

Association of Low Cardiac Output Syndrome with in Hospital Outcomes after on Pump Coronary Artery Bypass Grafting Surgery

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ABSTRACT

Objective: The main objective of current study was to explore the frequency of Low Cardiac Output Syndrome (LCOS) in patients underwent on-pump CABG.

Study design and place: The study was carried out in Cardiac Care Center, Bahawalpur From March 15, 2019, to October 31, 2020,

Materials and Methods: This prospective, descriptive study was conducted in the Cardiac Surgery, Cardiac Center Bahawalpur, Punjab. Total 250 patients were enrolled in this prospective, comparative study and divided into two groups. Group A (LVEF $\geq 40\%$) and Group B (LVEF $< 40\%$) the frequency of LCOS postoperatively was compared. the study was conducted. This study employed the non-probability, purposive sampling method. SPSS 22 was used to analyze data. Significant data was used as P-value 0.05.

Results: The average age of the participants was 50 ± 4.67 in Group A as compare with Group B (53.44 ± 3.24) years with p-value 0.034. Total 144(57.6%) Male and 106(42.4%) were female patients. The frequency of LCOS was 19(15.2%) versus 25(20%) (P=0.021). Findings showed that the significant difference in outcomes in terms of Renal Dysfunction, Prior CVA, Stroke, ICU stay(days), Recent MI and mortality between the groups without LCOS and with LCOS. The findings of current study can be helpful for management in patients with low Ejection Fraction undergoing CABG which has been shown a higher perioperative risk and a better survival after myocardial revascularization. In this setting the long-term benefits clearly overcome an increased peri-operative mortality

Conclusion: Those with pre-operative LVEF less than 40% had a significantly different frequency of LCOS than patients with LVEF greater than 40%. In comparison to patients without LCOS, individuals with LCOS had considerably worse outcomes in terms of stroke, respiratory failure, renal failure, ICU stay, hospital stay, and death.

Keywords: CABG, LCOS, LVEF, CVA, MI, ICU

INTRODUCTION

The best treatment option that still excels medicine in individuals with symptomatic multivessel coronary artery disease and severe left ventricular failure is coronary artery bypass grafting (CABG) surgery. (1). It is an open-heart procedure. In order to build a bypass around the heart's obstructed arteries, during the procedure, veins or arteries are removed from another region of the body. Every year, more than thousand CABG operations are performed in the United State of America (1).

Myocardial dysfunction causes a reduction in systemic perfusion, which leads to low cardiac output syndrome (LCOS), a clinical disease. Metabolic acidosis is the outcome of an imbalance between oxygen supply and consumption at the cellular level. (2) LCOS is diagnosed by the requirement of intra-aortic balloon pump or postoperative inotropic support to maintain a cardiac index 2.2 L/min/m² or a systolic blood pressure > 90 mmHg, respectively. (3).

LCOS is one of the major side effects of coronary artery bypass grafting (CABG), accounting for 13.5% of all complications and increasing morbidity and death by 25.4%. (4). The development of LCOS post CABG is associated with 10 to 17 times increase in mortality as well as a substantial rise in comorbidities (5) in the form of respiratory failure, stroke, acute renal failure and the chance of reoperation, more need of ventilator support, longer intensive care unit (ICU) and hospital stays. Patients with impaired ventricular function have a limited margin for myocardial protection, making them more susceptible to myocardial damage after surgery, which can result in LCOS (6-7). In these cases, the goal of myocardial protection is to reduce the severity of cardiac injury because the defective myocardium may not have suffered irreversible damage and may even be shocked or hibernating. LV dysfunction in the post-operative period is the most important independent predictor of LCOS, and it is significantly worse in patients with reduced ejection fraction. (8)

However, cardiac surgery outcomes have improved over time, which has resulted in a marked decline in the number of

adverse cardiac events. Further stratifying individuals with decreased cardiac function who are still candidates for cardiac surgery would benefit from the development of more sophisticated preoperative prognostic markers. In addition to EF, various biological and procedural factors, ongoing advancements in perioperative medicine and surgery, and the amount of activity in the hospital should all be considered.

Objective: The incidence of Low Cardiac Output Syndrome (LCOS) after CABG, the relationship between LCOS and the degree of preoperative LV dysfunction by comparing the frequency of LCOS with preoperative LVEF $\geq 40\%$ versus $< 40\%$, and the in-hospital prognosis of CABG with LCOS versus without LCOS..

MATERIALS AND METHODS

This prospective, descriptive study was conducted in the Cardiac Surgery, Cardiac Center Bahawalpur, Punjab, Pakistan. The study duration was starting from March 15, 2019, to October 31, 2020. The study enrolled 250 patients fulfilling inclusion criteria. Preoperatively consent was taken. Name, age, sex, height, weight, and address were collected as demographic data. 250 patients were preoperatively divided into two groups: group A, consisting of 125 patients with LVEF $\geq 40\%$, and group B, comprising of 125 patients with pre-operative LVEF $< 40\%$. The frequency of LCOS postoperatively was compared between the groups. Data were examined using SPSS 25 and p-values < 0.05 were considered significant.

Inclusion Criteria: All patients receiving isolated elective CABG with blood cardioplegia. Need for mechanical circulatory support with an intra-aortic balloon pump (IABP) to maintain systolic blood pressure above 90 mmHg.

Exclusion Criteria: Patients having CABG together with a valve replacement procedure. Patients with a history of LCOS may be using inotropic or IABP supports before surgery. Patients who had renal insufficiency before surgery. Patients who were ventilated before surgery were not included in this research.

RESULTS

Table 1: Shows there is a significant difference in the age of patients (P=0.034), smoking status (P=0.038), DM (P value 0.042).The p-values of LVEF, Number of grafts, aortic cross clamp time and CPB time are significant.(P-value 0.037)

Table 1: Demographics risk factors and intra-operative characteristics of the patients

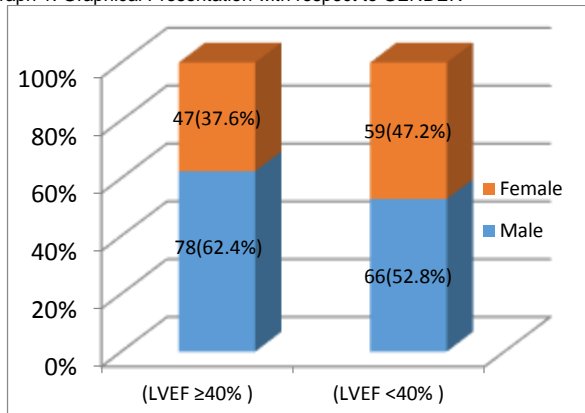
Characteristics	Group A (LVEF ≥40%)	Group B (LVEF <40%)	P- value
Age(Years)	50 ± 4.67	53.44 ± 3.24	0.034
Gender	Male	78(62.4%)	0.002
	Female	47(37.6%)	
Smoking (%)	32(25.6%)	49(39.2%)	0.038
Hypertension (%)	31(24.8%)	38(30.4%)	0.379
Diabetes-mellitus (%)	28(22.4%)	47(37.6%)	0.042
LCOS %	19(15.2%)	25(20%)	0.021
Number of grafts	3.78 ± 1.61	1.88 ± 3.69	0.035
CPB time(minutes)	79.34 ± 34.82	84.56 ± 31.50	0.037

Table 2. Table showing outcome of LCOS

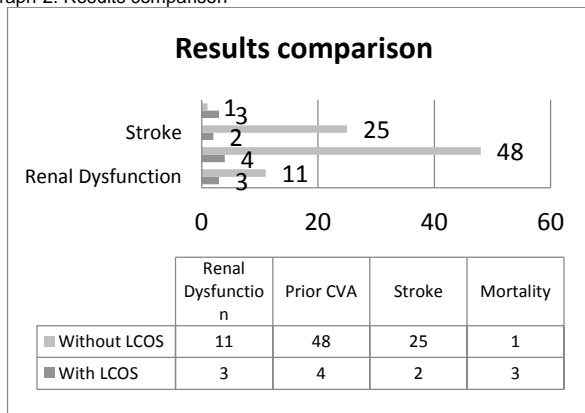
Factors	With LCOS (49)	Without LCOS (201)	P-value
Renal Dysfunction	3(6.12%)	11(5.47%)	<0.001
Prior CVA	4(8.16%)	48(23.88%)	<0.001
Stroke	2(4.1%)	25(12.44%)	<0.001
ICU stay(days)	9.64 ± 7.51	3.23 ± 1.67	0.017
Recent MI	8(16.32%)	59(29.35%)	0.001
Mortality	3(6.12%)	1(0.01%)	<0.001

Table 2: The outcomes of LCOS were Renal Dysfunction (6.12% vs 5.47%), Prior CVA (8.16% vs 23.88%), stroke (4.1% vs. 12.44%, P = <0.001), ICU stay days (9.64 ± 7.51 vs. 3.23 ± 1.67, P = 0.017), recent MI (16.32% vs 29.35%, P = 0.001) and mortality (6.12% vs. 0.01%, P = < 0.001) in patients without LCOS and with LCOS respectively.

Graph 1: Graphical Presentation with respect to GENDER



Graph-2: Results comparison



DISCUSSION

The current study explored association of low cardiac output syndrome with in hospital outcomes after on pump coronary artery bypass grafting surgery. The average age of the participants was 50 ± 4.67 in group A as compare with group B (53.44 ± 3.24) years with p-value 0.034. Total 144(57.6%) Male and 106(42.4%) were female patients. Findings showed that the significant difference in outcomes in terms of Renal Dysfunction, Prior CVA, Stroke, ICU stay(days), Recent MI and mortality between the groups without LCOS and with LCOS

The clinical profile, development, and variations in morbidity and mortality of LCOS in the after cardiac surgery were studied by Vela et al. (2018). There were variations in postoperative clinical course and mortality amongst the subgroups. The median patient age was 68.3 + 9.3 years, there were 65.2% male in this study. (18)

Results showed significant renal replacement needs (p = 0.007), and mortality (p = 0.01) over the course of the study between the subgroups. (18)

In a research by Sa et al. (8), it was discovered that patients with LCOS required a prolonged hospital stay, which was 21.87 ± 7.24 days as opposed to 10.54 ± 5.23 days for patients without LCOS. In a different research by Ding et al., individuals with and without LCOS experienced hospital stays of 21.3 ± 6.4 vs 8.4 ± 2.3 days, respectively [4]. According to my research, hospital stays for patients with and without LCOS were 9.56 ± 2.40 days and 15.22 ± 3.89 days, respectively.

According to Aithoussa et al.,(5) the development of LCOS following CABG is linked to a 10 to 17-fold increase in mortality but according to the research findings conducted by Sa et al.(8), patients who acquired LCOS had a death rate of 52.8%, similar study conducted by Ding et al. (4) discovered that patients who had LCOS had an operative death rate of 25.4%. The study's findings revealed that surgical mortality in patients with LCOS was significant with P- value 0.001.

CONCLUSION

Those with pre-operative LVEF less than 40% had a significantly different frequency of LCOS than patients with LVEF greater than 40%. In comparison to patients without LCOS, individuals with LCOS had considerably worse outcomes in terms of stroke, respiratory failure, renal failure, ICU stay, hospital stay, and death.

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