

HEMODYNAMICS IN THE COMMON CAROTID ARTERY AND SEVERITY OF CAROTID ATHEROSCLEROSIS IN PATIENTS WITH ESSENTIAL HYPERTENSION

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AIM: To investigate the relationship between hemodynamic parameters of the common carotid artery and the severity of carotid artery atherosclerosis in patients with essential hypertension.

METHODS: Bilateral sides of the common carotid artery, external and internal carotid arteries in 80 patients with essential hypertension were measured by B-mode and Doppler ultrasound. The patients were divided into 4 groups according to the severity of carotid atherosclerotic plaques: none, mild, moderate and severe. Hemodynamic parameters of bilateral common carotid arteries, including peak and mean circumferential wall tension (CWTp and CWTm), tensile stress (TSp and TSm), wall shear stress (WSSp and WSSm) and Young's modulus (E), were calculated after measurements of arterial diameter, intima-media thickness (IMT), and blood flow velocity. All measurements were performed in the common carotid arteries, 1 to 2 centimeter proximal to the bifurcations.

RESULTS: In a simple regression model, the severity of carotid plaques was positively associated with CWTp and CWTm, and negatively associated with TSp and TSm. Spearman correlation coefficients were 0.319, 0.239, -0.274 and -0.338 (all $P < 0.05$). Multiple stepwise regression analysis that adjusted for body mass index, systolic blood pressure, pulse pressure, total cholesterol, HDL-cholesterol, and brachial-ankle pulse wave velocity, found that the severity of carotid plaques was independently associated with age, CWTp and TSm. Neither wall shear stress nor Young's modulus were associated with the severity of carotid plaques.

CONCLUSIONS: In a population-based sample of hypertensive adults, the severity of carotid plaques was positively associated with age and peak circumferential wall tension and negatively associated with mean tensile stress, which may contribute to the plaque burden of low-resistance arteries.

Key words: hemodynamics, carotid atherosclerosis, hypertension

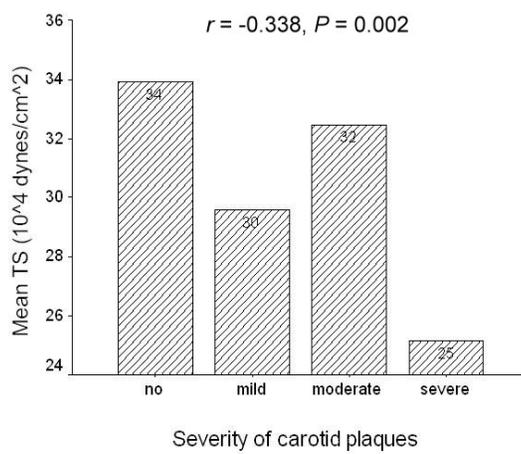
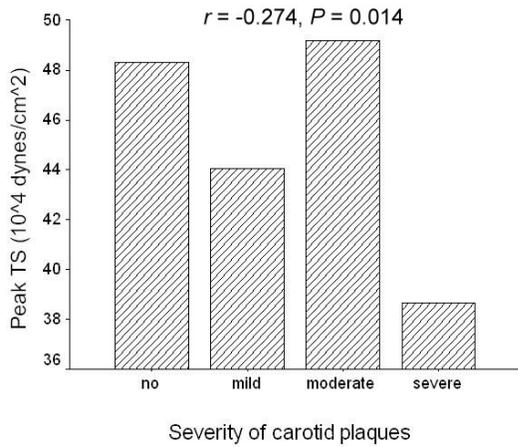
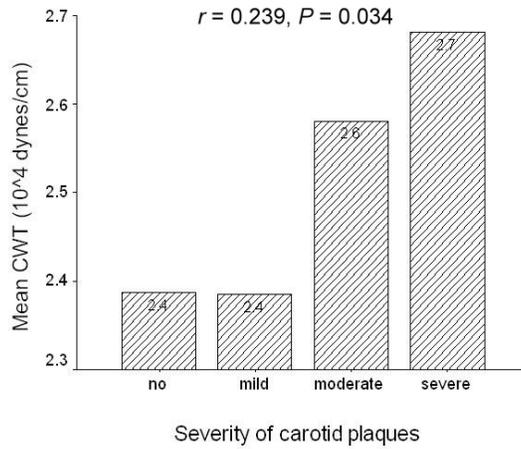
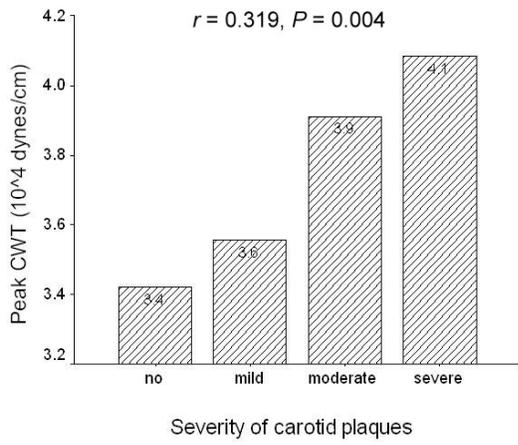


Figure. Spearman's rank correlation of peak and mean circumferential wall tension (CWT, upper panel) and tensile stress (TS, lower panel) to the severity of carotid plaques. There was a significant positive correlation between peak and mean CWT and the severity of carotid plaques. Inversely, there was a significant negative correlation between peak and mean TS and the severity of carotid plaques.