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ORIGINAL ARTICLE

THE OUTCOME AND DEMOGRAPHIC CHARACTERSTICS OF 20 PATIENTS WITH VALVE SURGERY DONE BY TEAM ETHIOPIA

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ABSTRACT

Background: *Ethiopia has a large burden of rheumatic heart disease, but is still in the process of establishing a regular heart surgery program. Since the commencement of open-heart surgery at Cardiac Center of Ethiopia by the local team 20 valve surgeries with different complexities have been performed.*

Objective: *To assess the outcome and demographic characteristics patients who had valvar heart surgery by an Ethiopian team*

Method: *A cross-sectional study was conducted using data collected from clinical records of patients who underwent valve surgery from May 2017 up to March 2018 at the Cardiac Center of Ethiopia by a local team. This study assessed the patient characteristics and outcome of the surgery.*

Results: *A total of 20 valve surgeries were performed. Patient's age ranged from nine years to 75 years with mean age of 26.4 years. Three quarters, 15/20 (75%), of the patients received mechanical valve replacement, while 2/20 (10%) had tissue valve replacement. Three patients underwent mitral valve repair and three patients had double valve replacement. Two patients underwent mitral valve replacement plus left maze procedure. There was one death, a patient who underwent mitral valve replacement.*

Conclusion: *The outcome of patients who had open-heart valvular surgery by the Ethiopian cardiac team was encouraging. Only one of the 20 patients in our series died.*

Key words*: Local team, Ethiopia, 20 valves surgery.*

INTRODUCTION

Despite the fact that open-heart surgery began in the 1950s, still after 70 years, it has not gained due recognition when drone by surgeons in developing setting. Cardiac surgeons traveling to East Africa on humanitarian surgical missions did a large number of valve surgeries, which were almost all due to rheumatic heart disease. Since its inauguration in 2009, the cardiac center of Ethiopia (CCE) has served a substantial number of valve surgeries over a nine-year period until this study was done.

In 2006, Suri and colleagues (1) noted an early death after mitral valve repair of 0.7% compared with 5.6% with valve replacement. They also noted improved long-term survival up to 15 years with mitral valve (MV) repair. This is mirrored by a larger comparison by Gammie and colleagues (2) of the Society of Thoracic Surgeons (STS) National Adult Cardiac Surgery Database that revealed a 3.8% operative mortality in MV replacement (n=25,671) patients compared with repair (n=32,699, 1.4%, $p < 0.0001$). In multivariable comparisons, repair was independently associated with a lower peri-operative proportion of death (OR=0.52, $p< 0.0001$).

In long-term risk-adjusted outcome comparisons from the Duke series, mitral valve repair was independently associated with improved survival across the spectrum of patient risk and valve disease etiology (3). Even in elderly patients, repair afforded high relative survival benefit, as compared with both tissue and mechanical valve replacement.

According to a recent analysis of STS database from 2002 to 2010, death after isolated surgical aortic valve replacement (AVR) was 3%. However postoperative stroke remains a major cause of morbidity after AVR, especially in high-risk and elderly patients, and the true incidence of this complication from a population-based perspective remains unclear (4,5).

Ethiopia is one of the sub-Sahara African countries with a huge burden of rheumatic heart disease (RHD) with the highest mortality rate. One recent collaborative echocardiographic (ECHO) screening project from Ethiopia and South Africa using World Heart Federation (WHF) criteria reported a definite RHD prevalence of 16 per 1000 (6). In rural Ethiopia, annual death reaches 12.5% among patients with RHD (7). and as many as 70% of such patients die before 26 years of age (8)

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Since the commencement of open-heart surgery by the local team, 85 cardiac surgeries have been performed, of which 20 were valve surgeries. In this series, we assessed the performance and outcome as measured by number of deaths over 30-day after surgery by team Ethiopia.

PATIENTS AND METHOD

Symptomatic patients who underwent valve surgeries by the local team at cardiac center of Ethiopia over nine months were included in the study. All the 20 valve surgeries, which were performed by Ethiopian surgeons and perfusionist were included. Those patients only having either severe mitral stenosis (MS) having trans-mitral mean gradient of >10mmHg and MV orifice </= 1cm^2, or aortic stenosis (AS) having peak trans-aortic valve gradient of >/= 60mmHg, or severe mitral regurgitation (MR) who are having grade III and above regurgitation, or severe aortic regurgitation (AR) who had grade III and above regurgitation underwent the surgery. The follow up period duration varies from one month to nine months. Patient follow up was performed by doing direct patient evaluation, and reviewing of the ECHO report and hospital records.

Occurrence of any of five major complications (prolonged ventilation >24 hours, deep sternal wound infection, reoperation, renal failure or stroke), in the immediate postoperative time before discharge considered as indicator complications.

Long term follow-up evaluation included death and its cause (if known), reoperation to replace the prosthesis, indication for reoperation, and the presence of the following complications at any time in the post operative period: (1) thromboembolism including any sudden focal transient or permanent neurological deficit, (2) anticoagulant-related hemorrhage requiring transfusion or hospital admission, (3) prosthetic valve endocarditis (4) mechanical valve failure (5) post operative surgical site wound infection, (6)Para prosthetic regurgitation.

A standard midline approach, cross clamping of the aorta and St. Thomas regular cardioplegia used for all patients. The approach for mitral valve for all patients was through the left atrium (LA) using Sondergaarden groove incision. The decision to have mechanical or tissue valve was mainly by age. Those above 60 years will have tissue valve and young female patients who request tissue valve in order to have safe pregnancy were also offered the chance. All mechanical valves used were bi-leaflet valves.

The decision to repair valve was made with assessment of the valve on pre operative ECHO along with our cardiologist.
Those lesions with either pure MS or pure MR without heavy calcification and heavy rheumatic burden underwent valve repair. The three patients who have mitral valve repair were by putting the appropriate ring size for the valve. The other two valve repair done along with AVR was only bilateral open mitral valvotomy (OMV).

Two patients underwent cut and sew left maze procedure, which composed left atrial appendage (LAA) excision from inside and closing it in two layers using 4: 0 prolene, pulmonary vein isolation, connecting lines with mitral valve annulus, and LA reduction. Both patients were having giant LA 70mm and 74mm. Both are having persistent atrial fibrillation despite on treatment for more than a year, but the main reason for doing maze was both patient didn't want to continue warfarin and requested for a safe pregnancy. The data was analyzed using percentile, standard deviation, mean, average and range.

RESULTS

Complete data for the 20 patients included in the study were available and there was no missed data in the record reviewed.

Demographic data: Patients in our series came from six regions of the country. Addis Ababa represented 7/20 (35%) and the Amhara Region made 6/20 (30%) of the cases. The age distributions of the patients showed 15/20 (75%) were in the age group from 20-40 years. The minimum age was nine years and maximum age was 75 years with a mean age of 26.4years. Sixty percent of our patients were females and 40% are males.

Type of procedures: The majority of our patients 15/20 (75%) received mechanical valve replacement while only 2/20 (10%) had tissue valve replacement. Out of the 20 patients 14 (70%) had only replacement surgery, 3/20 (15%) had only mitral valve repair, and 3/20 (15%) had both replacement and repair surgery simultaneously. From the 20 patients 6 (30%) underwent only MVR, 3/20 (15%) underwent only AVR, 3/20 (15%) underwent double valve replacement (DVR), 3/20 (15%) underwent only mitral valve repair, 3/20 (10%) underwent AVR plus mitral valve repair, and 2/20 (10%) underwent MVR plus left maze procedure (Figure 1. One of the MVR patients had LA clot removal with LAA excision.

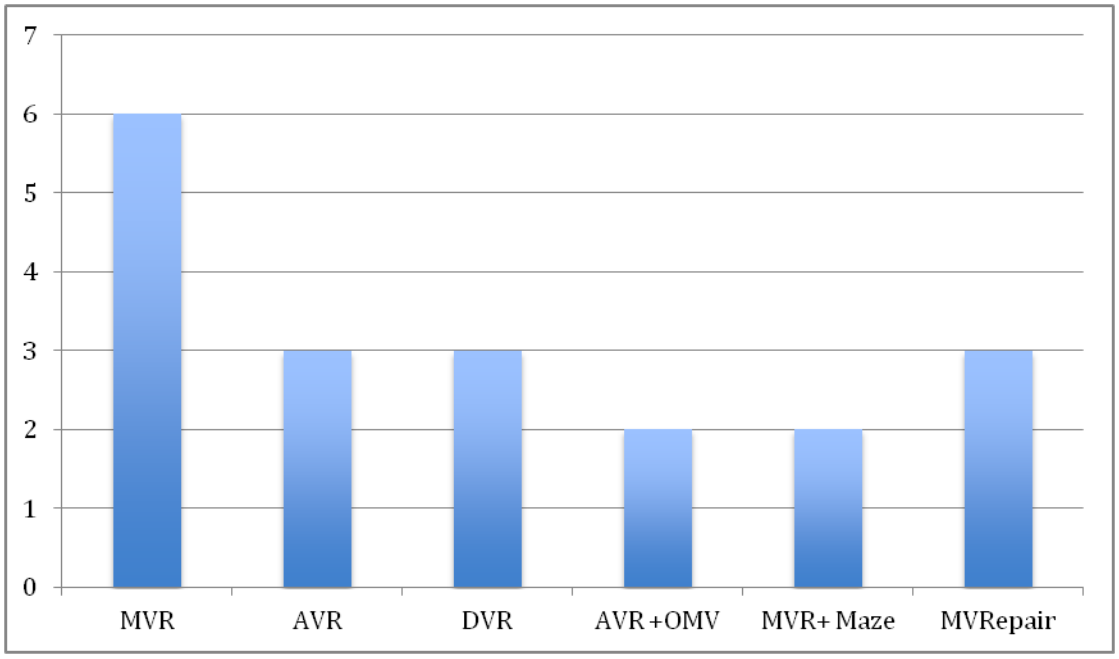

Figure 1: Type of surgery done among the 20 patients with valvular hear disease.

Preoperative TTE variables: The majority of our patients were in atrial fibrillation 14/20 (70%) with giant left atrium. Most of our patients 12 (60%) have LV systolic ejection fraction > 50%. The rest, 8/20 (40%) had moderate LV dysfunction. Only 6/20 (30%) had severe pulmonary artery hypertension (PAH), and 5/20 (25%) had moderate PAH.

Etiology: Only 2/20 (10%) of the cases had non-rheumatic etiology. One of them was severe AS secondary to congenital bicuspid aortic valve and the other was an old person with degenerative calcific aortic stenosis. The rest, 18/20 (90%) had chronic rheumatic valvular heart disease.

Early death: Only 1 (5%) of the 20 patients died early in the postoperative period. The patient was ambulatory class IV New York Heart Association (NYHA) classification. The cause of death was attributed to low cardiac output state.

Late death: There was no death reported in the series after discharge from hospital until the last follow up date when this data is collected.

Early complication: There was one patient who had to be taken to the OR a day after DVR was done due bleeding from the aortic root. Bleeding was arrested and pack was removed. Another patient for whom mitral valve repair was done, the post operative trans -thoracic echocardiography (TTE) showed >1 MR. There was one death on the first postoperative day of a patient who had MVR with a mechanical valve. Two of our patients who underwent MVR and AVR had significant pericardial effusion, which required pericardial drainage three weeks after the surgery.

Late complication: One patient for whom MVR was done developed superficial sternal wound infection and had repeated visit for wound care at the outpatient department for more than three months. Significant aortic para-valvar leak was found in one patient who underwent across the aortic prosthetic valve on the 8th month follow (Figure 2).

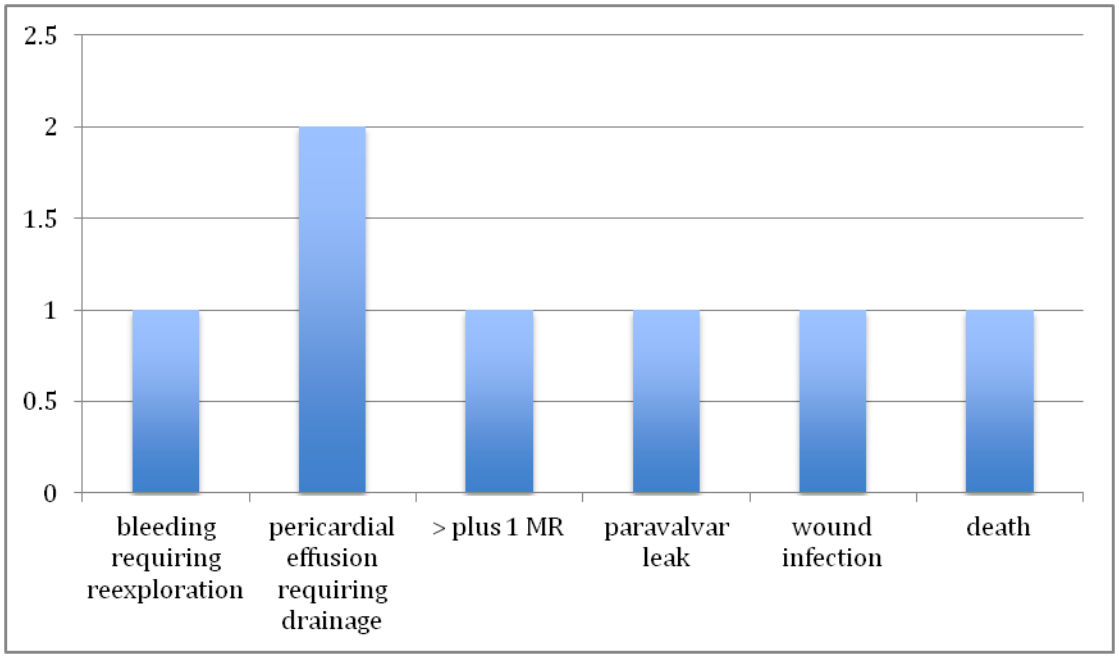

Figure 2: Major complications among 20 patients who had valve surgery.

DISCUSSION

RHD occurs in the multicultural world as an acute or chronic rheumatic condition (burn-out rheumatic valvular heart disease) in varying degrees, including annulus dilatation, leaflet prolapse, tethering, restricted leaflet motion, shortened or elongated chordae, malformed papillary muscles, and left ventricular dysfunction. The mitral valve is involved in about 92% of the cases and mitral regurgitation is the most common lesion, which requires surgical treatment (9–12,13-16).

According to the current American College of Cardiology/American Heart Association guideline for surgical intervention in patients with AR, AVR or repair is a class I indication for symptomatic patients with severe AR irrespective of LV systolic function (17,18) (Level of evidence B).

Preoperative concomitant atrial fibrillation is usually treated with the Cox–Maze IV atrial ablation procedure (19). The goal is to complete surgical therapy with a long-term functional repair of the patient's own mitral valve and normal sinus rhythm, so that the patient can be maintained only on aspirin, with the attendant lower complication rates of autologous repair.
Cox Maze procedure was introduced to the world in 1992 to the world by Cox et al.

This is one of the complex cardiac surgeries dared by few cardiac surgeons around the world. This unique surgery has been done in this country for the first time with the desired outcome, patient converted to sinus rhythm and didn't required warfarin.

The left a trial maze procedure is an effective alternative adjunct procedure for elective open-heart surgery to treat a trial fibrillation, depending upon the patient's clinical condition. (20) Long-term treatment with war far in should not be required, and other cardiac medicines may be eliminated following mitral valve replacement with homograft or tissue valve combined with Maze III procedure. (21)

Left maze along with MVR with tissue valve was performed by the request of our newly married patient to guarantee safe pregnancy. Fortunate enough she turned out sinus rhythm from the beginning to the last follow up at six month. However our second left maze with tissue valve complicated with bleeding and paravalvar leak. Due to this we explanted the tissue valve replaced with mechanical valve. She didn't either come to sinus rhythm. However, during her last follow up at five month she gain more than 10Kg and demanding badly for pregnancy.
In those patients presenting with concomitant aortic (AV) and mitral (MV) valve disease, the historical procedure of choice has been double valve replacement.

However, with the proven benefits of mitral valve repair over replacement for patients with isolated mitral valve disease (22,23) many have adopted a mitral repair strategy when feasible in patients requiring concomitant aortic and mitral valve surgery. Meanwhile, others choose to maintain a double valve replacement strategy secondary to the fear that a failed MV repair will require a second aortic cross-clamp with resultant increased cardiopulmonary bypass time.

One of our patient for whom DVR was done had severe calcific MS as well as severe aortic stenosis. However, after coming off bypass there was bleeding deep down at the LA and aortic root junction. After trying everything, we packed the mediastinum with packs and patient shifted to intensive care unit (ICU). Next day when chest was open, it was dry and closed after removing the packs. Patient was seen at 8th month follow up and ECHO showed 3mm paravalvar leak at the aortic valve.

The second DVR was done with mechanical valve 25mm at mitral and 18mm at aortic valve. However, we ended up with aortic opening stretched into the root. Aortic root augmented with sauvage patch and aorta closed. As a result her postoperative time become uneventful.

In case of severe mitral stenosis due to rheumatic heart disease MVR is definitely a much simple and more durable option for this subset of patients, but patient survival is much better with open mitral comissurotomy (OMC) (24,25). Similarly, thromboembolism, anticoagulant-related hemorrhage, and other valve related complications outweigh the durability of valve replacement (25). In addition to this, the cost benefit and freedom from expensive anticoagulation and its monitoring are some important advantages of OMC, especially for rural people in developing countries like Ethiopia.
Two of our patients underwent AVR with OMV and postoperative TTE showed MVA by plannimetry > 2m2. The gradient across mitral valve is <5 mmHg.

Mitral valve repair in rheumatic disease is feasible, but the long-term functional results are suboptimal. It has become the preferred surgical method over replacement because of its good functional results, rapid recovery of the left ventricle, socioeconomic benefits, and positive impact on quality of life. Pure mitral incompetence may be reparable and long lasting, while valves with mixed lesions may be reparable but fail afterwards. (26)

A pure MS with pliable anterior and posterior leaflets and without extensive calcification and pathological changes of the submitral apparatus has a 60% probability of repair success as compared to 30% for a mixed lesion (hazard ratio 1.72; 95% confidence interval, p=0.006) (27-30).
Two of our patients underwent OMV and AVR for severe MS with severe AR with a descent outcome. Both patients have MVA > 2cm2 and trans-mitral gradient < 5mmHg.

Failures resulting in a mild mitral regurgitation (MR), as evidenced by intra operative trans esophageal ECHO, which occur within 2–3 years after repair is related to improper indication, inadequate repair, and technical factors (31,32). Consequently, to avoid early reoperation, an inadequate leaflet coaptation of less than 8 mm in length with a mild MR in the operating room should not be accepted.

Our 12 years old patient who had mitral repair for severe MR using 26mm CE ring was found to have +2 MR in the ICU. However, the lack of pediatric TEEprobe predisposes our team for this outcome. The epicardial ECHO shown 9mm coaptation height and no MR. We followed the patient just one month with the MR still there.

Our mortality was a 32 years old woman who undergoes MVR with mechanical valve. Despite the fact that she was admitted repeatedly for CHF and she can hardly walk for five minutes on a flat floor. TTE showed fair biventricular function. The courage to do the case was augmented by the family who repeatedly knocked our door to proceed. The surgery was uneventful with the shortest possible cross clamp time in our patients. During closure of chest, however, she arrested and we go back on pump again and supported the heart for 2 hours. With hiked up cocktails of inotropes we could shift the patient to ICU, but patient went into retractable low output state due to LV failure and died the next day.

Limitations: This is an early experience and the follow up period is short. In this regard, the outcome and the complication rate should be regarded as preliminary.

Conclusion and recommendation: The sort-term outcome of valve surgery by the local team was excellent. We believe the service need to be scaled-up and all government and partners need to contribute to strengthen the program in order to avail the service to the large number of patients living with RHD in Ethiopia.

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