# TRAUMATIC BRAIN INJURY IN A RAT LATERAL FLUID PERCUSSION MODEL: ELECTROPHYSIOLOGICAL, MORPHOLOGICAL AND BEHAVIORAL MANIFESTATIONS

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Post-traumatic epilepsy (PTE) is a major concern for patients with traumatic brain injury (TBI). The risk of developing PTE after TBI peaks within the first year after TBI, however, it is sustained for >10years. PTE accounts for 10-20% of epilepsy cases in the general population. Immediate and early seizures after TBI are acute symptomatic events resulting in secondary brain damage which induces further complications and being significant risk factor for PTE development.
There are virtually no rodent studies of TBI-induced PTE linking early seizures with PTE and exploring early epileptogenesis. Lateral fluid percussion brain injury is a widely used model of TBI in rats reproducing clinical signs and presumably PTE pathogenesis during the late period. To study early consequences of severe TBI we used this model (3-4 atm) in adult male Sprague-Dawley rats. To estimate the time course of epileptiform discharges during wake-sleep cycle, global brain function video-electrocorticograms were recorded during a week prior and a week after TBI. To monitor epileptiform discharges we developed an automatic detection algorithm of EEG events with high value of power spectral density based on wavelet transform. Symptoms of depression and anxiety were assessed in light-dark box and elevated plus-maze tests. Histological analysis of brain tissue was performed 1 week after TBI.
Immediately after TBI tonic-clonic seizures occurred. High voltage rhythmic spikes (HVRS) were detected in background records and after TBI, particularly during the early stage of NREM sleep. After TBI, the number of HVRS was 8-fold higher in about 50% of animals as compared to sham operated controls suggesting that HVRS represent a subclinical epileptiform activity in acute period of TBI. Histological studies revealed cortical damage to the ipsilateral hemisphere (neurodegeneration, gliosis, microglial activation, accumulation of IgG) as well as remote ischemic-like damage to the hippocampus. During acute posttraumatic period rats demonstrated symptoms of anxiety and depression associated with sleep disturbances.
Thus, we have shown for the first time behavioral, electrophysiological and morphological consequences of TBI during the early period. HVRS may represent epileptiform activity potentially involved in PTE development and be one of early markers/events of commencing epileptogenesis.

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