



Cardiac surgery in sub-Saharan Africa: a report of 3-year experience at the Douala General Hospital

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Background: Cardiac surgery was started at the Douala General Hospital since 2012 as a result of a North-South collaboration between Cameroon and Belgium. Five cardiac surgery missions have been carried out since then. This work aimed at assessing three years of this initial experience.

Methods: We carried out a cross-sectional descriptive study between November 2012 and March 2016. We reviewed the case records of all patients with heart disease, and with an indication for surgery.

Results: A total of 45 patients with heart diseases who had an indication for surgery were retained for this study. There were 23 women and 22 men. Of these, 27 patients benefited from surgical intervention. Their mean age was 41±18 years (range, 14 to 85 years). The most common physical sign was heart murmur in 29 (64.4%) patients. Valvular Heart diseases were the most frequent in 32 (71.1%) patients, which were predominantly rheumatic heart diseases (RHD) in 25 (55.6%) patients. The most frequent surgical procedures were valve replacement with prosthesis, followed by repairs of congenital abnormalities. Mechanical prosthesis were mostly used (8/12 cases). Short-term intra-hospital mortality was 7.4%. The main cause of death was acute ventricular failure.

Conclusions: The pilot phase of the cardiac surgery program at the General Hospital of Douala (DGH) was successful. Patients could be operated at a lower cost locally. Efforts must be made for the creation of an autonomous local team.

Keywords: Cardiac surgery; Douala General Hospital; sub-Saharan Africa (SSA)

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Introduction

Cardiovascular diseases (CVDs) are the leading cause of mortality in the world (1). There is an increasing trend in Sub-Saharan Africa (SSA) in the last decade, with about 35 million people being affected. It is estimated that CVDs cause about 1 million deaths, representing 22% of mortality worldwide (1).

Some of these cardiac diseases require surgical management. In the absence of sufficient infrastructures and adequate technical platforms in low-income settings, patients are referred abroad. These transfers have both financial and social implications for African nations and the family of the patients (2).

In 1985, open heart surgery was started in Yaoundé—the political capital of Cameroon, in collaboration with the French (3). In 2008, a similar collaboration was established with the Belgians (4). In 2012, cardiac surgery was started in the General Hospital of Douala (DGH)—the economic capital of Cameroon, in collaboration with the free University of Bruxelles and Derluyn foundation. This North-South collaboration with the DGH known as the “Cardiac surgery program” has carried out five heart surgery missions. Little is known about the profile of heart diseases seen, surgical uptake, and outcome of this programme. This work aimed at reporting the experience of the first three years of this programme at the DGH.

Methods

Ethical statement

This work was approved by the institutional review board of the Douala General Hospital (DGH) (Ref. No. 038AR/MINSANTE/HGD/DM/02/16). We carried out this work in accordance with the declarations of Helsinki (as revised in 2013). We report this work according to the Standard for Reporting Observational Study (STROBE) checklist.

Study design and setting

We carried out a cross-sectional descriptive study in the cardiology unit, cardiovascular intensive care unit, and in the surgical unit of DGH from October 2012 to November 2015. We reviewed (retrospectively) the medical files of all patients with a heart disease, and who had an indication for heart surgery. We excluded files with incomplete key information (type of heart disease). The DGH is a tertiary health institution located in the economic capital of

Cameroon (Political capital—Yaounde), SSA. It also serves as a teaching hospital, and has a catchment population of over three million inhabitants. It also receives referrals from the Central African sub-region.

Participants, source of data, and variables

These were all patients of both sex, with a heart disease requiring surgery, seen in the cardiology unit during the “Cardiac surgery programmes”. Patients were recruited from their case records. We excluded incomplete records (nature of heart disease not recorded). We collected information on the age, sex, city of origin, past medical history, symptoms and signs at presentation, nature of heart disease, surgical procedure (yes/no), type of procedure, reason for no procedure, post-procedure complications, and fatal outcome.

Sample size and power

We describe the initial 3-year experience of cardiac surgery at the DGH. All eligible cases were considered for this report.

Statistical analysis

Data were analyzed using the software *EPI Info* Version 3.1 (Centers for Disease Control and Prevention, Atlanta, Georgia, USA). We present qualitative data as frequencies and percentages. Age is presented as mean \pm standard deviation (SD).

Results

A total of 45 patients with heart diseases who had an indication for surgery were retained for this study. There were 23 women and 22 men. Of these, 27 patients benefited from surgical intervention. Their mean age was 41 ± 18 years (range, 14 to 85 years). Demographic and clinical characteristics are shown in *Table 1*. Most patients (42.2%) lived in Douala. Hypertension was the most frequent medical history reported by 16 (35.6%) patients. Dyspnea was reported by 8 (17.8%) patients. Heart murmur was the most frequent physical finding heard in 29 (64.4%) patients. Thirteen (28.9%) patients were in congestive heart failure. The distribution of the different heart diseases is shown in *Table 2*. Valvular heart diseases were the most frequent, seen in 32 (71.1%) patients, which were predominantly

Table 1 Basic characteristic of the study population

Variable	Frequencies	Percentage (%)
Residence		
Douala	19	42.2
Yaoundé	15	33.3
Others	11	24.4
Past history		
Hypertension	16	35.6
Valvular heart disease	5	11.1
Tobacco consumption	4	8.9
Congenital heart disease	3	6.7
Diabetes	3	6.7
Mitral valve plasty	2	4.4
Functional signs		
Dyspnea	8	17.8
Angina	4	8.9
Fever	2	4.4
Murmur	1	2.2
Physical signs		
Heart murmur	29	64.4
Congestive heart failure	13	28.9
Left heart failure	5	11.1
Right heart failure	1	2.2
Hepatomegaly	5	11.1
Systemic inflammation response syndrome	3	6.7
Lower limb edema	3	6.7
Ascites	1	2.2
Hepatojugular reflux	1	2.2

rheumatic heart diseases (RHD) seen in 25 (55.6%) patients. Aortic valvular involvement represented 28.8% of valvular heart diseases with mitral valve involvement accounting for 22.3% of cases. Infective endocarditis was found in 4.4% of cases. Of the 45 patients, 13 (29.6%) had congenital heart diseases, with the most frequent being persistent ductus arteriosus (9.1%), followed by atrial septal defect and coarctation of the aorta, which all accounted for 6.8% of cases. Three (6.6%) patients presented with atrial tumors.

Table 2 Distribution of patients according to different pathologies

Diseases	Frequencies	Percentage (%)
Rheumatic valve disease		
Mitral stenosis	3	6.7
Mitral insufficiency	3	6.7
Mitral valve disease	2	4.4
Aortic stenosis	1	2.2
Aortic insufficiency	9	20.0
Aortic valve disease	2	4.4
Tricuspid insufficiency	1	2.2
Degenerative valve disease		
Calcified aortic stenosis	2	4.4
Dystrophic valve disease		
Mitral and aortic insufficiency	1	2.2
Endocarditis		
Mitral insufficiency	2	4.4
Congenital heart diseases		
Patent ductus arteriosus	4	8.9
Coarctation of aorta	3	6.7
Atrial septal defect	3	6.7
Bicuspid aortic valve	1	2.2
Ventricular septal defect	1	2.2
Tetralogy of Fallot	1	2.2
Tumors		
Right atrium	2	4.4
Left atrium	1	2.2
Others		
Aortic aneurysm	5	11.1
Pericarditis	2	4.4
Valsalva sinus aneurysm	1	2.2
Aortic dissection	1	2.2

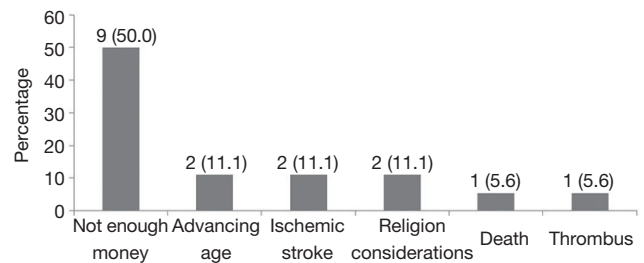
Of the 45 patients, 27 (60%) underwent cardiac surgery, with 3 (11.1%) closed-heart surgeries and 24 (88.9%) open-heart surgeries. The surgical procedures are summarized in *Table 3*. Valve replacement was the most common type of surgery carried out in 12 (44.5%) patients, followed by correction of congenital heart diseases in 9 (33.3%)

Table 3 Type of surgery

Procedure(s)	With prosthesis		Without prosthesis	Total (%)
	BP	MP		
Interventions				
Mitral valve replacement	1	2	–	3 (11.1)
Aortic valve replacement	1	3	–	4 (14.8)
Mitral and aortic valve replacement	0	1	–	1 (3.7)
Mitral annuloplasty	–	–	1	1 (3.7)
Mitral valve replacement + aortic annuloplasty	1	–	–	1 (3.7)
Mitral valve replacement + tricuspid annuloplasty	1	–	–	1 (3.7)
Ventricular septal defect closure	–	–	3	3 (11.1)
Atrial septal defect closure	–	–	3	3 (11.1)
Ductus arteriosus closure	–	–	3	3 (11.1)
Benthal surgery		2	–	2 (7.4)
Tyron/Davis surgery	–	–	1	1 (3.7)
Myxoma cure	–	–	2	2 (7.4)
Axillary-femoral bypass	–	–	2	2 (7.4)
Total	12 (44.5)	15 (55.5)		27(100.0)

BP, biological prosthesis; MP, mechanical prosthesis.

patients. The distribution of patients based on their reasons for not undergoing surgery is shown in *Figure 1*. The cost of surgery was the limiting factor in 9 (50%) patients, followed by advanced age, recent stroke, and religious constraints. Early in-hospital post-surgical complications are shown *Table 4*. Two patients had infection, and two with massive hemo-pericardium. Conduction disorders and thromboembolic events were present in one patient each.

**Figure 1** Distribution of patients based on their reasons for not undergoing surgery.**Table 4** Non-lethal complications recorded during the period of complications

Type	Frequency	Observations
Infections	2	Wound suppuration, secondary infection of chest wall
Hemorrhages	2	Hemopericardium needing surgical drainage
Conduction disturbances	1	Complete AV block, needing pacemaker placement
Thromboembolic event	1	Ischemic stroke
Others	2	Pneumopathy

Among the 27 patients operated, two died in the hospital (intra-hospital mortality rate: 7.4%). No late complication has been recorded.

Discussion

We carried out this cross-sectional descriptive study at the DGH with the aim of reporting the disease profile, surgical uptake, and outcome of the first 3 years of the Cardiac surgery programme. The outcome of this North-South collaboration was successful. Most of the cases were rheumatic valvular heart disease and congenital heart disease. The surgical uptake was low.

A major limitation of this study is the small size. No case of coronary bypass graft was captured. This is however a less frequent disease condition, and the few cases needing surgery are treated abroad. We are in the pilot phase of this programme, which shows the potential of treating common disease conditions locally.

RHD is the most frequent acquired valvulopathy in

low-income settings. The diagnosis is usually made late when significant valvular destructions have developed necessitating surgical intervention (5). Congenital heart diseases are also frequent, with most cases diagnosed late in life. Our findings are consistent with that reported by Ngatchou *et al.* who reported RHD in up to 72% of patients (4). This stresses the need to put in place effective primary and secondary preventive programmes of RHD in our setting, as the cost of surgery still remains high for most patients (2). All age groups can benefit from heart surgery locally with good outcomes. This is consistent with other reports from SSA, where patients as old as 85 years benefitted from heart surgery (6,7). Life expectancy in SSA is increasing, with a resultant double burden of RHD and degenerative heart disease that require surgery. There are differences on the burden and surgical uptake according to sex in the rare SSA literature. This stress the need to compile such data so as to have a better view (3,7,8).

Valve replacement was the most frequent surgical procedure in low-income settings. We attributed this to high prevalence of RHD in Africa (3,4). RHD is a chronic inflammatory condition involving the heart valves. Repairing such valves might be associated with subsequent surgery due to the progressive nature of the disease, thereby incurring an additional cost. However, most patients are seen at an advanced stage of the disease, with valve replacement surgery as the only option. The type of prosthesis implanted (mechanical or bioprosthesis) in our series depends on patient preference to an extent. Kingue *et al.* reported a high rate of bioprosthesis implantation due to the difficulties associated with managing anti-coagulants when mechanical valves are inserted in low-income settings (3). Open heart surgery was carried out in most series, probably due to the high rates of advanced valvular heart diseases and complex congenital heart diseases encountered (7). Trans-catheter closed heart surgery is not well developed in our setting.

The early surgical mortality rate varied across series, as low as 1.6% (7), and as high as 42.9% (6). This could be due to the choice of patients admitted into surgery. This however deserves a closer look. Two of our patients (7.4%) died in the early post-operative period due to acute ventricular failure. No other case of death has been recorded in our series in the long term. The quality of life was best in those operated for congenital heart disease in our series.

The rate of post-surgical infections also varied across series, as low as no complication (7), and as high as 18.1% (3). We do not have a clear explanation for this

variation as this is multifactorial.

Due to the complexity of operated cases, these results of the first 3 years of the Cardiac surgery programme could be considered as good when compared to that reported in the literature (9-11).

Conclusions

The results of the pilot phase of cardiac surgery programme in Douala, Cameroon was successful. This was made possible by the close collaboration between the Cameroonian and Belgian teams. The continuity of the project requires the re-enforcement of technical platform, increase the human resource capacities, and subsidize surgery through a universal health coverage due to the low uptake encountered.

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Footnote

Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at <http://dx.doi.org/10.21037/jxym.2017.08.03>). The authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). This work was approved by the institutional review board of the Douala General Hospital (DGH) (Ref. No. 038AR/MINSANTE/HGD/DM/02/16). Informed consent was taken from all subjects.

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