

ORIGINAL ARTICLE

Outcomes and Trends of Surgical Ventricular Septal Defect Repair in a Tertiary Care Hospital in Pakistan: a Retrospective Study

Azam Jan*, Zainab Rustam, Khalid Saifullah Baig, Haseeb Ahmad, Ahmad Mehmood, Muhammad Zaid Ali, Waleed Shehzad Ali, Ameer Muhammad

Department of Cardiothoracic Surgery, Rehman Medical Institute, Peshawar, Pakistan

Abstract

Background: Ventricular septal defect is the most common congenital heart malformation in newborns. About 77% of newborns diagnosed with congenital heart disease had ventricular septal defect in Pakistan. VSD closure is one of the commonest procedure performed by pediatric cardiac surgeons. With advancement in preoperative and postoperative management, VSD closure has a very low incidence of postoperative complications.

Methodology: Patients who underwent VSD closure at our center from 2017 to 2021 were reviewed in the database. Patients with a simple VSD were included and those with a concomitant complex congenital cardiac anomaly were excluded. Data was analyzed in SPSS 23.

Results: Among the patients, 62.8% were males and 37.2% were females. Mean age was 10.36 ± 9.69 years, with 39.7% of the subjects below the age of 5. Increased ICU stay was defined as stay in the ICU for more than 48 hours and increased hospital stay was described as postoperative stay of more than 7 days. Nine patients had a prolonged hospital stay and four patients had a prolonged ICU stay. One patient went under reopening due to bleeding tamponade and one had a deep sternum infection. In hospital mortality rate was 2.4%.

Conclusion: VSD has a very low mortality rate in our center. Further studies are required to identify risk factors for morbidity and mortality. Long term follow-up studies should be conducted to identify rate of long term complications.

Keywords: Ventricular septal defects, Congenital heart defect, Hospital Mortality, Length of stay.

How to cite: Jan A, Rustam Z, Baig KS, Ahmad H, Mehmood A, Ali MZ, Ali WS, Muhammad A. Outcomes and Trends of Surgical Ventricular Septal Defect Repair in a Tertiary Care Hospital in Pakistan: a retrospective study. *Avicenna J Med Sci* 2021; 1 (1): 14-17

Introduction

Ventricular septal defect is the most common congenital heart malformation in newborns, with incidence rising as testing becomes more common and imaging advances. The incidence of VSD ranges from 1.56 to 53.2 per live births (1).

Studies based in Pakistan showed that 77% of newborns diagnosed with congenital heart disease had ventricular septal defect and another study demonstrated an incidence of 29% (2, 3). VSD may occur as an isolated malformation or as a feature of genetic disorder. 5-8% newborns with congenital heart disease have a chromosomal disorder including down syndrome, digeorge syndrome and turner syndrome (4).

Management of ventricular septal defect varies based on the severity of symptoms, size of the defect and development of complications. Hence, VSD closure is one of the commonest procedure performed by pediatric cardiac surgeons

Corresponding Author: Azam Jan

Affiliation: Department of Cardiothoracic Surgery, Rehman Medical Institute, Peshawar, Pakistan.

Email: azam.jan@rmi.edu.pk

Received: July 25, 2021

Revised: August 24, 2021

Accepted: September 12, 2021

DOI: [https://doi.org/10.59119/ajms.2021\(1\).1.4](https://doi.org/10.59119/ajms.2021(1).1.4)



This is an Open Access article distributed under the terms of the Creative Commons Attribution-Non Commercial 2.0 Generic License

eISSN 2958-2741 | pISSN 2958-2733

Table 1. Characteristics of patients going under VSD surgical repair

Characteristic	N=
Age	Mean: 10.36 ± 9.69 years
1. Toddlers (Age 2 or less years)	1. 16 (20.5%)
2. Preschool (3 to 5 years)	2. 15 (19.2%)
3. Childhood (6 – 12 years)	3. 21 (26.9%)
4. Teens (13 – 17 years)	4. 11 (14.1%)
5. Adults (18+)	5. 15 (19.2%)
Male	49 (62.8%)
Female	29 (37.2%)
Weight	26.6 ± 18 kg
BMI	N
Underweight	1. 21 (35.6%)
Healthy weight	2. 29 (49.2%)
Overweight	3. (6.8%)
Obese	4. (8.5%)
NYHA class	NYHA class (n= 46)
NYHA Class I	10 (21.7%)
NYHA Class II	24 (52.17%)
NYHA Class III	8 (17.39%)
NYHA Class IV	4 (8.6%)

Table 2. lists the intraoperative characteristics of patients. Increased ICU stay was defined as stay in the ICU for more than 48 hours and increased hospital stay was described as postoperative stay of more than 7 days. Mean hospital stay was 5.9 days and ICU stay was 45.74 hours. Average time of post-operative mechanical ventilation was 3.57 hours. Intraoperative blood products were used in 66.7% of the patients and post-operative blood products were used in 16% of the patients.

Table 2. operative characteristics of patients going under surgical VSD repair

Characteristics	N=
Hospital stay (days)	5.9 ± 2.37
ICU stay (hours)	45.74 ± 16.5
Perfusion time (mins)	69.97 ± 22.3
Cross clamp time (mins)	41.41 ± 21
Mechanical ventilation time (post-operative) (hours)	3.57 ± 2.9
No. of blood products used intraoperatively	52 (66.7%)
No. of blood products used post-operatively	13 (16%)

Adverse outcomes and post-operative complications are summarized in Table 3. Nine patients had a prolonged hospital stay and four patients had a prolonged ICU stay. One patient went under reopening due to bleeding tamponade and one had a deep sternum infection. In hospital mortality rate was 2.4%.

Table 3. Mortality and morbidity of patients going under VSD repair

Complications	N=
Reopening to bleeding tamponade	1 (1.2%)
Prolonged ventilation (above 24 hours)	1 (1.2%)
Prolonged hospital stay (more than 7 days)	9 (11.8%)
Prolonged ICU stay (more than 48 hours)	4 (5.4%)
Deep sternum wound infection	1 (1.2%)
In patient mortality	2 (2.4%)

Discussion

The study showed excellent results of surgical closure of VSD with only 2.5% mortality rate in our center. We had diverse age groups of patients, with the majority (26%) presenting in their childhood (age 6 – 12 years). Comparing this result to a similar study done in Karachi with a mortality rate of 3.4%, our findings demonstrate a lower mortality rate (8). Studies done in higher income and developed countries have either no mortality rate from surgical VSD closure or a very low percentage when compared to our cohort (9, 10).

Surgical closure of VSD is a safe procedure with a very low mortality rate, further risk factors should be identified to improve post-operative complication rate further.

Predictors of mortality and morbidity could not be determined in this study due to a low complication rate. Studies done in another center demonstrated low body weight at the time of the operation was associated with increased morbidity (7). However, some studies have showed no association of low body weight with postoperative complications (5). A study in Pakistan found that age below 5 years was associated with adverse outcomes. Another study reported no such associations but found that younger patients had an increased postoperative stay (11, 12). On the contrary, Anderson et al. determined increased risk of composite surgery by 1.8 fold for every kilogram decrease in weight in infants below the age of 6 months (7). This study also reported that age over 6 months and higher weights were associated with decreased incidence of postoperative heart block and hemorrhage. Bushra et al. also found weight less than 10 kilograms and age less than a year correlated with higher peri and post-surgical complications (8).

Other possible risk factors for a complicated VSD closure are the presence of atria septal defect and pulmonary arterial hypertension. A study reported the presence of ASD with VSD was a statistically significant risk factor for increased perioperative morbidity (13). The absence of PAH is significantly associated with lower morbidity and mortality, and repair of VSD without PAH is a major indication for surgery (14).

There are very few studies describing the effect of longterm VSD repair. According to one study, patients are at risk of developing sick sinus syndrome (4%) at a mean follow-up of 15 years. Aortic regurgitation (16%) was another late finding in this cohort. This study followed up patients of underwent the procedure between 1968 and 1980. Follow-up of the same cohort at 40 years demonstrated systolic dysfunction of left ventricle in 21% and systolic dysfunction of right ventricle in 17%. There was a 5% increase in aortic regurgitation (21%) and the mortality rate was 14% (15,16). Given the advancements in the current era regards to pre and post-operative care and surgical techniques, we can expect a lower morbidity and mortality rate. Even though in hospital mortality rate in our study and recent study is 0 – 3%, it would be interesting to follow up on this cohort to determine longterm complications. Further long-term studies

should be conducted to determine long-term complications to observe if any difference in outcomes has occurred.

Conclusion

Surgical repair of ventricular septal defect is a safe procedure with a very low mortality rate. The majority of the patients presented in childhood but a significant percentage presented in adulthood. Less than 50% of the patient population had a healthy BMI.

Ethical approval and consent

The study was approved by the institutional board of studies and informed consent was obtained from each participants included in the study.

Acknowledgment

We thank the study subjects for participating in this study.

Disclosure

The authors report no conflicts of interest.

Author's contributions

AJ and ZR was involved in the execution of the project designed, executed the study and wrote the manuscript. All named authors have read and approved the final version of the manuscript.

Data availability

Available from the corresponding author on reasonable request.

References

1. Sands AJ, Casey FA, Craig BG, Dornan JC, Rogers J, Mulholland HC. Incidence and risk factors for ventricular septal defect in “low risk” neonates. *Archives of Disease in Childhood-Fetal and Neonatal Edition*. 1999 Jul 1;81(1):F61-3.
2. Scully BB, Morales DL, Zafar F, McKenzie ED, Fraser Jr CD, Heinle JS. Current expectations for surgical repair of isolated ventricular septal defects. *The Annals of thoracic surgery*. 2010 Feb 1;89(2):544-51.
3. Mohammad N, Shaikh S, Memon S, Das H. Spectrum of heart disease in children under 5 years of age at Liaquat University Hospital, Hyderabad, Pakistan. *Indian heart journal*. 2014 Jan 1;66(1):145-9.4. Hoffman JIJPCoNA. Congenital heart disease: incidence and inheritance. 1990;37(1):25-43.

-
4. Vaidyanathan B, Roth SJ, Rao SG, Gauvreau K, Shivaprakasha K, Kumar RK. Outcome of ventricular septal defect repair in a developing country. *The Journal of pediatrics*. 2002 Jun 1;140(6):736-41.
 5. Kogon B, Butler H, Kirshbom P, Kanter K, McConnell M. Closure of symptomatic ventricular septal defects: how early is too early?. *Pediatric cardiology*. 2008 Jan;29:36-9.
 6. Anderson BR, Stevens KN, Nicolson SC, Gruber SB, Spray TL, Wernovsky G, Gruber PJ. Contemporary outcomes of surgical ventricular septal defect closure. *The Journal of thoracic and cardiovascular surgery*. 2013 Mar 1;145(3):641-7.
 7. Bushra O, Amanullah M, Mehnaz A. Surgical outcomes of pediatric patients with ventricular septal defects in a tertiary referral center in Pakistan: a retrospective cohort study. *Journal of Clinical and Experimental Cardiology*. 2013;4(10):1.
 8. Herbst C, Zhang H, Renjie Hu R. Pediatric cardiac surgical patterns of practice and outcomes in Europe and china: an analysis of the European Congenital Heart Surgeons Association (ECHSA) congenital heart surgery database. *Congenit Heart Dis*. 2021 Jan 1.
 9. Schipper M, Slieker MG, Schoof PH, Breur JM. Surgical repair of ventricular septal defect; contemporary results and risk factors for a complicated course. *Pediatric cardiology*. 2017 Feb;38:264-70.
 10. Saleem K, Sultan M, Sadiq N. Surgical closure of ventricular septal defect—experience at Armed Forces Institute of Cardiology. *Pak Armed Forces Med J*. 2014;1(1):S100-104.
 11. Ashfaq A, Zia HA, Amanullah MM. Is early correction of congenital ventricular septal defect a better option in a developing country. *Journal of the Pakistan Medical Association*. 2010;60(4):324.
 12. Knott-Craig CJ, Elkins RC, Ramakrishnan K, Hartnett DA, Lane MM, Overholt ED, Ward KE, Razook JR. Associated atrial septal defects increase perioperative morbidity after ventricular septal defect repair in infancy. *The Annals of thoracic surgery*. 1995 Mar 1;59(3):573-8.
 13. Aydemir NA, Harmandar B, Karaci AR, Sasmazel A, Bolukcu A, Saritas T, Yucel IK, Coskun FI, Bilal MS, Yekeler I. Results for surgical closure of isolated ventricular septal defects in patients under one year of age. *Journal of Cardiac Surgery: Including Mechanical and Biological Support for the Heart and Lungs*. 2013 Mar;28(2):174-9.
 14. Roos-Hesselink JW, Meijboom FJ, Spitaels SE, van Domburg R, Van Rijen EH, Utens EM, Bogers AJ, Simoons ML. Outcome of patients after surgical closure of ventricular septal defect at young age: longitudinal follow-up of 22–34 years. *European heart journal*. 2004 Jun 1;25(12):1057-62.
 15. Menting ME, Cuypers JA, Opić P, Utens EM, Witsenburg M, van den Bosch AE, van Domburg RT,
 16. Meijboom FJ, Boersma E, Bogers AJ, Roos-Hesselink JW. The unnatural history of the ventricular septal defect: outcome up to 40 years after surgical closure. *Journal of the American College of Cardiology*. 2015 May 12;65(18):1941-51.