

Pediatric Anti-epileptic Therapy for Traumatic Brain Injury Protocol

Traumatic brain injury (TBI) is a major cause of morbidity and mortality in the pediatric population. Children with moderate to severe head injury are at risk for long-term neurologic disability. Brain injury can predispose these patients to seizures, both early (within seven days of injury) and late (after seven days from initial injury).

Post-traumatic epilepsy (PTE) is defined as recurrent seizure disorder due to brain injury following trauma. [1] There are several risk factors for the development of PTE. Early seizures and low Glasgow Coma Scale (GCS) on admission can increase the relative risk of PTE by 17. [2] Foreign body from penetrating brain injury can produce a focus for seizure activity and increases the risk of late PTE to 50%. [2]

While the literature on pediatric prophylactic anti-epileptic drug (AED) use in those with TBI is limited, there is data to support the empiric use of AED's to treat early post-traumatic seizures (PTS) to prevent further secondary brain injury. In the 2003 guidelines for the management of pediatric TBI, the use of empiric AED's was recommended for children (especially those < 2 years old) due to the increased incidence of PTS with severe TBI. [3]

A subcommittee of the American Academy of Neurology developed practice parameters for the use of empiric AED's after TBI based on analysis of the literature. The committee concluded that "prophylaxis with phenytoin in patients with severe TBI is established as effective in decreasing the risk of early PTS."

The development of seizures can cause both physical and psychological injury while complicating acute management of TBI and may affect future rehabilitation. Thus, the control of PTS is important in the care of the TBI patient. At the same time, the use of AED's also carries the risk of adverse effects, especially with prolonged use. [1] Examples of complications include: intravenous site reactions, Stevens Johnson syndrome, granulocytopenia, liver disease, ataxia and neurobehavioral side effects. Therefore, the implementation of a pediatric anti-epileptic therapy protocol for patients with TBI is important.

Having defined criteria for using prophylactic therapy and recommendations for drug/drug doses will standardize our practice so we can more safely treat those with seizures and those at risk for early seizures. By setting guidelines for length of treatment, drug monitoring, and neurology follow up, we hope to decrease the risk of adverse effects from the use of AED.

References

- (1) Agrawal A, Timothy J, Pandit L, et al. Review Post-traumatic epilepsy: An overview. *Clin Neurol and Neurosurg* 2006;108:433-439.
- (2) Annegers JF, Hauser WA, Coan SP, et al. A population-based study of seizures after traumatic brain injuries. *N Engl J Med* 1998;338:20-24.
- (3) Chapter 19: The role of anti-seizure prophylaxis following severe pediatric traumatic brain injury. *Pediatr Crit Care Med* 2003;4(3 suppl):S72-S74.
- (4) Chang BS and Lowenstein DH. Practice parameter: Antiepileptic drug prophylaxis in severe traumatic brain injury. Report of the Quality Standards Subcommittee of the American Academy of Neurology. *Neurol* 2003; 60:10-16.
- (5) Young KD, Okada PJ, Sokolove PE, et al. A randomized, double-blinded, placebo-controlled trial of phenytoin for the prevention of early posttraumatic seizures in children with moderate to severe blunt head injury. *Ann Emerg Med* 2004;43:435-466.
- (6) Chumnanvej S, Dunn IF, Kim DH. Three-day phenytoin prophylaxis is adequate after subarachnoid hemorrhage. *Neurosurgery* 2007;60(1):99-103.
- (7) Abend NS, Huh JW, Helfaer MA, et al. Anticonvulsant medications in the pediatric emergency room and intensive care unit. *Pediatr Emerg Care* 2008;24(10):705-718.
- (8) Lewis RJ, Yee L, Inkelis SH, et al. Clinical predictors of post-traumatic seizures in children with head trauma. *Ann Emerg Med* 1993;22:1114-1118.
- (9) Blyth BJ, Bazarian JJ. Traumatic alteration in consciousness: Traumatic brain injury. *Emerg Med Clin N Am* 2010;28:571-594.
- (10) Tilford JM, Simpson PM, Yeh TS, et al. Variation in therapy and outcome for pediatric head trauma patients. *Pediatr Crit Care* 2001;29(5):
- (11) Bratton SL, Chestnut RM, Ghajar J, et al. XIII. Antiseizure prophylaxis. *J Neurotrauma* 2007;24(1 suppl):S83-S86.
- (12) Jones KE, Puccio AM, Harshman J, et al. Levetiracetam versus phenytoin for seizure prophylaxis in severe traumatic brain injury. *Neurosurg Focus* 2008;25(4):1-5.
- (13) Jette N, Claassen J, Emerson RG et al. Frequency and predictors of nonconvulsive seizures during continuous electroencephalographic monitoring in critically ill children. *Arch Neurol* 2006;63:1750-1755.