Effects of Mild Traumatic Brain Injury on the Visual System

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Previous studies at the Roskamp Institute and in other laboratories have demonstrated that the visual system is particularly vulnerable to the effects of repeated mild traumatic brain injury (r-mTBI). However, many important details about the mechanisms of the negative impact of r-mTBI on the visual system, specifically the inflammatory changes in the optic nerve at acute to sub-chronic periods after injury (24 hours to 3 weeks), remain poorly understood. That provides a rationale to examine these changes in detail. Slides of previously mounted optic nerve tissue from wild type mice (both control and r-mTBI) were stained with various immunohistochemistry protocols including GFAP, Iba-1, and APP to qualitatively analyze the immune response cells present and location of axonal damage. As well, tissue samples from both groups were stained by use of an H&E (hemotoxylin and eosin) protocol to outline nuclei density. All tissue slides were then imaged with CellSens software, and those stained with H&E were analyzed for cellularity with ImageJ software. Data proved consistent and accurate, showing that over a period of 3 weeks tissue exposed to r-mTBI had a significantly higher number of cells/micrometer, along with a visual increase in immune response cells. Results were analyzed with a statistical t-test and proven statistically significant. This analysis can be utilized in the scientific research field of traumatic brain injury in humans, in particular those who have succumbed to concussions, and this data can be further used in clinical measures for inflammatory drug testing that targets inflammation near the chiasm of the optic nerve post injury.