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"Visualization of brain water dynamics reveals the pathophysiological roles of aquaporin-4(AQP4) in neurodegenerative disorders"

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Water, which constitutes approximately 80% of the brain, is fundamental in various physiological and pathological conditions. And aquaporin-4 (AQP4) plays an important role to regulate brain water dynamics. Recent studies suggested that the fluid flow in the brain may contribute to the clearance of wastes. Understanding fluid dynamics in the brain, therefore, has great potential for elucidating the mechanisms of neurodegenerative disorders. However, in sharp contrast to solutes, the dynamics of water in brain tissues have been poorly characterized, due to lack of appropriate analytical tools. Here, we aimed to overcome this limitation by applying stimulated Raman scattering (SRS) multimodal multiphoton confocal microscopy to live brain tissues as well as *in vivo* mouse brain. Indeed, SRS can readily distinguish D₂O and H₂O and is able to visualize dynamics of D₂O ~100 μm deep in brain tissues, owing to high tissue penetration of near infrared laser being used. The modified SRS system visualizes the dynamics of D₂O in mouse brain *in vivo* following intravenous introduction of the D₂O-based saline solution through the femoral vein. Thus, our approach reveals unique properties of the water dynamics in the living brain as well as roles of AQP4 by comparison between WT and AQP4-null mice. AQP4 has been implicated in several neurologic conditions, such as brain edema, seizure and neurodegenerative diseases. Understanding of AQP4 function will also provide new insights into several neurologic disorders especially regarding to brain water dynamics, and we believe that AQP4 is a potential therapeutic target in multiple neurologic conditions.

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Large Meeting Room, Faculty of Medicine Bldg. B

Host: Akiyuki Taruno