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Article

Outcome of Concomitant Coronary Artery Bypass Surgery with Valve Replacement and the Role of Echocardiography for Assessment Overall Survival of Patients

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Abstract:

Background *Coronary* artery disease (CAD) and significant aortic valve stenosis are common co-morbidities.

Objective: This study was conducted assessment outcomes for patients who underwent to concomitant coronary artery bypass surgery and valve replacement.

Patients and methods Our paper was conducted a cross-sectional study to analyse the clinical and demographic results for patients from Iraq who underwent CABG with valve replacement. The study focused on clinical demographic characteristics to identify the surgical outcomes of (CABG) for 86 cases, both male and female, aged between 50 and 70. Clinical data was collected from different hospitals in Iraq between 8th July 2022 and 15th October 2023. The data was analysed using the SPSS program.

Results and Discussion Our paper was conducted a study to analyse the clinical and demographic results for patients who underwent CABG. It was found that the rate of men was 66.3%, whereas for women it was 33.7%. It was observed that patients with Single-vessel disease had a rate of 50%, while patients with Three-vessel disease had a rate of 25.6%. It was identified that CPB operative time was (105 ± 35), ACC time was (63 ± 27), and systolic pulmonary artery pressure was (50 ± 18). To further our findings, our study revealed a postoperative complication rate of 23 cases (26.8%). The most prevalent factors affecting patients after surgery were Sternal wound infection (8 cases, 9.3%)

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and bleeding (6 cases, 7%). The study outlines a decrease in patient survival rates over time following surgery. The data reveals the survival rate of patients in the first 20 months to be 80%, dropping to approximately 44% after 120 months.

Conclusion The study demonstrated the efficacy of the CABG procedure in reducing patients' complications by 26.8%. However, the study did observe a decrease in the survival rate over time.

Keywords: Coronary artery bypass grafting (CABG); Valve displacement surgery; and complications

1. Introduction

Echocardiography is essential for evaluating patients who are undergoing simultaneous procedures of (CABG) and valve replacement. It aids in forecasting results and directing clinical decision-making. Preoperative echocardiographic characteristics, namely the size of the right ventricle (RV), are linked to prognosis and mortality in patients with carcinoid heart disease (CHD) who are undergoing valve surgery [1] ,[2], [3] where Performing transesophageal echocardiography (TEE) during isolated coronary artery bypass grafting (CABG) is linked to reduced operational mortality and a higher likelihood of unscheduled valve surgeries and Transthoracic echocardiographic data are utilised to forecast the likelihood of death and complications during coronary artery bypass grafting (CABG) procedures Nevertheless, the impact of (CABG) on the immediate results of patients Iraqi undergoing surgery for infective endocarditis (IE) with pre-existing coronary artery disease (CAD) remains unknownwhere In the case of patients having In medicine, transcatheter aortic valve replacement (TAVR) is increasingly used for assessing coronary artery disease (CAD) by coronary tomography angiography (CTA). However, pharmacological therapy is recommended for asymptomatic and stable CAD patients [4], [5].

Echocardiography is a powerful tool for assessing patients who are undergoing both coronary artery bypass grafting (CABG) and valve replacement, providing important information for their evaluation. It enables the evaluation of overall and local heart muscle performance, heart muscle blood flow restriction, heart muscle viability, and the occurrence of problems such as blood clot formation in the left ventricle, heart muscle tearing, and fluid buildup around the heart [6]. In addition to echocardiography allows for the immediate assessment of heart function, providing guidance for treatment decisions and monitoring the effectiveness of treatment and Additionally, it can aid in determining the characteristics of cardiovascular compromise and comprehending the cardiac function and hemodynamic alterations in individuals who are severely unwell Nevertheless, echocardiography is subject to several constraints, such as restricted echogenicity in certain instances and reliance on the operator and Although there are limits, echocardiography plays a vital role in assessing patients who are undergoing both (CABG) and valve replacement. It provides significant information for clinical decision-making and prognosis analysis [7].

Coronary artery disease (CAD) is observed in over 60% of individuals undergoing surgical aortic valve replacement (SAVR) and can be found in up to 65% of those undergoing transcatheter aortic valve replacement (TAVR) [8]. The strong connection between these two conditions is believed to be due to a common pathophysiology, which involves an in-

flammatory response caused by low-density lipoprotein. This response leads to a faster development of atherosclerosis. Additionally, both conditions share risk factors such as age, smoking, high blood pressure, and high cholesterol levels. [9], [10], [11], [12]. Results vary when valve replacement and coronary artery bypass operations are performed simultaneously. While arterial grafts lower mortality and post-operative dialysis, the number of grafts performed increases morbidity and death. There is no change in mortality when bilateral internal thoracic arteries (BITA) are used [13]. Trans catheter aortic valve replacement (TAVR) and concurrent off-pump CABG can be less invasive procedures. However, the addition of CABG may raise the risk of stroke after surgery without improving long-term survival [14]. The combination of CABG and MVR operations may result in higher mortality and worse in-hospital outcomes [15].

The advent of TAVR has resulted in a paradigm change in the treatment of acute aortic valve stenosis. With it comes the problem of managing concurrent CAD optimally. Patients with unrevascularized CAD were excluded from the PARTNER as well as US Core Valve High-Risk Study trials, which ultimately led to TAVR approval by the US Food and Drug Administration. With additional advancements in the safety of TAVR, nevertheless, the focus has shifted back to determining the ideal treatment strategy [16], [17], [18], [19]. Revascularization by percutaneous coronary intervention (PCI) may be less dangerous now, in the early days of TAVR, than the inclusion of CABG was in the early days of SAVR, and This paper was focused to assess the results of patients who have undergone of concomitant coronary artery bypass surgery and valve replacement [20].

There are advantages and disadvantages to concurrent coronary artery bypass grafting (CABG) and valve replacement. Benefits include a less invasive alternative method for individuals with aortic stenosis and coronary artery disease who are not a good candidate for percutaneous coronary intervention and who have intermediate or high surgical risk [21]. Nevertheless, without improving long-term survival, adding CABG to valve surgery in patients with significant coronary artery disease (CAD) and infective endocarditis (IE) may raise the risk of postoperative stroke [22]. When it comes to prosthesis selection, patients undergoing simultaneous aortic valve replacement (AVR) with CABG do not experience any differences in survival, stroke, or overall reoperation rates between biological and mechanical valves [23].

2. Patients and Methods

Our paper was conducted a study to analyse the clinical and demographic results for patients IRAQI with CABG with valve replacement, and the study focused on clinical and demographic characteristics to identify the surgical outcomes of (CABG) in 86 patients, both male and female, aged between 50 and 70. Clinical data was collected from different hospitals in Iraq between 8th July 2022 and 15th October 2023. The data was analysed using the SPSS program.

To design methodology, our study analysed the impact of two types of obesity on patients who have undergone to surgery (CABG), with a sample size of 86 patients classified by their BMI below or above 30. CABG has defined as surgery that conduct for patients to enhance the flow rate of blood to the heart for patients with CAD. We collected our data from patients who underwent CABG, a necessary procedure when the coronary arteries supplying blood to the heart are compromised and valve displacement is required.

Our study analysed the preoperative comorbidities of patients who underwent CABG, including atrial fibrillation, COPD, diabetes mellitus, dialysis, hyperlipidaemia, hypertension, and severe CKD. We also considered patients who smoked. Our study contributed to the analyse of the surgical outcomes before surgery of patients who had undergone (CABG) surgery. This included different kinds, which consist of left main and single-vessel disease, three-vessel disease, also two-vessel disease. Additionally, we plotted the surgical outcomes of distal anastomosis in association with patients ages at 1, 2, 3, 4, and 6 post-surgeries. We observed their CPB time, ACC time, and systolic pulmonary artery pressure. Furthermore, our clinical outcomes were based on patients who experienced postoperative complications, such as bleeding, new-onset dialysis, sternal wound infection, and stroke. Finally, we assessed the survival rate of at-risk patients after surgery.

The transthoracic echocardiography and ECG were conducted concurrently using the General Health Vivide E 9 echocardiographic equipment, which is equipped with TDI capabilities and a phased array transducer with a frequency of 5 MHz The researcher conducted measurements while the participant was positioned on their left side. Echocardiographic examination and measurements are performed in accordance with the guidelines set forth by the American Society of Echocardiography.

3. Results

Table 1. Clinical baseline demographic of patients based on age.

		Age-patients
N	***Va***	86
	Mis	0
Me		65.4070
Med		66.0000
SD		4.95243
Sk		-1.427
Std. E		.260
Min		50.00
Max		70.00
	Cumulative	5625.00

Table 2. Classify of clinical CABG patients for both men and women.

		Number of patients	**Per (%)**	**VP (%)**	**CP (%)**
V	Women	29	33.7	33.7	33.7
	Men	57	66.3	66.3	100.0
	T	86	100.0	100.0	

Table 3. Preoperative comorbidities**.**

		Number of patients	**Per (%)**	**VP (%)**	**CP (%)**
V	*Atrial fibrillation*	4	4.7	4.7	4.7
	COPD	1	1.2	1.2	5.8
	Diabetes mellitus	30	34.9	34.9	40.7
	Dialysis	6	7.0	7.0	47.7
	Hyperlipidaemia	5	5.8	5.8	53.5

	Hypertension	28	32.6	32.6	86.0
	Severe CKD	12	14.0	14.0	100.0
	T	86	100.0	100.0	

Table 4. Determine clinical characteristics of patients who underwent to surgery based on smoking.

		Number of patients	Per (%)	VP (%)	CP (%)
V	No	38	44.2	44.2	44.2
	Yes	48	55.8	55.8	100.0
	T	*86*	*100.0*	*100.0*	

Table 5. Determine clinical characteristics of patients who underwent to surgery based on BMI.

		Number of patients	Per (%)	VP (%)	CP (%)
V	<30	25	29.1	29.1	29.1
	>30	61	70.9	70.9	100.0
	T	86	100.0	100.0	

Table 6. Clinical preoperative surgical outcomes for patients who conduct CABG surgery.

		Number of patients	Per (%)	VP (%)	CP (%)
V	Left main	5	5.8	5.8	5.8
	Single-vessel disease	43	50.0	50.0	55.8
	Three-vessel disease	22	25.6	25.6	81.4
	Two-vessel disease	16	18.6	18.6	100.0
	T	86	100.0	100.0	

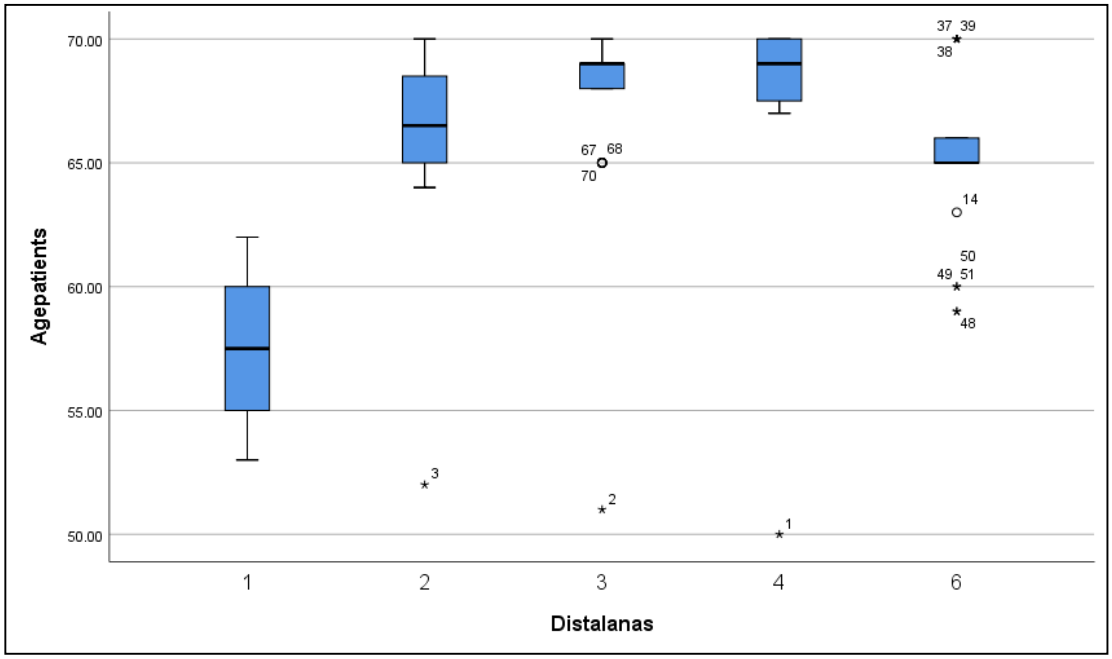

Figure 1. Plotting Coronary of distal anastomosis surgical outcomes in association with age of patients.

Table 7. Clinical outcomes of patients

		Number of patients	Per (%)	VP (%)	CP (%)
V	No use of ITA	38	44.2	44.2	44.2
	Use of bilateral ITA	48	55.8	55.8	100.0
	T	86	100.0	100.0	

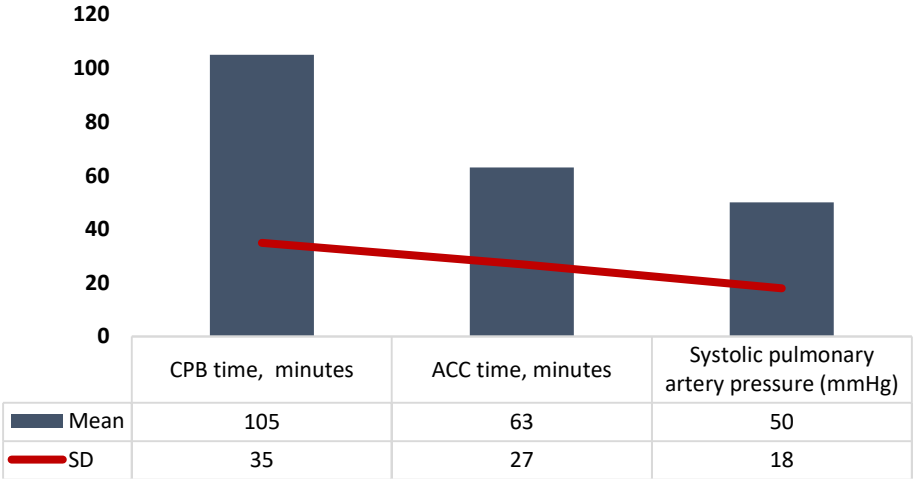

Figure 2. Clinical Coronary grafting of operative time within CPB time, ACC time, and systolic pulmonary artery pressure.

Table 8. Post-operative complications.

		Number of patients	Per (%)	VP (%)	CP (%)
V	Bleeding	6	7.0	7.0	7.0
	New-onset dialysis	4	4.7	4.7	11.6
	None	63	73.3	73.3	84.9
	Sternal wound infection	8	9.3	9.3	94.2
	Stroke	5	5.8	5.8	100.0
	T	86	100.0	100.0	

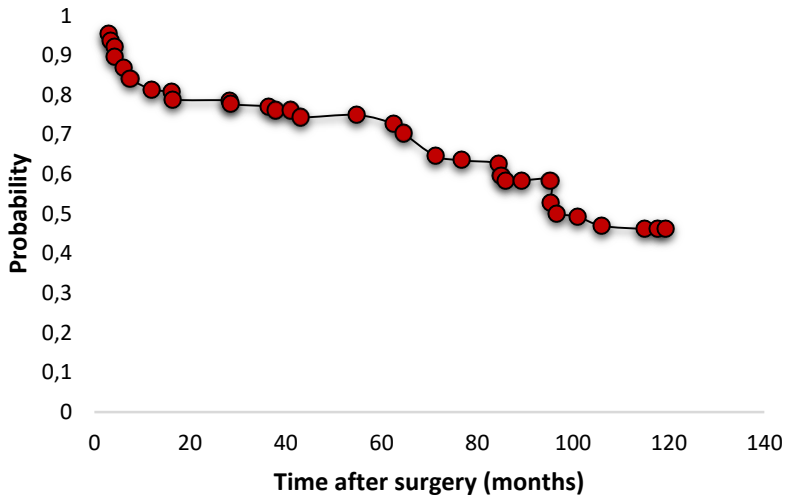

Figure 3. The Role of Echocardiography for Assessment Overall survival of patients after surgery according to Kaplan–Meier Curve.

Table 9. Final outcomes according to Aortic valve area, Peak velocity, m/sec, Aortic valve area

Aortic valve area	0.82 ± 0.28
Peak velocity, m/sec	4.3 ± 0.9

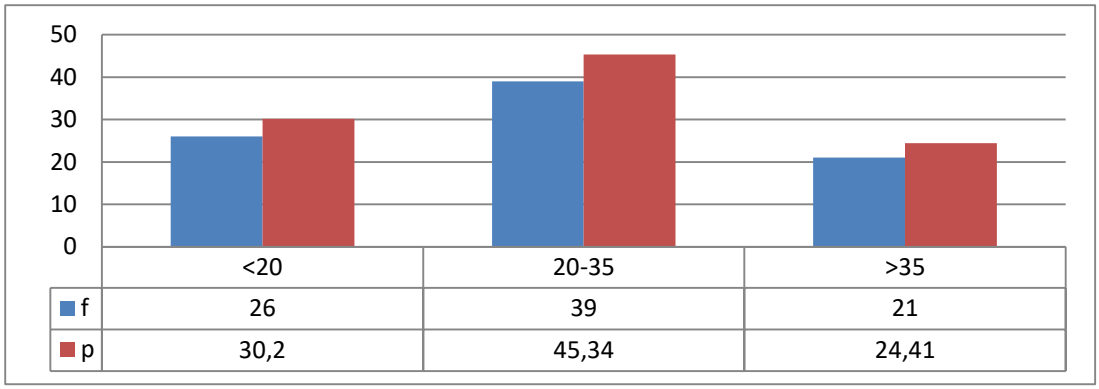

Figure 4. Outcomes of patients according to PG (frequency, percentage).

4. Discussion

The clinical outcomes obtained from 86 patients who underwent coronary artery bypass surgery (CABG) were analysed. It was found that the rate of men was 66.3%, whereas for women it was 33.7%. The most common comorbidities preoperatively were diabetes mellitus and hypertension, affecting 34.9% and 32% of patients, respectively. The study aimed to ascertain the prevalence of smoking among patients. Clinical demographic characteristics were analyzed to determine the percentage of smokers, which was found to be 55.8%, while non-smokers made up 44.2% of the patient population. Additionally, the study revealed that 70.9% of patients had a BMI greater than 30, with the remaining 29.1% having a BMI below 30. It was observed that patients with Single-vessel disease had a rate of 50%, while patients with Three-vessel disease had a rate of 25.6%. The research conducted for Clinical Coronary Grafting evaluated operative time within CPB time, ACC time, and systolic pulmonary artery pressure. It was identified that CPB operative time was (105 ± 35), ACC time was (63 ± 27), and systolic pulmonary artery pressure was (50 ± 18). To further our findings, our study revealed a post-operative complications rate of 23 cases (26.8%). The most prevalent factors affecting patients after surgery were Sternal wound infection (8 cases, 9.3%) and bleeding (6 cases, 7%). The study outlines a decrease in patient survival rates over time following surgery. The data reveals the survival rate of patients in the first 20 months to be 80%, dropping to approximately 44% after 120 months.

Furthermore, the mortality rate of patients who underwent concomitant coronary artery bypass surgery with valve replacement varied across studies. One study indicated that the mortality rate was low, with only 12.5% in-hospital mortality for patients who had CABG surgery procedures conducted with valvular surgery [24]. Another study found that during the 10-year follow-up period, the survival rate was equal to that of patients undergoing isolated aortic valve replacement [25]. In contrast, a French study found that the 30-day mortality rate was almost 18.6% in patients who underwent valve surgery combined with coronary artery bypass grafting, which was significantly higher than the 6.2% mortality rate in patients who underwent isolated valve surgery [25]. However, these studies observed a mortality rate of approximately 6% for patients who have aortic valve replacement during CABG surgery [26]. In addition, some researches was indicated that the most common complications were postoperative bleeding, mediastinitis, and cardiac rhythm disturbances, with a mortality rate of 2.7% [27], while an American study published in 2019 discovered that Sternal wound infection had a greater impact on patients, as did the risk for

combined valve and bypass procedures, instead with improvements within surgical techniques along with myocardial protection methods, perioperative mortalities have demonstrated a declining trend, where it was associated with a reduction in late survival within all patients at highest risk through the early term. [28]. Furthermore, while some studies discovered that a comparatively small ejection fraction and long aortic cross-clamping had been the only factors that reached statistical significance as surgical risks, mitral regurgitation because of ischaemic papillary muscle dysfunction, advanced rheumatic mitral regurgitation, and tight aortic stenosis combined with coronary artery disease appeared to be indicators of poor prognosis [29], [30], [31].

5. Conclusion

Although the drop-in survival rate of patients, CABG remains the prefect surgical options in the long term. Our study noted that the survival rate of patients gradually decreases. However, our study recorded that the rate of complications for patients after surgery was low, representing 26.8%. Furthermore, our result found that sternal wound infection is the most common of complication who affect patients in the long term. Where we conclude that Echocardiography is essential for forecasting ventricular remodelling and functional recovery, determining the size and volume of the left ventricle, identifying regional wall motion abnormalities, assessing myocardial viability, measuring left ventricular filling pressures, evaluating the severity of mitral regurgitation, and measuring systolic pulmonary artery pressure.

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