ORIGINAL ARTICLE

Frequency of Types of Ventricular Septal Defect in Cardiology Department of the Children Hospital & ICH, Lahore

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ABSTRACT

Aim: To determine the frequency of various types of Ventricular Septal Defect and its associated complications on echocardiography.

Methods: This descriptive study was conducted at Children Hospital and Institute of child health care Lahore. Duration of study was 3 months from July to September 2015. Three hundred and seventy five patients of Ventricular septal defect without age and gender discrimination were selected by convenient sampling. Data was recorded on proforma to evaluate which type of ventricular septal defect present in patients using Soto's classification and their associated complications.

Results: In this study mean age was 3.2±3.3 years. Out of 375 patients, 265(70%) were presented with perimembranous VSD, 90(24%) were muscular VSD, 24(6.4%) were Doubly committed subarterial VSD and least frequent were inlet type 20(5.4%) of the total. Pulmonary hypertension was noted in 137(48.2%) cases, aortic valve prolapse was present in 83(29.22%) cases, varying degrees of aortic valve regurgitation was seen in 28(9.85%) patients, right ventricular outflow track obstruction was seen in 22(7.7%) cases, left ventricular outflow track obstruction was present in 14(4.9%) cases and infective endocarditis was not seen in any patient.

Conclusion: Perimembranous ventricular septal defect was found to be the commonest type of ventricular septal defect. Large ventricular septal defects usually lead to severe pulmonary hypertension. Severe pulmonary hypertension was the commonest complication followed by Aortic Valve Prolapse and Aortic Regurgitation. Rest of the complications were rare

Keywords: Ventricular septal defect, Aortic cusp prolapse, Aortic regurgitation

INTRODUCTION

Ventricular septal defect (VSD) is a growing defect of the interventricular septum resulting from a deficiency of progress or a failure of alignment or fusion of component parts of ventricular septum[1]. The ventricular septum is a 3-D structure having five components: the membranous part which is smaller part, the muscular part, the infundibular part, the atrioventricular part, and the inlet part. Ventricular septal defects occur from lacking of growth of these components whichdiffer in size from small to large septal defect[2].

Embryologically between 4-8 weeks of gestation, the ventricular chamber is separated into 2 parts. This process complete the fusion of the membranous part of the interventricular septum, the endocardial cushions, and the bulbous cordis. The muscular part of the interventricular septum grows cephalad as each ventricular chamber expands, finally meeting with the right and left ridges of the bulbous cordis. The right ridge merges with the tricuspid valve and the endocardial cushions, separating the tricuspid valve from the pulmonary valve. Leaving the aortic ring in connection with the mitral ring, the left ridge merges with the interventricular septum ridge. The fibrous tissue of the membranous part of the interventricular septum splits the two ventricles and finallycomplete the closure[3].

During systole blood shunts from left to the right ventricle leading two net effects, first, it causes the left ventricular volume overload. Secondly because of persistent left to right shunt its causes pulmonary hypertension .The pulmonary arterial hypertension if persisted it is progressive in nature. Large left to right shunt clinically presents with breathlessness, difficult in feeding and failure to thrive during infancy patients with smaller defects usually be asymptomatic.

Soto *et al*., (1980) classify ventricular septal defect into following types[4,5] .

1. Perimembranous VSD (80%)
2. Muscular VSD (5-20%)
3. Doubly committed subarterial VSD (Which are also called. Infundibular, supracristal and sub pulmonary) (5-7%)
4. Inlet VSD (8%)

Complications associated with ventricular septal defect are pulmonary hypertension, aortic valve

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prolapsed, aortic valve regurgitation, right ventricular outflow track obstruction, left ventricular outflow track obstruction and infective endocarditis[1].

MATERIALS AND METHODS

A cross-sectional descriptive echocardiographic based study carried out in the department of Pediatric Cardiology children hospital Lahore. Study was conducted from July 2015 to September 2015. A total of 375 patients were included by consecutive sampling. All new children below fifteen years of age with suspected acyanotic congenital heart disease referred to a single tertiary referral center were analyzed. The diagnosis was primarily made on echocardiography Patients with VSD as a part of other congenital cardiac anomalies were excluded from the study.

Data collection procedure: All echocardiography reports were reviewed from hospital record. Patients having isolated Ventricular Septal Defect (absence of any other major cardiac anomaly) only were included in the study. Patients having minor associated anomaly, like a small patent ductusarteriosus, a small secundum atrial septal defect and mild mitral regurgitation were also included. VSD were classified as Perimembranous, Doubly committed subarterial, Muscular and Inlet VSD using Soto's classification. Records of the selected patients were reviewed to assess the frequency of various types of VSD. Associated complications like severe pulmonary hypertension, aortic valve prolapse and aortic regurgitation, acquired right and left ventricular outflow tract obstruction and infective endocarditis were also noted. The data was reviewed for age of presentation, sex, type of VSD and associated complications. Data was entered and processed using SPSS version 20.

RESULTS

A total 375 patients had isolated VSD. Mean age was 3.1±3.64 years (range: 1 day to 15 years). Females were 150 (40%) and males were 275 (60%)(Figure-1). Patients were classified according to Soto's classification[5] as Perimembranous, Muscular, Doubly committed subarterial type and Inlet VSD. Distribution of patients with different types of VSD is presented in (Table-1). Of 375 patients 265 (70%)were Perimembranous type, 90 (24%) were Muscular type, 24(6.4%) were doubly committed subarterial type and 20(5.4%) were having Inlet VSD (Fig 2).

Complications were noted, pulmonary hypertension was the most common complication associated with large VSD and it was noted in 137(48.2%) patients. The most common complication seen with small and moderate VSD was aortic cusp prolapse and aortic regurgitation followed by right and left ventricular outflow tract obstruction and then infective endocarditis. About, 83(29.2%) cases were having right aortic cusp prolapse and varying degrees of aortic valve regurgitation was seen in 28(9.85%) patients (Table 2). This complication was observed more frequently with perimembranous type of VSD. Out of total right ventricular outflow track obstruction was seen in 22(7.7%) cases, left ventricular outflow track obstruction was present in 14(4.9%) cases and infective endocarditis was not seen in any patient.

Table 1: Frequency of types of VSD

Types	Frequency	%age
Perimembranous VSD	265	70%
Muscular VSD	90	24%
DCSA	24	6.4%
Inlet VSD	20	5.3%

VSD=Ventricular septal defect, DCSA=Doubly committed subarterial

Fig.1: Male and female ratio

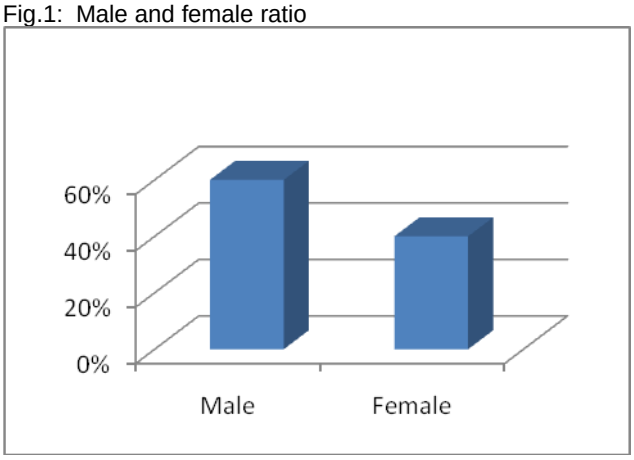

Fig. 2: Bar chart of frequency of types of VSD

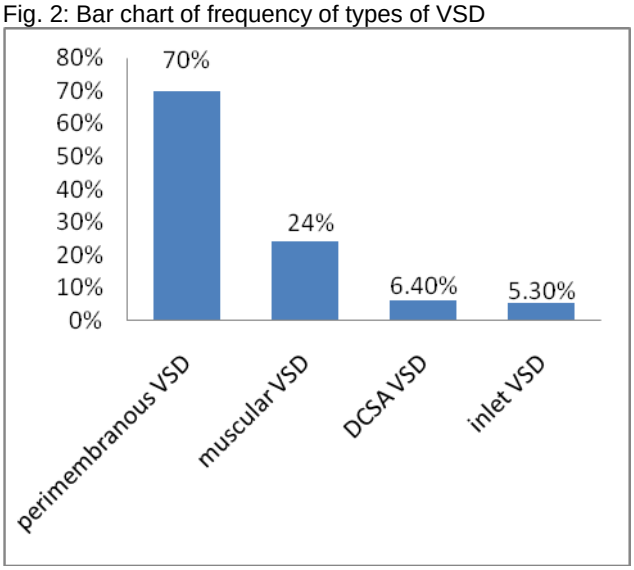

Table 2: Complications associated with different types of VSD

Complications	Perimembranous vsd	Muscular vsd	DCSA vsd	Inlet vsd
Pulmonary hypertension	79(41.57%)	40(72.7%)	4 (16.6%)	14 (93.33%)
Aortic valve prolapsed	66(34.7%)	5(9.09%)	11(45.8%)	1 (6.66%)
Aortic valve regurgitation	21(11.05%)	2(3.63%)	5(20.8%)	0
RVOT obstruction	14(7.36%)	6(10.90%)	2(8.33%)	0
LVOT obstruction	10(5.26%)	2(3.63%)	2(8.33%)	0
Infective endocarditis	0	0	0	0

DISCUSSION

This study was conducted at Department of Cardiology, Institute Of Child Health Care Children Hospital, Lahore. Similarly Chaudhry *et al*., (2011) study on 5018 patients with congenital heart diseases underwent echocardiography in Ch Perveiz Elahi Hospital Multan. A total of 1276 patients had isolated VSD. Mean age was 3.1±3.64 years (range: 1 day to 15 years). Females were 440 and males were 836. Of 1276 patients, 1014 (79.3%) were Peri-membranous type, 124(9.8%) were muscular type, 85(6.7%) were doubly committed subarterial type and 53(4.2%) inlet VSD. Severe pulmonary hypertension was noted in 286(22.4%) cases. Aortic valve prolapse was present in 85(6.7%) cases and varying degrees of aortic valve regurgitation was seen in 67(5.2%) patients. They conclude that peri-membranous vsd is commonest type which leads to pulmonary hypertension[1]. Another study at NWFP showed similar results[6]. The commonest type was of perimembranous VSD in our study. The second in order of frequency were muscular VSD (24%) and least frequent were doubly committed subarterial type, which accounted for 6.4% of the total. These results were more in keeping with what is found in Western literature, where the largest group of VSD consists of perimembranous type, muscular and doubly committed subarterial type in decreasing order of frequency[7]. There are very few local studies on this subject. In a study at NICVD, Karachi, Aziz et al. found that perimembranous VSD were 92% of total VSD, doubly committed subarterial type were 7% and the least common were muscular i.e. 1.7%[8]. However, in this study, the largest group of patients were older than one year (68% of patients) and the ages of patients were between one day and 15 years with mean age of 3.1±3.64 years, and muscular VSD was found mostly in younger patients. It may be that small muscular VSD tend to close earlier than perimembranous[7]. Similar results were shown in local studies by UzmaKazmiet al[10]

Table-1: Types of VSD (n=1276). Type Number Percentage Perimembranous 1014 79.3 Muscular 124 9.8 DCSA 85 6.7 Inlet 53 4.2 Table-2: Complications associated with VSD. Complications Number Percentage (%) Severe pulmonary hypertension 286(22.4%) Aortic cusp prolapse 85(6.7%) Aortic regurgitation 67(5.2%) RV outflow tract Obstruction 21(1.6%) LV outflow tract Obstruction 9(0.7%) Infective endocarditis 6(0.5%) Table-3: Aortic cusp prolapse and aortic regurgitation. Subtype Complication Percentage (%) Aortic cusp prolapse Perimembranous (1014) 73 7.1 Doubly committed subarterial VSD(85) 12 14 Aortic regurgitation Perimembranous (1014) 58 5.7 Doubly committed subarterial VSD(85) 09 10.5 conducted in Lahore [9,10]. Aortic valve prolapse was present in 6.7% of total patients. This frequency is in keeping with other studies. Lueet al[11] found aortic cusp prolapse and aortic regurgitation in 11.9% of their patients with VSD. Brauner et al. found aortic cusp prolapse in over 5% of children with VSD[12]. In yet another study Ando et al[13] found 16% cases of right coronary cusp prolapse in patients of VSD. Classically Doubly committed subarterial type VSD is associated with progressive development of aortic cusp prolapse and aortic regurgitation. Contrary to this, our study showed that incidence of aortic cusp prolapse and aortic regurgitation with perimembranous outlet VSD was higher than previously noted in literature. About, 34.7% of perimembranous outlet VSD had aortic cusp prolapse. This finding is in accordance with a study conducted at Multan, where 7.1% of perimembranous outlet VSD was having prolapsed aortic cusp [1]. Similar findings were noted by Somanath et al [14]. They found 84% perimembranous and 16% doubly committed subarterial VSD with aortic regurgitation. Glenn et al[15] found that 5.8% patients of VSD developed infundibular stenosis. In the present study right ventricular outflow tract obstruction was found in 4.9% of cases. Limitations of this study are that it does not give the incidence or prevalence of ventricular septal defect and its complications in total population as it was confined to one hospital attendance. Also, excluded were children not reaching a tertiary care center due to poor access to medical facilities, yet, results are comparable with other local and international studies. As it was a retrospective study, it was difficult to control bias and confounders. Also, we had to rely on the available written record. Results are, at best, hypothesis-generating.

CONCLUSION

Perimembranous ventricular septal defect was found to be the commonest type of ventricular septal defect. Severe pulmonary hypertension was the commonest complication seen with ventricular septal defects.

Limitation: During study we face some limitations that this study is conducted in a two center. That's why it is not appropriate to generalize the data to the other centers. We suggest that data should be collected countywide to generalize the results.

Ethics committee approval: Taking approval through ethical committee of The Children Hospital and Institute of Child Health, Lahore.

Consent form filled after taking consent from mother and father.

Conflicts of interest: No Conflict of interest

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