DTI as a diagnostic tool for mTBI

Abstract:

Long-term sequelae from mild traumatic brain injury (mTBI), or concussion, has been an increasing concern for young adults, particularly in athletes and members of the military. Variability in the rate of recovery leaves many individuals with long-term physical, cognitive, and emotional impairments, while others recover rapidly with little to no long-term complications. Currently, there are no available clinical tests that can account for this fact in a diagnostic fashion. Diffusion tensor imaging (DTI), a magnetic resonance imaging (MRI) technique, has the potential to follow the progression of mTBI though structural neuroimaging, and might prove to be useful in understanding the relationship between structural abnormality and functional activity of the brain following mTBI. After being diagnosed with a concussion, patients (ages 18 – 60) from the Fletcher Allen Emergency Department were recruited to partake in two MRI sessions, along with cognitive testing, within 24 and 48 hours post-injury as well as 7 – 10 days post-injury. The goal is to recruit 120 patients with mTBI and 30 orthopedic trauma controls/ healthy controls. From the subjects recruited thus far, changes in DTI measures have shown sensitivity and specificity for concussion 7 – 10 days post injury when compared to controls, but not within the first time point (24 – 48 hours post-injury). For this reason, it is likely that two DTI images are necessary to diagnose a concussion in order to account for variation among subjects. Also, multiple regions of interest (ROIs) were found to be associated with cognitive recovery upon exploratory analysis, and a correlation was found between memory scores, processing speed and reaction time with specific regions of the brain. These results suggest functional recovery may be associated with measurable changes in DTI, although further study is necessary to validate these findings. Ongoing investigations will provide additional insight into the performance characteristics of DTI as a diagnostic test for concussion.