

FREQUENCY OF CAROTID ARTERY DISEASE IN CANDIDATES UNDERGOING CORONARY ARTERY BYPASS GRAFT

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All the authors contributed significantly to the research that resulted in the submitted manuscript.

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ABSTRACT

Objective: To determine the frequency of carotid artery disease in patients undergoing coronary artery bypass graft (CABG) and to assess the association between carotid artery disease and coronary artery disease (CAD).

Methodology: This cross sectional study was conducted at Rawalpindi Institute of Cardiology, Rawalpindi, Pakistan from October 2013 to April 2014. All participants underwent pre-operative carotid Doppler assessment for level of stenosis and site of carotid plaque. Using the criteria defined by the Society of Radiologists in the Ultrasound Consensus, the degree of stenosis was stratified into the categories of normal (no stenosis), 50% non-obstructive carotid disease, 50-69% significant stenosis, 70% critical stenosis to near occlusion, near occlusion, and total occlusion.

Results: The total number of patients were 140 with the mean age of 59.6 ± 7.1 years. Male to female ratio was 4:1. Normal carotid arteries were seen in 31 (22.2%) patients, while 79 (56.4%) had non-obstructive carotid disease, 15 (10.7%) had significant stenosis, 12 (8.5%) had critical stenosis, and 3 (2.1%) had near occlusion stenosis. Carotid bulb was the most common site of plaque while the left internal carotid artery was the commonest site of both significant and critical stenosis. Near occlusion was noted in left ICA in two patients and right external carotid artery in one patient. Out of 128 patients who underwent CABG, 128 had TVD, DVD in 8 and 4 had SVD on coronary angiography.

Conclusion: We concluded that high number of patients (77.85%) have carotid artery disease on routine ultrasonic carotid assessment. Carotid bulb was the most common site of plaque while the left internal carotid artery was the commonest site of both significant and critical stenosis.

Key Words: Carotid Artery Disease, Coronary Artery Disease, Coronary Bypass Graft, Internal Carotid Artery, External Carotid Artery, Triple Vessel Disease

INTRODUCTION

Cardiovascular disease (CVD) is one of the most common causes of death and disability in the world, with the expected rise to the global leading cause even over and above the infectious diseases.¹ The complete spectrum of atherosclerotic vascular diseases from coronary heart disease (CHD) to cerebrovascular disease (CBVD) and peripheral arterial diseases constitutes the term cardiovascular disease.¹ What used to be a disease specific to a certain economic stratum has spread to encompass all strata, with the rate of death and disability ensuing from CVD among the low-income class increasing exponentially.¹ After being already established as the major cause of mortality and morbidity in the developed countries, the prevalence of CVD is increasing alarmingly quickly in the developing countries as well, with atherosclerosis being responsible for many of the severe manifestations, such as myocardial ischemia, acute myocardial infarction, heart failure, and stroke.² The coexistence of carotid artery diseases (CADs) and CVD is a common finding, albeit a challenge to the physician. Despite the stress on non-surgical management approaches to CVD, coronary artery bypass graft (CABG) still remains one of the most frequent operations for the treatment and management of CVD. The fact that patients with concomitant CVD and carotid disease are at the risk of developing peri-operative neurological events, such as stroke; the most prevalent pertinent event, further complicates the situation.³ The atheromatous status of the extra cranial carotids can be evaluated relatively safely, conveniently, and inexpensively by means of vascular sonography. The superiority of sonography over other methods for the gradation of carotid stenosis has been demonstrated by numerous studies, with some studies actually showing the accuracy of the test to be at least 90%.⁴ This imaging technique has undergone rapid and massive improvements, ever since the first report of intima-media thickness by Pignoli et al, further refining and tuning the results, so that carotid intima-media thickness (CIMT) has now come to be almost a standard imaging test for atherosclerosis, proving to be not only accurate but also cost-effective, dependable, and reproducible.⁵ Further progress has led to the development of the Doppler ultrasonography, which has come to replace all other imaging techniques to be the first in line and the most common technique for diagnosing carotid artery disease.⁶

While the vast majority of the studies are carried out on Caucasians, there have been very few studies in Pakistan that assessed the prevalence of CAD in patients undergoing CABG. The aim of this study was to determine the frequency of carotid artery disease in patients undergoing CABG at Rawalpindi Institute of Cardiology (RIC), Rawalpindi, Pakistan.

METHODOLOGY

This cross sectional study was conducted at Rawalpindi Institute of Cardiology, Rawalpindi Pakistan from October 2013 to April 2014. All patients underwent a detailed history and clinical examination. The carotid arteries were evaluated using Toshiba 64 Aquillion system equipped with a 7.5MHz real-time linear array B mode transducer. This examination was performed with the patient in supine position and head tilted towards the opposite side. Using the criteria defined by the Society of Radiologists in Ultrasound Consensus Conference, the degree of stenosis was classified as normal (no stenosis), 50% (non-obstructive carotid disease), 50-69% (significant carotid disease), $\geq 70\%$ (critical stenosis), and total occlusion.⁶ Patients with previous CABG, congestive cardiac failure and high-risk surgery were excluded. The carotid arteries were evaluated for:

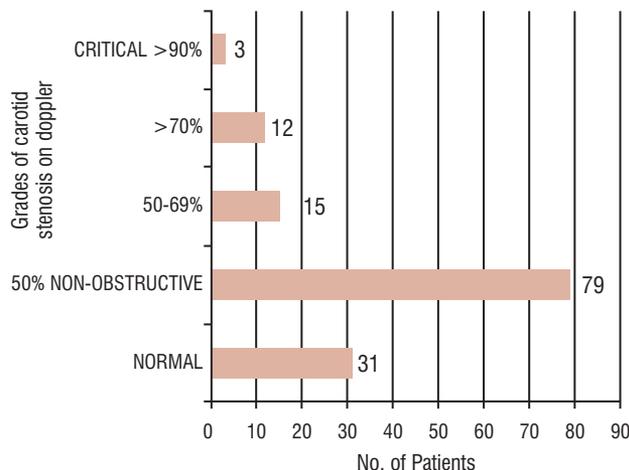
- (1) The intima-media thickness (IMT),
- (2) Presence and site of plaques,
- (3) The degree of stenosis.

Data was analysed using SPSS version 16. Numerical variables like age were presented as mean \pm SD. Categorical variables were presented as frequencies and percentages.

RESULTS

Mean age of patients was 59.6 ± 7.1 years. Male to female ratio was 4:1. The total number of patients was 140, out of which normal carotid arteries were seen in 31(22.2%) patients, while 79(56.4%) had non-obstructive carotid disease, 15(10.7%) had significant stenosis, 12(8.5%) had critical stenosis, and 3(2.1%) had near occlusion stenosis. Carotid bulb was the most common site of plaque while the left ICA was the commonest site of both significant and critical stenosis. Near occlusion was noted in left ICA in two patients and right ECA in one patient (Figure 1). Patients who underwent CABG, 128 had TVD, DVD in 8 and 4 has SVD on coronary angiography.

Figure 1: Grading of Stenosis on Doppler



DISCUSSION

Significant carotid artery disease in candidates going for coronary artery bypass graft (CABG) increases the risk of developing peri-operative neurologic events. Therefore, a pre-operative carotid Doppler ultrasonography, which is simple, non-invasive, and of low cost may be imperative. We conducted this study to look at the frequency of Carotid disease in our population.

The current study shows high frequency (77.8%) of carotid disease among patients undergoing elective coronary bypass graft surgery. Carotid artery disease in preclinical stage with carotid intima-media thickness (CIMT) > 1 mm and non-obstructive (50%) plaques is associated with an increased risk of stroke, neurologic injury, in-hospital mortality, and longer hospitalization in patients undergoing cardiac surgery. The risk of perioperative stroke in patients with normal carotid artery undergoing CABG is between 0.2% and 5.3%, but it increases to 15% in patients with critical carotid stenosis (>70% lesion).³

In our study, the frequency of significant carotid artery stenosis in patients referred for CABG is 10.7%, which is consistent with the previous studies that have reported similar incidence of 6.1-31.7% in CABG patients.^{7, 11, 12-15} For critical stenosis (>70%), the incidence has been reported to be 4.1-13.3%, which is also consistent with our findings of critical stenosis in 8.5% patients.^{8,9,12,16} Kallikazaros et al, reported the carotid bulb as the most common site, followed by internal carotid artery and the common carotid artery (CCA).¹⁶ This remains consistent with our findings of the carotid bulb being the most common site of plaque formation and critical stenosis most commonly occurring in the left internal carotid artery.

Our study clearly shows that there is a high prevalence of carotid artery disease among patients undergoing CABG, which highlights the importance of routine ultrasonographic imaging and Doppler ultrasound assessment in these patients. It is hoped that through these early diagnostic measures, regardless of the degree of stenosis, significant pre and post CABG complications with respect to cerebrovascular accidents can be prevented. Our study group was small due to the involvement of a single clinical center. Since the study was cross-sectional in design, the clinical end-points were not followed.

CONCLUSION

We concluded that high number of patients (77.85%) have carotid artery disease on routine ultrasonic carotid assessment undergoing CABG. Carotid bulb was the most common site of plaque while the left ICA (internal carotid artery) was the commonest site of both significant and critical stenosis.

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