

TRAUMA AND FOREIGN BODY

Ear Trauma:

The ear is divided anatomically to three parts: outer, middle and inner. It lies within the temporal bone and contains the facial nerve.

External ear trauma:

A.Auricular trauma: Auricle is the most commonly affected part in the ear.

Causes:

- (1). Direct blunt trauma to the auricle (boxers ears).
- (2). Spontaneous: degenerative vascular disease of old age with affection of blood vessel walls, or with hemorrhagic blood diseases. The blood is extravasated between the cartilage and the perichondrium. Rate of recurrence is high.

1.Hematomas: are the most common ear trauma.

- The auricular cartilage gets its blood supply from the surrounding perichondrium. The Hematoma will separate the perichondrium from the cartilage, cutting the blood supply and leading to necrosis that could lead to cartilage death within few days.
- After the hematoma resolves, the cartilage will dissolve and won't regenerate again (unlike the bone) and this will lead to the **permanent cauliflower** deformity. Imp
- Cauliflower deformity will only occur if the hematoma was not treated properly. And it can result from any trauma to the cartilage.
- Therefore, hematomas should be treated early by drainage followed by pressure dressing to avoid recurrence. And reaccumulation.

Treatment:

Early: If the blood is still fluid: aspiration under complete aseptic conditions with pressure bandage and antibiotics.

Late: If the blood has clotted: incision along the helix and evacuation of the clot together with antibiotics.

If left untreated the auricle becomes deformed, fibrosed and thick and is called a cauliflower ear.

Cauliflower ear:

A hematoma auris may become infected causing perichondritis, which may also be due to surgical trauma or frunculosis. The auricle is red, hot, and tender and later heals with fibrosis leading to a cauliflower ear. The treatment is incision drainage together with excision of necrotic cartilage and antibiotic.

2.Avulsion:

- Reimplantion.
- Microvascular anastomosis.

3.Laceration from glass, knives, and bite injuries.

4.After cancer removal.

5.Frostbite in freezing areas. Because it cuts the blood supply to the organ.

6.Burns.

7.Ear piercing: common in females.

In lobules: lacerations and cuts.

In cartilaginous auricle: hematoma, infection and cauliflower deformity due to necrosis.

Ear piercing traumas and ear surgeries might heal by keloid scar especially in dark skin people that will need steroid and more complicated treatment.

N.B. Its better not to pierce the cartilaginous part of the ear, and if so pierce it under sterile conditions.

B. External canal injuries: its 2.5 cm long

External canal might also be traumatized by a foreign body insertion. It will most commonly affect the outer-skin- part, but might also extend proximally to affect the tympanic membrane.

Injury and laceration to the external canal might be complicated by otitis externa, which will be treated according to the cause by antibiotics or drops.

It might also be severe enough to perforate the tympanic membrane, it might also lead to laceration and displaces the ossicles and may also further involve the middle ear or even a temporal bone fracture.

Middle Ear Trauma:

1.Blast injuries.

2.Insertion of foreign objects into the ear, e.g. pencil

3.Skull base fractures.

4.Hemotympanum: The presence of blood in the tympanic cavity of the middle ear canal when there is cut that is not severe enough to cause perforation Usually we don't interfere, the body will absorb it and will disappear spontaneously. It might lead to temporary minor hearing loss that will recover within few days.

N.B.

If the trauma was affecting the tympanic membrane, it will lead to pain. If it was deep enough affecting the middle ear it will result in vertigo if pressed on the inner ear. If it was prolonged and complicated by infection, it will result in discharge.

You have to differentiate between acute trauma and chronic suppurative otitis media cases for medico-legal importance. In acute trauma you will find fresh blood, after a while the edges will be irregular and in chronic cases the edges will be regular and thick.

5.Traumatic tympanic membrane perforation: usually due to high air pressure or explosions for example, it may result from "slapping" or "Barotraumas" from the increased pressure in aircrafts.

- It happens in a closed area where pressure is increased in external canal and will perforate the tympanic membrane. It may also occur from explosions in war zones, due to increased air pressure in the ear.

- The patient may complain from increased hearing in the affected ear if the membrane was perforated without ossicles involvement.
- **Management:** don't give antibiotics unless the trauma was with contaminated object.
 - Cover the ear with cotton when taking a shower. To prevent the water entry.
 - 90% of perforations will heal within 8 months (if it was small it will take up to 2 months). Therefore, we treat it conservatively and wait up to 9 months. Don't rush to tympanoplasty only if it didn't heal by 9 months, we treat it by tympanoplasty.
 - Audiograms, to make sure that the ossicles are not injured. If there was a big gap in the audiogram that reflects an ossicular involvement. If the ossicles were injured the patient will have conductive hearing loss and will need an ossiculoplasty to correct it.

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6. Injury to the ossicles: will result in conductive hearing loss. We detect its injury by performing an audiogram. Ossicular injury is treated surgically by ossiculoplasty. The most commonly affected part is the incudostapedial joint.

7. Facial nerve injury as it passes through the temporal bone. It will be affected in major mostly transverse temporal fractures.

WAHBA NOTES:

Traumatic Rupture of The Tympanic Membrane:

Causes:

- (1). **Self inflicted trauma:** cleaning the ear with a hairpin or key.
- (2). **Sudden air compression:** as in blows to the ear or as in explosions or blast injury.
- (3). **Sudden water compression:** as in diving or water polo or wrong ear wash.
- (4). **During manipulations to remove a foreign body.**
- (5). **Otitic barotraumas:** especially when there is an old scar in the tympanic membrane.
- (6). **Longitudinal fracture of the skull base.**

Clinical picture:

Symptoms: History of trauma to the ear followed by:

- (1). Earache.
- (2). Tinnitus and deafness.
- (3). Slight bleeding except with fracture skull base where bleeding is excessive and may be accompanied by CSF otorrhea.
- (4). Sensation of air escaping from the ear during blowing of the nose.

Signs: must differentiate between traumatic and pathological perforation for medico-legal importance.

| | Traumatic | Pathological |
|---------------------------------|-----------------------------------|----------------------|
| Discharge | Blood | Pus |
| Perforation: Site | Anteroinferior or posteroinferior | Anywhere |
| Shape | Irregular | Regular |
| Edges | Irregular, blood clots | Regular, pus, smooth |
| Mucosa of the middle ear | Healthy | Diseased |
| Rest of drum | Normal | Thickened |

Treatment:

- (1). Instruct the patient to avoid wetting of the ear, no ear wash, no eardrops.
- (2). Instruct the patient to avoid blowing of the nose as this dislodges the fibrinous plug that heals the perforation.
- (3). Avoid any manipulation, if necessary as to remove a blood clot that must be under sterile conditions.
- (4). Prophylactic antibiotics.
- (5). In the majority of cases spontaneous healing will take place. If it does not and the perforation persists for 3-6 months perform a myringoplasty.

Inner Ear Trauma:

- NISNHL. Noise induced sensorineural hearing loss. E.g. drill sounds.
- Acoustic Trauma. E.g. explosions.
- Barotraumas- pressure.

1.Noise induced SNHL:

- One of the most common occupationally induced disabilities.
- Tinnitus (warning sing). The 1st symptom to appear.
- The first sign is a depth in the audiogram. Usually is limited to 3, 4 and 6 kHz.
- 4 kHz greatest loss.
- Susceptibility: headphones, drilling workers, Factories and airport workers
- Age, gender, race.
- The noise should be: 90 db for 8 hours, 95 db for 4 hours, 100 db for 2 hours, 105 db as in airplane for 1 hour.
- **Treatment:** prevention by wearing ear protectors and screening for early detection is the most important. The sensorineural loss is irreversible but prevent further trauma by transferring the job when the patient starts to develop sensorineural hearing loss for example.



2.Barotraumas: any increase or decrease in the pressure. For example: scopa diving (avoided by going up gradually) or airplanes previously (they were non pressurized)

- Injury of the tympanic membrane and middle ear.

- Unequal zed pressure differentials between the middle and external ears.
- Flying or underwater driving (scuba diving)
- Eustachian tube disease (injured or infected) may predispose to barotraumas if they travel for long distances due to pressure differences. In these cases we advise the patients to use decongestants.
- **Signs and symptoms:**
 1. Pain.
 2. Hearing loss.
 3. Hyperemia and possible tympanic membrane perforation.
 4. Edema and ecchymosis of the middle ear mucosa.
 5. Counductive hearing loss.
 6. Hemotympanum.
 7. Transudative middle ear.

Temporal bone trauma:

- **These fractures are classified with respect to the axis of the petrous ridge and include:**

1. Longitudinal fractures: The most common (70-80%). Carries the best prognosis, since the facial nerve crosses longitudinally its will rarely be affected and paralyzed (the facial nerve will most commonly be intact). Rarely a small part of the semicircular canals will be affected leading to mild vertigo. Hemotympanum might frequently occur due to bleeding after the fracture.

2. transverse fractures: (10-20%). The facial nerve is usually cut in these fractures and the patient will end with facial palsy (therefore, bad fracture). Might be associated with tympanic membrane perforation. It is usually a multiple bone fracture and not only an isolated fracture. Symptoms: vertigo, dizziness, nausea.

3. Combined: (10%) fractures. The worst.

- **Etiology:**

1. blunt closed-head trauma: Motor Vehicle accidents (dashboard fall on the side) are the most common (31%). falls, and motorcycle accidents.

- **Frequency:** Approximately 5% of people who have head trauma have temporal bone fractures.
- Facial paralysis most commonly occurs after **transverse fracture** of the temporal bone, (50%) However, paralysis also occurs after longitudinal fractures (25%).

2. Penetrating injuries: e.g. laceration, stab wounds. Rarely seen.

- **Evaluation:**

1. don't forget your **ABC** (airway, breathing and circulation). Most important.
2. **History:** from the patient himself if he was conscious or from any other member who attended the trauma or accident. Take a History of The mechanism and details of the traumatic forces involved.

3. Physical Examination

4. After the patient's condition is hemodynamically secured by an I.V line and the acute injuries are stabilized, look for signs and symptoms of facial nerve palsy
5. He or she should be evaluated again for other minor injuries.

- **Imaging studies:** to know all associated conditions and fractures.
 - CT scan: High-resolution CT scans of the temporal bone.
 - The integrity of the ossicular chain may also be evaluated with an optimal CT scan
- **Complication of Temporal bone fracture:**
 1. Hearing loss. If ossicles and tympanic membrane involved.
 2. Vertigo. If semicircular canals are involved.
 3. Tinnitus.
 4. Facial paralysis.
 5. CSF leak because it's a skull fracture. Might be complicated by meningitis.
 6. Carotid injury.

Facial Trauma:

Some traumas will completely separate the skull from the mandible and others will only be localized and minor fractures. Some fractures might obstruct the airway and might not be obvious initially and clinically; therefore you have to always check the airways as an initial step. #1 in facial trauma is airway evaluation because they might die of airway obstruction.

Orbital Floor Fractures (blowout): it will affect the weak part of the orbit. Floor of the orbit (roof of maxillary sinus).

- It can occur as isolated injuries.
- Or in combination with zygomatic arch fractures. Le Fort type II or III mid-face fractures, and medial wall or orbital rim fractures.
- The object will be intermediate in size. The commonest example is a tennis ball, which is not small enough to perforate the eye and not large enough to reach the eyebrow.
- The force will lead to inferior rectus and fat entrapment inferio-medially leading to enophthalmos.
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- **Clinical:**
 1. **Limitation of movement.**
 2. **Diplopia. (especially in upgaze)**
 3. Decreased visual acuity.
 4. Blepharoptosis.
 5. Patients may complain of epistaxis and eyelid swelling following nose blowing. The globe can be ruptured
 6. Enophthalmos.
 7. Chemosis.
- **Imaging studies:**
 - Anteroposterior x-ray views of the orbit.
 - The most common views are the Caldwell and Waters projections.

- CT scanning (preferably): obtain both axial and direct coronal to properly evaluate the orbit and the floor.
- **Teardrop** fracture sign on x-ray.
- **Treatment:** Trans-conjunctival incision, bridge the gap and then relieve the inferior rectus muscle and fat. We can also do it endoscopically through the middle meatus. If left untreated will lead to permanent enophthalmos.

Nasal Trauma: it's important to ask about the duration of trauma. (onset)

Causes:

1. Traumatic. Most commonly.
 2. Iatrogenic (surgical)
 3. Foreign bodies. If stayed for long time will lead to necrosis of cartilage.
- The bones of the nose are the most frequent broken in the face. It will affect the patient's appearance.
 - Immediate evaluation is necessary to make sure there is **no septal hematoma** (blood between the septum and cartilage)
 - If septal hematoma develops (it should be drained), it might be complicated by an infection, 5 days later it will progress to an abscess. This may lead to cartilage necrosis and the patient might end up by a **saddle nose deformity** because of supportive cartilage loss.
 - Usually a lot of swelling and edema that may interfere with a proper evaluation. Therefore, we reexamine after a week (3-4 days) if child or 3 weeks if adult (children have faster healing than adults). We assess if there was any deviation or fracture.
 - Do an intranasal reduction in cases of nose fracture. If the bone healed alone without reduction this will lead to deformity that will need a dissect rhinoplasty.
 - In more complicated fracture, or when reduction or hematoma treatment have been delayed **septorhinoplasty** need to be done at later date. For children wait until age 18 years old.

Laryngeal Trauma: it is very important because its life threatening.

Functions:

1. Airway. breathing
2. Voice.
3. Swallowing.
4. Well protected (mandible, sternum)
5. Support: Hyoid, thyroid, cricoid.
6. Outcome determined by initial management.

Mechanisms of Injury: might be a suicidal attempt in adults, in children its mostly accidental.

1.Blunt:

- MVA, strangulation (suicide), clothesline, sports related.
- Significant internal damage, minimal signs.

2.Penetrating: common

- Gun shot wounds: damage related to velocity.
- Knife: easy to underestimate damage.

3. Inhalation trauma

History: very important

1. Change in voice – most reliable. Indicated vocal cord involvement.
2. Dysphagia or Odynophgia following trauma.
3. Difficulty breathing (dyspnea)– more severe injury.
4. Hemoptysis.
5. Anterior neck pain.

Physical exam: looking for:

1. Stridor. Noisy breathing
2. Hoarseness.
3. Subcutaneous emphysema. Cut in the larynx or trachea.
4. Laryngeal tenderness, ecchymosis, edema.
5. Loss of thyroid cartilage prominence.
6. Major blood vessel or nerve injury.
7. Associated injuries – vascular, cervical spine, esophageal.

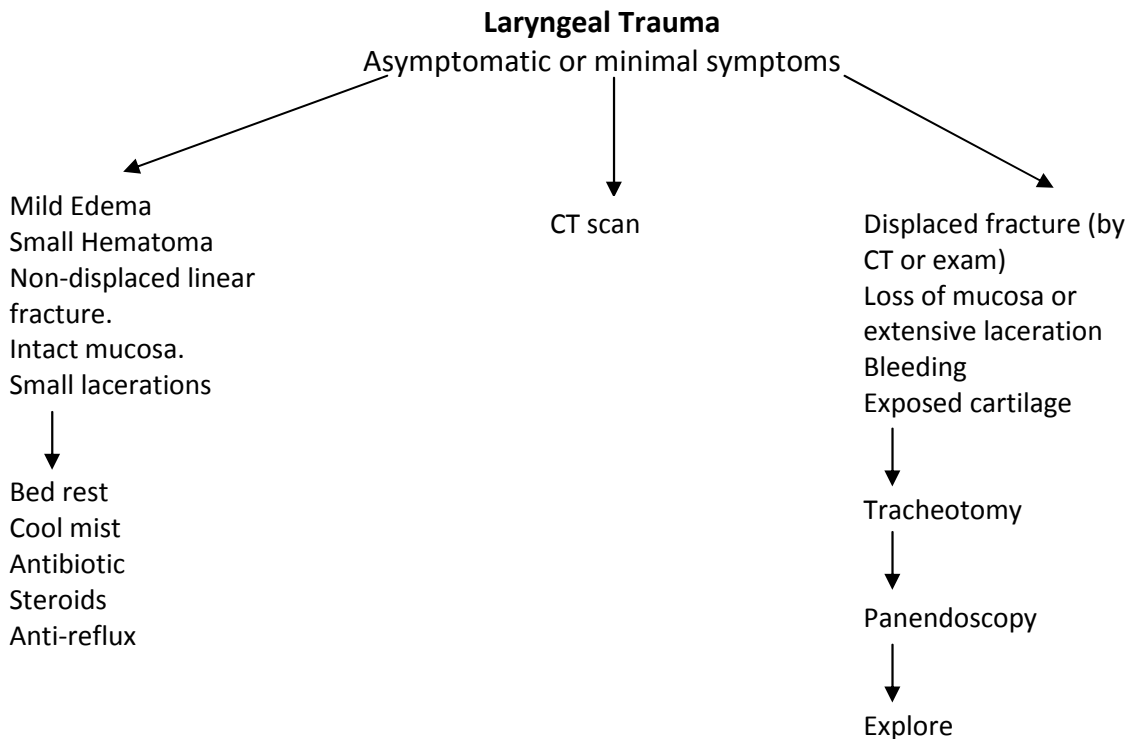
Investigations:

1. Flexible Fiberoptic Laryngoscope.
2. Perform in emergency room.
3. Findings dictate next step.
4. CT scan.
5. Tracheotomy.
6. Endoscopic or external surgical exploration.
7. Other studies angiography, cervical spine radiographs and barium esophagrams.

Management: you have to always secure the airway as an initial step.

- Airway management. Laryngo-tracheal tube or tracheostomy. If inhalational injury ventilate the patient.
- Medical management. We might give epinephrine, steam inhalation to decrease congestion, steroids to decrease the inflammation.
- Surgical management.

N.B do a flexible laryngoscope to visualize the extent of injury. If the patient is stable you might do an exploratory surgery. We might need a vascular surgeon especially in cases of shot wound as it might lead to shearing.



Foreign Body

More common in children and mentally retarded patients.

The Ear:

- **Common** problem, especially in toddlers.
- The vast majority of items are lodged in the **ear canal**.
- Most cases of foreign bodies in the ear are **not serious**.
- Common objects found in ears include food material, beads, toys, and insects.

Sings and symptoms:

- Foreign body in the ear **undetected** and can cause an **infection** in the ear.
- **Pain**.
- Decrease in **hearing**.
- **Bleeding** is also common not urgent doesn't require immediate intervention
- A live insect in the ear. The insect's movement can cause a **buzzing** the ear.

Treatment:

- Removal of the foreign body in the clinic, if uncooperative child we remove it microscopically under minor sedation.
- Urgent removal is indicated if the object is causing **significant pain** or discomfort.
- **Removal button batteries** can decompose within 25 hours in the body to allow the chemicals to leak out and cause burn. **Urgent** removal is advised.

- **Urgent removal** is also recommended for **food or plant** material (such as beans) because these will swell when moistened. If swollen will effect the external canal and might lead to otitis externa. The problem is it might get swollen and large that it can't be removed externally. Therefore, we remove it under GA in children and give antibiotics.
- If it was an insect then you have to kill it by oil before removing it, provided that there is no perforation.

Foreign Body in the Nose:

- The most common site is the inferior turbinate.
- It differs from the ear in that the nose is an airway.
- **Treatment:**
 1. the most important thing is to secure the airway.
 2. If the foreign body was located anteriorly and the child was cooperative we might remove it by a forceps in the clinic.
 3. If it was more posteriorly, at the level of the nasopharynx, or the child is struggling or uncooperative; the foreign body could be pushed on attempts to remove it and might lead to further complications such as: inhalation or reaching the lungs. In these cases, take the patient to the O.R and remove it under G.A.

Foreign Body in the pharynx:

Larynx more serious than pharynx

- Foreign body ingestion.
- Coins. Coin is important, if stayed in any place for a long time it will melt and its components will lead to necrosis and if in the nose it will lead to septal perforation, if in the esophagus, esophageal perforation.
- Meat. (Fish bone)
- Vegetable matter.
- Dentures.
- Less than 24 hour.

Foreign body aspiration: more serious than ingestion

History:

- Parental suspicion.
- Chocking
- Gagging
- Wheezing if prolonged in the chest, might be mistaken with bronchial asthma.
- Hoarseness
- Dysphonia.
- Pneumonia, foreign body will lead to infection.
- A positive history must never be ignored, while a negative history may be misleading.

N.B. The commonest site of ingestion injury is in the cricopharyngeal fossa because the cricopharyngeal sphincter will have a protective role. Ingestion injury is common among neurological disease affecting swallowing. Its not serious unless very large object.

Physical exam:

- Larynx/cervical trachea.
 - Inspiratory or biphasic stridor.
- Intrathoracic trachea.
 - Prolonged expiratory wheeze.
- Bronchi
 - Unequal breath sounds.
 - Diagnostic triad - <50%
- Unilateral wheeze
- Cough
- Ipsilaterally diminished breath sounds
- **Fiberoptic laryngoscopy.**

Flexible Laryngoscopy:

- Proper equipment.
- Assess nares/choanae.
- Assess adnoid and lingual tonsil.
- Assess TVC mobility.
- Assess laryngeal structures.

Radiology:

- Plain films: not all foreign bodies are radio-opaque therefore wont be visualized in these cases we go by the history even in the absence of +ve radiographs.
 - Chest and airway AP and lat.
 - Expiratory films.
- Fluoroscopy if foreign body stayed for long and you are suspecting an injury.
- Barium swallows.
- CT, MRI, Angiography.

N.B inhalation injury is more serious than ingestion, but ingestion is more common.

Foreign Body in the esophagus:

Esophageal perforation:

- The most common cause of an esophageal perforation is injury during placement of a naso-gastric tube or a medical procedure such as esophagoscopy.
- A tumor, gastric reflux with ulceration, violent vomiting or swallowing a foreign object or caustic chemicals.
- Injuries that hit the esophagus area (blunt trauma) and injury to the esophagus during an operation on another organ near the esophagus. Rare cases have also been associated with childbirth defecation, seizures, heavy lifting, and forceful swallowing.

Symptoms and signs:

- The main symptom is **pain** at first, but the condition can progress to shock – even death – if untreated.
- Signs include **fast breathing, rapid heart rate, low blood pressure, and fever.**
- Patient with **a perforation** in the uppermost portion of the esophagus may have neck pain or stiffness and air bubbles underneath the skin.
- Patients with a perforation in the middle portion or lowermost portion of the esophagus may have difficulty swallowing, chest pain, and difficulty breathing.

Exams and tests:

- **A chest x-ray** may reveal that there is air in the soft tissues of the chest, fluid that has leaked from the space around the lungs, or a lung collapse.
- **A chest CT scan** may show an abscess in the chest or esophageal cancer. X-rays taken after you drink a non-harmful dye can help pinpoint the location of the perforation.

The definitive treatment:

- Is to repair the perforation, for some patients with perforation in the uppermost (neck region) of the esophagus, the perforation may heal by itself if the patient does not eat or drink for a period of time. In this case nutrition must be provided by another source, such as a stomach feeding tube.
- For perforation in the mid-portion and lower-most portions of the esophagus, an operation is usually required for repair. Depending on the size and location of the perforation, the leak may be treated by simple repair or by removal of the esophagus.

Complications:

Possible complications include:

- Permanent damage to the esophagus (narrowing or stricture).
- Abscess formation in and around the esophagus.
- Infection in and around the lungs.

GOOD LUCK
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