 3 years (2004 - 2006) on the 5,668 live births and found that lesions among these babies were ASD (26%), ventricular septal defect or VSD (16.9%), patent ductus arteriosus or PDA (18%) and tetralogy of Fallot or TOF (14%)[11]. It may be noted that atrial septal defect (ASD) is a common cardiovascular malformation that affects over 1 in 1000 live births. Thus ASD accounts for 10% of congenital heart defects and ostium secundum defect account for 85%[6]. A patent foramen ovale (PFO) exists in 30-40% of the normal adult population and act as a potential right-to-left shunt[7].

ASD diagnosis depends on symptoms, signs, noninvasive and

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invasive investigations. ASD may be of different types by their physical and functional characteristics. However, there is no adequate reporting on the morphological types ASD and other associated cardiovascular disorders in the Bengali population of Bangladesh is lacking. Considering the above points, the present study was designed to determine the different morphological types of ASD and associated cardiovascular disorders distributed among Bangladeshi patients undergoing surgical repair.

Methodology

This cross-sectional descriptive study was carried out from July, 2010 to June, 2011 at the National Institute of Cardiovascular Diseases (NICVD) and National Heart Foundation and Research Institute (NHF&RI) in Dhaka. ASD patients diagnosed by registered cardiac surgeons of either sex undergoing surgical repair through convenience sampling technique were enrolled for this study. An informed consent was taken from patients or one of the parents in case of minors. Examinations of hospital records of patients were used for identifying the morphological types of ASD and associated cardiovascular disorders determined by the registered cardiologists at echocardiography. The associated cardiovascular disorders were also detected using 2-D M mode color Doppler echocardiography. Per-operative photographs of the defect were taken from the above patients. The classification was also confirmed preoperatively by the registered cardiac surgeons.

Results

A total number f 50 patients were recruited for this study. The mean age of the study sample of the 50 ASD patients was 19.9±11.16 years (mean ± SD), with an age range of 2 months to 45 years. There were 19(38%) males and 31(62%) females. Male-female ratio was 1:1.9 (Table 1).

Table 1: Age and sex distribution of patients (n= 50)

Age (years)	Male	Female	Total
0 - 10	3	9	12 (24)
11 - 20	4	7	11 (22)
21 - 30	9	10	19 (38)
31 - 40	2	3	5 (10)
41 - 50	1	2	3 (6)
Total	**19**	**31**	**50**

Among the 50 patients, only two morphological types of ASD were identified. They were fossa ovalis (Ostium secundum) type was found in 48(96%) cases and sinus venosus type was found in 2(4%) cases (Table 2).

Table-2: Frequencies of different morphological types of ASD (n= 50)

Types of ASD	Frequency	Percentage
Ostium secundum	48	96%
Sinus venosus	2	4%

Table-3: Cardiovascular disorders associated with ASD (n= 50)

Echo finding	Frequency	Percentage
Dilated right atrium	42	84.0
Dilated right ventricle	42	84.0
Pulmonary hypertension	38	76.0
Tricuspid regurgitation	33	66.0
Dilated pulmonary artery	24	48.0
Mitral valve prolapse	6	12.0
Ventricular septal defect	4	8.0
Pulmonary stenosis	3	6.0
Tricuspid atresia	2	4.0
Patent ductus arteriosus	1	2.0
Mitral regurgitation	1	2.0

Pulmonary hypertension was the most common complication associated with large ASD and it was noted in 38(76%) patients. The internal dimension of both the right atrium and right ventricle was increased in 42 (84%) cases. Out of these 33 (66%) were associated with tricuspid valve regurgitation and 3 (6%) patients with VSD contributed to pulmonary stenosis and 2 (4%) had tricuspid valve atresia. Large ASD was associated with mitral valve prolapsed in 6 (12%) cases and most of the patients in this group were below twenty five years (Table 3).

Discussion

Small atrial communications often close spontaneously, but moderate to large ASDs should be closed typically between ages 2 to 6 years[8]. Moderate and large ASD cause right atrial and ventricular overload, ultimately pulmonary artery hypertension leading to elevated pulmonary vascular resistance, right ventricular hypertrophy, heart failure, and atrial arrhythmias[9].

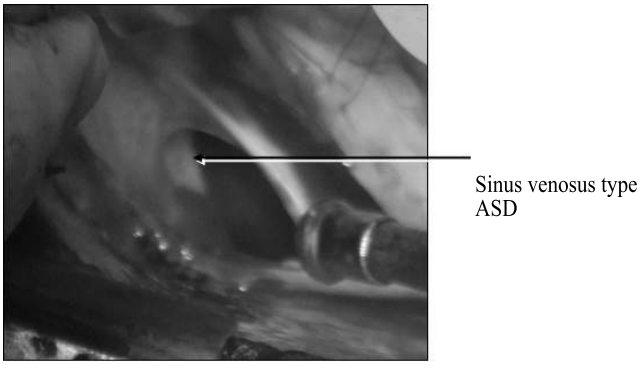

Figure 2: Showing fossa ovalis type ASD with well formed margin as well as the crista terminalis and musculi pectiniti are seen

Pulmonary hypertension usually occurs in the second decade of life and more in females but rarely occurs in infants with large ASD[10]. Echocardiography is helpful for the measurement of atrial septal defects, the diagnosis of sinus venosus defects and the assessment of associated congenital anomalies or other abnormalities such as mitral valve prolapse or partial anomalous pulmonary venous drainage[9]. Secundum ASD usually shows right ventricular enlargement and paradoxical

motion of the inter-ventricular septum in many cases[10-12].

In the present study, the commonest age of presentation was second and third decade. Female and male ratio was found in 1.9:1. The predominant type was the Ostium secundum out of six varieties. The obvious preponderance of the Ostium secundum type is almost universal[6,13-16]. In the United States, Carr14 noted that about 15 to 30% of the healthy adults had an unfused foramen ovale in which the valve functioned normally. Webb and Gatzoulis[9] observed that sinus venosus ASD constituting 5 to 10% of all ASDs in their study. Bezold[17] reported on a study in the United States in which less than 1% cases were of the coronary sinus type. Doherty[15] observed Ostium secundum defects accounting for about 80% of ASDs; the Ostium primum type representing 10% and the sinus venosus type being seen in about 10% of cases.

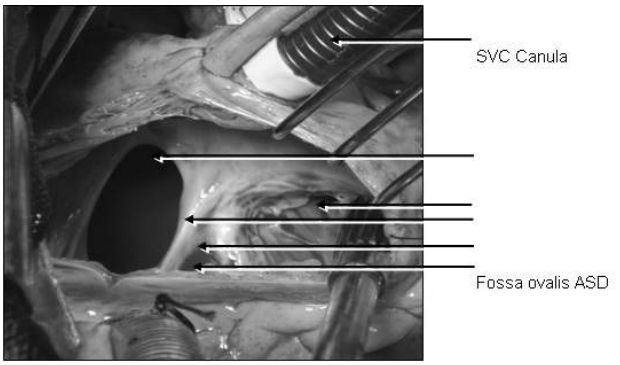

Fig.3. Showing a sinus venosus type of ASD

In the present study, pulmonary hypertension was seen in 76% patients. Mild to moderate degree of pulmonary hypertension occurs in many ASD patients as a reflection of aging and pulmonary vascular diseases which may occur in up to 5 to 10% of patients with untreated ASDs[9]. Besterman[18] found that 41 patients with ASD developed significant pulmonary hypertension. Libby et al[19] mentioned that the development of pulmonary hypertension can occur at an early age. Carr[14] has found that pulmonary hypertension is unusual before 20 years of age and it is seen in 50% of individuals above the age of 40 years.

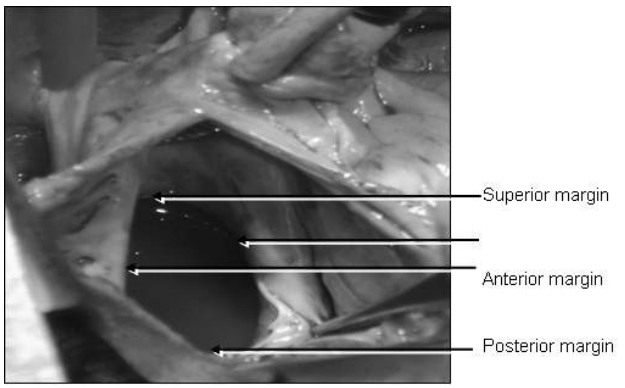

Fig.4. Showing fossa ovalis type of ASD as well as the triangle of Koch, tendon of Todaro and the opening of coronary sinus

In the present study mitral valve prolapse was found in 12% of the patients. Mitral valve prolapsed associated with secundum

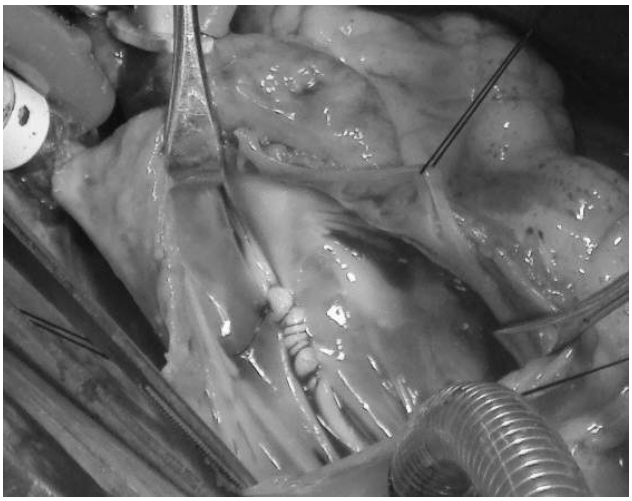

Fig.5. Showing a fossa ovalis type of ASD with all the margins being deficient

ASD is a functional disorder and has reported in 47 patients. Mitral valve prolapse is encountered at a rate of 25-95 % in patients with atrial septal defect[20-21]. In current study tricuspid regurgitation was seen in 66.0% of the patients. Similar finding was noted by Kai et al[22]. Tanji et al[23] found 38% patient of ASD with congenital tricuspid regurgitation and peripheral pulmonary stenosis.

Conclusion

Ostium secundum type of ASD is found to be the commonest type of ASD. Pulmonary hypertension was the commonest complication followed by tricuspid regurgitation and dilated pulmonary artery. Mitral valve prolapse was the commonest anomaly followed by ventricular septal defect and tricuspid atresia.

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