Lindegaard Ratio

The Lindegaard index is the relation of MCA-mean velocity to ipsilateral mean velocity of the cervical internal carotid artery (ICA).

High velocities in the MCA (>120cm/s) may be due to hyperaemia or vasospasm.

the Lindegaard Ratio helps distinguish these conditions.

<3 = hyperaemia

(>3) = vasospasm

→ 3-6 mild

→ >6 severe

A Lindegaard ratio (ratio of middle cerebral artery to extracranial ICA) of >3 and >6 is indicative of mild-moderate and severe vasospasm respectively and differentiates vasospasm from hyperperfusion. An increase in CBFV of >50% in 24 h is also predictive of vasospasm [1].

Case series

Paredes et al., prospectively studied cranioplasty performed at a hospital over a 5-year period. The National Institute of Health Stroke Scale and Barthel index were recorded prior to and within 72 h after the cranioplasty. A perfusion computed tomography (PCT) and transcranial Doppler sonography (TCDS) were performed prior to and 72 h after the surgery. For the PCT, regions irrigated by the anterior cerebral artery, the middle cerebral artery (MCA), the posterior cerebral artery, and the basal gangliawere selected, as well as the mean values for the hemisphere. The sonography was performed in the sitting and the supine position for the MCA and internal carotid. The velocities, pulsatility index, resistance index, and Lindegaard ratio (LR) were obtained, as well as a variation value for the LR (ΔLR = LR sitting - LR supine). Fifty-four patients were included in the study. Of these, 23 (42.6%) patients presented with objective improvement. The mean cerebral blood flow of the defective side (m-CBF-d) increased from 101.86 to 117.17 mL/100 g/min ($p = 0.064$), and the m-CBF of the healthy side (m-CBF-h) increased from 128.14 to 145.73 mL/100 g/min ($p = 0.028$). With regard to the TCDS, the ΔLR was greater on the defective side prior the surgery in those patients who showed improvement (1.295 vs. -0.714; $p = 0.002$). Cranioplasty resulted in clinical improvement in 40% of the patients, with an increase in the post-surgical CBF. The larger variations in the LR when the patient is moved from the sitting to the supine position might predict the clinical improvement [2].

1)
Malhotra K, Conners JJ, Lee VH, Prabhakaran S. Relative changes in transcranial Doppler velocities are inferior to absolute thresholds in prediction of symptomatic vasospasm after subarachnoid hemorrhage. J Stroke Cerebrovasc Dis. 2014;23:31–6.
2)
Paredes I, Castaño AM, Cepeda S, Alén JA, Salvador E, Millán JM, Lagares A. The Effect of Cranioplasty on Cerebral Hemodynamics as Measured by Perfusion Computed Tomography and Doppler Ultrasonography. J Neurotrauma. 2016 Sep 1;33(17):1586-97. doi: 10.1089/neu.2015.4261. Epub 2016 Jan 28. PubMed PMID: 26541365.