Traumatic and non-traumatic brain hemorrhage/ patho summary lec2

Intracranial hemorrhage

- **Intracranial hemorrhage can be traumatic or non-traumatic:**

- **Causes of non-traumatic hemorrhage:**

1. Primary brain parenchymal hemorrhage, which is caused mainly by hypertension.
2. Cerebral amyloid angiopathy
3. Ruptured aneurysms
4. Vascular malformation
5. Vasculitis

- **Other (rarer) causes of intra-cerebral hemorrhage**

- Bleeding disorders
- Drug related: anti-coagulants
- Cocaine use
- Tumors, Can encroach on a vessel and cause bleeding

1. Primary brain parenchymal haemorrhage

- Primary = spontaneous = non-traumatic.
- Peak 60 years of age.
- Mostly **due to rupture of a small intra-parenchymal vessel.**
- Hypertension is the leading cause.
- Most affected sites: basal ganglia, thalamus, pons and cerebellum.
- Outcome depends of the site and extent of haemorrhage

- **Why hypertension causes parenchymal hemorrhage?**

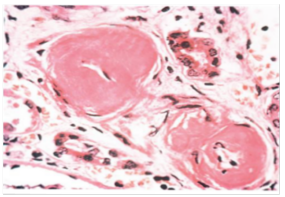
• Hypertension causes hyaline arteriolosclerosis, results in weak arterioles, now the arterioles can rupture especially
if there is sudden or sustained increase in blood pressure.

• Minute aneurysms can form **(Charcot- Bouchard micro aneurysms)** because of the weak vascular walls and these also can rupture.

Hyaline arteriolosclerosis

• Homogeneous pink hyaline thickening of the arteriolar walls with luminal narrowing and loss of underlying structural detail.

• Occurs due to leakage of plasma components across injured endothelial cells into vessel walls and increased extracellular matrix production by smooth muscle in response to chronic hemodynamic stress.



Symptoms of parenchymal brain haemorrhage

1. neurological symptoms related to the area affected
2. symptoms of increased intracranial pressure

Morphology

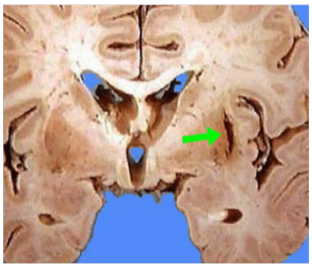
- Extravagated blood.
- With time, Resolution and cavity formation

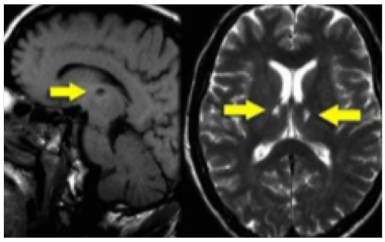
Effects of hypertension on the brain:

- Massive intracranial haemorrhage.
- Lacunar infarcts.
- Rupture of small penetrating vessels
- Acute hypertensive encephalopathy= edema

Vessel rupture in hypertension

- Small penetrating vessels may rupture.
- Cause small haemorrhages = **Slit haemorrhages.**





Lacunar infarcts

- Small infarcts, mostly in deep grey matter (basal ganglia and thalamus), internal capsule, deep white matter and pons.
- Caused by occlusion of penetrating branches of a large cerebral artery.
- Effect: depends on site.

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2. Vasculitis

- inflammation of the blood vessel wall, weakens the vessel wall so it can rupture and cause hemorrhage.

- **Causes of vasculitis**

A. Infectious arteritis:

• previously seen with syphilis and TB.
• Now in association with: CMV, herpes, aspergillosis, immunosuppression.

B. Polyarteritis nodosa.

C. Primary angiitis of CNS cause diffuse encephalopathy with cognitive dysfunction.

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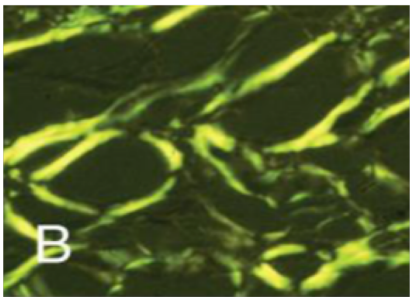
3. Cerebral amyloid angiopathy

- Amyloid deposition in the walls of arteries weakens the vessel wall.
- Bleeding, usually in the lobes of cerebral cortex (lobar hemorrhage)



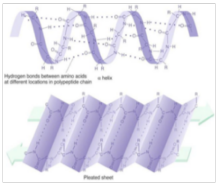
Congo Red Stain

- **Amyloidosis**

Deposition of extracellular fibrillary proteins, that are responsible for tissue damage and functional compromise.

- These abnormal fibrils are produced by the aggregation of misfolded proteins (which are soluble in their normal folded configuration).
- Amyloid is deposited in the extracellular space in various tissues and organs of the body.

- **By electron microscope**



All types of amyloid consist of continuous, non-branching fibrils with a diameter of approximately 7.5 to 10 nm. With a cross-β-pleated sheet conformation.

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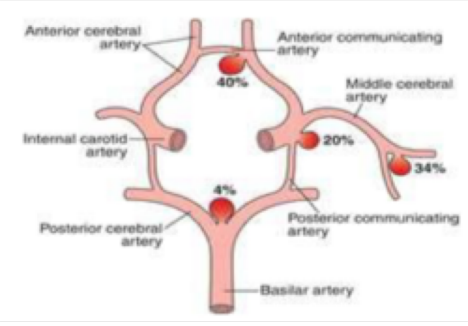
4. Ruptured berry aneurysm

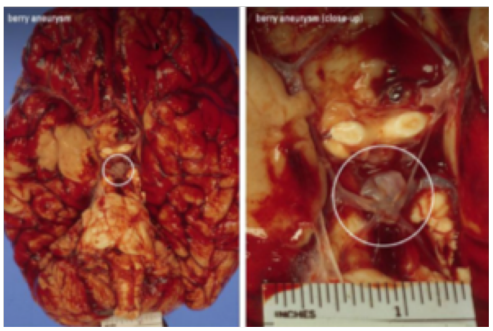
- happens usually due to increased intracranial pressure.
- Sudden severe headache followed by loss of consciousness
- 25-50% die
- Survivors: risk of recurrent bleeding.
- **Berry aneurysm:** 90% in the anterior circulation, Near major arterial branching points
-Multiple in 20 – 30 % of cases

Morphology

- Berry aneurysm: thin-walled outpouching of an artery.

- **Ruptured aneurysm**
- Mainly causes **subarachnoid** hemorrhage but also can cause hemorrhage within the brain paranchyma.





Subarachnoid haemorrhage

- Most common cause: ruptured berry aneurysm.
- Other causes: vascular malformations, trauma, tumors, haematological disturbances.

5. Vascular malformations

- Arteriovenous malformations
- Cavernous malformations
- Capillary telengectasia
- Venous angioma

- **AV malformation**
- Most common type of vascular malformation
- Males>females
- Present at 10-30 years of age.
- Symptoms: seizures and intracranial hemorrhage

Morphology of AV malformation

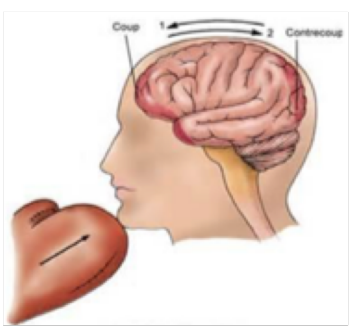
- Network of disorganized vascular channels

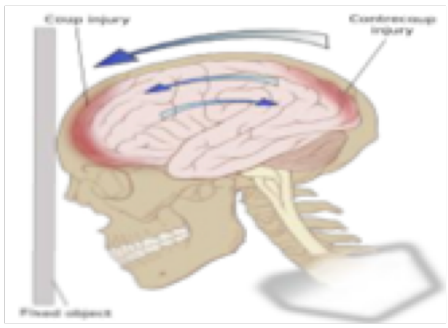
- **Traumatic lesions**

•Trauma to CNS causes mortality or disability
• Outcome depends on extent of trauma and site affected.
• Spinal cord trauma.. can cause severe disability.
• Brain stem trauma... can be fatal.

- **Head injury**

• Blunt or penetrating, Open or closed.
• Severe brain damage can occur without external signs of head injury.
• Lacerations and even skull fractures are not necessarily associated with brain damage.





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.

Note:

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

Brain injury

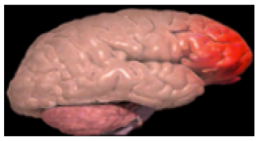
- Concussions
- Contusions
- Lacerations
- Diffuse axonal damage

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
- Recovery is complete but amnesia of the episode.

Contusion

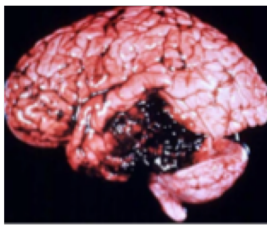
- Caused by rapid tissue displacement, disruption of vascular channels with subsequent haemorrhage, tissue injury and edema.
- Common in areas overlying rough and irregular bone surface: orbitofrontal region, temporal lobe tips.



Contusion/morphology

- Wedge shaped; widest aspect closest to point of impact.
- Edema and extravasated RBCs.
- Superficial aspects of cortex affected more (contrary to ischemic injury).

Lacerations



- Penetrating injuries cause skull fractures and brain lacerations
- It's a tissue tearing and hemorrhage.

- Old traumatic injury: depressed, retracted, yellow brown patches involving the gyri.

- Larger lesions: cavity, resembling remote infarcts.

Diffuse axonal injury

- Brain trauma can cause subtle widespread injury to axons within the brain: = diffuse axonal injury.
- Movement of one region of the brain relative to another.. disrupt axonal integrity.
- Appear under LM as axonal swelling, Can lead to severe irreversible neurologic deficit.

Traumatic vascular injury

- Epidural
- Subdural
- Subarachnoid
- Intraparenchymal

Epidural hematoma

- Dural vessel torn due to fracture.
- Usually: middle meningeal artery is torn
- 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, leading to bleeding in the subdural space.