ISSN: 0975-3583,0976-2833 VOL13, ISSUE 03, 2022

Results of Atrial Septal Defect Repair

Ishtyak Ahmed Mir[1], Noor Ali[2], Arvind Kohli[1], Mohit Arora[3], Vivek Gandotra[4]

[1]Associate Professor, Department of Cardiovascular and Thoracic Surgery, Super-specialty Hospital Government Medical College, Jammu, India.
[2]Professor, Department of Cardiovascular and Thoracic Surgery, Super-specialty Hospital Government Medical College, Jammu, India.
[3]Lecturer, Department of Cardiovascular and Thoracic Surgery, Super-specialty Hospital Government Medical College, Jammu, India.
[4]Consultant, Department of Cardiovascular and Thoracic Surgery, Super-specialty Hospital Government Medical College, Jammu, India.

Abstract

Background: Atrial Septal defect is the third most common type of congenital heart defect, results because of abnormal foetal development, can be uncomplicated or more complex and in majority presents in late life. Secundum type atrial septal defects are among the most common cardiac malformations and occur in 10 to 15 % of all patients with congenital heart diseases. Women are affected about twice as frequently as are men. Pathophysiology of the shunt is such that, an Atrial Septal Defect may not be clinically evident in first two years of life. **Material and Methods:**The study was conducted in the Department of Cardiovascular and Thoracic Surgery on patients operated for atrial septal defect.**Results:**A total of 53 patients, mostly in second decade, irrespective of age, sex, clinical presentation and surgical outcome were included in the study. Female patients were more. Breathlessness was the presenting symptom, and left parasternal lift common clinical observation. Transthoracic echocardiography was the investigation of choice, and around 80% had fossa ovalis type of defect. All the patients were operated under cardiopulmonary bypass, and direct repair was done in majority. There was no mortality.**Conclusion:**A seemingly benign condition can present with a grim phenomenon. Early and precise diagnosis, followed by definitive management (Device closure / Open Surgical repair) gives excellent results.

Keywords: Atrial septal defect, Direct Repair, Patch Closure

Corresponding Author: Dr. Ishtyak Ahmed Mir, Associate Professor, Department of Cardiovascular and Thoracic Surgery, Super-specialty Hospital Government Medical College, Jammu, India. Email: ishtyak_mir@rediffmail.com

Introduction

Atrial septal defect (ASD) a congenital defect, is a hole in the wall (septum) between two upper chambers of the heart (atria). The defect may be so small, that it goes undetected for years. Although various types of ASD are described such as Fossa ovalis type, Posterior, Sinus venosus, Coronary sinus defect, Confluent, Ostium primum defect, and Sinus venosus malformation / Syndrome, only defects at the site of oval fossa (secundum defects) are true defects. These defects occur because of deficiency of septum which can be short or perforate, or septum may not have developed. An ASD results in a shunt of oxygenated blood from the left atrium (LA) to the right atrium (RA), because left ventricle (LV) is a thicker muscle then right ventricle (RV). The difference in thickness is reflected by a difference in distensibility of the two ventricles as a result of which, with an intact atrial septum, normal mean left atrial pressure is double the pressure of right atrium. Clinical features besides others may have right ventricular volume overload, widely split and fixed second heart sound. Transthoracic echocardiography (TTE) will reveal the size and location of ASD. Pulsed and colour doppler

ISSN: 0975-3583,0976-2833 VOL13, ISSUE 03, 2022

identify the left to right shunt at the atrial level. Partial anomalous pulmonary venous connections (PAPVC) can be determined by two-dimensional echocardiography / colour Doppler. Older children's and adult patients may need Transoesophageal echocardiography (TEE). Cardiac catheterisation is rarely needed.

After the first successful intracardiac repair of ASD, on extracorporeal circulation in 1953, and subsequently using hypothermia and inflow occlusion, direct repair or patch closure had been the surgical procedure of choice. For decades ASD repair was done, approaching heart by median sternotomy, and performing the procedure under cardiopulmonary bypass (CPB). However, of late these invasive procedures have been replaced by minimally invasive procedures. In advanced centres Device closure of ASD is done with excellent results.

In centres where minimally invasive facilities are not available and where patients cannot afford to go to higher centres, direct or patch repair of ASD is done under cardiopulmonary bypass.

Materials and Methods

The study was conducted in the Department of Cardiovascular and Thoracic Surgery. All the patients irrespective of age, sex, clinical presentation, associated anomaly and surgical outcome were included in the study. Besides a detailed history a thorough general and systemic examination was done. Echocardiography was the investigation of choice and TTE was done in all. After the diagnosis was confirmed, patients were prepared for preanesthetic check-up and surgery, by carrying out various tests, such as Complete blood count, liver / Kidney function, Coagulogram, Cultures, Serology, Blood grouping, blood sugar, TSH, X-Ray Chest and PFT. An informed consent was taken from the patient or from the parents / guardians of the patients. Heart was approached by median sternotomy, pericardiotomy was done, exposing aorta superiorly, and diaphragm inferiorly. Thymus was either reflected or excised. Superior dissection included exposure of innominate vein. Umbilical tapes were passed around superior vena cave (SVC), and inferior vena cava (IVC) for snugging. Dissection between aorta and pulmonary artery (PA) was done for application of safe aortic cross clamp. Purse string sutures were given for aortic, superior / inferior vena cava and cardioplegic cannula, cannulation. After purse string sutures, patients were heparinised (as per desired ACT) and cannulated systematically. Heart was arrested by using hypothermic cardioplegia / ice slush. Septal defect was approached by oblique right atriotomy. ASD (and any other intracardiac procedure) was repaired / done under cardiopulmonary bypass, and aortic cross clamp. Deairing was done before tightening the last suture in septal defect. Cardioplegia was repeated after every 20 to 25 minutes. After the intracardiac procedure RA was closed, deairing done and cross clamp removed. Patients were weaned off bypass gradually, and decannulated systematically. Effect of heparin neutralised, haemostasis was achieved, sub-sternal tube drains were placed, in case of breach of pleura in pleural cavities also, temporary pacing wires were fixed, and chest was closed. Intraoperative findings were recorded, adverse events were noted.

All the patients were shifted to intensive care unit, some even intubated. Patients with patch repair and those above 35 years of age were put on antiplatelet drugs for six weeks. Post-operative complications were recorded, after discharge patients were followed in outpatient department. Morbidity and mortality were recorded.

Results

53 patients were included in the study, 54.71% were female, 37.73%, 20.75% were in second and fourth decade respectively. Breathlessness was the presenting symptom in 66.03, Table-1, and parasternal lift was observed in 64.15%, Table-2. X-Ray chest showed features of enlarged right atria / ventricle. Incomplete RBBB was noted in about 96% of the patients.

ISSN: 0975-3583,0976-2833 VOL13, ISSUE 03, 2022

TTE was done in all, TEE and coronary angiography in some. 56.60% were in functional class-I, Fossa ovalis defect was documented in 90.56%, Table-3. Associated anomalies not requiring surgical interventions included mitral valve prolapse in 13.30%, mitral stenosis 11.32%. After median sternotomy, and pericardiotomy, pericardial stay sutures were placed, and intrapericardial anatomy assessed. CPB was established with perfusate temperature at 34 C, cardioplegic needle was placed in ascending aorta, aorta was clamped, and cold cardioplegic solution injected. The caval tapes were snugged and right atrium opened obliquely. A few stay sutures were placed on the edges of the atriotomy incision, and the anatomy confirmed. Direct repair was done in 58.49% using synthetic, monofilament, nonabsorbable polypropylene suture, (continuous), and patch repair was done by using autologous pericardium or dacron, Table-4. Associated procedures included mitral valve repair in one, mitral / pulmonary valve dilatation in one each. The RA was closed in two layers, horizontal mattress and over and over continuous suture using 5-0 polypropylene. Deairing was done and cross clamp removed. Cardiac activity was smooth and uneventful in majority. After hemodynamic stability or at least one third of the cross-clamp time, patients were weaned of bypass gradually, and decannulation was done systematically. Cross clamp time of up to 40 minutes, 50 minutes and more was recorded in 54.71%, 37.73% and others respectively, accordingly the CPB time was from 50 to more than 90 minutes. Patients were extubated in operation theatre, and some after overnight ventilation, 7.54% patients needed prolonged ventilation more than 96 hours, and an equal number of patients needed re-intubation. Tube drainage of more than 1000 ml was recorded in five patients, three were re-explored. There was no mortality.

Table 1: Distribution of patients with symptomatology

Symptoms	Number of subjects	Percentage %
Breathlessness	35	66.03
Palpitations	19	35.84
Recurrent RTI	12	22.64
Oedema	4	7.54

Table 2: Distribution of patients with clinical signs

Clinical Sign	Number of Patients	Percentage (%age)
Parasternal lift	34	64.15
Fixed split 2ndsound	19	35.84
Anaemia	14	26.53
Oedema	9	16.98
Mid systolic murmur	7	13.20
Raised JVP	5	9.43

Table 3: Distribution of patients with type of ASD

Type of ASD	Number of Patients	Percentage (%age)
Fossa ovalis	48	90.56
Posterior defect	2	3.77
Sinus venosus	1	1.88
Confluent defects	1	1.88
Coronary Sinus	1	1.88

ISSN: 0975-3583,0976-2833 VOL13, ISSUE 03, 2022

Table 4: Distribution of operations performed

Type of ASD	Number of Patients	Percentage (%age)
Direct Repair	31	58.49
Patch closure	26	41.50

Discussion

Secundum type of ASD are among the most common cardiac malformations and occur in approximately 10 to 15 percent of all patients with congenital heart disease. Because of its late presentation is also called as adult congenital heart disease. Depending upon the size of the defect ASD is classified as small, moderate and large. Spontaneous closure has been reported in small and medium sized defects but not in large defects. Clinical diagnosis has been documented only in early forties,[1]and before that only one had been correctly diagnosed during life.[2]The first clinical trial was Murrays's closure of ASD in a child in 1948.[3]The successful ASD repair was reported in 1953.[4]Only about 0.1% of individuals born with a large ASD and no other important cardiac anomaly die in infancy, and that few who are unrepaired die in first or second decade, about 5 to 15% die in third decade.[5]Presentation is variable, and only about 1% of patients born with large ASD have symptoms during first year of life.[6-8]but even in isolated secundum atrial septal defects pulmonary hypertension may be present in up to 13% of the patients under 10 years of age,[9]also pulmonary hypertension may be more in patients who reside at high altitude. Spontaneous closure though rare has been reported in about 14%,[10]and increase in size as time passes has been clearly demonstrated in the case of patent foramen ovale.[11]Most of the patient in present study presented late, either they were not symptomatic or they were being treated at non specialised centres for respiratory tract infections. Breathlessness as the presenting symptom is well established, so are recurrent respiratory tract infections, palpitations and atrial fibrillations. Clinical signs diagnostic of a large shunt at atrial level are overactive left parasternal systolic lift, fixed splitting of the second heart sound. Electrocardiography revealing incomplete right bundle branch block, and enlarged RV / RA on chest radiography help in narrowing the diagnosis. Echocardiography as the investigation of choice to diagnose ASD, is in accordance to the observations made in other studies.[12,13]Median sternotomy was done in all to approach heart, and it is an established fact that, standard surgical ASD repair after median sternotomy is a low-risk procedure with close to zero operative mortality.[14]Because of advances in minimally access surgery various techniques have been devised to approach heart for atrial septal defect repair, and totally endoscopic atrial septal defect repair offers the best cosmetic outcome.[15]It is a fact that minimally invasive approaches improve cosmesis, shorten hospital stay, hasten return to full function and can be performed without increased risk in terms of mortality and morbidity.[16]Surgical repairs of ASD via median sternotomy, right sub -mammary / and right vertical infra-axillary thoracotomy can present satisfactory results, but the latter two incisions have an excellent cosmetic result.[17]According to current guidelines, a hemodynamically significant ASD with enlarged right side heart structures should be closed electively once the diagnosis is confirmed,[18]but increased risk of an early ASD closure is associated with additional chromosomal abnormalities and pulmonary hypertension.[19]Hospital mortality for repair of ASD has approached zero for many years, and even in late fifties was around 3% only.[20]No mortality in the present study is of no significance, because patients' number was less, secundum type of defect was common, more than 56% were in functional class-1, none had severe pulmonary hypertension, and no major associated procedure was performed simultaneously. Time related survival after ASD repair in first few years is that of matched general population, but in older patients' survival is lower than in the matched population.[21]long term results were not available because the patients rarely attend the

ISSN: 0975-3583,0976-2833 VOL13, ISSUE 03, 2022

hospital after first two years of surgery or after the functional class improves. None of the patients required reoperation in the present study, which is contrary to the observations in literature. Approach to heart for ASD repair can be achieved by thoracotomy (anterior/ posterior / anterolateral / posterolateral/ right vertical axillary), sternotomy (upper / lower / partial / mini), but all have their limitations, the results of VATS, Robotic, and totally endoscopic repair are excellent, but nothing can be substitute for device closure of ASD.
The study has limitations, and had no pre-schoolers, majority were in functional class-I, with simple ASD, no associated complex pathology, all the preoperative parameters were not evaluated, and follow-up was erratic. In conclusion ASD can present at any age in any functional class, detailed history, thorough general / systemic examination is helpful, Echocardiography helps confirm diagnosis, direct or patch repair under CPB gives excellent results.

Conclusion

A seemingly benign condition can present with a grim phenomenon. Early and precise diagnosis, followed by definitive management (Device closure / Open Surgical repair) gives excellent results.

References

1. Bedford BE, Papp C, Parkinson J. Atrial septal defect. Br Heart J 1941; 3: 37.
2. Roesler H. Interatrial septal defect. Arch Intern Med 1934; 54: 339.
3. Murray G. Closure of defects in cardiac septa. Ann Surg 1948; 128: 843.
4. Gibbon JH. Application f a mechanical heart-lung apparatus to cardiac surgery. Minn Med 1954; 37: 171.
5. Craig RJ, Selzer A. Natural history and prognosis of atrial septal defect. Circulation 1968; 37: 805.
6. Adams CW. A reappraisal of life expectancy with atrial shunts of secundum type. Dis Chest 1965; 48: 357.
7. Dimich I, Steinfeld L, Park SC. Symptomatic atrial septal defect in infants. Am Heart J 1973; 31: 7.
8. Spanglerler JG, Feldt RH, Danielson GK. Secundum atrial septal defect encountered in infancy. J Thorac Cardiovasc Surg 1976; 71: 398.
9. Cherian G, Uthaman CB, Durairaj M, Sukumar IP, Krishnaswami S, Jairaj PS, et. al. Pulmonary hypertension in isolated secundum atrial septal defects: high frequency in young patients. Am Heart J 1983; 105: 952.
10. Ghisla RP, Hannon DW, Meyer RA, Kaplan S. Spontaneous closure of isolated secundum atrial septal defects in infants: an echocardiographic study. Am Heart J 1985; 109: 1327.
11. Hagen PT, Scholz DG, Edwards WD. Incidence and size of patent foramen ovale during the first 10 decades of life: an autopsy study of 865 normal hearts. Mayo Clin Proc 1948; 59: 17.
12. Forfar JC, God MJ. Functional and anatomical correlates in atrial septal defect. An echocardiographic analysis. Br Heart J 1985; 54: 193.
13. Lieppe W, Scallion R, Behar VS, Kisslo JA. Two-dimensional echocardiographic findings in atrial septal defect. Circulation 1977; 56: 447.
14. Horvath KA, Burhe RP, Collins JJ, Cohn LH. Surgical treatment of adult atrial septal defect: early and long-term results. J Am coll Cardiol 1992; 20: 1156-9.
15. Koray AK, Tayfun Aybek, Gerhard Wimmer-Greinecker, Feyzan Ozaslan, Farhad bakhtiary, Anton Moritz, Selami Dogan. Evolution of surgical techniques for atrial septal

ISSN: 0975-3583,0976-2833 VOL13, ISSUE 03, 2022

defect repair in adults: A 10-year single-institution experience. The journal of Thoracic and Cardiovascular Surgery, September 2007; 134 (3): 757-64.
16. Matthew Liava'a, David kalfa. Surgical closure of atrial septal defects. J Thorac Dis 2018; 10 (suppl 24): S2931-S2939.
17. Zeng-rong Luo, Qiang Chen, Ling-li Yu, Liang-wan Chen, Zhong-yao Huang. Comparative study between surgical repair of Atrial Septal Defect via Median Sternotomy, Right Submammary Thoracotomy, and Right Vertical Infra-Axillary Thoracotomy. Braz J Cardiovasc Surg, 2020; 35(3): 285-90.
18. Feltes TF, Beekman RH, Cheatham JP, Feinstein JA, Gomes AS, et. al. Indications for cardiac catheterization and intervention in pediatric cardiac disease: a scientific statement from American heart association. Circulation (2011); 123: 2607-52.
19. Gustaf Tanghoi, Gunnar Sjoberg, Estelle Naumburg. Predictors of the Need for an Atrial septal Defect Closure at Very Young Age. Front. Cardiovasc. Med January 2020; 6: 185.
20. Steele PM, Fuster V, Cohen M, Ritter DG, McGoon DC. Isolated atrial septal defect with pulmonary vascular obstructive disease- long-term follow-up and prediction of outcome after surgical correction. Circulation 1987; 76: 1037.
21. Murphy JG, Gersh BJ, Mcgoon MD, Mair DD, Porter CJ, Ilstrup DM, et. al. long-term outcome after surgical repair of isolated atrial septal defect. Follow-up at 27 to 32 years. N England J Med 1990; 323: 1645.