RESEARCH ARTICLE

IS CORONARY ARTERY BY PASS SURGERY A RISK FOR CEREBROVASCULAR ACCIDENTS IN SMOKERS?

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ARTICLE INFO	ABSTRACT
	Objective: This study aimed to reveal that how often smoker patients with coronary bypass surgery are exposed to cerebrovascular events compared to nonsmokers. **Methods:** In our clinic between December 2011 and September 2013, 100 patients with coronary artery bypass surgery were included in the study. First, patients were divided into two groups: Group 1 (n = 20) smokers and Group 2 (n = 80) non-smokers. Postoperative CVA risk assessments of these patients were done according to the American Heart Association (ACC / AHA) criteria. **Results:** The patients evaluated were 73 male and 27 female. In the smokers group 1 person, in the non-smokers group 2 people had CVA. There were no significant differences between the two groups (p> 0.05). There were no significant differences for intraoperative cardiopulmonary bypass and aortic cross-clamp time between the two groups (p> 0.05). Carotid in tima and media thickness (CIMT) in the group of smokers show a significant difference compared to non smokers (p <0.05). **Conclusion**: When postoperative evaluation between the two groups, in non-smokers group in two patients CVA has been diagnosed (2.5%); in smokers group in one patient CVA has been diagnosed (5%). Although the incidence of CVA was not significantly different, CIMT showed a significant difference in smoking patients compared to non-smokers(p <0.05).

INTRODUCTION

As known, the most important health problem in developing and developed countries is Coronary artery disease. Diagnosis and treatment of coronary artery disease, in terms of health care costs maintain its position in the top row. Prior treatment of coronary artery disease is the prevention of atherosclerosis, so, it should be carried out without the formation of these diseases. If it is diagnosed at an advanced stage and medical treatment is not successful, coronary artery bypass surgery (CABG) is required. There is a risk for this surgery according to the patient's age, carotid artery disease, peripheral artery disease, chronic obstructive pulmonary disease and smoking(1). CVA is the most feared complication in patients undergoing coronary artery bypass surgery(2).CVA can result from various causes(3). SVO is composed of two kinds;

Type 1: include focal cerebral infarction and transient ischemic attacks,

Type 2: characterized by intellectual impairment and disorientation.

In this study, we studied the rate of postoperative CVA in smoker and non-smoker patients.

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MATERIALS AND METHODS

Between December 2011 and September 2013, 100 patients with coronary artery bypass surgery were studied retrospectively. Patients were divided into two groups; Group 1 cigarette smokers (n = 20) and Group 2 non-smokers (n = 80). Group 1 consists of smokers and Group 2 consists of non-smokers and patients who gave up smoking at least one year before. The patients who has coronary artery disease, but can not have coronary bypass surgery, with chronic obstructive pulmonary disease, who gave up smoking in one year, with carotid stenosis more than 70% and with carotid intima-media thickness (CIMT) measurement mismatch were not included in the study. Preoperative risk analysis for postoperative CVA risk was done with the use of the American Heart Association (ACC / AHA) criteria. CVA risk scores, along with other risk factors, were used to assess the appropriate time for surgery. Other risk factors used in the evaluation process were age, gender, body mass index (BMI), hypertension, diabetes mellitus (DM), CIMT and ejection fraction below 45%. During the scanning of patient, files history, preoperative blood tests, pulmonary function tests, chest radiography, echocardiography, and bilateral carotid artery doppler ultrasound examinations were evaluated in the study. CIMT measurement is a simple, reliable and approved non-invasive tests for detection of

subclinical atherosclerosis. CIMT was measured with Vivid 7 (GE Vingmend Ultrasound AS, Horten, Norway) with a linear array 10 mhz probe. Both common carotid arteries 10 mm apart the carotid bulbus were measured. CIMT was measured on the far wall of the image at three adjacent sites 1 mm apart, and the average value of the three measurements was used for analyses. All of surgeries were performed with the support of cardiopulmonary bypass and proximal anastomoses were done with a side clamp. After the patients were extubated and orally feeding has started, 300 mg / day of aspirin was given to reduce the risk of stroke after surgery in all patients routinely. In preoperative and postoperative periods, to regulate blood sugar levels in diabetic patients; diabetic diet and insulin infusions were routinely used. Infusion of insulin was used to maintain blood glucose levels below 185 mg / dl for all patients. In our clinic, patients were followed for coronary and cerebrovascular accidents in the first post-operative month, these examined findings were retrospectively observed. Suspicious patients who have positive signs were evaluated by the department of neurology.

smokers (p> 0.05). Preoperative estimated risk for CVA, postoperative CVA percentage, cardiopulmonary bypass time, cross-clamping time did not differ significantly in smokers and non-smokers (p> 0.05). During the course of studies, three CVA cases were observed. Clinical statements in all three cases were considered as transient ischemic attack. In the first month controls, there were no sequelae. Smokers group showed a significant difference compared with nonsmokers group in terms of CIMT. It was thought that this could arise as an increased risk of CVA.

Discussion and Conclusion

As shown in several studies, the prevalence of smoking is higher in men than in women. Smoking is actively effective in atherosclerotic process, plays an active role since plaque formation in this pathway. Also it has been shown that it increases risks for formed plaque rupture, platelet aggregation on plaque and its resulting myocardial infarction, claudication and stroke. Cessation of smoking preoperatively has a positive

Table 1. Comparison of the demographic data for smokers and non-smokers

	Smoker N=20	Non smoker N=80	P value b
Age (years), mean±SD	67.4±12.4	69.2± 9. 3	0.09
Gender (F/M), n	4/16	23/57	0.64
BMI kg/m2, mean±SD	29.4±4.8	28.6± 5. 6	0.48
DM, n (%)	4(20)	5 (25)	0.28
Hypertension, n (%)	4/20 (20)	22/80 (27.5)	0.44
Estimated Preoperative CVA Risk mean±SD	0.80±0. 3	0.76±0.4	0.36
Postoperative CVA, n (%)	1/20(5)	2/80(2.5)	0.84
Patients with EF < 45, n (%)	4/20(20)	14/80(17.5)	0.40
Cardiopulmonary bypass time (minute), mean±SD	114±18	111.2±19	0.84
Cross clamp time (minute), mean±SD	78±11	76±10	0.92
CIMT (mm), mean±SD	0.89±0.10	0.86±0.11	<0.01

BMI: Body mass index, CIMT:Carotis Intima Media Thickness, CVA: Cerebro vascular accident DM: Diabetes mellitus,
EF: Ejection fraction, F: Female, M:Male   Bold = P < 0.05.

Statistical Analysis

SPPS (version 15.0, SPSS, Chicago, Illinois, USA) is used for the statistical analysis. Quantitative variables were expressed as the mean value ±SD or median (minimum-maximum), and qualitative variables were expressed as percentages (%).The two groups were compared with the Kolmogorov-Smirnov test. A comparison of parametric values between three groups was performed using the Mann-Whitney U-test or student t test. Categorical variables were compared by the Chi-square test or Fisher's exact test. A p value <0.05 was considered statistically significant.

RESULTS

In our study, 73 male and 27 female patients were included. Demographic data regarding the cases is indicated in Table 1. Patients' ages, BMI, renal function tests, total cholesterol values, ejection fractions, diabetes mellitus rates for smokers and non-smokers did not differ significantly in both groups. The rate of patients with ejection fraction lower than 45% did not show significant difference between smokers and non-

contribution in terms of operative mortality (4). Smoking creates an inflammatory response in leukocytes using various pathways and leads to atherosclerotic condition. Firstly enhance adherence of leukocytes to the endothelium of blood vessels (5). Free oxygen radicals, released from neutrophils, have detrimental effects on vascular endothelial cells, and all harmful effects arises from this fact (6). Free oxygen radicals cause oxidative stress at the cellular level. As a result of increased levels of oxidants and decreased levels of antioxidants, free oxygen radicals accumulate (7,8). Both intracellular (superoxide dismutase, catalase and glutathione peroxidase) and extracellular (vitamins C and E) antioxidant enzyme systems and vitamins which are active in normal individuals, do not show the exact activity in patients who smoke. Degenerative effects of cigarette occurs when free radicals in smoke (hydroxyl radical, peroxynitrite, hydrogen peroxide) oxidize other systems.

In addition, smoking also aggravates thrombosis. Studies have been shown, cigarette smoking increases, the levels Von Willebrand factor, catecholamine and thromboxane, and platelets are more active in smokers (9). It leads to endothelial

dysfunction by reducing production of nitric oxide, which is endothelial origin and a strong vasodilator and reducing endothelial bioactivity. There are a lot of studies in the literature about the relationship between smoking and the cerebrovascular events. As a result, a strong link between smoking and stroke was concluded, it has been demonstrated that the risk of stroke in smokers is two to four times greater than nonsmokers (10). The risk of stroke, when compared to non-smokers and quitters is is higher in smokers, and smoking also is known to increase the risk of cerebral infarction. Subclinical peripheral arterial disease and subclinical cerebrovascular events with CIMT should be evaluated in early stages. With proper treatment, side effects that may occur due to this disease will be decreased. In this group of patients, CIMT is an easy, non-invasive and important method that should be consulted for detection of disease at early stages (11). CIMT values in our study showed significant differences in patients who smoke (p <0.05). Also in another study, it has been found that the patients who don't give up smoking after coronary or peripheral bypass operations, were younger, had more preoperative cigarette consumption volumes, had more peripheric bypass operation, and had less family support for giving up smoking. Although the majority of patients, who underwent bypass surgery, left their smoking habit in the early postoperative period, some are starting to smoke again later (12).

Limitations of the Study

During retrospective screening of the files, some datas could not be reached for certain patients and some of the achieved data was not healthy and could not be evaluated. In some data, duration and the amount of smoking for patients was not recorded. Also, in some of the data, it could not be stated exactly when they quitted smoking, so smoking exposure was not clear. In some patients, the amount and duration of smoking and coronary artery disease duration was not recorded, so a full and healthy relation could not be established. Due to the aforementioned reasons, we believe that prospective studies would be more useful, but in our study, we have determined that measurements of CIMT was significantly higher in smokers. We believe that this can cause an increase in the rate of CVA in smokers.

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