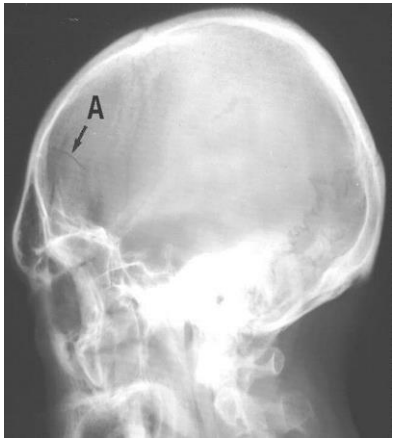
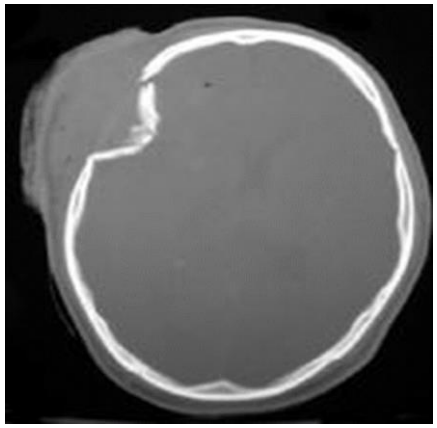
Traumatic vascular disease of the nervous system

CENTRAL NERVOUS SYSTEM TRAUMA:

Result morphology depend on:

- Penetrating or Blunt trauma→ Open or Closed
- Mobile or immobile head at time of trauma
- Lesions at bony prominences e.g
  - Frontal, orbital, temporal & occipital poles
  - Spinal cord
- Edema may occur worsen the condition
- ? skull fracture





there are two types of skull fractures:

- Hair line fracture: a break in the bone without damage to the skin, a break in a cranial bone resembling a thin line, without splintering, depression, or distortion of bone
- DEPRESSED “or “DISPLACED: a break in a cranial bone (or "crushed" portion of skull) with depression of the bone in toward the brain

There are two types of brain injuries:

✓**parenchymal injury:** هون الي متضرر هو نسيج الدماغ نفسه و البعاده بكون بسبب صدمه قويه مصحوبه **hair line fracture**

✓**vascular traumatic injury:** هون السبب انه الضربه عملت **rapture of blood vessel**

A.Parenchymal injury:

✓Concussion

Definition	- Is a clinical syndrome of altered consciousness secondary to head injury - Immediate and temporary disturbance of brain function with reversible altered consciousness
Cause and pathogenesis	Brought by a change in the momentum of the head when a moving head suddenly arrested by impact on a rigid surface. Pathogenesis is unknown but may result from temporary deregulation of the reticular activating system in the brainstem
Signs and symptom	No demonstrable lesion ما فيه اشي برا على الجلد او العضم Signs: confusion, headache, visual disturbances, nausea, vomiting, dizziness…. Then recovery with Amnesia for the event
neurologic picture	Loss of consciousness, Temporary respiratory arrest Loss of reflexes
Outcomes	neurologic recovery is complete , amnesia for the event persists
Complications مهمات	- Post concussive neuropsychiatric syndromes typically associate with repetitive trauma are well recognized - Significant cognitive impairment with distinct pathologic findings called chronic traumatic encephalopathy

✓Direct parenchymal injurie: Contusions

Definition	a bruise of the brain tissue (وذمه)
Cause and pathogenesis	Caused by blunt trauma to the brain Mechanism:blow to the surface of the brain transmitted through the skull leads to rapid tissue displacement , disruption of vessels , hemorrhage and tissue injury.
neurologic damage	The pia- arachnoid is not breached Tissue injury, more on crests of gyri ± The crest of gyri are most susceptible than the depth of sulci كل ما نزل بالعمق لجوا كلما قلت احتمالية الاصابه اكثر اشي محتمل ينصاب هو اكثر اشي برا
outcomes	Intraparenchymal, subarachnoid hemorrhage Coup Contusion & Contrecoup contusion الهم جدول مقارنه تحت
Most affected sites مهمات	regions of the brain overlying rough and irregular inner skull surfaces, such as: The orbital surfaces of the frontal lobes and the temporal lobe tips are less frequent over the occipital lobes, brainstem and cerebellum until these sites are adjacent to a skull fracture

in terms to the outcomes:

Coup Contusion	**Contrecoup contusion**	**Intracerebral hemorrhage**	**Cerebral Edema**	**Diffuse Axonal Injury**

Contusions immediately beneath and associated with direct trauma *Stationary head, no fracture, enough energy to damage brain المقارنه بين اول اثنين مهمه	* Contusions at a distance from & frequently opposite to the point of trauma * Often represent rotational & deceleration injury, related to irregularities of the skull opposite point of impact	Cutting of brain vessels, high impact	Occurs with and without an obvious structural lesion Note: Can occur without evidence of hemorrhage	Stretching force & cutting of axons Acceleration / Deceleration injury. 50% of patients with posttraumatic coma. Affect white matter (corpus callosum, paraventricles, hippocampus & at junction of grey & white matter.
If the head is immobile at the time of trauma, only a coup injury is found. Is caused by contact between the surface of the	If the head is mobile at the time of the trauma, both coup and contrecoup contusions may be found. - Is thought to arise when the brain			Characteristic asymmetric axonal swelling (Retraction Balls), micro hemorrhages, microglia, later gliosis Post-traumatic dementia & vegetative state

brain and skull at the site of impact	strikes the opposite inner surface of the skull after sudden deceleration			

Both types of contusions have similar gross and microscopic appearances.

The distinction is made on identification of the point impact.(مهمه من الجدول)

MORPHOLOGY:

Contusions are wedge-shaped with the broad base lying along the surface at the point of the impact

Microscopic examination:

a. In the earliest stage: Edema and hemorrhage.

b. During next few hours:

- Extravasation of blood extend throughout the cortex to white matter then to the subarachnoid space.

c. Old traumatic lesions:

- Are depressed retracted yellow brown patches (called plaque jaune).

B. Traumatic vascular injuries

✓Epidural Hematoma

Definition	Blood accumulation in the epidural space. Normally the dura is fused with the periosteum on the internal surface of the brain.
Cause	Rupture of middle meningeal artery. Dural arteries, most importantly, the middle meningeal artery are vulnerable to injury especially with skull fracture in which the fracture cross the course of the vessel. Seen in 3% of significant trauma.
outcomes	Rapid collection of blood (30 – 50ml → symptoms) Usually acute & accompanied by skull fracture. Mass effect Dura & Brain compression Rapid increase in ICP.
clinically	Patient has LUCID interval for hours followed by rapid loss of consciousness. Fatal within 24 – 48 hrs. if untreated

Notes lucid interval is a temporary improvement in a patient's condition after a traumatic brain injury, after which the condition deteriorates	1- In children in whom the skull is deformable, a temporary displacement of skull bones leading to lacerations of a vessel can occur in the absence of skull fracture. 2- When blood accumulates slowly, patients can be lucid for several hours between the moment of trauma and the development of neurologic signs.. An epidural hematoma may expand rapidly and constitutes a neurosurgical emergency necessitating prompt drainage and repair to prevent death

✓Subdural hematoma

Definition	Accumulation of blood in space created between tow Dural layers. The dura is composed of two layer, The external collagenous layer and inner border cell layer with scant fibroblasts and abundant extracellular space devoid of collagen When bleeding occurs, these two layers separate and create the subdural space in which the blood accumulates.
Cause and pathogenesis	Most occur with changed head velocity e.g. boxers, battered baby & old age.

	More common than epidural Disruption of Bridging Veins from brain to Dural sinuses, more over convexities ,About 50% of acute are accompanied by fracture
Outcomes	**Morphological:** Grossly: - Acute subdural hematomas appear as a collection of freshly clotted blood along the brain surface, without extension into the depths of sulci. - Flattened underlying brain and subarachnoid space is often clear. **-venous bleeding is self-limited** - breakdown and organization of the hematoma take place over time 1-Lysis of the blood within one week 2-Growth of granulation tissue from the Dural surface into the hematoma (2 weeks) -Typically, the organized hematoma is firmly attached to the inner surface of the dura and is free of the underlying arachnoid, which does not contribute to healing. -The lesion can eventually retract as the granulation tissue matures until only a thin layer of reactive connective tissue remains ("subdural membranes").
	Clinically:

	May be categorized based on the interval between the hematoma and the traumatic event: **– Acute**: within 3 days of trauma - Clear history of trauma - Frontoparietal is common - Slow collection of clotted blood with surrounding edema→ increased ICP - Nonfatal Cases→ Chronic **– Subacute**: between 3 days and 3 weeks after trauma **– Chronic**: develops after 3 weeks -Trauma often not recorded - More in elderly with brain atrophy or Battered Baby Syndrome -Hematoma → Fluid filled cyst enclosed by membrane may be resorbed, or calcified - Risk of rebleeding in first few months Clinically: confusion, dementia

	Neurologic signs are attributable to the pressure exerted on the adjacent brain. - Symptoms may be localizing but more often are nonlocalizing, taking the form of headache confusion, and slowly progressive neurologic deterioration. Subdural hematomas typically become manifest within the first 48 hours after injury. -They are most common over the lateral aspects of the cerebral hemispheres and may be bilateral. - Symptomatic subdural hematomas are treated by surgical removal of the blood and associated reactive tissue