

Full Length Research Paper

Surgical management and long term postoperative follow-up of atrial septal defects in adults

Kouassi Antonin SOUAGA¹, Jean Calaire DEGRÉ¹, Koutouan Eric KATCHÉ¹, Yoboua Aimé KIRIOUA-KAMENAN¹, Kwadjau Anderson AMANI¹, Gnamien Randolph NIAVA¹, Kouadio Joseph KOUAME², Landry KOHOU-KONE², Yves N'GORAN³, Kouassi Flavien KENDJA¹, Michel KANGAH¹

¹Department of Cardiovascular Surgery of the Abidjan Heart Institute, Côte d'Ivoire

²Department of Anesthesia and Intensive Care of the Abidjan Heart Institute, Côte d'Ivoire

³Department of Pediatric Cardiology of the Abidjan Heart Institute, Côte d'Ivoire

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The aim is to report an Ivorian experience of the surgical management of atrial septal defects in adulthood. Our retrospective study included 19 patients over 18 years old operated on for atrial septal defects (ASD) between January 2005 and December 2015 at the Abidjan Heart Institute (AHI). 13 women and 6 men with a mean age of 26 ± 9.07 years were included. For each patient we noted the clinical and para-clinical signs as well as the operative result and the short and long term follow-up data. Patients were symptomatic in 73.7% of cases. Two patients had atrial flutter. On cardiac echo-Doppler, the right ventricle measured 43.5 ± 4.2 mm. The systolic pulmonary artery pressure was 45 ± 14.7 mmHg. There were 3 cases of grade III tricuspid insufficiency and 1 case of abnormal venous return. Closure of the septal defect was performed with an autologous pericardial patch in 18 cases. Operative mortality was nil. The average length of stay in the surgical intensive care unit was 2.5 days. Eleven patients presented immediate postoperative complications, including 2 cardiac and 9 extracardiac. The total postoperative hospital stay was 14.7 days. After a mean follow-up of 8.25 ± 4 years, all patients had functional improvement with a significant decrease in right ventricular size and pulmonary arterial pressure. Surgical management of atrial septal defects in adulthood is associated with low mortality with a satisfactory functional outcome.

Key words: Atrial septal defect, surgical closure, adult.

INTRODUCTION

Atrial septal defect (ASD) is defined as an abnormal communication between the two atria that occurs during embryonic development. It creates a left to right shunt. It is a frequent anomaly that represents about 10% of heart diseases diagnosed at birth (Ward, 1994). It is

increasingly early diagnosis thanks to the progress of echocardiography that allows its rapid closure with a complete cure, thus avoiding its evolutionary complications (Diller and Gatzoulis, 2007; Le Gloan et al., 2018; Yong et al., 2009). This closure is recommended

E-mail: dr_souaga@yahoo.fr.

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before school age (Liava'a and Kalfa, 2018). However, some forms can be discovered in adulthood. They represent about 30 to 40% of the heart diseases diagnosed in adults (Ariane et al., 2007). The management of these adult forms is the subject of much debate and controversy (Ward, 1994; Gatzoulis et al., 1996; Humenberger et al., 2011). In Africa, studies on this subject are rare, so in addition to the article entitled "Ostium Secundum Atrial Septal Defect in Adults in Abidjan" published by Yangni-Angate et al. (1993), we report the results of our experience in the surgical management of ASD in adults.

PATIENTS AND METHODS

This is a retrospective study conducted at the Abidjan Heart Institute and concerns patients operated on between January 2005 and December 2015. Nineteen patients with ostium secundum ASD confirmed by cardiac Doppler ultrasound and operated on in adulthood (over 18 years) were included in this study. The parameters studied were epidemiological, clinical, and para-clinical data, surgical treatment, postoperative outcome, and long-term follow-up (the last control was performed in November, 2019).

There were 13 women and 6 men, with a mean age of 26 ± 9.07 years (18 - 45 years). They were 5 (26.3%), asymptomatic patients and 14 patients (73.7%) had symptoms. Functional signs were dominated by exertional dyspnea. On chest radiography, the mean cardiothoracic index (CTI) was 0.57 (0.48-0.64). On electrocardiogram, 2 patients had atrial flutter and 14 patients had complete or incomplete right bundle branch block. On cardiac echo-Doppler, the right ventricle end diastolic diameter was 43.5 ± 4.2 mm (40 - 49 mm). The mean left ventricular ejection fraction was 0.64 ± 0.04 (0.54 - 0.74). The septal curvature reported in all patients was type I in 6 patients and type II in 13 patients. Systolic pulmonary artery pressure was assessed preoperatively in all patients. The mean was $45 \text{ mmHg} \pm 14.7$ (34 - 75 mmHg). Cardiac catheterization was required in patients with severe PAH (PASP ≥ 60 mmHg) to not only confirm the level of PAH but also to measure pulmonary resistances. A pulmonary resistance < 6 Wood units ensured reversibility of PAH. Three patients had moderate tricuspid insufficiency (Grade III). One patient had an abnormal pulmonary venous return. This was the right superior pulmonary vein which terminated in the right atrium (Table 1). Statistical analysis was performed in a descriptive and analytical manner using EPI info software, version 6. Statistical tests were performed with the same software and we used the Student test. The threshold of significance was 0.05. Quantitative data were described by the mean and the standard deviation, while qualitative variables were described by the proportions.

RESULTS

The surgical procedures were performed under general anesthesia in intubated and ventilated patients with invasive blood pressure monitoring. Patients were positioned in the supine position with their arms at their sides. The approach was a vertical median sternotomy in all patients. All procedures were performed under extracorporeal circulation with aortic clamping. The time of the extracorporeal circulation was 69.7 min (28 - 105 min) and that of the aortic clamping was 34.7 min (17 - 57

min). The closure of the septal defect was performed after a right atriotomy, with a synthetic Dacron patch in 1 case and in 18 cases with an autologous pericardial patch previously treated with 2% glutaraldehyde sutured with an overjet of polypropylene size 6/0. De Vega annuloplasty was performed in 3 patients with moderate to severe tricuspid insufficiency associated with atrial septal defect. Abnormal venous return was tunneled through the ASD.

Operative mortality was zero. The average length of stay in the surgical intensive care unit was 2.5 days with extremes of 1 and 5 days. Eleven patients presented immediate postoperative complications. Two were cardiac complications and nine were extracardiac complications (Table 2). Cardiac complications were marked by cardiac rhythm disorders such as supraventricular tachycardia with transient evolution under antiarrhythmic treatment. One patient among the 2 patients in preoperative atrial flutter remained in flutter after failure of intraoperative cardioversion. The average postoperative stay in the cardiac surgery hospitalization unit was 11.9 days (5 - 19 days). The total postoperative hospital stay was 14.7 days. No secondary cardiac complications were reported (Table 2). The mean postoperative follow-up time was 8.25 years (4.2 years - 14.3 years). At the last follow-up, all patients were asymptomatic at NYHA functional stage I or II. One patient (5.3%) presented supraventricular rhythm disturbances. It was the patient in flutter whose rhythm disorder had been corrected by cardioversion. On radiography, the mean CTI was 0.54 (0.47 - 0.66). On cardiac echocardiography, there was a significant decrease in the size of the RV from $43.5 \text{ mm} \pm 4.22$ preoperatively to $35 \text{ mm} \pm 5$ postoperatively ($P = 0.041$). As well as the pulmonary artery pressure with a PASP of $45 \text{ mmHg} \pm 14.7$ preoperatively to $33 \text{ mmHg} \pm 12$ (20 - 61 mmHg) postoperatively ($P = 0.047$). LVEF was 0.64 ± 0.04 (0.54 and 0.74).

DISCUSSION

ASD is the most common congenital heart disease in adults, where they account for approximately 30-40% (Ariane et al., 2007). These aged forms are often symptomatic, the symptoms being dominated by exertional dyspnea and supraventricular rhythm disorders (Le Gloan et al., 2018). Cardiac echo Doppler alone can provide the different elements of the diagnosis. It may reveal severe pulmonary hypertension, which may suggest a form that has already progressed to Eisenmenger's syndrome. Cardiac catheterization in these cases was necessary not only to confirm the level of PAH but also to measure pulmonary resistance. This ensured that the PAH was reversible.

Numerous studies have demonstrated the benefit of ASD closure in the elderly, regardless of age, with an

Table 1. Distribution of epidemiological, clinical, and para-clinical characteristics.

Characteristics	Values
Sex n(%)	
Female	13 (68.4)
Male	6 (31.6)
Age	26 +/-9.07 years (range 18 to 45 years)
Circumstances of discovery n(%)	
Incidental discovery	5 (26.3)
Symptoms	14 (73.7)
Functional signs n(%)	
Exertional dyspnea (NYHA III-IV)	9 (47.4)
Palpitation	3 (15.8)
Chest pain	2 (10.5)
Electrocardiogram	
Sinus rhythm	14 (73.7)
Atrial flutter	2 (10.5)
Atrial extrasystole	3(15.8)
Radiography (CTI)	0.57 (range 0.48 to 0.64)
Ultrasound signs	
RV size (EDD) in mm	43.49 mm +/- 4.22(range 40 to 49 mm).
Ejection fraction	0.64 +/- 0.04 (range 0.54 to 0.74).
Septal curvature n(%)	
Type I	6 (31.6)
Type II	13 (68.4)
Flow ratio (PQ/SQ)	2.21(range 1.8 to 3.1)
Systolic pulmonary artery pressure	45 mmHg +/- 14.7(range 34 to 75 mmHg).
ASD size (mm)	32 mm (range 29 to 42 mm)
Associated lesions	
Tricuspid insufficiency n(%)	3 (15.9)
Abnormal pulmonary venous return n(%)	1 (5.3)

RV=Right ventricle; EDD= End-Diastolic diameter; CTI=cardio-thoracic index; PASP=Pulmonary artery systolic; pressure. QP pulmonary flow QS=systemic flow.

Table 2. Immediate postoperative complications observed.

Complications	n	%
Cardiac		
Rythme discordes	2	10.5
Extracardiac		
Atelectasis	3	15.8
Pleural effusion	1	5.3
Phrenic parisis	1	5.3
Pneumopathy	4	21

improvement in symptoms and a reduction in pulmonary arterial pressure, of course, in the absence of contraindications (Humenberger et al., 2011;

Konstantinides et al., 1995; Kuijpers et al., 2015; Mulder, 2010; Chen et al., 2015). Currently, in developed countries, the reference treatment for ASDs is

interventional catheterization, in accordance with the European recommendations of 2010 (Miltner et al., 2013). It is feasible in 80% of cases. Conventional surgery is still indicated for the closure of very large communications, as well as for ASDs with particular anatomical location, inaccessible to percutaneous closure such as sinus venosus, "low" septal defect or ostium primum Baskett et al., 2003; Brickner et al., 2000; Fraisse et al., 2018; Miltner et al., 2013). In our study, we used conventional surgery in all cases (open heart surgery under extracorporeal circulation). This is explained by the fact that percutaneous closure is not a routine activity in our center. The preferred approach for ASDs is right atriotomy, which allows closure of the septal defect and, at the same time, cure of any abnormal pulmonary venous return, as well as annuloplasty of the tricuspid valve if necessary (Houyel, 2002; Liava'a and Kalfa, 2018). In our series, the approach was right atriotomy in all cases. This approach allowed us to perform DEVEGA annuloplasty in three patients with significant tricuspid insufficiency and abnormal venous return was tunneled through the ASD. In almost all cases, the filling material was pericardium previously treated with gluteraldehyde. In only one case, a dacron patch was used. Surgical closure of ASD in elderly patients is a procedure associated with low morbidity and mortality (Speechly-Dick et al., 1993; Stellin et al., 2004). In general, throughout the literature, operative mortality for patients operated on in adulthood for atrial septal defects varies between 0 and 1.8% (Attie et al., 2001; Niwa et al., 2004; Siddiqui et al., 2014; Speechly-Dick et al., 1993). In our study, the mortality rate is 0%.

Surgical treatment exposes to complications related to the surgical procedure, anesthesia or extracorporeal circulation. In our study, 11.7% of complications were cardiac complications and were represented by cardiac rhythm disorders. As for extracardiac complications, they are essentially made up of pulmonary and infectious complications. They represent 52% of complications. Chatzis et al. (2005); Liava'a and Kalfa, (2018); and Nyboe et al., (2013) report the occurrence of postoperative complications which are represented by strokes, mediastinitis, pneumothorax, atelectasis and pleurisy. They are reported in a proportion of about 10 to 15%.

In our study, the operated patients all showed a significant improvement of their clinical condition with a disappearance of clinical signs and an improvement of the functional stages ranging from stages III or IV to NYHA stage I or II in the medium term. Stellin et al. (2004), thus assert that surgery for congenital heart disease in adulthood is a safe, beneficial, and low-risk treatment that changes the natural history of patients by improving their clinical status. Despite the difficulties encountered in our practice setting, our results are in agreement with this statement. Postoperative follow-up is also marked by the secondary appearance of rhythm

disorders. A study carried out in London (Haddad et al., 2015) showed a long-term increase in the number of patients with rhythm disorders. Indeed, rhythm disorders can occur after surgical repair. This secondary appearance would be linked to the irreversible after-effects, in particular atrial dilatation (Houyel, 2002). In our study, no patient presented an appearance of rhythm disorders after surgery. All our patients were operated on by conventional surgery and no residual shunt was found in all patients. The operative results in the literature show the absence of residual shunts in patients operated on by conventional surgery (Shah et al., 1994). Residual shunts are found in patients operated by interventional catheterization (Van Aerschot et al., 2012).

Conclusion

The surgical approach to adult congenital heart disease in our developing countries is different from that in developed countries. The majority of patients are discovered after the onset of symptoms and the time to surgical management is long. However, the operative results are satisfactory in terms of morbidity and mortality with functional improvement. Efforts should be made for early detection of these congenital heart diseases, follow-up of patients and facilitation of access to management centers. This would allow a reduction in their incidence in adulthood.

CONFLICT OF INTERESTS

The author has not declared any conflict of interests.

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