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Surgical repair of thoracic aortic aneurysm and dissection in the Sub-Saharan Africa: 30-day outcomes from a Cameroonian Center

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The real incidence of thoracic aorta aneurysm and dissection (TAA) in the sub-Saharan region is unknown. Owing to diagnostic limitations and the absence of specialized centers, reports on TAA surgery have been anecdotal. We report our 30-day outcomes over an 8-year period following TAA surgery at the Shisong Cardiac Center, a Cameroonian cardio-surgical institution. Between November 2010 and May 2018, TAA was diagnosed in 35 patients at the Shisong Cardiac Center. Twenty eight (n=28) patients underwent surgical repair during the same period [Mean age: 43.8±14.7 years, range: 18-72 years; males: 18/28 (64.2%)]. Patient profiles, disease etiology and surgical outcomes were retrospectively reviewed. Uncontrolled hypertension was the commonest risk factor (17/28, 60.7%). Genetic disorders were found in 5/28 patients (17.8%) including 4 with bicuspid aortic valve and 1 with Marfan's Syndrome. The operative mortality was 10.7% (n=3/28). Twenty one (n=22/28, 75%) patients had composite aortic root replacement (Bentall and De Bono); four patients (n=4/28, 14.2%) had ascending aorta graft replacement and two patients (n=2/28, 7.1%) underwent reductive aortoplasty (Robiscek). Associated procedures were mitral surgery (4/28, 14.2%), tricuspid repair (3/28, 10.7%) and CABG (1/28, 3.5%). One case of stroke was reported in the immediate postoperative period. The incidence of TAA in the sub-Saharan region seems to be underestimated due mainly to insufficient number of specialists and medical infrastructures. A major attention should be paid during the evaluation of patients with risk factors. These early results demonstrate the feasibility of surgical correction in our country with encouraging results.

Key words: Thoracic aneurysm, aneurysm repair, Sub-Saharan Africa.

INTRODUCTION

More than sixty years after the first successful surgeries (Cooley, 2003), thoracic aortic aneurysm (TAA) repair is still among the major challenges in cardiovascular surgery. Owing to his asymptomatic and insidious nature,

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adequate diagnostic assessment remains crucial for a timely surgical repair.

In regions with limited access to cardiovascular care as the sub-Saharan Africa (SSA) (Unger, 1999), the burden of TAA is likely to be underestimated leading to life-threatening complications such as dissection, rupture or death in the majority of cases for the absence of a prompt and adequate therapy.

Although the real burden of TAA in the SSA remains unknown, recent observations have pointed out a rise in regional death rates from aortic aneurysms and dissection in the region over the last two decades (Elefteriades and Farkas, 2010; Sampson et al., 2014). This results from both inadequacy of local preventive healthcare policies and the general poor awareness on the burden of cardiovascular diseases (CVD) in the region, including the risks from uncontrolled hypertension (Ataklte et al., 2015; Addo et al., 2007), the vascular manifestations of the endemic infections such as syphilis and HIV (Woolgar and Robbs, 2002; Nair et al., 1999), and the effects of the ongoing epidemiological transition among others.

The current scarcity of epidemiologic and surgical data on TAA in the SSA (Julius et al., 2010; Barnard CN and Schrire, 1963; Antunes et al., 1984) is then more suggestive of the great deficit of cardiovascular specialists and institutions in the region (Unger, 1999) rather than a presumed but unproven low prevalence of the disease.

The current paper reviews the 30-day outcomes after surgical treatment of TAA and dissection in a Cameroonian cardio-surgical center (Appolonia et al., 2010).

PATIENTS AND METHODS

From November 2010 to July 2018, total of twenty eight patients with TAA underwent surgery at the department of cardiovascular surgery of the Shisong Cardiac Center. Data on the modality of diagnosis, the etiology, and the early clinical outcomes were retrospectively reviewed. The preoperative clinical data of patients are reported in Table 1.

This study was approved by the scientific committee of the institution which waived the need for patient consent.

Diagnostic imaging assessment and indication for TAA repair

The cohort includes cases of TAA diagnosed in our outpatient department and those referred from outside hospitals. All the patients were reviewed by a multidisciplinary team of specialists (heart surgeon, cardiologists, and anesthesiologists) and underwent a diagnostic imaging protocol including routine Chest-X Ray and trans-thoracic echocardiography. Diagnostic catheterization with an aortography was also performed in some cases with associated congenital disease. Computed tomography scan and magnetic resonance imaging modalities were performed for complete assessment in cases with chronic dissection or in those with suspicion of extended TAA at the echocardiography. All the patients underwent transoesophageal echocardiography at the time of their operation.

TAA repair was indicated in all the patients with dissection regardless of the aortic size. An aortic diameter of 55 mm was the main cut-off for non-dissected aneurysms. In cases with associated valvular disease, concomitant TAA repair was considered for lower aortic size (≥55 mm in morphologically tricuspid aortic valve). Lower levels thresholds were considered in those with BAV or any related genetic disorder.

Surgical technique

A full median sternotomy was performed in all cases. Arterial site cannulations were the ascending aorta, right axillary artery, the femoral artery and innominate artery according to the involvement of the aortic arch or in the presence of dissection. Venous drainage was obtained through right atrial or bicaval cannulation depending of the associated procedures. Transoesophageal echocardiography was used in all the cases for intraoperative assessment of the aortic disease and the associated lesions. Crystalloid cold cardioplegia (Custodiol HTK, KÖhler Chemie GmbH, Bensheim, Germany) was used for myocardial protection in the majority and administered through the aortic root or selectively in the coronaries ostia. In the absence of associated disease, proximal procedure (including root replacement) was first performed. In cases requiring aortic arch surgery, the distal anastomosis was performed with open technique under deep hypothermic arrest (rectal temperature of 28°C) and anterograde bilateral cerebral protection was obtained by selective perfusion of both carotid arteries (Kazui's technique).

Statistical analysis

Statistical analysis was performed with StatView 4.5 (SAS Institute Inc, Abacus Concepts, Berkeley, CA). Clinical variables including patient age, sex, rate of hypertension and aortic diameter were expressed as mean values ±1 standard deviation. Operative mortality and complications were expressed in percentage (%).

RESULTS

Patient's demographics

The mean age of the patients was 43.8±14.7 years (range: 18-72 years). 60.7% (n=17/28) of the cases were male. The indication for surgery were degenerative aneurysm in 18 (18/28, 64.2%), aortic dissection in 9 (9/28, 32.1%) and pseudoaneurysm not syphilitic in one patient (1/28, 3.5%). Uncontrolled hypertension was the commonest risk factor (17/28, 60.7%). Five patients had genetic syndromes including 4 with bicuspid aortic valve (BAV) and 1 case with Marfan's syndrome who presented with aortic dissection (Figure 1). Among the patients with aortic dissection, only 2 were acute (<14 days from symptoms).

Surgical outcomes

The 30-day mortality was 10.7% (3/28). A 52 year-old man who had combined Mitral valve surgery and bentall operation (No dissection) died few hours after surgery for low cardiac output syndrome despite maximal medical

Table 1. Patient's clinical data.

Variable	Value
Age in years, mean ± SD (range)	43.8±14.7 (18-72)
Male sex, n (%)	17 (60.7)
BMI in kg/m2, mean ± SD (range)	25.5±5.4 (16.1-35.5)
History of hypertension, n (%)	17 (60.7)
Smoking, n (%)	3 (10.7)
Diabetes, n (%)	1 (3.5)
Genetic disorders, n (%)	5 (17.8)
-BAV n (%)	4 (14.2)
-Marfan's syndrome, n (%)	1 (3.5)
TAA diameter mm, mean (range)	63.6±17.9 (51-120)
Arch and descending aorta involvement, n (%)	11 (39.2)
Thoracic aortic dissection, n (%)	9 (32.1)
-Stanford type A, n (%)	9/9 (100)
-Stanford type B, n (%)	0/9 (0)
-Acute (<14 days), n (%)	2/9 (22.2)
Concomitant heart disease	
Aortic valve disease	27 (96.4)
Mitral valve disease	3 (10.7)
Tricuspid valve disease	1 (3.5)
Coronary artery disease	1 (7.1)
Aortic Coarctation	2 (7.1)
Symptoms at admission	
Dyspnea	26 (92.8)
Chest pain	2 (7.1)

BMI: Body mass index; BAV: bicuspid aortic valve; TAA: thoracic aortic aneurys.

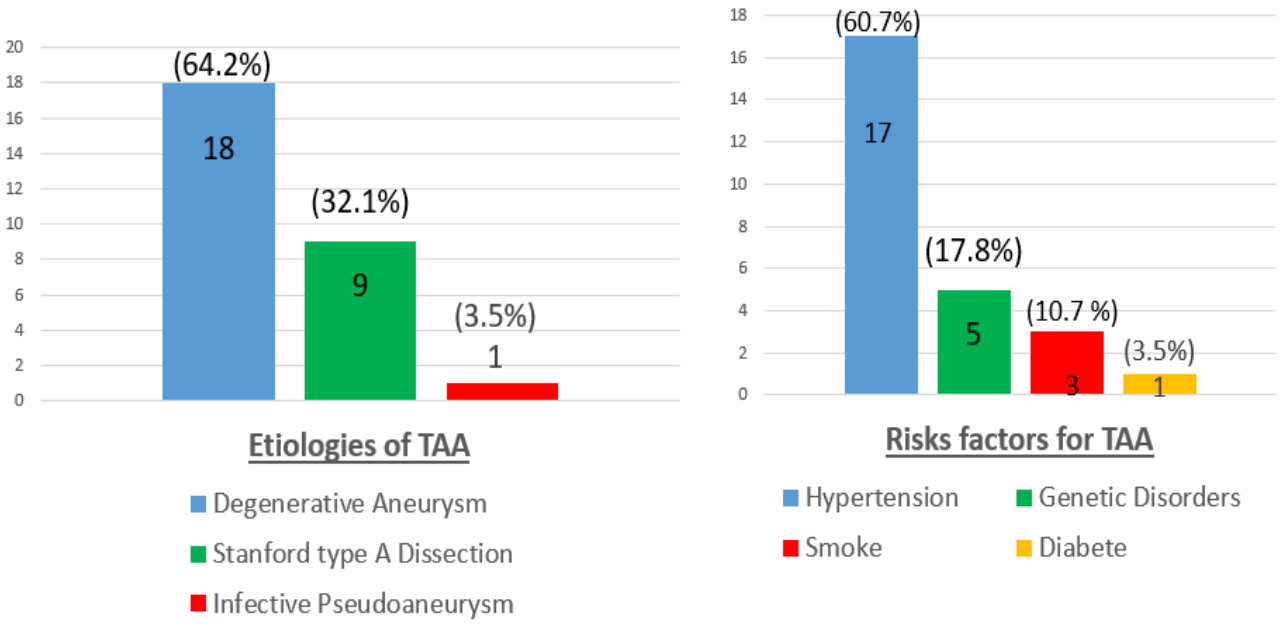

Figure 1. TAA etiologies and risks factors.

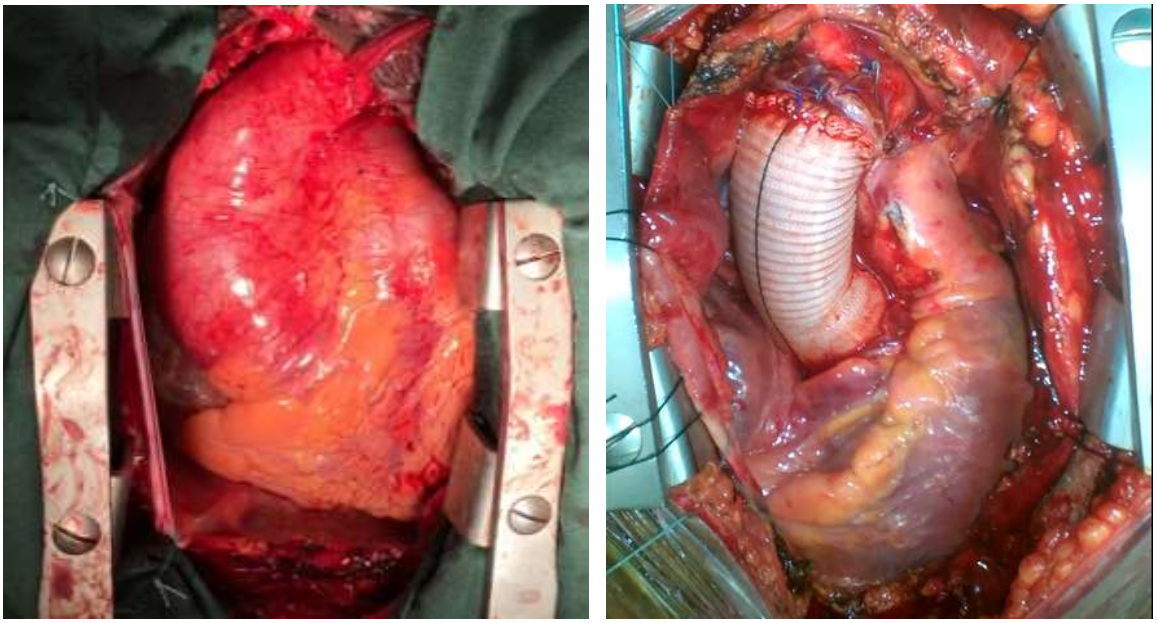

Figure 2. Intraoperative view of TAA. Before (a) and after (b) composite root replacement.

support and intraoperative aortic counterpulsation. Other two deaths occurred in two patients with type A dissection (acute and chronic) due to postoperative malperfusion following a bentall and extended arch replacement. One case of transitory ischemic stroke was observed in the early postoperative period among those who survived the surgery. Two (n=2) patients underwent chest reexploration for bleeding. One patient had transitory acute renal failure with complete resolution within the 7th postoperative day. Composite aortic root replacement (Bentall operation, Figure 2) was performed in 22 cases (78.5%) whereas ascending aorta repair and aortic aortoplasty (Robiscek technique) were done in four and two patients, respectively. Concomitant procedures were mitral valve surgery (n=3), CABG (n=1), and tricuspid annuloplasty (n=1). Surgical data are summarized in Table 2.

DISCUSSION

Observations from our series support a major prevalence of TAA among the young SSA population when compared with other groups. This corroborates the previous findings by others SSA studies reporting a mean age between 56.15 and 51.2 years in patients with TAA in the region (Julius et al., 2010; Kitchen, 1989). Although the role of genetic predisposition remains questionable, the rate of TAA in the SSA seems to be mainly related to the increase burden of uncontrolled hypertension (60.7% in our cohort) in the region and the vascular complications of endemic infections in a context of limited access to healthcare facilities. Indeed, syphilis and tuberculosis diseases were common causes of TAA in early SSA studies (Barnard and Schrire, 1963; Antunes et al., 1984) whereas cases of vascular aneurysms from HIV infection have been increasingly described in the young SSA population (Woolgar and Robbs, 2002; Nair et al., 1999).

Not surprisingly, the diagnosis of TAA was mainly incidental in our series. This emphasizes on a possible underestimation of his real prevalence which could be higher than hitherto perceived. Indeed, recent autopsy and epidemiological studies have suggested a trend toward an increase death rate from aortic aneurysm and dissection in the sub-Saharan region (Elefteriades JA, Farkas, 2010; Sampson et al., 2014), underlining the ineffectiveness of local healthcare policies reflected by the lack of specialized cardiovascular units. In our country, nurses and general practitioners are actively involved in the management of cardiovascular diseases suggesting possible misinterpretations. Additionally, there is a lack of local expertise in cardiovascular imaging protocols and imaging modalities such as Computed Tomography Angiography or Magnetic Resonance Imaging have not been accessible neither affordable by the majority.

Published studies on TAA surgery in SSA are anecdotal. No data from the SSA area are currently available in the main platforms such as the International Registry of Aortic Aneurysm and Dissection (Hagan et al., 2000). This demonstrates the lack of high volume or reference centers for aortic aneurysm surgery in the whole area. This poor volume of TAA surgeries indicates both a diagnostic deficit and the structural limitations from the few existing cardio-surgical centers. With few

Table 2. Operative data.

Variable	Values
Associated procedures	
Aortic valve surgery	27
Mitral valve surgery	3
Tricuspid valve surgery	1
CABG	1
Bentall procedure, n (%)	22 (78.5)
Ascending aorta graft replacement, n (%)	4 (14.2)
Aortic Aortoplasty (Robiscek), n (%)	2 (7.1)
Concomitant aortic arch/hemi-arch surgery, n (%)	11 (39.2)
Arterial cannulation site, n, %	
-Distal ascending aorta/proximal arch	15 (53.5)
-Axillary artery	8 (28.5)
-Femoral artery	2 (7.1)
-Innominate artery	1 (3.5)
Cardiopulmonary bypass time, mean ± SD (range)	207.8±73.2 min (115-340)
Cross-Clamping time, mean ± SD (range)	157±45 min (84-255)
Aortic graft diameter, mean ± SD (range)	27.4±2.6 mm (22-30)
Postoperative complications	
-Bleeding, n (%)	3 (10.7)
-Malperfusion syndrome, n (%)	2 (7.1)
-Acute renal failure, n (%)	1 (3.5)
-Stroke, n (%)	1 (3.5)
Intensive Unit Stay, mean ± SD (range)	71±35 h (38-164)
30-day mortality, n (%)	3 (10.7)
Causes of deaths	
-Malperfusion syndrome	2 (7.1)
-Low cardiac output syndrome	1 (3.5)

CABG: Coronary artery bypass grafting; SD: standard deviation.

exceptions, SSA cardio-surgical programs are still depending on sporadic and short missions by foreign experts. In this context, patients with complex lesions such as TAA are rarely selected considering the impact on the limited resources including the risk of prolonged postoperative hospital stay. In our series, only 4/28 cases (14.2%) where operated during foreign missions during the initial phase of our program, whereas the majority (24/28, 85.7%) were treated over the last 6 years after setting a more regular activity with the local team. This has equally permitted to provide emerging care of acute aortic events which could have not been possible when relying exclusively periodical missions.

The operative mortality was 10.7% including patients with aortic dissection (2/9, 22.2%). This compares favorably with early experiences with TAA surgery in the SSA. Barnard and Schrire (1963) reported 37.5% of operative death in a series of 8 patients who underwent complex TAA repair. Similarly, Antunes et al. (1984) a global mortality rate of 19.5 and 56% in 31 patients after surgery for TAA and aortic dissection, respectively. This increase mortality was seemingly related to the complexity of TAA lesions from predominant infectious etiology (syphilitic pseudoaneurysm) and the limitations in surgical techniques at that time. Similarly, our results were potentially influenced by some technical and logistic aspects. Indeed, the absence of a prompt endovascular intervention to treat postoperative malperfusion syndrome following aortic dissection repair, and the lack of cardiocirculatory devices as support for patients with low cardiac output syndrome were potentially detrimental. Furthermore, intraoperative monitoring of cerebral perfusion was suboptimal as no Near Infrared Spectroscopy device was available increasing the risk of

neurologic injury.

Limitations of the study are related mainly to the small sample. However, our main focus was to give a current snapshot of what can be achieve on TAA surgery in our region.

In conclusion, the incidence of TAA in the sub-Saharan region seems to be underestimated due mainly to the insufficient number of cardiovascular specialists and medical infrastructures. A major attention should be paid during the evaluation of patients with risk factors such as uncontrolled hypertension. Our operative mortality is encouraging and demonstrates the feasibility of complex TAA repair even in a limited resources setting.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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