

Use of Magnetic Resonance Venography for Characterization of Extracranial Venous System in Patients with Multiple Sclerosis and in Normal Controls

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Objective: To investigate the extracranial venous flow morphology in patients with multiple sclerosis (MS) and in normal controls (NC), by using magnetic resonance venography (MRV).

Background: Chronic cerebrospinal venous insufficiency (CCSVI) is a vascular condition characterized by anomalies of the primary veins outside the skull that restrict the normal outflow of blood from the brain. CCSVI was recently described in patients with MS, and its diagnosis is currently based on the fulfillment of the venous hemodynamic (VH) Doppler criteria (Zamboni, JNNP, 2009). The value of MRV for diagnosing CCSVI in MS has not been previously assessed in a blinded, controlled study.

Methods: Fifty-seven (57) consecutive MS patients (42 relapsing-remitting and 15 secondary-progressive) with mean age 44.7 yrs, mean disease duration 13.2 yrs and median EDSS 2.5, and 21 age- and sex-matched NC were scanned on a GE 3T scanner by using 4D Time Resolved Imaging of Contrast KineticS (TRICKS) and enhanced and unenhanced 3D Time of Flight (TOF) MRI sequences. The jugular vein flow morphology was assessed by dividing the jugular veins into two segments: inferior and superior. The flow was classified for each segment as absent, pinpoint, flattened, crescentic and ellipsoidal. Only, the absent and pinpoint flow was considered as pathologic. The vertebral vein flow was classified as absent/present. The prominence (defined as diameter of the veins >5mm or >7mm in the inferior segments) of vertebral, deep cervical, thyroid, external and anterior jugular and facial veins, and of jugular arch was evaluated. Left and right asymmetries were compared. All MRI scans were examined in a fully blinded manner by 2 independent neuroradiologists.

Results: Although absent and pinpoint flow on 3DTOF and 4DTRICKS were more frequently present in MS patients than NC in jugular veins, no significant differences were found between the 2 groups in either one of the examined MRV parameters, except for higher pinpoint flow in right superior jugular vein on 3DTOF in MS patients (9 vs. 0, $p=0.049$) (Figure 1). No differences were found between the 2 groups for the vertebral veins. There were no venous flow morphology differences between TRICKS and 3DTOF. The intra- and inter-rater agreement was slightly better on TRICKS than on 3DTOF.

Conclusion: No extracranial venous flow morphology MRV differences were detected between MS patients and NC. This initial blinded controlled study showed that MRV has no promising value in differentiating venous flow morphology between MS patients and NC. This finding has extreme importance, as the endovascular treatment (EVT) for CCSVI is currently proposed to MS patients based on their MRV findings.

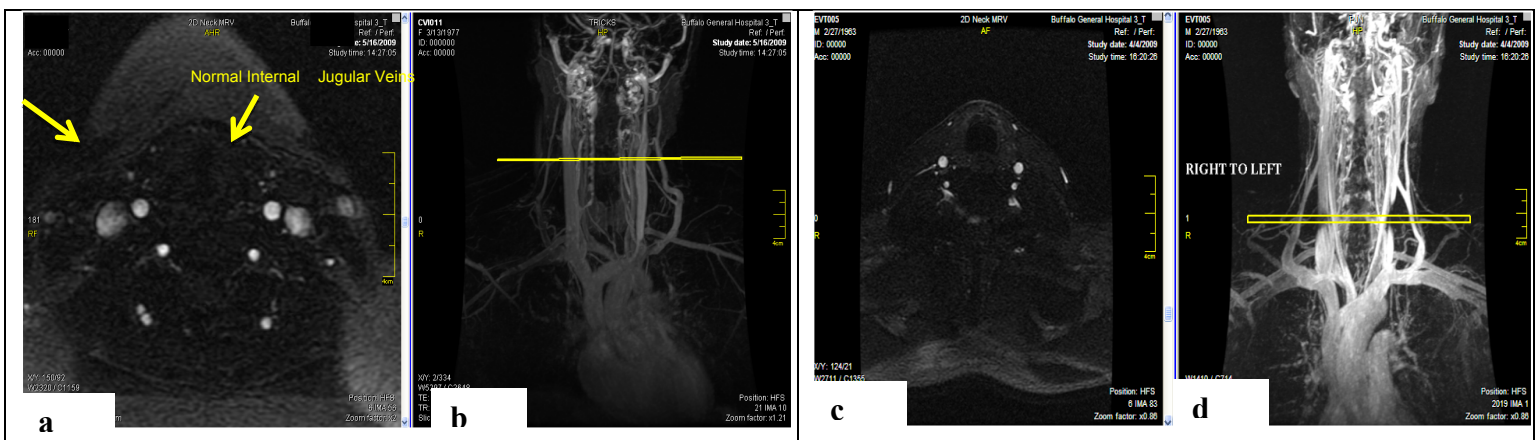


Fig 1. Extracranial venous flow morphology in multiple sclerosis (MS) patient (c, d) and in age- and sex-matched normal control (NC) (a, b), was investigated by using magnetic resonance venography (MRV) on a GE 3T scanner. 4D Time Resolved Imaging of Contrast KineticS (TRICKS) (b, d) and enhanced and unenhanced 3D Time of Flight (TOF) (a, c) MRI sequences were performed. In total, no significant extracranial venous flow morphology MRV differences were detected between MS patients and NC. However, absent and pinpoint flow on 3DTOF and 4DTRICKS was more frequently present in MS patients (c, d). This reached significance for the right superior jugular vein on (9 vs. 0, $p=0.049$) (Figure 1).