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Outcome of Coronary Artery Bypass Surgery for Patients with Left Ventricular Systolic Dysfunction

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Abstract: Background and objective: The clinical outcomes for patients experiencing left ventricular (LV) dysfunction are unsatisfactory. The present study was conducted with the objective of evaluating the clinical outcomes of patients diagnosed with LVEF who have undergone coronary artery bypass surgery. **Methods:** The study investigated how people who had left ventricular ejection fraction (LVEF) deficiencies fared after coronary artery bypass graft (CABG) surgery. Eighty-eight individuals who had CABG surgery and were between the ages of 30 and 60 were included in the data set. From February 2023 to March 2024, different hospitals in Iraq provided the patient data. Duration of operation, mortality rate, length of hospital as well as intensive care unit stay, and complication rate were among the surgical data that were collected. Throughout the one-year surgical follow-up phase, patients were given a questionnaire to complete in order to gauge their quality of life. **Results:** The present study constitutes an analysis of the clinical findings of 88 patients, with a male-to-female ratio of 72.73% to 27.27%, respectively. The prevalence of current smoking was found to be 70.45%, while a history of stroke was documented in 11.36% of the total patient population. The mean bypass time was 122.42 ± 41.88 minutes, with a mean hospital stay of 9.53 ± 3.1 days. The incidence of perioperative myocardial infarction, renal failure requiring dialysis, low cardiac output syndrome, and mortality was observed to be 5 cases, 5 cases, 6 cases, and 3 cases, respectively. Echocardiographic measurements revealed a decrease in left ventricular internal diameter, measured in centimetres (LVIDd, cm), from 5.2 ± 1.0 cm in the preoperative period to 4.7 ± 1.0 cm in the postoperative period. Meanwhile, left atrial diameter (LAD) exhibited an increase from 4.4 ± 0.6 cm in the preoperative phase to 4.7 ± 4.9 cm in the postoperative phase. In the evaluation of quality of life, it was observed that two factors demonstrated the general health of patients. The physical aspect was measured at 34.18 ± 6.78 before CABG, while the pain aspect was measured at 30.28 ± 9.78 before CABG. Following CABG, these measures increased to 78.11 ± 9.23 and 77.22 ± 6.55, respectively. **Conclusion:** People who suffer from LVEF have LVIDd decreased, and the LAD increased with CABG. In patients with lower pre-operative LVEF and poor clinical outcomes, CABG was also the best procedure for improving LV systolic function.

Keywords: Left ventricular systolic dysfunction; Coronary artery bypass graft surgery; Echocardiography; and SF, 36 A questionnaire quality of life.

INTRODUCTION

In the developed world, cardiovascular disease is currently the leading cause of mortality [Yancy, C. W . *et al*., 203]. With symptoms including angina pectoris, dyspnea, arrhythmias, myocardial infarction, as well as heart failure, coronary heart disease (CHD) is the leading cause and has become an epidemic in Western industrialized nations. [Hillis, L. D. *et al*., 2011; Levine, G. N. *et al*., 2011]

After viral and parasitic illnesses, cardiovascular disease is the second biggest cause of mortality globally, resulting for over 17.5 million deaths annually [Fihn, S. D. *et al*., 2012]. According to WHO forecasts, it will continue to be the top cause of death for both men and women for Germany and other industrialized nations until 2022. [Caracciolo, E. A. *et al*., 1995]

Three linked clinical entities are referred to as acute coronary syndrome (ACS) when a patient has acute symptoms of coronary artery disease (CAD), which is the most prevalent cardiovascular illness. These include myocardial infarction with ST-segment elevation in the ECG, non-ST elevation myocardial infarction (NSTEMI), along with unstable angina without troponin I or T elevation. [Varnauskas, E, 1988; VA Coronary Artery Bypass Surgery Cooperative Study Group, 1992]

Acute chest discomfort that frequently extends for the left shoulder and arm is the hallmark first sign of acute coronary syndrome. However, unexpected symptoms such as nausea or abrupt shortness of breath are also frequent, as are unique localizations of discomfort around the upper part of the abdomen, back, and lower jaw [Velazquez, E. J. *et al*., 2011; Velazquez, E. J. *et al*., 2016; Michler, R. E. *et al*., 2013]

During cardiac catheterization, selective coronary angiography, as well as ventriculography, can be used to pinpoint the precise site for coronary artery stenoses and assess the left ventricle's functioning. [Grover, F. L. *et al*., 2001]

Bypass surgery has become a well-established component of the treatment regimen for coronary artery disease, with the perioperative mortality rate

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falling to well below five percent at recent decades due to growing experience and advancements in techniques and materials. [Jain, R. *et al*., 2014]

2. PATIENTS AND METHODS

2.1. Study Design

Eighty-eight people who had left ventricular contractile dysfunction, ages 30 to 60, participated in cross-sectional research. Between February 2023 and March 2024, all patients had coronary artery bypass surgery at different hospitals in Iraq. Within five months of surgery, along with between two and twenty months after surgery, all patients had left ventricular function echocardiograms.

2.2. Patients' Data

Patient data were collected from different hospitals in Iraq. Patients were recruited: 1) aged 30-60 years; 2) patients with anemia; 3) patients with obesity and other comorbidities. Patients who were 1) older than 60 years and younger than 30 years, 2) patients with serious diseases such as cancer, tumors, or other diseases, and 3) pregnant women were excluded.

2.3. Echocardiographic Measurements of LVEF

2D echocardiography tests, including chamber quantification measures, were performed out by experienced echocardiographers, and the data was examined and verified by cardiologists who were qualified in 2D echocardiography. The LV performance factors that were examined included LVEF, left atrial dimension (LAD), LV mass, septal wall thickness, posterior wall thickness, as well as LV internal diameter at end-diastole (LVIDd).

3. RESULTS

Table 1: Baseline characteristics of patients in this study

Categories	Parameters	LVEF, 88	LVEF, %
Age, (y)			
	< 60	34	38.64%
	≥ 60	54	61.36%
Gender, (M/F)			
	Male	64	72.73%
	Female	24	27.27%
BMI, (Kg/m2)			
	24.5 – 28.0	22	25.00%
	28.5 – 32.0	27	30.68%
	> 32.0	39	44.32%
Current smoking			
	Smokers	62	70.45%
	No	26	29.55%
Comorbidity			
	Hypertension	51	57.95%
	Diabetes mellitus	36	40.91%
	Hypercholesterolemia	48	54.55%
	Chronic obstructive pulmonary disease	2	2.27%
	Atrial fibrillation	18	20.45%
Prior myocardial infarction, %			
	Yes	6	6.82%
	No	82	93.18%
Family history of CAD, %			
	Yes	38	43.18%
	No	50	56.82%
Stroke history, %		10	11.36%
Prior cardiac surgery, %		3	3.41%
Education level, %			
	Primary	15	17.05%
	Secondary	29	32.95%
	University	44	50.00%
Income level, $, %			
	< 600	30	34.09%
	600 – 900	38	43.18%
	> 900	20	22.73%

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Table 2: Diagnostic outcomes

Variables	LVEF, 88	LVEF, %
GFR, mL/min/1.73 m2	87.20 ± 35.43	
Hemoglobin, g/dL	14.2 ± 1.6	
NYHA class III/IV	58	65.91%
LVEF (echocardiography), %	37.8 ± 8.5	
Diseased coronary vessels		
1 vessel, %	6	6.82%
2 vessels, %	9	10.23%
3 vessels, %	73	82.95%

Table 3: Operative results

Categories	Parameters	LVEF, 88	LVEF, %
Basics data			
	Bypass time, minutes	122.42 ± 41.88	
	Ischemic time, minutes	79.61 ± 29.53	
	Urgent surgery, %	13	14.77%
	Ventilation time, h	21.4 ± 5.6	
	ICU duration, h	74.18 ± 28.49	
	Hospital stays, days	9.5 3.1	
	Number of grafts	3.2 ± 0.6	
Secondary data			
	Reoperation for bleeding	4	4.55%
	Perioperative myocardial infarction	5	5.68%
	Stroke	3	3.41%
	Ventricular arrhythmia	2	2.27%
	Renal failure requiring dialysis	5	5.68%
	low cardiac output syndrome	6	6.82%
	Death	3	3.41%

Table 4: Echocardiographic measurements were observed of all total patients

Variables	LVEF Patients	
	Pre - CABG	Post - CABG
LVEF, %	58.4 ± 6.1	55.3 ± 9.5
LVIDd, cm	5.2 ± 1.0	4.7 ± 1.0
LVIDs, cm	3.2 ± 0.5	3.3 ± 0.2
LAD, cm	4.4 ± 0.6	4.7 ± 4.9
LV mass, g	250.3 ± 70.0	240.5 ± 64.4
PWT, cm	1.0 ± 0.3	1.0 ± 0.3
SWT, cm	1.1 ± 0.2	1.1 ± 0.2

Table 5: Evaluation of general health quality–life of patients with LVEF

ITEMS	Before CABG	After CABG
Physical	34.18 ± 6.78	78.11 ± 9.23
Pain	30.28 ± 9.78	77.22 ± 6.55
Energy	38.93 ± 9.50	67.43 ± 4.62
Mental	44.13 ± 1.08	71.34 ± 4.10
Social	47.45 ± 2.44	76.16 ± 4.49
General	45.80 ± 6.56	76.30 ± 2.28

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4. DISCUSSION

The incapacity of the heart to pump blood effectively is referred to as left ventricular systolic dysfunction (LVSD), and it can result in a variety of clinical problems [Garcia, S. *et al*., 2012; Lang, R. M. *et al*., 2005]. In this research, patients who had lower preoperative LVEF had improved LV systolic function. The lack of regular echocardiography post-CABG may be the cause of the restricted evaluation of changes in LV systolic features and function before and after surgery.

Even while the LVEF decline was small (mean 3% reduction), it could not have had significant clinical significance [Adabag, A. S. *et al*., 2007]. The EF change ranged from -33% to 15%, suggesting that some patients suffered a clinically relevant loss in EF. Due to intraoperative global ischemia, myocardial stunning, or early after-surgery graft failure, LV systolic performance may deteriorate following CABG surgery. To validate these results, prospective research with unselected subjects is required. [Leung, J. M, 1993]

Patients experiencing left ventricular systolic dysfunction (LVSD) are significantly affected by coronary artery bypass grafting (CABG), which may enhance cardiac function and survival rates [Al Aloul, B. *et al*., 2012]. Particularly in individuals with lower preoperative left ventricular ejection fraction (LVEF), studies indicate that CABG can improve LVEF and minimize significant adverse cardiac events. [Diller, G. P. *et al*., 2008; Elefteriades, J. A. *et al*., 1993]

Studies comparing cardiac imaging prior to and following CABG are few. those whose systolic function was unaltered prior to surgery. Another study found that 32 individuals who were prospectively evaluated five days, six weeks, and eighteen months after CABG had better LV diastolic function [Cornel, J. H. *et al*., 1998; Vakil, K. *et al*., 2016]

Contrary to our findings, this small trial did not reveal a significant decline in LV systolic performance following CABG. Numerous smaller trials have shown that LV function improves after CABG in patients with initial LV systolic dysfunction. [Gheorghiade, M. *et al*., 2006; Wood, P. W. *et al*., 2014]

5. CONCLUSION

In our investigation, those who had pre-operative LVEF demonstrated improved LV systolic function, and pre-operative LVEF shows to be a significant predictor of change in LV function after surgery in patients undergoing CABG. The additional LV indices that changed after CABG seemed to be LVIDd, which dropped, and LAD, which increased.

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