

# CNS lecture 7

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Brain is very vulnerable → protected  
by skull  
↳ injury of skull can affect  
brain

## Traumatic lesions

- Trauma to CNS causes mortality or disability
- Outcome depends on extent of trauma and site affected. → if affects medulla → death → even if minimal
- Spinal cord trauma.. Severe disability.
- Brain stem trauma... can be fatal

nothing seen  
but brain affected  
↑ inside

# Head injury

- Blunt or penetrating. → there is a wound (skull open)
- Open or closed.
- Severe brain damage can occur without external signs of head injury → patient must be kept under observation
- Lacerations and even skull fractures are not necessarily associated with brain damage

- Repetitive episodes of trauma can later lead to neurodegenerative process e:g Alzheimer

The mechanism is unknown

# Traumatic parenchymal injury

When an object impacts the head:

- Injury of brain at site of impact: coup injury
- Injury opposite to site of impact: countercoup
- Both are contusions

at same side of insult

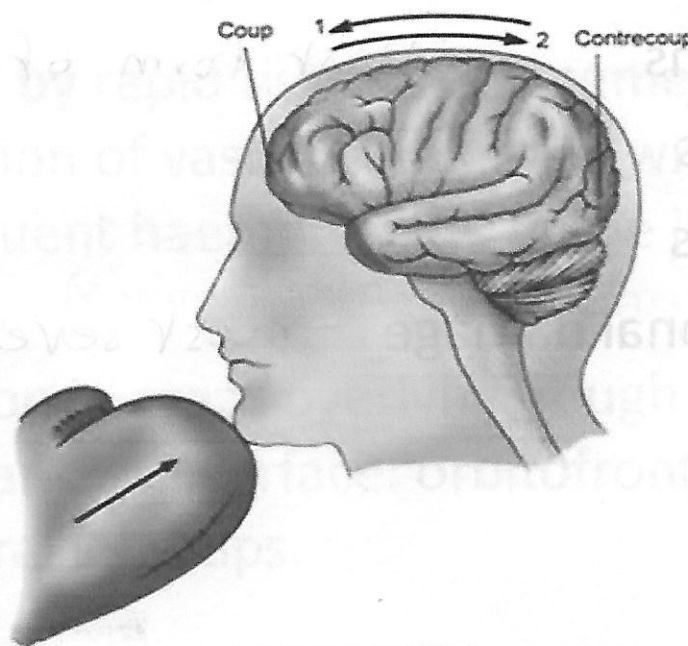
(contralateral side)

↓  
due to movement of brain relative to solid bone during the insult

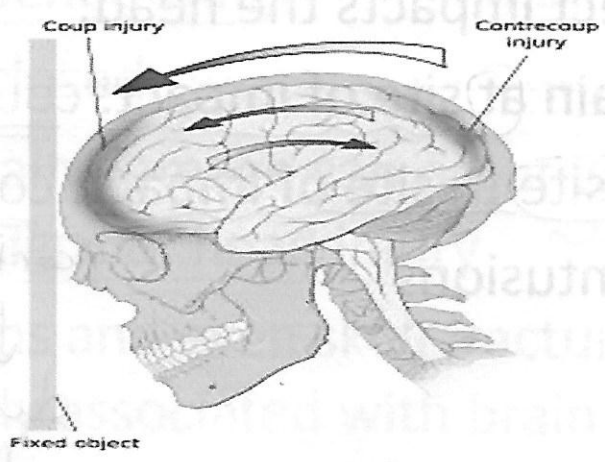
(brain moves towards rigid skull

↓  
Skull

↓  
damage to vulnerable tissue)



# Traumatic parenchymal injury



## Brain injury - 4 types (Trauma in brain)

- ① • Concussions - mildest form of brain injury
- ② • Contusions
- ③ • Lacerations
- ④ • Diffuse axonal damage - most severe

Severity increases as you go down

## ① concussions

- Reversible altered consciousness after head injury in the absence of contusions
- Transient dysfunction in the form of: loss of consciousness, temporary respiratory arrest, loss of reflexes.
- Pathogenesis: unknown → everything goes back to normal
- Recovery is complete but amnesia of the episode.

\* Nothing seen macro- or microscopically but functional loss.

## ② contusion

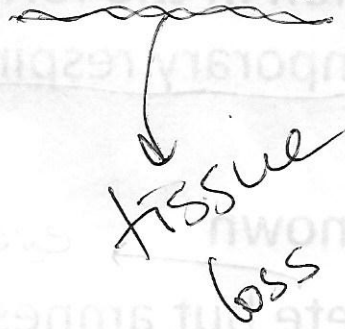
— more severe  
— seen injury  
— some (little) injury

- Caused by rapid tissue displacement, disruption of vascular channels with subsequent haemorrhage, tissue injury and edema. Minimal injury → extravasation of some RBCs
- Common in areas overlying rough and irregular bone surface: orbitofrontal region, temporal lobe tips.

\* NO tissue loss

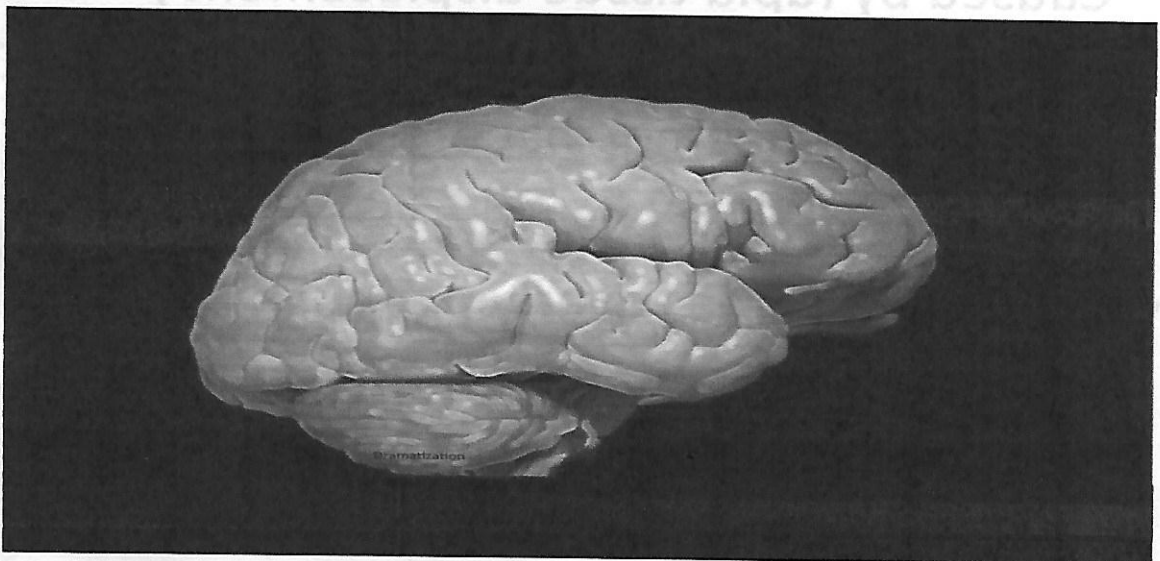
### ③ lacerations — visible injury ⊕ hemorrhage — loss of tissue

- Penetrating injuries cause skull fractures and brain lacerations
- Laceration: tissue tearing and hemorrhage.

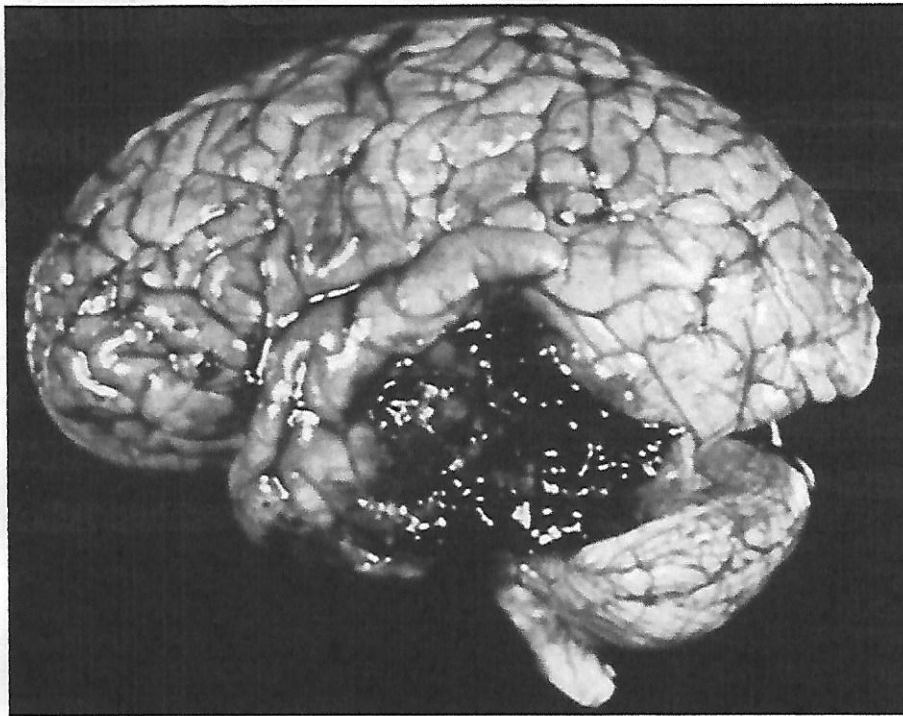


### contusion

- simple hemorrhage  
on brain



# laceration



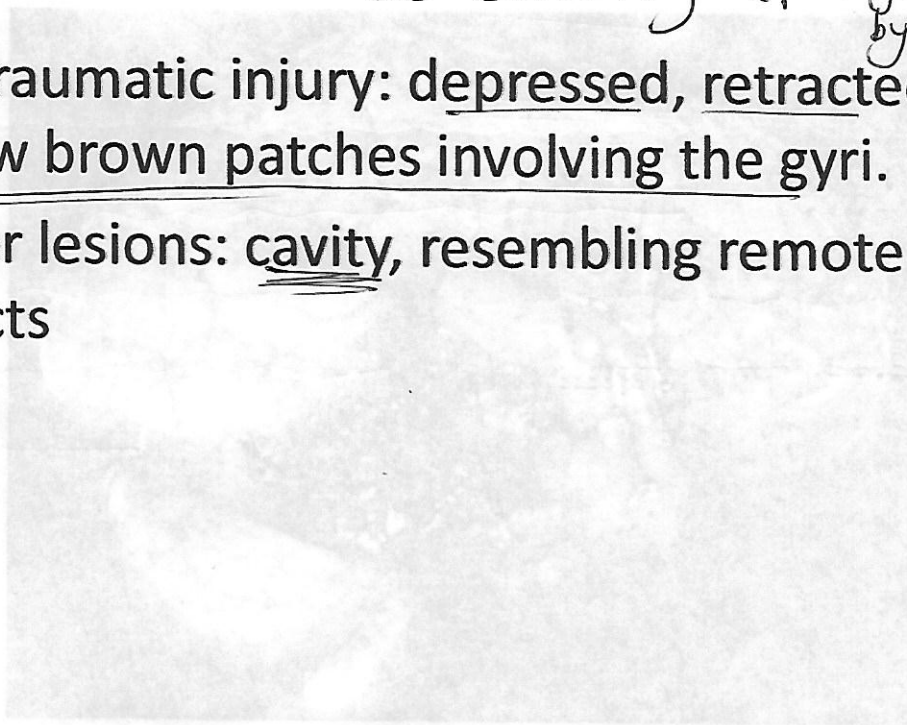
## \* Contusion/morphology

→ triangle

- Wedge shaped, widest aspect closest to point of impact. (widest area is base of triangle at site of injury)
- Edema and extravasated RBCs.
- Superficial aspects of cortex affected more (contrary to ischemic injury)

with time → hemorrhage is absorbed → area becomes a cavity (phagocytosed by macrophages)

- Old traumatic injury: depressed, retracted, yellow brown patches involving the gyri.
- Larger lesions: cavity, resembling remote infarcts



## ④ Diffuse axonal injury

Injury that caused submovement of axons (white matter) relative to each other

- Brain trauma can cause subtle widespread injury to axons within the brain: = diffuse axonal injury Mild subtle movement BUT affects ALL axons → will result in severe irreversible damage
- Movement of one region of the brain relative to another.. disrupt axonal integrity. Acute movement
- Appear under LM as axonal swelling
- Can lead to severe irreversible neurologic deficit. ↓ a functional problem



# Traumatic vascular injury

trauma affecting blood vessels

- ① • Epidural
- ② • Subdural
- ③ • Subarachnoid
- ④ • intraparenchymal

4 types of hemorrhage in brain

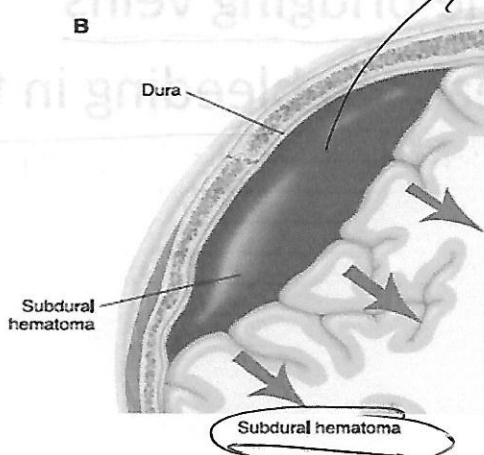
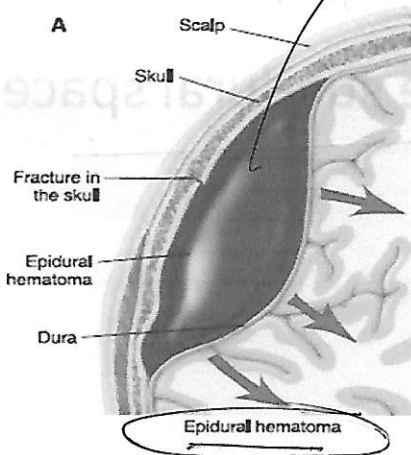
hemorrhage

loss of blood vessel within brain parenchyma (inside)

most common cause is ruptured berry aneurysm

peeling of dura → blood accumulates between dura & skull

blood accumulates beneath dura



\* Dura adheres to skull → normally

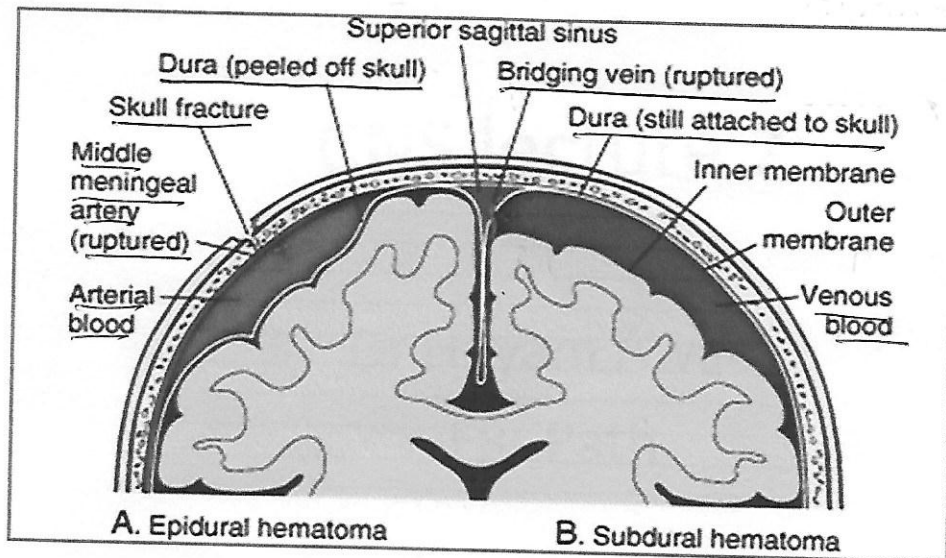
\* Trauma to brain → rupture of some vessels → accumulation of blood

## → Epidural hematoma

- Dural vessel torn due to fracture.
- Usually: middle meningeal artery → ruptures
- Blood accumulates under arterial pressure and dissects the dura, compressing the brain parenchyma

## → Subdural hematoma

- Rapid movement of brain during trauma.. Can tear the bridging veins
- This leads to bleeding in the subdural space



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