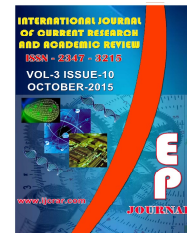




International Journal of Current Research and Academic Review

ISSN: 2347-3215 Volume 3 Number 10 (October-2015) pp. 1-7

www.ijcrar.com



The Prevalence of Carotid Artery Stenosis in Patients Underwent Heart Surgery in Hospitals that Related to Ahvaz Jundishapure University of Medical Sciences

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KEYWORDS

CABG,
Heart surgery,
Carotid artery
stenosis,
CAS

A B S T R A C T

Common pathogenesis of atherosclerotic coronary and carotid diseases has resulted in ever increasing attention of cardiovascular surgeons to detect, evaluate and treat Carotid Artery Stenosis especially in patients undergoing CABG. In this study we examine the prevalence of CAS in cardiac surgical patients through survey responses provided by mentioned diagnostic methods in this study. This is an epidemiological cross sectional study that was conducted in the Cardiac Anesthesia Department at the Referral Hospitals of Golestan and Imam, Ahvaz, Iran, between 2011 and 2012. We examine the prevalence of CAS in cardiac surgical patients. A researcher made questionnaire was used to collect the data. Then data were analyzed using SPSS17. The mild, moderate and severe stenosis were seen in the 61 (10.0%), 31 (5.1%), and 12 (0.2%) of the cases, respectively. Furthermore, total obstruction (99% -100) was observed in one patient (0.2%). The 83 patients (13.7%) had the left carotid stenosis. Out of these patients 63 (10.4%), 12 (0.2%), and 8 (1.3%) patients had a stenosis less than 50%, 50–70%, and higher than 70%, respectively. Fifty two of these patients (8.6%) had at least one atrium plaque and no complete arterial obstruction was observed in them. The 69 patients (11.3%) right the left carotid stenosis. Out of these patients 53 (9.5%), 12 (0.2%), and 4 (0.7%) patients had a stenosis less than 50%, 50–70%, and higher than 70%, respectively. 58 patients (9.5%) were with at least one atrium plaque. The complete arterial obstruction was observed in one patient. In the present study, as mentioned in the chapter of results, the percentage of diseases of diabetes, hypertension, lung disease and high blood fat among patients has been very impressive. As it was seen, 100% of patients who have carotid artery stenosis were diagnosed with high blood pressure.

Introduction

Atherosclerosis is derived from Latin and literally means hardening of the arteries. It is a general term indicating the thickening of an artery wall which leads to loss of its elasticity. Arteriosclerosis is an epidemic in most developed countries. However, it has a much lower prevalence rate in Central and South America, Africa and Asia. Women, who are experiencing pre-menopause, have lower risk of developing atherosclerosis than men of the same age.

Nevertheless, as the risk of the disease grows with age especially in postmenopausal women, the risk becomes equal in men and women in their sixties and seventies (Kumar *et al.*, 2012). Carotid Artery Stenosis is an important cause of stroke (Thomas and Robert, 2010). Roughly 730 thousand strokes occur in the United States of America annually which cost over 40 million dollars yearly. Atherosclerotic disease of the carotid artery is responsible for half of them. History of cerebrovascular accident, hypertension, acute coronary syndrome and smoking are the most common risk factors associated with carotid artery stenosis (DOV *et al.*, 2000).

As mentioned before, females over 60 are more likely to be afflicted by this condition (Alamowitch *et al.*, 2001; Sabeti *et al.*, 2001). Diagnostic procedures include doppler ultrasound, multi slice CT scan digital subtraction and magnetic resonance angiography. However, doppler ultrasound is the gold standard of diagnosis (Forouzan-nia *et al.*, 2006).

Common pathogenesis of atherosclerotic coronary and carotid diseases has resulted in ever increasing attention of cardiovascular surgeons to detect, evaluate and treat carotid artery stenosis especially in patients undergoing CABG (Khairi and Crowson,

1995). Coronary arteries bypass surgery is widely practiced globally. It has been proved that patients who suffer from Carotid Artery Stenosis (CAS), when undergo such operations, are in danger of ischemic stroke before surgery (Tarzamani, 2007). This reduces the quality of life, raises the mortality rate, intensifies the treatment costs and increases the length of hospital stay (Durand *et al.*, 2004). As a matter of fact, studies show that about 3% of the CABG surgeries are complicated by pre-surgery ischemic stroke (Forouzan-nia *et al.*, 2006). Given that patients suffering from CAS are exposed to high risk of neurological disorders associated with CABG surgery, we decided to examine the prevalence of CAS in cardiac surgical patients through survey responses provided by mentioned diagnostic methods in this study so that we can pinpoint high risk groups of patients who have arterial stenosis and are candidates for heart surgery.

Methods and Materials

Study Design

This is an epidemiological cross sectional study that was conducted in the Cardiac Anesthesia Department at the Referral Hospitals of Golestan and Imam, Ahvaz, Iran, between 2011 and 2012.

Study Population

Participants were selected from the patients who underwent the coronary artery bypass graft (CABG). The carotid Doppler ultrasound was performed before the CABG. According to the previous study of Forozannia *et al.* (2006), a sample size of 395 people was calculated.

This sample size was increased to 608 patients due to be available more records, and gave more validity to the results. we

used data from Dr Ahmad Ebadi library and its necessary to say that several years ago he started to Data collection and help anesthesia resident to research about his patient, so this study used from his data and also published some of this result in another valuable article (Firoozabadi *et al.*, 2014). Exclusion study criteria were: the patients who did not undergo cardiac surgery with an exception the CABG prior to the Doppler ultrasonography of carotid arteries. The ethical committee of the Ahvaz Jundishapur University of Medical Sciences approved the study.

Intervention

A researcher- made questionnaire was used to collect the data. This questionnaire included the age, gender, smoking, blood pressure, diabetes the report of the doppler ultrasonography of carotid arteries. The severity of the carotid artery stenosis was measured based on following definition:

Mild stenosis: stenosis below 50%

Moderate stenosis: stenosis between 50 and 70%

Severe stenosis: stenosis above 70%

Statistical analysis

Then data were analyzed using SPSS17. Descriptive statistics was used for presenting tables and figures and Chi-square test was used for comparing carotid artery stenosis in both sexes in different ages.

Data gathering instrument was researcher-constructed questionnaire including patients' demographic information like age and gender and carotid artery diseases data obtained by Doppler method.

The Chi-square test was used to compare the ratio of carotid artery stenosis in the different genders and ages.

Results and Discussion

The six hundred and eight patients were enrolled in the cross-sectional study. Of these patients, 477 people (78.5%) were male and 131 (21.5%) were females (Table 1). In our study 477 (78.5%) and 131 (21.5%) patients were male and female (F/M1: 6). Chi-square showed that the difference of the carotid artery stenosis in two genders is statistically significant ($P=0.026$).

The mild, moderate and severe stenosis were seen in the 61 (10.0%), 31 (5.1%), and 12 (0.2%) of the cases, respectively. Furthermore, total obstruction (99% -100) was observed in one patient (0.2%). The 83 patients (13.7%) had the left carotid stenosis. Out of these patients 63 (10.4%), 12 (0.2%), and 8 (1.3%) patients had a stenosis less than 50%, 50–70%, and higher than 70%, respectively. Fifty two of these patients (8.6%) had at least one atrium plaque and no complete arterial obstruction was observed in them. The 69 patients (11.3%) right the left carotid stenosis. Out of these patients 53 (9.5%), 12 (0.2%), and 4 (0.7%) patients had a stenosis less than 50%, 50–70%, and higher than 70%, respectively. 58 patients (9.5%) were with at least one atrium plaque. The complete arterial obstruction was observed in the one patient.

The Chi - Square test showed a significant difference between the age groups in the carotid artery stenosis degree ($P =0.001$). This means that with aging the carotid artery stenosis rate among patients has also increased. The frequency of the carotid artery stenosis by age groups, smoking and associated diseases is shown in the tables 2, 3 & 4.

In Frozan-nia's study (2006), 76.2% of patients were males and 23.8% of them were women. In Tarzmani's study (2007), 73.1%

of patients were male and 26.9% were female; as well as in Nichal's study (2008), the ratio of male to female has been reported equal to 3 to 1. In other studies conducted on patients with the same condition (Patients candidate for CABG or patients who underwent CABG and vascular ultrasound and Doppler was done for them), percentage and the ratio of male to the female was

similar to the present study and consistent with the obtained results. As it was mentioned, the average age of the patients in the study is equal to 57.3 years. In addition, 1.5%, 18.8%, 49.5%, 23.4%, and 6.9% of patients were under 40, 20–40, 50–60, 60–70, and above 70 years of age, respectively. So, the largest number of patients was in the age range of 50–70 years.

Table.1 Frequency and percentage of the patients according to the age groups

Age groups	Frequency	Percentage
40Under	9	1.5
40-50	114	18.8
50-60	301	49.5
60-70	142	23.4
70 +	42	6.9

Table.2 The frequency of the carotid artery stenosis by age groups

Age	Frequency	Percentage
40Under	1	11.1
40-50	10	8.8
50-60	51	16.9
60-70	27	38.1
70+	16	19
Total	105	17.3

Table.3 The frequency of the carotid artery stenosis by smoking

	Smoking	No smoking	Total
Stenosis	46(7.5%)	59(92.5%)	105(17.3)
No stenosis	171(28.1%)	332(71.9%)	503(82.7%)
Total	217(35.6%)	391(64.4%)	608(100%)

Table.4 The frequency of the carotid artery stenosis compared with the diseases

Disease	Diabetes	Hypertension	Lung disease	Hyper lipidemia
Stenosis	43 (7%)	17.3105	12 (1.9%)	74 (12.1%)
No stenosis	9170(27%)	59.5 362	36 (5.9%)	334 (54.9%)
Total	1213 (35%)	72.5441	48 (7.9%)	408 (67.1%)

The average age of the patients in studies of Shirani *et al.* (2006), Tarzmani (2007), Rosa and Portal (2010), Berens *et al.* (1992), Rashid *et al.* (1996) and Akhtar *et al.* (2009) were 60, 58.5, 63, 65, 65.3 and 65 years, respectively. Also, the age range of the patients in Frozannia's study (Forouzan-nia *et al.*, 2006) and Nichal's study (Nichal *et al.*, 2008) was 35–95, and 65–75 years, respectively. As it was observed, the average age and the age range of our patients is close to the same study; although the minimum average age across all these studies is relevant to this study that it could be from the numerous causes. Different factors, including environmental, geographical, racial and nutritional factors can be reasons for this difference although slight. Also in this study, the 82.7 of the patients were without carotid artery stenosis; 17.3% of the patients were with the carotid artery stenosis; 10%, 5.1%, and 2% of the patients were with the mild stenosis (below 50%), moderate stenosis (between 50 and 70%), and severe stenosis (above 70%), respectively; in addition, complete obstruction was observed in a patient (0.2%). In addition, 13.7% of the patients had the stenosis of the left carotid artery; 8.6% of the patients also had at least one atrium left carotid plaque; 11.3% of the patients had at least one atrium right carotid plaque; moreover, 74 out of 477 male patients (15.5%) were with the stenosis of the carotid artery; 31 out of 131 (23.7%) female patients had the carotid artery stenosis. Moreover, the Chi - square test showed that amount of carotid artery stenosis in women was significantly more than in men ($P = 0.026$). In Shirani's study (Shirani *et al.*, 2006), carotid artery stenosis among patients who underwent heart surgery was 6.9%, but in the patients 65 years old and a higher age were 12.5%. In Forouzan-nia's study (Forouzan-nia *et al.*, 2006), 43.6%, 20.4%, 33.3%, and 2.7% of

the patients had normal doppler, mild stenosis, moderate stenosis; and severe stenosis. In Rosa's study (Rosa and Portal, 2010), prevalence of significant carotid artery stenosis in the patients was 18.7%. 3.6% of patients were without carotid artery stenosis; 77.8%, 11.6%, and 0.2% of the patients were with carotid artery stenosis less than 50%, 70–99%, and shortness of arterial occlusion, respectively. In Rockman's study (Rockman *et al.*, 2004), the one-way or two-way carotid artery more than 50% was in 66 patients (10.8%). In the study of Auastasiadis (Auastasiadis *et al.*, 2009), 7.16%, 5.86%, and 6.51% of patients were with the severe, moderate, and mild stenosis, respectively. In Tarzmani's study (Tarzmani, 2007), 4.8%, 7.4%, 43.2%, and 42.1 of the patients had the plaques on the right and left common carotid arteries, the right and left internal arteries, respectively. Moreover, 1.8% of the patients had a significant stenosis in the internal arteries, and 1.1% of them had severe and critical stenosis in the internal carotid arteries. In Lewis's study (Lewis *et al.*, 1995), 22% of the patients had stenosis more than 50%, in one or both carotid arteries; also 12% of them had stenosis as 80%. In Rashid's study (Rashid *et al.*, 1996), 7% of the patients were with stenosis over 80%. In Zayde's study (Zayde *et al.*, 2009), 97.1% did not have carotid artery problem. In Zayde's study (Zayde *et al.*, 2009), 2.25% of the patients had the significant unilateral internal carotid artery stenosis, and one patient (0.56%) was with unilateral internal carotid artery clod. In Akhtar 's study (Akhtar *et al.*, 2009), 20% of patients had critical stenosis (over 75% of the diameter of the artery) and 3% of patients had complete carotid artery stenosis as well; 50% of patients were with atherosclerotic plaques that were more on the right side and in the common carotid artery. In Shuzou's study (Shuzou *et al.*, 2005), 19.6% of

patients suspected disease of carotid artery had stenosis in Doppler ultrasound. In Nichal's study (Nichal *et al.*, 2008), one patient was with the complete blockage of the carotid artery; 70% or more (2.6%) had stenosis; 10.3% of the patients had the stenosis of 50–69% and 24.8% of them were with the stenosis of 30–49% in the carotid artery. The results of the study are consistent with some similar studies, including Rosa and Portal (2010), Rockman *et al.* (2004), Berens *et al.* (1992), Auastasiadis *et al.* (2009), Ikuof *et al.* (2000), Zayde *et al.* (2009), Shuzou *et al.* (2005) and Nichal *et al.* (2008). However, no significant similarity has shown in the other studies that this can be rooted in different causes, including the possible differences in the genetic, regional differences, and even the existing differences in the person doing the Doppler ultrasound device and the server. Furthermore, in this study, the age have a significant relationship with the increased amount of trouble ($P = 0.001$) that this has been concluded in Shirian's study as well (Shirani *et al.*, 2006). In Akhtar's study (Akhtar *et al.*, 2009) as well as 50% of patients were with atherosclerotic plaques that were more on the right side. In the present study, 8.6% of the patients had the left carotid atrium plaque and as well as, 11.3% were with the plaques on the right carotid.

Acknowledgment

The expense of this thesis has been provided by the credit of the approved research project no u_91072 and all right of this thesis is reserved for Ahvaz Jondishpour University of Medical Science.

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