Neck & Facial injuries

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Objectives

- To understand the anatomy of Zones of neck with relation to trauma; Zone 1, Zone 2, and Zone 3
- To know the structures in each zone; respiratory, GI, vertebral, and vascular systems.
- ABCDE of basic principles of trauma
- Types of neck injuries; blunt and penetrating
- Symptomatology of neck and facial injuries; bleeding, hoarseness, stridor, haematemesis, hemoptysis, dysphagia
- Clinical signs of neck and facial injuries; shock, neck wounds, subcutaneous emphysema, deformity
- Principles of resuscitation.
- Investigations; X-ray C-spine, upper aero digestive endoscopy, CT, CT angiography, MRA
- Management; skin laceration, cartilaginous injuries, esophageal and tracheal injuries
Surgical Anatomy

A) The anterior triangle
Lies between:
1. Anterior border of the sternomastoid muscle
2. Lower border of the mandible
3. The midline

B) The posterior Triangle
Lies between:
1. Posterior border sternomastoid muscle
2. Anterior border of the trapezius muscle
3. Middle 1/3 of clavicle
The anterior triangle is called the visceral triangle of the neck because it contains the most important structures passing to and descending from the brain:

1. **Carotid sheath**: Carotid vessels, internal jugular vein, Ansa cervicalis (C1,2,3), sympathetic chain
2. **Branches of external carotid artery**
3. **Hypoglossal nerve**
4. **Submandibular salivary glands**
5. **Thyroid gland**
Contents of posterior triangle:
- **Muscles:** Inferior belly of omohyoid muscle
- **Arteries:**
  - 1- 3rd part of subclavian
  - 2- Transverse cervical artery
  - 3- Suprascapular artery
- **Veins:**
  - 1- Subclavian vein
  - 2- Transverse cervical vein
  - 3- Suprascapular vein
- **Nerves:**
  - 1-Accessory nerve
  - 2- Ansa cervicalis, phrenic nerve
  - 3- Roots of brachial plexus
- **Lymph nodes:**
  - Supraclavicular lymph nodes
The platysma muscle

- The **superficial fascia** in the neck contains **a thin sheet of muscle (the platysma)**, which begins in the superficial fascia of the thorax, runs upwards to attach to the mandible and blend with the muscles on the face.

- It is innervated by the cervical branch of the facial nerve [VII], and is only found in this location.
• **Deep to the superficial fascia**, the deep cervical fascia is organized into several distinct layers.

  1- **an investing layer**, which surrounds all structures in the neck;

  2- **the prevertebral layer**, which surrounds the vertebral column and the deep muscles associated with the back;

  3- **the pretracheal layer**, which encloses the viscera of the neck;

• the carotid sheaths, which receive a contribution from **the three fascial layers** and surround the two major neurovascular bundles on either side of the neck.
Zones of the neck

- Zone I
- Zone II
- Zone III
Zones of the neck

- The neck is commonly divided into three horizontal zones:
  - **Zone I** is the thoracic inlet and extends roughly from the sternal notch & clavicle to the cricoid cartilage.
  - Injuries in this zone carry the highest mortality because of the presence of the great vessels (subclavian, proximal carotid) and the difficult surgical approach (thoracotomy).
• **Zone II** is the midportion of the neck and it extends from the cricoid cartilage to the angle of the mandible.

• *Injuries in this zone are usually clinically apparent, and vascular control is relatively straightforward.*
• **Zone III** extends from the angle of the mandible to the base of the skull.

• *Exposure in this zone, particularly of the distal carotid artery, can be quite difficult & may require disarticulation of the mandible.*

• **Penetrating wounds may traverse more than one zone and require evaluation of all possible structures in all affected zones.**
Maxillofacial injuries

- It must be remembered always that an intact and unscarred face is very important to the individual.
- Facial soft tissues have an excellent blood supply and heal well.
- Thus all injuries, even trivial, should be treated with great care, to produce an optimal outcome.

Causes:
- Road traffic accidents
- Fights
- Contact sports as soccer
• All penetrating neck injuries are potentially life threatening
• Classified as:
  • **Blunt & superficial to the platysma**
  • **Deep & penetrating** if it goes deep to the platysma
Symptoms & signs

- Injuries to the larynx or the trachea can cause hoarseness of voice, stridor or dyspnea.
- **Tracheal injuries** can cause surgical emphysema.
- **Esophageal injury** cause severe chest pain & dysphagia.
- Cervical pain & tenderness over the cervical spines.
- Altered level of consciousness.
- **Vascular injury** will lead to marked blood loss and hematoma.
Work up

- If the patient is stable, diagnostic studies should be done
- **Arteriography** is done for penetrating injuries in zones I & III
- **Colored duplex** and **Surgical exploration** is indicated in penetrating injuries in zone II
- **Endoscopy, bronchoscopy** are done to exclude esophageal or tracheal injuries
- **Plain x ray** for any soft tissue injury with tender spine
Neck injuries

- **Important facts:**
  - All neck injuries are potentially life-threatening.
  - Classified as blunt or penetrating.
  - Penetrating injuries are divided into 3 zones I, II, III.
  - Blunt trauma rarely require surgery but may cause fracture or dislocation of the cervical spines.
Clinical assessment

1- Injuries that do not penetrate the platysma can be considered superficial, and no further investigation is needed.

2- Injuries anterior to the sternomastoid are significant injuries & those posterior to the sternomastoid are unlikely to involve major vascular or aero digestive structures.

3- Penetrating injuries to the posterior triangle should raise concern about trauma to the cervical spine and spinal cord.
Management

- Neck injuries can **compromise the airway**
- Directly or indirectly cause **a head injury**
- Cause injuries to **the cervical spine**.

*So, the management of extensive maxillofacial injuries should be directed to: ABC*

1. Clear the airway
2. Care of breathing
3. Control of bleeding
Care of the airway

- Airway obstruction may arise from inhalation of tooth fragments, accumulation of blood and secretions, & dropped back tongue in the unconscious or semiconscious patient.

- To avoid this, the patient should always be nursed in the semi-prone position (Recovery position) with the head supported on the bent arm, and never lying on his back.
The semi-prone position (Recovery position)

Fig. 38.1 The patient should be nursed in the semiprone position to allow secretions, blood and foreign bodies to fall from the mouth.
Resuscitative Priorities

1 - Airway clearance:

Clear airway by jaw thrust & chin lift:
- Remove an oral foreign body; dentures, food particles, etc. by finger sweep.
- Blood and secretions are removed from the oropharynx by suction.
- Occlude sucking chest wound with dressing.
- Stop external bleeding my direct & indirect compression.

Gag reflex +ve → airway tube

Gag reflex –ve → endotracheal tube
- Hemorrhage from the carotid artery, jugular vein, and great vessels.
- Injuries in zone II are usually clinically apparent, with significant hematoma or frank external hemorrhage.
- These injuries are approached by immediate surgical exploration, with direct pressure used to maintain hemostasis until vascular control can be achieved.
- Venous injuries are ligated
- Arterial injuries are reconstructed
Based on the difficulty of vascular exposure in both zone I and zone III, **arteriography** is mandatory before surgical exploration in all patients.
3-The potential for blunt injury to the larynx (assessed by direct laryngoscopy) & trachea, must be kept in mind in any patient with evidence of a blunt trauma to the neck.

- Look for hoarseness of voice, stridor, dyspnea or surgical emphysema.
- CT of the neck is commonly used to assess the larynx in blunt injury
Figure 20-7  Use of computed tomography in blunt neck trauma. The study shows a fracture of the thyroid cartilage, with significant airway swelling and air in the soft tissues surrounding the larynx.
**Indications of surgical exploration of the neck:**

1. Severe external hemorrhage
2. Large or expanding hematoma
3. Air movement through the wound with breathing, crepitance in the neck, voice changes, dysphagia.
4. Any zone II injury penetrating the platysma

Neck injuries not requiring operative exploration may need some investigations:

- CT, bronchoscopy, angiography, esophagoscopy, and esophagography, to exclude injury.
Indications for Neck Exploration

- **Vascular**
  - Expanding hematoma
  - External hemorrhage
  - Diminished carotid pulse

- **Airway**
  - Stridor
  - Hoarseness of voice
  - Hemoptysis
  - Surgical emphysema

- **Digestive Tract**
  - Dysphagia
  - Surgical emphysema

- **Neurologic**
  - Lateralized neurologic deficit
  - Altered state of consciousness not caused by head injury
In brief, hemostasis should be maintained initially by direct pressure or digital occlusion.

Arterial injuries should be debrided and repaired by direct anastomosis or interposition synthetic graft, usually polytetrafluorethylene (PTFE) graft or venous graft.

Venous injuries are usually ligated.
When to ligate arteries?

- Major injuries to the external carotid can be safely treated by ligation.
- Ligation of the common or internal carotid carries much more functional morbidity and should be done only for uncontrollable hemorrhage or if repair is technically impossible.
- Extra cranial-intracranial bypass has been suggested in patients requiring ligation of the common or internal carotid, but experience is limited.
Airway Injuries

• Simple lacerations of the trachea can frequently be repaired by direct non-absorbable suture.

• If there is significant tissue loss, the trachea can usually be mobilized sufficiently to allow for approximation of the 2 ends.

• Loss of a larger portion of trachea may necessitate tracheostomy for further complex reconstructive procedures.
Laryngeal injuries are treated by closure of mucosal lacerations and reduction of cartilaginous fractures.
Esophageal Injuries

- Injuries to the esophagus present a difficult problem, usually **misdiagnosed**.
- **If the diagnosis is made early**, **primary surgical repair either by a one-layer or two-layer**.
- **If the diagnosis is delayed** for more than 12 hours: **diversion and drainage**
  (cervical oesophagostomy & gastrostomy)
Prognosis

- **Cervical spinal cord injury** result in paralysis & ? Respiratory failure
- **Soft tissues, trachea & esophagus** have good prognosis when are treated early
- **Big vessels injury** have good prognosis when treated before shock or cerebral ischemia
- **Overall mortality 10%**
Soft tissue injuries of the face
Skin wounds:

- Treated in the theatre
- Clean & irrigate the wound with N saline
- Remove foreign bodies
- Minimal wound debridement
- Cut wounds are sutured with fine suture materials
- Avulsed flaps are sutured in their original sites
- Cover the raw areas, better with rotation skin flaps (full thickness), than with partial thickness grafts
- Avoid tight compresses
Facial nerve injuries:

- Diagnosed by clinical examination
- The affected side of the face looks flat, without any facial expressions
- No corrugations of the forehead on looking upward
- The eye can not be closed
- The lips cannot be closed and whistling & blowing can not be performed
- Food collects between the cheek and the teeth
- Loss of taste of the anterior 2/3 of the tongue
Treatment

- Injuries medial to the midpupillary line need no treatment
- Lateral injuries need nerve repair by sutures or by nerve graft
Parotid injuries:

- Injury to the parotid duct → end to end anastomosis over a small Silastic catheter
- Alternative; the proximal cut end may be sutured to the oral mucosa
- **Injury to the gland:**
  - Suture the skin injury over the gland & put a drain
  - Two days of intravenous dexamethasone (8 mg twice a day) should follow the surgery.
  - Antibiotics are recommended.
  - The resulting salivary sinus will stop leaking in 3 weeks
Eyelids injuries:

- Done by an ophthalmologist
- Suture the lid in layers with special concern about the cut levator muscle, otherwise ptosis will result
- Injury to the lacrimal gland & duct must be repaired under magnification to avoid epiphora & dacryocystitis
• **Ear injuries:**
  • Full thickness tears are sutured by cutaneous perichondral fine stitches
  • All hematomas around the auricle are evacuated

• **Nasal injuries:**
  • Nasal tears are sutured
  • Septal hematoma is evacuated to avoid resorption of the septal cartilage
• **Lips injuries:**
  - Sutured in 3 layers; skin, muscles & mucous membrane

• **Intra-oral injuries:**
  - If widely separated, the edges of the wound are loosely approximated

• **Animal bites:**
  - Heavily contaminated left open
  - Debridement, antibiotics & rabies vaccine
Facial fractures
Mandibular fractures

- **Causes:**
  - Falls, kicks, fist blows, car accidents or pathological fractures
Sites of fractures

Figure 20-10  Anatomy of the mandible and common lines of fracture.
Sites of fractures

- Fracture of the body near the mental foramen is the commonest.
- In bilateral cases, the fractured segment is displaced backward with the tongue (by the action of digastric & geniohyoid muscles) leading to respiratory obstruction.
Clinical picture

- Pain, blood stained saliva, impaired speech, inability to swallow & numbness in the lower lip
- **On exam:**
  - Swelling & hematoma in the floor of the mouth
  - Crepitus overlying the fractured bone
  - Irregularity in the alveolar margin
Investigations

- **Plain X ray is diagnostic**
  - Postero-anterior and occipito-mental radiographs taken at 10 and 30 degree are the best initial radiographs to illustrate the site and displacement of the fractured bone.

- **Panorama view** essential for the plan of correction
  - A panoramic oral radiograph is the radiograph of choice for the mandible as it shows the whole bone from condyle to condyle.

- **CT scan** may be needed
  - The orbital floor may be visualized best by a computerized tomography (CT) scan in the coronal plane,
Treatment

1 - First aid measures:
- Jaw support with a special bandage (4-tailed bandage)
- Analgesic & antibiotic

2 - Reduction & fixation by:
- A) Arch bars and interdental wiring
- B) Plates and screws
Interdental wiring

Fig. 38.8 Intermaxillary fixation using eyelet wires.
Fractures of maxilla

- Usually secondary to car accidents
- Clinically; there will be:
  - *Pain, excess salivation, mal-occlusion, epistaxis, diplopia, swelling and crepitations*
Le Fort classification for fracture maxilla (René Le Fort in 1901)

- **Le Fort I:**
- A transverse fracture above the level of the teeth
Le Fort I:

Treated by intermaxillary fixation then to the inferior orbital margin with wires
**Le Fort II:**

- A pyramidal fracture, passing through the base of the nose & the posterior wall of the maxillary sinus across the orbit and the ethmoids.
- The cribiform plate may be fractured, leading to a dural tear and CSF leak.
Treated by intermaxillary fixation by wires then to the zygomatic process
• **Le Fort III:**
• This is a complete craniofacial disjunction *i.e.*; separation of the facial bones from their cranial attachment
Treated by correction of the nasal and zygomatic fractures & treatment of fracture maxilla as Le Fort I, II.
Fractures of the nose

- Caused by direct trauma to the nasal bones
- Pain, swelling, epistaxis, crepitus
- Plain X ray is diagnostic
Treated by manual reduction or by instrumental (Asch’s forceps) reduction & fixation by nasal packing for 3 days with external splint for 7 days
Fractures of the zygoma

- Pain, swelling in the eyelids, flattening of the cheek, crepitus and irregular orbital margin
- Numbness in the cheek & upper teeth due to injury of infra-orbital nerve
- A particularly useful sign in the fractured zygoma is the frequent subconjuctival hemorrhage with no posterior border when the patient is asked to look to the opposite side
This gives a positive indication of a fracture of the bone behind.

Treated by fixation with wires or plates and screws.
Blowout fractures

- Direct trauma to the globe of the eye may push it back within the orbit.
- The globe may herniate into the maxillary sinus (fracture of infraorbital plate)
Clinical picture:

- Pain is experienced on movements of the eye.
- Enophthalmos & profound diplopia can follow with marked edema around.
- Anaesthesia over the distribution of the infraorbital nerve may be an important clue to the blow-out fracture.
Treatment:

- The floor of the orbit is approached either through a blephoroplasty incision in the lower eyelid or through the inferior fornix.
- The herniated orbital tissues are gently separated from the fractured bones and freed so that no trapping remains.
Defects of the orbital floor are repaired with bone from the cranium or by titanium mesh.
The materials are fixed with wires, screws or plates and the wound is closed.
Temporomandibular dislocation

- Commonly bilateral, more in females
- **Causes:**
  - Direct blow, yawning, wide opening of mouth
- **Treatment:**
  - *better under general anesthesia*
  - Reduction can be achieved manually by downward traction on the molars with padded thumb and upward rotation of the body of mandible with the outer fingers
THANK YOU