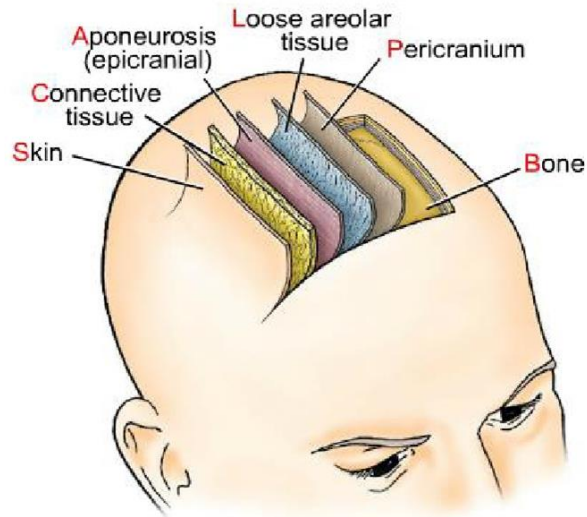


# NEUROSURGERY

## HEAD INJURIES

### I. *Scalp Injuries*



#### A) Scalp Haematoma :

##### \* Types:

##### 1-Subcutaneous haematoma:

- Small dense painful moves with the scalp over the skull.

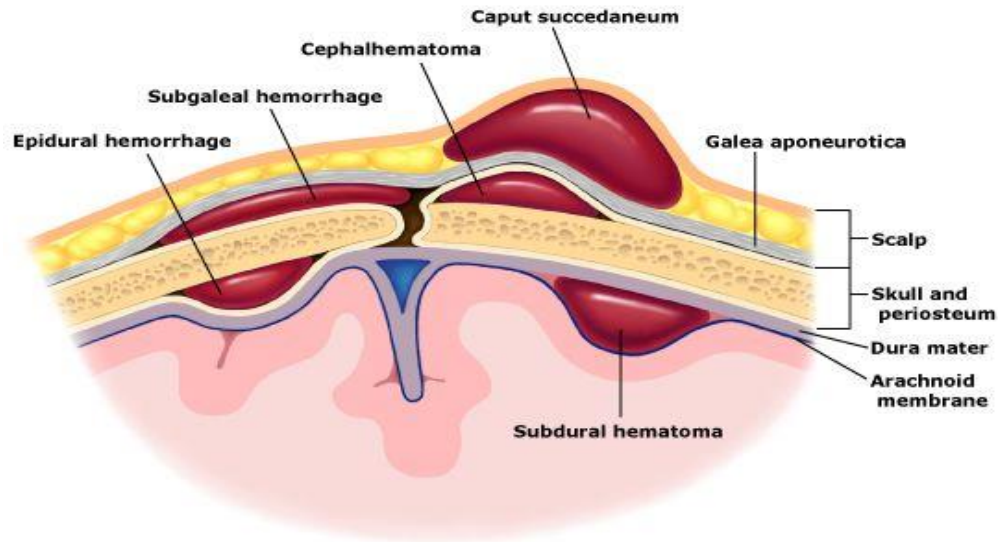
##### 2-Subaponeurotic haematoma: (Subgaleal haematoma)

- The scalp float over a large fluctuating haematoma extends from supra-orbital margins, to nuchal lines and laterally to temporal lines .

##### 3- Subpericranial haematoma: (Cephal haematoma)

- Usually occur in newly born due to **birth trauma** .
- The haematoma is **limited** by the suture lines to one bone. (Usually **parietal** bone).
- **D.D. is depressed fracture** : Which has hard edge and its surface is depressed below the level of the skull while in cephal haematoma the edge is indurated (fibrin deposition) and its surface is above the level of the skull .

***\*Hematoma related to scalp and dura matter \****



***\*Cephal hematoma\****



***\*SC hematoma\****

***\*Sub-aponeurotic hematoma\****



- Depressed fracture
- Haematoma.



**Pressure bandage**

**\* Treatment:**



- 1- **S.C haematoma:** Cold compresses & it resolves spontaneously.
- 2- **Subaponeurotic & subpericranial haematoma:** Aspiration & pressure bandage.

## B) Scalp Wounds :

- \* **Types:** Incised, lacerated or punctured.
- \* **Complications:** Haemorrhage, sepsis & sinus thrombosis.



### \* Treatment:

**A) First aid :** **Packing & direct pressure bandage** to stop bleeding but if there is a fracture under the wound, this should be avoided and instead put a **tourniquet** around the head to occlude the feeding vessels of the scalp.



### **B) In the hospital:**

1- Haemorrhage is **stopped** temporarily by artery **forceps** applied to the **galeal aponeurosis** & allow them to fall over the skin edge to kink the bleeding vessel.

2- Hair is **shaved** for at least 5 cm. around the wound then clean the wound with antiseptic solution.

3- **Minimal excision** of the wound then explore it to exclude skull fracture (temporary dressing and X-ray may be needed before closure of the wound).

4. The wound is **sutured in 2 layers**, galea to galea by

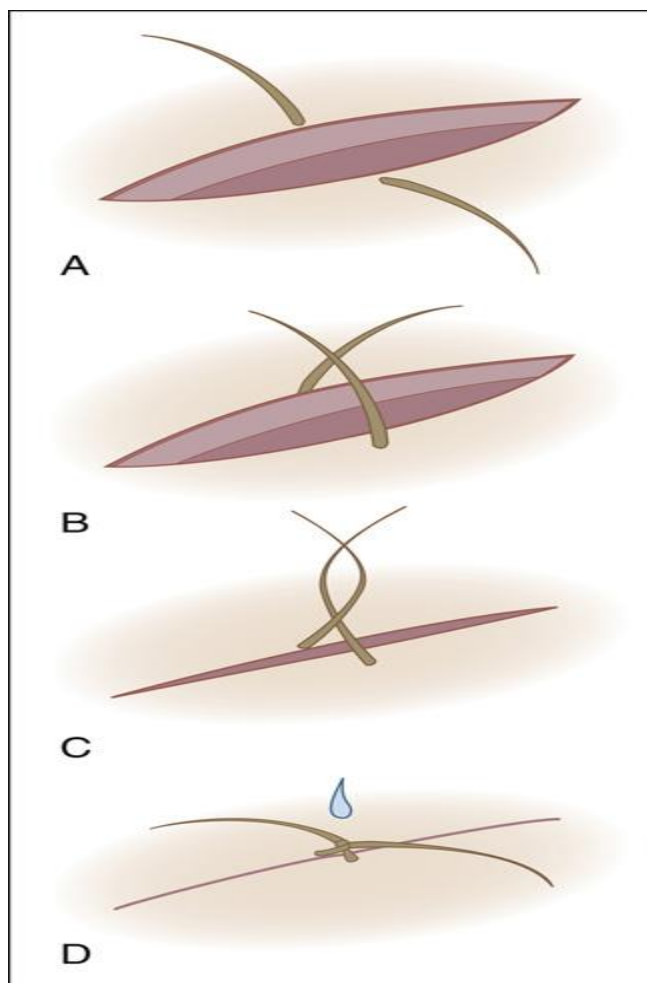
continuous absorbable sutures and skin to skin, with interrupted non-absorbable **sutures** or recently closed by **staples** . If there is liability of infection, close the wound with one layer of loose sutures.

- **Recently hair apposition technique and tissue adhesive is used to close scalp wound .**
- **Please watch the following excellent video**  
<https://www.youtube.com/watch?v=DG7NuWInakM>

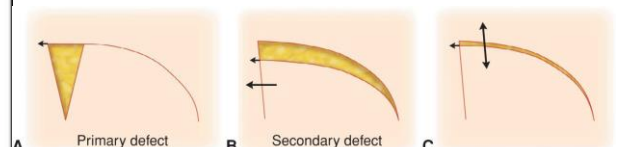
5. Any **gap** due to tissue loss is closed by **rotational flap**.

6. **Antibiotic and tetanus prophylaxis** to avoid infection.

#### Hair apposition technique



#### Closure by staples



#### Rotational flap

## SKULL FRACTURES

### I. Fracture Vault of Skull

\* **Aetiology:**

1. Direct blow on the skull → depressed fracture.
2. Skull compression by hard flat surface → fissure fracture.
3. Missile injury .

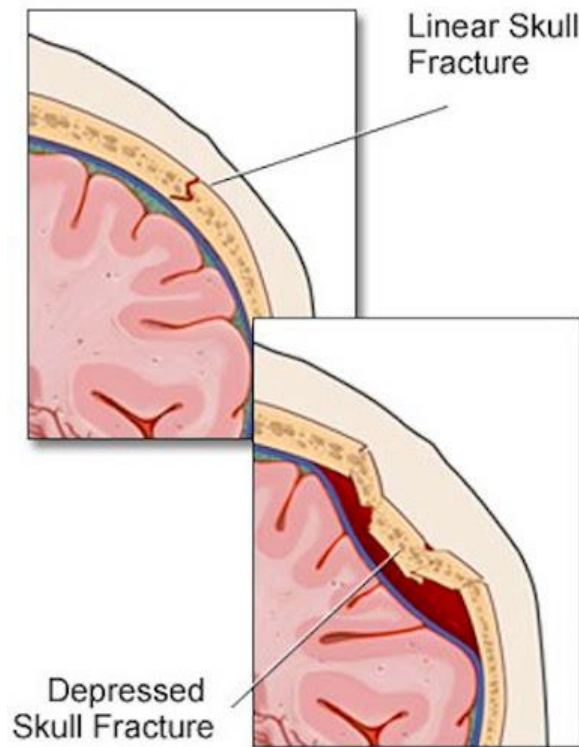
\* **Pathology:** The skull fracture may be:

**I) Simple fracture** :(closed fracture) , not associated with scalp wound.

- This may be: 1. Fissure fracture.                      2. Depressed fracture.

**II) Compound fracture:** (opened fracture) associated with a scalp wound.

- This may be: 1. Fissure fracture.                      2. Depressed fracture.



\* **Complications:** Usually occur in compound fracture.

1. **Dural tear** → prolapsed of brain .
2. Injury of **venous sinuses** → intracranial **haemorrhage**.

3. **Escape** of intracranial contents (Blood , C.S.F., brain).
4. Associated **brain injuries** (mention in short).
5. Introduction of **infection** (osteomyelitis, meningitis, encephalitis and brain abscess).
6. Introduction of **foreign body** to the brain.
7. **Epilepsy**: Elevation of depressed segment may diminish this complication.
8. **Cosmetic** deformity.

\* **Clinical picture:**

**A) Simple fissure fracture:**

1. There is a **haematoma** over the fracture.
2. The **fissure** cannot be felt through the intact scalp.
3. Manifestations of **brain injuries** are rare.

**B) Simple depressed fracture.:**

1. There is a **haematoma** over the fracture.
2. The depressed **fracture** may be felt through the intact scalp.
3. Signs of **brain injuries** are not common.
4. **D.D:** from subpericranial haematoma (mention).

**C) Compound fracture:**

1. There is **escape** of blood, C.S.F. & brain through **scalp wound** .
2. The fissure or depression can be **seen and felt**. The fissure appears as a bleeding linear crack and it should be differentiated from a **suture** line which lies at a special anatomical site, zigzag in shape and not heeds.
3. Signs of associated **brain injuries** are common. (Mention).

\* **Investigations:**

**1. Skull X-ray:** Show the type, site & size of the fracture. A fissure fracture should be differentiated from the middle meningeal vessels which lie in a known anatomical position and characterized by arborization.

**2.** C.T. scan is the most important investigation nowadays as it diagnose fracture base or vault of skull, brain oedema, laceration, contusion and site, size & progress of intracranial haematoma

\* **Treatment:**

**A) Simple fissure fracture:** Rest in bed for 3 days to 3 weeks ( according to severity of trauma ) with continuous observation ( especially for fracture in the parietal or temporal bones )to detect early manifestation of brain compression if occurs.

**B) Compound fissure fracture:**

1. If there is **no depressed bone** or underlying bleeding (by CT) , excision and **suture** of scalp wound.

- This is followed by complete rest in bed with continuous **observation** to detect complications early if occurs.
- The **site** of the fracture e.g. over the course of middle meningeal vessel should alert the surgeon for possibility of extradural haemorrhage .

2.If there is **depressed bone** ,excise the fracture line with nibbling forceps followed by removal of the displaced bone.

**C) Depressed fracture:**

**1. Conservative:** Rest in bed with continuous observation to detect complications for simple small (less than one inch) smooth, uncomplicated fractures without any indication of surgery.

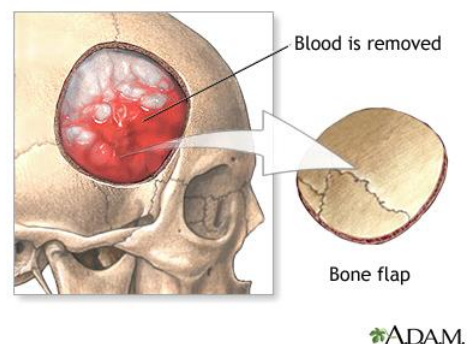
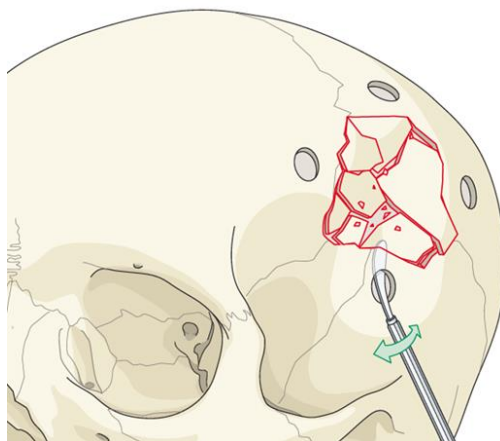
**2. Surgical:**

• **Indications:**

1. Large depressed fracture (more than one inch).
2. Depressed fracture over a motor or speech area.
3. Compound depressed fracture.
4. Underlying bleeding or Brain compression.
5. X-ray show spicules of bone penetrate the dura.
6. Fracture overlying venous sinus.
7. Cosmetic deformity.

• **Method:**

1. The **hair** is shaved widely with minimal excision of the **wound** (if present).
2. **Pericranium** is detached from the bones & a small **burr hole** is made in the normal bone at the periphery of the depression.
3. A curved **bone elevator** is gently introduced separating the dura from the overlying bone fragments to reduce the depressed bones.



**Elevation of depressed fracture**

**Exploration of underlying dura**

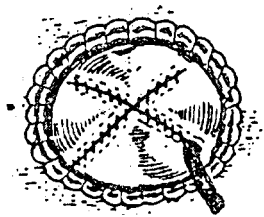
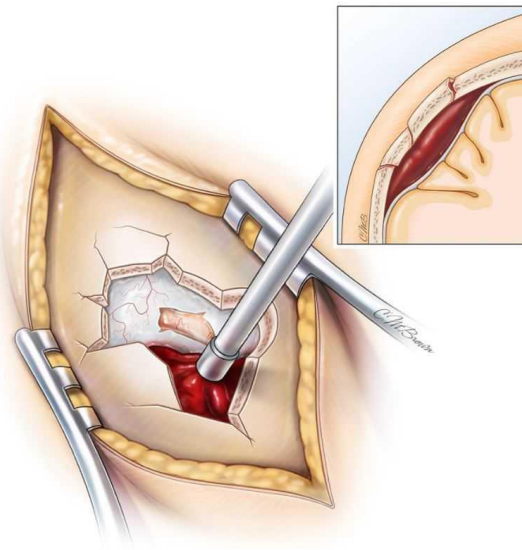
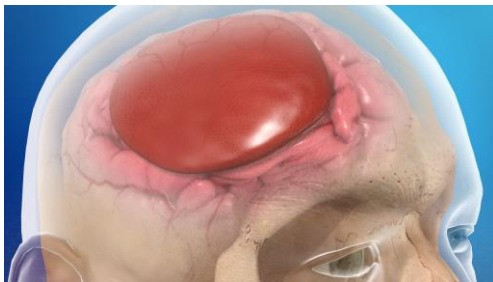
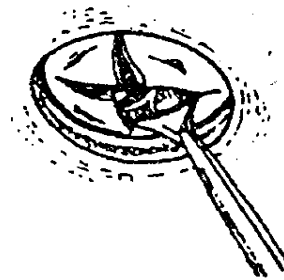
4. **Remove** any F.B. & blood clots and loose fragments.

**5. Exploration of underlying dura:**



- a - **If the dura is intact** leave it except if there are evidences of subdural haemorrhage (swelling and dark colour).
- b - **If the dura is injured**, open it to remove any spicules of bones or F.B and to suck necrotic brain.

**Cruciate division  
of the dura.**



**Closure of dura**

**Sucking out the subdural clot.**

**6. Absolute haemostasis.**

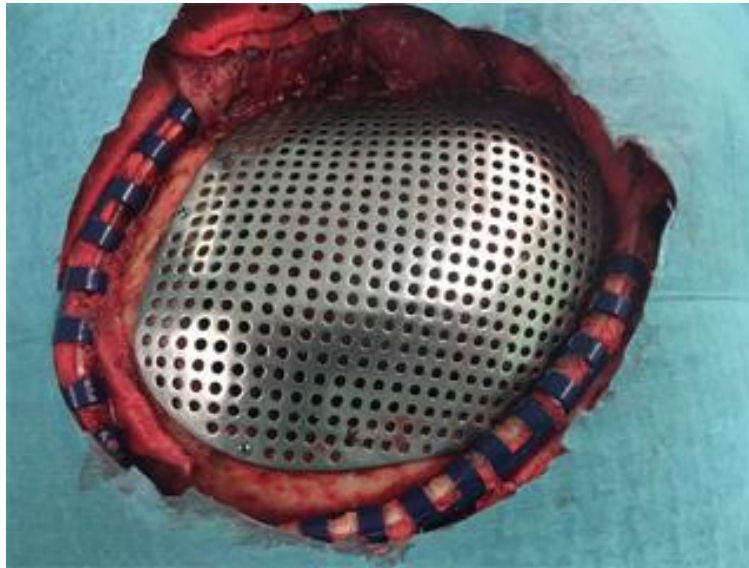
**7. Repair the dura** (by sutures or grafted with a piece of pericranium).

**8.** Loose non-contaminated bone fragments are **replaced** to act as bone graft .

**9. Plastic repair** of the defect in the skull (**cranioplasty**) may be needed.

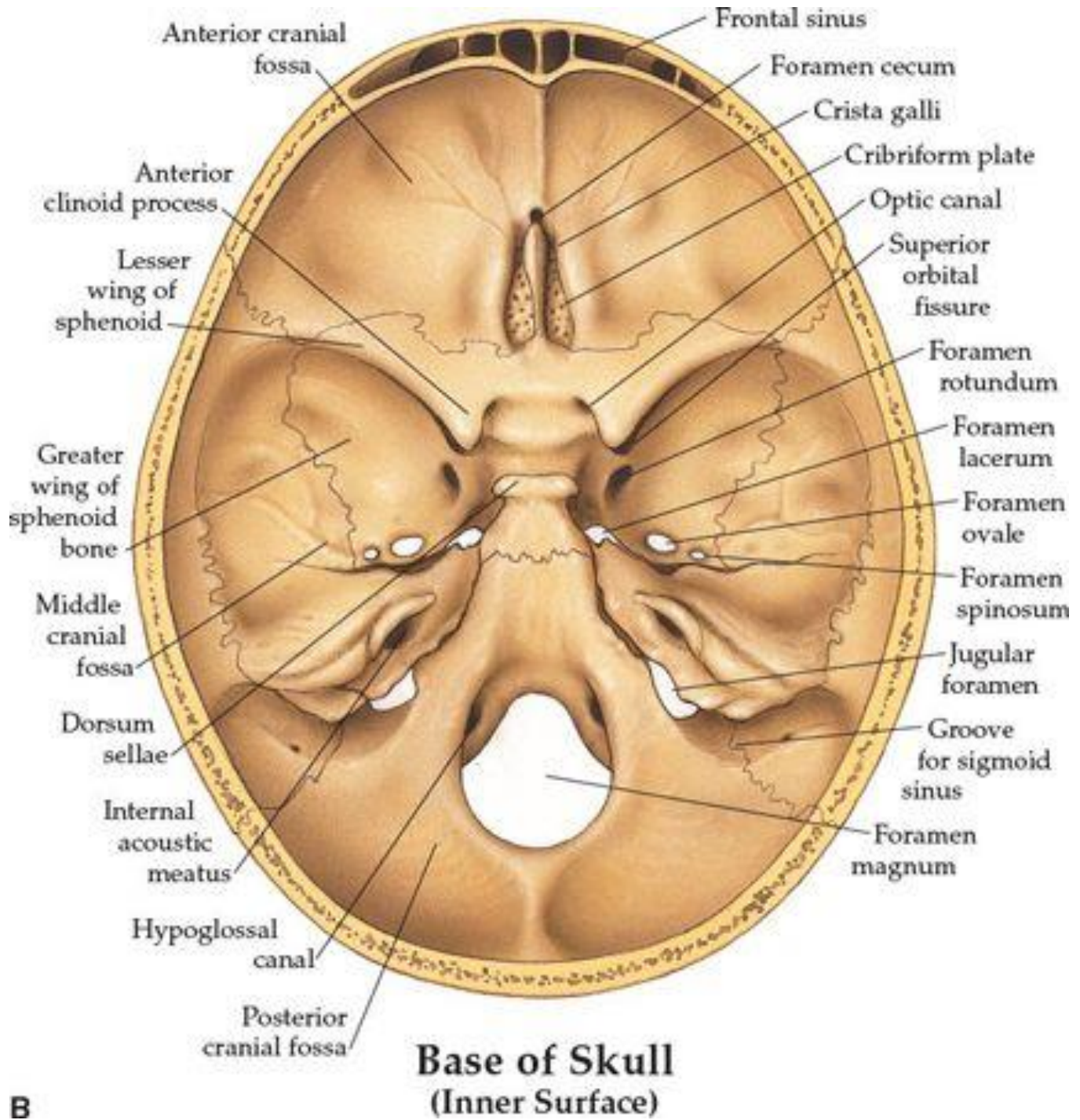
**10.** Repair of the scalp **wound**.

11. Prophylactic **antibiotics**.



**Cranioplasty**

II. Fracture Base of Skull



\* **Aetiology:**

## TRAUMA 2

A) **Usually** due to **indirect trauma** to the vault, spine, face or chin.

B) Direct trauma: Rare, through the nose, mouths, orbit or pharynx.

### \* **Pathology:**

A) The base of skull is rigid and weakened by multiple foramina  
→Fracture base is irregular fissure running between these foramina.

### B) **Types:**

1. **Simple:** Rare, the fracture does not open to the exterior.

2. **Compound:** The **commonest**, the fracture open to the exterior.

### \* **Complications:**

A - **Escape** of intracranial contents (blood, C.S.F and brain).

B - Introduction of **infection** (meningitis, encephalitis, brain abscess).

C - **Brain** injuries are very common (mention in short )

D - **Cranial nerves** injury (except 2nd & 12th. nerve which run in strong optic and hypoglossal canals respectively).

### \* **Clinical picture:**

#### A) **Fracture anterior cranial fossa:**

**1- Epistaxis:** If cribriform plate of ethmoid is fractured. In unconscious patient the blood may be swallowed to be vomited later on.

**2-** If the cribriform plate is fractured and the dura is torn, **rhinorrhea** with a continuous salty taste (C.S.F contain excess chlorides). Air may enter the cranial cavity ( **pneumocephalus** ).



**3 Subconjunctival haemorrhage:** If the orbital roof is fractured. It

**TRAUMA 2**

should be differentiated from subconjunctival hge due to direct trauma to the eye ( ordinary black eye).

<b>A. Subconjunctival haemorrhage due to direct trauma to the eye ( Ordinary black eye)</b>	<b>B. Subconjunctival haemorrhage due to fracture base</b>
1. Immediately after trauma to the eyes.	1. Delayed after trauma to head.
2. Conscious.	2. Unconscious due to brain injury .
3. Skin bruises are present.	2. No skin bruises.
4. Develops in the upper lid.	3. Develops in the lower lid first.
5. Triangular with its posterior border seen and its base towards the cornea.	4. Triangular with no posterior limit and its apex towards the cornea
6. No impairment of ocular mobility.	5. Ocular mobility may be impaired.
7. Proptosis does not occur.	6. Proptosis occurs.



- **Subconjunctival Ecchymosis**–
- Flame shaped hemorrhage with posterior limit not seen .  
( Suspect # of the orbital walls )

**4.**Orbit fracture → Periorbital ecchymosis → **Panda or raccoon sign.**

**5. Escape** of brain matter.

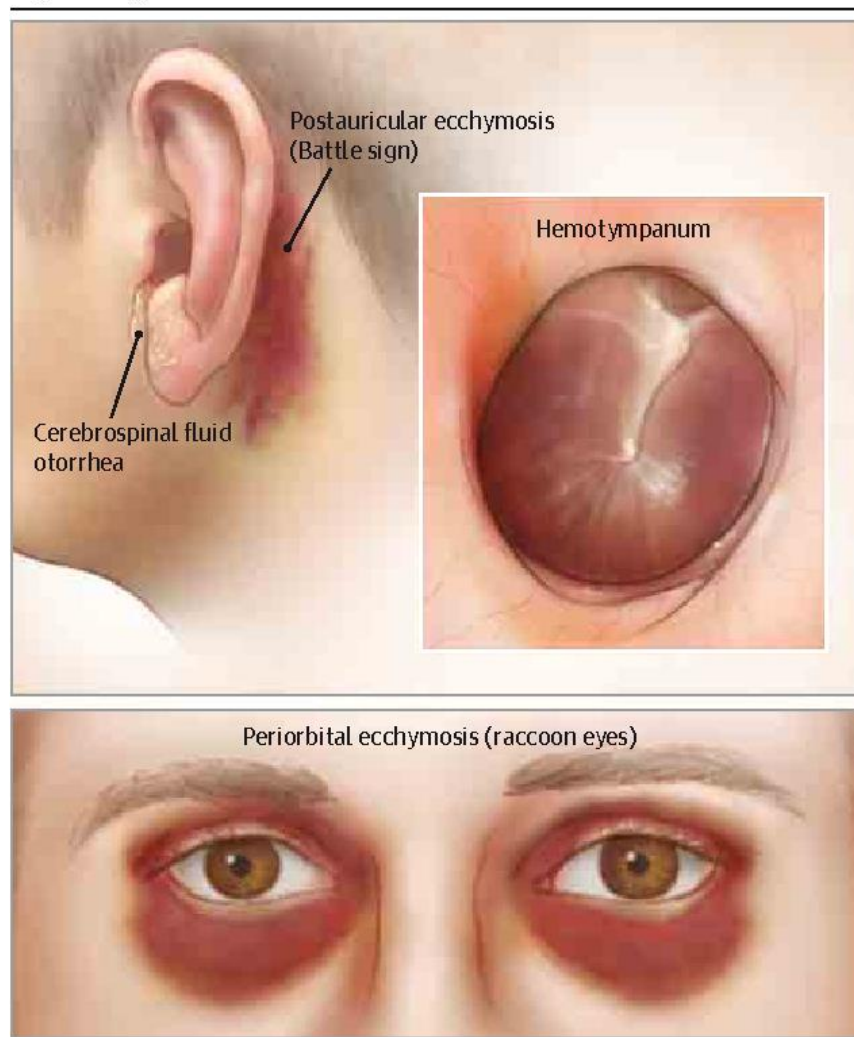


## 6. Cranial nerves injury :

- The **olfactory nerve** ( 1<sup>st</sup>. cranial nerve) is frequently torn → partial anosmia which pass unrecognized (unless its fellow is damaged).
- **Optic nerve** (2<sup>nd</sup>. cranial nerve) usually escape because it is protected in strong optic canal .
- **3rd** (produced dilated fixed pupil in conscious patient), **4th**, **ophthalmic division of 5th** and **6th** cranial nerves are usually affected as they pass in the superior orbital fissure.

## 7. Manifestations of **brain injuries**. (Mention in short).

Figure 1. Signs of Basilar Skull Fracture



**B) Fracture middle cranial fossa:**

1. Escape of blood and C.S.F from the ear (**otorrhea**) is characteristic sign.
  - **D.D.:** From ruptured drum. In case of fracture base blood does not clot and escape for several days (C.S.F. prevent clotting).
2. **Hemotympanum** refers to the presence of blood in the middle ear cavity , which is the area deep to the eardrum.

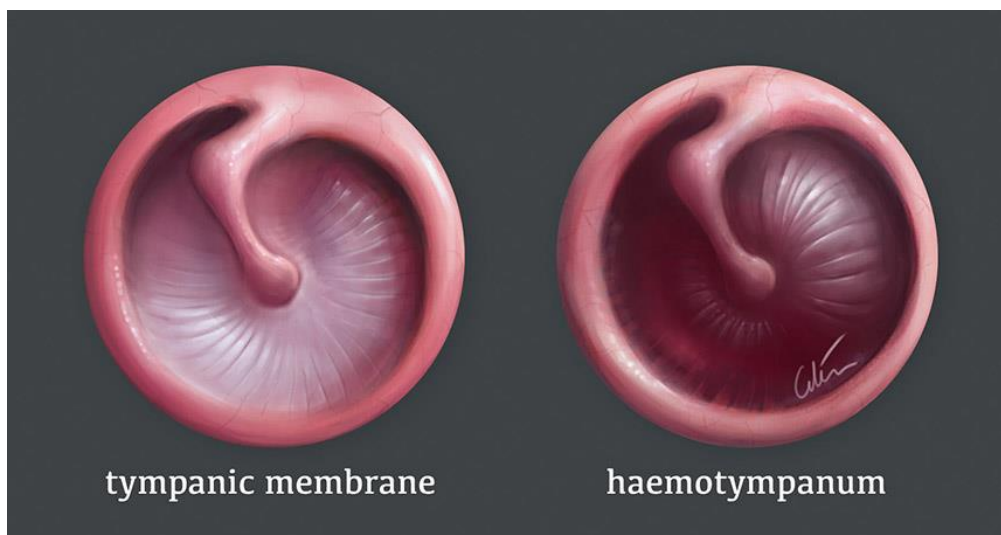
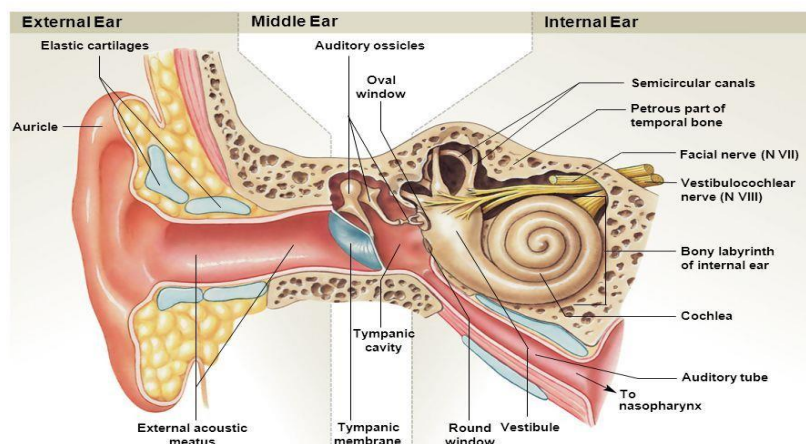


Figure 17-21 The Anatomy of the Ear



## TRAUMA 2

- 3. Epistaxis** if sphenoid sinuses are fractured with affection of cavernous sinus or internal carotid artery.
- 4 .** Injury of mastoid antrum or mastoid air cells surgical emphysema & discoloration behind the auricle over the mastoid process (**Battle's sign**).
- 5.** Injury of mandibular and maxillary division of 5<sup>th</sup>, 7<sup>th</sup> and 8<sup>th</sup> **cranial nerves**.
- 6.** Manifestation of **brain injuries**. (mention in short).

### C) Posterior cranial fossa:

- 1. Extravasation of blood** → **suboccipital haematoma** → swelling & discoloration at the nape of the neck.
  - 2.** Irritation of upper cervical nerves → **head retraction and neck rigidity**.
  - 3.** Injury of **9, 10,11, cranial nerve** in the jugular foramen. The 12<sup>th</sup> nerve is protected by the condyloid process (reflect the fracture to the foramen magnum).
  - 4. Brain injuries** are common to the medulla and pons → deep coma and death.
- \* **Investigations:** mainly C.T scan + other investigations for head injury.

### \* Treatment:

#### A) Prevention of infections :

- 1. Antibiotics** continued for one week after cessation of leakage.
- 2. Plug** the bleeding orifice with sterile cotton.

#### B) Control escape of C.S.F. and blood:

- 1 .** Complete rest in the **semi-sitting** position.





## TRAUMA 2

2. If leakage persists for more than **10 days, repair** of the dural defect

**C)** Management of associated **brain injuries** if present.