

## FREQUENCY OF CAROTID ARTERY DISEASE IN PATIENTS WITH LEFT MAIN STEM CORONARY DISEASE UNDERGOING CORONARY ARTERY BYPASS GRAFTING

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### Contribution

DN,RAK conceived the idea, planned the study and drafted the manuscript. AM, MAK, NW, JN & MA collected data, did statistical analysis and critically reviewed manuscript. All authors contributed significantly to the submitted manuscript.

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### ABSTRACT

**Objective:** To assess the frequency of carotid artery disease in patients with left main stem coronary disease undergoing coronary artery bypass grafting.

**Methodology:** This cross sectional study was conducted in Department of Cardiovascular surgery Lady Reading Hospital Peshawar from July 2014 to June 2016 for a period of two years. All the patients with Left main stem disease referred for coronary artery bypass grafting were scanned for carotid stenosis with duplex scan. Patients with ongoing angina, hemodynamic instability, emergent CABG were excluded. The carotid stenosis  $\geq 70\%$  was considered severe while 50-69% was considered moderate.

**Results:** A total of 109 patients were included in the study. Of them 87 (79.80%) were males. Mean age of the patients was  $60.87 \pm 4.88$  years. Out of total 109 patients 69 (63.30%) patients had no carotid artery diseases or non significant disease i.e. less than 50% stenosis, while 30 (27.5%) had moderate disease (50-69% stenosis). While 10 (9.20%) had severe carotid artery stenosis ( $\geq 70\%$ ).

**Conclusion:** There is high frequency of significant carotid artery stenosis in patients with left main stem coronary disease. It is recommended that all the patients with left main stem disease should be screened with carotid duplex scan to decrease neurological complications during CABG.

**Key Words:** Carotid artery stenosis, Coronary artery bypass grafting, Left main stem coronary artery disease.

## INTRODUCTION

Despite improvements in mortality for coronary artery bypass grafting (CABG) the cerebrovascular complications remain important. Neurological complications are associated with high morbidity, mortality and increased cost. The patients who suffer perioperative stroke have 21% mortality with mean hospital stay of 25 days among patients who survive.<sup>1</sup>

Extracranial carotid artery disease is important predictor of stroke. Carotid artery stenosis may potentially reduce blood flow to the brain during the surgery and may be the source of emboli, which could result in the stroke or Transient Ischemic Attack (TIA). The risk of stroke or Transient Ischemic Attack in patients with asymptomatic carotid artery disease is 9.2% as compared with 1.3% in patients with no carotid artery disease.<sup>2</sup> Preoperative diagnosis and carotid endarterectomy performed with CABG yield a lower stroke rate. On the other hand in patients with uncorrected significant carotid artery disease the risk of stroke is 10 folds high at a mean follow up of 48 months as compared to the patients undergoing combined CABG and carotid endarterectomy.<sup>3</sup>

Non invasive carotid screening by carotid duplex is used only in selected high risk patients. Carotid artery disease and coronary artery disease share common risk factors and frequently coexist. And there is high prevalence of extracranial carotid artery disease in patient with left main stem (LMS) coronary artery disease and compared with patients with no left main stem disease.<sup>4</sup> This indicates a

need for preoperative carotid ultrasound examination in patients undergoing isolated coronary revascularization for left main stem coronary disease.<sup>5</sup>

The current study is planned to evaluate the frequency of extracranial carotid artery disease in patient with left main stem coronary artery disease referred to our unit for CABG.

## METHODOLOGY

This study was conducted in Department of Cardiovascular Surgery Government Lady Reading Hospital Peshawar from July 2014 to June 2016 for a period of two years. All the patients presenting to department for CABG who had LMS disease were included in the study. Patients with ongoing angina, hemodynamic instability, emergent CABG were excluded. A detailed history, examination and investigations were performed to evaluate the risk factors like age, gender, diabetes, hypertension, and previous history of transient ischemic attacks/stroke.

Bilateral carotid artery screening was performed by consultant radiologist. Peak systolic velocity was measured in internal carotid artery and is compared with common carotid artery. The Duplex criteria for assessment of degree of carotid stenosis is given in table 1.

The stenosis of 70% or above was considered severe, while stenosis between 50% -69% was considered moderate. All the data was entered and analyzed by statistical package for social sciences SPSS version16.

**Table 1: Duplex Criteria for Assessment of Degree of Carotid Stenosis**

Duplex measurement	Mild	Moderate	Severe
PSV <sub>ICA</sub>	< 125	125-229	≥ 230
PSV <sub>ICA/CCA</sub>	< 2	2.0-3.9	> 4

PSV peak systolic velocity ICA Internal carotid artery CCA common carotid artery

## RESULTS

During the study period 523 CABG were performed in the department. Out of these, 109 patients had left main stem disease. Out of these 109 patients who were included in the study 87(79.80%) were males while 22(20.20%) were females. Age of the patient range form 49 to 71 with mean age 60.87 ±4.88 years. About 59 (54.13%) patients had history of smoking, 35(32.11%) had hypertension, and 23(21.10%) were diabetics, 5 (4.59%) patients had history

of TIA while 2 (1.83%) patients had history of previous stroke.

Out of total 109 patients 69 (63.30%) patients had no carotid artery diseases or non significant disease i.e. less than 50% stenosis, while 30 (27.5%) had moderate disease (50-69 % stenosis).About 10 (9.20%) had severe carotid artery stenosis ( ≥70%) (table 2). Out of 10 patients with severe stenosis, 7 patients had left carotid stenosis while 2 patients had right carotid stenosis while1 patient had severe disease on right side and moderate disease on left side. In moderate

**Table 2: Frequency of Carotid Artery Stenosis in Study Population (n=109)**

No.	Degree of stenosis	Number of patients n(%)
1	<50%	69(63.30%)
2	50-69%	30 (27.5%)
3	≥70%	10 (9.2%)

disease group 12 patients had left sided carotid stenosis, 15 patients had right sided disease while 3 patients had bilateral moderate disease.

## DISCUSSION

Coronary atherosclerosis is a multi-focal disease with concomitant involvement of peripheral and carotid vessels. Patients with severe coronary artery disease like LMS disease have increased frequency of carotid artery disease and peripheral vascular disease. Concomitant involvement of cerebrovascular and coronary circulation represents a subset of patients with advanced atherosclerosis which can translate into increase risk of perioperative stroke, increased hospital stay and mortality.<sup>5</sup> Preoperative identification and concomitant carotid endarterectomy with CABG decreases this stroke risk.<sup>6-8</sup> But in practice only minority of patients undergoing CABG are screened for carotid artery disease. In one study of 529 patients from united kingdom only 8% patients were screened for carotid disease.<sup>9</sup> In another study aiming at assessment of clinical utility of carotid duplex in CABG patients, Among 3233 patients in the cohort who underwent cardiac surgery, 515 (15.9%) patients underwent a carotid duplex ultrasound preoperatively, and 2718 patients did not (84.1%).<sup>10</sup> The common clinical practice is to screen only selected high risk patients for carotid artery disease. Advanced age, previous history of stroke or transient ischemic attack, patients with carotid bruit, female gender, hypertension, smoking, dialysis dependent renal failure and presence of LMS disease have been described as risk factors for carotid artery disease in various studies.<sup>5,11</sup>

Left main stem coronary artery disease has consistently been described as a risk factor for presence of concomitant carotid artery disease. In the current study 27.5% of the patients with LMS disease had moderate carotid disease while 9.2% had severe carotid artery disease. This is in consistent with the previous studies. In a study of 99 patients with LMS diseases Khan et al found that more than 30% of the patient had carotid artery disease when carotid arteries were scanned with duplex scan.<sup>12</sup> In a similar study patients undergoing surgical revascularization for LMS disease were compared with an age and sex matched group of patients undergoing revascularization for triple vessels disease. They found that 28% patient had carotid artery disease in LMS group as compared to 11% in triple vessels group ( $p=0.04$ ). They concluded that the presence of atherosclerotic disease of carotid arteries and ascending aorta is significantly more in LMS group as compared to triple vessels group in patients undergoing surgical revascularization.<sup>4</sup> In another study of 539 patients with no symptoms of cerebral ischemia prevalence of carotid artery disease more than 75% in patients undergoing CABG was 8.7%.<sup>13</sup>

Significant carotid artery disease is common in patients undergoing CABG. In studies about one third of the patients

referred for CABG had significant carotid artery disease. Wanamaker et al studied 559 patients who underwent CABG.<sup>5</sup> He concluded that 35.7% of the patients had significant ( $>50\%$ ) disease. Increased age, female gender, hypertension, previous history of cerebrovascular accident, peripheral vascular disease, chronic kidney disease, left main stem disease were risk factors. When analyzing left main disease he found that there is statistically significant difference regarding prevalence of LMS disease among the two groups. Prevalence of LMS disease was 53% among patients with severe carotid artery disease while it was 27% among patients with no carotid artery disease ( $p=0.0004$ ). This study recommended routine screening for carotid artery disease in all patients undergoing CABG. In another study in order to investigate the frequency of carotid disease and to identify high-risk groups among patients scheduled for isolated coronary artery bypass grafting (CABG) procedures under nonemergent conditions, 678 consecutive patients underwent preoperative carotid artery duplex scanning before CABG and it was concluded that there is a linear association between carotid disease and coronary disease ( $p < 0.05$ ).<sup>14</sup>

Drohomyrecka A. et al in a study to assess factors which may facilitate the selection for elective carotid artery ultrasound examination in patients undergoing CABG, used logistic regression analysis to determine the risk factors for carotid artery stenosis. Out of total 682 patients significant carotid artery stenosis  $>50\%$  was present in 123 (18%) patients. This figure is significant lower than current study but it includes all the patients referred for CABG in contrast to our study which includes patients with left main stem coronary artery disease only. He further concluded that presence of left main stem disease was predictor of bilateral carotid stenosis (at least one of them was more than 70%). Other predictor of bilateral carotid disease were history of stroke and lower extremity peripheral vascular disease. They recommended preoperative carotid artery ultrasound, irrespective of patients age, in all patients with more advanced symptomatic atherosclerosis, such as presence of left main stem disease, unstable angina, lower extremity peripheral vascular disease or history of cerebrovascular accidents or stroke.<sup>11</sup>

## LIMITATIONS

This study is single center experience in which patients with unstable angina and emergent cases were excluded. Further left main stem patient were not compared with controls. Furthermore carotid duplex was used for assessment of carotid artery which has inter observer variability. No angiography or cross sectional imaging was used.

## CONCLUSION

There is high frequency of significant carotid artery stenosis in patients with left main stem coronary disease. It is

recommended that all the patients with left main stem disease should be screened with carotid duplex scan to decrease neurological complications during CABG.

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