

Aberrant Brain Networks Efficiency in Mild Traumatic Brain Injury Patients with Depression Symptom – A Multimodal Study

Tuesday 3:20-3:30 PM | SSJ19-03 | Room: N228

PURPOSE

Comorbid psychiatric disorders, such as anxiety disorders and major depressive disorders (MDD), are very common among military personnel with traumatic brain injury (TBI). The goal of this study is to identify relationships between brain microstructural changes and network connectivity in military mild TBI (mTBI) patients.

METHOD AND MATERIALS

Participants included 130 male active service members diagnosed with mTBI (age 34.7 ± 7.8 years old) and 53 non-TBI male controls (age 31.9 ± 8.3 years old) who underwent structural MRI, diffusion weighted imaging (DWI) and resting state fMRI (rsfMRI) exams on a 3T MRI scanner. Depression symptoms were rated based on the Beck Depression Inventory (BDI). Subjects with a BDI score greater than 20 are considered to have moderate to severe depression symptoms, and less than 19 is considered mild or minimal. Global probabilistic tractography was performed to reconstruct major white matter tracts followed by extraction of diffusion tensor imaging metrics (Fig A). Normalized Z-score of correlation coefficients of rsfMRI temporal dynamics were reconstructed for statistical analyses. Probabilistic ICA (FSL MELODIC) was applied to identify the functional networks.

RESULTS

Among 130 mTBI participants, 75 of them were classified as having moderate to severe depression symptoms. The moderate to severe MDD TBI group had lower FA than mild depressed mTBI group over the hippocampal branch of the right cingulum bundle, and both of the temporal and parietal branches of the right superior longitudinal fasciculus. For functional connectivity, the moderate to severe MDD mTBI had decreased connectivity within the anterior default mode network (Fig. B) and executive control network, but increased thalamo-striatal connectivity than the non-TBI and/or mild depressed mTBI, suggesting reduced DMN suppression and increased rumination in symptomatic depressed mTBI (Fig. C).

CONCLUSION

Our results suggest that disrupted neurocircuitry, particularly the cognitive-emotional pathways, e.g. cingulum bundle interconnecting frontal cortex, parietal cortex and limbic system, play an important role in the comorbidity of MDD-TBI spectrum disorders.

CLINICAL RELEVANCE/APPLICATION

Aberrant WM tracts and changed functional connectivity interconnecting the fronto-cingulate-temporal regions and the limbic system suggest poor top-down emotional processing and greater maladaptive rumination in symptomatic depressed mTBI patients.