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Does injection in the cisterna magna drive fluid flow into the brain? ADITYA RAGHUNANDAN, ANTONIO LADRON DE GUEVARA RUIZ, University of Rochester, JEFFEREY TITHOF, Department of Mechanical Engineering, University of Minnesota, JOHN THOMAS, Department of Mechanical Engineering, University of Rochester, MAIKEN NEDERGAARD, DOUGLAS KELLEY, University of Rochester — According to the glymphatic hypothesis, fluid enters the brain and clears neuronal waste products, such as amyloid-β, from deep within the brain tissue. Failure to clear such waste products can lead to large amyloid deposits in the brain – the diagnostic signature of Alzheimer's disease. The pulsatile convective influx of cerebrospinal fluid (CSF) through narrow perivascular spaces surrounding the brain's vasculature is integral to this clearance mechanism. Experiments that inject tracer particles in the cisterna magna have shown evidence that CSF flow is driven by arterial pulsation. Yet, this notion remains controversial as the tracer injection process could also drive flow by increasing intercranial pressure. Here, we present results quantifying the glymphatic influx from experiments that combine in vivo imaging and particle tracking. We utilize a dual syringe system with simultaneous injection and withdrawal of fluid from the cisterna magna. The net change in intercranial pressure is negligible, but tracers are still found to be actively pumped into the brain. Furthermore, we show that mean flow speeds and flow characteristics observed across injection methods are consistent, bolstering the hypothesis that arterial pulsation is the primary driver of flow into the brain.

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