Reclaim the Brain:What's the Rationale for Using Prehospital Anti-Epileptics and Hypertonic Saline in Pediatric TBI ?

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Pediatric Traumatic Brain Injury Data

- **475,000/ year in the US aged 0–14 yo. sustain TBI**
- **37,000 are hospitalized**
- **2,685 die because of their injuries**
- **61% moderate-to-severe TBI experience some form of disability**
  - **Early TBI is linked to chronic epilepsy**
  - **TBI recovery can take up to 6 months**

Pediatric TBI Severity

GLASGOW COMA SCALE

	<2 Years Old	Age 2 - Adult	
	EYES		
4	Spontaneous	Spontaneous	4
3	To speech	To speech	3
2	To pain	To pain	2
1	None	None	1
	VERBAL		
5	Coos, babbles	Oriented	5
4	Irritable, cries	Confused	4
3	Cries to pain	Inappropriate words	3
2	Moans to pain	Incomprehensible	2
1	None	None	1
	MOTOR		
6	Normal spontaneous movements	Obeys commands	6
5	Withdraws from touch	Localizes to pain	5
4	Withdraws from pain	Withdrawal to pain	4
3	Abnormal flexion	Flexion to pain	3
2	Abnormal extension	Extension to pain	2
1	None	None	1
	Total PGCS Score	**Total GCS Score**	

Differences Peds v Adults ?

The pediatric scalp is highly vascularized

Even a small loss of blood volume can lead to hemorrhagic shock in a newborn, infant, and toddler, which may occur without apparent external bleeding

Children experience continued vomiting , LOC, AMS, Scalp swelling, Seizures, Blood or Fluid from the ears

Pediatric TBI Protocol Goals

YOU OWE ME 20 DOLLARS!!

PCFR TBI Protocol

Any pediatric patient < 16 with a TBI

Clinical assessment shows evidence of significantly elevated intracranial pressure and possible impending cerebral herniation

5 Signs and Symptoms :

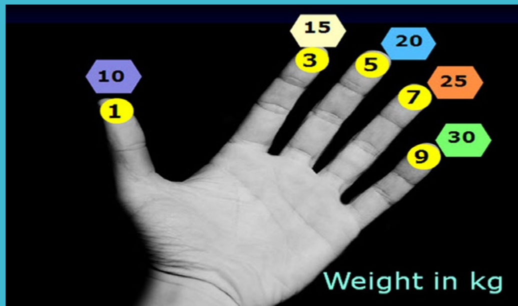
Patient with a **GCS < 8 with ETI / SGA PLUS at least 1 of the following**:

1. Unilateral fixed or dilated pupil
2. Unilateral paralysis
3. Decerebrate / Decorticate posturing
4. Seizure after the injury

TBI Airway Protocol

Secure airway initially using BVM

TBI Medication Protocol



3% Saline infusion

5ML/KG max of 250ML IV or IO

Keppra loading dose

60MG/KG max dose of 1 gram IV or IO

Keppra

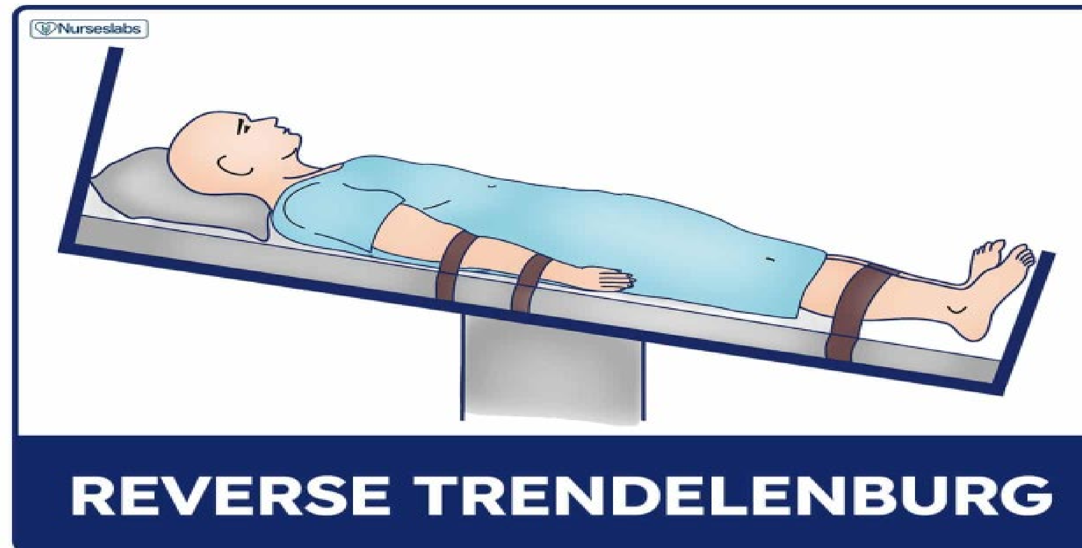
- Anti-anticonvulsant
- Effective and safe agent for early-onset seizure prophylaxis in pediatric patients
- Manages post-traumatic seizures, it has low toxicity unlike phenytoin, and is empirically used clinically in hospitals after severe TBI

3% Normal Saline or Hypertonic Saline

- **3% (HTS) works by extracting fluid from swollen cerebral tissue by osmosis and diminishes the harmful effects of secondary brain injury**
- **3% Hypertonic saline**
  - **↓ Intracranial pressure ICP**
  - **↑ Cerebral perfusion pressure CPP**

TBI Protocol Oxygenation

1. Avoid hypoxia - Keep Oxygen saturation > 95%
2. $ETCO_2$ goal = 30-35mmHg
3. Ensure appropriately sized c-collar is in place
4. Head midline to promote cerebral venous drainage
5. Elevate head of bed 30 degrees
   - Reverse Trendelenburg position if full spinal precautions are being used



TBI Protocol Blood pressure

- **Avoid hypotension to maintain CPP**
    a. **0-5 years – MAP > 55mmHg**
    b. **6-12 years – MAP > 70mmHg**
    c. **>12 years – MAP > 85mmHg**

Transport to nearest Pediatric Trauma Center

Arnold Palmer Childrens or TGH

Main investigator... Dr Plumley APH

Thank you

THANK YOU
DR. PLUMLEY!