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Surgical Management of Cardiac Valvular Lesions in a Tertiary Sub-Saharan Centre

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Abstract

The aim of the study was to investigate the pattern of valvular lesions, the early post surgical mortality, and challenges in the care of operated patients in St. Elizabeth Catholic General hospital, cardiac centre.

Patients and methods: This retrospective analysis included 116 patients aged between 6 and 64 years old who underwent mitral repair or replacement and/or aortic valve replacement or repair in the cardiac centre from its inauguration in November 2009 through June 2011. Data from patients' records, operative intervention, and preoperative and postoperative two-dimensional echocardiographic studies were reviewed. Patients and their family were contacted a month, and three months after been discharged from the hospital and later every three months. The duration of the follow-up was from 3 months to 20 months.

Results: 116 patients aged between 6 and 64 years old with a mean age of 45 ± 6.5 years old underwent surgical correction of mitral and or aortic valvulopathy. Mitral regurgitation was the commonest echocardiographic diagnosis present in 51.7% patients; 13.3% patients had mixed mitral valve disease, 35% had pure mitral stenosis. Before surgery, 3 patients were in class IV, 10 in class III, 12 in class II and 4 in class I according to the New York Heart Association's classification. Patients were extubated from 5-10 hours after surgery with low doses of inotropes. The mean stay in intensive care unit was 1.5 ± 0.5 days. The drains were removed at the 3rd ± 1.5 post surgical days in the ward. In the early post surgical period, the ejection fraction (EF) changed from 45.3 ± 1.5% to 56.1 ± 1.4% ($p<0.005$) in 3 months and stayed almost the same after six months 57.2 ± 2.7% ($p>0.05$); at nine months it was 55.1 ± 1.8% ($p>0.05$), at 12 months – 58.4 ± 1.7% ($p>0.05$), at the latest patient's check up, the EF was 56.2 ± 1.3% ($p>0.05$); however the basal part of the interventricular septum was hypokinetic. The changes of the left ventricular diastolic diameter (LVIDD) were as follow: from 57.2 ± 1.5 mm to 55.3 ± 1.1 mm ($p<0.05$) after 3 months, 54.2 ± 2.7 mm ($p>0.05$) after six months; after nine months, it was 55 ± 1.8 mm ($p>0.0$). We could not identify the real cause of death in the patients because of lack of human resources and logistics however according to the relatives, we could think of sudden death, as the first cause, infectious diseases. The challenges faced are patients' negligence and poor discipline, wrong beliefs, poverty.

Conclusion: Post rheumatic mitral valve regurgitation is the pathology the most encountered. The study showed very good early results in the post surgical follow-up of patients with valve replacement for the correction of post rheumatic valvulopathy. Post surgical echocardiogram is characterised by motion abnormalities of the basal part of the interventricular septum. Due to financial limitation poverty and illiteracy of parents, the post surgical follow up of patients is challenging.

Introduction

Rheumatic heart disease is the most important sequelae of acute rheumatic fever, which is caused by group A streptococci and usually presents in childhood, affecting 5 to 14 years old although it can strike people up to the age of 30 [1]. In poor and developing nations, it remains a major cause of morbidity and premature death, imposing a substantial burden on healthcare systems with limited budgets [2]. The incidence of RHD in the world is at least 15.6 million cases; the highest documented prevalence of the disease among children from developing countries in sub-Saharan Africa is 5.7 per 1,000 [3,4]. The main valves severely damaged by endocarditis are the mitral and the aortic valves. Mitral valve repair is the preferred treatment, but this is not always possible, and mitral valve replacement (MVR) may be the only option. Because bioprosthetic mitral valves in children are subject to early calcification, mechanical prostheses are favoured even though they require life long anticoagulation [5]. The incentive to avoid valve replacement in young children is fostered by the concern that operative mortality is high, ranging from 10% to 36%. Other concerns include the potential morbidity associated with long-term anticoagulation and the need for subsequent prosthetic valve replacements as the

child grows [6,7]. The aim of the study was to investigate the pattern of valvular lesions, the acute and early post surgical mortalities, and challenges in the care of patients who underwent a surgical correction of a valvulopathy and followed up in St. Elizabeth Catholic General hospital, cardiac centre.

Material and Methods

Patients

Ethics Committee of the St. Elizabeth catholic general hospital,

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Shisong, approved the study. Between November 2002 and December 2011, 116 patients aged between 6 and 64 years old with a mean age of 45 ± 6.5 years underwent a surgical correction of heart valvulopathy. Data from patients' records, preoperative, operative and postoperative two-dimensional echocardiographic studies were reviewed. Transthoracic echocardiography was performed using commercially available echocardiography equipment (Acuson Sequoia, Acuson Co, Mountain View USA) with a 3.5 MHz transducer. Left ventricular systolic performance was assessed by determination of the ejection fraction. The mitral valve prosthesis was studied from an apical position and peak inflow velocities of the E and A waves over the prosthesis determined. The inflow Doppler signals were digitised and the mean gradient across the valve computed. In addition a qualitative assessment was made of prosthetic valve leaflet motion and the presence of pannus or paravalvar leaks. The right atrioventricular valve was assessed for regurgitation and the right ventricular pressure estimated from the Doppler signal when possible. All patients were operated upon in the surgical unit of St. Elizabeth Catholic general hospital, cardiac centre.

Pre surgical state of patients

The medication prescribed while waiting for surgery were angiotensin converting enzyme inhibitors, diuretics; those having atrial fibrillation were taking anticoagulant, maintaining the INR between 2-3; to rate control was given priority. The antibiotic prophylaxis for recurrences was also given. Patients and their parents were counselled about the type of surgery that will be performed, the associated risks and a concern form was then signed.

Post surgical state and follow-up

The post surgical follow up was initiated after the correction of the valvulopathy. The patients underwent clinical examination, followed by the electrocardiogram (ECG), and a comprehensive TTE immediately after surgery, a month after surgery, then every 3 months after surgery. The total duration of the follow-up was from 3 to 20 months.

Definitions of terms

Acute mortality is the mortality from the day of surgery till the 30th post operative day, early mortality is the mortality registered from the 31st post operative day till 1 year after surgery.

Statistical analysis

Statistical analyses were performed using the χ^2 test and the Wilcoxon rank sum test for non para-metric variables. A paired t test was used for continuous variables. This is a descriptive study; results are presented as the mean ± the standard deviation. All statistical analyses were performed using the SPSS 11 program; for statistical difference the Student t test and $p<0.05$ was considered significant.

Results

Pattern of valvulopathies

Mitral valve pathology was the most encountered Post rheumatic mitral valve regurgitation was the pathology the most encountered (61.5%, n=48), followed by post rheumatic aortic valve regurgitation (38.5%, n=30), mitral valve stenosis, mitral valve disease, aortic valve stenosis and combined mitro-aortic valvulopathy were also represented. Tricuspid regurgitation with elevated pressure in the right ventricle as complication of mitral lesion was detected in 42 cases (52.5%).

Surgical management of valvulopathies

Mitral valve replacement with the implantation of mechanical prosthesis was done in 60%, n=47. Mitral valve repair, aortic valve replacement and repair were done respectively in 20.5% n=16, 41% n=32 and 2.5% n=2. In 18% n=14 because of severe lesions were implanted both mitral and aortic mechanical prosthesis.

Electrocardiogram

Left ventricular hypertrophy 47.3% was the most seen change on the ECG. Also were right ventricular hypertrophy 22.3%, left auricular hypertrophy 20.1%, right auricular hypertrophy 10.3%, left bundle branch block 57.7%, right bundle branch block 42.3%. Arrhythmias were represented with sinus tachycardia 48.3%, atrial fibrillation 15.2%, ventricular premature contractions 19.4%, and atrial premature contractions 17.1%.

Transthoracic doppler-echocardiogram

We could see during the echographic examination the fibrotic destruction of the mitral valve. The valves were calcified, immobile in case of stenosis, rigid with coaptation default and retraction of the subvalvar apparatus in case of regurgitation. Complications of RHD observed included different stages of tricuspid regurgitation and elevated pressure in the right ventricle. The mean vena contracta was 13.2 ± 2.1 mm, the mitral valve annulus 3.6 ± 1.8 mm, the left atrium major axis 10.2 ± 3.2 mm, the minor axis 9 ± 2.5 mm. Giant left atrium was seen in 5 cases with a major axis 132 ± 1.3 mm, the minor axis 110 ± 0.8 mm. The mean diastolic diameter of the left ventricle, systolic diameter of the left ventricle, the ejection fraction, shortening fraction were respectively 56 ± 3.5 mm, 45 ± 2.1 mm, 56 ± 4.5%, 25 ± 2.3%.

Acute post surgical course

The extubation was done from 3 to 12 hours after surgery; few were having low doses of inotropes. The chest drains were removed on day two after surgery. The mean stay in the intensive care unit was 36 ± 12 hours. The mean stay in the hospital was 17 ± 4 days. Patients with bleeding 2% were re-intubated for for a mean time of 36 ± 12 hours for the revision of the sternum. Moderate pleural effusion was observed in 9% n=7; after drainage, an appropriate dose of diuretics was given with success. The mean stay in the hospital was 18 ± 5 days. The TTE done in the acute post surgical period was showing a dyskinesia, hypokinesia, akinesia and sometimes paradoxal motion of the basal part of the interventricular septum. We could also see residual prosthesis regurgitation. No death was recorded intraoperatively, 3 deaths – 4% were recorded in the acute postsurgical period.

Electrocardiogram

In 10% of patients, AF persisted after surgery while in 5% it changed to sinus rhythm. 3 patients after surgery had a 2nd degree atrioventricular block Mobitz II which changed into a regular sinus rhythm 7 days after.

Early post surgical state and follow-up

In the early post surgical period, we observed an improvement of the global contractility. The parameters were LVDD: 52 ± 1.3 mm, LVSD: 40 ± 1.1 mm, EF: 63%, the SF: 27%. Three months after surgery, the parameters were: general and segmentary contraction; the ejection fraction (EF) changed from 45.3 ± 1.5% to 56.1 ± 1.4% (p<0.005) in 3 months and stayed almost the same at twelve months – 58.4 ± 1.7% (p>0.05), at the latest patient's check up, the EF was 56.2

± 1.3% (p>0.05) however the basal part of the interventricular septum was almost unchanged, hypokinetic in case of mitral replacement and dyskinetic in case of aortic replacement. The evolution of the left ventricular diastolic diameter (LVIDD) was as follow: from 57.2 ± 1.5 mm to 55.3 ± 1.1 mm (p<0.05) after three months, at twelve months 55.3 ± 1.7 mm (p>0.05); the EF was 54.6 ± 0.9 mm at the last check up of the patients (Table 1). In patients with pulmonary hypertension, we observed a reduction of the pressures in the right ventricle, from the acute post surgical period till the last follow-up readings, from 98.3 ± 2.5 mmHg before surgery to 40.4 ± 1.5 mmHg (p<0.05) in the acute post surgical period and 25.1 ± 0.5 mmHg (p<0.05) at the last follow-up. The peak inflow velocities of the E and A waves in the early post surgical state and later were within the normal ranges according to the type of the mechanical prosthesis implanted. The clinical condition of the patient had really improved, according to NYHA classification in class I were 70 patients, in class II – 8 patients. A year freedom from prosthetic valve infection, bleeding, paravalvular leak and mitral valve reoperation was 100% (Figure 1).

Post surgical challenges

The INR: The operated patients are coming from different towns of Cameroon, often located very far from the cardiac centre. Instead of patients coming to check the INR monthly or twice a week, after stabilising the INR a chart of oral anticoagulant was given for three months, the time appointed for the next follow-up. The loss of follow-up was 3%.

Mortality

Causes of death of patients operated upon can be classified in two: death related to the malfunction of the mechanical prosthesis and death related to other factors. Malfunction of the prosthetic valve can be due to a perivalvar leakage, a desinsertion of the mechanical prosthesis, thrombosis of the mechanical valve, vegetation, etc. Other factors can be infectious diseases (malaria, AIDS, typhoid fever, etc…..), trauma, renal impairment in patients with diabetes, negligence, financial limitation, some beliefs of the patient's family. The aetiology of early mortality in all patients was unknown because we used to be informed about the death, patients living far from the cardiac centre. Three deaths in the acute post surgical period (one due to acute renal failure and 2 due to low output) and 4 deaths in the early post surgical period (due to the thrombosis of the prosthesis) were registered giving a total mortality of 8%.
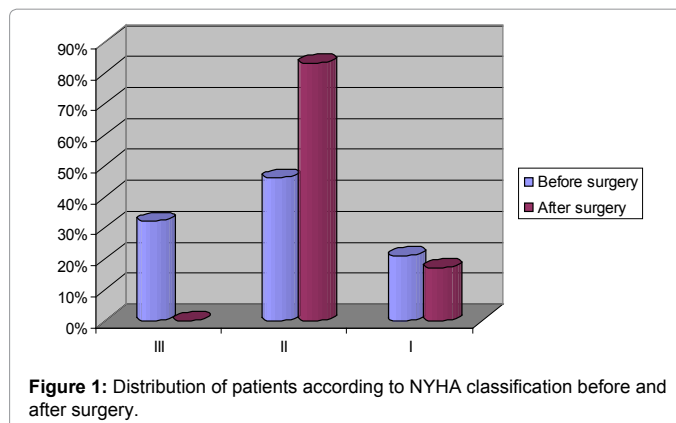
Valve replacement/Repair

It is well known that the surgical treatment of choice of valvulopathies is the repair or plasty of the damaged valve depending on the skill of the surgeon. In our centre, patients are presenting with much damaged valves not giving way to a repair. Also, patients are

Figure 1: Distribution of patients according to NYHA classification before and after surgery.

consulting in very advanced stages of the disease when the only life saving solution is the replacement of the valve. Replacement is the choice of some patients mainly because of financial limitations in case of a later re-operation. We see that patients with plasty without INR control were financially and psychologically free of the laboratory test (INR). All of them were having good clinical and instrumental parameters both on the electrocardiogram and at the echocardiogram. Also post surgical death was less registered in these patients (only a case who died of renal impairement).

Financial limitations

In a third wall country without subsidization from the government and inexistence insurances, we are having more than 300 patients with post rheumatic valvulopathies and waiting for surgery.

Discussion

In the study, we tried to report the pattern of valvulopathies, acute and early post surgical results of patients after surgical correction of valvulopthies in St. Elizabeth catholic general hospital, cardiac centre. Acute rheumatic fever and its complications is becoming a rarity in the western world; it is still non uncommon in the developing countries. In our study, we can see that the most affected population are very young people. Some are compensated, others having congestive heart failure. Hillman ND et al. reported surgery in children having a mean age of 13 ± 4 years old declaring that the incidence of post rheumatic cardiopathies has increased in United States of America [7]. In Brazil the mean age at the time of first surgery was 12.0 ± 2.8 years [8]. We see that in Cameroon, Brazil or in United States of America, post rheumatic valvulopathies are affecting almost the same population. On the TTE, the valves were rigid, calcificated with coaptation default in case of regurgitation, with a poor opening in case of stenosis. We could observe a dilatation of all the chambers; in some cases, we observe a giant left atrium with a major axis dimension of 13 cm. The pathology the most encountered was mitral valve regurgitation like in the study of Andréa Rocha e Silva et al. in Brazil [9]. The acute post surgical course of the patients was without events: there was no death we observed residual functional regurgitation. The only predicted changes were the global hypocontractility of the left ventricle, also the dyskinesia, hypokinesia, akinesia and sometimes paradoxal motion of the basal part of the interventricular septum in the acute post surgical course which was constant till 3 months after surgery. The mean stay in the intensive care unit was 1.5 ± 0.5 days. The drains were removed at the 3rd ± 1.5 post surgical days in the ward. In a patient, because of bleeding from a small vessel, the chest was re-opened for a revision of the

	EF (%)	LVIDD (mm)	RV pressures (mmHg)
Acute post surgical period	45.3 ± 1.5*	59.2 ± 1.5*	40.4 ± 1.5 *
3 months	56.1 ± 1.4	55.3 ± 1.1	
6 months	57.2 ± 2.7	54.2 ± 2.7	
9 months	55.1 ± 1.8	55 ± 1.8	
12 months	58.4 ± 1.7	55.3 ± 1.7	
Latest datas	56.2 ± 1.3	54.6 ± 0.9	25.1 ± 0.5

*- p<0.05

Table 1: Echocardiographic parameters during the follow-up. (EF: Ejection fraction, LVIDD: left ventricular diastolic diameter, RV pressures: Right ventricular pressures).

mediastinum. Fortunately, on the ECG of patients with second degree AV block after a week, a regular sinus rhythm was recorded. Sachweh JS et al. evaluating early and late outcomes after mechanical systemic heart valve replacement in pediatric patients reported the operative mortality was 3.1%. Perioperative complications were complete heart block (n=5), ventricular fibrillation (n=1) and myocardial infarction (n=1). Perioperative morbidity was exclusively related to patients with mitral valve regurgitation. They concluded, saying that anticoagulation self-management is safe and well accepted mechanical aortic and mitral valve replacement in infants and children [10]. B. J. Barnard et al. reported similar results, with a mitral surgery or replacement [11]. In our case, the elevated post surgical mortality can be due to the geographical location of the cardiac centre, lack of infrastructures and qualified and well trained doctors and cardiologist. Preoperative left ventricular dysfunction (ejection fraction<40%), old age (age>70 years old), renal impairment were the factors contributing to acute mortality and poor background added to the two up-cited factors were the factors contributing to early mortality. Similar results got Frank Edwin et al. in Ghana. They reported overall 30 days mortality being 5.3% and late mortality 5.3%. Left ventricular dysfunction (ejection fraction<45%) was the most important factor contributing to both early late mortality [12]. B J Barnard et al. also reported similar results, higher than the ones registered in our centre: the 30 days mortality was 5.6%, the most common cause being low cardiac output. Late death occurred in 14.3% [11]. In an older population, when the repair is possible, long term results are good and stable, as was shown in the important series of Chauvaud et al. [13] that included 951 patients having mitral repair for regurgitation with a 2% hospital mortality and a 10 and 20 year survival of 89% and 82%, respectively. Freedom from reoperation was 82% and 55% in the same time periods, and the main cause for reoperation was progressive fibrosis of the mitral valve. Also Yan and co-workers had a 10 year freedom from reoperation of 72%. Furthermore, in their experience, survival and freedom from thromboembolic events was better than with valve replacement (88% vs 73% and 92% vs 71%, respectively). Although it is evident that in this aetiology mitral repair has long term results that are not as good as those achieved in degenerative disease, it avoids the risks associated with anticoagulation, especially in a population which is characteristically non-compliant with all types of medication. On the other hand, reoperations on repaired valves are low risk procedures [14]. No malignant rhythm disturbance was recorded on the ECG. In patients, AF persisted after surgery. All the patients are in class II according to NYHA classification. We could observe late presentation in patients in subgroup A, coming to consult the first time presenting with severe congestive heart failure. Usually they need stabilization prior to surgery. Patients in subgroup B because of financial limitation and because they wanted to be free from anticoagulation opted for biological prosthesis. We cannot forget the social aspect of the problem: these patients will grow up and will not be able to help themselves, nor the brothers and sisters, quite difficult situation for their families. It is important to mention that in this part of Cameroon, we are grateful for the partnership of the St. Elizabeth catholic general hospital with Policlinico San Donato in Milan, Associazione bambini cardiopatici nel mondo and Cuore Fratello in all aspects for the surgical correction of the valvulopathies, complications of RHD. We have to underline an important moment, the necessity to explain to the parents of the children the importance to be coming for regular evaluations after the implantation of the mechanical valve. Those parents are seeing their child healthy and they think that they don't need any medication anymore.

Conclusion

The study showed very good early results in the post surgical follow-up of patients with valve replacement for the correction of post rheumatic valvulopathies. Post surgical echocardiogram is characterised by motion abnormalities of the basal part of the interventricular septum. Due to financial limitation poverty and illiteracy of parents, the post surgical follow up of patients is challenging.

Recommendations

- Open INR checking points in all the regions of Cameroon.

- Reorganisation of the health care system in Cameroon with a better distribution of qualified human resources.

- Subsidization of expensive procedures.

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