

Longitudinal effects of common carotid artery stenosis on ocular hemodynamics assessed using laser speckle flowgraphy in a rabbit model

ABSTRACT

Real-time impairment of ocular blood flow (OBF) under common carotid artery stenosis (CCAS) has not been ascertained. We aimed to longitudinally assess the impact of CCAS on OBF using a rabbit model. About 75% stenosis was created by tying the common carotid artery with a plastic mandrel using a nylon suture. The plastic mandrel was gently removed, leaving a ligature. Neurological and behavioral assessments were recorded as the clinical indicator of stroke severity. With laser speckle flowgraphy, the pulse waveform parameters namely mean blur rate (MBR), blowout score (BOS), blowout time (BOT), rising rate, S1-area, falling rate (FR), S2-area, flow acceleration index (FAI), acceleration time index, resistive index (RI) and the difference between the maximum and minimum values of MBR (AC) were assessed in overall, vessel, and tissue regions of the optic nerve head (ONH). Longitudinally, BOS significantly increased until day 19 post-surgery, whereas FAI, RI, and AC significantly decreased. Beyond day 19, BOS, BOT, FR, FAI, RI, and AC significantly decreased. We defined two stages representing impaired vessel conditions, namely the vessel resistance phase, where BOS increases and FAI, RI, and AC decrease, and the vessel elasticity phase where BOS, BOT, FR, FAI, RI and AC decrease. These stages provide information about atherosclerosis, assessable non-invasively through the eye.

Keyword: Optical imaging; Predictive markers; Stroke