Developing topics

Novel MRI techniques identifying vascular leak and paravascular flow reduction in early Alzheimer disease

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Abstract

Background: With beta amyloid and tau antibody treatment trial failures, avenues directed to other facets of the disease pathophysiology are being explored to treat in the preclinical or early clinical state. Clear evidence of blood brain barrier (BBB) breakdown occurring early in the AD process has recently been established. Likewise, the glymphatic system regulating water and solute inflow and outflow in parallel with the vascular system is affected causing delayed clearance of fluid waste. It’s dysfunction as a component of AD along with BBB leak are reasonable candidates to explore for future treatments.

Method: We will review the known physiology and anatomy of the BBB system, its relationship to the glymphatic system and the microglial surveillance system. Ideally, human medication trials require a non or minimally invasive method of quantifying both improvements in BBB integrity and glymphatic fluid clearance correlated with clinical outcomes.

Result: Dysfunction of this tripart system occurring in Alzheimer disease (AD) will be reviewed along with existing MRI tools for identifying altered flow dynamics useful for monitoring improved functionality with future treatments.

Conclusion: High resolution dynamic contrast enhanced MRI imaging demonstrating BBB leak and the recently reported non-invasive 3D PASL MRI pilot study demonstrating significant delay in glymphatic clearance in AD subjects appear to be the best candidates.
Figure 1

Figure 2 Pathologic sequence AD