

In Hospital Outcomes of Obese Patients with Multi-Vessel Coronary Artery Disease undergoing Off Pump Coronary Artery Bypass Graft Surgery

Obese Patients
with Multi-Vessel
Coronary Artery
Disease

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ABSTRACT

Objective: To determine the outcomes of obese patients with multi vessel coronary artery disease undergoing Off Pump coronary artery bypass graft (CABG) surgery.

Study Design: A retrospective study

Place and Duration of Study: This study was conducted at the Cardiac Surgery department of Choudhary Pervaiz Elahi Institute of Cardiology (CPEIC) Multan from January 2021 to August 2021 for a period of 08 months.

Materials and Methods: All the patients that underwent OPCAB were grouped in two categories on basis of BMI, In A group patients were obese and in B group patients were non-obese. They were compared for the following variables: age, gender, weight, Heart association of New York Functional Class (NYHA), Angina Class of Canadian Cardiovascular Society (CCS), extent of coronary artery involved disease, Number of grafts and left ventricular ejection fraction (EF). Data in groups was compared by using ANOVA test in normally distributed variables and in not normally distributed variables Kruskal-Wallis test was applied. *P*-value of less than 0.05 was taken as significant.

Results: Majority of patients in our study were males. (87%, n=75) whereas only 11 % (n=9) patients were female. The mean age of patients in our study was 43.36±7.6 years. The most important finding of this study is that the rate morbidity and mortality was same in the patients that were labelled as obese and non-obese and underwent OPCAB. Regarding the post-operative course mean duration of inotrope usage was 11.17±2.29 hours and when the comparison was done among the two study groups a statistically significant was observed ($p < 0.05$).

Conclusion: In obese patients off pump coronary artery bypass grafting is beneficial. These patients are already compromised due to the associated side effects of obesity and avoiding CPB may be beneficial for short term outcome of these patients.

Key Words: Obesity, Multi-vessel coronary artery disease, Off-pump CABG, Bypass circuit machine (CPB)

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INTRODUCTION

In case of coronary artery bypass grafting (CABG) is most frequently performed surgery in coronary heart disease. This surgery can be conducted either with the use of a bypass circuit machine (CPB) or on a beating heart that is known as off pump coronary artery bypass grafting (OPCAB).

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Literature is divided on the best approach among these two methods due to inconsistent results. The benefits that are expected theoretically for the off-pump CABG technique have not been validated by latest randomized clinical trials¹⁻². Some observational studies have concluded that off pump CABG has certain benefits in high-risk subgroups such as diabetics, low ejection fraction patients and obese patients³⁻⁴. Traditionally, the off-pump technique was favored to avoid the harmful side effects of using an extra corporeal circuit, the extra corporeal circuit activates the inflammatory response in the body as the blood comes in contact with it⁵⁻⁶.

Coronary artery by-pass grafting is the most frequently done surgery in patients of coronary artery disease. This surgery can be conducted by off pump or on pump technique. The number of patients suffering from obesity is increasing day by day in both the developing and the developed countries⁷⁻⁸. Internationally, the incidence of obesity has developed into an epidemic. There more than a billion people that are termed as

overweight and obese patients are estimated at a staggering 300 million⁹. Conventionally, obesity is thought as a common risk factor for the patients that are undergoing CABG surgery. Risk of in hospital mortality and post-operative morbidity is increasing in patients with increased BMI or obese¹⁰⁻¹¹. So this study is designed to report the in hospital results of off pump coronary artery by-pass grafting in patients that are obese because of it is cleared considered as risk factor for surgery. There is no current study conducted on the outcomes of off pump CABG in obese patients.

MATERIALS AND METHODS

This retrospective study was conducted at cardiac surgery department of CPE Institute of Cardiology Multan. The information of all the patients operated for Off Pump CABG between January 2021 to August 2021 by a single surgeon were retrospectively collected and analyzed from the cardiac surgery database. Due approval was taken from the Hospital ethical committee. The patients were grouped as A and B. In group A obese patient (BMI ≥ 30 kg/m²) while Group B was made of patients who were not obese (BMI less than 30 kg/m²). The patients with recent MI, congestive cardiac failure, emergency CABG, renal failure and redo cases were not included in the study.

The following variables were extracted from the data: age, gender, weight, Heart association of New York Functional Class (NYHA), Angina Class of Canadian Cardiovascular Society (CCS), extent of coronary artery involved disease, Number of grafts and left ventricular ejection fraction (EF). The main outcome measures for our study were hospital stay, in hospital mortality, ventilation time, ICU stay and period of inotropic support.

All the patients underwent median sternotomy. An activated clotting time of greater than 400s was achieved with full Heparin dose of 300U/kg. Internal Mammary artery of left side was harvested and anastomosed to left anterior descending artery. The rest of the vessels were bypassed using the vein grafts. Heparin was fully annulled with protamine after the procedure. Patients were shifted to a dedicated intensive care unit (ICU) for post-operative monitoring.

The data was managed and analyzed using SPSS version 26. Shapiro Wilkins test was used to assess the normality of data. All the continuous variables were shown as mean and standard deviation. The categorical variables were shown as frequencies and percentages. Data in groups was compared by using ANOVA test in normally distributed variables and in not normally distributed variables Kruskal-Wallis test was applied. P-value of less than 0.05 was taken as significant.

RESULTS

The results were analyzed using SPSS version 26, in the study time period a total of 86 patients fulfilled the

inclusion criteria and were included in this study. Majority of patients in our study were males. (87%,n=75) whereas only 11 % (n=9) patients were female. Regarding the age of patients. The mean age of patients in our study was 43.36±7.6 years. Regarding symptoms of patient, majority had angina for a time period of 1-5 years (81.4%, n=65). Regarding CCS classification, 90% (n=78) had a CCS Class of III, whereas 8.1%(n=7) patients had CCS Class IV. The risk factors of the patients in our study are summarized in table 1.

Table No.1: Different risk factors of the patients

Diabetes	
On Insulin	25(29%)
On Oral hypoglycemic	11 (12.7%)
No diabetes	53 (62.6%)
Hypertension	
No hypertension	37(43%)
Controlled on Medication	49 (57%)
Smoking	
No smoking	29(33.7%)
Smoking >8 weeks	57(66.3%)
Hypercholesterolemia	
Yes	15(17.5%)
No	71(82.5%)
Unknown	2(2.32%)

Table No.2: The disease characteristics

Extent of significant CAD	
1 vessel Disease	7(8.13%)
2 vessel Disease	60(70%)
3 vessel Disease	19(22%)
Left Main disease	
>70%	19(22.1%)
51-70%	13(15.1%)
50%	6(7%)
No LMS	48(56%)

Table No.3: Pre-operative and post-operative details of patients

Pre-operative details	
	Mean ± SD
Hemoglobin(g/dl)	11.181±1.387
Creatinine (mg/dl)	0.63 ± 0.12
Post-operative details	
Inotropes Usage (hours)	11.17±2.29
ICU stay(hours)	34.74±15.012
Ventilation time (hours)	8.16±4.625
Total Chest Drainage (mls)	876.70±345.838
Total Hospital Stay(days)	7.45±2.94
In hospital Mortality	0(0%)

Regarding the status of coronary artery disease, the majority of patients in our study were having two vessel disease (80%, n=69). The disease characteristics are summarized in table 2 and the pre-operative and post-operative characteristics, are summarized in Table 3.

The patients in our study were divided into two groups based on the ejection fraction. In group A obese patient ($BMI \geq 30 \text{ kg/m}^2$) while Group B was made of patients who were not obese (BMI less than 30 kg/m^2). Shapiro Walkins test was used to test normality of data and since the variables were not normally distributed so Kruskal Wallis 1-way ANOVA test was used to compare the three groups. The results of the comparison are summarized in table 4.

DISCUSSION

The important finding in this study is that despite having a BMI greater than 30 in majority of patients, there was no in-hospital mortality in our study. Majority of patients in our study had two vessel diseases. (70%). This result may be due to the late presentation of patients to cardiac surgery services. Regarding the post-operative course. The mean duration of inotrope usage was 11.17 ± 2.29 hours and when the comparison was done among the two study groups, it was found that the difference between the two groups was statistically significant, ($p < 0.05$) the maximum duration of inotropes was in the study group that had the ejection fraction below 30%. This result can be explained by the fact that these patients already have a compromised heart with reduced contractility and these patients need high inotropic support for an extended period of time so that they can undergo an uneventful recovery after off pump coronary artery bypass grafting. The other post-operative details like ventilation time, total chest drainage, total hospital stay was similar in all groups and there was no significant difference found between the groups.

The most important finding of this study is that the morbidity and mortality rates were same in the patients that were labelled as obese and non-obese and underwent OPCAB. These results are promising due to the increasing incidence and prevalence of obesity and the medical conditions that are associated with increase weight. It is pertinent to know that a BMI greater than 30 kg/m^2 is associated with excessive surgical risks¹². This is in contradiction to the results that are obtained in our study, as in our study we had zero mortality. This result could only be explained due to the surgical technique used in this study i.e. OPCAB technique. Literature shows that the use of off pump CABG surgery in patients that are obese, decreases the in-hospital morbidity and mortality rates as paralleled with conventional surgery that involves CPB and cardioplegic arrest¹³. Furthermore, there is undeniable proof that the off pump technique causes a decreased levels of interleukins in the circulation. This has a very vital role because the levels of circulating interleukins have a role in neutrophil movement and thus have a role in myocardial injury.

Though increased BMI is considered to be a key risk factor in any surgery especially the CABG surgery, the results of our study show that obesity is not a risk factor when the patients undergoing off pump coronary bypass grafting are considered. This result is identical to the results that have been reported in previous studies^{12, 14}.

In contrast to this study, Prabhakar et al. concluded that in patients that have a BMI greater than 35 kg/m^2 , there is a substantial increase in the incidence of in hospital mortality. They also stated that there is a small but significant increase in mortality in moderately obese patients where there is 50% rise in mortality in patients that have a BMI greater than 40 kg/m^2 ^{15, 16}.

Our study showed no differences, among the two study groups in various variables like duration of mechanical ventilation, ICU stay. These results are comparable to other studies¹⁷.

There are several limitations of this study. First and the foremost, this study is a retrospective study conducted at a single center with a small sample size and short follow up duration. This may have an impact on the generalizability of the findings. More studies are needed with a large sample size to determine the long-term effects of OPCAB in obese patients.

CONCLUSION

Off pump coronary artery bypass grafting in obese patients is beneficial. These patients are already compromised due to the associated side effects of obesity and avoiding CPB may be beneficial for short term outcome of these patients.

Author's Contribution:

Concept & Design of Study:	Shafqat Hussain
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Conflict of Interest: The study has no conflict of interest to declare by any author.

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