# Association of Post-Traumatic Epilepsy on Recovery from Severe Traumatic Brain Injury: Sliding Scale Approach

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**Background**: Post-Traumatic Epilepsy (PTE) affects one-third of severe traumatic brain injury (TBI) patients and is associated with poor functional outcomes. While TBI is characterized by continued recovery years after injury, the trajectory of functional recovery in PTE patients is not well understood. Using a novel sliding scale, we hypothesized that PTE acts as a 'second hit' after TBI, slowing recovery over time.

**Methods**: We performed a retrospective analysis of severe TBI patients (Glasgow Coma Scale (GCS) ≤ 8) treated from 2002 to 2018 at a Level 1 trauma center. We used the International Mission on Prognosis and Analysis of Clinical Trials (IMPACT) model to assign a sliding scale score. This score was based on the difference between the expected threshold for an unfavorable outcome (Glasgow Outcome Scale (GOS) = 1-3) and the actual score. Hence, a sliding score captures the magnitude of change between levels on the GOS according to each patient's baseline prognosis. Scores ranged from -3 to +2, with positive scores denoting improvement compared to baseline prognosis, as expected in most TBI patients. Thus, a sliding scale score serves as a marker of a patient's expected recovery over time. We used the Wilcoxon Rank-Sum test to compare the change in sliding scores over time for patients with and without PTE.

**Results**: We had 392 patients with a median age of 33 (interquartile range (IQR)=23-47.5) Improvement for patients with PTE on the sliding scale was less (25.42% compared to 32.62% without PTE) over two years post-injury. PTE patients show a significant decline in functional outcomes compared to non-PTE patients during the 6 to 24-month follow-up period (p=0.04.)

**Conclusion**: Post-traumatic epilepsy is associated with delayed recovery after severe TBI. Future PTE clinical trials should consider a sliding scale approach to explore if early, aggressive treatment improves functional outcomes.