Beyond Neurons: Mapping the Fine-Scale Organization of Blood Vessels in the Brain May Provide New Insights Into the Mechanisms of Dementia

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While significant advances in neuroscience have been achieved in understanding, diagnosing, and treating neurological diseases, still much remains to be characterized. The purpose of this study is to assess scans and measurement techniques to optimally map the fine-scale organization of arteries, veins, penetrating arterioles, and venules in the brains of mouse models. Samples were collected using different lenses, dimensions, and slices in the scan. The research focused on quantifying the number and density of vessels, measuring the dimensions and spacing of these blood vessels, and comparing the results based on how the sample was generated. I used Imaris software to extract the metrics, using datasets with layered scans, collected using two-photon imaging. Summary of results: At height Z=200μm, there are more venules (17) than arterioles (11), the arteriole spacing ranges from 20μm to 828μm and the venules spacing ranges from 60μm to 816μm. At height Z=550μm, the same number of arterioles and venules are present, the arteriole spacing ranges from 80μm to 742.2μm and the venules spacing ranges from 89.5μm to 800.5μm. Conclusion: As the clipping plane height increases, fewer vessels reach that height. The density of the vessels decreases as we traverse upwards along the 3D cube scan. The findings from such studies can help build a comprehensive view of the brain vasculature, the study of how the brain adapts to changes in health and during disease progression, and for early detection to better battle neurodegenerative diseases and strokes.