“Oligodendrocyte precursors migrate along vasculature in CNS development and disease”

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Abstract

Oligodendrocytes myelinate axons in the central nervous system and develop from oligodendrocyte precursor cells (OPCs) that must first migrate extensively during brain and spinal cord development. Despite decades of work on OPC migration, it has remained unclear how this highly migratory cell type distributes so rapidly around the developing CNS. We show that OPCs require the vasculature as a physical substrate for migration. We observed that OPCs of embryonic mouse brain and spinal cord, as well as human cortex, emerge from progenitor domains and associate with the abluminal endothelial surface of nearby blood vessels. Migrating OPCs crawl along and jump between vessels. OPC migration in vivo was disrupted in mice with defective vascular architecture but normal in mice lacking pericytes. Thus physical interactions with the vascular endothelium are required for OPC migration. We identify Wnt-Cxcr4 (chemokine receptor 4) signaling in regulation of OPC-endothelial interactions and propose that this signaling coordinates OPC migration with differentiation. Additionally we will discuss how perivascular migration of OPCs is involved in remyelination of lesions in Multiple Sclerosis and Cerebral Palsy, and how this type of migration contributes to tumor cell invasion and vessel co-option in glioblastoma.

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