



Heart catheterization in adults in a sub-Saharan tertiary centre: 8 years' experience

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Background: The goal of the investigation was to analyze the results of heart catheterization in the Cardiac centre Shisong from December 2010 till December 2017.

Methods: This retrospective study done in the Cardiac centre Shisong in adult patients that underwent a procedure in the catheterization laboratory from December 2010 till December 2017.

Results: Three hundred and sixty-five adult underwent a cardiac catheterization procedure during the study period. Among the patients, 126 were female while 239 were male. The mean age at presentation was 52.6 ± 12.9 years old. Patients were coming from neighboring countries: Nigeria $n=5$ (1.3%), Tchad $n=3$ (0.8%), Equatorial Guinea $n=4$ (1%), Democratic republic of Congo $n=2$ (0.5%). Patients were also coming from all the ten regions of Cameroon: Littoral $n=122$ (33.2%), Centre $n=127$ (34.8%), North west $n=47$ (12.9%), South west $n=17$ (4.5%), West $n=26$ (7.1%), North $n=7$ (1.8%), Adamaoua $n=8$ (2.1%), Far North $n=5$ (1.3%), South $n=2$ (0.5%), East $n=4$ (1%). Depending on the type of procedures diagnostic coronarography in case with suspicion of coronary artery disease and presurgical coronarography were the main procedures done in 171 patients (46.8%) and in 146 patients (40%) respectively. Diagnostic coronarography was positive in 31 cases (8.4%). In patients with ischemic heart disease (IHD), percutaneous intervention with dilatation of the coronary arteries and implantation of stents was done in 19 cases (5.2%). The remaining 12 cases (3.2%) were having many lesions that could be managed only by coronary artery grafting surgery, done with success in all the cases. In grown up congenital heart disease patients, diagnostic catheterization was done in 48 cases meanwhile interventional catheterization: pulmonary artery valvuloplasty, patent ductus arteriosus (PDA) closure, atrial septal defect closure and decoarctation of the aorta were done in $n=11$ (3.4%), $n=9$ (2.4%), $n=12$ (3.2%), $n=6$ (1.6%) cases respectively.

Conclusions: Coronary heart disease was confirmed by angiography in 8.4% cases, and among grown up congenital heart disease 'patients, atrial septal defect was the pathology the most managed. Heart catheterization is done in the Cardiac centre Shisong with good results.

Keywords: Cardiac catheterization; adult; Cardiac Centre Shisong

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Introduction

The confirmation of the diagnosis of cardiovascular diseases (CVDs) in sub-Saharan Africa relies essentially on echocardiography, which is performed in few referral

centres in urban areas due to low availability of human resources for cardiovascular care (1). Interventional cardiology and cardiac surgery are not readily available in most countries. In some, these services rely essentially on

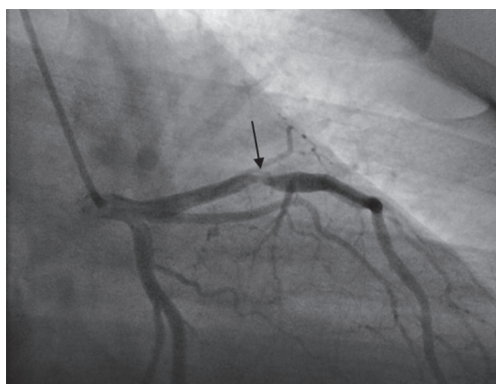


Figure 1 Significant stenosis of the main left circumflex coronary artery (arrow).

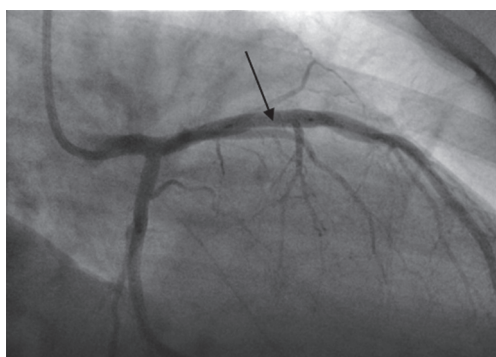


Figure 2 Plasty of main left circumflex coronary with good reperfusion (arrow).

collaborative partnerships that bring teams from overseas to perform cardiac catheterization and surgery at subsidized prices, while progressively training the local teams (2). The aim of the study is to analyze the results of cardiac catheterization in adults since the beginning of the activity in the cardiac centre, from December 2010 till December 2017.

Methods

This is a retrospective study done in the Cardiac centre Shisong in adult patients that underwent a procedure in the catheterization laboratory from December 2010 till December 2017. Shisong Cardiac Centre is the only private confessional cardio-surgical Center in Central/West Africa, equipped with ultra-modern technologies and prepared to offer a wide range of cardiology services including diagnosis and treatment of congenital heart defects, coronary artery disease, valvular heart disease and electrophysiology. It

offers both diagnostic and interventional catheterism in a hemodynamic laboratory (3,4). Three hundred and sixty-five adult underwent a cardiac catheterization procedure during the study period. Among patients, the usual vascular access was via the right femoral artery. In patients in need of percutaneous coronary intervention (PCI), coronary ostia were cannulated and contrast injected to image and assess the coronary arteries to determine if intervention was required. Major epicardial vessels or their branches with stenosis >70% or left main stem stenosis >50% were defined as significant stenoses which would require intervention (5). These vessels underwent PCI with percutaneous transluminal coronary angioplasty (PTCA) ± stenting. Stents used were either drug eluting stents or bare metal stents. Following PCI, the patients were monitored overnight in the high dependency unit to exclude any complications, prior to discharge home. Data in patient's files were collected and analyzed. Values are expressed as mean ± the standard deviation (SD) and statistical analysis were performed using the Student's *t*-test. The SPSS 11 statistical analysis software was used for all analysis. The study was approved by the scientific committee of the institution.

Results

Three hundred and sixty-five adult underwent a cardiac catheterization procedure during the study period. Among the patients, 126 were female. The mean age at presentation was 52.6 ± 12.9 years old. Patients were coming from neighboring countries: Nigeria $n=5$ (1.3%), Tchad $n=3$ (0.8%), Equatorial Guinea $n=4$ (1%), Democratic republic of Congo (DRC) $n=2$ (0.5%) (Figure 1). Patients were also coming from all the ten regions of Cameroon: Littoral $n=122$ (33.2%), Centre $n=127$ (34.8%), North west $n=47$ (12.9%), South west $n=17$ (4.5%), West $n=26$ (7.1%), North $n=7$ (1.8%), Adamaoua $n=8$ (2.1%), Far North $n=5$ (1.3%), South $n=2$ (0.5%), East $n=4$ (1%) (Figure 2). Hypertensive and diabetic cases were representing respectively $n=145$ (39.7%) and $n=65$ (17.8%) of the population. Patients smoking tobacco were $n=5$ (1.3%), and obese were $n=212$ (58%). Depending on the type of procedures diagnostic coronarography (Figure 3) in case with suspicion of coronary artery disease (with positive exercise test, patients unable to perform the test) and presurgical coronarography were the main procedures done in 171 patients (46.8%) and in 146 patients (40%) respectively. Diagnostic coronarography was positive in 31 cases (18.1%). We had mostly important

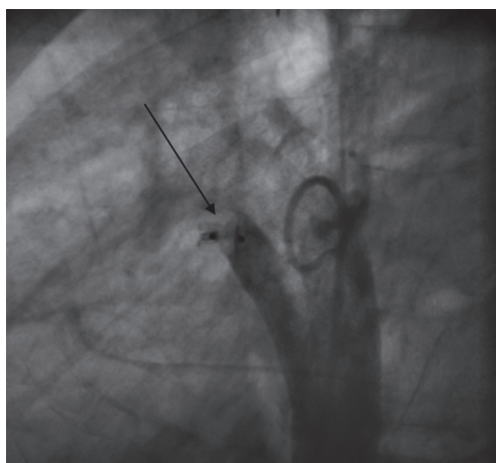


Figure 3 Patent ductus arteriosus occluder device well placed (arrow).

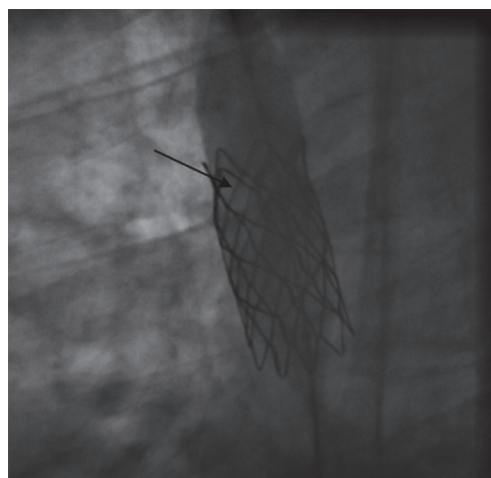


Figure 5 Stent inserted at the level of the coarctation with good result (arrow).

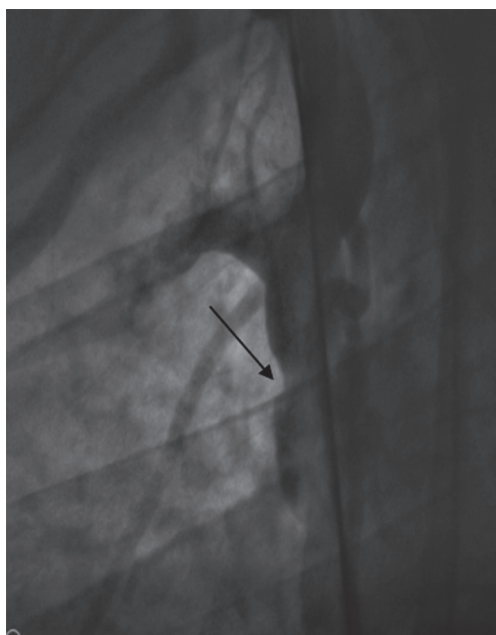


Figure 4 Severe coarctation of the aorta (arrow).

lesions more than 70% affecting the left anterior descending branch (61%), the circumflex branch of the left coronary artery (21%).

In patients with confirmed ischemic heart disease (IHD), percutaneous intervention (*Figures 4,5*) with dilatation of the coronary arteries and implantation of stents was done in 19 cases (61.2%). The remaining 12 cases (38.8%) were having many lesions that could be managed only by coronary artery grafting surgery, done with success in all the cases.

Presurgical coronarography was positive in 3 males (2%)

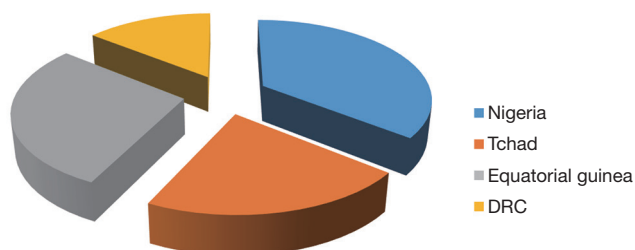


Figure 6 International patients represented in the Cardiac Centre Shisong.

and 2 females (1.3%). Percutaneous intervention was done in 2 male and a female and in the remaining patient with disseminated and important lesions was done coronary artery bypass grafting surgery.

In grown up congenital heart (GUCH) disease patients (*Figure 6*), diagnostic catheterization was done in 48 cases meanwhile interventional catheterization: pulmonary artery valvuloplasty, patent ductus arteriosus (PDA) closure (*Figure 7*), atrial septal defect closure and decoarctation of the aorta (*Figures 8,9*) were done in n=11 (3.4%), n=9 (2.4%), n=12 (3.2%), n=6 (1.6%) cases respectively. The remaining 10 cases (2.7%) were having advanced pathologies with very high pulmonary resistances in whom there was not benefit of any intervention. The length of stay in the hospital for all interventional procedures was 3 ± 1.5 days. Complications of the procedures were: embolization of the device in a patient with PDA closure that was surgically removed and the PDA ligated, hematoma at the puncture site in n=2 (0.5%) patients.

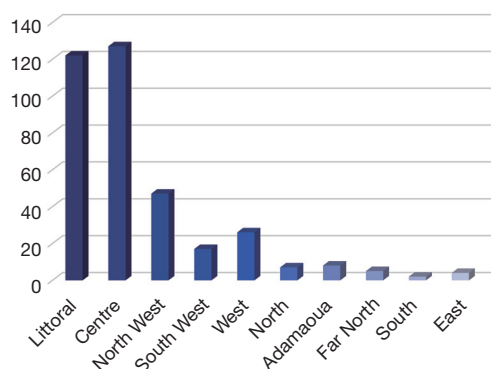


Figure 7 Repartition of patients depending on regions in Cameroon.

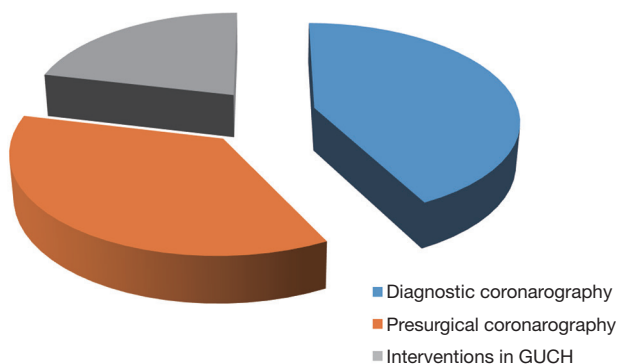


Figure 8 Types of heart catheterization done in adult patients in the Cardiac Centre. GUCH, grown up congenital heart.

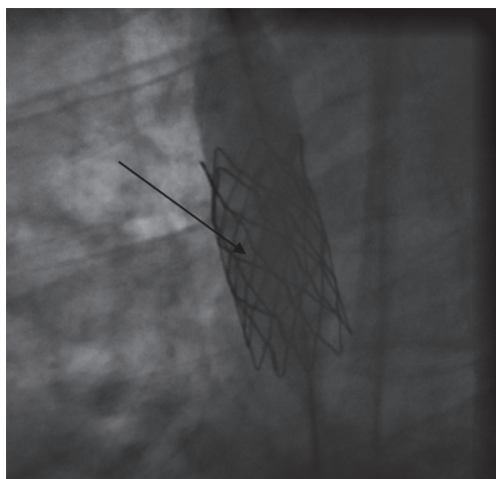


Figure 9 Stent inserted at the level of the coarctation with good result (arrow).

Discussion

Cardiac catheterization is an integral part of the diagnosis and treatment of CVD and is one of the most widely performed procedures with the highest volumes seen in the United States where more than a million diagnostic coronary angiograms were performed in 2011 (6). Cardiac catheterization has greatly evolved since Frossman performed the first right heart cardiac catheterization in 1929. From selective coronary angiography by Sones in 1958, to coronary balloon angioplasty by Gruntzig in 1977, cardiac catheterization has evolved into a myriad of diagnostic and interventional procedures like mitral valve repair, Trans-catheter aortic valve replacement, and congenital defect closure (7).

IHD

Initially thought to be very uncommon in the West African population, it has been noted that there is now a rising incidence of coronary artery disease (8-10). There has unfortunately been a paucity of diagnostic and interventional facilities in most West African countries. In our results, percutaneous intervention with dilatation of the coronary arteries and implantation of stents was done in 19 cases (61.2%). The remaining 12 cases (38.8%) were having many lesions that could be managed only by coronary artery grafting surgery. In Nigeria, Johnson *et al.* reported that out of 152 Nigerians that were referred with a diagnosis of IHD, 80 were confirmed at coronary angiography to have coronary artery disease and PCI was performed in 48 patients (62.3%) but 29 patients (37.7%) did not have PCI due to some technical moments depriving them from the procedure (11). In Uganda, University Hospitals Harrington Heart and Vascular Institute and Case Western Reserve University have partnered with the US and Ugandan collaborators to improve cardiovascular capabilities. Key outcomes of this approach have been the completion of formal training of the first interventional cardiologist and heart failure specialists in the country (12). In Senegal, Mboup and Thiam reported 34 patients who underwent PCTI procedure with success, they said PCI are feasible with high success and low complication rates (13).

Presurgical coronary angiography in adult patients

Coronary angiography is widely indicated to detect

associated coronary artery disease when surgery is planned. Knowledge of coronary anatomy improves risk-stratification and determines whether coronary revascularization is indicated in association with valvular surgery (14). In our study, in total 146 patients, 45 years old and above for male $n=83$ (56.8%) and 50 years old and above for female $n=63$ (43%) suffering from acquired heart disease, having myxoma prior to open heart surgery for total correction of pathologies was done coronarography to visualize coronary arteries to exclude any pathology. In Morocco (15), preoperative angiography was indicated for patients Whose age is greater than 50, the procedure was performed on 198 (19.3%) patients in our sample. The results of preoperative coronary angiography were normal in 176 cases and pathological in 22 cases. In Spain, preoperative coronary angiography is indicated in males who are ≥ 60 years old and in females who are ≥ 65 years old, and in younger patients who present angina or risk factors, regardless of the valvulopathy present. So late surely because the valvulopathy is degenerative (16).

Grown up patients with congenital heart disease

GUCH provide a wide variety of challenges for the interventional cardiologist. The most common interventions in our own practice are closure of atrial septal defects and patent foramen ovale. Transcatheter PDA closure is also now routine, and occlusion of coronary artery fistulae can be safely attempted using coil embolisation (17). Balloon dilatation of pulmonary valve stenosis has excellent success rates, and dilatation or stenting of pulmonary artery stenoses is also beneficial in selected cases. Dilatation or stenting of aortic coarctation is now becoming more widespread, and has promising results. In our study, we had pulmonary artery valvuloplasty, PDA closure, atrial septal defect closure and decoarctation of the aorta were done in $n=11$ (3.4%), $n=9$ (2.4%), $n=12$ (3.2%), $n=6$ (1.6%) cases respectively. The remaining 10 cases (2.7%) were having advanced pathologies with very high pulmonary resistances in whom there was not benefit of any intervention. Late presentation in case with congenital heart disease is a problem of concern in our setting. We are working hard to create awareness about congenital heart diseases in the adult and encourage them to seek help from instructed medical personnel for comprehensive assessments. In Nigeria (18), Animasahun *et al.* reported that Interventional procedures for congenital heart diseases currently are available locally, but the high degree of manpower training required, the

cost, and the local availability of consumables are major factors limiting their use. Regional and international collaboration could be mutually beneficial. The definitive treatment of PDA is by closing it either by a transcatheter approach or by surgery. Transcatheter closure has been established to be the method of choice for treating a PDA in adults with very good outcome. However, surgical closure is still the method of choice for treating very large PDAs not amenable for catheter intervention (19).

In Senegal, Mbaye *et al.* registered 50 dossiers of patients equivalent to a prevalence of 0.75%, with a female predominance (64%). Main malformations were the atrial septal defect (38%), pulmonary stenosis (14%), the ventricular septal defect (12%) and PDA (10%). The treatment was medical in 43 patients and 7 patients had surgical repair (20). In Ivory Coast, surgical correction has been the only option (21). We see that Shisong Cardiac Centre is a leader in the sub region in the transcatheter management of grown up cardiac pathologies. The key procedures any African cath lab should offer: right- and left-sided pressure studies, coronary angiography, PCI (notably with radial access), mitral/pulmonary valvuloplasty, PDA closure atrial septostomy, pacing, both permanent and temporary, pericardiocentesis, bilateral iliac intervention. This is an ideal scenario and Africa as a whole is still a long way from achieving it. As Dr Bourlon pointed out, facilities vary greatly across the continent (22). We are working very hard to get to this ideal. *"There are a few cath labs that are well equipped and manned by well-trained staff. Many others have extremely limited resources, however, requiring interventional cardiologists to be versatile and skilful. And in many parts of Africa, a cath lab is just a dream."*

Conclusions

Coronary heart disease was confirmed by angiography in 8.4% cases, and among grown up congenital heart disease 'patients, atrial septal defect was the pathology the most managed. Heart catheterization is done in the Cardiac centre Shisong with good results.

Acknowledgements

None.

Footnote

Conflicts of Interest: The authors have no conflicts of interest

to declare.

Ethical Statement: The study was approved by institutional ethics committee of the Cardiac Centre Shisong and informed consent was taken from all the patients.

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