The Possible Role of Cranio-Cervical Trauma and Abnormal CSF Hydrodynamics in the Genesis of Multiple Sclerosis

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KEY POINTS FROM THIS ARTICLE:

1) Eight MS patients and 7 normal volunteers were MRI scanned on a 0.6 T scanner with a quadrature head-neck combination coil to visualize the overall CSF flow pattern. The scans were performed in both the upright and recumbent positions using the FONAR UPRIGHT(R) Multi-Position™ MRI.

2) An important benefit of MRI technology is the ability to visualize the plaque lesions of Multiple Sclerosis.

3) The advent of phase coded MR imaging has made it possible to visualize and quantify the dynamic flow of the cerebrospinal fluid (CSF) within the cranial vault and spinal canal.

4) UPRIGHT(R) Multi-Position™ MR scanning has uncovered a key set of new observations regarding Multiple Sclerosis (MS), which observations are likely to provide a new understanding of the origin of MS.

5) “The UPRIGHT(R) MRI has demonstrated pronounced anatomic pathology of the cervical spine in five of the MS patients studied and definitive cervical pathology in the other three. The pathology was the result of prior head and neck trauma.”

[KEY POINT]

6) Seven of 8 MS patients in this study had a history of serious prior cervical trauma which resulted in significant cervical pathology. The cervical pathology was visualized by UPRIGHT(R) MRI.

7) “Upright cerebrospinal fluid (CSF) cinematography and quantitative measurements of CSF velocity, CSF flow and CSF pressure gradients in the upright patient revealed that significant obstructions to CSF flow were present in all MS patients. The obstructions are believed to be responsible for CSF ‘leakages’ of CSF from the ventricles into the surrounding brain parenchyma which ‘leakages’ can be the source of the MS lesions in the brain that give rise to MS symptomatology.”

8) The CSF flow obstructions are believed to result in increases in intracranial pressure (ICP) that generate ‘leakages’ of the CSF into the surrounding brain parenchyma.
9) In 7 of 8 MS patients, anatomic pathologies and CSF flow abnormalities were found to be more severe in the upright position than in the recumbent position.

10) “Traditionally the symptom-generating lesions in the brain and spinal cord of Multiple Sclerosis (MS) patients are ascribed to tissue specific autoimmune interactions.”

11) Abnormal CSF flows were found in all eight MS patients. “The abnormal CSF flows corresponded with the cranio-cervical structural abnormalities found on the patients’ MR images.

12) “Every MS patient exhibited obstructions to their CSF flow when examined by phase coded CSF cinematography in the upright position.”

13) “All MS patients exhibited CSF flow abnormalities that were manifest on MR cinematography as interruptions to flow or outright flow obstructions somewhere in the cervical spinal canal, depending on the location and extent of their cervical spine pathology. Normal examinees did not display these flow obstructions.”

14) “Trauma may have a causative role in the onset of MS.” [Important]

15) “All seven patients had distinct cervical anatomic pathology on their current MR images that corresponded with their trauma histories, thereby establishing that the historical trauma events contributed directly to their permanent pathologies of the cervical spine and that their cervical trauma histories were not immaterial.”

16) “Four had received neck injuries in motor vehicle accidents, three of which were whiplash injuries, and the fourth a “reverse whiplash” (neck flexion preceding neck extension) injury. A fifth, patient was involved in a severe motor vehicle accident at age 2–3 that “totalled” the car in which she was riding without a seat belt or infant seat.”

17) “In all but two of the patients the trauma preceded the onset of MS symptoms by more than 8 years.”

18) “The abnormal CSF flow dynamics found in the MS patients of this study corresponded to the MR cervical pathology that was visualized.” [Key Point]

19) “The findings raise the possibility that interventions might be considered to restore normal intracranial CSF flow dynamics and intracranial pressure (ICP).” [Important]

20) The elevated peak CSF velocities measured in the MS patients indicate elevated intracranial pressures (ICP) in these MS patients. The elevated ICP is the origin of the CSF “leaks” that appear in MS patients.
21) “The most important finding of this study is that cerebrospinal fluid ‘leaks’ from the ventricles of the brain into surrounding brain parenchyma, possibly secondary to trauma induced blockages of CSF flow and resulting increases in ICP, may be playing an important etiologic role in the genesis of Multiple Sclerosis.”

22) Protein is the principal ingredient, other than water, of the cerebrospinal fluid. These authors suggest that the “leakage” of these CSF antigenic proteins, could be the source of the antigens generating the autoimmune reactions known to be the origin of MS lesions.

23) Trauma induced “leakage” of CSF antigenic proteins into the surrounding brain parenchyma is contributing to the formation of MS plaques.

24) “The findings further suggest that going forward, victims of Motor Vehicle Whiplash injuries with persisting symptoms, e.g., headache, neck pain, should be scanned by UPRIGHT(R) MRI to assure that their CSF hydrodynamics and cervical anatomy (C1-C7) are normal. Should their CSF hydrodynamics prove abnormal, they should be monitored by UPRIGHT(R) MRI to assure they are restoring to normal over time, or ultimately decompressed by expansion stenting or cervical realignment if they are not.”

25) “In conclusion, the results of our investigation suggest that Multiple Sclerosis may be biomechanical in origin wherein traumatic injuries to the cervical spine result in cervical pathologies that impede the normal circulation of CSF to and from the brain.” “The obstruction to CSF outflow would result in an increase in ventricular CSF pressure (ICP) which in turn could result in ‘leakage’ of cerebrospinal fluid and its content antigenic proteins (e.g., tau proteins) into surrounding brain parenchyma. The attachment of antigenic proteins to surrounding brain nerve fibers would stimulate the antigen-antibody reactions that produce the axon demyelinations characteristic of MS.”

COMMENTS FROM DAN MURPHY:

This is an important article for chiropractors. These authors suggest that cervical spine trauma and malalignment obstructs the flow of cerebral spinal fluid. This obstruction of CSF flow increases intracranial pressure, causing cerebral spinal fluid to leak out, along with antigenic proteins. The immune system’s response to these antigenic proteins cause the demyelination of multiple sclerosis.

These authors suggest that the improvement of spinal malalignment could improve cerebral spinal fluid flow, stopping the aforementioned cascade to MS. In fact, in one of the MS patients, the UPRIGHT MRI found a malalignment of C-1. This malalignment “was successfully treated by Dr. Scott Rosa, using the Atlas Orthogonal (AO) instrumentation.” “The patient's symptoms, severe vertigo accompanied by vomiting when recumbent and stumbling from unequal leg length, ceased upon treatment.” Objective improvements in obstructed CSF fluid was also noted “immediately following treatment with the AO instrument.”