FREQUENCY OF COMPLETE HEART BLOCK AFTER SURGICAL CLOSURE OF PERIMEMBRANOUS VENTRICULAR SEPTAL DEFECT

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ABSTRACT

Objective: To find the frequency of complete heart block (CHB) in patients undergoing surgical perimembranous Ventricular septal defect (VSD) closure.

Methodology: This was a Descriptive cross sectional study performed in Cardiovascular Department Lady Reading Hospital Peshawar. Data was collected from 28 January 2013 to 28 July 2013 with sample size of 103.Sampling technique was non probability consecutive. All patients with perimembranous ventricular septal defect, aged 5 years to 25 years with any gender were included in the study.

Results:-Mean age was 12.63 years ± 6.63. Patients were divided in four categories according to their age. Over all complete heart block in the perimembranous ventricular septal defect after surgical closure was 10(9.71%). Age wise distribution of complete heart block shows that majority of the complete heart block 6(12.8%) were found in age less than or equal to 10 years.

Conclusion:-VSD closure is less often associated with CHB but there should be arrangements for pace maker to timely pace the patient in case of any emergency.

Key Words: Complete heart block, Ventricular septal defect , Surgical closure

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INTRODUCTION

Ventricular septal defects (VSD) are the most frequent congenital cardiac disease[1]. Isolated VSD accounts for 20% of all congenital cardiac diseases. Perimembranous VSD is the most frequent Ventricular septal defect which constitutes 80% of all VSDs[2-4].

First surgical closure of VSD was performed in 1954[5]. Over the period of time however significant changes occurred in surgical techniques. Initially VSD closure was two stage procedures, with initial Pulmonary artery (PA) banding followed by VSD closure has now shifted to primary VSD closure at an early age group[5, 6]. The strategy for perfusion has also changed. Initially these procedures were performed in total circulatory arrest with cooling to 18°C .Nowadays these procedures are performed in mild cooling with standard cardiopulmonary bypass. Finally, the approach has also changed from a transventricular procedure[7] to a transatrial procedure[7-9].

Complications of VSD closure are rare, but still serious problems can occur in the form of cerebral damage and even death. Another serious complication which can occur in these patients is the production of complete heart block. The conduction system, specifically the bundle of His and its branches, is almost always closely related to the defect and is, therefore, at risk during the insertion of the individual stitches[10]. When CHB occurs in these patients, it usually needs insertion of permanent pace maker. These patients are also high risk for lat death[11].

After the Lev and others effort of delineating the course of conduction tissue in various types of congenital heart diseases, the occurrence of post operative CHB has significantly reduced. In earlier reports of 1971, the risk of surgical CHB was as high as 25%[11]. Currently the incidence has dramatically reduced from 1-4 % due to improvement in surgical technique and better understanding of the anatomy of the conduction tissue in various congenital cardiac anomalies[12]. Anderson et al even reported much less incidence of 0.7% for closure of isolated VSD[13]. Contrary to these Yang R et al, reported high incidence of CHB in surgical VSD closure to as high as 14.5%[14].

The present study will provide us local data about the magnitude of heart block in patients subjected to VSD closure. As mentioned above the literature suggested that heart block after VSD closure is still a common problem and needs to be addressed seriously to avoid pacemaker installation.

METHODOLOGY

This was a Descriptive cross sectional study performed in Cardiovascular Department Lady Reading Hospital Peshawar. Data was collected from 28 January 2013 to 28 July 2013 with sample size of 103.Sampling technique was non probability consecutive. All patients with perimembranous ventricular septal defect, aged 5 years to 25 years with any gender were included in the study. After getting approval from the hospital ethical committees to conduct the study, all patients with perimembranous VSD were included in the study after informed consent.

Patients were worked up with detailed history taking and clinical examination. All patients were subjected to surgery for the closure of VSD on next OT day via a transatrial surgical approach. All the surgeries were performed by experience surgeons.

Data were stored and analyzed in SPSS version 14. Mean ± SD were calculated for quantitative variables like age. Frequencies and percentages were calculated for categorical variables like sex, Complete Heart Block. Complete heart block was stratified among age and sex to see the effect modifications. All results were presented in the form of table and graphs.

RESULTS

In this study, 103 patients with perimembranous ventricular septal defect were observed, in which 58(56.31%) were male and 45(43.69%) were female patients. Male to female ratio was 1:29.1.

The study included age ranged from 5 up to 25 years. Average age was 12.63 years ± 6.63SD. Patients were divided in four categories according to their age. Group 1 included patients of age group between 5 to 10 years, group 2 include age between 11 to 15 years, group 3 included age between 16 to 20 and group 4 was having age between 21 to 25 years. Most patients presented in lower age group. Out of total, 47 (45.6%) patients were in the age range of less than 10 years.

Over all complete heart block in the perimembranous ventricular septal defect after surgical closure was 10(9.71%). Age wise distribution of complete heart block shows that majority of the complete heart block 6(12.8%) were found in age less than or equal to 10 years. (Table 1)

Gender wise stratification shows that 6(10.3%) male presented with perimembranous ventricular septal defect developed complete heart block while 4(8.9%) female patients developed same problem. This shows that the gender has no such role in complete heart block after closure of perimembranous ventricular septal defect. (Table 2)

DISCUSSION

The development of the Amplatzer Membranous VSD Occluder has led to numerous case series, and over

Table 1: Age wise distribution of complete heart block

		Heart Block		Total
		Yes	No	
age (in years)	5-10	6	41	47
		12.8%	87.2%	100.0%
	11 - 15	2	23	25
		8.0%	92.0%	100.0%
	16 - 20	1	12	13
		7.7%	92.3%	100.0%
	21-25	1	17	18
		5.6%	94.4%	100.0%
TOTAL		10	93	103
		9.7%	90.3%	100.0%

Table 2: gender wise distribution of complete heart block

		Heart Block		Total
		Yes	No	
Gender	Male	6	52	58
		10.3%	89.7%	100.0%
	Female	4	41	45
		8.9%	91.1%	100.0%
Total		10	93	103
		9.7%	90.3%	100.0%

period of time more than 2000 devices have been implanted worldwide[15-22]. With improved experience many previous complications like feasibility of deployment, shunt occlusion and valvular dysfunction overcome to much extent. However, there has been constant concern about the long-term follow-up of these patients[18]. Also reports of device-associated complete heart block (CHB) have emerged[107-111].

Most common cause of hemodynamically significant VSD in infants and children is Perimembranous ventricular septal defects (PMVSDs). Although device closure of certain VSDs can be performed successfully by transcatheter or hybrid approach like muscular, residual postsurgical, posttraumatic, and post infarction defects but initial attempts at transcatheter PMVSDs were largely unsuccessful[26-27].

Surgery is the gold standard for PMVSD closure. Though it is generally considered a safe procedure but in fact some potential complication can occur , like significant residual VSD in 1% to 5%[28-31], the necessity for reoperation in 2%[28-31], and even death in 0.5%[28-31]. Complete heart block can occur even in patients undergoing surgical PMVSD closure; which is expected in about 1% to 5% of subjects so treated[28-32]. We also found that frequency of CHB after VSD closure is 9.7% which is close to the data in literature.

Previous studies suggested that smaller infants are at higher risk of developing CHB in surgical management of PMVSD. They found that age ranged from 2.5 to 12 years, and weights ranged from 14 to 45 kg are risk factors for developing CHB[21-23]. In our study we found that CHB is more common at younger age group. We have categorized patients in four groups on age basis and CHB was more in age group 5-10 years which is also supported by literature. Multivariable analysis using Cox proportional hazard regression analysis showed that age was significantly associated with the occurrence of CHB (p _ 0.028; relative risk 0.25).

Most recently, Butera and colleagues[21] reported incidence of CHB as 8.7% in their 104 cases, and PPM was required in 6 (5.7%) patients, 2 in the early phase and 4 during late follow-up. This finding is close to our result of having CHB in 9.7% of patients.

CHB can occur in early phase of procedure especially mechanical trauma/compression by the delivery system or device which is likely to resolve. Chronic inflammation or fibrosis is more likely to be responsible for the late-onset type[23, 25]. Some cases of early CHB resolve spontaneously or with temporary pacing, corticosteroid and/or high-dose acetylsalicylic acid therapy, or device removal[18, 24].

CHB following surgical repair may be transient or permanent. Transient CHB in this setting generally reverts to sinus rhythm within the first 7-10 days. Weindling et al. have shown that 63% of patients with CHB after surgery regained atrioventricular conduction in the first post-operative month; in the majority (97%) this occurred in the first 9 days after surgery[33].

LIMITATION

Our study is having several limitation like small sample size which impacts the implication of this study results. We studied only in hospital CHB in patients undergoing VSD repair.Our results are showing high frequency of CHB because some of the CHB after surgery are transient and may be reversible.So more longer duration studies are needed to find the more accurate outcomes after VSD closure.

CONCLUSION

Surgical management of PMVSD is associated with good outcome but CHB can be expected in some cases which needs timely intervention in the form of pace maker therapy.

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CONTRIBUTORS

SMAS conceived the idea, planned the study, and drafted the manuscript. I and MGK helped acquisition of data and did statistical analysis. AM and NU drafted the manuscript and critically revised the manuscript. RAK supervised the study. All authors contributed significantly to the submitted manuscript.