ORIGINAL ARTICLE

Outcome of Restrictive Ventricular Septal defect, with special reference to Aortic Valve Prolapse and Aortic Regurgitation

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ABSTRACT

Background: VSD is the most common heart defect. Incidence, prevalence, and clinical outcomes of VSD have been reported to vary significantly in different geographic areas. The aortic valve prolapse and aortic regurgitation reported to be high in Japan and China when compared to white Caucasian population especially in perimembranous VSD.
Method: Descriptive study conducted from January to December 2015 at Children Hospital Lahore. The records of only ventricular septal defect on children below 15 years assessed for the aortic valve prolapse and aortic insufficiency. The record was analyzed with SPSS 20 version.
Result: Medical records of 883 patients with small ventricular septal defect (VSD) reviewed to determine aortic valve prolapse and aortic regurgitation. There were 535(60.6%) males and 348(39.4%) were females. Aortic cusp prolapse developed in 120 patients (13.6%) $p \leq .05$, and 20 patients (2.5%) developed aortic regurgitation $p \geq 0.05$ .VSD was perimembranous in 581(65.8%), trabecular muscular in 111(12.6%), Subaortic in 73(8.3%), doubly committed subarterial in 53(6.0%), Inlet in 50(5.7%) and outlet in 15 (1.7%) patients. Aortic cusp prolapse found most commonly in Perimembranous type of VSDs in our setup (98/120) while second common type of VSD seen is doubly committed type (11/120) and third common type seen is subaortic type of VSD (10/120).
Regarding age groups aortic cusp prolapse found more common in more than 10 years of age 36.8% .Surprisingly aortic cusp prolapse also seen in 8.8% of patients with VSD below 1 year of age. $p \leq 0.05$.
Conclusion: Prolapse of aortic cusp and aortic regurgitation commonly found in perimembranous type of VSD rather than doubly committed VSD in our setup.
Keywords: Ventricular septal defect, Aortic cusp prolapse, Aortic regurgitation, Perimembranous VSD.

INTRODUCTION

VSD is resulting from deficiency in parts of ventricular septum[1]. Ventricular septal defect found in more than 15-20% of congenital heart defects[2]. The VSD groups into perimembranous, muscular and doubly committed subarterial (DCSA) types[3]. Perimembranous types of VSD found upto 80%[4]. In perimembranous VSDs due to aneurysms of tricuspid valve, it usually close the defect completely or partialy[5]. Muscular VSD found in 5-20% of the defects and having good outcome and higher chance of spontaneous closure than other VSD[6]. Supra-cristal VSD found in 5-7% of cases and are more common in Asian[7]

The small VSDs related with many complications. The prolapse of the aortic cusp classically found in supra-cristal and less likely in perimembranous VSD[8] resulting aortic regurgitation. According to literature this problem seen less than 5% of patients with VSD[9]. Aortic regurgitation is considered happen because of weakly supported right coronary cusp combined with the Venturi effect produced by the jet passing through VSD causing prolapse of aortic cusp.[10] Aortic insufficiency is progressive therefore if developed then is an indication for surgery[11].

METHODS

Echocardiographic records of VSD patients reviewed from record room. Patients only having restricted VSD were included in the study. Associated complications like aortic valve prolapse and aortic regurgitation were noted.
Patient population: The patient visited in the department of echocardiology, Children hospital Lahore from January to December 2015 .The total 883 patients with small VSDs (male/female 535/348)were selected. Other associated heart defect excluded from the study. Other complication of small VSD also excluded from the study. 2-D echo: All echocardiograms performed and interpreted at echo department. Standard transthoracic M-mode, 2-D and Doppler echocardiography done with GE VIVID-7 DIMENSION echo-machine. The VSDs were classified by their location into perimembranous, inlet, outlet, doubly committed and muscular. A normal left ventricular end-diastolic diameter (LVEDD) recorded according to age. The pressure difference between both ventricles were assessed from the CW.
Statistical analysis: Descriptive study, Data was entered and processed using SPSS version 20 and it was analyzed by the Chi-square method and value of less than 0.05 consider as significant.

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RESULT

The 883 patients with small VSDs were recorded. There were more male than female (60.6 % males and 39.4% females).(Fig. 1) Regarding types of ventricular septal defects , we found Perimembranous ,muscular , sub-aortic supra-cristal inlet and outlet in 65.8%, 12.6%,8.3%, 6.0%, 5% and 1.7% of patients respectively (Table 1).

Table1: Type of VSD (n=883)

VSDs	Total	%age
Perimembranous	581	65.8
Muscular	111	12.6
Subaortic	73	8.3
DCSA	53	6.0
Inlet	50	5.7
Outlet	15	1.7
Total	883	100

The aortic cusp prolapse was found more common in restrictive ventricular septal defects i.e., developed in 13.6% of patients (n=120) $p \leq 0.05$. Aortic regurgitation secondary to aortic cusp prolapsed was found in 20(2.3%) of patients (Table 2). Aortic cusp prolapse was found commonly in perimembranous ventricular septal defect i.e. 11.09% (98/120) as compared to doubly committed VSD which was 1.2% (11/120) $p \leq 0.05$. Third group of VSD with aortic cusp prolapse was Sub-aortic type of VSD (10/120) (Fig 2, Table-2). Similarly aortic regurgitation was also commonly found in perimembranous ventricular septal defect (16/20) .On the contrary aortic insufficiency found less frequently in doubly committed VSD (2/20) in our setup $p \leq 0.05$.(Table-3). Regarding age groups we found aortic cusp prolapse in 8.8% patients within 1 month to 1 year, 16.6% between 1 - 5 years, in 21.6% patients between 5 - 10 years, and in 36.8% patients more than 10 years of age.(Table 4)

Table-2: Type of VSD with Aortic cusp prolapse Cross tabulation

	RCCprolapse
Subaortic	10(13.7%)
Perimembranous	98(16.9%)
Muscular	0
Outlet	1(6.7%)
Inlet	0
DCSA	11(20.8%)

Table-3 : Types of VSD with AR

Type VSD	AR		Total
	no	yes	
Subaortic	72	1	73
perimembranous	565	16	581
muscular	110	1	111
outlet	15	0	15
inlet	50	0	50
DCSA	51	2	53

Table 4: The relation of age groups with Aortic cusp prolapsed.

			Aortic cusp prolapse		
			No	yes	Total
age	1days to 1year	Count	414	40	454
		% within age	91.2%	8.8%	100.0%
		% within Aortic cusp prolapse	54.3%	33.3%	51.4%
	1year to 5 year	Count	257	51	308
		% within age	83.4%	16.6%	100.0%
		% within Aortic cusp prolapse	33.7%	42.5%	34.9%
	5year to 10year	Count	80	22	102
		% within age	78.4%	21.6%	100.0%
		% within Aortic cusp prolapse	10.5%	18.3%	11.6%
	10 to onward	Count	12	7	19
		% within age	63.2%	36.8%	100.0%
		% within Aortic cusp prolapse	1.6%	5.8%	2.2%
Total		Count	763	120	883
		% within age	86.4%	13.6%	100.0%
		% within Aortic cusp prolapse	100.0%	100.0%	100.0%

Fig. 1: Gender difference with types of VSD.

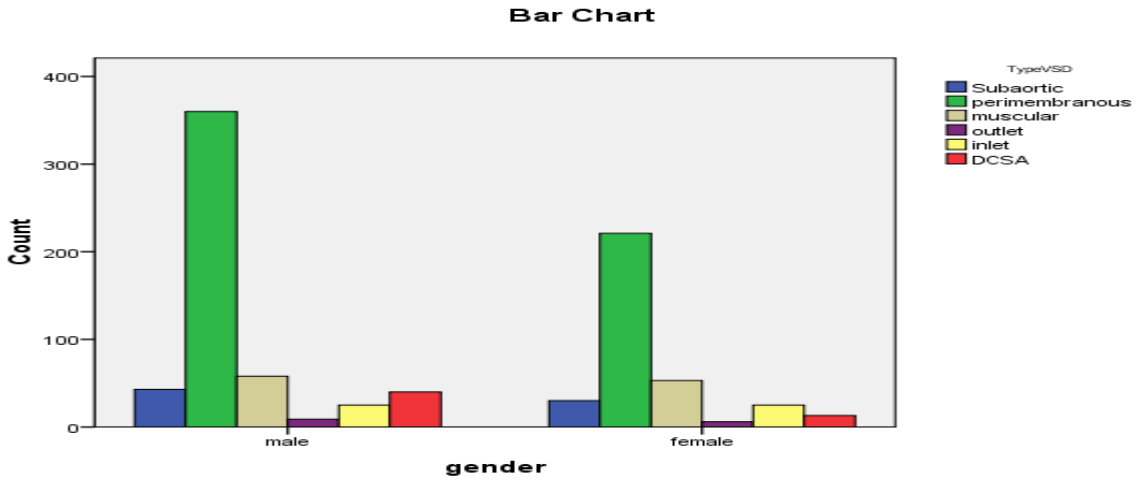
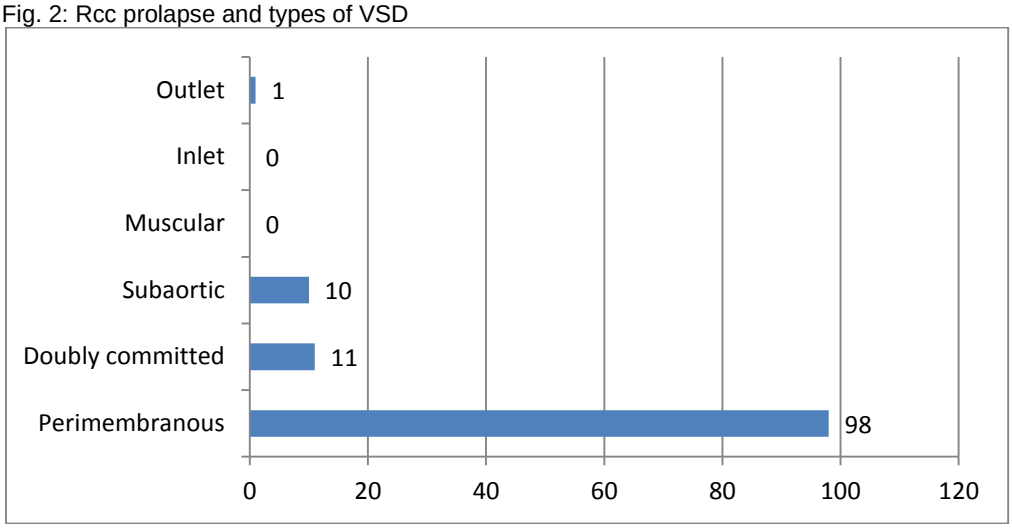


Fig. 2: Rcc prolapse and types of VSD



DISCUSSION

In our study we found that regarding complication aortic cusp prolapse was found to be the commonest one i.e. developed in 120(13.6%) p ≤ .05 of patients. Same result supported in a study of Uzma Kazmi et al conducted in Lahore [11,12] . Lue et al [7] found prolapse of aortic cusp and aortic insufficiency in 11.9% of their patients with VSD. Brauner et al. also found the prolapse of oartic cusp in over 5% of children with VSD [13,14] .Ando et al found right coronary cusp prolapse in 16% patients of VSD[15].

Supra-cristal VSD is related with development of aortic cusp prolapse and aortic regurgitation[16].Study from Multan by Tauseef Asma et al revealed that prolapse of aortic cusp and insuffenceny was found in 6.7% cases while 85% cases belonged to perimembranous type of VSD and 14% patients with supra-cristal VSD developed prolapsing aortic cusp[16] . In our study, the prolapsing aortic cusp with insufficiency in doubly committed VSD only 1.2%.

Development of aortic regurgitation later on stated within 2% to 20% in previous studies [17] .Regurgitation of aortic valve can be directly related to verity of the VSD. This seen mainly in case of doubly committed type, but can also be seen in perimembranous defects [18,19] . Patients with prolapsing aortic cusp are at the greater risk of emerging progressive aortic insufficiency.[20] Therefor it was thought that doubly committed VSDs with aortic valve prolapse and AR should be corrected even if the defect is small [21]. Aortic insufficiency occurs more frequently in cases of doubly committed VSD i.e., 10% of cases, while in some studies up to 20% to 30% has been reported in Asian populations [22] .If the prolapse of aortic cusp is large then it can cause the obstruction at the outlet tract of the RV also. These results were more in keeping with what is found in Western literature, where the largest group of VSD consists of PM type, muscular and DCSA following in decreasing order of frequency[6]. Aortic valve prolapse was present almost exclusively in patients with PM outlet type. There was only one case of DCSA with aortic valve prolapse. This frequency is quite high and is in keeping with other studies. [21]Aortic valve prolapse was almost exclusively affecting the right cusp. Chiu et al. found that in DCSA, the prolpase cusp was always the RCC but in perimembranous outlet VSD besides RCC.[10] NCC involvement was also significant e.g. 16.5%.[17] In another study, Somanath et al. found RCC prolapse in 48%, NCC prolapse in 41% and both (RCC and NCC prolapse) in 11% of their patients with perimembranous VSD[18].

The mean age of the subjects having AV prolapse was 5.8 years. Chiu et al. found that the mean age of onset of AV prolapse in their patients with DCSA and PM outlet ype of VSD were 4.9 and 5 years respectively.[10] Somanath al. found grade 1 and 2 AR in 51% of patients and grade 3 and 4 AR in 48%. Their study group consisted of older patients suggesting that severity of AR may progress with increasing age.[23] .Our study showed that aortic cusp prolapse founf 8.8% of patirnts below 1 year of age .

Limitations: This study does not reflect the total population because it was limited to one hospital .Similarly we had to rely on the available record. Right and non- coronary cusp is not indicated in this study also.

CONCLUSION

The presence of aortic valve prolapse and aortic regurgitation was found to be high (13.6%) espacially in perimembranous outlet defect rather than DCSA.

IBR approval: Taking approval through institutional review board and ethical committee of The Children Hospital and Institute of Child Health, Lahore.

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