



**ThinkAskLearn**  
Health Professional Education

**Tight Brains: Understanding  
Neuro Trauma**

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**Head Injury**

- It's raining; it's pouring,
- The old man is snoring,
- He went to bed and bumped his head,
- And he couldn't get up in the morning.






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**Classification of Primary Injury**

- Skull fracture
- Concussion
- Contusion
- Intracranial Haematoma
- Diffuse Axonal Injury
- Penetrating Injury



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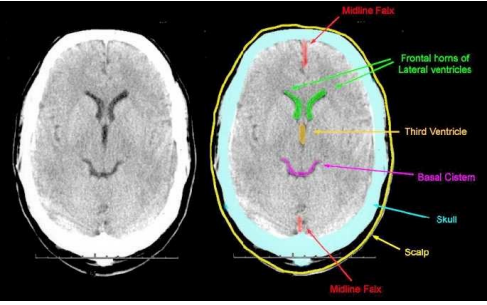
**Base of Skull Fracture**






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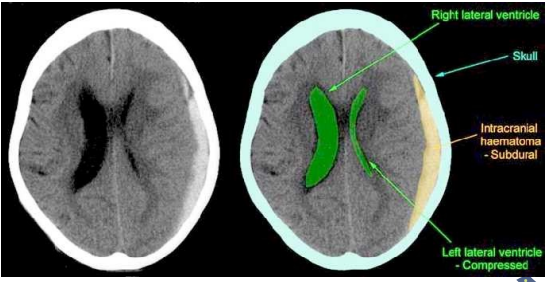
**The Normal Brain**






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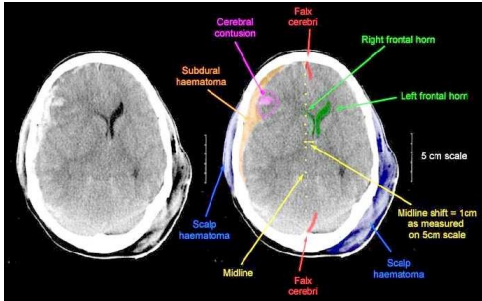
**Subdural Haematoma**





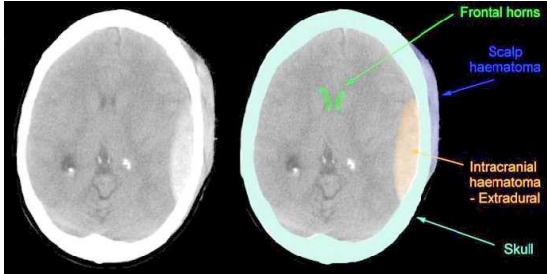
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Subdural Haematoma



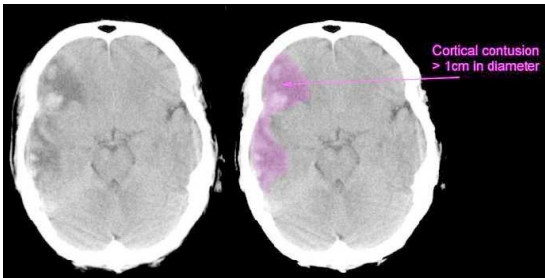
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ExtraDural Haematoma



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Cerebral Contusion



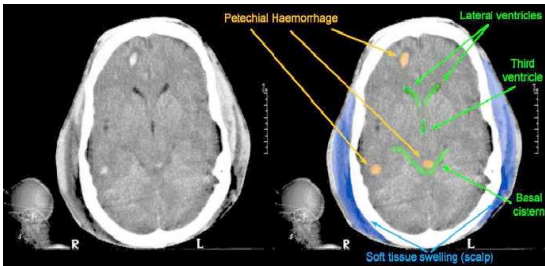
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Diffuse Axonal Injury

- Acceleration/deceleration injuries
- Shearing and rotational forces on the axonal network result in major structural and functional disturbance at a microscopic level
- Non-specific or minimal changes on initial CT scanning
- Repeated scans- small diffuse haemorrhagic areas
- Increasing generalised cerebral oedema

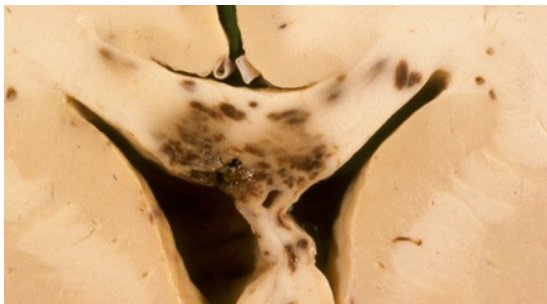
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Diffuse Axonal Injury



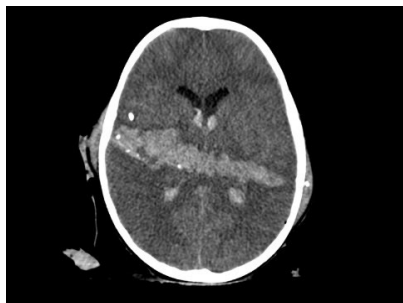
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Diffuse Axonal Injury



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## Penetrating Trauma



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## A Quick Case

- Working in large regional hospital
- 250km from tertiary trauma
- 23 year old male
- Factory Worker
- Large steel beam fallen from roof
- Landed on head – crush
- GCS 3 at Scene

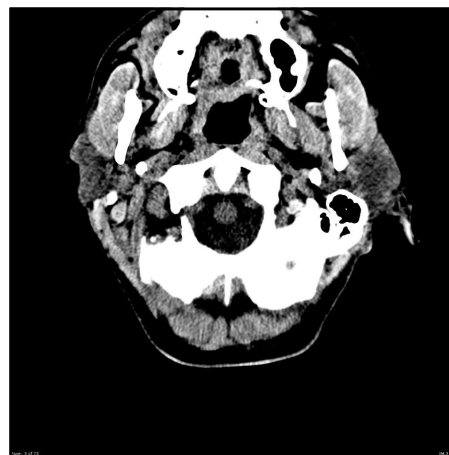


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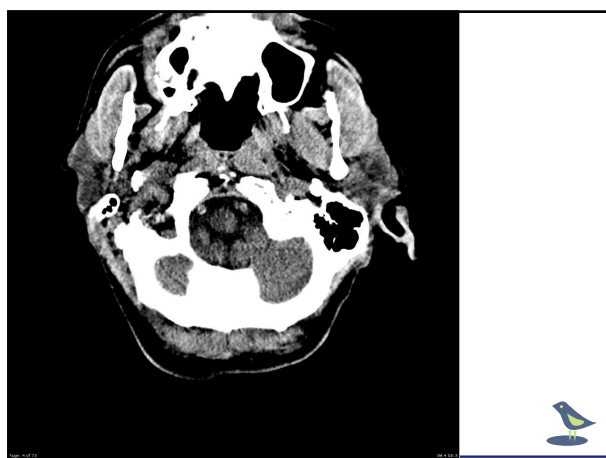
M – Steel Beam to Head from 6m  
I – Closed Head Injury – Gcs 3  
Fracture Femur Lt Side  
Multiple Abrasions  
S – P 125, SBP 100mmHg, SpO2 88% 15l/min  
NRB RR  
T – Hi Flow O2, Airway opening, C-Spine  
precautions, IVC X2 NS 300mls  
Air Splint to leg



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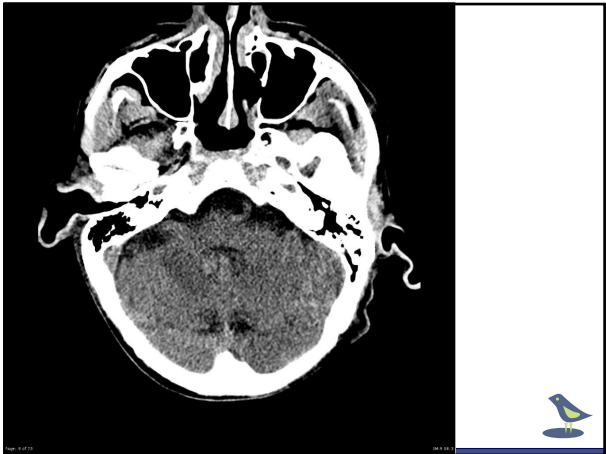
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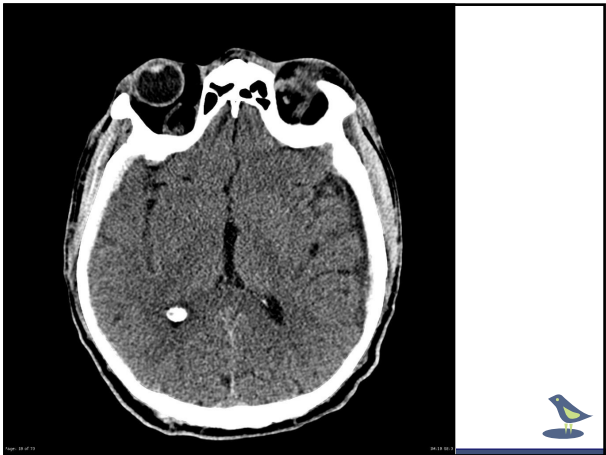
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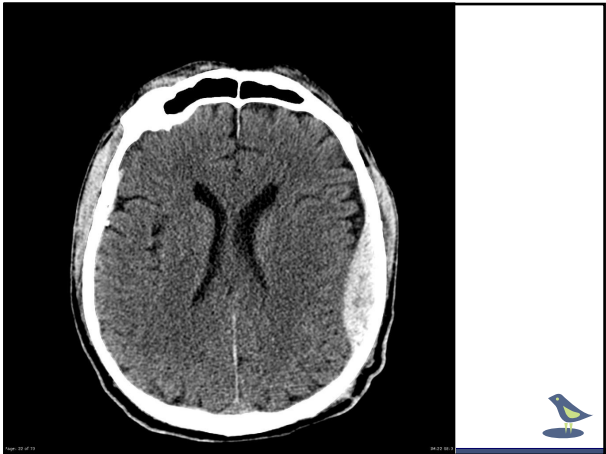
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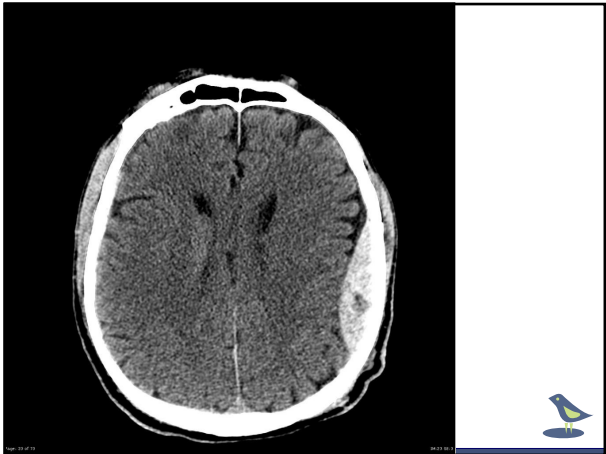
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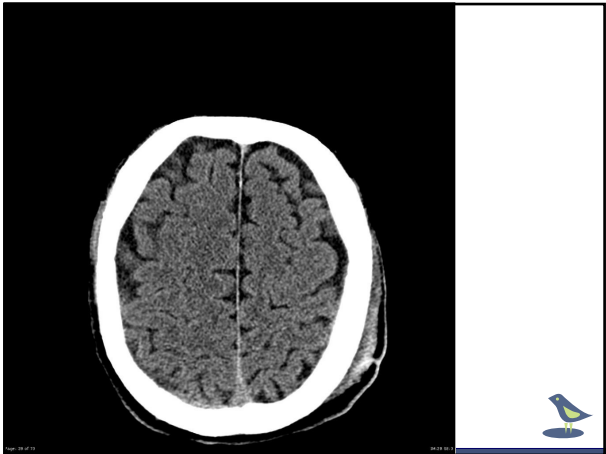
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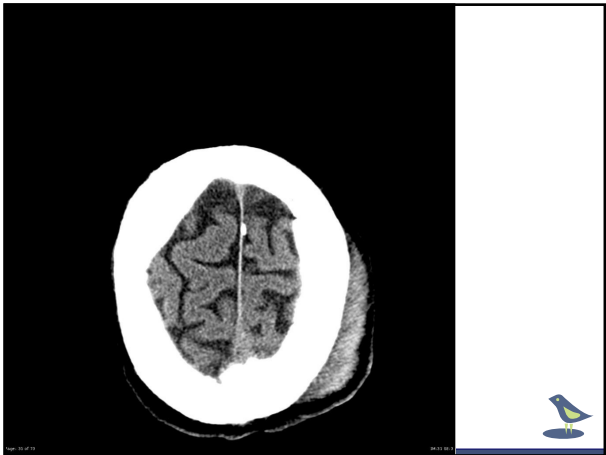
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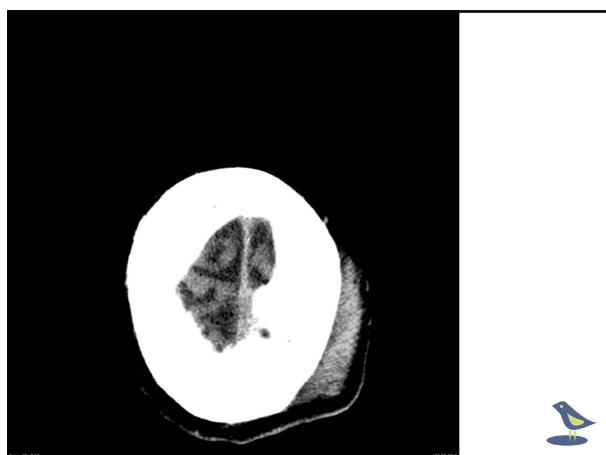
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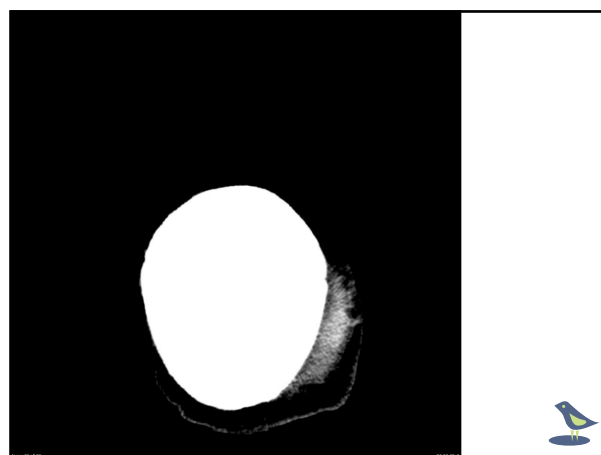
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### Patient needs to be transferred

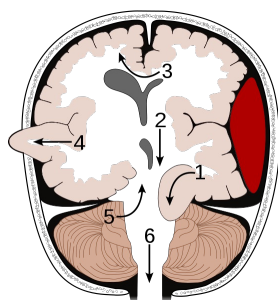
- Outline what needs to be done for this patient to be transferred
- Half the group will be receiving the patient
- Half the group will be sending the patient

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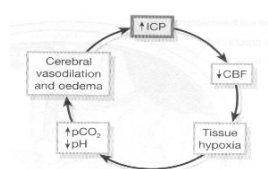
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### Herniation Syndrome



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### Secondary Brain Injury

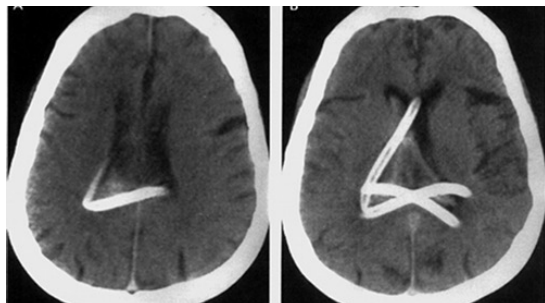


- Secondary brain injury results from cerebral hypoxia, caused by hypotension and inadequate ventilation
- **This leads to –** Ischaemia
- ↑ICP Neurochemical derangements

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## Nothing Nasally in Head Trauma



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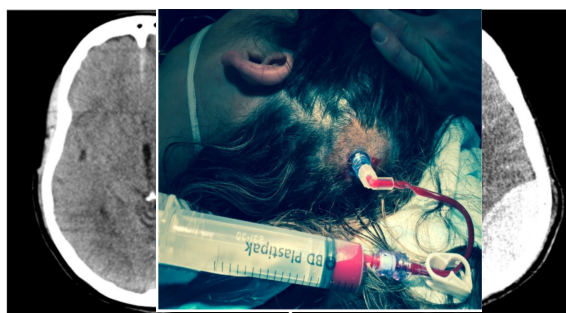
## IO to the Brain?

Temporising extradural haematoma by craniostomy using an intraosseous needle

Harry Bulstrode<sup>a,\*</sup>, Silvester Kabwama<sup>b</sup>, Andrew Durnford<sup>c</sup>, Jonathan Hempenstall<sup>c</sup>, Aabir Chakraborty<sup>c</sup>

*Injury, Int. J. Care Injured* 48 (2017) 1098–1100

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## ABC'S for Severe Head Injury

- A – GCS <13 consider early intubation, control airway and ventilation- Avoiding hypoxia
  - Avoid hyperoxaemia
- Control CO<sub>2</sub>
  - Normocarbic CO<sub>2</sub> 35-45mmhg
  - Caution with ET-CO<sub>2</sub>- Correlated with arterial CO<sub>2</sub>
  - High CO<sub>2</sub> – Vasodilation
  - Low CO<sub>2</sub> – Vasoconstriction

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## ABC'S for Severe Head Injury

- C - Maintain BP
  - keep MAP >90mmhg
  - 1 episode of hypotension 30% increase in mortality
- Simple supportive measures
  - Normoglycaemic
  - Normothermic
  - Sedated/analgesia – Keep ICP normal
  - Seizure control – phenytoin, not routinely given
  - EEG in ICU

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## ABC'S for Severe Head Injury

- Simple measures
  - ETT taping not tying
  - Avoid poorly fitting C-spine collar
  - Invasive procedure – suctioning, turning, provide sedation
  - Head up 30 degrees- practical in ED?

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### ABC'S for Severe Head Injury

- Invasive intervention
  - Moving to OT asap
  - ICP monitoring – evidence in use?? Change in outcome
  - Electrolyte balance esp sodium
  - Identify coagulopathy patient
  - Role of Hypertonic Saline
  - Role of mannitol – Osmotic diuretic to reduce swelling - Rapid increasing ICP



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### In Conclusion

- HI is common presentation to ED.
- CT is imaging modality of choice
- ED nurses play significant role in preventing secondary hypoxia in severely head injured patients
  - Analgesia, Sedation, Monitoring, Positioning



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