DOI: https://doi.org/10.53350/pjmhs22166736

ORIGINAL ARTICLE

In-Hospital Complications Among Patients Undergoing Coronary Artery Bypass Grafting Having Severe Left Ventricular Dysfunction

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ABSTRACT

Objective: To assess the in-hospital complications of patients undergoing coronary artery bypass grafting (CABG) with severe LV dysfunction and to recognize the risk factors for adverse outcomes.

Methods: This was a prospective descriptive study, containing patients who underwent CABG from 01-June-2019 to 31-Jan-2022 with documented LVEF < 35%. 190 patients for has been selected for this study. Postoperative data in ICU and ward regarding morbidity, mortality, hemorrhage, cardiac arrest, pacemaker implantation, IABP insertion requirement, and discharge data were collected to determine early postoperative outcomes.

Results: The study sample enrolled 190 patients with multivessel CAD with severe LV dysfunction (EF <35%), of all patients, 147 were male and 43 female. Post-surgery hemorrhage has been observed in 23 (12.1%) patients, 9 patients were taken for re-exploration. The average ICU stay of 5.1 ± 3.6 days and Overall hospital mortality was 14 (7.3%). Patients with LV dysfunction and diabetes have a high mortality rate (OR 8.66, p-value of 0. 01), which is highly significant. patients with LV dysfunction with renal failure have a significant mortality rate risk (OR 3.85, p-value of 0.014).

Conclusion: Our findings that CABG is associated with enhanced survival in multivessel coronary disease with LV dysfunction with low mortality and postoperative morbidity. In patients with LV dysfunction, diabetes and renal failure are important risk factors in decision making.

Keywords: LV dysfunction, CABG, In-hospital mortality, coronary artery disease (CAD)

INTRODUCTION

Multivessel coronary artery disease (MVCAD) is one of the main causes of left ventricular (LV) dysfunction. Left ventricular dysfunction is consider when left ventricular ejection fraction (LVEF) < 35% .[1] The prevalence of LV dysfunction undergoing CABG has registered from 3.4 to 15%.[2] CAD patient with LV dysfunction either undergoes a coronary angioplasty procedure or a coronary artery bypass graft (CABG). However, based on the previous studies' results CABG has a better clinical outcome with a significant decrease in readmission and mortality compared to coronary angioplasty in patients with severe LV dysfunction.[3, 4] Apart from CABG, patients with LV dysfunction have other alternative options such as heart transplant or device implantation. The cost-effectiveness of devices and the unavailability of a donor's heart for transplantation has optimized the alternate options[5]. In CABG, still, there is no evidence of proper grafting strategy in LV dysfunction patients.[6] Patients with LV dysfunction undergoing CABG have higher surgical mortality and decreased survival rate compared with preserved LV. However, over time the mortality rate has been reduced from 20% (1980) to <5% (2012)[7], This improvement has come through the application of different myocardial protection management strategies. Even though, the CABG surgery has been challenging significantly among these patients. [4] Patients with LVD have risk factors such as hyperlipidemia, diabetes mellitus, and hypertension which enhance the mortality rate post-operatively.[8]

The present study was designed to assess the in-hospital complications of patients undergoing CABG surgery with severe LV dysfunction and to recognize the risk factors for adverse outcomes.

METHODS

This is a prospective descriptive study, it was accompanied by the patients undergoing CABG from 01-June-2019 to 31-Jan-2022 with documented LVEF < 35%. All CABG procedures denoted standard surgical methods to surgical myocardial revascularize grafting with and without the use of cardiopulmonary bypass support.

The ethical approval obtained from the institutional review board of the hospital, 190 patients for CABG were selected. Consent was taken from all the patients before the study to ensure the confidentiality of their data and identity.

All the participants were categorized based on the LV dysfunction severity. The LV dysfunction was analyzed with the 2D echocardiogram. LV dysfunction was categorized into severe LV dysfunction (LVEF < 35%), moderate LV dysfunction (LVEF 35% to 45%) and mild LV dysfunction (LVEF 45% to 55%). All the data were entered into the surgical database.

Pre-operatively, baseline demographics data such as age, gender, BMI, presence of co-morbid diseases such as diabetes mellitus (DM), hypertension (HTN), hyperlipidemia, renal-function test, blood urea, creatinine level, and severity of CAD were recorded. Clinical cardiac data were noted such as Heart rate (HR), 2D echo results, and coronary angiography. A total number of days stay in ICU and ward has been collected.

Postoperative data in ICU and ward regarding morbidity, mortality, hemorrhage, cardiac arrest, pacemaker implantation, IABP insertion requirement, and discharge data were collected.

Data analysis was carried out by SPSS v23.0, quantitative variables were calculated as Mean ±SD, and a t-test was used to compare the relationship between quantitative data. Multivariant analyses were used to evaluate the patient's risk factors and mortality relationship. P-value<0.05 is significant.

RESULTS

The study sample enrolled 190 patients with multivessel CAD with severe LV dysfunction (EF <35%), of all patients, 147(77.36%) were male and 43(22.6%) were female. Table 1 shows the demographic data of patients, 59.4% of patients were hypertensive and 44.7% were diabetes. Followed by 34.2% renal failures. 2D echography shows 41.05% of patients were having akinetic movement and 39.47% were hypokinetic. Angiography data reveals that 96.8% of patients were having LAD artery as the culprit. Followed by RCA and LCX. 12.1% of patients were diagnosed with Left main coronary disease. Post-surgery data has been presented in table 2. 11 (5.7%) of patients were inserted with

IABP during and post-operatively. A total of 12 patients got cardiac arrest (11 ICU & 1 ward) in patients have been reverted by cardio-pulmonary resuscitation (CPR). Post-surgery hemorrhage has been observed in 23 (12.1%) patients, 9 patients were taken for re-exploration. The average ICU stay of 5.1 ± 3.6 days and Overall hospital mortality was 14 (7.3%).

Table 3 shows the multivariate analysis of ICU mortality with the risk factors (age, diabetes, hypertension, family history, and renal failure). Patients with LV dysfunction and diabetes have a high mortality rate (p-value of 0.01). Patients with LV dysfunction and renal failure also had a significant mortality rate risk (p-value of 0.014).

Table-1: Demographic data of patients (n=190)

Gender (Male/Female)	147(77.36%) / 43(22.6%)
Height(cm)	165 ± 6.3
Weight (kg)	66 ± 7.5
BMI(kg/m^2)	26.76±4.94
Hypertension, n (%)	113(59.4%)
Diabetes mellitus, n (%)	85(44.7%)
Renal failure	65(34.2%)
Family history	9(4.73%)
Blood urea (mg/dl)	24.13±2.82
Serum creatinine(mg/dl)	1.32±3.2
2D echocardiography data	
LVEF (%)	24.13±2.82
LV size(systolic in cm)	6.44±5.23
LV size(diastolic in cm)	3.56±1.20
Akinetic	78(41.05%)
Hypokinetic	75(39.47%)
LMCA disease, n(%)	22(12.1%)
LAD disease, n(%)	184(96.8%)
LCX disease, n(%)	144(75.7%)
RCA disease, n(%)	164(86.3%)

Table 2: Post-surgery discoveries of the patients (n= 190)

IABP insertion n, (%)	11 (5.7%)
Pacemaker insertion n, (%)	03 (1.5%)
ICU hemorrhage n, (%)	23 (12.1%)
Re intubation n, (%)	8 (4.2%)
Ventilation > 24 hrs. n, (%)	14 (7.3%)
Cardiac arrest in ICU n, (%)	11 (5.8%)
Cardiac arrest in ward n, (%)	01 (0.5%)
ICU mortality n, (%)	13 (6.81/%)
Ward mortality n, (%)	01 (0.5%)
Overall hospital mortality n, (%)	14 (7.3%)
Duration of ICU stay (days)	5.1 ± 3.6
Duration of ward stay (days)	4.1 ± 1.8

Table 3: multivariate analysis for risk factors.

Characteristic		Mortality		OR (95% CI)	P-value
		Alive	Died		
Age		53.95 +8.46	59.0+8.19	1.02 (0.96 – 1.09)	0.038
Gender	Male	137 (72.11 %)	10 (5.26 %)	0.71 (0.21 – 2.39)	0.58
	Female	39(20.53 %)	4(2.11%)		
Hypertension	Yes	103 (54.21%)	10 (5.26%)	1.77 (0.53 – 5.86)	0.34
	No	73 (38.42%)	4 (2.11%)		
Diabetic	Yes	72 (37.89%)	12 (6.32%)	8.66 (1.8 – 39.89)	0.01
	No	104 (54.74%)	2 (1.05%)		
Renal failure	Yes	56 (29.47%)	9 (4.74%)	3.85 (1.23 -12.04)	0.014
	No	120 (63.16 %)	5 (2.63%)		
Family history	Yes	6 (3.16%)	3 (1.58%)	7.72 (1.72 – 35.12)	0.02
	No	170 (89.47%)	11 (5.79%)		

DISCUSSION

There is inadequate data regarding surgical benefits in patients with severe LVEF.[9] The best revascularization technique in individuals with CAD and severe LV dysfunction is still unclear [10]. It is very well known that compared to patients with normal ventricular function, CABG patients with LVEF less than 35% experience higher surgical mortality and shorter survival times. patients undergoing CABG might have LV dysfunction leading to hypokinetic or akinetic segments, representing obtainable hibernating myocardium, which may have resulted in increased long-term survival in this study. These results are comparable with those of other studies assessing revascularization in patients with CAD and DM [11-14]. Kapur et al. reported a trend toward improved outcomes in individuals treated with CABG.[11]

Postoperative management of comorbidity risk factors and use of the postoperative IABP, and enhanced techniques of anesthesia may decrease mortality rate[15, 16]. Ramanathan et al. described that young patients have a high mortality rate in research on the combined effects of age on survival after CABG.[17]

The overall finding was that mortality rates increased as people aged [18]. In our study, patients' mean age was 54.14 ± 8.43 years, and as it was predicted, age was a significant predictor of a greater mortality rate in patients undergoing CABG for severe LV dysfunction. Our study results co-ordinate with Ahmadali Khalili's research results. CABG is reported low postoperative morbidity and mortality in severe LV dysfunction patients.[8]

Results indicating the impact of DM on survival following coronary artery surgery are inconclusive [19]. These conflicts may be caused by several variables, including the degree of DM management, the severity of CAD, and surgical methods.[20] our results mimic these results with a p-value of 0.001 with the patients with LV dysfunction and diabetic Mellitus as comorbid. coronary disease with DM and LV dysfunction gives more of the "real-world" surgeons who have been largely underrepresented.

The present study was descriptive; therefore, the present study was inherent limitations. The study center was limited to small sample collection due to less flow of CABGs with LV dysfunction, which needs to be done in a large center with a higher period.

CONCLUSION

Our findings that CABG is associated with enhanced survival in multivessel coronary disease with LV dysfunction with low mortality and postoperative morbidity. In patients with LV dysfunction, diabetes and renal failure are important risk factors in decision making, identifying such factors pre-operatively and managing in postoperatively to decrease the in-hospital mortality rate is highly appreciable.

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