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The drainage of brain interstitial fluid (ISF) is partitioned in the rat brain

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Purpose: The present study aims to explore the fundamental characteristics of brain interstitial fluid (ISF) drainage in living rat brains by using MRI and to investigate the correlations between the ISF drainage and regional structure of ECS.

Methods & Materials: The ISF drainage was traced with Gd-DTPA in rat brain *in vivo*. The distribution and clearance of the traced brain ISF in eleven regions were observed by using the dynamic MR scans. The maximal distribution Vd in each region was standardized and mapped. Based on the traditional diffusion mathematic model, the regional diffusion parameters and tortuosity of brain extracellular space (ECS) were calculated and derived from the concentration-time curve in ROI on MRI.

Results: Eleven partitioned ISF drainage areas were demonstrated. The clearance rate of ISF and tortuosity of ECS were specific in different brain regions, the highest ECS tortuosity was found in the midbrain (2.41 ± 0.88) and the longest clearance time was 72 hours in the olfactory bulb with a half-time time of 4.65 ± 0.91 hours, the maximal volume distribution was revealed in the caudate putamen $(10.39 \pm 1.39\%)$, in which a cross-regional distribution was presented and the brain ISF finally drained into CSF compartment.

Conclusion: Our study suggested that rat cerebrum could be divided into 11 sub-regions based on the intrinsic property of ISF drainage and ECS structure. The knowledge of brain ISF drainage system would provide a useful reference for interstitial drug delivery, like the convection-enhanced drug delivery or simple diffusion delivery.

Biography

Hongbin Han completed his Ph.D. from Peking University Health Science Center and obtained the professional qualification in MRI Pulse Sequence Design in United States. He is the Deputy Director of Scientific Research Department of Peking University Health Science Center. He has published more than 100 papers in reputed journals and serving as the Vice-Chairman of Magnetic Resonance Imaging Society affiliated to Chinese Society of Medical and Academic consultant of Beijing Society of Radiographers and Radiological Technologists.

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