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CORONORY ARTERY BYPASS GRAFTING VERSUS PERCUTANEOUS CORONORY INTERVENTION IN PATIENTS WITH SYMPTOMATIC MULTIVESSEL CORONORY DISEASE

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ABSTRACT

Ischemic Heart Disease is a prevalent vascular condition of heart characterized by the development of atherosclerotic plaque within the vessel lumen. To evaluate clinical decision-making by comparing the long-term outcomes, safety, and effectiveness of CABG with PCI in patients with symptomatic multi-vessel coronary disease. This Cross-sectional study was conducted at Chaudhry Pervaiz Elahi Institute Of Cardiology Wazirabad during July to December 2023. Convenient sampling technique was used in this study. Data was collected with the help of Performa and by conducting a general history of the present condition of the patient after the fluoroscopic procedure (PCI) and surgical procedure (CABG), who came with complaints of MVCAD. Performa included questions about the history, presenting complaints, risk factors, information about obstructed vessels and their treatment decisions, ejection fraction, complications during the procedure, and outcomes after the procedure. The majority of the patients with symptomatic multi-vessel coronary artery disease were under the age of 75 (55.58%). The majority of patients with MVCAD were males 99(75.6%). Most of the patients presented complaints of central chest pain 34(26.0%). The most common complaint was central chest pain, observed in 26%. Additionally 22.9% presented with chest pain accompanied by SOB, while 13% reported chest pain radiating to both arms, shoulders, and back. Chest pain radiating with SOB was reported by 18.3%, and 11.5 presented with chest pain along with other symptoms. In conclusion, the comparison between coronary artery bypass grafting (CABG) and percutaneous coronary intervention (PCI) in patients with symptomatic multivessel coronary disease reveals equivalent improvement in angina symptoms after 4 months.

INTRODUCTION

Ischemic Heart Disease is a prevalent vascular condition of heart characterized by the development of atherosclerotic plaque within the vessel lumen.[1] Multivessel Coronary Artery Disease (MVCAD) is characterized by stenosis of lumen minimum of 70% in at least two major coronary vessels, or in one coronary vessel in conjunction with a 50% or greater stenosis of the left main trunk.[2] Patients with coronary vascular disease who experience continuing complaints and a reduced quality of life while undergoing medical therapy are typically considered for revascularization.[3] Multivessel ischemic disease is both common and associated with increased mortality risk.[2] It affects a significant proportion of individuals with angina, with estimates ranging from 45% to 88% of men.[2]

Compared to single-vessel disease, MVCAD carries a mortality hazard ratio of 3.14, indicating a substantially higher risk of death.[2] For symptomatic heart disease the most prevalent revascularization techniques are Coronary-artery bypass grafting (CABG) and percutaneous coronary intervention (PCI).[4] CABG seems to be better than PCI for patients with diabetes and MVCAD.[2] However, patients without DM, decision-making regarding the choice between CABG and PCI is more nuanced and requires careful consideration of various factors.[2]

Heart Vascular disease that is prevalent cardiac condition represented through the formation of atherosclerotic lesion within vessel lumen.[1] Coronary artery disease has been identified as the main factor of death and disease in human.[5] Ischemic heart Disease is most of the primary vascular problem of heart that impact the individual population globally.[5] The coronary arteries, which serve as the major blood vessels responsible for providing the heart with an adequate supply of blood, oxygen and essential nutrients, face challenges in delivering an adequate supply to the heart muscles.[6] It has been shown that this condition is the primary cause of mortality in both developed and underdeveloped nations.[7] CAD is a chronic atherosclerotic condition that has possible manifestations such as persistent angina, unpredictable chest pain, heart attack, or cardiac arrest.[8] Lifestyle has an enormous effect in triggering the onset of heart failure.[8] Cardiovascular conditions are reaching pandemic proportions in developing countries.[9] Heart vascular problems arises from the formation of atherosclerotic blockages within coronary arteries.[5] It can leads a blockage of blood flow, creating an imbalance between the myocardium's demand for oxygen and its supply.[5]

The blockage of the heart vessel manifests signs of arterial disease, such as sensations of pain, feeling heavy, and tightness beneath the sternum. These symptoms may spread to the face, backwards, and upper limbs.[11] The incidence of heart failure shows notable variations influenced by geographical locations, ethnic backgrounds, and gender disparities.[7] CAD is associated with numerous risk factors. Some can be mitigated through lifestyle changes and medical interventions; others are beyond individual control.[12] Modifiable risk factors for CAD comprise hypertension, hypercholesteremia, smoking, diabetes, obesity, a sedentary lifestyle, unhealthy dietary habits, and stress.[12] Non-modifiable hazards of cardiac vascular disease exits chronological age, gender, ancestral history, and ethnicity.[12] About 30–40% of yearly fatal incidents are considered of being linked with ischemic heart disease, with a significant portion attributable to smoking. Smokers are reported to have a 70% higher CAD mortality rate compared to nonsmokers.[13]

Objective

To evaluate clinical decision-making by comparing the long-term outcomes, safety, and effectiveness of CABG with PCI in patients with symptomatic multi-vessel coronary disease.

Material And Methods

This Cross-sectional study was conducted at Chaudhry Pervaiz Elahi Institute Of Cardiology Wazirabad during July to December 2023. Convenient sampling technique was used in this study.

Sample Size

We used a cost-benefit approach for sample size determination. We included all patients in our sample who treated at the Chaudhry Pervaiz Elahi Institute of Cardiology, Wazirabad within six months after the approval of synopsis. The estimated sample size was 100.

Inclusion Criteria

- Patients with the history of CAD
- Patients under 75 years of age
- Both Genders
- Multi vessel disease

Exclusion Criteria

- Non-Cooperative patients
- Valvular heart disease patients
- Congenital Heart disease patients
- Single vessel disease

Technique

Heart catheterization was performed by percutaneous technique through the right radial or femoral artery by using a 6F arterial sheath under local anesthesia. In some cases, general anesthesia may be used. This procedure was performed using JL 3.5 6F and JR 4.0 right 6F coronary catheters. Non-ionic contrast was used. The guidewire is in place, and a balloon-tipped catheter is threaded over the guidewire to the site of the blockage. The balloon is then inflated, compressing the plaque against the artery walls and widening the artery to improve blood flow. A stent is inserted into the newly widened artery to help keep it open. The stent is collapsed around the balloon catheter and expands when the balloon is inflated. This holds the artery open and helps prevent it from narrowing again. After the procedure is completed, the balloon catheter and guidewire are removed, and pressure is applied to the insertion site to prevent bleeding. A bandage or closure device may be used to seal the incision. The patient is typically monitored for a few hours after the procedure and may need to stay overnight in the hospital for observation, depending on the situation.

Data Collection Procedure

Data was collected with the help of Performa and by conducting a general history of the present condition of the patient after the fluoroscopic procedure (PCI) and surgical procedure (CABG), who came with complaints of MVCAD. Performa included questions about the history, presenting complaints, risk factors, information about obstructed vessels and their treatment decisions, ejection fraction, complications during the procedure, and outcomes after the procedure.

Data Analysis Procedure

Data was collected during the specified period and the data analysis and compilation of results was conducted using IBM SPSS (Statistical Package for Social Sciences) version 26. Quantitative and qualitative

variables were reported as mean standard deviation, and percentage. Different statistical techniques were used to explain. The various outcomes of MVCAD patients after treatment were then condensed into graphs, tables, and charts using the Chi-Square test and two independent t-tests.

Results

The majority of the patients with symptomatic multi-vessel coronary artery disease were under the age of 75 (55.58%). The majority of patients with MVCAD were males 99(75.6%). Most of the patients presented complaints of central chest pain 34(26.0%).

Table 1: Presenting Complaints of Patients

PRESENTING COMPLAINTS			
		Frequency	Percent
Valid	NO SYMPTOMS	10	7.6
	CENTRAL CHEST PAIN	34	26.0
	CHEST PAIN WITH SOB	30	22.9
	CHEST PAIN RADIATE TO BOTH ARMS, SHOULDERS AND BACK	17	13.0
	CHEST PAIN RADIATE WITH SOB	24	18.3
	OTHERS	15	11.5
	Total	130	100.0

Table 1 shows that 7.6% reported no symptoms. The most common complaint was central chest pain, observed in 26%. Additionally 22.9% presented with chest pain accompanied by SOB, while 13% reported chest pain radiating to both arms, shoulders, and back. Chest pain radiating with SOB was reported by 18.3%, and 11.5 presented with chest pain along with other symptoms.

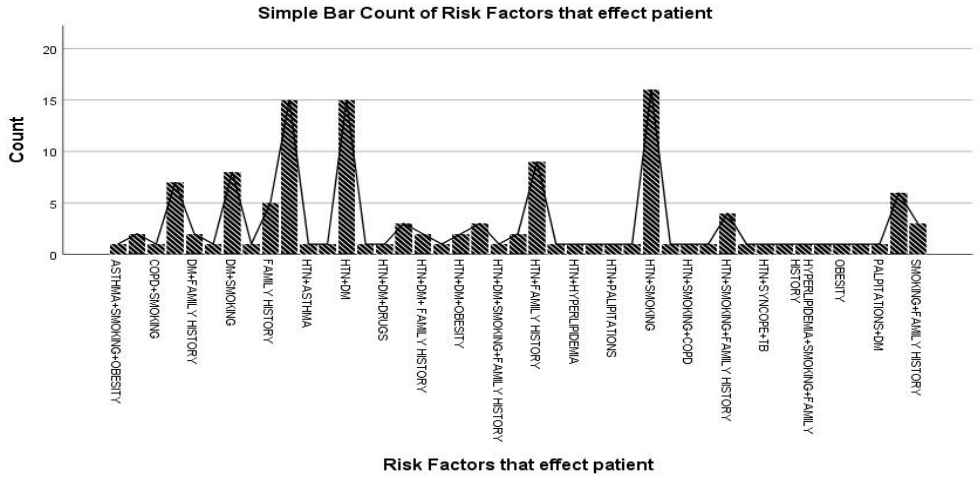

Figure 1 shows the simple bar count of risk factors that affect the patients in which most of the patients have the risk factor of hypertension with smoking.

Table 2: Angiographic Results of Patients

ANGIOGRAPHIC RESULT			
		Frequency	**Percent**
Valid	**DVCAD**	22	16.8
	TVCAD	68	51.9
	TVCAD+LMS	37	28.2
	TVCAD+RIA	3	2.3
	Total	130	100.0

Table 2 illustrates that 16.8% were diagnosed with DVCAD, while 51.9% had TVCAD. Additionally 28.2% were diagnosed with TVCAD along with left main stem involvement (TVCAD+LMS), and 2.3% had TVCAD along with right coronary artery involvement (TVCAD+RI).

Table 3: Shows Crosstab of Treatment Decision * Blood Transfusion

Crosstab					
			Blood transfusion		
			NO	**YES**	**Total**
Treatment Decision	**PCI**	**Count**	67	4	71
		% Within Treatment Decision	94.4%	5.6%	100.0%
	CABG	**Count**	29	30	59
		% Within Treatment Decision	49.2%	50.8%	100.0%
Total		**Count**	96	34	130
		% Within Treatment Decision	73.8%	26.2%	100.0%

Table 3 shows the cross-tabulation of treatment decisions with blood transfusion. The total number of patients who were treated with PCI was 71, out of which 5.6% had the outcome of a blood transfusion.

Table 4: Chi Square Test

Chi-Square Tests			
	Value	**df**	**Asymptotic Significance (2-sided)**
Pearson Chi-Square	34.107[a]	1	.000
N of Valid Cases	130		
a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 15.43.			

Table 4: Shows the result of the chi square test of the cross-tabulation of treatment decision and blood transfusion. And the p value is 0.000, which is less than the alpha value (0.05). So, we conclude that the result is significant.

Table 5: Chi Square Test

Chi-Square Tests			
	Value	**df**	**Asymptotic Significance (2-sided)**
Pearson Chi-Square	.254[a]	1	.615
N of Valid Cases	130		
a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 25.42.			

Table 5 shows that chi square calculated value of 0.25 is less than the chi square tabulated value, which is 3.84. And the p value is 0.615, which is greater than the alpha value (0.05). So, we conclude that the result is not significant.

Discussion

Multivessel coronary artery disease (MVD) is characterized by the narrowing of the coronary artery lumens, with stenosis of at least 70% observed in two major coronary arteries or in one coronary artery in combination with a stenosis of 50% or more in the left main trunk.[2] The current study was conducted at the Echocardiographic, Angiographic, and Surgical departments of Chaudhary Pervaiz Elahi Institute of Cardiology, Wazirabad. The study extended over a period of six months. Echocardiography, a non-invasive procedure, holds significance in the management of CAD patients. Percutaneous coronary interventions (PCI) are minimally invasive procedures used for both the diagnosis and treatment of coronary artery disease. On the other hand, coronary artery bypass grafting (CABG) is a fully invasive procedure associated with major outcomes but is effective in treating the disease.

In the current study, 130 patients were examined after the PCI and CABG procedures in the treatment of multivessel coronary artery disease. According to the current study, most patients were males 99(75.6%), with an age group of 41–60 years 83(63.4%). A previous study conducted by Emily Bryer et al. in December 2020 yielded comparable findings, indicating that between 45% and 88% of men with angina exhibit multivessel coronary artery disease (MVD). This condition is associated with a mortality hazard ratio of 3.14 compared to single-vessel disease.[2] In another earlier study conducted by Muhammad Adil et al. on May 22, 2023, similar results were observed, with 62.50% of the study population being male. The mean age of the participants was 55.58 ± 11.16 years.[49]

According to the present study, the majority of patients presented to the hospital with central chest pain as their chief complaint, accounting for 34 (26.0%) cases. Angina, characterized by chest pain radiating to both arms, shoulders, and back, was the most common symptom of coronary artery disease, observed in 17 (13.0%) patients. Additionally, chest pain accompanied by shortness of breath was reported in 30 (22.9%) cases. A prior study conducted by Muhammad Adil et al. on May 22, 2023, corroborated these findings, indicating that chest pain remains the most prevalent presenting complaint among cardiovascular patients, likely attributable to significant risk factors.[49] Another earlier study by Jay Bharat Bhalky et al., conducted in 2022, presented similar findings, indicating that 30.93% of patients were diagnosed with asymptomatic coronary artery disease (CAD).[50]

The current study revealed that hypertension and smoking emerged as the primary risk factors contributing to the development of coronary artery disease. Similar findings were reported in a previous study conducted by Muhammad Adil et al. in May 2023.In the study, 33.75% of the patients were identified as smokers, while hypertension was found to be present in 48% of the patient population.[49]

According to the present study, PCI exhibited a lower mortality rate compared to CABG. Among patients who underwent PCI, the mortality rate during hospitalization was 5.6%, with 1.4% mortality after discharge. In contrast, among patients who underwent CABG, the mortality rate during hospitalization was 6.8%, with an equal mortality rate of 6.8% observed after discharge. Similar results were reported in a previous study conducted by P J N Andrade et al. in 2011. In their investigation of patients with multi-vessel disease, PCI demonstrated a tendency towards lower early mortality (1.2% versus 2%). However, there was a trend indicating the superiority of CABG in terms of late mortality (10.5% versus 9.6%).[40]

Conclusion

In conclusion, the comparison between coronary artery bypass grafting (CABG) and percutaneous coronary intervention (PCI) in patients with symptomatic multivessel coronary disease reveals equivalent improvement in angina symptoms after 4 months. However, PCI patients are more likely to require further interventions and experience complications at the puncture site, while CABG patients have a higher likelihood of requiring blood transfusions during the procedure.

REFERENCE

Shahjehan RD, Bhutta BS. Coronary artery disease. 2020.

Bryer E, Stein E, Goldberg S. Multivessel coronary artery disease: The limitations of a “one-size-fits-all” approach. Mayo Clinic Proceedings: Innovations, Quality & Outcomes. 2020;4(6):638.

Windecker S, Stortecky S, Stefanini GG, Rutjes AW, Di Nisio M, Siletta MG, et al. Revascularisation versus medical treatment in patients with stable coronary artery disease: network meta-analysis. Bmj. 2014;348.

Wilson JM. Coronary artery bypass surgery and percutaneous coronary revascularization: impact on morbidity and mortality in patients with coronary artery disease. Coronary Artery Disease. 2015:683-726.

Malakar AK, Choudhury D, Halder B, Paul P, Uddin A, Chakraborty S. A review on coronary artery disease, its risk factors, and therapeutics. Journal of cellular physiology. 2019;234(10):16812-23.

Bhowmik D, Das B, Dutta A. Angina pectories-a comprehensive review of clinical features, differential diagnosis, and remedies. Elixir Pharmacy. 2011;40:5125-30.

Gaziano TA, Bitton A, Anand S, Abrahams-Gessel S, Murphy A. Growing epidemic of coronary heart disease in low-and middle-income countries. Current problems in cardiology. 2010;35(2):72-115.

Nikorowitsch J, Borchardt T, Appelbaum S, Ojeda F, Lackner KJ, Schnabel RB, et al. Cardio-renal biomarker soluble urokinase-type plasminogen activator receptor is associated with cardiovascular death and myocardial infarction in patients with coronary artery disease independent of troponin, C-reactive protein, and renal function. Journal of the American Heart Association. 2020;9(8):e015452.

Nishiga M, Wang DW, Han Y, Lewis DB, Wu JC. COVID-19 and cardiovascular disease: from basic mechanisms to clinical perspectives. Nature Reviews Cardiology. 2020;17(9):543-58.

Vivien LCC, Kiong PB, Khurana R. Coronary Artery Disease of the Heart (CAD).

Kucia AM, Beltrame JF, Keenan J. Chest Pain Assessment. Cardiac Care: A Practical Guide for Nurses. 2022:216-30.

Hajar R. Risk factors for coronary artery disease: historical perspectives. Heart views: the official journal of the Gulf Heart Association. 2017;18(3):109.

Jha P. The hazards of smoking and the benefits of cessation: a critical summation of the epidemiological evidence in high-income countries. Elife. 2020;9:e49979.

Huxley RR, Woodward M. Cigarette smoking as a risk factor for coronary heart disease in women compared with men: a systematic review and meta-analysis of prospective cohort studies. The Lancet. 2011;378(9799):1297-305.

Unwin N, Guariguata L, Whiting D, Weil C. Complementary approaches to estimation of the global burden of diabetes. The Lancet. 2012;379(9825):1487-8.

Battiprolu PK, Lopez-Crisosto C, Wang ZV, Nemchenko A, Lavandero S, Hill JA. Diabetic cardiomyopathy and metabolic remodeling of the heart. Life sciences. 2013;92(11):609-15.

Mamudu HM, Paul TK, Wang L, Veeranki SP, Panchal HB, Alamian A, et al. The effects of multiple coronary artery disease risk factors on subclinical atherosclerosis in a rural population in the United States. Preventive Medicine. 2016;88:140-6.

Mathieu P, Lemieux I, Després JP. Obesity, inflammation, and cardiovascular risk. Clinical pharmacology & therapeutics. 2010;87(4):407-16.

Steptoe A, Kivimäki M. Stress and cardiovascular disease. Nature Reviews Cardiology. 2012;9(6):360-70.

Kivimäki M, Nyberg ST, Batty GD, Fransson EI, Heikkilä K, Alfredsson L, et al. Job strain as a risk factor for coronary heart disease: a collaborative meta-analysis of individual participant data. The Lancet. 2012;380(9852):1491-7.

Ma C-Y, Xu Z-Y, Wang S-P, Peng H-Y, Liu F, Liu J-H, et al. Change of inflammatory factors in patients with acute coronary syndrome. Chinese Medical Journal. 2018;131(12):1444-9.

Reckord N, Behnes M, Natale M, Mukherji A, Rusnak J, Ansari U, et al. High sensitivity troponin I and T reflect the presence of obstructive and multi-vessel coronary artery disease being assessed by coronary computed tomography angiography. Current Pharmaceutical Biotechnology. 2017;18(6):508-15.

Park D-W, Clare RM, Schulte PJ, Pieper KS, Shaw LK, Califf RM, et al. Extent, location, and clinical significance of non–infarct-related coronary artery disease among patients with ST-elevation myocardial infarction. Jama. 2014;312(19):2019-27.

Peng L, Guo X, Gao Y, Guo Q, Zhang J, Fang B, et al. Impact of right coronary dominance on triple-vessel coronary artery disease: A cross-sectional study. Medicine. 2018;97(32):e11685.

Votavová R, Linhartová A, Kořínek J, Marek J, Linhart A. Echocardiography in coronary artery disease. Cor et Vasa. 2015;57(6):e408-e18.

Esmaeilzadeh M, Parsaee M, Maleki M. The role of echocardiography in coronary artery disease and acute myocardial infarction. The journal of Tehran university heart center. 2013;8(1):1.

Rallidis LS, Makavos G, Nihoyannopoulos P. Right ventricular involvement in coronary artery disease: role of echocardiography for diagnosis and prognosis. Journal of the American Society of Echocardiography. 2014;27(3):223-9.

Lee SH, Park J-H. The role of echocardiography in evaluating cardiovascular diseases in patients with diabetes mellitus. Diabetes & Metabolism Journal. 2023;47(4):470.

Molina EJ, Shah P, Kiernan MS, Cornwell III WK, Copeland H, Takeda K, et al. The society of thoracic surgeons intermacs 2020 annual report. The Annals of thoracic surgery. 2021;111(3):778-92.

Wilson WM, Cruden NL. Advances in coronary stent technology: current expectations and new developments.
Research reports in clinical cardiology. 2013:85-96.