Original Article

Early Outcome of Surgical Closure of 200 Ventricular Septal Defects: Single Surgeon Experience

Surgical Closure of Ventricular Septal Defects

Faiz Rasool

ABSTRACT

Objective: To see the early outcome of surgical closure of 200 ventricular septal defects
Study Design: Retrospective study
Place and Duration of Study: This study was conducted at the children's Hospital Lahore, Hameed Latif Hospital Lahore and University of Lahore Teaching Hospital Lahore from January 2018 to October 2020.
Materials and Methods: Files of the patients who underwent VSD closure by a single surgeon (author) were reviewed. Age, weight, presenting symptoms, indication for surgery, associated lesions, cardiopulmonary bypass time, cross clamp time, duration of mechanical ventilation, mortality, risk factors for mortality, and complications were studied.
Results: 200 patients underwent VSD closure from January 2018 to October 2020. Mean age was 11 months, mean weight was 7 kg. Pulmonary hypertension was the most common indication for VSD closure. Average cardiopulmonary bypass time was 48 minutes; average cross clamp time was 32 minutes. Peri operative mortality was 3.5%.
Conclusion: In a resource limited country like Pakistan where there are only few centers are performing pediatric cardiac surgery, our series of 200 VSD closures represent reasonable outcome.

Key Words: ventricular septal defect. VSD closure, heart block

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INTRODUCTION

Ventricular septal defect (VSD) is the most common congenital cardiac anomaly in children. Isolated VSD accounts for 37% of all congenital heart disease in children. The incidence of isolated VSD is about 0.3% of newborns. [1] The interventricular septum is a curved structure because of the pressure difference in right and left ventricles. It is composed of five parts: the membranous, muscular, infundibular, atrioventricular and the inlet.[2,3] Failure of one of these components to form will result in ventricular septal defect. There are mainly 4 types of VSD. Type 1 is outlet VSD, type 2 is membranous VSD, type 3 is inlet VSD and type 4 is muscular VSD.[4]

The physiologic consequences of any hole between the ventricles are related to its size, and to the relative resistances produced in the pulmonary and systemic vascular beds.

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Left ventricular volume overload, pulmonary hypertension, infective endocarditis, aortic regurgitation, and eisenmenger syndrome are the potential complications.[5]

It is estimated that every year 42000 babies are born with CHD in Pakistan.[6]

According to cardiothoracic surgeon registry there are 0.52 (0-25.97) pediatric cardiac surgeons per million population globally. Large disparities exists between regions, ranging from 0.08 pediatric cardiac surgeons per million population (sub-Saharan Africa) to 2.08 pediatric cardiac surgeons (North America).[7] In Pakistan, ratio is same as that of Africa, that is 0.08/million.

In most of the patients, VSD closure is required in infancy. In this article, author has retrospectively reviewed the results of 200 ventricular septal defects that were closed in the period of last three years.

MATERIALS AND METHODS

Study type: Retrospective; case series
Study duration: Study was done from January 2018 to October 2020.
Setting: Surgeries were performed at children's Hospital Lahore, Hameed Latif Hospital Lahore and University of Lahore Teaching Hospital Lahore.
Inclusion criteria: all the patients undergoing VSD closure.

Exclusion criteria: Patients undergoing VSD closure as a part of treatment for other diseases like tetralogy of fallots, truncus srteriosis, transposition of great arteries etc.

Files of the patients who underwent VSD closure by a single surgeon (author), from January 2018 to October 2020, were reviewed. Age, weight, presenting symptoms, indication for surgery, associated lesions, cardiopulmonary bypass time, cross clamp time, duration of mechanical ventilation, mortality, risk factors for mortality, and complications were studied.

Patents who had VSD closure during operation for other diseases like Tetrology of fallot, complete AV canal defects, transposition of great arteries, and truncus arteriosis, were not included in the study..

RESULTS

200 patients underwent VSD closure from January 2018 to October 2020. 160 at Children's Hospital Lahore, 32 at Hameed Latif Hospital Lahore and 28 at university of Lahore teaching hospital Lahore.

Age: Age of the patients ranged from 3 months to 14 years with the mean of 11 months

Weight: weight ranged from 2.5kg to 42 kg with mean of 7kg

Indication For Surgery: table 1 shows the indications for surgery. Pulmonary hypertension was the most common indication for VSD closure.

Concomitant Surgical Procedures: table 2 shows the concomitant surgical procedures

Cardiopulmonary Bypass Time: Cardiopuomonary bypass time ranged from 35 minutes to 285 minutes with the mean of 48 minutes

Cross Clamp Time: cross clamp time ranged from 21 minutes to 200 minutes with the mean of 32 minutes

Types of VSDs: type 2 VSD was the most common type of VSD. Detail is provided in table 3

Mortality: 7 patients died. All of these died of ventilator associated pneumonia leading to sepsis and multi organ failure. 4 patients were having weight less than 3.5 kg. They could not be weaned from mechanical ventilation. 4 were having persistent pulmonary hypertension.

Complications: fig 1 shows the detail of complications.

Table No.1: indication for surgery

Indications for surgery	n	%
Pulmonary hypertension	152	76%
Right coronary cusp prolapsed	17	8.5%
Aortic regurgitation	13	6.5%
RVOT obstruction	12	6.%
Failure to thrive	3	1.5%
LV volume overload	3	1.5%

Table No.2: Concomitant procedures

Concomitant procedures	N	%
PDA ligation	45	22.5%
Right ventricular outflow tract muscle resection	10	5%
Pulmonary valvotomy	2	1%
PA debanding	2	1%
Aortic valve repair	6	3%
Creation of flap valve in VSD patch	3	1.5%
Closure of additional muscular VSD	2	1%
Coarctation of aorta repair	1	0.5%

Table No.3 Miscellaneous details

Total number of patients	200	
Age	3months - 14 years (mean 11months)	
Weight	2.5 – 41 kg(mean 7kg)	
CPB time	35-285 (mean 48 minutes)	
Cross clamp time	21-200 minutes(mean 32miutes)	
Type 1 VSD	35	18.5%
Type 2 VSD	148	74%
Type 3VSD	8	4%
Type 4 VSD	9	4.5%

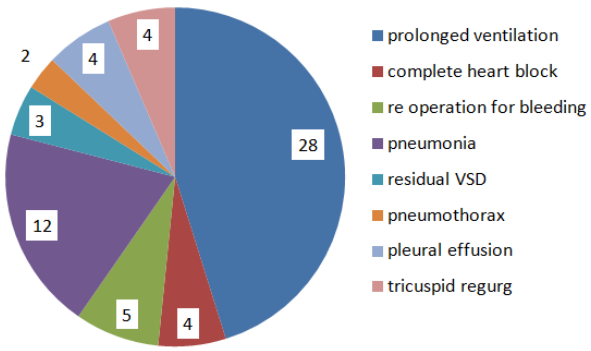

Figure No. 1 complication after VSD closure

DISCUSSION

The outcomes after surgical closure of VSD have improved over time with the advance in surgical techniques, cardiopulmonary bypass, anaesthesia and postoperative care[8]. However, the disturbance of conduction system like complete heart block and right bundle branch block, residual ventricular shunt, neurologic injury, and postoperative mortality are important postoperative problems, more frequent in infants with malnutrition. [9]

Mortality after VSD closure in developed countries is 0.5-1.7% [10-12], but it is still high in developing countries like Pakistan. Mortality rate in our series is comparable to other studies in Pakistan [13,14], which had mortality rate of 3.4% to 6%. Weight less than 3.5kg and persistent pulmonary hypertension were identified as the risk factors for mortality in our series. Another study by kamal saleem[15] had mortality of 11%. Body weight less than 5 kg, young age, high pulmonary artery to systemic pressure ratio and presence of additional left to right shunt were identified as risk factors for adverse outcome.

A study by Jamal Abdul Nasir 16 had incidence of aortic valve repair associated with VSD was 30%, while in our series, only 3 percent of the patients with VSD required aortic valve repair.

While in most of the recent studies,[17-20] show device closure of the VSD, but in Pakistan most of the centers are doing surgical closure of the VSDs.

Incidence of complete heart block after VSD closure is less than 1% in international literature. But a study from Pakistan [21] had 10% incidence of heart block after VSD closure. In that study all patients with perimembranous ventricular septal defect, aged 5 years to 25 years were included. Results showed complete heart block in the perimembranous ventricular septal defect after surgical closure was 10(9.71%).

In our series 2% of the patients developed complete heart block that required permanent pace maker in peri operative period. 1 of them developed sinus rhythm 2 days after the permanent pace maker insertion.

CONCLUSION

In a resource limited country like Pakistan where there are only few centers are performing pediatric cardiac surgery, our series of 200 VSD closures represent reasonable outcome. We have not mentioned about the follow up of those patients which is shortcoming in this series.

Author's Contribution:

Concept & Design of Study:	Faiz Rasool
Drafting:	Faiz Rasool
Data Analysis:	Faiz Rasool
Revisiting Critically:	Faiz Rasool
Final Approval of version:	Faiz Rasool

Conflict of Interest: The study has no conflict of interest to declare by any author.

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