**Appendix: A brief tutorial of relevant MRI sequences**

**FLAIR (fluid attenuation inversion recovery) -** *A fluid sensitive (T2-weighted) sequence in which the signal from cerebrospinal fluid is nulled. This increases the conspicuity of hyper-intensities in the periphery of the cerebral hemispheres as well as the deep peri-ventricular white matter. This technique can help differentiate between CFES and DAI based on the pattern and distribution of white matter changes, as well as presence or absence of cortical involvement.*

**DWI (diffusion-weighted imaging) -** *Detects decreases in random (Brownian) motion of water molecules very early (within one hour) after injury. Cytotoxic cellular swelling, resulting from a variety of causes including ischemic infarct, contusion, and traumatic axonal injury, are typical causes of restricted diffusion. Hyper-intensity on DWI can also result from vasogenic edema, and with chronic white matter changes such as gliosis or encephalomalacia. This phenomenon is known as T2 shine-through. ADC (apparent diffusion coefficient) maps provide a measure of the magnitude of restricted diffusion. DWI should always be evaluated in conjunction with ADC. Increasing degrees of restricted diffusion from cytotoxic edema will result in greater degrees of low signal intensity on ADC, whereas vasogenic edema and chronic white matter changes are associated with increased Brownian motion and will be associated with high ADC signal. Cortical contusions and diffuse axonal shear injury (DAI) are associated with combinations of vasogenic and cytotoxic edema and may exhibit both restricted diffusion and shine-through. Similarly, vasculitic changes from free fatty acids in CFES can cause break down of the blood brain barrier resulting in vasogenic edema leading to localized infarcts resulting in cytotoxic edema. The key to distinguishing between DAI and CFES is the size and distribution of these lesions, as described in the text and figures.*

**SWI (susceptibility weighted images) -** *SWI is an extremely sensitive high resolution technique which detects magnetic field distortion, and changes in phase (through a second filtering step) caused by paramagnetic and ferromagnetic blood breakdown products including deoxyhemoglobin (seen acutely), intracellular methemoglobin (sub-acutely), hemosiderin, and ferritin (chronically). SWI is can detect hemorrhage associated with contusion, micro-hemorrhages associated with shear injury such as in DAI or and the vasculitic micro-hemorrhages associated with CFES. The high sensitivity of SWI for micro-hemorrhage is very useful for distinguishing between CFES, which is associated with an extensive diffuse pattern of fine micro-hemorrhages that extend to the digitate white matter while DAI is associated with coarse micro-hemorrhages with a characteristic distribution as shown in figure 9.*

**DTI (diffusion tensor imaging) -** *While ADC is a scalar measure of diffusivity, which encodes diffusion in 3 axes, DTI provides information regarding diffusivity in up to 30 directions. The directionality of a diffusion tensor is expressed as a quantitative measure called fractional anisotropy. The propensity of water molecules to diffuse in an axial direction along coherent highly organized white matter tracts results in a high fractional anisotropy (FA), whereas greater degrees of radial diffusivity seen with disturbed leaky white matter tracts and swollen axons result in low FA. Fractional anisotropy provides a quantitative measure of neuronal damage which can be correlated with short and long-term neurocognitive changes. Post-processing software can be used to generate fiber tracking images which can depict disruptions in white matter tracts qualitatively.*