



PATHOLOGY



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CENTRAL NERVOUS SYSTEM (CNS) TRAUMA

★ Trauma to the brain & spinal cord is a significant cause of death & disability. **Site & Severity** of injury affect the outcome: **Injury** of several cubic centimeters, of brain, (1) in the **frontal lobe** parenchyma may be **clinically silent**, or (2) **severely disabling** (spinal cord), or (3) ☠ **fatal** (involving the brain stem)

★ Magnitude & distribution of traumatic brain lesions depend on the **shape**¹ of the object causing the trauma, the **force**² of impact, & whether the head is **in motion**³ at the time of injury.

★ A blow to the head may cause: (1) **penetrating open injury**, or (2) **blunt closed injury**.
هذا كان في حالة حركة؟ (لما يكون بالسيارة)

☹ **From medico-legal point of view**, severe brain damage can occur **in the absence** of external signs of head injury, &
مثل حوادث السيارات أو ضربتها على الراس لكن لا يوجد علامة على الرأس

😊 **Conversely**, severe scalp lacerations & even skull fractures do not necessarily indicate damage to the underlying brain.

☹ Trauma can cause (1) **fractures** (Basal, Depressed, Linear) of skull, or of the spine, (2) **parenchymal** & (3) **vascular injuries**; **combinations** are common. *Basal:- كسري في قاعدة الجمجمة، أو رخ يعبر من الair sinus ونخرج من الأنف (Rhinoorrhea) (فطر حيداً). أو من الأذن

* Basal Fractures :- في قاعدة الدماغ .

1- Result in opening of the nasal cavity, CSF will leak out of the nose → Rhinorrhoea "خثرة جذا".

2- in middle fossa → CSF leaks through the ear
Otorrhea "خثرة جذا".

وافتقار complication له هو ال infection الذي قد يؤدي إلى meningitis or encephalitis.

3- leads to communication between arterial and venous sinuses in the base of skull

بما فيه فتح في الرأس →

* Depressed skull Blunt غير حادة تصرب ال skull
وتكسره كالعظمة ال انكسرت روح تدخل للدماغ روح تصعب

source of infection ← fear of meningitis
brain substance ال تؤدي إلى

وحتى لو تعوض مكان ال injury وصار فيه Fibrosis يؤدي إلى

Epilepsy

* Linear Fractures :- كور خطية بدون ما تأثر على المادة الدماغية

2) Parenchymal :- to the brain substance itself
قد تكون laceration أو contusion كدمة

3) to the arteries or sinuses.

or combination

Traumatic Parenchymal Injuries

▼ When there is impact of an object with the head, injury may occur from collision of the *brain* with the *skull* (I) at the site of impact (a *coup* injury, e.g., at frontal pole) or (II) on the opposite side {*contrecoup, at the occipital area in the above case of (I)*}, Both coup & contrecoup lesions are... (F 9-19)

☹ Contusions, caused by rapid tissue displacement with disruption of BVs, & subsequent H, tissue injury, & edema.

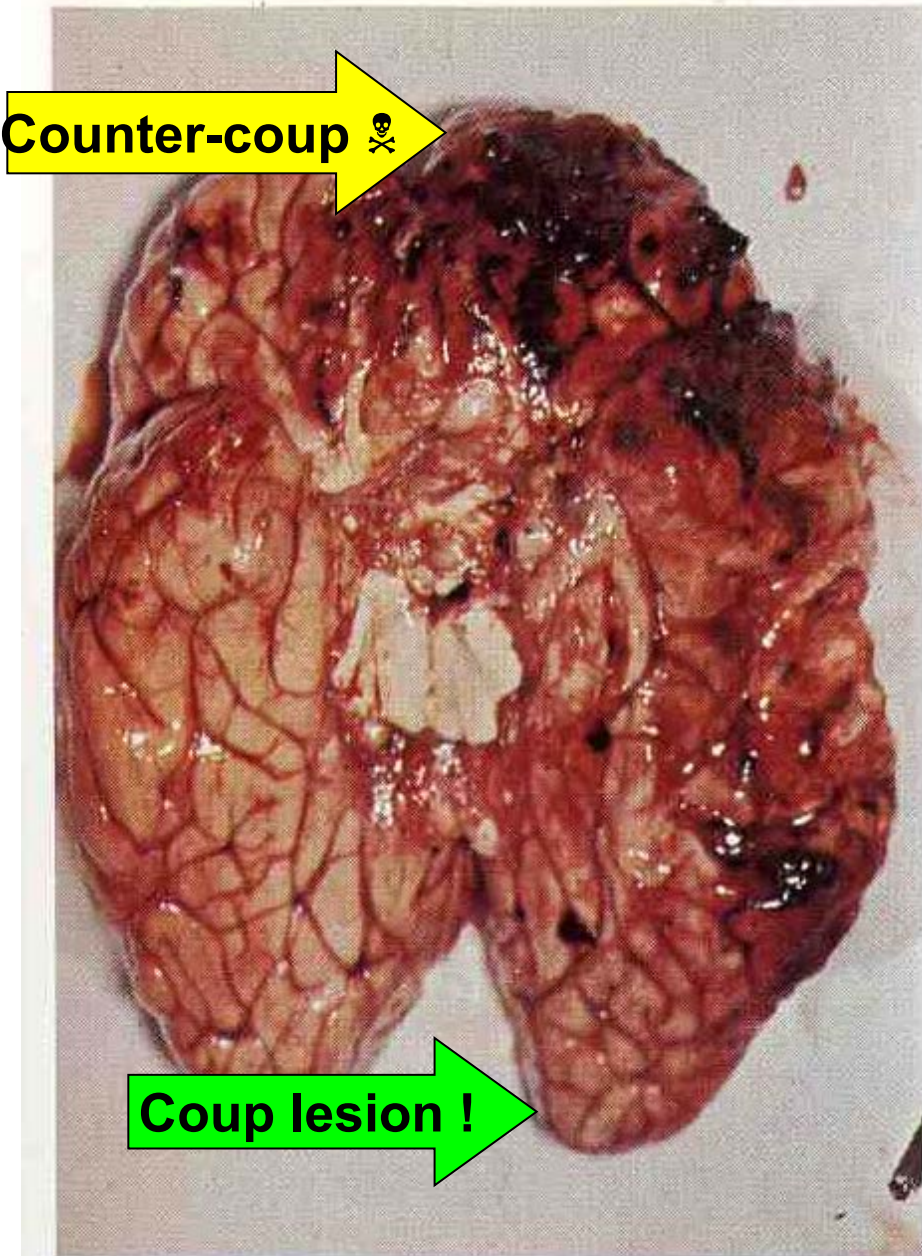
الدماغ يحيرته للخلف بعين (occipital) إذا انضرب على منطقة الجبهة
موجود

★ Since they are the points of impact, crests of gyri are most susceptible, whereas cerebral cortex along the sulci is less vulnerable. The most common locations where contusions occur correspond to the most frequent sites of (I) direct impact & to (II) regions of the brain that overlie a rough & irregular inner skull surface, including, (A) orbital gyri of frontal lobes & (B) temporal lobes (F23-12).

في كل الضربات الدماغ يحرك و إذا تحرك هكذا rough وحسنه يحير فيه confusion and hemorrhage.
موجود

▼ Penetration of the brain, either by a (1) projectile, e.g., bullet or (2) a skull bone fragment from a fracture, results in laceration with tissue tearing, vascular disruption, hemorrhage, & injury, along a linear path [focal lesion].

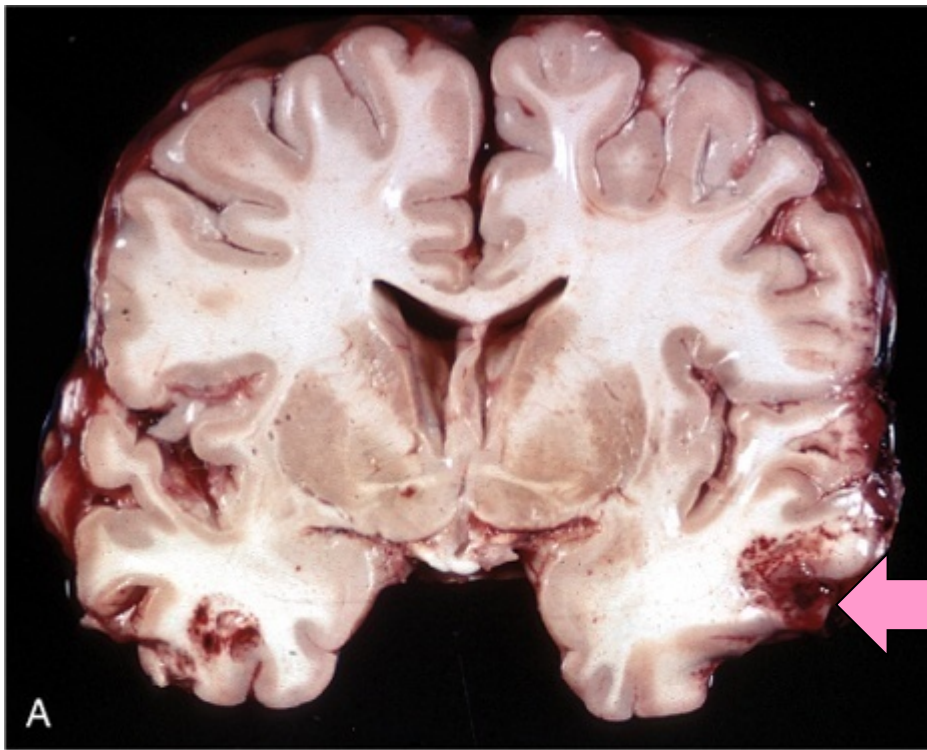
بالطلقة أو السطحة مكانها بالزبط.



F 9-19: Contusions: brain.

★ This patient sustained severe **trauma to the left occipital region of the head** which has caused extensive fronto-temporal (Counter-coup) contusions & lacerations of the brain (at top center & bottom right). النزيع في جدار بار frontal lobe

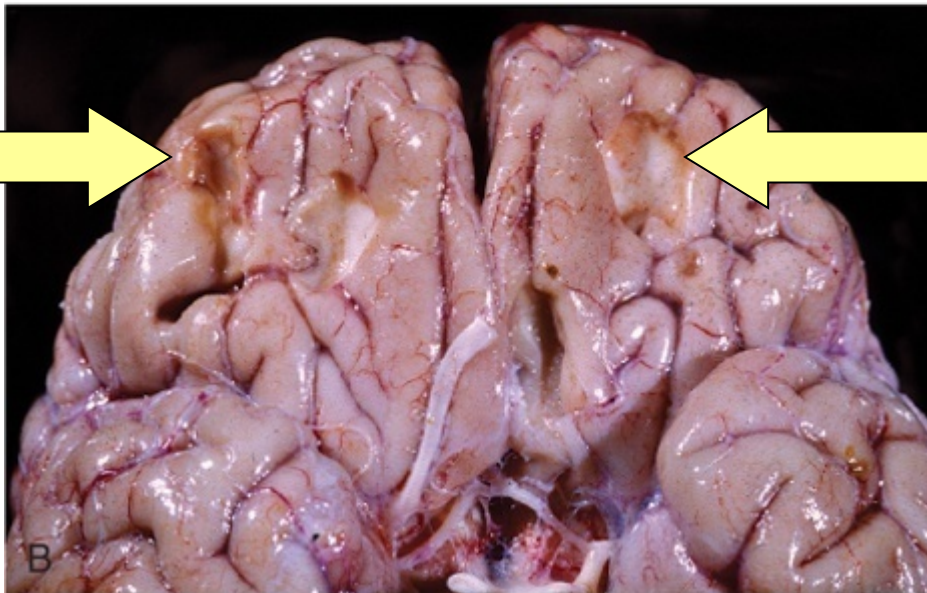
☺ In this case, the counter-coup lesion is much more extensive than the coup lesion which are at the point of impact (occipital area)



F23-12: Cerebral trauma.
A, Acute contusions with areas of hemorrhage & tissue disruption, present in both temporal lobes,

in Both temporal lobes

*لأنها المنطقة الملاصقة لـ temporal
التي تتعرض لضربة*



B, Old contusions are present on the inferior, (orbital gyri) of frontal lobes surfaces of this brain.

*كرومة قديمة
تزيغ قديم.*

▶ **GROSSLY**, ★ ^{مثلث الشكل} contusions, when seen on cross-section, are **wedge shaped** with the broad base ▼ spanning the surface & centered on the point (impact). The histologic appearance of contusions is independent of the type of trauma (F23-12A).

★ ^{مهم} In the earliest stages there is **edema & hemorrhage**, with **blood extravasates** throughout the damaged tissue, **across the width of the cerebral cortex, & into the white matter & subarachnoid spaces**.

☀ Although functional effects are seen earlier, the...
■ H, the neuronal cell necrotic changes of injury (*red neurons*) takes about 24 hours to appear, followed by the usual course of inflammatory response, with neutrophils followed by macrophages.

☹ In contrast to ischemic lesions, in which the superficial layer of cortex may be preserved, ▶ trauma affects the superficial layers most severely ▼.

★ **Grossly, old traumatic lesions** have a characteristic depressed, retracted, yellowish brown patches involving the crests of gyri (Fig. 23-12B).

مكان زيج الكهف .

More extensive H regions of brain trauma give rise to larger cavitated lesions. In sites of old contusions, there are → gliosis + predominate residual hemosiderin laden macrophages

← old hemorrhage .
injury على الدماغ .
مخارج الدمع .
☺ Concussion →

☺ Concussion is Reversible loss of consciousness from head injury, in the absence of contusion.
فقدان الوعي لفترة قصيرة ولكن لا يوجد أذى damage .

☺ The characteristic transient neurologic dysfunction includes loss of consciousness + temporary respiratory arrest + loss of reflexes. Although neurologic recovery is complete, amnesia for the event persists.
لن نسيان الأحداث السابقة .

☺ ? The pathogenesis of Concussion with the sudden disruption of nervous activity is unknown.

☠ Diffuse axonal injury → axons from brain to spinal cord. تدمير كل ال

★ Although injury to the surface of the brain is often the most ★ dramatic, however, widespread injury to axons within the brain (called diffuse axonal injury) can be even more devastating.

★ The movement of one region of brain relative to another lead to the disruption of axonal integrity & function. خطر جدا

→ Angular acceleration alone, in the absence of impact, may cause axonal injury as well as H.

حركة الرأس من العمود لليسار نتيجة لكمة أو ضربية، راح يتحرك الدماغ مكانه مع ما راح يصير عليها stretch طبعاً الأس من العمود لليسار نتيجة لكمة أو ضربية، راح يتحرك الدماغ مكانه مع ما راح يصير عليها stretch spinal cord يكون ثابت لذلك بس الbrain يتحرك والتالي

★ 50% of patients who develop coma shortly after trauma, ★ even without cerebral contusions, are believed to have white matter damage & diffuse axonal injury. Although these changes may be widespread, lesions are most commonly found near the (angles of the lateral ventricles) & (in the brain stem) خطر جدا

تقطع ويقتل 50% will die. تقطع ويقتل

يظهر نتيجة قطع ال axon يظهر نتيجة قطع ال axon

Diffuse axonal injury characterized by the wide, but often, ★ asymmetric distribution of axonal swellings (spheroids) that appears within hours of the injury & may persist for much longer. These are best demonstrated with silver stains or by immunohistochemistry for proteins within axons.

Traumatic Vascular Injury

★ Vascular injury is a frequent component of CNS trauma & results from direct trauma & disruption of the BV wall, leading to H. Depending on which BV rupture, H may occur in any of several compartments (sometimes in combination): epidural, subdural, subarachnoid, & intraparenchymal (F23-13A).

★ Subarachnoid & intraparenchymal H most often occur at sites of contusions & lacerations.

Epidural (extra-dural) H

☀ The dura is normally fused with the skull periosteum. BV that run in the dura, most importantly the **middle meningeal artery**, are vulnerable to injury, particularly with skull fractures.

☹ In children, in whom the skull is deformable, a temporary displacement of the skull bones may **tear a BV in the absence of a skull fracture**.

★ Once torn, the accumulation of arterial blood under arterial pressure cause separation of the dura from the inner surface of the skull (F23-13B). The expanding hematoma has a smooth inner contour that compresses the brain surface.

↳ ذنھا مكوّنة من اال dura .

جمع دموي

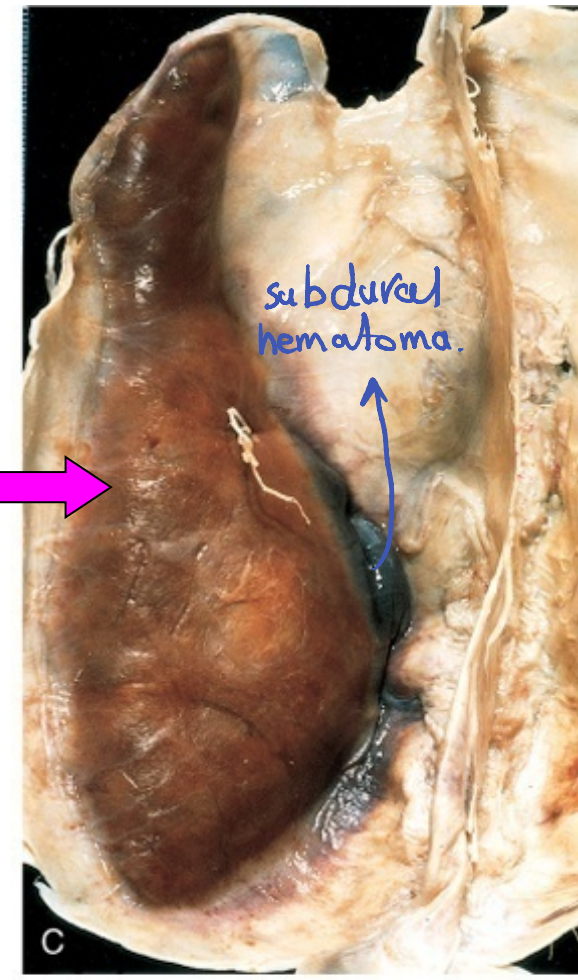
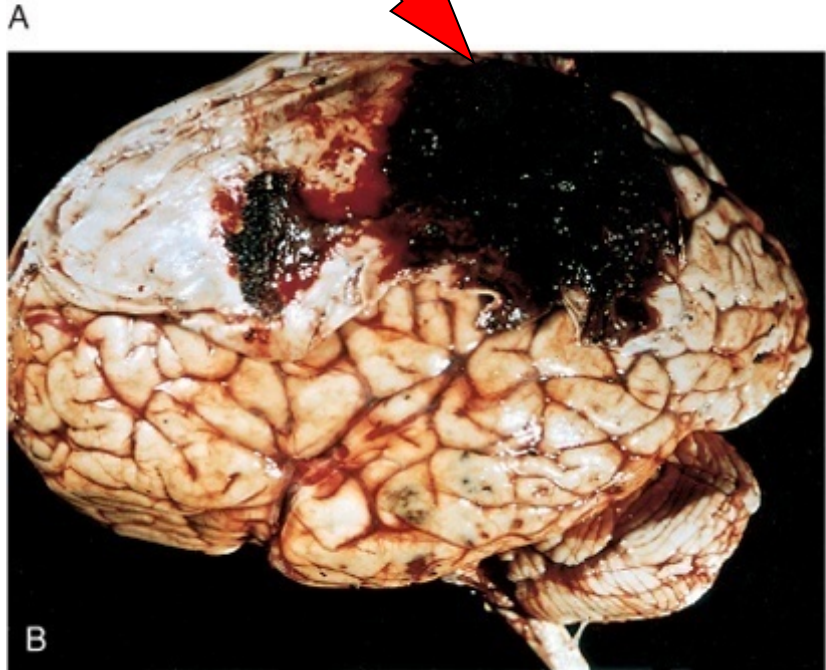
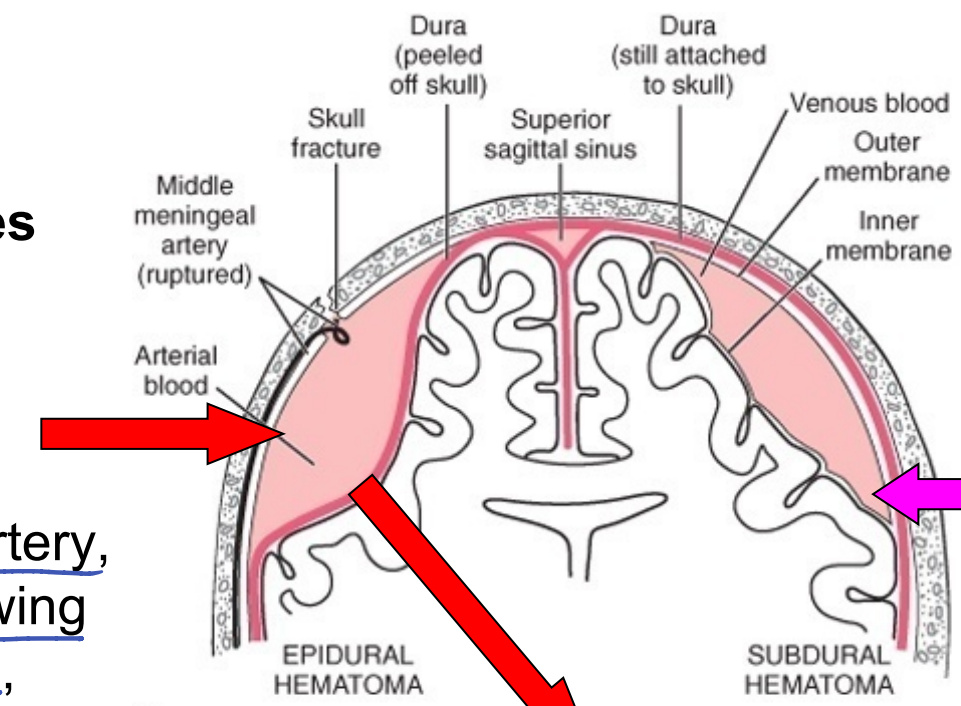
F23-13:
Traumatic intracranial hemorrhages

A, Epidural hematoma

Rupture of a middle meningeal artery, usually following skull fracture, leads to accumulation of arterial blood between the dura & the skull.

B, Epidural hematoma

covering a portion of the dura.



rupture in transverse sinus. *السبب هو*

C, Large organizing subdural hematoma attached to the dura. *كتار دورا*