

# Cardiac Surgery at Yaoundé General Hospital by a Local Team: Activity Report from September 2022 to January 2024

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## Abstract

Introduction: The practice of cardiac surgery (CS) in sub-Saharan Africa faces a number of challenges. We report on the surgical activities of the first 17 months of the program launched at the Yaoundé General Hospital (YGH), describing the types of interventions and the early results. Patients and Methods: This was a descriptive cross-sectional study including patients who underwent CS from September 2022 to January 2024 at the YGH. Clinical, operative and postoperative data were collected and analysed retrospectively by R software. Results: A total of 37 patients underwent CS during the study period, divided into 23 (62.2%) open-heart and 14 (37.8%) closed-heart cases. Males predominated (sex ratio 1.17). The median age and interquartile range (IQR) were 36 years (9 - 51). Isolated valve surgery, in 15 (40.5%) cases, was the most common procedure in open-heart surgery cases. Closed-heart surgery involved closure of the patent ductus arteriosus in 9 (24.3%) cases, coronary artery bypass grafting in 3 (8.1%) cases, and pericardectomy in 2 (5.4%) cases. The median duration of extracorporeal circulation and aortic cross-clamping was 101 min (IQR 84 - 143) and 74 min (IQR 54 - 112) respectively. The median duration of mechanical ventilation was 2 hours (IQR 2 - 3). The median intensive care unit stay and median hospital stay were 2 days (IQR 2 - 3) and 7 days (IQR 5 - 8) respectively. Operative mortality was 2 (5.4%). Conclusion: Cardiac surgery remains a major challenge for African populations. The early results achieved by the local team are satisfactory. An increase in surgical activity should be strongly encouraged to facilitate local training and ensure the sustainability of the activity.

#### **Keywords**

Cardiac Surgery, Sub-Saharan Africa, Cameroon

### **1. Introduction**

Cardiovascular diseases are rapidly increasing in Africa and represent a public health issue. Their management, particularly for surgical heart diseases, is challenging due to insufficient healthcare services, and available financial and human resources [1]. The practice of cardiac surgery (CS) in Sub-Saharan Africa faces numerous challenges. This type of surgery is costly as it requires expensive perioperative equipment, single-use materials, and a multidisciplinary team involving several specialists. Consequently, it remains unavailable in most developing countries, with a frequency of cardiac operations in Africa of 18 cardiac operations per million inhabitants per year [2]. Some affluent patients receive treatment abroad through medical evacuations, while others, less fortunate, have no choice but to live in morbid conditions. In Cameroon, cardiac surgery was introduced in 1985 at the Yaoundé University Hospital Center (YUHC). Six cardiac surgery missions were conducted from July 1985 to April 1990, benefiting 83 patients [3]. Since then, CS programs have followed one another with the support of North-South cooperations [4] [5]. In this same spirit and with the aim of perpetuating the CS activity, facilitating its access to the Cameroonian population, and to the sub-region of Central Africa, a new CS program was launched at the Yaoundé General Hospital (YGH) in September 2022, supported by public authorities and NGOs. We report the results of the surgical activities during the first 17 months, describing the indications, types of interventions, and early outcomes.

#### 2. Methodology

#### 2.1. Type of Study

We conducted a retrospective cross-sectional study over a 17-month period from September 2022 to January 2024 at the Yaoundé General Hospital (HGY), a first-category hospital with surgical department. The study population consisted of patients who underwent cardiac surgery. A non-probability sampling method was used, with consecutive and exhaustive recruitment of medical records of patients meeting the eligibility criteria.

Inclusion criteria: we included in the study all the patients who underwent cardiac surgery and whose medical records contained an echocardiogram for medical diagnosis, as well as operative and postoperative data.

Exclusion criteria: we exclude patients who underwent any type of surgery

other than cardiac surgery.

#### 2.2. Data Collection

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<sup>2</sup> (m<sup>2</sup>), 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.

# 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 conducted using R software version 4.4.0 [6]. We performed descriptive statistical analysis, where qualitative variables were expressed in frequencies and proportions, and quantitative variables were expressed as median with their interquartile range (IQR). The results were presented in text and tables, and analyzed, commented on, and discussed.

# 3. Results

In total, 37 patients underwent CS during the study period. Male gender predominated with a sex ratio of 1.17. The median age and interquartile range (IQR) were 36 years (9 - 51). The most frequent symptom was dyspnea, with 24 cases (64.86%) classified as New York Heart Association (NYHA) class < 3 and 13 cases (35.14%) as NYHA class  $\geq$  3. Congenital malformations accounted for 12 cases (32.43%), while acquired forms represented 25 cases (67.57%). Various types of lesions are reported in **Table 1**, with valvular pathologies being the most common. Electrocardiographically, sinus rhythm and atrial fibrillation were present in 33 cases (89.2%) and 4 cases (10.8%), respectively. Echocardiographically, 32 patients (86.49%) had an ejection fraction  $\geq$  50%, while 5 patients (13.51%) had < 50%.

In our cohort, 23 patients (62.2%) underwent open-heart surgery, and 14 patients (37.8%) underwent closed-heart surgery. Isolated valve surgery (37.8%) was the most common intervention in open-heart surgery cases, followed by the Bentall procedure. Closed-heart surgery included closure of patent ductus arteriosus in 9 cases (24.3%), coronary artery bypass grafting in 3 cases (8.1%), and pericardiectomy in 2 cases (5.4%). The various types of interventions are reported in **Table 2**.

Preoperative variables	Value
Number of patients n (%)	37 (100)
Age (years), median (IQR)	36 (9 - 51)
Male gender n (%)	20 (54.05)
Body Mass Index (kg/m²), median (IQR)	21.45 (19.47 - 24.54)
Symptoms	
Dyspnea	
NYHA functional class $\ge$ 3 n (%)	13 (35.14)
NYHA functional class < 3 n (%)	24 (64.86)
Palpitation n (%)	9 (24.32)
Staturo-ponderal delay	8 (21.62)
Chest pain	5 (13.51)
Aetiology	
Acquired n (%)	25 (67.57)
Congenital n (%)	12 (32.43)
Types of lesions	
Mitral and/or aortic valvulopathy n (%)	14 (37.84)
Patent ductus arteriosus n (%)	10(27.03)
Coronary artery disease n (%)	3 (8.1)
Ascending aortic aneurysm + AR n (%)	2 (5.4)
Atrial septal defect n (%)	2 (5.4)
Myxoma n (%)	2 (5.4)
Chronic constrictive pericarditis n (%)	2 (5.4)
Aortic dissection n (%)	1 (2.7)
Cardiac injury n (%)	1 (2.7)
Electrocardiographic characteristics	
Sinus rhythm n (%)	33 (89.2)
Atrial fibrillation n (%)	4 (10.8)
Echocardiographic characteristics	
LVEF (%)	
≥50% n (%)	32 (86.49)
<50% n (%)	5 (13.51)

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

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

Operative and post operative characteristics	Value	
Type of surgery		
Open-heart surgery		
Isolated valve surgery n (%)	14 (37.8)	
Mitral replacement, n (%)	8 (21.6)	
Aortic replacement, n (%)	3 (8.1)	
Mitro-aortic replacement, n (%)	2 (5.4)	
Mitral replacement + Tricuspid valve repair, n (%)	1 (2.7)	
Bentall procedure n (%)	3 (8.1)	
Closure of atrial septal defect n (%)	2 (5.4)	
Myxoma ablation n (%)	2 (5.4)	
Surgical closure of PDA + Mitral valve repair n (%)	1 (2.7)	
Closure of cardiac injury n (%)	1 (2.7)	
Closed-heart surgery		
Surgical closure of PDA n (%)	9 (24.3)	
Coronary artery bypass grafting, n (%)	3 (8.1)	
Pericardiectomy n (%)	2 (5.4)	
Operative and post-operative data		
Cardiopulmonary bypass time (minutes) median (IQR)	101 (84 - 143)	
Cross clamping time (minutes), median (IQR)	74 (54 - 112)	
Mechanical ventilation (hours), median (IQR)	2 (2 - 3)	
Intensive care unit length of stay (days), median (IQR)	2 (2 - 3)	
Hospital stay (days), median (IQR)	7 (5 - 8)	

Table 2. Patient's characteristics, operative and post operative data.

PDA, patent ductus arteriosus; IQR, interquartile range.

Twenty-five interventions (67.57%) were performed under cardiopulmonary bypass. The median duration of cardiopulmonary bypass and aortic cross-clamping were 101 minutes (IQR 84 - 143) and 74 minutes (IQR 54 - 112), respectively.

For all interventions, the median duration of mechanical ventilation was 2 hours (IQR 2 - 3). The median length of stay in the cardiac intensive care unit (CICU) and the overall hospital stay were 2 days (IQR 2 - 3) and 7 days (IQR 5 - 8), respectively. The operative mortality rate was 2 (5.4%). Table 2 summarizes the operative and postoperative characteristics, and Table 3 outlines the postoperative complications.

Complications	Value
Chest re-exploration for bleeding, n (%)	1 (2, 7)
Wound infection, n (%)	1 (2, 7)
Operative mortality, n (%)	2 (5, 4)

#### Table 3. Postoperative complications

#### 4. Discussion

In our study, which aimed to present the activity report of the local team by describing the indications, types of interventions, and early outcomes after cardiac surgery at HGY from September 2022 to January 2024, a total of 37 patients were managed. This limited number of patients over 17 months of activity is consistent with the situation in most African countries, where patients face difficulties accessing cardiac surgery due to high financial costs and lack of universal medical coverage [7]. In our study, the median age was 36 years with a male predominance, consistent with Abdallah R. Makalla *et al.* in East Africa, who found an average age of 30.6 years and a sex ratio of 1.18 [8].

Regarding symptomatology, dyspnea was present in all patients, and 35.14% were in functional class  $\geq$  III according to the New York Heart Association (NYHA). Yangni-Angate *et al.* [9] found 60% of patients in functional class NYHA  $\geq$  III, which can be attributed to delayed diagnosis and management due to the low purchasing power of populations in developing countries and insufficiently widespread universal coverage.

Congenital malformations accounted for 12 cases (32.43%), while acquired forms accounted for 25 cases (67.57%) in our cohort. Acquired forms were dominated by valvular pathologies, as seen in several studies in sub-Saharan Africa [9] [10] [11]. The high prevalence of rheumatic heart disease, the most common heart disease in developing countries, including Cameroon [12] [13], justifies these findings and also explains the leading position of isolated valve surgery (37.8%) in our study and in various other studies in Africa [14] [15].

The median duration of cardiopulmonary bypass and aortic cross-clamping in our study was 101 minutes and 74 minutes, respectively, which are better results compared to those found by Momar Sokhna Diop *et al.* in Senegal, with respective durations of 132 minutes and 101 minutes for aortic valve surgery [16]. The interventions performed under cardiopulmonary bypass in our cohort varied, ranging from closure of atrial septal defects to more complex interventions such as Bentall procedures.

The operative mortality rate in our study was 5.4%, corroborating the findings reported by Akintoye O. *et al.*, who reported an overall operative mortality rate of 5.49% in a systematic review of African studies on valve surgery [17].

# 5. Limitations of Our Study

This was a single-center study with a small size of sample due to nascent cardiac

surgery activityand its high cost.

## **6.** Conclusion

Cardiac surgery remains a major challenge for populations in developing countries, particularly in Cameroon. The preliminary results from the local team are satisfactory. An increase in surgical activities should be strongly encouraged to facilitate local training and ensure the sustainability of the activity. This can be achieved through thorough patient evaluation for appropriate indications and through financing strategies to enable prompt and adequate patient care.

# 7. 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.

# **Conflicts of Interest**

The authors declare no conflicts of interest regarding the publication of this paper.

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