#218 Siobhan Lawless Advisor(s): Peter Bergold

Chronic and progressive deficits after a single closed head injury in mice

Chronic sensorimotor deficits occur following repetitive head injuries in mice, yet less is known about chronic changes following a single closed head injury (CHI). A challenge to study the long-term consequences of CHI is distinguishing between the effects of age and injury. A second challenge is detecting suboptimal behavioral strategies that compensate for evolving brain injury. More sensitive metrics are needed to assess presence, duration, and compensation for long-term sensorimotor deficits following a single closed head injury. Mice were tested on Neurological Severity Score (NSS), open field, rotorod, and beam walk at 7 or 180 days following a single CHI above the right parietal lobe. Injured mice showed no NSS impairment at 7 or 180 days post injury (DPI). Injured mice at 180DPI, spent more time in the center of an open field suggesting less basal anxiety than at 7DPI. On rotorod, injured mice differed from sham-injured at 7DPI in trial-to-trial and total latency. At 180DPI, sham-injured mice showed an age effect in total latency. On the 3cm beam, time to traverse and foot faults had no age or injury effects. On the 2cm and 1cm beams, time to traverse detected age effects not detected by foot faults. These data suggest that these standard analyses of beam walk detected effects of age, but not injury. We therefore used DeepLabCut tracking software to detect suboptimal strategies. DeepLabCut allows markerless assessment of the absolute position (absition) of all four limbs as mice traversed the beam. On the 3cm beam, forelimb and hindlimb absition showed neither an age nor injury effect. On the 2cm beam, forelimb absition showed a bilateral age effect at 180DPI. On the 1cm beam, forelimb absition in injured mice worsened bilaterally between 7 and 180DPI. Absition of the left hindlimb, that is controlled by the injured right parietal lobe, worsened between 7 and 180DPI. These data suggest both chronic and progressive injury following a single CHI in mice.

Additional contributors to this project:
David Havlicek
Craig Kelley
Elena Nikulina