

Resources

- Guidelines for the Acute Medical Management of Severe Traumatic Brain Injury in Infants, Children, and Adolescents – Second Edition (2012)
- Guidelines for the Management of Severe Traumatic Brain Injury – 3rd Edition (2007)

Evidence Based treatments

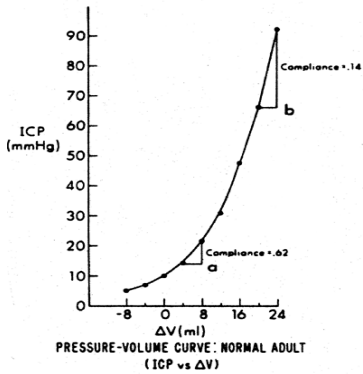
Class I Evidence: Good quality Prospective Randomized Controlled Trial (RCT)

Class II Evidence: Moderate or poor quality RCT or Good-Quality cohort or good-quality Case control

Class III Evidence: Moderate or poor-quality RCT or cohort; Moderate or poor-quality case-control; case series, databases, registries, expert opinion

Modified Monro-Kellie hypothesis

- The sum of the intracranial volumes of blood, brain, and CSF and other components (ie blood clot, tumor) is constant and that an increase in any one of these must be offset by an equal decrease in another, or else the pressure in the closed inelastic cranium will rise and pressure is distributed evenly throughout the intracranial cavity.



Glasgow Coma Scale (GCS)

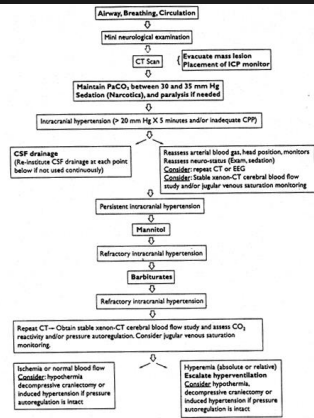
Points	Best eye	Best verbal	Best motor
6	-	-	obeys
5	-	oriented	localizes
4	spontaneous	confused	Withdraws to pain
3	To speech	inappropriate	Flexor (decorticate)
2	To pain	incomprehensible	Extensor (decerebrate)
1	none	none	none

Head injury severity

- Mild: GCS 14-15
- Moderate: GCS 9-13
- Severe: GCS 3-8

Initial assessment of TBI

1. ABCs (hypoxia, airway, hypotension, anemia, etc)
2. Seizures
3. Infection?
4. Spine injury



ICP management principles and considerations

1. HOB 30 degrees, head midline
2. Temperature (level II evidence moderate hypothermia 32-33 degree C (89-91 degrees F)
3. Mass lesion (ie hematoma), consider decompressive craniectomy
4. Hyperventilation: level III evidence, not below PCO2 30 mm Hg, avoid elevated pCO2
5. Mannitol/hypertonic saline 3%
6. Ventriculostomy/lumbar drainage/CSF drainage
7. Consider seizures as cause, consider seizure prophylaxis
8. Sedation and neuromuscular blockade; no propofol on infants and children
9. Barbiturates an option to consider, level III evidence
10. CPP = MAP – ICP, minimum 40 mm Hg in children
11. Treat ICP greater than 20 mm Hg

Neurological exam

- 1. visual exam: external trauma, scalp, ears, raccoon's eyes, facial fractures
- 2. carotid and orbital auscultation
- 3. cranial nerve exam
- 4. level of consciousness, communication, orientation
- 5. motor exam
- 6. sensory exam
- 7. Reflexes

Definitions:

- Concussion
- Contusion (cerebral)
- Contrecoup injury
- Diffuse axonal injury (DAI)
- Basilar skull fracture
- Subdural hematoma
- Epidural hematoma
- Traumatic intracerebral hemorrhage

6/28 3 1/2 year old boy fell from barn loft ladder onto concrete. LOC at scene. Brief CPR from bystanders at the scene. He was hemodynamically stable at scene and en route to hospital. Best neurological exam before sedation/paralysis was described as posturing type movement.

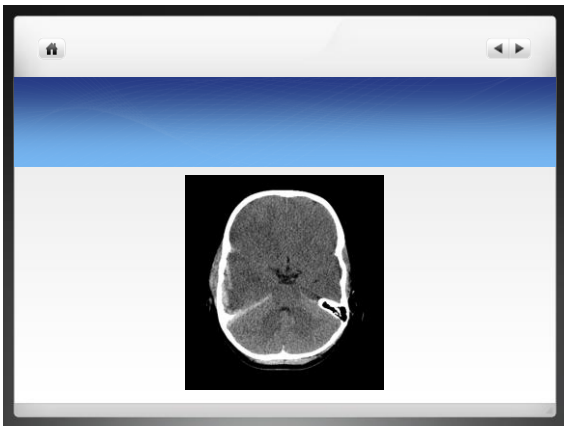
Head CT performed

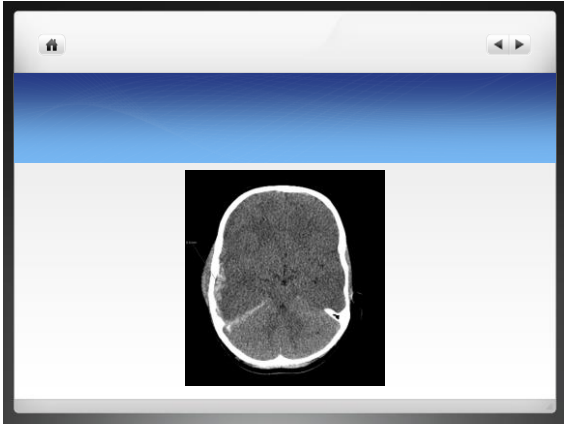
- Right temporal and frontal skull fracture and underlying acute subdural hematoma

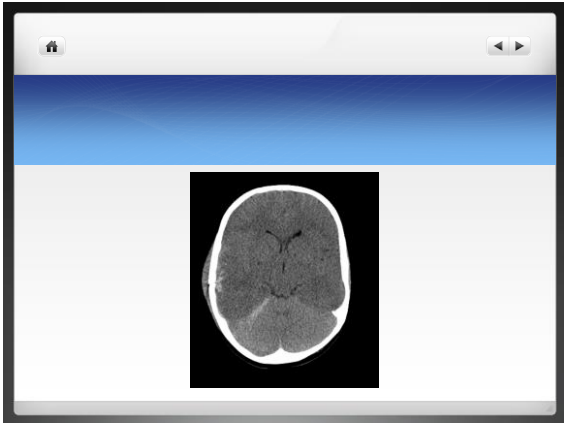






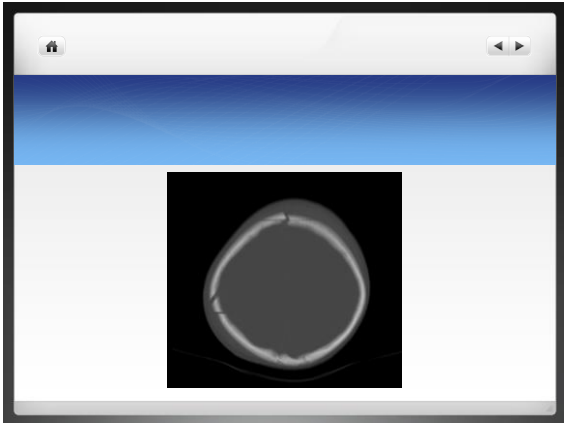


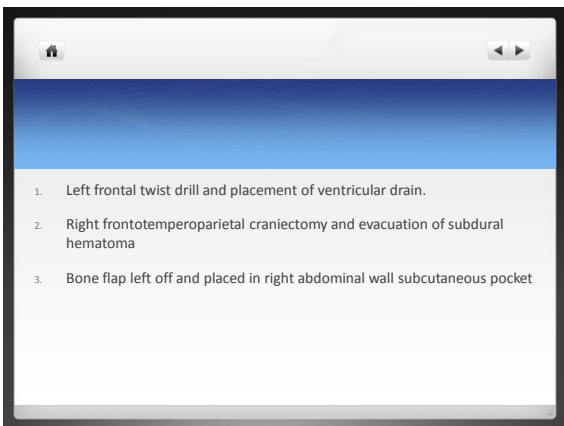


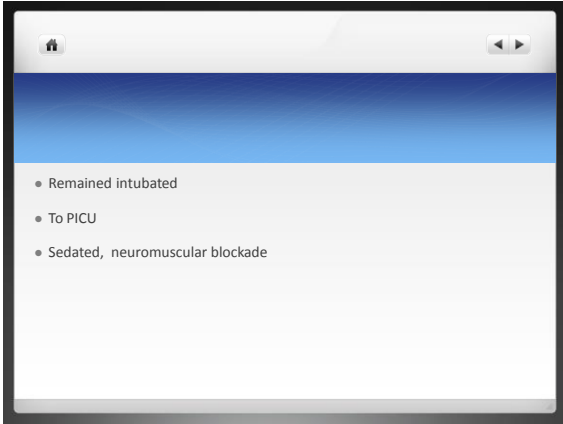


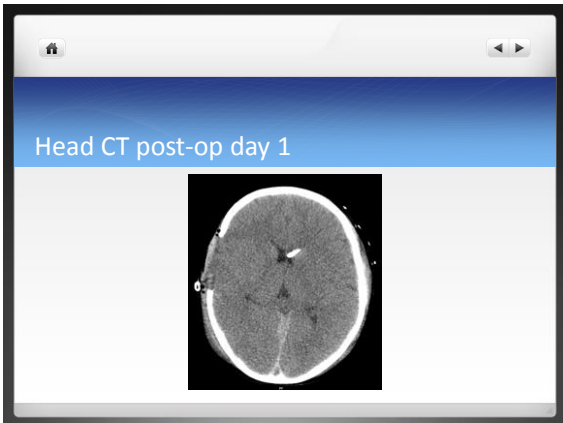


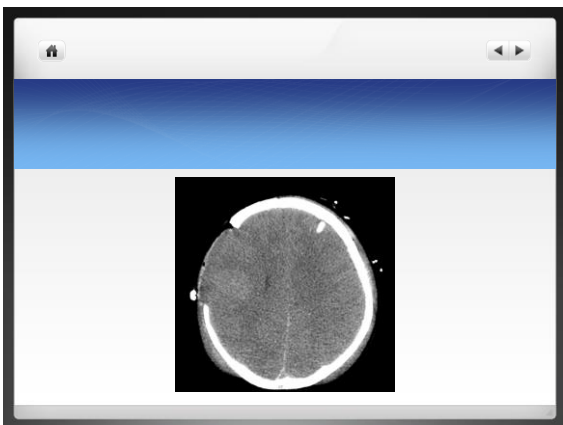












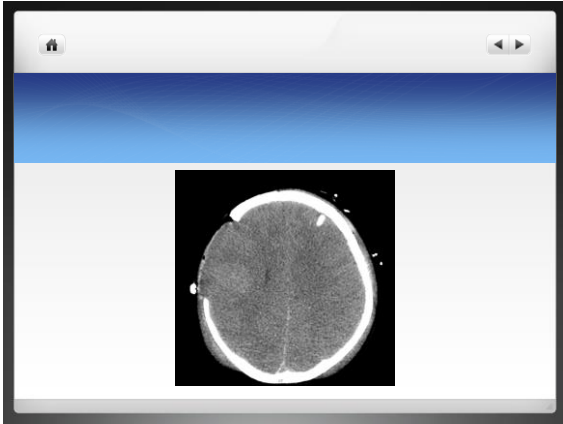
Post-op day 1

- ICPs 15-24 overnight
- EVD 15 cc/hr of CSF
- Versed, Norcuron, Fentanyl drips

Post-op day 2

- Tmax up to 102, very bad
- ICPs up 25-29 mm Hg
- Coughing and moving with stimulation
- CPP = MAP - ICP
- Goal CPP of 40, so goal MAP of 70
- Augment BP
- Add gm Mannitol
- CT head with open cisterns, collapsed ventricular system
- Bronchoscopy for mucous plug and atelectasis



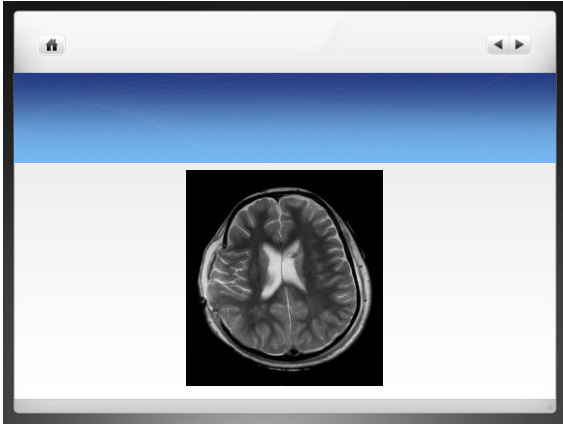


Post-op day 7

- Transitioned from mannitol prn to 3%NaCl drip around POD 4.
- ICPs 20
- Serum Na stable at 148
- Tolerating feedings, transpyloric
- Stopped Neuromuscular blocker and weaning sedation

Post-op day 9

- Opens eyes, moving some
- MRI for prognostic purposes
- Slowly raising EVD to wean off

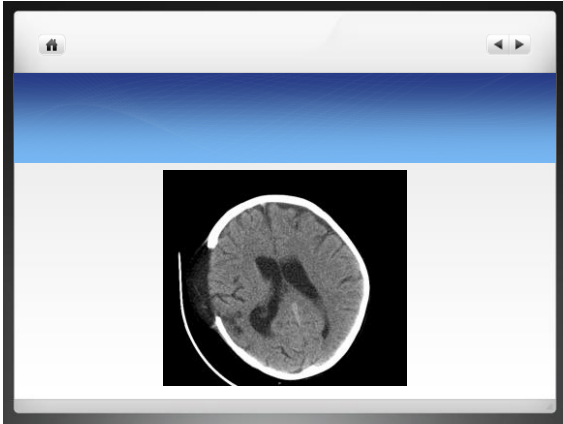


Post-op day 12-14

- EVD removed
- Sitting up, purposeful movement, eyes open
- Progressed to some PO intake

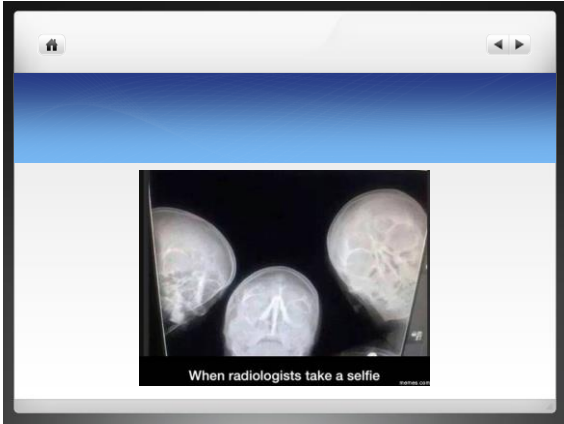
Post-op day 20-21

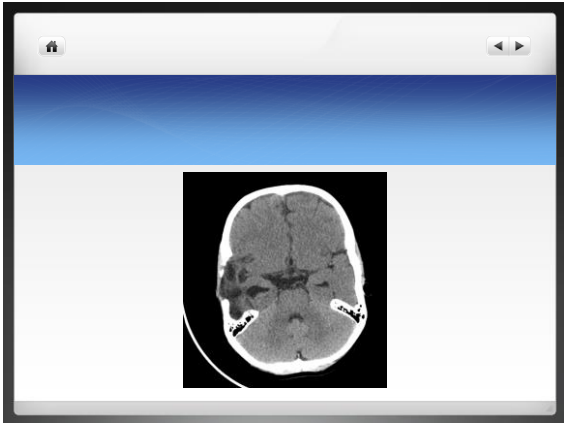
- Fitted with helmet
- Eating
- Talking
- Left leg drags a little with walking
- Needs significant assistance to walk
- Home at request of parents with outpatient therapies

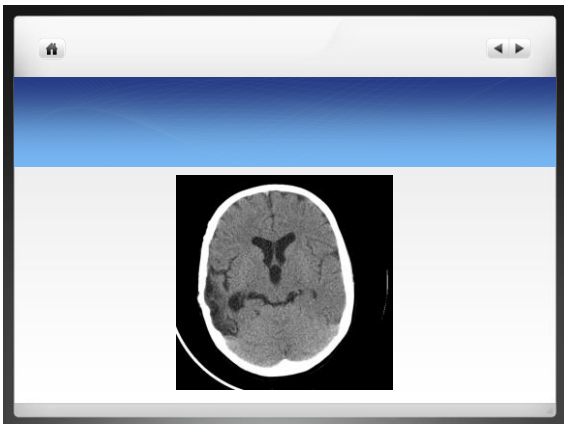


- Electively re-admitted about one month post injury for replacement of bone flap
- Discharged on postop day 2
- Will continue helmet for 8 more weeks





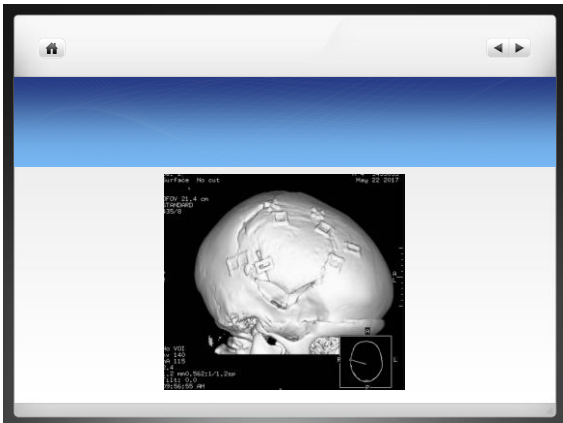


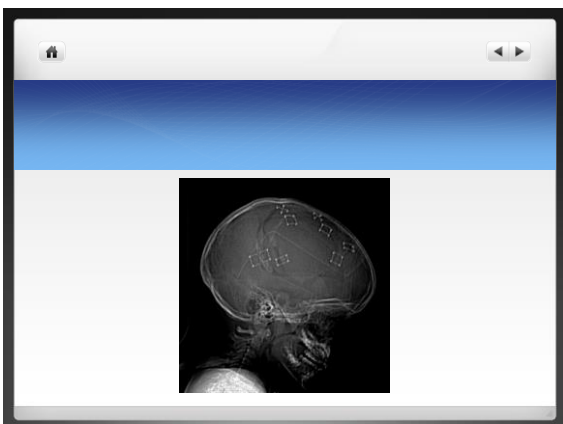


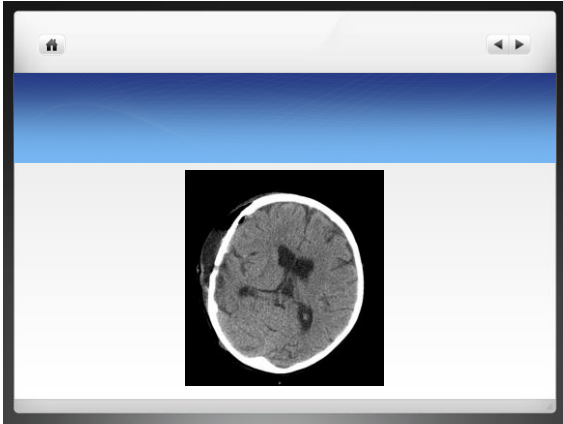
• Returned for office follow-up two months after bone flap replacement with increased fluid under scalp and mobile bone flap

• Horsing around with brothers and sisters

• Return to OR with repair of dura and revision of cranial flap







- At 3 months, 4 months, and 7 months post-op office visits his scalp and bone flap have healed
- Now out of helmet
- CT showed good healing
- Now just over 5 years old
- Swings left leg slightly but doing well
