

# Seizures in Mild Traumatic Brain Injury: Prospective Analysis of 134 Patients with mTBI

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## INTRODUCTION

In most cases of mild Traumatic Brain Injury (mTBI), the radiological imaging does not reveal a detectable morbidity. The diagnosis is mainly based on physical and neurological examination findings, duration of unconsciousness (usually less than 30 minutes) post-traumatic amnesia (PTA, usually less than 24 hours), and the Glasgow Coma Scale (mTBI sufferers have scores of 13 to 15) (**Borg J 2004**). The most worthwhile techniques for studying the acute pathophysiology of concussion is by the recording of neuro-physiological activity such as the electroencephalogram (EEG) (**Shaw NA 2002**). This study is to find correlation of loss of consciousness and cognitive impairment in mild traumatic brain injury as a predictor of high risk for post traumatic seizures.

## MATERIAL & METHODS

A prospective study of 134 patients presented to the TBI clinic in 2 years. The patient population age group was 18 to 70 years, and the male to female ratio was 5:4.

A routine 1 hour EEG as a standard protocol was followed after clinical evaluation and administration of the Montreal cognitive assessment. The routine EEG is usually 22 minutes to 40 minutes and has less sensitivity and yield. We performed an hour long EEG with hyperventilation, photic stimulation, drowsiness and sleep stages EEG tracing.

Inclusion criteria of patients selection in the post mTBI seizure group: 1. Episodes started after the head injury or head injury equivalent concussion head injury, 2. Episodes started within 3 months of the head injury, 3. Recurrent loss of consciousness or altered consciousness, 4. Post episode confusion and post event tiredness or rest.

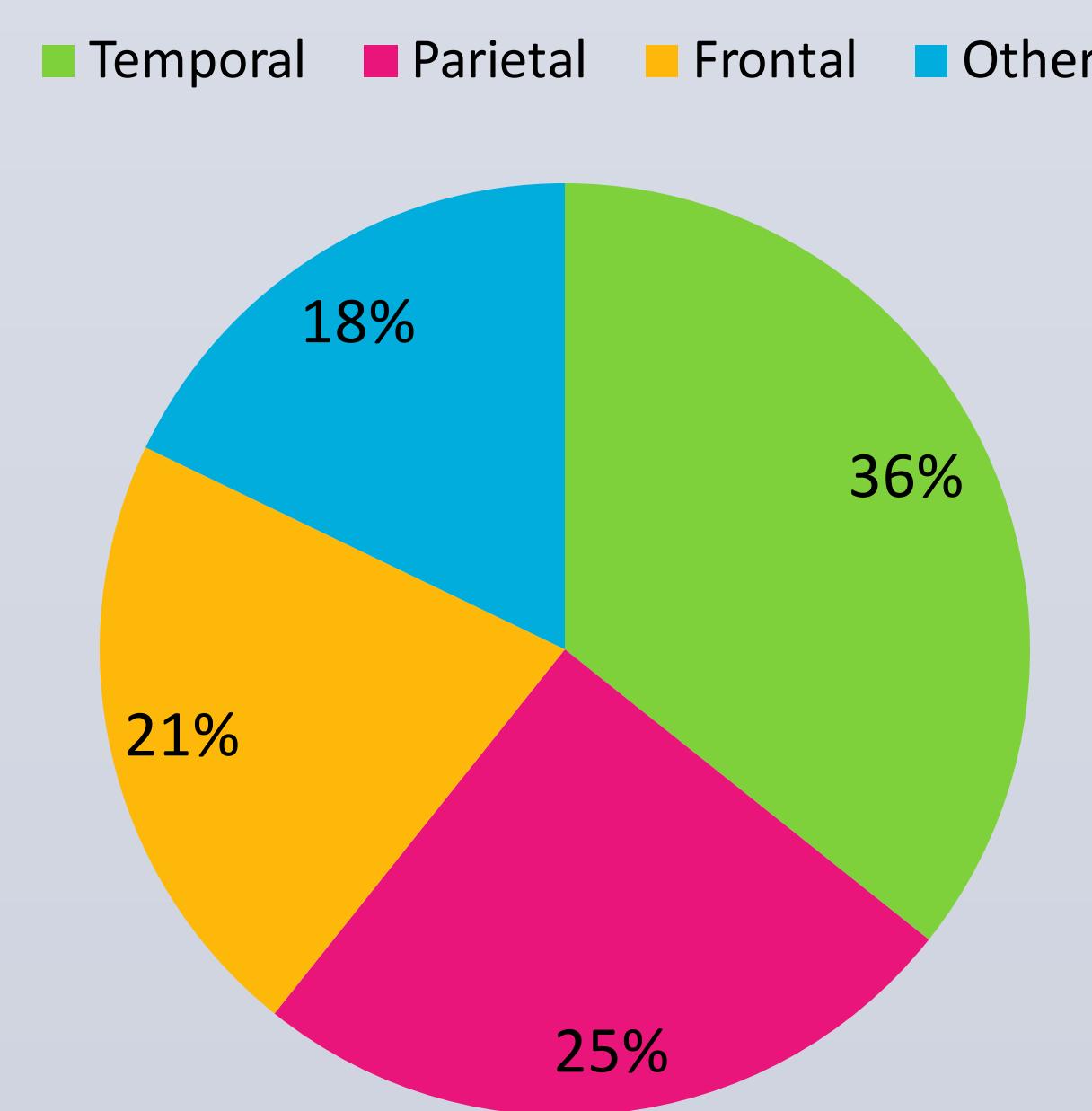
## METHODS (Contd.)

5. No recollection of the events, 6. At least 1 visit to ER for the event described as above, 7. Normal EKG, 8. Normal brain MRI or CT scan after the head injury, 9. Loss of consciousness or altered consciousness to the complete regain of consciousness lasted less than 5 minutes, 10. Abnormal EEG. 11. Focal at least 1 neurological unexplained symptoms of Semiology of event suggestive of seizure like disorder meet one criteria from witness history a. Tonic phase or b. Clonic phase or c. fall or d. tongue bite or e. loss of bladder control f. slurred speech and loss of track of conversation. or g. altered unexplained behavior, or h. waking up with headaches 12. Abnormal mTBI EEG.

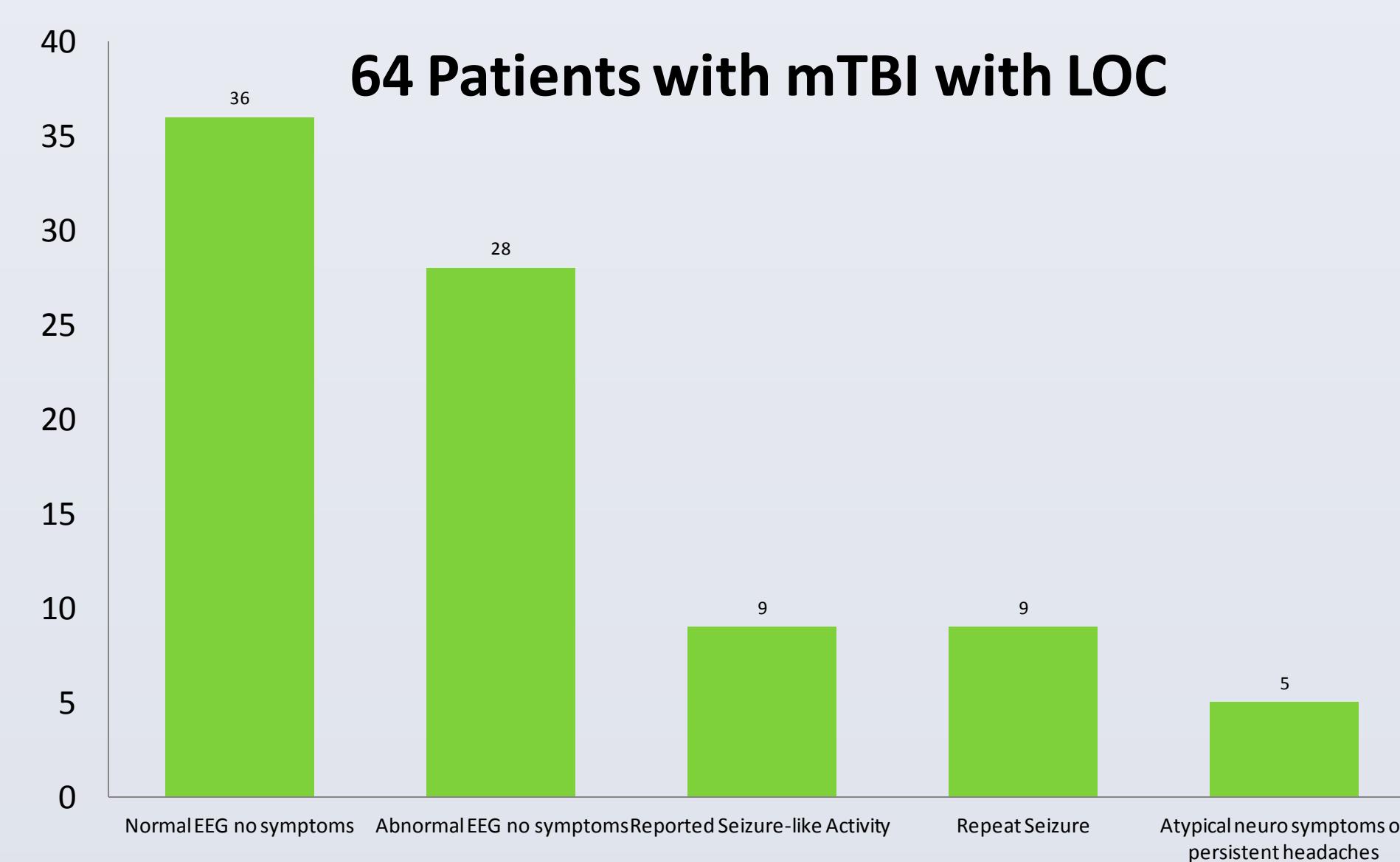
## RESULTS

Of the 134 patients presented, 64 patients (47.7%) experienced post traumatic transient loss of consciousness. 28 patients (20.8%) demonstrated detectable abnormal electrical activity on the standard 22 - lead EEG recording. Temporal lobe (n=10) was the most common site of abnormal electrical activity followed by parietal (n = 7) and frontal (n = 6) lobes.

### mTBI Site Specific Seizure Activity



Characteristics in LOC Group	Number
Loss of Consciousness	64
Asymptomatic Normal EEG	36
Asymptomatic Abnormal EEG	28
Reported Seizure-like Activity	9
Repeated Seizure	7
Atypical Neuro Symptoms or Persistent Headaches , Ab EEG	5



19/28 (70.3%) had experienced loss of consciousness immediately following the accident in abnormal EEG group.

A general linear model multifactor analysis of variance (ANOVA) showed loss of consciousness ( $p = 0.043$ ) as the only factor directly relating to the demonstration of abnormal electrical discharges on EEG.

Our analysis clearly showed that the actual incidence of clinically overt seizures was 6.7% as well as the abnormal electrical activity was 20.9% in patients with mTBI. 94/134 ( 70%) of the patients with abnormal EEG also showed abnormal composite cognitive score (MoCA) thus corroborating previously established theory that most common injury in mTBI occurs in the medial temporal lobe areas and can affect cognition (Summon 2009).

## CONCLUSIONS

Almost 1.1 million individuals that experience a TBI, are evaluated and released from an emergency department each year. Mild TBI comprises 70%–80% of all head injuries. Recent studies have attempted to localize medial temporal lobe damage in mild TBI using sophisticated imaging techniques like SPECT (**Umile 2002**) and positional papers by Annegers et al (**Annegers 1992**) which stated that the standardized incidence ratio for post traumatic seizures was 1.5% (95 percent confidence interval, 1.0 to 2.2) after mild injuries. We do not have any standard protocol for recommendation and follow up after mTBI patients are discharged from emergent care. Our study is consistent with the landmark studies; there is direct correlation of the loss of consciousness and the abnormal EEG and Post Traumatic Seizure Disorder in mTBI patients. The patients with loss of consciousness after mTBI should follow up with EEG within 2 weeks.

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