

## In Hospital Outcomes of Combined Coronary Artery Bypass Grafting (CABG) and Carotid Endarterectomy (CEA)

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### ABSTRACT

**OBJECTIVE:** To determine the early outcomes of surgery in patients who underwent CABG plus CEA and those in whom carotids left untreated in patients having concomitant coronary artery plus carotid artery disease.

**METHODOLOGY:** In this retrospective comparative analysis, we included 60 patients of severe coronary and carotid artery disease, 30 patients who underwent concomitant CABG plus CEA surgery and others who underwent only CABG and no CEA in spite of having severe carotid artery disease. All CEA patients were asymptomatic. These patients were operated from 1-Dec-2010 to 31-Dec-2015. Incidence of stroke and mortality were the primary study outcomes.

**RESULTS:** Mean age of patients in CABG+CEA group was  $55.24 \pm 6.89$  versus  $57.53 \pm 9.42$  years in CABG group. There were 80.0% males in CABG+CEA group and 73.3% in CABG group. 66.7% patients in CABG+CEA group were hypertensive and there were 63.3% hypertensive patients in CABG group. In patients of CABG+CEA, total 2 (6.6%) patients died. One patient died on operation day when he was on ventilator. His brain could not be assessed. One patient had stroke on opposite side of CEA. Doppler study showed stenosis of CEA graft, so its graft was revised. This patient expired after one week. In patients of CABG only, stroke occurred in one patient and that patients died on 5<sup>th</sup> operative day.

**CONCLUSION:** In present study, cerebral morbidity was little high in CABG+CEA patients but with in-significant statistical difference. There is no benefit of prophylactic CEA in cardiac surgery patients having severe asymptomatic carotid artery disease.

**KEYWORDS:** Carotid artery disease, Carotid endarterectomy, Coronary artery disease.

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### INTRODUCTION

Coronary artery bypass grafting (CABG) is the most widely performed cardiac surgery around the globe. There is a close relationship between the coronary arteries and carotid arteries. Carotid artery stenosis is present in about 6-8% of total cases of CABG and it significantly effects the outcomes of CABG<sup>1</sup>. Carotid artery stenosis increases the risk of stroke and hence death in affected patients. About 18% of total deaths after cardiac surgery are reported due to stroke<sup>2</sup>. Reported incidence of severe significant carotid artery stenosis (70% reduced diameter) in patients undergoing CABG is between 2-19%<sup>3</sup>. Routine use of preoperative carotid Doppler study has increased the prevalence rate of asymptomatic carotid stenosis.

In patients with severe carotid artery stenosis, the management options are either medical therapy, carotid endarterectomy (CEA) or carotid artery stenting (CAS). Studies have proved that the rate of stroke and early mortality is high in CAS as compared to CEA<sup>4,5</sup>. In patients undergoing CABG having

concomitant coronary artery and carotid artery disease, the management options are to perform CEA either with CABG or few months after CABG. Some surgeons prefer to perform CABG and CEA as a staged procedure. In their view this will help to reduce mortality due to stroke and provide better outcomes after CABG. While some researches advocate to perform CABG and CEA in a single procedure. And some studies have found that asymptomatic carotid artery disease did not worsen the outcomes of CABG surgery if left untreated for life<sup>6</sup>. So still there are no recommended guidelines regarding management of carotid artery disease in coronary patients. This study was conducted with the aim to determine the early outcomes of CABG surgery in patients who underwent CABG plus CEA and those in whom carotids left untreated in patients having concomitant coronary artery plus carotid artery disease.

### METHODOLOGY

This retrospective study carried out at Choudhry

Pervaiz Ellahi Institute of Cardiology (CPEIC), Multan. Cardiac surgery has been started at CPEIC Multan since October 2007. This is tertiary care center of cardiology and cardiac surgery and is presently performing over 1500 patients open heart surgeries annually. In our hospital routine use of carotid Doppler study is done by radiologist in old age patients who are planned for CABG. Indications of carotid Doppler study are; history of vertigo, CVA/TIA, age more than 60 years, diffuse coronary artery disease, bruit on auscultation. In doubtful patient's carotid angiogram and CT angiogram are done. In this retrospective comparative analysis, we included 60 patients of severe coronary and carotid artery disease, 30 patients who underwent concomitant CABG plus CEA surgery and others who underwent only CABG and no CEA in spite of having severe carotid artery disease. In both groups, patients were asymptomatic and were not having any neurologic morbidity due to carotid artery disease. Consecutive sampling was used for combined CABG plus CEA patients. While we used simple random sampling for selection of CABG only patients because of their large numbers. These patients were operated from 1-Dec-2010 to 31-Dec-2015. Patients with total occluded artery and who underwent staged operation CEA followed by CABG were excluded. This study had approval from department of academic affairs of the hospital.

Post-operative complications like stroke, hypoglossal nerve injury and mortality were noted. Any patient who had not recovered neurologically from operation within 48 hours was included in definition of stroke.

Data of all patients undergoing combined CABG and CEA were retrieved from case records and electronic database. It included age gender, weight, body surface area, diabetes, hypertension, and smoker. At the end morbidity and mortality were noted. All patients were followed till their stay in the hospital.

**Procedures:**

CEA and CABG were performed by same surgical team under general anesthesia. CEA was done first on tight lesion side, and then followed by CABG. Wound was kept open until patient is wean off from by pass and heparin reversed.

For carotid endarterectomy, saphenous vein graft was harvested to put graft on carotid artery. Incision was given vertically over carotid area. Veins in this area were ligated. Jugular veins, common carotid artery at its bifurcation into internal and external carotid artery were identified. Tape was passed behind it. Heparin was given. Carotid vessels were clamped proximally and distally. Arteriotomy was started from common carotid up to bifurcation. It is opened distally up to

extent of atheroma. Plaques were removed. Venous patch of saphenous vein graft was applied over Arteriotomy incision. Wound ass packed. After CEA, cardiopulmonary bypass was started. When CABG was finished and protamine was given, neck was closed and radivac drain was put in wound.

For data analysis we applied chi-square test and independent sample t-test to compare patient's variables between the groups. These tests were applied using SPSS V23 software.

**RESULTS**

In this study, baseline variables of study patients such as age, gender and conventional risk factors of atherosclerosis such as diabetes, smoking and hypertension were similar between the groups. Pre-operative ejection fraction was 54.80±11.24 in CABG+CEA group and 53.96±8.09 in CABG group (Table I).

In patients of CABG+CEA, total 2 (6.6%) patients died. One patient died on operation day when he was on ventilator. His brain could not be assessed. One patient had stroke on opposite side of CEA. Doppler study showed stenosis of CEA graft, so its graft was revised. But still patient had stroke. CT scan showed brain infarction. This patient expired after one week. One patient had numbness of tongue. One patient had haematoma at incision site. However, these two patients recovered and discharged to home.

In patients of CABG only, stroke occurred in one patient and that patients died on 5<sup>th</sup> operative day. There was no any other mortality in these patients.

**TABLE I: BASELINE VARIABLES**

	CABG+CEA (n=30)	CABG Alone (n=30)	P-value
Age	55.24±6.89	57.53±9.42	0.29
Male Gender	24 (80.0%)	22 (73.3%)	0.54
Female Gender	6 (20.0%)	8 (26.7%)	
Diabetes	10 (33.3%)	11 (36.7%)	0.78
Smoking	9 (30.0%)	11 (36.7%)	0.58
Hypertension	20 (66.7%)	19 (63.3%)	0.78
Pre-op EF	54.80±11.24	53.96±8.09	0.74

**TABLE II: COMPARISON OF STROKE AND MORTALITY RATE BETWEEN THE GROUPS**

	CABG+CEA (n=30)	CABG Alone (n=30)	P-value
Stroke	2 (6.6%)	1 (3.3%)	0.55
Mortality	2 (6.6%)	1 (3.3%)	0.55

## DISCUSSION

Patients with Cerebrovascular and coronary artery disease shows advanced atherosclerosis. Treatment option either combined CABG and CEA or staged operation is controversial. Stroke is main complication after CEA. Causes of perioperative stroke are multifocal e.g. embolization of atheromatous material from atherosclerotic aorta, cerebral hypoperfusion, thromboembolism from left atrium, air embolism, embolization of micro aggregates of blood elements formed during CBP and intracranial haemorrhage. Stroke can lead to increased morbidity and increased cost. Some studies have shown satisfactory results for combined carotid and coronary surgery.<sup>7</sup> Preference either CEA in symptomatic patients or asymptomatic is controversial. The North American Symptomatic Carotid Endarterectomy Trial (NASCET) and European Carotid Surgery Trial (ECST) both showed that carotid surgery is beneficial for symptomatic carotid stenosis<sup>8</sup>, however recent guidelines did not recommend CEA in asymptomatic patients having severe carotid artery disease. But we operated these patients before publication of new guidelines<sup>9</sup>. The Asymptomatic Carotid atherosclerosis study (ACAS) has shown surgery is beneficial for reduction in total ipsilateral neurologic events in patients with 60% carotid stenosis from 18% to 7% over 5 years<sup>10</sup>. A recent trial by Feldman DN et al<sup>11</sup> found 4.4% mortality rate in patients who underwent combined CABG and CEA and these authors also found a less rate of stroke in these patients who underwent carotid artery stenting. Another study, conducted in Germany by Weimar C et al<sup>12</sup> found 18.5% rate of stroke and death in patients of combined CABG+CEA as compared to 9.7% in patients who underwent CABG alone but having severe carotid artery disease. Another study they found that incidence of postoperative neurological complication with carotid stenosis >80% was 18.2% and without carotid stenosis was 1.7%<sup>12</sup>. Hertzner NR 1989<sup>13</sup> showed stroke rate in combined procedures was 2.8% as compared with 14.4% for staged operations, however mortality rates were similar. Cerebral revascularization should proceed coronary revascularization. CABG can be done prior to CEA in LMS, unstable angina cases. Combined operations carried out by Akin CW et al<sup>14</sup> and Daily PO et al<sup>15</sup> found these to be cost effective and having low morbidity and stroke rate. Options in management in concomitant in carotid and coronary disease include performing only CABG, staging CEA and CABG that is CEA performed either before CABG or within 10 days of CABG (reverse staging) and combined CEA and CABG. Seven patients (5.8%) sustained perioperative cerebrovascular accidents. Two patients had transient

ischemic attacks. The procedure-related mortality rate was 5.8%<sup>16</sup>. In another study the overall rate of perioperative stroke or death for all surgical patients within 30 days of trial surgery was 7.1%<sup>17</sup>. In our hospital 2 (6.6%) out of 30 patients died.

## CONCLUSION

We are unable to rule out either combined CABG and CEA is beneficial for the patients or not. In our study, cerebral morbidity was little high in CABG+CEA patients. However, due to small sample size of our study, we cannot say that CABG+CEA have higher adverse effects. A meta-analysis also found lower risk of stroke in patients of severe carotid artery disease who underwent CABG only as compared to the combined CABG+CEA approach. And this analysis concluded that there is no benefit of prophylactic CEA in cardiac surgery patients and CEA should only be considered in symptomatic patients<sup>18</sup>. The major limitation of this study is that we did not had the data of post-op atrial fibrillation, which is also a risk factor of stroke after CABG.

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