



NECK INJURY

SUPERVISED BY
DR. MOHAMMAD ASEM

Presented by:

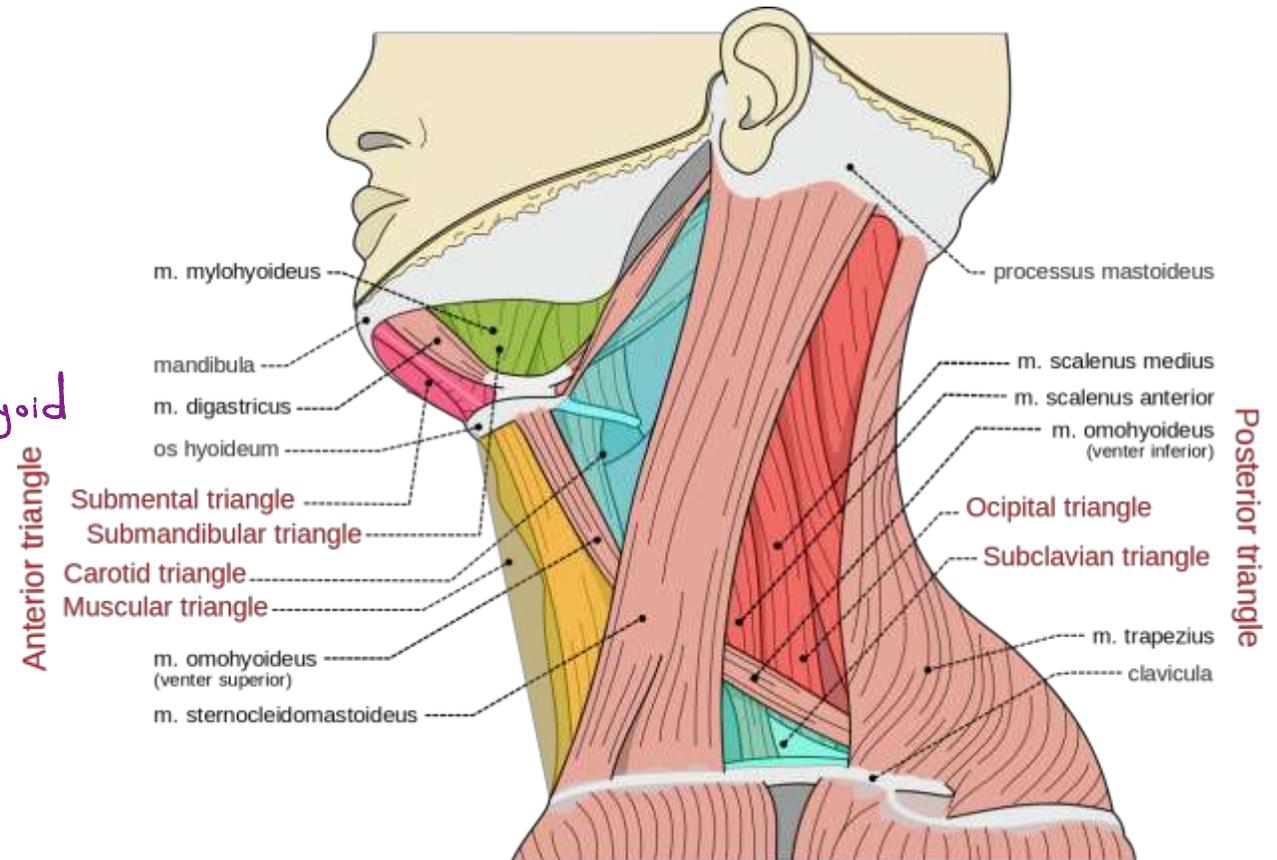
Sondos Qatawneh
Lara Abu Alhaj
Reziq Maaytah
Adli Qatawneh

Introduction

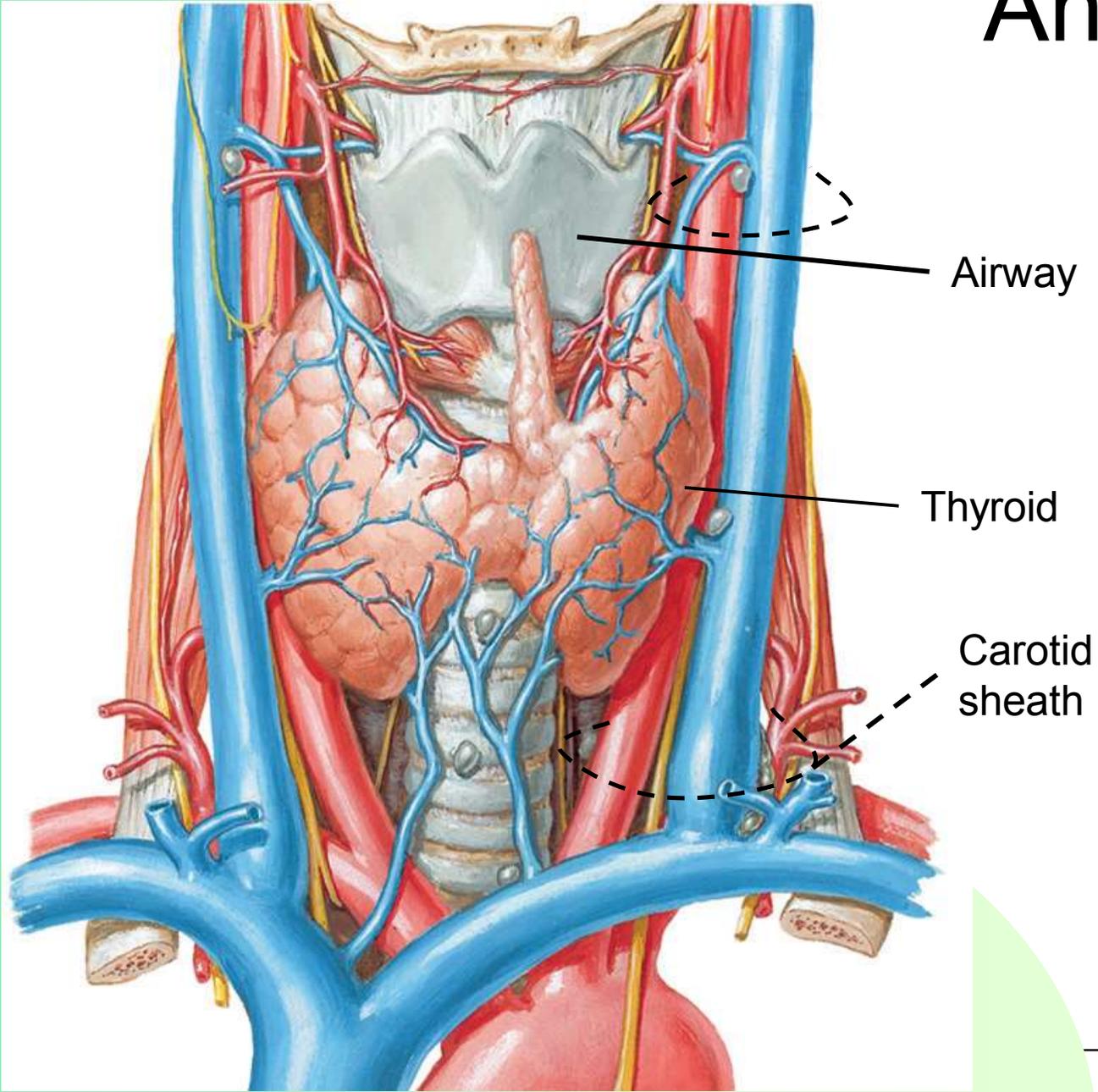
1. Neck injuries is one of the most critical injuries, Its both an inlet and an outlet containing various structures.
2. Patient may appear normal at first but deteriorate after few hours (either death, paralysis, asphyxia, ..)
3. Neck anatomy is significant to identify the location of trauma and exact place of injury to predict the damaged structure.
4. Neck is divided to Triangles. (Anterior + posterior triangles)
anterior triangle is also is divided to 3 zones (zone 2 is the most important)
5. Most important information to ask about in a neck trauma:
 1. site
 2. type of injury (blunt/penetrating)
 3. Signs (Hard/soft)

Anatomy of the neck

- the neck is divided into 2 triangles anterior and posterior separated by **Sternocleidomastoid** muscle.
- Posterior triangle is bordered posteriorly by **Trapezius** muscle divided to (Occipital triangle, Subclavian triangle) *by omohyoid muscle*
- Anterior Triangle is divided to:
 1. Submandibular triangle
 2. Submental Triangle
 3. Carotid
 4. Muscular triangle *by omohyoid ms.*
- Borders of anterior triangle:
 - Superiorly** – inferior border of the mandible.
 - Laterally** – anterior border of the sternocleidomastoid.
 - Medially** – sagittal line down the midline of the neck.



Anatomy of the neck



Airway

Thyroid

Carotid sheath

The three structures located in the carotid sheath include the common

- carotid artery
- internal jugular vein
- vagus nerve

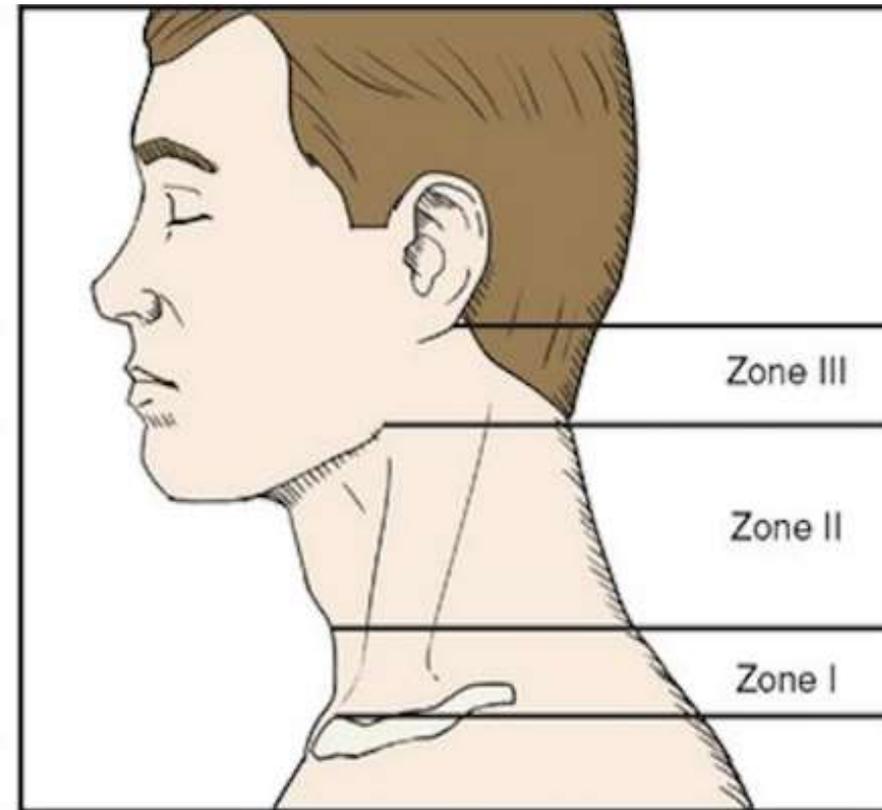
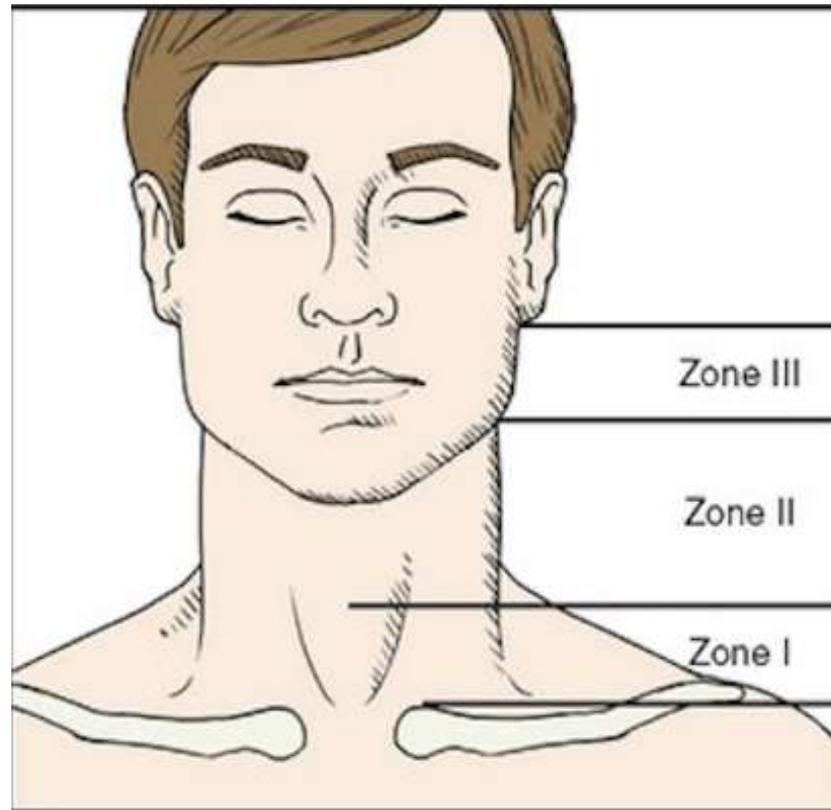
Content of each zone

is important

Neck Zones

- In the setting of penetrating trauma, the neck is divided into three anatomic zones in order to summarize structures that are at risk for potential injury.

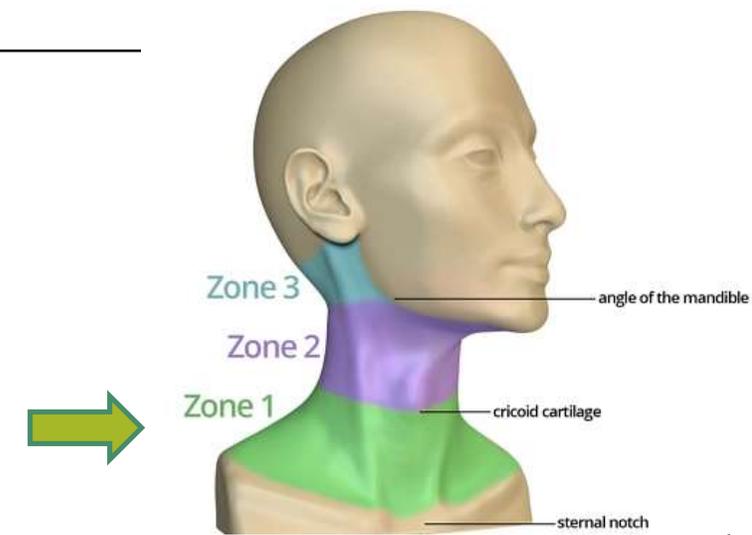
- Remember that the neck zones are numbered in the direction of carotid blood flow.



Anatomical zone	Features
Zone I	<ul style="list-style-type: none"> - From clavicles to cricoid cartilage - Defines area containing major vital structures - Is considered to be well protected
	<p>Contains:</p> <p>intrathoracic major vessels subclavian veins and arteries, the proximal vertebral and carotid arteries oesophagus, proximal trachea, larynx brachial plexus, spinal cord superior mediastinum, pleura</p>
Zone II	<ul style="list-style-type: none"> - From cricoid cartilage to the angle of the mandible - Defines area containing all vital structures - Is considered to be least protected, very superficial
	<p>Contains:</p> <p>Carotid arteries, jugular veins, vertebral arteries Trachea, larynx, oesophagus Spinal cord</p>
Zone III	<ul style="list-style-type: none"> - From the angle of the mandible to the base of the skull - Very confined, protected area - Difficult to assess and explore
	<p>Contains:</p> <p>Distal vertebral and carotid arteries Pharynx Spinal cord</p>

Anterior triangle-Zone I

Borders : Clavicles and sternal notch, Cricoid cartilage

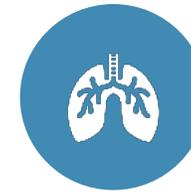


Blood vessels:

aortic arch, subclavian, and innominate (brachiocephalic) vessels



Nerves: brachial plexus, left recurrent laryngeal nerve, spinal cord, sympathetic trunks



Respiratory: trachea, apex of the lung



Digestive: esophagus



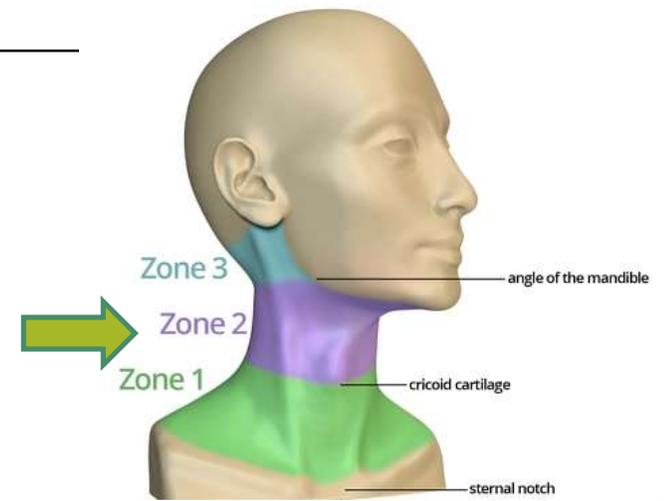
Lymphatic: thoracic duct on the left



Thyroid gland.

Anterior triangle-Zone II

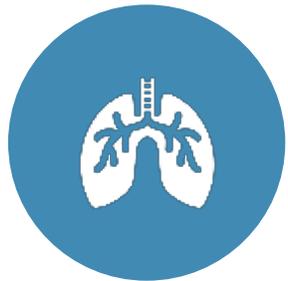
Borders :Cricoid cartilage ,Angle of the mandible



Blood vessels: carotid vessels,
internal jugular vein



Nerves:vagus, recurrent
laryngeal, phrenic nerve



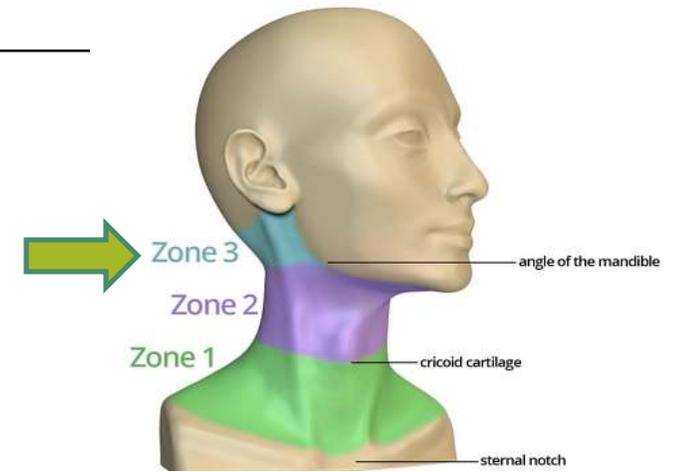
Respiratory: Trachea, larynx



Digestive: esophagus

Anterior triangle-Zone III

Borders :Angle of mandible, Base of skull



Blood vessels :
carotid vessels, internal jugular vein



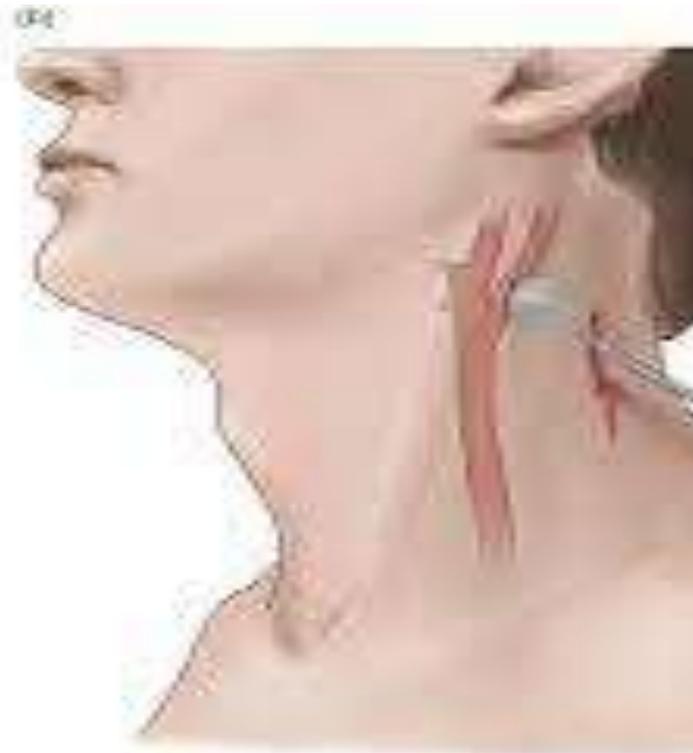
Nerves:
cranial nerves VII-XII



Respiratory/digestive:
pharynx mainly the oropharynx



Glands:Parotid gland



PENETRATING NECK INJURIES

Classification of penetrating neck injuries

Injuries penetrating the platysma are classified according to the anatomical location to:

- Posterior triangle injuries
- Anterior triangle injuries

The anterior triangle is subdivided into zone I, zone II and zone III

Posterior triangle injuries



Generally these injuries are *less likely to involve the major structures.*



The spinal cord, brachial plexus, and vertebral arteries may be at risk.



If the injury is very low, the subclavian vessels or the lung apex could be involved

crepitus
hoarse voice
pain with coughing
cough up blood
dyspnea
drex, stridor

dysphagia
bloody saliva, NG, vomit
crepitus
neck pain

esophagus
(most often missed)

carotid

stroke
expanding hematoma
excessive bleeding
bruit/thrill
pulse deficit

jugular
hematoma
excessive bleeding
hypotension

platysma

phrenic nerve
vert. art. syncope/stroke
 $\frac{1}{2}$ diaphragm paralysis

sympathetic chain

HORNER'S SYNDROME



Signs/Symptoms/Hard signs of penetrating neck injuries

01

Vascular

They include **active arterial bleeding**, pulsatile or expanding **hematoma**, or the **presence of shock**, a palpable thrill, audible bruit, and neurological deficits that indicate a possible stroke. The presence of one of these findings (particularly the first three) is an indication for immediate surgical exploration.

02

Horner's syndrome

(ptosis, miosis, and anhydrosis) may indicate **injury to the vessels** in the neck on the basis of anatomical proximity, because sympathetic fibers are located along the course of the common carotid and internal carotid arteries.

03

Thrill/bruit

Damage to the subclavian or carotid artery and adjacent vein can create an **arteriovenous fistula**; turbulent blood flow causes the vein to vibrate, leading to a palpable rumble or a whooshing sound on auscultation

Signs/Symptoms/Hard signs

04

Stridor

upper airway obstruction caused by compression of the trachea from a large hematoma, soft tissue swelling, direct laryngeal injury, or bilateral recurrent laryngeal nerve injury; it warrants immediate attention to the airway, usually in the form of endotracheal intubation

05

Odynophagia

suggestive of an injury to the oropharynx or esophagus

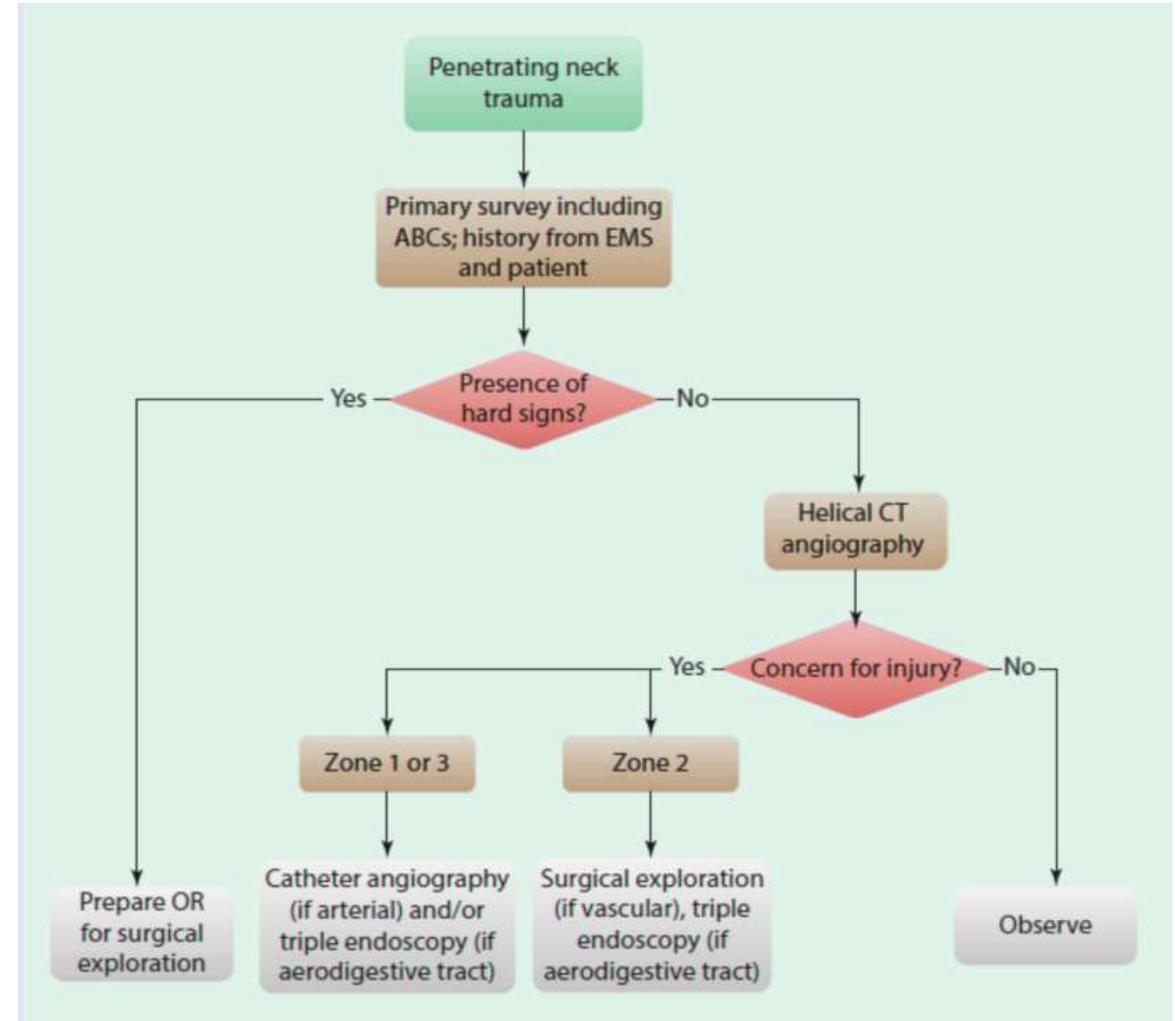
06

Crepitus

subcutaneous emphysema (air trapped under the skin) secondary to injury of the aerodigestive tract (trachea, bronchus, or esophagus) or lungs

‘Hard signs’ indicating immediate explorative surgery in penetrating neck injury.

- Shock
- Pulsatile bleeding or expanding haematoma
- Audible bruit or palpable thrill
- Airway compromise
- Wound bubbling
- Subcutaneous emphysema
- Stridor
- Hoarseness
- Difficulty or pain when swallowing secretions
- Neurological deficits



What Are the First Steps in the Management of a Penetrating Neck Wound?

- The initial evaluation and assessment of all trauma patients begins with the primary survey involves resuscitation in accordance with the Advanced Trauma Life Support (ATLS) principles

• **Airway**

- Clinical signs of airway injury include hoarseness, stridor, dyspnea, subcutaneous emphysema (in the absence of pneumothorax), bubbling from the wound and large volume hemoptysis
 - Airway compromise may be **directly** due to injury or **secondary**, e.g. oedema associated with a haematoma, or vocal cord paralysis (injury to the recurrent laryngeal nerve)
 - If the airway is compromised, oral intubation should be attempted whenever possible
 - If there is an obvious open injury to the airway, it is better to consider tracheostomy as soon as possible.

Breathing

- The apex of the lung may be involved , always do a chest X-Ray to check for a haemo- or pneumothorax.

Circulation

- Vascular injuries may present as neurological complications,
- (distribution of the middle cerebral artery may be secondary to a carotid artery injury)
- A high-flow intravenous line should be set up. Intravenous
- lines should be avoided in the arm on the side of the neck wound.
- Active external bleeding can be controlled by external digital
- pressure or by Foley catheter balloon tamponade that has
- been carefully inserted as deep as possible into the wound.
- This is an emergency measure that provides temporary control until surgery can be done.

Investigation

❑ Chest X-ray

- Essential in all patients with neck injuries.
- Do not sit patient up; if there is an open wound, it may cause a fatal air embolism or complicate a cervical spine injury.

❑ Cervical spine X-ray

- Look for the presence of fractures, foreign bodies, or air in soft tissues.

❑ CT scan or CT angiography

- In the stable patient, a spiral CT scan (if available) with intravenous contrast will provide information on soft tissue, bony structures, wound trajectory, and vascular injuries.
- Specifically look out for intimal injuries of the carotids.
- Oral contrast can be given if required to identify leaks.

❑ Color Flow Doppler (CFD)

- Color flow Doppler has been suggested as a reliable alternative to angiography in the evaluation of PNI.

Management

- Consider early intubation or surgical airway
- If all the investigations are normal, the patient may be observed over-night and **discharged home** if there is no deterioration.
- A hemothorax should be managed accordingly.
- If the patient is bleeding or airway compromised or investigations are abnormal, **immediate surgical intervention** is required.
- Small pharyngeal and tracheal injuries can be treated **conservatively**

BLUNT NECK TRAUMA

- motor vehicle accidents and sports
- result in laryngeal, vascular, and digestive injury
- easily underdiagnosed because their onset can be delayed
- occult cervical spine injury
- Strangulation
- Blows from fists or feet
- Excessive manipulation

- Common to all traumatic mechanisms is the direct transfer of severe forces to the larynx. These forces have the potential to produce many devastating injuries, including mucosal tears, dislocations, and fractures.
- Edema, hematoma, cartilage necrosis, voice alteration, cord paralysis, aspiration, and airway loss may accompany these injuries.
- Common signs of laryngeal injury include stridor, subcutaneous emphysema, hemoptysis, hematoma, ecchymosis, laryngeal tenderness, vocal cord immobility, loss of anatomical landmarks, and bony crepitus.

Laryngeal injuries vary by anatomical location

- ✓ **Supraglottis:** Traumatic forces commonly produce horizontal fractures of the thyroid alae and disruption of the hyoepiglottic ligament with subsequent superior and posterior displacement of the epiglottis.
- ✓ **Glottis:** Traumatic force results in cruciate fractures of the thyroid cartilage near the attachment of the true vocal cords.
- ✓ **Subglottis:** Crushing forces to the cricoid cartilage cause injury to the cricothyroid joint and may result in bilateral vocal cord paralysis from recurrent laryngeal nerve damage.
- ✓ **Hyoid bone:** Found more commonly in women, hyoid fractures tend to occur in the central part of the hyoid bone because of the inherent strength of the cornua.

- ✓ **Cricoarytenoid joint:** Traumatic forces that displace the thyroid alae medially or cause compression of the larynx against the cervical vertebrae often result in cricoarytenoid dislocation. This injury generally occurs unilaterally.
- ✓ **Cricothyroid joint:** Injury occurs when traumatic forces to the anterior portion of the neck cause the inferior cornu of the thyroid cartilage to be displaced posterior to the cricoid cartilage. This dislocation limits cricothyroid muscle function and therefore pitch control. Injury to the recurrent laryngeal nerve may also contribute to vocal cord paralysis

Classification and treatment of laryngotracheal trauma

Group	Symptoms	Sign	Management
Group 1	Minor airway symptoms	Minor hematomas Small Lacerations No detectable fractures	Observation Humidified air Head of bed elevation
Group 2	Airway compromise	Edema/hematoma Minor mucosal disruption No cartilage exposure	Tracheostomy Direct laryngoscopy Esophagoscopy
Group 3	Airway compromise	Massive edema Mucosal tears Exposed cartilage Vocal cord immobility	Tracheostomy Direct laryngoscopy Esophagoscopy Exploration/repair No stent necessary
Group 4	Airway compromise	Massive edema Mucosal tears Exposed cartilage Vocal cord immobility	Tracheostomy Direct laryngoscopy Esophagoscopy Exploration/repair Stent required

In any neck injury and the patient is stable
we should do Bronchoscopy and endoscopy

- assessment of airway

- jaw thrust if failed → laryngeal mask
if failed → intubation if failed → tracheostomy

- Breathing (Bilateral)

- circulation: HR, BP, Compression on site of
active bleeding or
by Ballon of Foley's
catheter

- Disability