Internal jugular vein cross-sectional area and cerebrospinal fluid pulsatility in the aqueduct of Sylvius

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Background: Constricted cerebral venous outflow has been linked with increased aqueductal CSF pulsatility in healthy individuals [1] and MS patients [2]. However, the relationship between the CSF pulsatility and internal jugular vein (IJV) cross-sectional area (CSA) is unknown.

Objective: To characterise links between IJV CSA and aqueductal CSF pulsatility in MS patients and healthy subjects.

Methods: 98 relapsing-remitting MS patients (62 males and 36 females; mean age=44.2 years) and 99 healthy controls (48 males and 51 females; mean age=43.9 years) were investigated. CSF flow quantification involved cine phase-contrast MRI, while IJV CSA was calculated using magnetic resonance venography. Cardiovascular risk factor data were collected. Statistical analysis involved correlation, and partial least squares correlation (PLSC), analysis [3].

Results: For healthy controls, PLSC revealed a significant relationship (p=0.001) between CSF pulsatility and IJV CSA in the lower neck (C5-C7), and a trend for this relationship (p=0.091) at C2-C4. PLSC revealed no relationships in MS patients. After controlling for age and cardiovascular risk factors, many significant correlations were identified in the healthy controls between the CSF and IJV variables [e.g. net positive CSF flow and left IJV CSA at: C7-T1 (r=0.416, p=0.002) and C5-C6 (r=0.389, p=0.003); and net negative CSF flow and left IJV CSA at: C7-T1 (r=-0.352, p=0.008) and C5-C6 (r=-0.349, p=0.009)], whereas there were only two significant correlations in MS patients [i.e. net positive CSF flow and right IJV CSA at: C5-C6 (r=0.311, p=0.035) and C4 (r=0.298, p=0.047)].

Conclusions: In healthy adults, higher aqueductal CSF pulsatility is correlated with increased IJV CSA (particularly in the lower neck) in a relationship independent of age and cardiovascular risk factors. This relationship is largely absent in MS patients. Given CSF pulsatility and venous drainage are linked in healthy individuals [1], it may be that increased IJV CSA is indicative of stasis in venous outflow.

(Word count = 300 words)

References:

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