Early Decompressive Craniectomy

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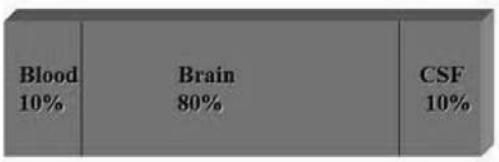
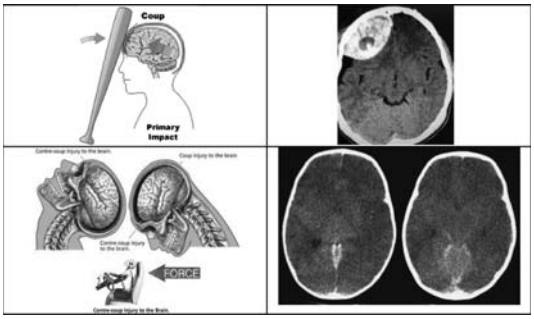
The Monro-Kellie Doctrine concept



$$V_{intracranial\ vault} = V_{brain} + V_{blood} + V_{csf}$$



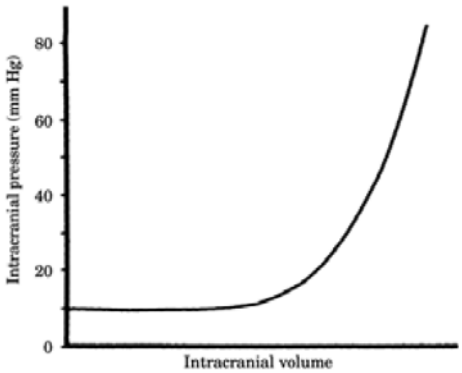
CPP=MAP-ICP

Normal CPP= 60-80 mmHg

Normal MAP=70-90 mmHg

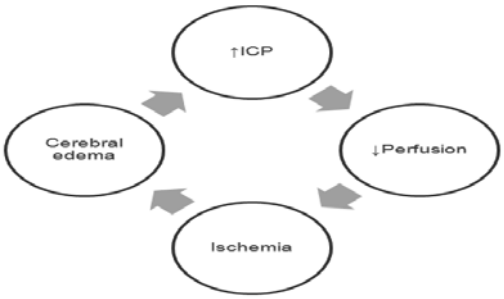
Normal ICP = 5-10 mmHg

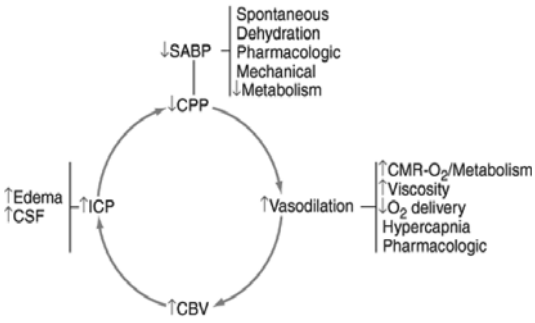
Intracranial volume-intracranial pressure curve



Pathophysiology of intracranial hypertension

- Limitation if physiologic compensation
- Cerebral perfusion is compromised
- Decrease oxygenation
- Disrupts cellular capacity
- Cellular edema
- Brain herniation





Source: Longo DL, Fauci AS, Kasper DL, Hauser SL, Jameson JL, Loscalzo J: *Harrison's Principles of Internal Medicine, 18th Edition*: www.accessmedicine.com

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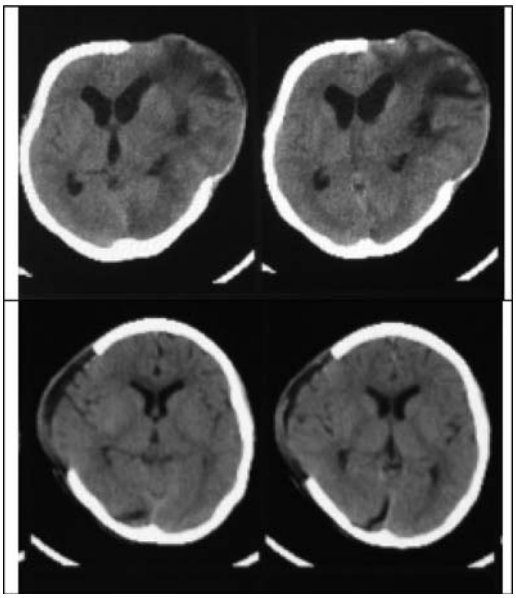
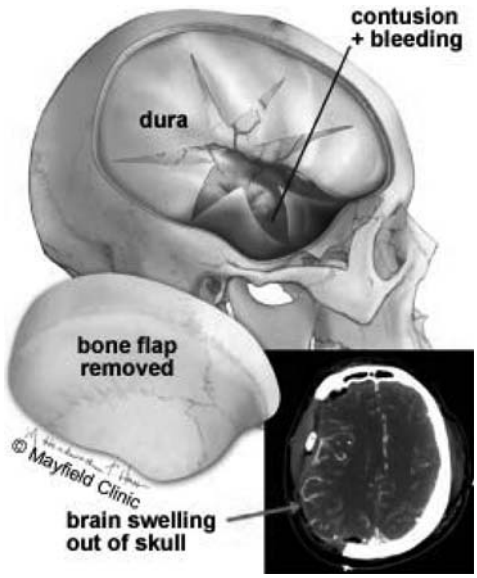
General management of TBI, intracranial hypertension

- Elevation of the Head
- Airway protection and controlled ventilation
- Sedation
- Treatment of Systemic hypertension and Fever
- Seizure Prophylaxis
- Fluid and Electrolyte
- Nutritional Support
- Prophylaxis of gastric ulceration and Thromboembolism

Poor outcome: CPP < 70, ICP > 20 mmHg

- Delayed diagnosis and treatment
- Ineffective surgical management
- Delayed complication detected





- Clinical research

ActaNeurochir Suppl. 2013;118:125-8. doi: 10.1007/978-3-7091-1434-6_22.

Decompressivecraniectomy in trauma: when to perform, what can be achieved.

Jasielski P, Głowacki M, Czernicki Z.

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- In our opinion DC is a suitable method of treatment for patients after severe traumatic brain injury. The best results were achieved in a group of patients aged <50 years, in particular <35 years old. DC gives extra additional space for damaged and edematous brain. DC should be performed early enough and should be large enough. Parameters of the DC obtained positive results with regard to patient status, but there are also other factors such as age and initial Glasgow Coma Scale (GCS) score, which can affect outcome.

Turk Neurosurg. 2010 Jul;20(3):382-9. doi: 10.5137/1019-5149.JTN.2785-09.1.

Effect of early bilateral decompressivecraniectomy on outcome for severe traumatic brain injury.

Akyuz M, Ucar T, Acikbas C, Kazan S, Yilmaz M, Tuncer R.

Akdeniz University, Faculty of Medicine, Department of Neurosurgery, Antalya, Turkey. mahmutakyuz@akdeniz.edu.tr

- This study indicates that early bilateral DC can be effective for controlling ICP in STBI patients. It is likely the favorable outcome results for Group 2 patients reflects the relatively short time between trauma and surgery. Therefore, these data indicate early bilateral DC can be considered as a first tier treatment in STBI patients.

CurrOpinAnaesthesiol. 2012 Oct;25(5):540-7. doi: 10.1097/ACO.0b013e328357960a.

Updates in the management of intracranial pressure in traumatic brain injury.

Wijayatilake DS, Shepherd SJ, Sherren PB.

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- Decompressivecraniectomy in refractory intracranial hypertension has been associated with poor functional outcomes; a large multicentre trial is currently comparing it against barbiturate coma.

Early Follow-up CT Brain in Traumatic Brain Injury

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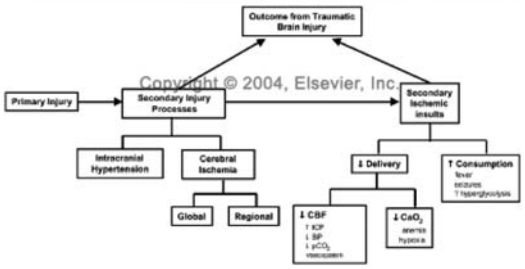
Outcome from traumatic brain injury



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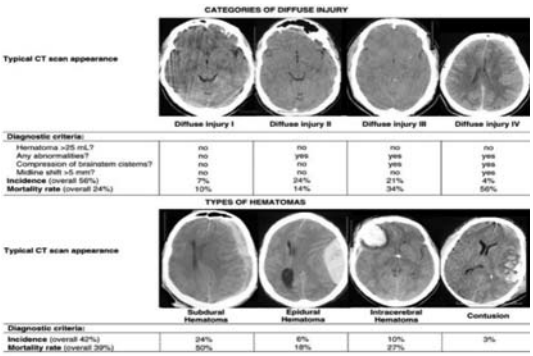
Primary brain injury



Secondary brain injury

- Intracranial hypertension
- Cerebral ischemia

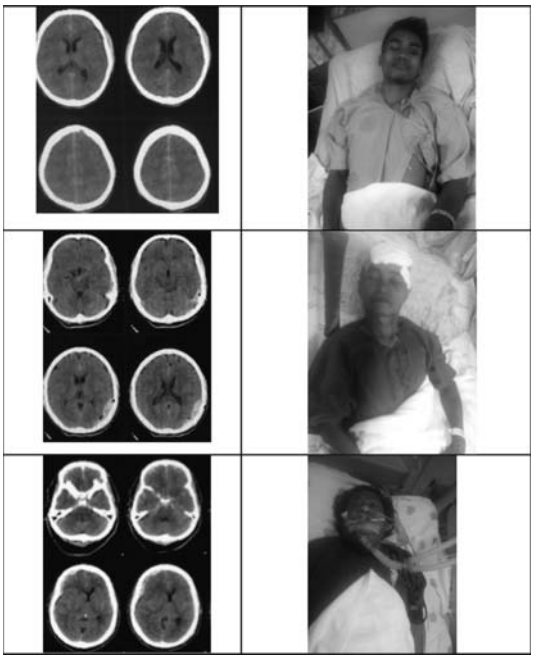
Secondary ischemic insults

- Decrease cerebral oxygen delivery
- Increase cerebral energy consumption

Monitoring options

- Neurological status
- Follow-up CT brain
- ICP monitoring
  - End-tidal CO_2
  - Jugular bulb oximetry (Jugular venous oxygen saturation)
  - Transcranialdroppler flow velocity
  - Single photon emission CT brain (brain tissue Po_2)
  - Xenon-enhanced CT brain

Role of follow-up CT brain



30 mo, CT Brain for TBI in Yasothon hospital				
24 hr CT brain		>24 hr CT brain		No F/U CT brain
6		21		251
Sx	No	Sx	No	Conservative Tx. Surgical intervention
2	4	5	16	

Clinical research

Emerg Med J. 2012 Jul;29(7):528-32. doi: 10.1136/emermed-2011-200162. Epub 2012 Feb 3.

Utility of routine follow-up head CT scanning after mild traumatic brain injury: a systematic review of the literature.

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- Routine follow-up CT scans rarely alter treatment for patients with complicated mild TBI. Follow-up CT scans based on neurological decline alter treatment five times more often than routine follow-up CT scans.

J Trauma. 2007 Jun;62(6):1339-44; discussion 1344-5.

Indications for routine repeat head computed tomography (CT) stratified by severity of traumatic brain injury.

Department of Surgery, Division of Trauma and Critical Care, Los Angeles County and University of Southern California Medical Center, Los Angeles, California, USA. carlosbr@usc.edu

- Patients with any head injury (mild, moderate, or severe) should undergo a repeat head CT after neurologic deterioration, because it leads to intervention in over one-third of patients. Routine repeat head CT is indicated for patients with a GCS score < or =8, as results might lead to intervention without neurologic change.

J Trauma Acute Care Surg. 2013 Apr;74(4):967-73 ; discussion 973-5. doi: 10.1097/TA.0b013e3182877fed.

Repeat headcomputedtomographyafter minimal braininjury identifies the need for craniotomy in the absence of neurologic change.

Divisions of Trauma and Surgical Critical Care, Dewitt-Daughtry Family Department of Surgery, University of Miami Miller School of Medicine and Ryder Trauma Center, Miami, FL 33136, USA.

- AftermTBI, worsening of repeat headCT finding is seen in a third of patients and is associated with worse outcomes. A substantial fraction of patients who require operative intervention will have no clinical changes in the first 8 hours, supporting the value of repeat headCT within this time frame.

Neurosurgery. 2013 Jan;72(1):56-62; discussion 63-4. doi: 10.1227/NEU.0b013e318276f899.

The value of scheduled repeat cranial computedtomographyafter mild headinjury: single-center series and meta-analysis.

Division of Neurosurgery, McMaster University, Hamilton, Ontario, Canada. Dr_menawer@hotmail.com

- The available evidence indicates that it is unnecessary to schedule a repeat CT scan after mild headinjury when patients are unchanged or improving neurologically. In the absence of supporting data, we question the value of routine follow-up imaging given the associated accumulative increase in cost and risks.