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Biomechanics of Human Carotid Artery with Pathological Tortuosity

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Pathological tortuosity of carotid artery ranks second among the causes of cerebro-vascular insufficiency. In their previous researches authors have described the influence of pathological tortuosity type on carotid artery behaviour. In this article we discuss the influence of different anatomic (bending angle, bulb size) and rheological factors on haemodynamics and stress-strain state of carotid artery with pathological tortuosity. Decreasing of the bending angle leads to blood volume reduction in brain and possible formation of septal stenosis in bending area. Diminution of hematocrit level promotes the initiation of atherogenesis in internal carotid bend. Computational modeling of reconstructive surgery of pathologically tortuous carotid of the patient with atherosclerosis was carried out. Numerical analysis of plausible model of patient carotid before pathology formation was conducted. Volume blood flow after surgery has increased by 11%, but remained to be lower than in the healthy patient.

Key words: finite-element analysis, pathological tortuosity, carotid artery, biomechanics.

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