EVALUATION OF CAROTID INTIMA-MEDIA THICKNESS IN THE PATIENTS WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE

OMER KARAKAS1, NESAT CULLU2, EKREM KARAKAS1, ZAFER HASAN ALI SAK1, MURAT YILDIZHAN1, ERDEM DAGLIOGLU1, OSMAN KONUKOGLU1, FERIT DOGAN1
Departments of 1Radiology, and ‘Pulmonology, Harran University, Faculty of Medicine, Sanlurfa, Turkey - Departments of 2Radiology, Mugla Sitki Kocman University, Faculty of Medicine, Mugla, Turkey

Introduction

Chronic obstructive pulmonary disease (COPD) is described as an illness condition characterized by poor reversible airway obstruction. COPD is usually progressive and linked to an abnormal inflammatory reaction of the lungs1,2. Even though principally a lung disease, COPD is documented to have significant systemic outcomes that may affect morbidity and mortality3. Especially, it is related to a noticeably increased risk of cardiovascular disease4. The mechanisms responsible for the association between COPD and atherosclerosis are still unclear, but the most likely are chronic systemic inflammation, hypercoagulable status, platelet activation and oxidative stress5.

Preclinical carotid atherosclerosis, characterized by increased intima-media thickness (IMT), is an indicator of atherosclerosis burden and cardiovascular disease risk6. COPD was correlated with increased IMT. Additionally, increased IMT was connected to increased cardiovascular mortality in patients with COPD7.

The aim of this study was to evaluate the changes of carotid intima-media thickness (CIMT) in the patients with chronic obstructive pulmonary disease (COPD).

Materials and methods

The study included 30 male patients and 30 healthy male subjects, who were admitted to our hospital during the

Abstract

Objectives. The aim of this study was to evaluate the changes of carotid intima-media thickness (CIMT) in the patients with chronic obstructive pulmonary disease (COPD).

Materials and Methods. The study included 30 male patients and 30 healthy male subjects. Patients with COPD had moderate level of pulmonary function testing. The study excluded participants taking medications and/or with a history of hypertension, diabetes mellitus (DM), dyslipidaemia and other cardiovascular diseases. The CIMT was bilaterally measured by a Doppler ultrasonography device. Measurements were automatically performed by using IMT (Intima Media Thickness) Software. Two measurements were taken from both the left and right common carotid artery. The mean measurement was used for analysis. Independent sample t-test was used for the comparison of means between the two groups. Pearson’s correlation and linear regression analysis was made to determine the atherosclerotic risk parameters affecting CIMT. Statistical significance was accepted at the level of P < 0.05.

Results. Mean CIMT in the COPD group and control group were 0.62 ± 0.05 mm and 0.45 ± 0.03 mm, respectively. In patients with COPD, the mean CIMT values had a significant negative correlation with FEV1/FVC ratio and FEV1 measurement. Linear regression analysis revealed FEV1/FVC ratio and FEV1 measurement as an independent predictor of the mean CIMT values.

Conclusions. We believe that CIMT measurements can be used in the determination of early atherosclerosis and cardiovascular risks in the patients with COPD. Decreased lung function can related with atherosclerosis.

Key words: Common carotid artery, COPD, Doppler ultrasonography, intima-media thickness.

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past year. Patients with COPD had moderate level of pulmonary function testing (PFT). To obtain uniformity of the distribution, all the patients and healthy controls were selected from the same age range and all participants were male. The forced expiratory volume in 1 second (FEV1) and forced expiratory volume in 1 second/forced vital capacity ratio (FEV1/FVC) measurements of the patient and control groups were obtained via spirometry.

The study excluded participants assuming drugs and/or with a history of hypertension, diabetes mellitus (DM), dyslipidemia and cardiovascular disease. All patients provided written informed consent before the procedure. This study was approved by the Ethics Committee of the University School of Medicine.

The carotid IMT were bilaterally measured by a high-resolution Doppler ultrasonography device (Esaote MyLab Twice, Genoa, Italy) with 12-5 MHz broadband linear array probes. Measurements were automatically performed by using IMT (Intima Media Thickness) Software (Figure 1). Measurements were done at least 10 mm proximal to the carotid bifurcation, in the posterior wall of the left and right common carotid artery. Two measurements were taken from both the left and right common carotid artery. The mean measurement was used for analysis.

Statistical analysis was performed using SPSS for Windows, Version 20 (SPSS Inc, Chicago, IL). Data normal distribution conformity was evaluated by the One Sample Kolmogorov Smirnov Test and homogeneity by the One-Way ANOVA test. For both the COPD and control group, data were obtained as mean standard deviations. Independent sample t-test was used for the comparison of means between the two groups. Pearson’s correlation and linear regression analysis was made to determine the atherosclerotic risk parameters affecting CIMT. Statistical significance was accepted at the level of P < 0.05.

Results

In the study, the mean age of the 30 male patients with COPD was 59.17±6.74 years (range 47-70 years), whereas the 30 healthy volunteers’ one was 59.23±6.30 years (range 45-68 years). Statistically significant difference was not found between the groups in terms of age distribution (P = 0.969). Statistical significant difference was determined between the groups according to FEV1/FVC ratio and FEV1 measurements (both P <0.001).

Mean CIMT in the COPD group and control group were 0.62 ± 0.05 mm and 0.45 ± 0.03 mm, respectively (P < 0.001).

In patients with COPD, the mean CIMT values had a significant negative correlation with FEV1/FVC ratio and FEV1 measurement (both P <0.001). Linear regression analysis revealed FEV1/FVC ratio and FEV1 measurement as an independent predictor of the mean CIMT values.

Discussion

Cardiovascular disease is a main reason of morbidity and mortality in patients with COPD. The all atherothrombotic effect of COPD has more proven by the increased risk of ischemic stroke in patients with COPD.

Pobeha et al. found the relationship between increased CIMT and increased cardiovascular disease risk with airway obstruction severity in COPD patients. In the study of Besir et al, CIMT in COPD patients was found to be higher than of healthy controls’ one. The mean CIMT values had a significant negative correlation with FEV1 measurement. Van Gestel et al. demonstrated that regardless of smoking status, and other comorbidities, moderate to severe COPD was independently associated with increased CIMT. Increased CIMT of COPD patients had higher cardiovascular mortality risk, compared to COPD patients with normal CIMT. Kim et al. established that COPD was associated with increased CIMT. Furthermore, the CIMT was significantly correlated with a decrease in lung function. In addition, increased CIMT was related with increased cardiovascular risk in patients with COPD. CIMT was significantly linked to FEV1, FVC, and FEV1/FVC.
Cardiovascular illness is the major reason of death in patients with mild to moderate COPD, and a decreased FEV1 has been documented to be an indicator for cardiovascular mortality. The other studies proposed that reduced FEV1 is associated with increased ischemic heart disease risk, stroke and sudden death. In the other study, reduced FEV1 was correlated with endothelial dysfunction and atherosclerosis.

In our study, CIMT in COPD patients was found to be higher than healthy controls’ one. Additionally, the increased CIMT was significantly correlated with a decrease in lung function. We found that FEV1/FVC ratio and FEV1 measurement were related with atherosclerosis.

The most important limitation of this study was to that serum or plasma biomarkers of inflammatory or oxidative pathways were not measured.

Conclusion

We believe that CIMT measurements can be used in the determination of early atherosclerosis and cardiovascular risks in the patients with COPD. Decreased lung function can related with atherosclerosis.

References


