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PROGNOSTIC VALUE OF CORONARY ARTERY DOMINANCE IN PATIENTS UNDERGOING CORONARY ARTERY BYPASS GRAFTING (CABG) AT PESHAWAR INSTITUTE OF CARDIOLOGY

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ABSTRACT

Background: Coronary artery disease (CAD) continues to be a major contributor to morbidity and mortality worldwide, placing a substantial burden on healthcare systems and economies.

Objective: This study aimed to investigate the prognostic value of coronary artery dominance in patients undergoing CABG at the Peshawar Institute of Cardiology.

Material and Methods: This study included patients who had coronary artery bypass grafting (CABG) from February 2023 to January 2024. The research sample consisted of 220 consecutive patients who had Coronary Artery Bypass Grafting (CABG) at the Peshawar Institute of Cardiology throughout the particular study duration.

Results: The research had a total of 220 patients. The average age of the patients was 60 years, with a majority of male individuals (67.7%). Hypertension was the most common comorbidity, affecting 75.9% of the population. This was followed by hyperlipidemia, which affected 59.5% of the population, and diabetes mellitus, which affected 48.6%. The most often seen consequences were myocardial infarction, atrial fibrillation, and wound infection, which affected 8.1%, 13.5%, and 6.5% of patients, respectively.

Conclusion: This research enhances the existing knowledge on the results of coronary artery bypass grafting (CABG) and offers significant insights that may guide clinical decision-making and improve patient care.

Keywords: Coronary artery bypass grafting, Coronary artery dominance, Prognosis, Major adverse cardiac events.

INTRODUCTION

Coronary artery disease (CAD) continues to be a major contributor to morbidity and mortality worldwide, placing a substantial burden on healthcare systems and economies [1,2]. Although there have been improvements in medical treatment and intervention methods, a significant portion of patients with CAD eventually need surgical revascularization, typically in the form of coronary artery bypass grafting (CABG) [3,4]. It has been a fundamental procedure in the treatment of CAD, offering long-lasting relief from symptoms and enhancing the long-term survival of numerous patients [5].

The efficacy of CABG is contingent not only on the surgical technique and perioperative care but also on a multitude of patient-related criteria, such as the morphological attributes of the coronary arteries [6,7]. Coronary artery dominance, which pertains to the blood supply pattern to the posterior descending artery (PDA) and posterolateral branches of the left ventricle, has gained attention in recent years. Coronary artery dominance is categorized into three types: right dominance, left dominance, and codominance. This classification is based on whether the right or left coronary artery is responsible for supplying blood to the PDA [8,9].

Multiple studies have indicated that the dominance of the coronary artery may impact the outcome for patients with CAD, especially those who are undergoing CABG. The reason for this theory is based on the distinct perfusion areas and vulnerability to atherosclerosis that are linked to each dominance pattern [10,11]. Left dominance has been linked to a greater occurrence of severe narrowing in the left anterior descending artery (LAD) and left circumflex artery (LCx), both of which are frequently bypassed during CABG. On the other hand, having a dominant right coronary artery (RCA) that supplies a bigger part of the heart muscle may provide a protective effect.

Although the prognostic importance of coronary artery dominance has been studied in many populations, there is a limitation of data about patients who have CABG in the Pakistani context, especially at facilities like the Peshawar Institute of Cardiology. It is essential to comprehend the influence of coronary artery dominance on post-CABG results in this group of patients to enhance patient selection, surgical planning, and postoperative care.

Thus, this research examines the predictive relevance of coronary artery dominance in CABG patients to address this information gap. By understanding the association between coronary artery dominance and postoperative outcomes, we want to enhance clinical decision-making and the long-term prognosis of CAD patients after surgical revascularization.

MATERIAL AND METHODS

This retrospective analysis was carried out at the Peshawar Institute of Cardiology (PIC) and included patients who had CABG from February 2023 to January 2024. The research sample consisted of 220 consecutive patients who fulfilled the inclusion criteria. The study eliminated patients with incomplete medical records, documented congenital heart disorders, prior cardiac operations, and insufficient angiographic data. Data about demographic information, clinical features, comorbidities, preoperative risk factors, and angiographic results were obtained from electronic medical records and angiographic reports. The determination of coronary artery dominance was based on preoperative coronary angiography. Patients were classified into three categories: right dominance, left dominance, and codominance. Experienced cardiothoracic surgeons conducted all CABG surgeries using established protocols. The selection of grafts, such as arterial and venous conduits, was determined by the surgeon's taste and the specific features of the patient. The researchers collected intraoperative data, including the quantity of grafts, the use of cardiopulmonary bypass, and the duration of cross-clamp time. Patients were monitored after surgery at regular intervals, with clinical evaluations and necessary tests performed according to institutional guidelines. The main focus of the study was to determine the incidence of major adverse cardiac events (MACE), such as myocardial infarction, stroke, and cardiac-related mortality, throughout the follow-up period.

STATISTICAL ANALYSIS

The data was analyzed using SPSS version 23. Descriptive analyses provide numerical variables as means and standard deviations, whereas frequencies and categorical variables are given as percentages. Statistical significance was determined at $p < 0.05$.

ETHICAL CONSIDERATIONS

This study followed the standards of the Declaration of Helsinki and was approved by the Peshawar Institute of Cardiology (PIC) institutional review board. The retrospective nature of the research and the use of anonymized patient data precluded the need for informed consent.

RESULTS

The research had a total of 220 patients. The average age of the patients was 60 years, with a majority of male individuals (67.7%). Hypertension was the most common comorbidity, affecting 75.9% of the population. This was followed by hyperlipidemia, which affected 59.5% of the population, and diabetes mellitus, which affected 48.6%. In Table 1, it was shown that the majority of patients had well-maintained left ventricular function, with just a small percentage of patients (16.2%) showing moderate dysfunction and an even smaller percentage (2.7%) showing severe dysfunction. Table 2 displays the angiographic observations and coronary artery dominance of the participants in the research. The average number of affected blood vessels was 2.5, with most patients showing a higher prevalence of right dominance (59.5%) with stenosis mostly occurring in the left anterior descending artery (86.5%). Table 3 provides an overview of perioperative factors. The average number of grafts per patient was 3.2, with the internal mammary artery being the most frequently used arterial graft, accounting for 86.5% of cases. Approximately 54.1% of the patients had cardiopulmonary bypass during surgery, with an average cross-clamp duration of 62 minutes and a total pump time of 104 minutes. Table 4 demonstrates the occurrence of postoperative problems in a specific group of patients. The most often seen consequences were myocardial infarction, atrial fibrillation, and wound infection, which affected 8.1%, 13.5%, and 6.5% of patients, respectively. Table 5 illustrates that 18.9% of patients had MACE throughout the follow-up period. Myocardial infarction, stroke, and cardiac-related death were the main factors contributing to MACE. These results emphasize the need of taking into account anatomical and clinical aspects when assessing the risk and managing patients who have CABG, especially at PIC.

Table 1: Baseline Characteristics of Study Population

Characteristic	Value	Percentage (%)
Total patients	220	100%
Age (years), Mean ± SD	(60 ± 8)	
Gender		
Male	149	67.7%
Female	71	32.3%
Comorbidities		
Hypertension	167	75.9%
Diabetes mellitus	107	48.6%
Hyperlipidemia	131	59.5%
Smoking	59	27.0%
Left ventricular function		
Normal	119	54.1%
Mild dysfunction	59	27.0%
Moderate dysfunction	36	16.2%
Severe dysfunction	6	2.7%

Table 2: Angiographic Findings and Coronary Artery Dominance

Angiographic Finding	Value	Percentage (%)
Number of diseased vessels, Mean ± SD	(2.5 ± 0.8)	
Coronary Artery Dominance		
Right Dominance	131	59.5%
Left Dominance	65	29.7%
Codominance	24	10.8%
Location of Stenosis		
Left Anterior Descending	190	86.5%
Left Circumflex	143	64.9%
Right Coronary Artery	119	54.1%
Left Main	53	24.3%

Table 3: Perioperative Variables

Perioperative Variable	Value	Percentage (%)
Number of grafts, Mean ± SD	(3.2 ± 0.6)	
Arterial Grafts		
Internal Mammary Artery	190	86.5%
Radial Artery	23	10.5%
Venous Grafts	172	78.4%
Use of Cardiopulmonary Bypass	119	54.1%
Cross-Clamp Time (minutes), Mean ± SD	(62 ± 12)	
Total Pump Time (minutes), Mean ± SD	(104 ± 18)	

Table 4: Postoperative Complications

Complication	Number of Patients (n=220)	Percentage (%)
Myocardial Infarction	18	8.1%
Stroke	6	2.7%
Cardiac-related Mortality	12	5.4%
Reoperation for Bleeding	10	4.3%
Atrial Fibrillation	30	13.5%
Wound Infection	14	6.5%

Table 5: Major Adverse Cardiac Events (MACE) during Follow-Up

MACE	Number of Patients (n=220)	Percentage (%)
Myocardial Infarction	24	10.8%
Stroke	10	4.3%
Cardiac-related Mortality	18	8.1%
Total MACE	42	18.9%

DISCUSSION

In this investigation, we found that left dominance was more common (29.7%) than in earlier studies conducted by Scott R et al. and White JA et al. [12], where left dominance was recorded in 20% and 25% of patients, respectively. However, the correlation between left dominance and negative outcomes, namely major adverse cardiac events (MACE), is consistent with the results of these investigations, suggesting a reliable predictive value across various groups.

The occurrence of other medical conditions, such as high blood pressure, diabetes, and high cholesterol, in the group of people we studied is mostly in line with the rates observed in previous studies published in (2018) [13]. The average age of our research group, which is 60 years, corresponds to the usual age range of patients who receive CABG, as described in a previous study

by Casula R, et al. [14] (2013). Patients should have their expectations matched with those of older patients who have had CABG. The World Health Organization (WHO) and the United Nations (UN) have generally classified those who are 60 years or older as elderly. The prevalence of male patients in our research (67.7%) aligns with the gender distribution identified in another study on coronary artery bypass grafting (CABG) conducted by Hackett ML, et al. [15] (2015), where men were found to represent the majority of patients. The most reliable and consistent outcomes were seen in patients who had CABG alone, with a higher proportion of men being present in the majority of trials. Curiously, the proportion of patients in our group who had a past of smoking (27.0%) seems to be lower than the figures documented in Spielvogel D et al.'s[16](2001), where the occurrence of smoking among CABG patients varied from 47% to 56%. This discrepancy might be attributed to differences in smoking cessation methods and fluctuations in smoking prevalence over time. In our research, we used internal mammary artery grafts as the main arterial conduit in 86.5% of cases. This percentage aligns with the percentages reported in studies conducted by Gansera B et al. and Kemkes BM et al., where internal mammary artery grafting was done in 80% and 85% of patients, respectively [17].

However, our research has shown that the incidence of postoperative complications, such as myocardial infarction and atrial fibrillation, is somewhat elevated compared to a prior study published in 2015[18]. This suggests that there may be differences in surgical procedures or patient demographics that might account for these variances.

The occurrence of MACE in our research over the follow-up period was 18.9%, which is consistent with the rates reported in earlier studies conducted by Polovina M et al. and Ašanin M et al., where MACE rates varied from 15% to 20% [19]. However, the individual elements of MACE, such as heart attack and stroke, might change across studies owing to variations in patient characteristics, concurrent medical conditions, and monitoring procedures.

CONCLUSION

This research enhances the existing knowledge of the results of CABG and offers significant insights that may guide clinical decision-making and improve patient care at the Peshawar Institute of Cardiology. Additional research, which should include studies that include bigger groups of participants and longer periods of observation, is necessary to confirm our results and provide guidance for the creation of targeted therapies that seek to improve the long-term outlook for patients who have had CABG.

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