Lymphatic Vessels Found in the Brain—Osteopathic Considerations


In previous editions of The Somatic Connection,1,2 we have reviewed basic science research illuminating osteopathic medical practice, particularly brain functions potentially affected by osteopathic manipulative treatment (OMT). In the October 2012 column,1 research on cerebrospinal fluid (CSF) drainage into the venous drainage system, now popularly termed the glymphatic system, was reviewed. The May 2014 column2 reviewed research elaborating how glymphatic system activity is enhanced during sleep and facilitates the cleansing of the brain. These reviews suggest the possible application of osteopathic cranial manipulative medicine procedures as possibly having effects on CSF functions.

Researchers at both the University of Virginia in Charleston and the University of Helsinki in Finland independently and concurrently found lymphatic vessels in the brain, which reverses decades-long basic science opinion that the brain was devoid of any lymphatics. These discoveries bring the lymphatic system into the same conversation as CSF with regard to intracranial fluid flow dynamics.

Both studies used lymphatic endothelial cell markers to identify lymphatic vessels in the dural membranes in and around the brain. Previous research found that CSF drained into the venous circulation through arachnoid granulations,3,4 and another study5 found that CSF is also drained into extracranial lymphatic and lymph nodes. However, the mechanism of how CSF entered the extracranial lymphatic vessel and nodes was unclear. The reviewed studies offer a clear explanation as to how CSF enters the lymphatic system and how cerebral interstitial fluid is cleared of waste products. Experts previously thought that the blood-brain barrier would limit clearance of macromolecules such as amyloid β and other waste products of cellular metabolism. Both studies suggest that the adjacent dural lymphatic network may be the mechanism for clearance of these larger molecules, some of which have been associated with Alzheimer disease.

Although there is still a need to demonstrate the impact of OMT on intracranial fluid dynamics, the scientific basis for the impact of OMT, including osteopathic cranial manipulative medicine, has now been laid out. Such OMT procedures as anterior cervical lymphatic drainage facilitation could affect intracranial fluid dynamics based on these new data. If we add in the immune system impact via the cranial lymphatic flow, brain-immune system interaction should also be examined.

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References