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CMI announces SWI. A major advancement in brain trauma imaging

Diffuse axonal injury (DAI) is one of the most common and devastating types of traumatic brain injury occurring in cases of severe head trauma. It is also increasingly recognized to be an important factor in moderate and mild traumatic brain injury.

Though severe diffuse axonal injury seldom kills, even mild DAI can result in cognitive dysfunction, depression, sleep disturbance, headache and other symptoms.

CT scans are the examination of choice immediately following trauma. However, among patients eventually proven to have DAI, the CT scan at initial presentation is completely normal in up to 80% of cases.

MRI is the imaging modality of choice in the evaluation of traumatic brain injury. T2*-gradient-echo sequences have become the mainstay of MRI exams for patients with suspected DAI due to increased sensitivity over conventional MRI sequences to detect microhemorrhages that occur in some lesions of axonal injury. Unfortunately the number of cases where the T2*-gradient sequence is positive is small, especially in mild DAI, and therefore many cases of suspected DAI remain non-specific on all conventional imaging modalities.

MRI manufacturers have tried to increase the magnetic field strength on some of their scanners from 1.5 Tesla to 3 Tesla, in part, to increase the sensitivity of sequences such as the T2* gradient sequence to detect subtle lesions. As yet, there is no evidence in the medical literature that shows that gradient sequences are more sensitive at 3T than 1.5T. Further, imaging artifacts including patient motion artifact are more severe at 3T than at 1.5T which may be a further limiting factor for the use of 3T systems to diagnose DAI.

A new MRI sequence has recently been developed called Susceptibility Weighted Imaging (SWI) which is currently only available in British Columbia at Canadian Magnetic Imaging. SWI relies on the magnetic susceptibility of tissues or compounds in the brain, such as iron-rich hemosiderin, which is a byproduct of hemorrhage. Because of the blood-brain barrier, hemosiderin deposits remain in the brain for a very long time after the initial trauma. SWI has been shown in several studies to be much more sensitive in detecting microhemorrhages than conventional methods, including T2*- gradient echo.

At CMI we have recently incorporated SWI into our trauma head examinations. Since we have incorporated this new sequence, several cases have had either normal or non-specific findings after conventional T2*-gradient imaging (including 3 Tesla imaging) but have demonstrated hemorrhagic shear injuries on SWI. As well, most cases that have had hemorrhagic DAI lesions on T2*-gradient have demonstrated a greater number of lesions with SWI. This can increase the confidence of diagnosis as well as demonstrate more accurately the scope of injury.

Although even the most sensitive imaging will always underestimate the true extent of DAI, it is our opinion that MRI with SWI is presently the most sensitive and specific DAI imaging examination and is the best test available today to provide your patient with definitive MRI evidence of Traumatic Brain Injury.

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