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Initial Experience in the Surgical Management of Valvular Heart Diseases at Yaoundé General Hospital: Preliminary Results

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Abstract

Introduction: Valvular heart diseases, often linked to rheumatic heart disease, represent a major cause of cardiovascular morbidity in sub-Saharan Africa. This study reports the preliminary outcomes of surgical treatment for valvular heart diseases initiated at the Yaoundé General Hospital (YGH) by an entirely local team. **Materials and Methods:** Between September 2022 and November 2024, 37 patients underwent surgery for valvular heart diseases at YGH. A retrospective analysis of clinical, operative, and postoperative data was conducted using R software (version 4.4.0). **Results:** Male patients predominated, with a sex ratio of 1.17. The median age at the time of surgery was 40 years (interquartile range [IQR]: 25.0 - 51.0). Dyspnea was the main symptom at admission, reported in 36 patients (97.3%). Rheumatic etiologies were the most frequent (25 cases, 67.57%), followed by atherosclerotic lesions (6 cases, 16.2%) and degenerative lesions (4 cases, 10.83%). Among the 37 patients, 19 (51.4%) underwent mitral valve replacement, 11 (29.7%) aortic valve replacement, 6 (16.2%) double mitral-aortic valve replacement, and 1 (2.7%) tricuspid valve replacement. Mechanical prostheses were implanted in 27 patients (73%), while 10 patients (27%) received biological prostheses. The median duration of cardiopulmonary bypass and aortic clamping was 101 minutes (IQR:

84.75 - 146.25) and 73 minutes (IQR: 55.75 - 116.25), respectively. The median duration of mechanical ventilation and ICU stay were 2 hours (IQR: 2 - 3) and 3 days (IQR: 2 - 4), respectively. The most frequent complication was postoperative anemia requiring blood transfusion in 16 patients (43.2%). Three patients (8.1%) required reoperation for bleeding. There was no in-hospital mortality. **Conclusion:** Valvular heart diseases treated at YGH are predominantly of rheumatic origin. Valve replacement was by far the most commonly used technique. Early outcomes are satisfactory and encouraging.

Keywords

Valvular Heart Diseases, Rheumatic Heart Disease, Cardiac Surgery, Sub-Saharan Africa

1. Introduction

Cardiac valvulopathies represent a major cause of cardiovascular morbidity and mortality worldwide, particularly in low- and middle-income countries where rheumatic etiologies still predominate [1]. In Cameroon, and more broadly in sub-Saharan Africa, data on the prevalence and management of valvulopathies remain limited, although rheumatic heart disease continues to be a public health concern [2].

Surgical treatment of valvulopathies, involving the repair or replacement of heart valves, is an essential therapeutic solution for patients with severe lesions. However, its implementation in resource-limited settings remains a considerable challenge due to constraints related to the cost of procedures, the availability of specialized infrastructure, and technical expertise [3] [4].

The Yaoundé General Hospital, a referral center for cardiac surgery in Cameroon, has recently launched a program dedicated to the surgical management of valvulopathies. This initiative aligns with a regional dynamic aimed at reducing reliance on costly medical evacuations and providing quality care locally.

The objective of this study is to present the preliminary results of this initial experience by analyzing the sociodemographic characteristics of patients, indications, techniques used, and immediate postoperative outcomes.

2. Methodology

2.1. Type of Study

This is a retrospective cross-sectional study conducted over a period from September 2022 to November 2024 at the Yaoundé General Hospital, a first-tier hospital-university institution in Cameroon. The hospital includes numerous specialized services, such as cardiovascular and thoracic surgery, with a team of qualified surgeons, paramedical staff, and adequate technical equipment to ensure the treatment and follow-up of cardiac surgery patients.

2.2. Data Collection

The study included patient records for valvulopathy surgeries with available clinical, paraclinical, operative, and postoperative data. Records with missing preoperative, operative, and/or postoperative data were excluded. A non-probabilistic sampling was conducted with consecutive and exhaustive recruitment of patients meeting the eligibility criteria. We used pre-designed questionnaire for data collection. Sociodemographic information, including age and sex, as well as anthropometric information, such as weight and height for the calculation of body mass index (BMI) using the formula weight (kg)/height^2 (m^2), were collected. Additionally, information on symptoms, clinical information on medical history such as hypertension, diabetes, obesity, smoking, and renal insufficiency was gathered. Paraclinical information, specifically electrocardiographic and echocardiographic characteristics, was collected for heart rhythm and for the diagnosis of the main cardiac pathology and associated lesions. Operative and postoperative data were also collected

Patients underwent surgery under general anesthesia with tracheal intubation and controlled ventilation, with invasive monitoring of hemodynamic parameters throughout the procedures. Interventions were performed through full median sternotomy under cardiopulmonary bypass (CPB) established by cannulating the ascending aorta and both vena cavae or the right atrium. Cardioplegic solution was administered antegrade into the aortic bulb or directly into the coronary ostia after aortic clamping.

2.3. Ethical Considerations

The institutional ethics committee of Yaoundé General Hospital approved the study. We ensured the confidentiality of the information collected.

2.4. Statistical Analysis

Statistical analysis was performed using R software (version 4.4.0) [5], following database import. Qualitative variables were expressed as counts and percentages; asymmetrical quantitative variables were expressed as medians with interquartile ranges (IQRs). Results were presented in text and tables, analyzed, commented on, and discussed.

3. Results

During the study period, 37 patients underwent surgical intervention for valvulopathy. Male patients predominated, with a sex ratio of 1.17. The median age of patients at the time of surgery was 39 years (IQR: 25.0 - 51.0). Two patients had a history of stroke occurring more than six months prior to surgical management. Dyspnea was the primary symptom at admission, reported by 36 patients (97.3%). Furthermore, 19 patients (51.3%) were classified as functional class III or IV according to the New York Heart Association (NYHA) criteria. Sociodemographic characteristics, symptoms, and clinical signs of patients are presented in **Table 1**.

Table 1. The demographic, clinical, and paraclinical characteristics of the patients.

Preoperative variables	Value
Number of patients n (%)	37 (100)
Age (years), median (IQR)	39 (25 - 51)
Male gender n (%)	20 (54)
Body Mass Index (kg/m²), median (IQR)	21.71 (19.47 - 26.12)
Symptoms	
Dyspnea	36 (97.3)
NYHA functional class ≥ 3 n (%)	19 (51.3)
NYHA functional class < 3 n (%)	17 (46)
Palpitation n (%)	14 (37.8)
Stroke, n (%)	2 (5.4)
Aetiology	
Rheumatic, n (%)	25 (67.6)
Degenerative n (%)	9 (24.3)
Endocarditis, n (%)	2 (5.4)
Congenital, n (%)	1 (2.7)
Electrocardiographic characteristics	
Sinus rhythm n (%)	28 (75.7)
Atrial fibrillation n (%)	9 (24.3)
Echocardiographic characteristics	
LVEF (%), median (IQR)	59 (50.0 - 65.0)

IQR, interquartile range; NYHA, New York Heart Association; AR, aortic regurgitation; LVEF, left ventricular ejection fraction.

Valvular etiologies were rheumatic (n = 25, 67.6%), degenerative (n = 9, 24.3%), infective endocarditis (n = 2, 5.4%), and congenital (n = 1, 2.7%). Lesions were monovalvular in 28 cases (75.7%), bivalvular in 8 cases (21.6%), and trivalvular in 1 case (2.7%). The types of lesions are detailed in Table 2.

Among the 37 patients included in the study, 16 (43.2%) underwent mitral valve replacement, 11 (29.7%) underwent aortic valve replacement, including six Bentall procedures. Four patients (10.8%) underwent double mitral-aortic valve replacement, and four others (10.8%) underwent mitral valve replacement combined with tricuspid valve repair. One patient (2.7%) underwent tricuspid valve replacement, while another (2.7%) underwent double mitral-aortic valve replacement combined with tricuspid valve repair. Mechanical prostheses were implanted in 27 patients (73%), while 10 patients (27%) received biological prostheses. The various types of interventions are reported in Table 3.

The median durations of cardiopulmonary bypass and aortic clamping were 101 minutes (IQR: 84.75 - 146.25) and 73 minutes (IQR: 55.75 - 116.25),

respectively. The median duration of mechanical ventilation was 2 hours (IQR: 2 - 3), while the median stay in the intensive care unit was 3 days (IQR: 2 - 4). Postoperative anemia requiring blood transfusion was the most common complication, observed in 16 patients (43.2%). This complication was particularly predominant in patients who underwent complex procedures, such as the Bentall procedure (6 cases) and surgeries involving the repair or replacement of two or three valves (10 cases). Five patients experienced a transition from sinus rhythm to atrial fibrillation, and three patients (8.1%) required reoperation for bleeding. No in-hospital mortality was reported. Table 3 summarizes the operative and postoperative characteristics.

Table 2. Etiologies and types of lesions.

Preoperative variables	Value
Aetiology	
Rheumatic, n (%)	25 (67.6)
Degenerative n (%)	9 (24.3)
Endocarditis, n (%)	2 (5.4)
Congenital, n (%)	1 (2.7)
Types of lesions	
Single valve n (%)	**28 (75.7)**
Mitral valve disease (MVD), n (%)	9 (24.3)
Mitral valve rigurgitation (MVR), n (%)	3 (8.1)
Mitral valve stenosis (MVS), n (%)	4 (10.8)
Aortic valve disease (AVD), n (%)	1 (2.7)
Aortic valve rigurgitation (AVR), n (%)	8 (21.6)
Aortic valve stenosis (AVS), n (%)	2 (5.4)
Tricuspid valve rigurgitation (TVR), n (%)	1 (2.7)
Double valve, n (%)	**8 (21.6)**
MVR + AVD, n (%)	1 (2.7)
MVS + AVD, n (%)	1 (2.7)
MVD + AVR, n (%)	2 (5.4)
MVR + TVR, n (%)	1 (2.7)
MVS + TVR, n (%)	3 (8.1)
Triple valve, n (%)	**1 (2.7)**
MVS + AVS + TVR, n (%)	1 (2.7)
Associated lesions	
Ascending aortic aneurysm, n (%)	5 (13.5)
Aortic dissection, n (%)	1 (2.7)

IQR, interquartile range; NYHA, New York Heart Association; AR, aortic regurgitation; LVEF, left ventricular ejection fraction.

Table 3. Patient's characteristics, operative and post operative data.

Operative and post operative characteristics	Value
Type of surgery	
Mitral replacement, n (%)	16 (43.2)
Aortic replacement, n (%)	11 (29.7)
Isolated aortic replacement, n (%)	5 (13.5)
Bentall, n (%)	6 (16.2)
Mitro-aortic replacement, n (%)	4 (10.8)
Mitral replacement + Tricuspid valve repair, n (%)	4 (10.8)
Tricuspid replacement, n (%)	1 (2.7)
Mitro-aortic replacement + Tricuspid valve repair, n (%)	1 (2.7)
Types of valve prostheses	
Mechanical prosthesis, n (%)	27 (73.3)
Biological prosthesis, n (%)	10 (21)
Type of surgical approach	
Longitudinal median sternotomy, n (%)	37 (100)
Operative and post-operative data	
Cardiopulmonary bypass time (minutes) median (IQR)	101 (84.75 - 146.25)
Cross clamping time (minutes), median (IQR)	73 (55.75 - 116.25)
Mechanical ventilation (hours), median (IQR)	2 (2 - 3)
Intensive care unit length of stay (days), median (IQR)	3 (2 - 4)
Hospital stay (days), median (IQR)	7 (7 - 10)
Postoperative complications	
Chest reexploration for bleeding, n (%)	3 (8.1)
Heart rhythm disorder, n (%)	5 (13.5)
Anemia requiring blood transfusion, n (%)	16 (43.2)
Operative mortality, n (%)	0 (0)

IQR, interquartile range.

4. Discussion

During the study period, 37 open-heart surgeries were performed for valvulopathies. The results of this study reflect the challenges and opportunities associated with the surgical management of valvulopathies in sub-Saharan Africa, particularly in Cameroon. In our study, rheumatic valvulopathies accounted for the majority of cases (67.6%), consistent with the literature, where this etiology predominates in low-income countries due to a high prevalence of acute rheumatic disease and limited access to early diagnosis and treatment [6]. Carapetis *et al.* highlighted that this high prevalence is due to the absence of effective primary and secondary prevention programs, particularly in regions where streptococcal

infections are inadequately treated [1]. A study conducted by Mocumbi *et al.* in sub-Saharan Africa also reported that rheumatic valvulopathies constituted up to 60% of valvular diseases requiring surgery, with similar sociodemographic characteristics, notably a young population [2]. In contrast, in high-income countries, valvulopathies are primarily degenerative, affecting an older population with median ages exceeding 65 years, as reported in the literature [3] [4]. Male predominance was observed in our study, consistent with findings from Daouda's series in Niger [7]. In our series, 97.3% of patients presented with dyspnea. This rate exceeds the 77% reported by Zongo's series [8] in Mali in 2019, which included all dyspnea stages. Palpitations were also observed in 37.8% of our patients, higher than the 20% reported by Yayehd [9] in Togo in 2012 and comparable to the 33.3% reported by Daouda in Niger in 2024 [7].

Median sternotomy was the surgical approach for all our patients, consistent with other African series [7] [8] [10]. In contrast, Western series describe alternative approaches, including lower partial sternotomy, right anterior minithoracotomy with endo-aortic balloon clamping, and fully endoscopic approaches [11] [12].

The mitral valve was the most frequently involved, with isolated mitral valvulopathies accounting for 43.2% and combined lesions accounting for 13.5%. This finding aligns with Zongo's results in Mali [8].

Most procedures in our series involved valve replacement. De Vega's tricuspid annuloplasty was performed in 13.5% of cases due to its accessibility, lower complexity, and reduced cost in our context, as it does not require a ring.

Mechanical prostheses were implanted in 73% of cases in our series, a result consistent with other African studies showing a predominance of mechanical prostheses [13]. The high use of mechanical prostheses observed in our cohort can be explained by the significant proportion of rheumatic valvulopathies, the young age of the population, and economic constraints limiting access to regular follow-up required for bioprostheses in this region. However, the predominant use of mechanical prostheses poses additional challenges, notably long-term anticoagulation management, which remains problematic in resource-limited settings [14].

The median CPB duration in our series was 101 minutes, similar to Daouda's series in Niger [7], which reported 106.6 minutes, and Nwiloh's series in Nigeria [15], which reported 103 minutes. This duration is longer than Fall's series in Senegal [16] which reported 52 minutes, but shorter than Zongo's series in Mali [8], which reported 142 minutes. The median aortic clamping duration was 73 minutes. Our results are close to those of Majdoub *et al*., who reported median durations of 105 minutes for CPB and 71 minutes for aortic clamping [17].

The most common complication in our cohort was postoperative anemia requiring transfusion (43.2%), which is similar to the rates reported in studies conducted in other African countries. A Senegalese study reported a postoperative transfusion rate of 45%, particularly high among patients operated on for multiple or complex valvular lesions [18].

In our series, there was no in-hospital mortality. This result surpasses those

reported in similar settings, where mortality rates range from 2% to 5% for complex valvular surgeries [19]. This difference could be attributed to the more advanced clinical condition of the population in other studies.

The study highlights the potential of a local team to perform effective valvular surgeries despite limited resources, including restricted access to advanced equipment, scarce prosthetic valves, and challenges in securing anesthesia and critical care drugs. These constraints influenced surgical decisions and limited patient access to treatment. Overcoming logistical and financial barriers is essential to broaden care access.

Key strategies include strengthening local supply chains for cardiac surgery materials, enhancing surgical training programs, and building partnerships with international organizations for equipment donations and technical support. Additionally, preventing acute rheumatic fever, a major risk factor for valvular diseases, is crucial for sustainable progress.

Limitations of Our Study

This study has certain limitations. It was a single-center study with a small sample size due to the still nascent cardiac surgical activity. Despite these limitations, our study provides valuable data on the surgical management of valvular heart diseases, but the absence of long-term follow-up data represents one of a major limitation of this study. It prevents a comprehensive assessment of late complications that may occur after the intervention, such as prosthetic degeneration or thromboembolic events.

Conclusion

This study highlights that the valvular diseases operated on at HGY are predominantly of rheumatic origin. Valve replacement was by far the most commonly used technique. The results obtained are encouraging and pave the way for continuous improvement in the management of valvular diseases in the region. Implementing specialized training programs, improving infrastructure, and reducing the costs of surgical devices remain priorities to increase access to these vital treatments. Additionally, the prevention of acute rheumatic fever through better access to simple antibiotic treatments could reduce the prevalence of rheumatic valvular diseases.

What Is New about This Study

This study highlights the possibility of a sustainable cardiac surgery program in Cameroon, a developing country by a local team.

Authors' Contributions

All authors participated in the study and have read and approved the final manuscript.

Declared

All authors contributed equally to the production of this manuscript.

Conflicts of Interest

The authors declare no competing interests.

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