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

NAMRAH SHAHID¹, SYED NAJAM HYDER², ALI HASAN³

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 septum¹. 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 which differ in size from small to large septal defect².

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 bulbus 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 bulbus 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 finally complete the closure³.

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 types⁴,⁵:
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...
prolapsed, aortic valve regurgitation, right ventricular outflow track obstruction, left ventricular outflow track obstruction and infective endocarditis¹.

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 ductus arteriosus, 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” 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

<table>
<thead>
<tr>
<th>Types</th>
<th>Frequency</th>
<th>%age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perimembranous VSD</td>
<td>265</td>
<td>70%</td>
</tr>
<tr>
<td>Muscular VSD</td>
<td>90</td>
<td>24%</td>
</tr>
<tr>
<td>DCSA</td>
<td>24</td>
<td>6.4%</td>
</tr>
<tr>
<td>Inlet VSD</td>
<td>20</td>
<td>5.3%</td>
</tr>
</tbody>
</table>

VSD=Ventricular septal defect, DCSA=Doubly committed subarterial

Figure 1: Male and female ratio

Figure 2: Bar chart of frequency of types of VSD
Table 2: Complications associated with different types of VSD

<table>
<thead>
<tr>
<th>Complications</th>
<th>Perimembranous vsd</th>
<th>Muscular vsd</th>
<th>DCSA vsd</th>
<th>Inlet vsd</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulmonary hypertension</td>
<td>79(41.57%)</td>
<td>40(72.7%)</td>
<td>4(16.6%)</td>
<td>14(93.33%)</td>
</tr>
<tr>
<td>Aortic valve prolapsed</td>
<td>68(34.7%)</td>
<td>5(9.09%)</td>
<td>11(45.8%)</td>
<td>1(6.66%)</td>
</tr>
<tr>
<td>Aortic valve regurgitation</td>
<td>21(11.05%)</td>
<td>2(3.63%)</td>
<td>3(12.0%)</td>
<td>0</td>
</tr>
<tr>
<td>RVOT obstruction</td>
<td>14(7.36%)</td>
<td>6(10.90%)</td>
<td>2(8.33%)</td>
<td>0</td>
</tr>
<tr>
<td>LVOT obstruction</td>
<td>10(5.26%)</td>
<td>2(3.63%)</td>
<td>2(8.33%)</td>
<td>0</td>
</tr>
<tr>
<td>Infective endocarditis</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

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 Pervez Elahi Hospital Multan. A total of 1276 patients had isolated VSD. Mean age was $3.1\pm3.64$ years (range: 1 day to 15 years). Females were 440 and males were 836. Of 1276 patients, 1014 (79.3%) were Perimembranous 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 perimembranous 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\(^3\). 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 $3.1\pm3.64$ years, and muscular VSD was found mostly in younger patients. It may be that small muscular VSD tend to close earlier than perimembranous\(^1\). 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%)
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

REFERENCES