Cerebral artery

see Anterior cerebral artery

see Middle cerebral artery

see Posterior cerebral artery

Quantitative data on branching patterns of the human cerebral arterial tree are lacking in the 1.0-0.1 mm radius range.

Helthuis et al. from the Department of Neurosurgery, Brain Technology Institute, Department of Anatomy, Department of Radiology, University Medical Center Utrecht, Department of Anatomy, Radboud University Medical Center, Nijmegen, The Netherlands, Department of Pulmonology, Heilig Hart Ziekenhuis, Mol, Belgium, aimed to collect quantitative data in this range, and to study if the cerebral artery tree complies with the principle of minimal work (Law of Murray). To enable easy quantification of branching patterns a semi-automatic method was employed to measure 1,294 bifurcations and 2031 segments on 7 Tesla-MRI scans of two corrosion casts embedded in a gel. Additionally, to measure segments with a radius smaller than 0.1 mm, 9.4 T-MRI was used on a small cast section to characterize 1,147 bifurcations and 1,150 segments. Besides MRI, traditional methods were employed. 733 bifurcations were manually measured on a corrosion cast and 1808 bifurcations and 1,799 segment lengths were manually measured on a fresh dissected cerebral arterial tree. Data showed a large variation in branching pattern parameters (asymmetry-ratio, area-ratio, length-radius-ratio, tapering). Part of the variation may be explained by the variation in measurement techniques, number of measurements and location of measurement in the vascular tree. This study confirms that the cerebral arterial tree complies with the principle of minimum work. These data are essential in the future development of more accurate mathematical blood flow models [1)].

1)
Helthuis JHG, van Doormaal TPC, Hillen B, Bleys RLAW, Harteveld AA, Hendrikse J, van der Toorn A, Brozici M, Zwanenburg JJM, van der Zwan A. Branching pattern of the cerebral arterial tree. Anat Rec (Hoboken). 2018 Oct 17. doi: 10.1002/ar.23994. [Epub ahead of print] PubMed PMID: 30332725.