SSC09-02

Scientific Papers

Head Impacts and White Matter Changes in High School Football: A TBSS Analysis

Monday, 10:40-10:50 AM
Location: N229

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CITE THIS ABSTRACT

PURPOSE

The purpose of this study is to determine if head impacts acquired over a season of high school football produce diffusion tensor imaging (DTI) white matter changes in the absence of clinically diagnosed concussion. We hypothesize that players with greater levels of head impact exposure (heavy hitters) compared to those with lower levels of impact exposure (light hitters), will have decreases in fractional anisotropy (FA) that have been associated with white matter injury.

METHOD AND MATERIALS

24 high schoolfootball players (mean age=16.7; age range=16-18) were instrumented with the Head Impact Telemetry System (HITs) during all practices and games. DTI images were acquired pre and post-season at 2 mm isotropic resolution in accordance with the NINDS Common Data Elements advanced protocol recommendations on a 3T Siemens MRI. Risk weighted cumulative exposure (RWE) was computed from the HITs data, representing the collected risk of concussion over the course of the season. Total impacts and RWE were used to separate the players into 9 heavy hitters (HH) and 151ight hitters (LH). None of the players experienced concussion during the season. A whole brain tract based statistics (TBSS) analysis was conducted on the FA data. A 2x2 (group x time) repeated measures ANOVA was used to determine within group and between group differences (HH vs LH) for pre and post-season. Results were corrected for multiple comparisons using threshold free cluster enhancement at $P < 0.05$.

RESULTS

Both groups demonstrated a main effect of time, with global increases in FA (post vs pre season) likely reflecting effects of brain development. Between group analyses revealed widely distributed statistically significant areas of decreased delta FA (post-pre season) for HH compared to LH (Figure 1). These areas included the splenium of the corpus callosum and deep white matter tracts.

CONCLUSION

High school football players experiencing greater levels of head impact exposure, in the absence of clinical concussion, have more loss in FA compared to a lower impact exposure group, raising concern for white matter injury or delayed development. Similar brain MRI changes have been previously associated with mild traumatic brain injury.

CLINICAL RELEVANCE/APPLICATION

This study adds to the growing body of literature providing evidence that a season of play in a contact sport can show brain MRI changes in the absence of concussion or clinical findings.