Abstract Title: #P04.273 - Evidence of primary vascular injury after acute head trauma in the Traumatic Head Injury Neuroimaging Classification (THINC) Study

Press Release Title: Study: Brain Imaging After Mild Head Injury/Concussion Can Show Lesions

Objective: To identify the neuroimaging correlates of these two pathological entities in hyperacute mild traumatic brain injury (mTBI).

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Background: Pathological studies following severe head trauma reveal small hemorrhagic lesions of two types: punctate lesions within the corpus callosum, grey-white junction, or brainstem are associated with diffuse axonal injury (DAI) while “streak-like” lesions in the parasagittal white matter track penetrating vasculature.

Design/Methods: This is a prospective study of acute TBI in the ED with evidence of blood on a clinical CT or research MRI. Focal lesions on T2* MRI were classified as i) microbleeds (punctate) or ii) linear lesions (tube-shaped, branching, multiple axial slices) and were graded for severity. Lesions were classified according to location, ischemia on DWI, edema on FLAIR, and focal findings on 3DT1. Concordance and discordance on CT was noted. Fisher exact was used.

Results: Of 256 studied over 24 months, 104 (41%) had imaging evidence of hemorrhage, with 78% male, median age was 50, 91% had arrival GCS 13-15, 67% reported loss of consciousness, 65% reported amnesia, and 39% had a negative CT. Median time injury to MRI was 17 hours. Of the 104, 21 (20%) had microbleeds while 34 (33%) had linear lesions. Microbleeds were distributed throughout the brain (lobar=37; deep=3; infratentorial=9), whereas linear lesions were found primarily in the anterior corona radiata (n=28; 82%). 20 (59%) linear lesions traversed white matter, gray matter, and sulcus on 3DT1. 23 (68%) were graded as “severe.” Ischemia on DWI or edema on FLAIR was association with linear lesions, p=0.001.

Conclusions: Linear hemorrhagic lesions following mTBI are distinct from punctate microbleeds and may be the imaging correlate of vascular injury seen in histopathology following severe TBI. While these lesions are often equated to DAI, the MRI findings are suggestive of primary injury to the vasculature, and thus may be a target for acute therapy.
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