RSNA®
Radiological Society of North America
RADIOLOGICAL SOCIETY OF NORTH AMERICA
820 JORIE BLVD, OAK BROOK, IL 60523
TEL 1-630-571-2670 FAX 1-630-571-7837
RSNA.ORG
NEWS

DIFFUSION TENSOR IMAGE ANALYSIS ALONG THE PERIVASCULAR SPACE (DTI-ALPS) DERIVED GLYMPHATIC INDEX CORRELATIONS IN PROFESSIONAL FIGHTERS

PURPOSE

Sports-related TBIs account for 1.2-30.3% of all TBI cases in the USA, with boxing and martial arts being major contributors. Repeated head impacts (RHI) have been indicated as a risk factor for neurodegenerative and neuropsychiatric disorders. The recently discovered glymphatic system, vital for clearing brain waste like amyloid-β and tau proteins, are shown to be affected in participants experiencing cognitive decline. The glymphatic system is evaluated using Diffusion Tensor Imaging (DTI) through the Along the Perivascular Space (ALPS) method, by measuring the ALPS index. We hypothesized that RHI will affect the glymphatic system causing lower ALPS in cognitively impaired fighters as compared to non-impaired fighters and total ALPS will show a significant correlation with the total number of knockouts in the impaired fighters.

METHODS AND MATERIALS

This longitudinal study included 280 male professional fighters (boxers and MMA) and 20 age-matched healthy controls. Recorded variables included age, race, and intracranial volume. 95 fighters were identified as impaired fighters based on neuropsychological testing of processing and psychomotor speed. 3T Verio Siemens MRI scanner with a 32-channel head coil was used. 71 directions DTI was acquired with b = 0 and b = 1000s/mm2. Using FSL software, diffusion metric images were generated, including FA and directional diffusivity maps along the x-, y-, and z-axes. Using the diffusivity values along the direction of the perivascular space compared with those of projection fibers and association fibers on a slice at the level of the lateral ventricle body, we computed DTI-ALPS. PALM in FSL was used to compare DTI-ALPS among the groups and understand the correlation between the DTI-ALPS index and the total number of knockouts. The results were considered at familywise error corrected p-value <0.05.

RESULTS

The non-impaired fighters had a significantly lower right and total glymphatic index as compared to the impaired fighters. The relationship between the glymphatic index and the knock-out history was significantly different between the two groups and that the impaired fighters had a non-significant negative correlation with the total number of knockouts.

CONCLUSIONS

Contrary to our hypothesis, though our results show that impaired fighters had a significantly higher glymphatic index, it deteriorated significantly with the total number of knockouts.

CLINICAL RELEVANCE/APPLICATIONS

Understanding RHI’s impact on the glymphatic system is crucial for early detection and management of neurodegenerative risk in contact sport athletes. This study uses the DTI-derived ALPS index as a noninvasive biomarker to assess glymphatic dysfunction and guide early intervention.