P-2.47

Erythrocyte Adhesion and Biomechanics on Carotid Artery Disease Patients

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Carotid artery disease (CAD) is characterized by the carotid artery occlusion, impairing blood flow to the brain, due to atherosclerotic plaque (AP) formation. Atherosclerotic plaque with significant stenosis predicts stroke risk. Fibrinogen levels are associated with blood clot formation. Using atomic force microscopy, we assessed changes in erythrocyte biomechanical properties, fibrinogen-erythrocyte and erythrocyte-erythrocyte interactions in CAD patients. Blood samples were collected from CAD patients before prophylactic carotid endarterectomy, and every 6 months until 36 months after surgery. Results were compared with healthy blood donors. Higher erythrocyte stiffness was detected on CAD patients before surgery, decreasing 12 months later. Patients had lower fibrinogen-erythrocyte binding forces after surgery. The erythrocyte detachment force also decreased. Higher fibrinogen (total and gamma prime variant) plasma levels were detected in CAD patients before surgery, decreasing after it. Changes in erythrocyte stiffness, adhesion and fibrinogen-erythrocyte binding force were observed during the 36-month follow-up. Erythrocyte adhesion results may eventually be assessed as a cardiovascular risk factor for CAD, to predict and prevent secondary events. Moreover, these results may contribute to the detection of higher probabilities of restenosis events associated with CAD.