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Comparison of the *Characteristics and Outcomes* of Patients Undergoing Concurrent CABG with MVR

Md. Alauddin[1*], Md. Zanzibul Tareq[2], Abu Jafar Md. Tareq Morshed[3], Md. Mohiuddin Aslam[4], Dharmendra Joshi[5], Nur-A-Musabber[6], Hridita Nawrin[7], Nazrana Martuza[8], Nahedul Morshed[9]

[1]Medical officer, Department of Cardiac Surgery, Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh
[2]Assistant Registrar, Cardiac Surgery, National Institute of Cardiovascular Diseases (NICVD), Dhaka, Bangladesh
[3]Assistant Registrar, Cardiac Surgery, National Institute of Cardiovascular Diseases (NICVD), Dhaka, Bangladesh
[4]Assistant Professor, Department of Orthopedic Surgery, SZMCH, Bogura, Bangladesh
[5]Resident, Department of Cardiac Surgery, Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh
[6]Medical Officer, Department of Endocrinology, MMCH, Mymensingh, Bangladesh
[7]Medical Officer, Covid19 Telehealth Service, DGHS, Bangladesh
[8]Assistant Professor, Biochemistry, Ashiyan Medical College, Dhaka, Bangladesh
[9]Resident Medical Officer, NHF&RI, Dhaka, Bangladesh

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***Corresponding author:** Md. Alauddin

Abstract **Original Research Article**

Background: Concomitant CABG patients in undergoing mitral valve replacement (MVR) has been shown to be an important risk factor for hospital mortality. Patients who have each mitral valve dysfunction and atherosclerotic coronary artery disease (CAD) kind a heterogeneous cluster in terms of origin of the control disease, extent of coronary atherosclerosis, left ventricular function, and hemodynamic standing at operation. ***Objective:*** To assess preoperative characteristics, postoperative complications, in-hospital mortality rate, and length of stay in hospital for patients undergoing concurrent CABG with MVR. ***Materials and Methods:*** Study were preoperative and postoperative clinical data from 175 patients undergoing concurrent CABG with MVR operation at Department of Cardiac Surgery, Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh from Jun 2018 to July 2020 were collected and entered into a database. Information was obtained by clinical and case note review as well as detailed questionnaires to physicians and patients. ***Results:*** This study were 175 concurrent CABG with MVR operations performed on patients. The mean age of patients was 57.95 ± 10.54 years and 5.7% were under 40 years. Male/female ratio was 1.05 (male 51.4%, female 48.6%). The mean ejection fraction was 48.15 ± 10.14 and BMI ≥30 was 18.3%. Among studied patients, 18.3% and 2.9% underwent aortic and tricuspid valve replacement, respectively. In-hospital mortality was 6.9% and 96.0% of patients were hospitalized ≥14 days. History of congestive heart failure (P=0.027) and postoperative brain stroke (P=0.004) were independent predictors for in-hospital mortality. ***Conclusion:*** In conclusion, based on the outcome of this research, among postoperative characteristics, re-intubation and congestive heart failure were associated with in-hospital mortality after concurrent CABG with MVR operation. Therefore, exact considering and control of these characteristics before and after CABG and MVR are necessary.

Keywords: Coronary Artery Bypass Grafting, Mitral Valve Replacement, Outcome, In-Hospital Mortality.

INTRODUCTION

MVR indicates a combination of more than three minor moving violations or minor preventable accidents during the past three years. Patients who have each mitral valve dysfunction and atherosclerotic coronary artery disease (CAD) kind a heterogeneous cluster in terms of origin of the control disease, extent of coronary atherosclerosis, left ventricular function, and hemodynamic standing at operation [1]. In recent years, 15% to 30% of patients undergoing mitral valve replacement (MVR) or mitral valve repair for non-ischemic mitral valve disease have vital CAD [2]. CABG+MVR can be performed safely in patients with moderate-to-severe IMR. CABG+MVR resulted in lower rates of complications than CABG only. Both surgical approaches resulted in significant improvement of postoperative LVEF. However, there was greater improvement in the CABG+MVR group. Internal thoracic arteries (also called ITA grafts or internal mammary arteries [IMA]) are the most common bypass grafts used. They are the standard of care, and the goal is to use these arteries for every patient who has isolated coronary artery bypass surgery. Heart failure is the most common cause of death among coronary artery bypass

graft (CABG) patients. Overview. Mitral valve repair and mitral valve replacement are procedures that may be performed to treat diseases of the mitral valve-the valve located between the left heart chambers (left atrium and left ventricle). Several types of mitral valve disease exist. MVR indicates one or more major moving violations or serious preventable accidents within the past three years. Predictors of early mortality related to combined coronary artery bypass attachment (CABG) and mitral valve placement embrace the requirement for replacement versus repair (in some however not all series); however, they will include alternative variables such as age, co-morbid conditions, the urgency of surgery, and left cavity perform [3].The combination of MVR with open-heart surgery is mostly thought-about to have a bigger early and late mortality than either procedure alone. CAD is often related to bicuspid valve disease, however might not be the explanation for the valve disfunction [4]. Though the incidence of synchronous coronary artery bypass graft with MVR exaggerated considerably from 1988 (18%) to 1997 (28%), the in-hospital survival rates for a similar 2 periods were similar (89% versus 90%, respectively). Clearly, concomitant CABG in patients undergoing primary MVR has been shown to be a vital freelance risk issue for short- and long-run mortality [5]. A few studies are out there regarding the result of concurrent CABG and control surgeries among our population. Therefore, we have a tendency to tried to think about early results of synchronous coronary artery bypass graft and MVR and additionally confirm main predictors of mortality among these patients.

Materials and Methods

This study were preoperative and postoperative clinical characteristics were collected and entered into a database from 175 patients undergoing concurrent CABG with MVR at Department of Cardiac Surgery, Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh from Jun 2018 to July 2020. Information was obtained by clinical and case note review as well as detailed questionnaires to physicians and patients.

Statistical Analysis

The following variables were collected for statistical analysis including general characteristics, current smoking history (patient regularly smokes a tobacco product/products one or more times per day or has smoked in the 30 days prior to admission) [6], hypercholesterolemia (total cholesterol ≥ 5.0 mmol/l, HDL-cholesterol ≤1.0 mmol/l in men, or ≤1.1 mmol/l in women, triglyceride ≥2.0 mmol/l) [7], family history of CAD (first-degree relatives before the age of 55 in men and 65 years in women) [8], hypertension (systolic blood pressure ≥140 mmHg and/or diastolic ≥90 mmHg and/or on anti-hypertensive treatment) (9), diabetes mellitus (symptoms of diabetes plus plasma glucose concentration ≥11.1 mmol/l or fasting plasma glucose ≥ 7.0 mmol/l or 2-hp ≥ 11.1 mmol/l) [10], renal failure (creatinine > 355 μmol/l with a rise of > 44 units or urine output below 0.3 ml/kg for 24 h), recent myocardial infarction (an acute event with abnormal creatine phosphokinase and troponin levels). Bangladesh Heart Association score, arrhythmia, and left ventricular ejection fraction. We considered four criteria to a complicated postoperative short-term outcome: 1) in-hospital postoperative complications including existence of at least one of these complications: cardiac complications (heart block, cardiac arrest, or atrial fibrillation) and non-cardiac complications (re-intubation, brain stroke, renal failure, or ventilation ≥ 10 hours); 2) prolonged hospital stay before and after operation; and 3) in-hospital mortality rate (sometimes termed operative mortality) defined as death within 30 days of operation [11].

Data Analysis

Results were reported as the mean ± standard deviation (SD) for quantitative variables and percentages for categorical variables. Effects of variables on in-hospital mortality were assessed using Pearson's χ^2-test. Predictors exhibiting a statistically significant relation in univariate analysis were taken for multivariate logistic regression analysis to investigate their independence as predictors. Odds ratio (OR) and 95% confidence intervals (CI) were calculated. *P* values of 0.05 or less were considered statistically significant. All the statistical analyses were performed using SPSS version 19.0 (SPSS Inc., Chicago, IL, USA) and SAS version 9.1 for Windows (SAS Institute Inc., Cary, NC, USA).

Results

This study were 175 concurrent CABG with MVR operations performed on patients. The mean age of patients was 57.95 ± 10.54 years and 5.7% were under 40 years. Male/female ratio was 1.05 (male 51.4%, female 48.6%). The mean ejection fraction was 48.15±10.14 and BMI ≥30 was 18.3%. The main preoperative patient characteristics are summarized in Table-1. Hypercholesterolemia, hypertension, and congestive heart failure were more common than other variables in concurrent CABG with MVR operation, whereas, infectious endocarditis, and left main disease were less common. In concurrent CABG with MVR operation, NYHA score II, III and IV were found in 46.2%, 32.7%, and 11.7% respectively. Also, mean NYHA score was 2.46 ± 0.84. Among all patients, 18.3% and 2.9% underwent aortic and tricuspid valve replacement, respectively. Also, 8.6% of patients underwent tricuspid reconstruction and annuloplasty, whereas, no aortic reconstruction and/or annuloplasty was performed.

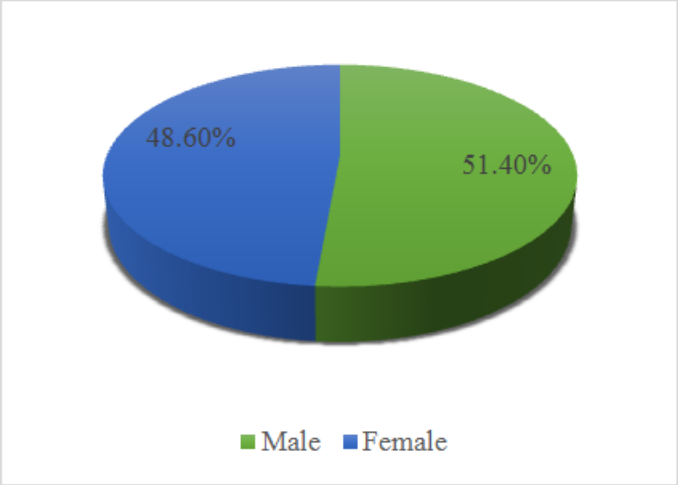

Fig-1: Sex distribution of CABG and MVR patients.

Table-1: The main preoperative patient characteristics of patients underwent concurrent CABG and MVR (n=175)

Variables	%
Male gender	51.4
Age <40 years	5.7
BMI ≥30	17.7
Cigarette smoking	28.2
Family history of CAD[a]	27.2
Diabetes mellitus	26.9
Hypercholesterolemia	54.9
Hypertension	55.7
Infectious endocarditis	2.9
Myocardial infarction	25.1
Congestive heart failure	56.0
Arrhythmia	20.7
Ejection fraction≤35%	13.7
Left main disease	9.1
NYHA [b] score II	46.2
NYHA score III	32.7
NYHA score IV	11.7
Mitral stenosis	46.3
Mitral insufficiency	88.9

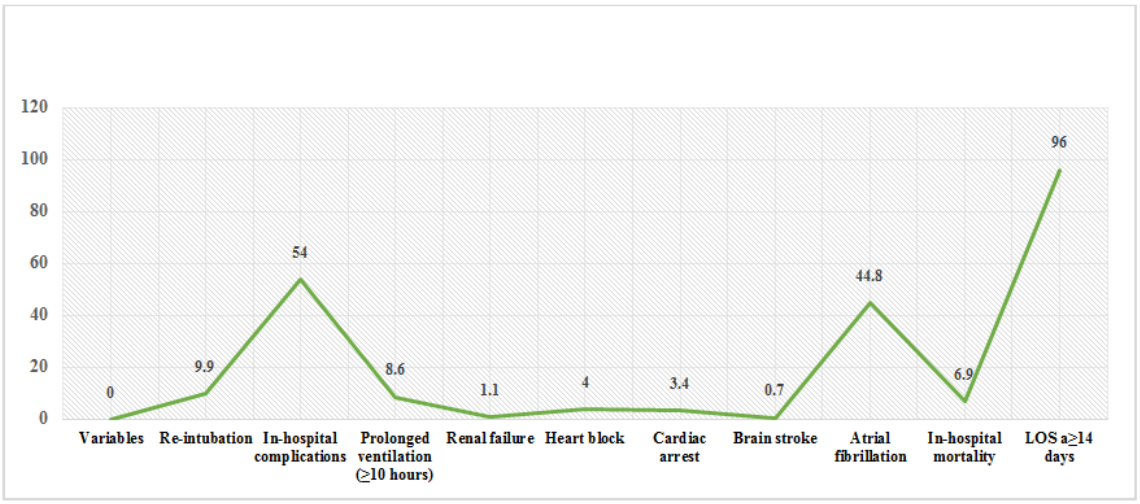

Fig-2: The main postoperative patient characteristics of patients underwent concurrent CABG and MVR

The main postoperative characteristics are summarized in Figure-2. Among postoperative complications, in-hospital complication and atrial fibrillation were more frequent than other complications. Also, in hospital stay ≥14 days was reported in 96% of patients. In-hospital mortality in concurrent CABG with MVR was 6.9%. Multivariate stepwise logistic regression analysis showed that among preoperative characteristics, only history of congestive heart failure (OR: 12.085, 95% CI: 1.021-143.007, *P* = 0.027) was associated with in-hospital mortality rate. Among postoperative characteristics, postoperative brain stroke (OR: 214.703, 95% CI: 6.287-415.213, *P* =0.004) and re-intubation (OR: 159.170, 95% CI: 16.094-999.99, *P*< 0.001) had a significant relation with in-hospital mortality.

DISCUSSION

Increases within the incidence of serious CAD resulting in MVR combined with CABG features a significant impact on the eventual patient outcome, in order that in-hospital mortality rates for these high risk patients may range from 7% to 24% [5]. Various studies have reported the profound effect of CAD on survival after bicuspid valve replacement [12-16]. We found that mean NYHA score in patients undergoing concurrent CABG with MVR operation was 2.46, whereas in Akins et al study, mean score was 3.4 [13]. The impact of etiology of associated mitral disease and a valve procedure on operative and long-term outcomes after coronary bypass surgery grafting surgery is yet to be clearly defined. We also found that mitral stenosis and insufficiency in these patients was 46.3% and 88.9%, respectively, but these frequencies were 24% and 76% in Disesa *et a*l., study [15]. In our study, NYHA score II, III and IV were found in 46.2%, 32.7%, and 11.7% of patients undergoing concurrent CABG with MVR operation, respectively; whereas these scores were reported elsewhere as 12%, 54%, and 29%, respectively [16]. Several studies have shown that severe CAD, acute myocardial infarct, low ejection fraction, ischemic mitral regurgitation, advanced coronary failure symptoms, failure to use internal mammary artery, valve replacement surgery and emergency operations are important predictors of operative mortality [14, 17, 18]. We showed that among preoperative criteria, only congestive heart failure (CHF) was a risk factor for in-hospital mortality of concurrent CABG with MVR operation, whereas age, history of other major predisposing factors for CAD, and NYHA score did not influence on in-hospital mortality. On the other hand, several studies obtained results contrary to ours, reporting high NYHA score as a risk factor for in-hospital mortality in concurrent CABG with MVR operation [14, 19]. However, in isolated MVR operation, NYHA score ≥ 3 was associated with in-hospital mortality. Similar to our study, in Garcia *et al.*, [19] and Stahle *et al.*, [20] studies, CHF was a major risk factor for in-hospital mortality of concurrent CABG with MVR operation. The other important result of our study was the role of re-intubation as a risk factor for in-hospital mortality in this type of operation. It seems that mortality caused by re-intubation is more related to complications of re-intubation. Patients requiring re-intubation have a poor prognosis, with hospital mortality exceeding 30 to 40%, although the reason remains unclear [21]. Ebstein *et al.*, showed that both cause for extubation failure and time to re-intubation were independently associated with in-hospital mortality [21]. In another study, compared with the first intubation and re-intubation, the estimated risk for nosocomial pneumonia has been shown to be 8 times higher and the increase for mortality increased 6- to 12-fold [22]. According to Weber's classification, patients in the combined procedure group had mild-to-moderate impairment of aerobic capacity after follow-up, whereas patients in the CABG surgery only group had moderate-to-severe impairment [23]. Other measures of heart function, including MR volume, plasma B-type natriuretic peptide concentration, and left ventricular end-systolic volume index, also improved to a greater extent in the CABG surgery plus MVR group than in those who underwent CABG surgery only. Survival was >90% in both groups at 1 year [23]. MVR is still a reasonable surgical option in many patients with IMR, mainly because of its reliability and reproducibility. It should be considered for patients with acute IMR, and for those with chronic IMR and multiple comorbidities, complex regurgitant jets (noncentral or more than one jet), or severe tethering of both MV leaflets [25-27]. Some studies indicate greater perioperative mortality associated with this procedure, suggesting that preference should be given to less aggressive procedures such as CABG only or CABG associated with MVR [24, 25]. However, our study had some limitations. First, although other studies did not show that the incidence of in-hospital mortality of concurrent CABG with MVR operation was influenced by the operative characteristics, we were not able to determine operative variables and technique effects on complications and outcome. Second, according to the presumably strong relation between re-intubation and in-hospital mortality, other studies are necessary for confirmation of this result.

CONCLUSION

In conclusion, based on the outcome of this research, among postoperative characteristics, re-intubation and congestive heart failure were associated with in-hospital mortality after concurrent CABG with MVR operation. Therefore, exact considering and control of these characteristics before and after CABG and MVR are necessary.

Conflict of interests: The authors declare that they have no competing interests.

[**Abbreviations:** CABG, Coronary Artery Bypass Grafting; CAD, Coronary Artery Disease; MVR, Mitral Valve Regurgitation; LOS, Length of Stay]

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