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ORIGINAL ARTICLE

Prevalence of carotid arterial diseases in patients undergoing CABG operations

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Abstract

Introduction: Prevalence of stroke following coronary artery bypass graft surgery (CABG) is % 2.1-5.2 and associated with high mortality. The purpose of this study was to investigate the prevalence of carotid artery disease in patients undergoing CABG surgery.

Methods: This cross-sectional study was performed in the years 2010-2011 on 192 patients who underwent open heart surgery (CABG) in Imam Reza Hospital in Mashhad. Questionnaires with items about demographic data, risk factors, and outcome of coronary angiography were completed by participants. Carotid Doppler ultrasonography was performed by a radiologist for all the patients, and the data were analyzed in SPSS (V: 15) using chi-square and t-test at $p<0.05$.

Results: In this study, 192 patients (116 male and 76 female) with the mean age of 60.3±10.82 were examined. The prevalence of 50% carotid stenos was 26.6%. Carotid stenosis was found to be directly and significantly related with age and severity of coronary artery disease.

Conclusions: Given the high prevalence of carotid artery stenosis in patients with coronary artery disease, evaluation of carotid arteries in patients undergoing CABG is very important, especially in case of old age and severe coronary lesions.

Key Words: Prevalence; Carotid artery stenosis; CABG

Introduction

Coronary artery disease (CAD) is one of the most common causes of death in modern societies especially in developing countries where the prevalence of CAD is rising due to poor lifestyle, stress, and risk factors for atherosclerosis [1]. Notably, the main cause of CAD is atherosclerosis [2].

Atherosclerosis is a systemic disease that affects the blood vessels generally and can be seen in all organs. One of the most common sites of involvement in atherosclerosis is the bifurcation of the ca rotid artery and the proximal internal carotid. Carotid atherosclerosis implications include cerebral transient ischemic attacks and stroke.

Stenosis of the extra cranial carotid arteries is

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responsible for 30-40% of ischemic cerebrovascular accidents [3].

Simultaneous occurrence of coronary and carotid arteries stenosis due to shared infrastructure (atherosclerosis) and with an expected phenomenon have been observed in various studies [3-5].

Coexistence of stenosis of carotid arteries that increases the risk of mortality and complications such as stroke after surgery is expected in patients undergoing CABG surgery. Therefore, it is necessary for the cardiac surgeon to know about the situation of the carotid arteries prior to CABG surgery. It is even suggested that during operation, surgical correction of the carotid artery (carotid endarterectomy) be performed in conjunction with CABG [3].

This study investigated the prevalence of carotid atherosclerosis lesion in patients undergoing CABG surgery.

Methods

This cross-sectional study included all patients who underwent isolated CABG surgery in Imam Reza Hospital of Mashhad in years 2010-2011. Before surgery, carotid ultrasonography was performed for all the patients by a radiologist using Toshiba Eccocee ultrasound machine with convex 3.75 MHZ and linear 7.5 MHZ probe.

Furthermore, the patients completed a questionnaire that collected information about demographics, risk factors for the condition, and results of coronary angiography by two trained nurses. The data were analyzed in SPSS (version 15) using X2 and t-test at $p<0.05$.

Results

This cross-sectional study was conducted on 192 patients. From among them, 116 (60.4%) were male, and the mean age of the patients was 60.3±10.82 with the minimum and maximum ages of 35 and 82 years. Most patients with carotid stenosis were in their sixties (Figure 1).

Carotid stenosis in 26.6% (51 of 192 patients) was observed (Figure 2).

Patients with carotid artery stenosis were older where the mean age of the patients with normal carotid was 58.7±10.79 years, and patients with carotid narrowing were 64.6±9.74 years (P=0.001) (Table 1).

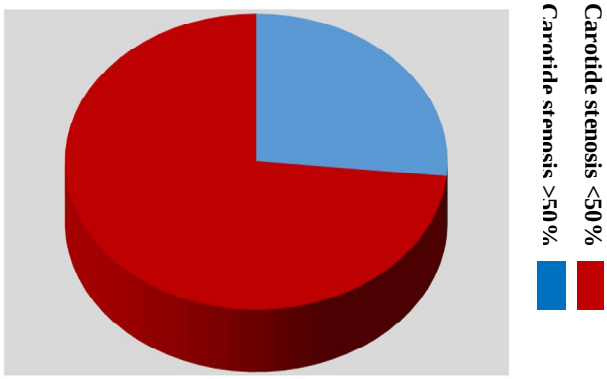


Figure 1: Carotid artery stenosis in patient's candidates for coronary bypass

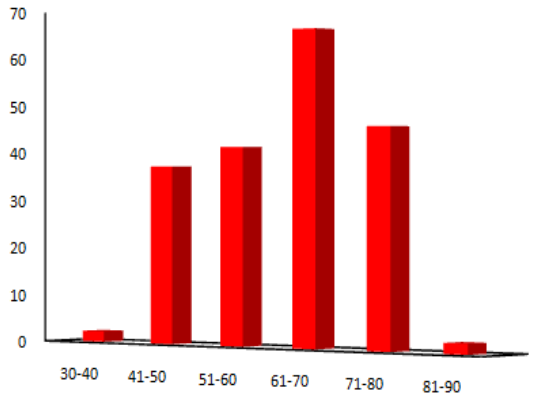


Figure 2: Distribution of carotid artery stenosis according to 10-year age groups

Table 1: Demographic characteristics of patients undergoing coronary artery

The number of involved Carotid vessels	SVD	2VD	3VD	Multi VD
Positive	1 (10%)	4 (15%)	20 (23%)	26 (33%)
Negative	9 (90%)	21 (85%)	65 (77%)	52 (67%)

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Table 2 shows information about carotid stenosis and severity of coronary stenosis. It shows that as severity of coronary artery disease increases, carotid stenosis becomes greater so that only 2% of carotid stenosis in patients with SVD was observed. However, 42% of patients with carotid artery stenosis were involved in more than three coronary arteries (multi vessels) (P=0.03). Carotid artery stenosis was not significantly associated with risk factors or sex.

Table 2: Mean age of patients undergoing coronary artery bypass with or without carotid stenosis

Variable	Mid age	Criteria deviation	P
Positive Carotide Dis.	64.6	9.74	0.001
Negative Carotide Dis	58.7	10.79	-

Discussion

Phenomenon of arteriosclerosis, as a pathophysiology of the coronary and carotid arteries, is expected to accompany these diseases [4, 5]. In Western countries, the incidence of carotid stenosis in patients with severe coronary artery disease is 2-18% [6, 7]. In Japan, the incidence of carotid stenosis in patients with severe coronary artery disease is 13.7% [8].

In Tamimoto, prevalence of carotid stenosis in patients with multivessel coronary diseases was 29.8% [9]. In Tarzamani in Tabriz, stenosis of carotid arteries in patients undergoing CABG surgery is very low 2.9% [10].

In our study, the prevalence of carotid stenosis in patients with coronary artery disease was 26.6%, which is consistent with reports from western countries, although inconsistent with Tarzamani's report. Therefore, race and environmental facilities seem to be involved.

In the study of Evagelopoulos, the mean age of patients with coronary artery disease with involvement of carotid arteries was 66.4 years [11] and the mean age of patients in Fukud's study was 65.3 years [12]. In our study, patients with carotid stenosis were in the 6th decade of life consistent with many other countries.

In the study of Tamimoto, it is determined that the disease of carotid stenosis is associated with age, hypertension, diabetes, history of MI, history of CABG prior, and severity of coronary artery disease. Besides, the age and severity of coronary arterial disease are independent risk factors on carotid stenosis [9].

Tahen's study reported age as an important factor in patients undergoing CABG surgery with carotid artery disease [13]. Shirami's study showed that age above 50 years is a risk factor for carotid stenosis in patients undergoing CABG [14]. In our study, old age and severity of coronary artery disease are significantly associated with carotid stenosis (P=0.001 and P=0.03, respectively).

Open heart surgery and coronary artery bypass can have such complications as bleeding, infection, heart attack and stroke. Contrary to other complication, stroke is an irreversible and debilitating disorder. Thus, it may neutralize the benefits of bypass surgery in the coronary artery stenosis.

Despite several studies that have investigated carotid artery diseases as a risk factor for stroke after CABG [15], the possibility that carotid artery diseases can be a factor of stroke following heart surgery is still controversial. Some studies have statistically suggested that carotid disease has not been the only factor of stroke in CABG operations [16-19].

In another study, carotid disease has been reported as a risk factor of stroke after coronary artery bypass surgery [20]. Considering the differences, it seems necessary to prepare a protocol for screening candidates for surgery of coronary artery bypass. Yet, such a protocol for screening these kinds of patients is not carotid artery diseases available.

Some researchers mentioned some criteria such as age, audible bruit, history of stroke, carotid surgery, peripheral vascular disease, diabetes, and hypertension [21-24].

The prevalence of carotid stenosis associated with CAD in the North East of Iran was higher than the statistics from some Western countries. It is recommended to perform Doppler ultrasound screening randomized for all patients to provide a clear guideline so that appropriate remedial action can be considered for the treatment of both coronary artery disease and carotid artery stenosis.

Conclusions

The prevalence of carotid artery disease in patients undergoing coronary artery bypass grafting in the North East of Iran is of a high percentage. Given the availability of screening, it is recommended to conduct screening for all patients undergoing CABG, especially those older than 60 years and with multiple coronary vessels. It is also suggested to have larger studies in order to prepare guidelines in accordance with the local conditions of each particular region.

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