CAROTID ARTERY INTIMA-MEDIA ELASTICITY MEASURED BY ULTRASONOGRAPHY IN SUBJECTS WITH NORMAL INTIMA-MEDIA THICKNESS CORRELATES WELL WITH ATHEROSCLEROSIS RISK FACTORS

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Background and Purpose: Investigations regarding arteriosclerosis of carotid arteries showed association between increased intima-media thickness (IMT) and cardiovascular risk factors. We developed a new transcutaneous ultrasound method for measurement of the elasticity with extremely high spatial resolution of 75 micrometers across the wall and 300 micrometers along the artery. In a pilot study the measured intima-media elasticity on influence of cardiovascular risk factors was examined by comparing the conventional IMT. Methods: The distribution of the elasticity was measured for the posterior wall of the common carotid arteries in 66 male subjects (aged 32 to 62-year-old, 49.8±6.74 years), who did not have atherosclerotic plaque and whose IMT was less than 1 mm (0.65±0.11 mm). The wall of the common carotid artery was divided into three layers (thickness of each layer, 396±37 micrometers). For each layer the elasticity $E(x,z)$ was averaged in the region of 18 mm along the artery. By applying the multiple regression analysis to the resultant three elasticity values, the IMT, and the cardiovascular risk factor, which was obtained from the age, hypertension, hyperlipidemia, diabetes mellitus, obesity, and cigarette smoking. Results: For these subjects, the risk factor was not significantly related to the IMT. However, the risk factor was significantly related to the average elasticity in the three layers ($r=0.568$, $p<0.00001$). Moreover, by applying the multivariate analysis to the elasticity values in the three layers, the strongest predictor of the risk factor was the elasticity in the intima-media ($r=0.640$, $p<0.00001$). Its regression coefficient was largest (0.025 MPa/%). Conclusions: The elasticity averaged in the intima-medial region was measured by a newly developed method and its correlation with the risk factor was higher than the conventional IMT and the overall elasticity of the common carotid artery.