Outcome of Coronary Artery Bypass Graft Surgery with Low Preoperative Ejection Fraction : A cross-sectional study

ABSTRACT:

Background: *Coronary artery bypass graft (CABG) surgery has been proven in several trials to have excellent outcomes in patients with coronary artery disease who have reasonably preserved cardiac function. Nonetheless, determining the value of coronary artery bypass grafting (CABG) in patients with low left ventricular ejection faction (shown as left ventricular ejection fraction 40B) has been challenging due to worries about increased operating mortality and decreased long-term survival.*

Objective: *Our main goal is to evaluate the Outcome of Coronary Artery Bypass Graft Surgery with Low Preoperative Ejection Fraction.*

Method: *This cross-sectional study carried out at tertiary hospital from June 2021 to June 2022. Where 100 patients who underwent coronary artery bypass graft (CABG) surgery in the Department of Cardiac Surgery were included in the study. The patients were divided into 2 groups as follows: Group—I, EF < 40% (n = 50) and Group-ll EF>40% (n = 50).*

Results*: During the study, where 55% were belong to 50-60 years age group and majority were male. In both group majority had diabetes and hypertension. All of the co—morbidities/risk factors were almost equally distributed between groups (p > 0,05). Except incidence of bleeding, which was significantly higher in Croup—I than that in Group—II (p = 0.01 0). In addition to that, in group 1 Heart failure seen in 1.5% cases followed by 2.3% had pneumonia, prolonged ventilation seen in 13.5%. where as in group 2 Heart failure seen in 0.5% cases followed by 1.8% had pneumonia, prolonged ventilation seen in 11%.*

Conclusion: *Lastly, the current study's large sample size suggests that CABG may be performed on patients with low EF <40% with outcomes (in terms of morbidity and death) that are equivalent to those of patients with EF > 40.*

Keywords: *Coronary Artery Bypass Graft Surgery (CABG), Low Preoperative Ejection Fraction, surgery.*

INTRODUCTION

"Despite advances in medical therapy and surgical practice, caring for individuals with coronary artery disease and low ejection fraction (EF) remains difficult. Intensive medical therapy, surgical revascularization, ventricular remodeling, and heart transplantation are now the gold standard for treating this population. Due to low long-term survival, medical therapy alone is not ideal". [1] Further, medical treatment for these situations necessitates frequent hospitalizations, which affects quality of life. [2]

With a 5-year survival rate of 65%, heart transplantation is an outstanding alternative with promising outcomes; nevertheless, it is impractical due to the lack of available donors.[3]

Furthermore, heart transplantation facilities are few in many parts of the globe. Additionally, the expense of caring for transplant patients after surgery is high. [3-5]

However, new developments in anesthetic, surgical technique, myocardial protection, and perioperative care have made CABG feasible in these patients. However, compared to patients with maintained left ventricular function, those with a poor EF have a greater risk of postoperative morbidity and death after undergoing coronary artery bypass grafting (CABG).

OBJECTIVE

Our main goal is to evaluate the Outcome of Coronary Artery Bypass Graft Surgery with Low Preoperative Ejection Fraction.

METHOD

This cross-sectional study carried out at tertiary hospital from June 2021 to June 2022. Where 100 patients who underwent coronary artery bypass graft (CABG) surgery in the Department of Cardiac Surgery were included in the study. As preoperative EF was not documented for 14 of the original 114 individuals, only 100 were studied.

The global EF was determined with one or both of following methods: calculation with 2—dimensional echocardiography via the biplane apical method and the modified Simpson's rule, 1 and/or ventricular—graphic evaluation performed by an independent surgeon and art independent cardiologist. The patients were divided into 2 groups as follows: Group—I, EF < 40% (n = 50) and Group-ll EF>40% (n = 50). All patients received short—acting anesthetic drugs to facilitate early extubation. Extracorporeal circulation was performed via a hypothermic no pulsatile flow. Cold crystalloid cardioplegia ("St. Thomas solution") was

used according to the surgeon's preference to induce and maintain cardioplegic arrest. Early outcome consisted of complications. Morality was defined as death that occurred from any cause within the first 30 postoperative days.

RESULTS

Table-1 shows age distribution of the patients where 55% were belong to 50-60 years age group. followed by 25% belong to >60 years age group and 20% belong to <50 years age group.

Table-1: Age distribution of the patients

Age group	Percentage (%)
<50 years	20%
50-60 years	55%
>60 years	25%

Figure-1 shows gender distribution where majority were male 75% and male 25%.

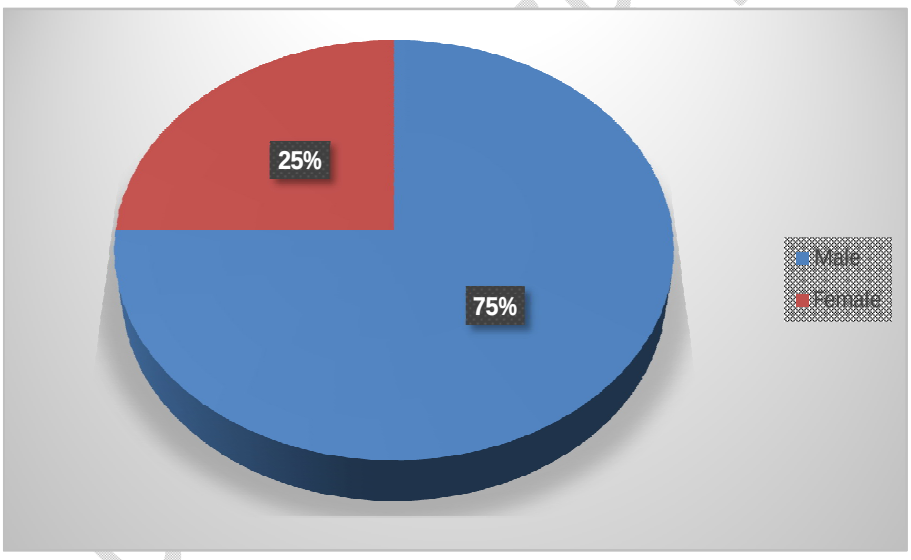

Figure-1: Gender Distribution

Table-2 shows base line characteristic between groups where no significant difference was noticed between two groups.

Table-2: Base line characteristic between groups

Age group	Group 1 %	Group 2, %
<50 years	20%	18%

50-60 years	55%	50%
>60 years	25%	32%
Gender	**Group 1 %**	**Group 2, %**
Male	70%	65%
Female	30%	25%

Table-3 shows distribution of the patients according to risk factors where in both group majority had diabetes and hypertension. All of the co—morbidities/risk factors were almost equally distributed between groups (p > 0,05).

Table-3: Distribution of the patients according to risk factors

Risk factors	Group 1 %	Group 2, %	P value
Diabetes	63%	70%	0.075
Hypertension	71%	73%	0.538
Dyslipidemia	61%	60%	0.318
Smoking	42%	40%	0.373

*multiple responses were noted

Table-4 shows outcome of patients where None of the complications, except incidence of bleeding, which was significantly higher in Croup—I than that in Group—II (p = 0.01 0). In addition to that, in group 1 Heart failure seen in 1.5% cases followed by 2.3% had pneumonia, prolonged ventilation seen in 13.5%. where as in group 2 Heart failure seen in 0.5% cases followed by 1.8% had pneumonia, prolonged ventilation seen in 11%.

Table-4: Outcome of patients

Outcome	Group 1, %	Group 2, %	P value
Arrhythmia*	0	0.3	0.464
Bleeding’	16.3	10.1	0.010
Reopening for bleeding*	7.5	7.5	0.978
Heart failure’	1.5	0.5	0.554
Pleural effusion*	1.5	2.6	0.486
Pneumonia*	2.3	1.8	0.801

ARDS’	0.5	0.4	0.64J
Prolonged ventilation*	Ɓ.5	11	0.302
CVA*	1.3	0.6	0.554
Hepatic dysfunction*	3.1	3.2	0.927
Septicemia*	3.5	3.0	0.735
Multiorgan fallure*	0.9	1.3	0.887

Figure-2 shows mortality outcome where in group 13% were died whereas in group 2 it was 4%.

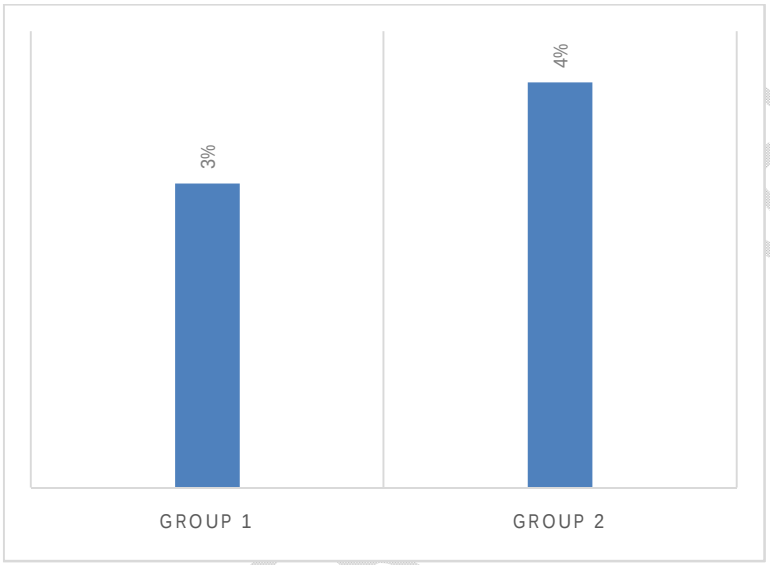

Figure-2: Mortality outcome.

DISCUSSION

Patients with low ejection fractions are often thought to be at higher risk of surgical complications and death; nevertheless, our research found that patients with left ventricular dysfunction (EF 40a) had a better functional status and 30-day mortality rate after coronary artery bypass grafting.[7-8] There was no statistically significant difference in outcome between patients with an ejection fraction of 40% and those with an EF of >40%. Both groups had similar demographic characteristics, comorbidities, and risk factor profiles at baseline. Surgery for patients with stable left ventricular dysfunction has been shown in a long-term follow-up research to provide advantages that exceed the slightly higher short-term risks.

Patients with an ejection fraction of 40% or less had double the risk of dying as those with an EF of 40% or more in that research[9], but we found no such difference in our research.

Various studies have put forward different results on the initial effect of isolated CABG on morality in patients with a low EF. Soliman Hamad and associates noted that "the early morality rate in patients with an EF < 35% was more than 6 times higher than that in patients with an EF > 50% (10.5% vs. 1.6%)".[10] Di Carli and colleagues reported "a 9.3% 30—day mortality rate in patients with an EF < 40%" .[11] Christakis and colleagues demonstrated a 9.8% operative morality rate in patients with an EF < 20%, and a study by Carr and colleaguesdemonstrated an 11% perioperative mortality rate in patients with an EF between 0% and 20%. Recently published data, however, has demonstrated a drop in surgical mortality. In an analysis of the New York State database the early death rate of individuals with an EF of < 20% was 4.6%. whereas another study found that just 4% of patients with an EF of 30% or less had a positive outlook while hospitalized.[2, 10]

In one study seen a similar in-hospital death rate (4% in our previous work) was seen in 75 prospectively investigated patients with an EF of 40%.[5] Moreover, improvements in cardiac anesthetic, perioperative treatment, surgical procedures, emergency cardiac care, and postoperative management seem to be responsible for the decrease in mortality. However, Alderman et al. showed that "the effect of surgery in patients with low ejection fraction was limited to those whose primary symptom was angina, and that individuals whose symptoms were predominantly caused by heart failure had only a little improvement".[12]

"Despite the promising results of coronary artery bypass grafting (CABG) in patients with impaired left ventricular function, most cardiac surgical facilities across the globe choose to keep high-risk patients with severe left ventricular (LV) dysfunction under medical treatment rather than perform CABG. Additionally, heart transplantation facilities are few in many parts of the globe".[13] Moreover, the postoperative care of transplant patients is expensive, and donors, particularly in underdeveloped countries, might be hard to come by.

CONCLUSION

Thus, the large sample size of the present research demonstrates that CABG may be done on patients with low EF (40B) with results (in terms of morbidity and mortality) that are equal to those of patients with EF > 40.

Consent

As per international standard or university standard, patient(s) written consent has been collected and preserved by the author

Ethical Approval:
As per international standard or university standard written ethical approval has been collected and preserved by the author(s).

REFERENCE

1. Alderman EL, Fisher LD, Litwin P, Kaiser GC, Myers WO, Maynard C, Levine F, Schloss M. Results of coronary artery surgery in patients with poor left ventricular function (CASS}. Clrculatlon. 1983; 68: 785-95.
2. Scott SM, Deupree HL, Sharma CVRK, Luchi pj. VA study of unstable artgfna. 1 \ -year results show duration of surgical advantage for patients with impaired ejection fraction. Circulation. T 994; 90(suppl II): 120-3.
3. Zubiate P, Kay JH, Mendez AM. Myocardial revascularizatlon for the patient with drastic impairment of function of the left ventricle. J ThoracCardiovasc Surg. 1977; 73: g4-6
4. Di Carli MF, Maddahi J, Rokhsar S, Schelbert HR, Bianco Bathes D, Brunken RC, Fromm B. Long-term survival of patients with coronary artery disease and left ventricular dysfunction: Implications for the role of myocardial viability assessment in management decisions. J Thorac CardiovascSurg. 1998; 116: 99 7-1004.
5. Passamani E, Davis KB, Cillespie MQ, Killip T. A randomized trial of coronary artery bypass surgery. Survival of patients with a low ejection fraction. N Engl J Med. 1985; 3\ 2: 1665-71.
6. John R, Rajasinghe HA, Chen JM, Weinberg AD, Sinha P, Mancini DM,Naka Y, Oz MC, Smith CR, Rose EA, Edwards NM. Long-term outcomes after cardiac transplantation: an experience based on different eras of immunosuppressive therapy. Ann Thorac Surg. 200\ ; 7Z: 440-9.
7. Kron IL, Flanagan TL, Blackbourne LH, Schroeder RA, Nolan SP. Coronary revascularization rather than cardiac transplantation for chronic lschemic cardiomyopathy. Ann Surg J 989; 21 0: 348-54.

8. Christakis GT, Weisel RD, Fremes SE, lvanov §, David TE, Co[dman BS, Salerno TA. Coronary artery bypass grafting in patients with poor ventricular function. j Thorac CardiovascSurg 1992; 103: 1 083-92.
9. Soliman Hamad I\4A, Albert HIVI van Straten, Jacques PAN Schonberger, Joost F ter Woorst, Andre M de Wolf, Elisabeth J Martens et al. Preoperative ejection fraction as a predictor of survival after coronary anery bypass grafting: comparison with a matched general population Journal of Cardiothoracic Surgery ZOT 0: 5: 29, Available a t : h t t p : / / w w w . c a r d I a t h a r a c I c s u r g e r y . org/content/5/ 1/29.
10. DI Carll MF, Maddahl §. Rokhsar S, Schelbeit HR, Blanco- Bathes D, Brunken RC, Fromm B: Long-term survival of patients with coronary artery disease and left ventricular dysfunction: implications for the role of myocardial viability assessment In management decisions. § Thorac Cardiovasc Surg 1998, 1 16T6): 997-I 004.
11. Chrlstakis GT, Weisel RD, Fremes SE, lvanov J, David TE, Coldman BS, Salerno TA: Coronary artery bypass grafting in patients with poor ventricular function. Cardiovascular Surgeons of the University of Toronto. J Thorac Cardiovasc Surg 1992; 103(6): 1 083-91.
12. 12.Carr JA, Haithcock BE, Paone G, Bernabei AF, Silverman NA: Long-term outcome after coronary artery bypass grafting in patients with severe left ventricular dysfunction. Ann Thorac Surg 2002; 74(5): 153a -6.