Redefining MRI:
From Image to Insight

ICMRI 2026
THE 14th INTERNATIONAL CONGRESS ON MRI
& 31st ANNUAL SCIENTIFIC MEETING OF KSMRM

AUGUST 27 - 28, 2026
Grand Walkerhill Seoul, Seoul, Korea
https://icmri.ksmrm.org/2026m

iMRI Invited

SY08-3

Brain Cleaning: Making the Invisible Visible

Roh-Eul Yoo

Seoul National University Hospital, Korea

The glymphatic system, glial-dependent waste clearance pathway, is an emerging circulatory model in the brain, characteristically devoid of authentic lymphatic vessels. The key component of the glymphatic system is the perivascular space (PVS). At the periarterial space, the cerebrospinal fluid (CSF) is allowed to enter the interstitial space of the brain through the aquaporin-4 water channels at the end feet of astrocytes. CSF mixed with the interstitial fluid then exits the brain via the perivenous space along with metabolic waste products. The waste clearance pathway downstream to the glymphatic system comprises meningeal lymphatic vessels, an authentic lymphatic network found at the dura, cranial nerves, and large vessels at the skull exits.

Accumulating evidence suggests the clearance of metabolites such as tau protein, amyloid-β, and lactate from the brain through the glymphatic system. Impairment of the glymphatic system is an important pathophysiology of various pathologic conditions, including Alzheimer's disease, traumatic brain injury (TBI), normal pressure hydrocephalus (NPH), Parkinson's disease, and sleep disorders. In particular, Taoka et al. have reported a close association between sleep and glymphatic activity in rats using an intravenously (IV) injected GBCA.

Fluorescent CSF tracers and intrathecally injected gadolinium-based contrast agents have been used to obtain the functional imaging of the brain waste clearance systems. Recent human studies have shown the potential of intravenous contrast-enhanced dynamic T1 mapping, DTI, intravenous contrast-enhanced black-blood imaging, and ASL-based imaging technique in imaging glymphatic and meningeal lymphatic vessel flow. In this brief lecture, clinically applicable imaging techniques and their limitations will be introduced.

Keywords: *Glymphatic flow, Meningeal lymphatic vessel flow, MR imaging*