Antiepileptic Drug prophylaxis for traumatic brain injury

- Guidelines for Seizure Prophylaxis in Patients Hospitalized with Nontraumatic Intracerebral Hemorrhage: A Clinical Practice Guideline for Health Care Professionals from the Neurocritical Care Society
- Antiseizure medication practices in the adult traumatic brain injury patient population
- A comparison of the antiepileptogenic efficacy of two rationally chosen multitargeted drug combinations in a rat model of posttraumatic epilepsy
- Effectiveness of Fosphenytoin and Levetiracetam to Prevent Posttraumatic Seizures in Young Children with Accidental or Abusive Traumatic Brain Injury
- You Say Potato, I Say Potatoe: Seizure Prophylaxis After Pediatric Traumatic Brain Injury
- Risk Factors and Outcomes of Late Posttraumatic Seizures in Combat-Related Traumatic Brain Injury
- Levetiracetam Dosing Based on Glasgow Coma Scale Scores in Pediatric Traumatic Brain Injury Patients
- Levetiracetam or Phenytoin as Prophylaxis for Status Epilepticus: Secondary Analysis of the "Approaches and Decisions in Acute Pediatric Traumatic Brain Injury Trial" (ADAPT) Dataset, 2014-2017

Posttraumatic Seizure

Antiepileptic drug prophylaxis for traumatic brain injury (TBI) is a treatment strategy aimed at preventing posttraumatic seizures. Posttraumatic seizures (PTS) are a common complication of TBI, and antiepileptic drugs are used to reduce the risk of both early seizures (occurring within the first week) and late seizures (occurring after one week and potentially leading to post-traumatic epilepsy).

Rationale: Early Seizures: These are usually the result of acute injury to the brain and may contribute to secondary brain damage through increased intracranial pressure, metabolic demand, and excitotoxicity. Late Seizures: These are more often related to the development of scar tissue, gliosis, and chronic changes in the brain. Late seizures are linked to a higher risk of developing epilepsy. Guidelines and Evidence: Early Seizure Prophylaxis:

Indications: AED prophylaxis is generally recommended for patients with severe TBI (e.g., Glasgow Coma Scale < 8), penetrating brain injuries, or significant brain contusions, subdural or epidural hematomas, depressed skull fractures, or intracerebral hemorrhages. Duration: Prophylaxis is typically recommended for 7 days following the injury. After this period, AEDs are generally discontinued unless the patient experiences a seizure. Drugs of Choice: Phenytoin has been the most commonly used AED for early seizure prophylaxis. Studies suggest that phenytoin is effective in reducing the incidence of early seizures but does not prevent the development of late seizures or epilepsy. Levetiracetam is increasingly used as an alternative to phenytoin due to its better side effect profile and ease of use (no need for serum level monitoring). It has shown similar efficacy to phenytoin in preventing early seizures but lacks definitive evidence of superiority. Late Seizure Prophylaxis:

Routine long-term prophylaxis for late seizures or post-traumatic epilepsy is not recommended for all

patients. AEDs are not effective in preventing late seizures in patients who have not experienced seizures in the acute phase. Individualized Approach: For patients who develop seizures after the first week, long-term AED treatment is typically initiated, tailored to the individual's specific seizure characteristics and other medical considerations. Key Points from Clinical Guidelines: American Academy of Neurology (AAN) Guidelines (2003): Prophylactic AED use is recommended for the first 7 days post-TBI to prevent early seizures, particularly in patients with severe TBI. AEDs should be discontinued after 7 days if no seizures occur, as prolonged use does not reduce the incidence of late post-traumatic epilepsy. Levetiracetam vs. Phenytoin: Studies comparing levetiracetam and phenytoin show similar efficacy in early seizure prevention, but levetiracetam is preferred due to its lower risk of adverse effects, lack of drug-drug interactions, and no need for serum level monitoring. Clinical Considerations: Adverse Effects: Phenytoin is associated with side effects such as gingival hyperplasia, bone density loss, and hepatic toxicity, whereas levetiracetam may cause behavioral changes, but overall is better tolerated. Patient Monitoring: If an AED like phenytoin is used, therapeutic drug monitoring is required to avoid toxicity. Levetiracetam does not require serum level monitoring, making it easier to manage. Conclusion: Early AED prophylaxis (for up to 7 days) is recommended in patients with severe traumatic brain injury to prevent early post-traumatic seizures. Long-term AED use is generally not advised unless the patient develops seizures after the acute phase, at which point treatment should be individualized. Levetiracetam is emerging as a preferred option over phenytoin due to its favorable side effect profile and ease of use, although both are effective for early seizure prophylaxis.