

Early management of traumatic brain injury: from roadside to ICU

Andrew Van der Poll

Anaesthetist and Intensivist Auckland City Hospital

There is a significant burden of disease.

• In Aus/NZ approx 1000 cases of severe TBI (GCS <8) per year with approximately 30% mortality and overall 50% are severely disabled or dead. Most recent USA figures are from 2013 and indicated almost 300,000 hospitalisations and 56,000 deaths. In 2010 TBI costs were estimated at \$76.5 billion USD. This is a pathology that strikes the young- it is the leading cause of disability in the under 40 age group and occurs because of

1. Motor vehicle accidents
2. Falls
3. Assaults

In this overview update talk we will cover

- Primary vs. Secondary brain injury and what we can do to prevent both
- Emergency roadside management and the targets for immediate resuscitation and care
- Management in the emergency department including updates on the research into the use of tranexamic acid as well as optimum blood pressure targets
- Further management within the secondary or tertiary hospital including
 - How to manage the head injured patient for non-neurosurgery
 - Indications for invasive intracranial pressure monitoring and what we use at Auckland City Hospital
 - Ongoing issues that arise after head injury and how to treat them, including “Brain Orientated Intensive Care”, the role of Decompressive Craniectomy, Barbiturate coma and most importantly, prognostication

References:

- 1) Personal communication Professor Andrew Udy – Deputy Director (Research), Department of Intensive Care Medicine, The Alfred, Melbourne, Australia. ANZICS APD data to 2013. Effect of Early Sustained Prophylactic Hypothermia on Neurologic Outcomes Among Patients With Severe Traumatic Brain Injury The POLAR Randomized Clinical Trial
- 2) [D. James Cooper, MD^{1,2}](#); [Alistair D. Nichol, MB, PhD^{1,2,3,4,5}](#); [Michael Bailey, PhD¹](#); et al *JAMA*. 2018;320(21):2211-2220. doi:10.1001/jama.2018.17075
- 3) Taylor CA, Bell JM, Xu L. Traumatic Brain Injury- Related Emergency Department Visits, Hospitalizations, and Deaths- United States, 2007 and 2013. *MMWR Surveill Summ* 2017; 66:1.
- 4) Brain Trauma Foundation, American Association of Neurological Surgeons, Congress of Neurological Surgeons et al. Guidelines for the management of severe traumatic brain injury. I. Blood pressure and oxygenation. *J Neurotrauma* 2007; 24 Suppl 1:S7.
- 5) Fuller G, Hasler RM, Mealing N, et al. The association between admission blood pressure and mortality in significant brain injury: a multi-centre cohort study. *Injury* 2014; 45:612.
- 6) Bernard SA, Nguyen V, Cameron P, et al. Prehospital rapid sequence intubation improves functional outcome for patients with severe traumatic brain injury: a randomized controlled trial. *JAMA* 2004; 291:1350.
- 7) CRASH-3 trial collaborators. Effects of tranexamic acid on death, disability, vascular occlusive events and other morbidities in patients with acute traumatic brain injury (CRASH-3): a randomised, placebo-controlled trial. *Lancet* 2019; 394:1713.
- 8) [John Scotter¹](#), Susan Hendrickson¹, Hani J Marcus², Mark H Wilson². Emergent Prognosis of patients with bilateral fixed dilated pupils secondary to traumatic extradural or subdural haematoma who undergo surgery: a systematic review and meta-analysis *Med J* 2015 Aug;32(8):654-9.
- 9) Temkin NR, Dikmen SS, Wilensky AJ, et al. A randomized, double-blind study of phenytoin for the prevention of post-traumatic seizures. *NEJM* 1990; 323:497.
- 10) SAFE Study Investigators, Australian and New Zealand Intensive Care Society Clinical Trials Group, Australian Red Cross Blood Service, et al. Saline or albumin for fluid resuscitation in patients with traumatic brain injury. *NEJM* 2007; 357:874.
- 11) Contant CF, Valadka AB, Gopinath SP, et al. Adult respiratory distress syndrome: a complication of induced hypertension after severe head injury. *J Neurosurgery* 2001; 95:560.
- 12) Cooper DJ, Rosenfeld JV, Murray L, et al. Decompressive craniectomy in diffuse traumatic brain injury. *NEJM* 2011; 364:1493.
- 13) Hutchinson PJ, Kolias AG, Timofeev IS, et al. Trial of Decompressive Craniectomy for Traumatic Intracranial Hypertension. *NEJM* 2016; 375:1119.
- 14) Lingsma HF, Roozenbeek B, Steyerberg EW, et al. Early prognosis in traumatic brain injury: from prophecies to predictions. *Lancet Neurol* 2010; 9:543