neck injury

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Introduction

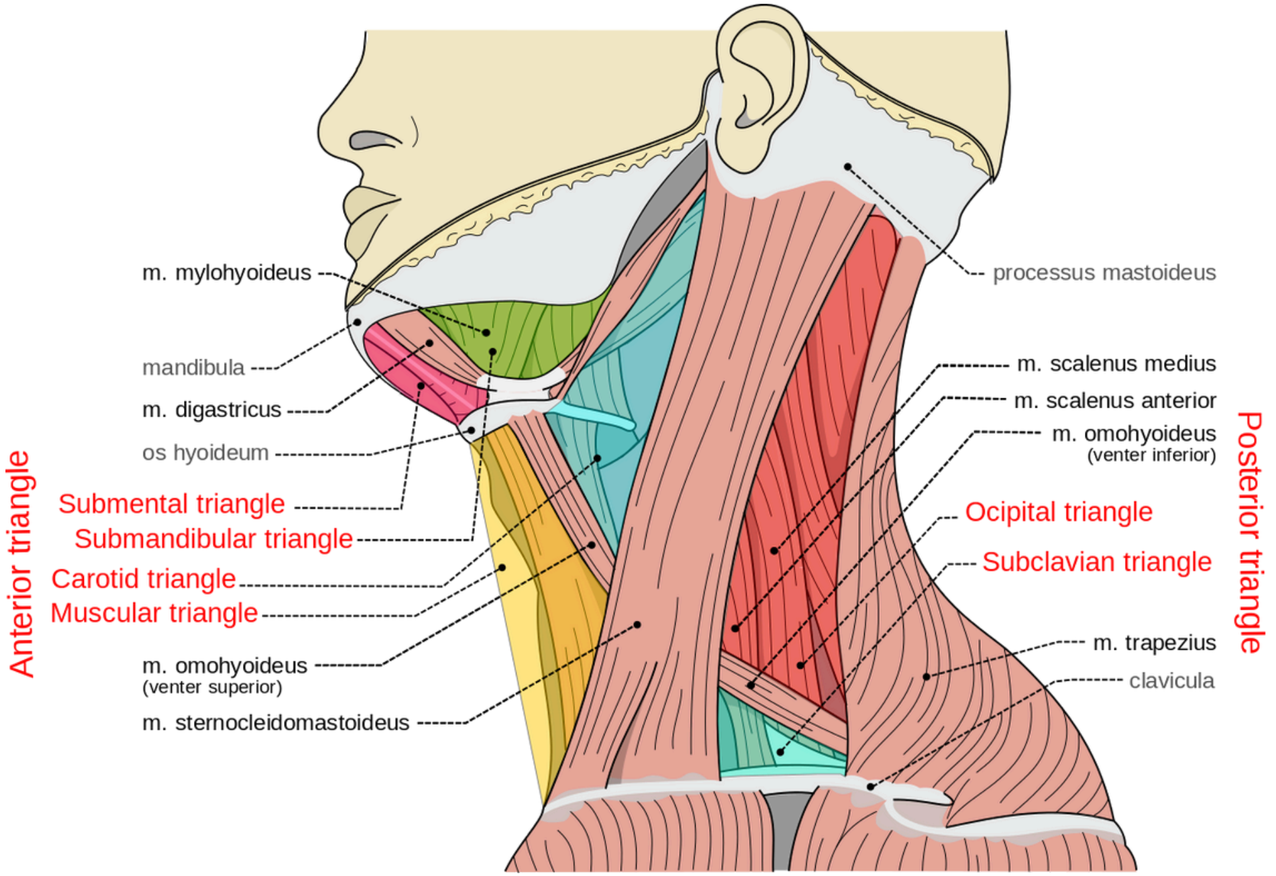
1. Neck injuries is one of the most critical injuries, Its both an inlet and an outlet containing various structures.
2. Patient may appear normal at first but deteriorate after few hours (either death, paralysis, asphyxia, ..)
3. Neck anatomy is significant to identify the location of trauma and exact 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

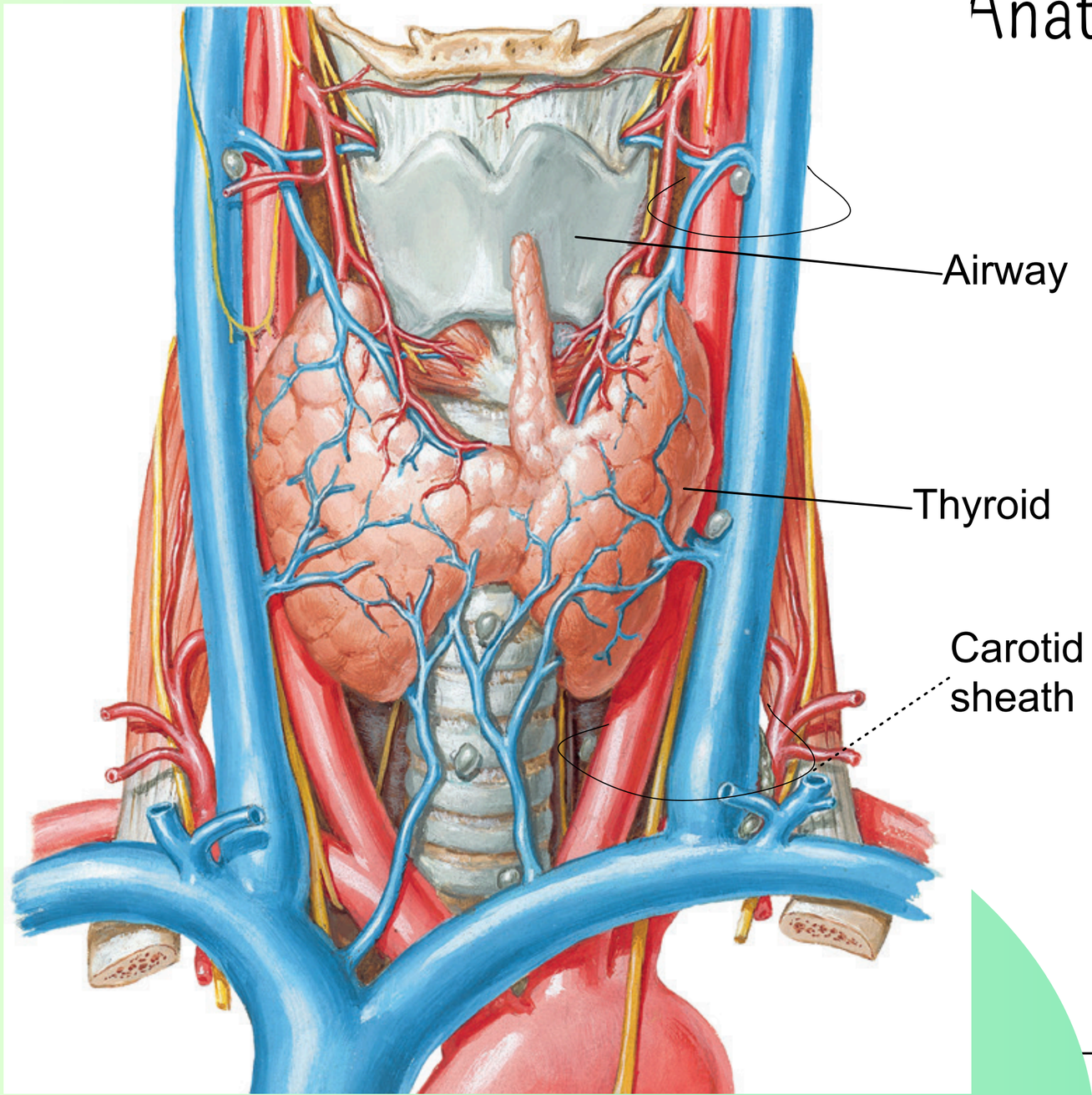
- the neck is devided into 2 triangels anterior and posteriour separated by **Sternocleidomastoid** muscle.

- Posterior triangle is bordered posteriorly by **Trapezius** muscle divided to (Occipital triangle ,Subclavian triangle)

- Anterior Triangle is divided to:
  1. Submandibular triangle 2. Submental Triangle 3. Carotid 4.Muscular triangle
- Boarders 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

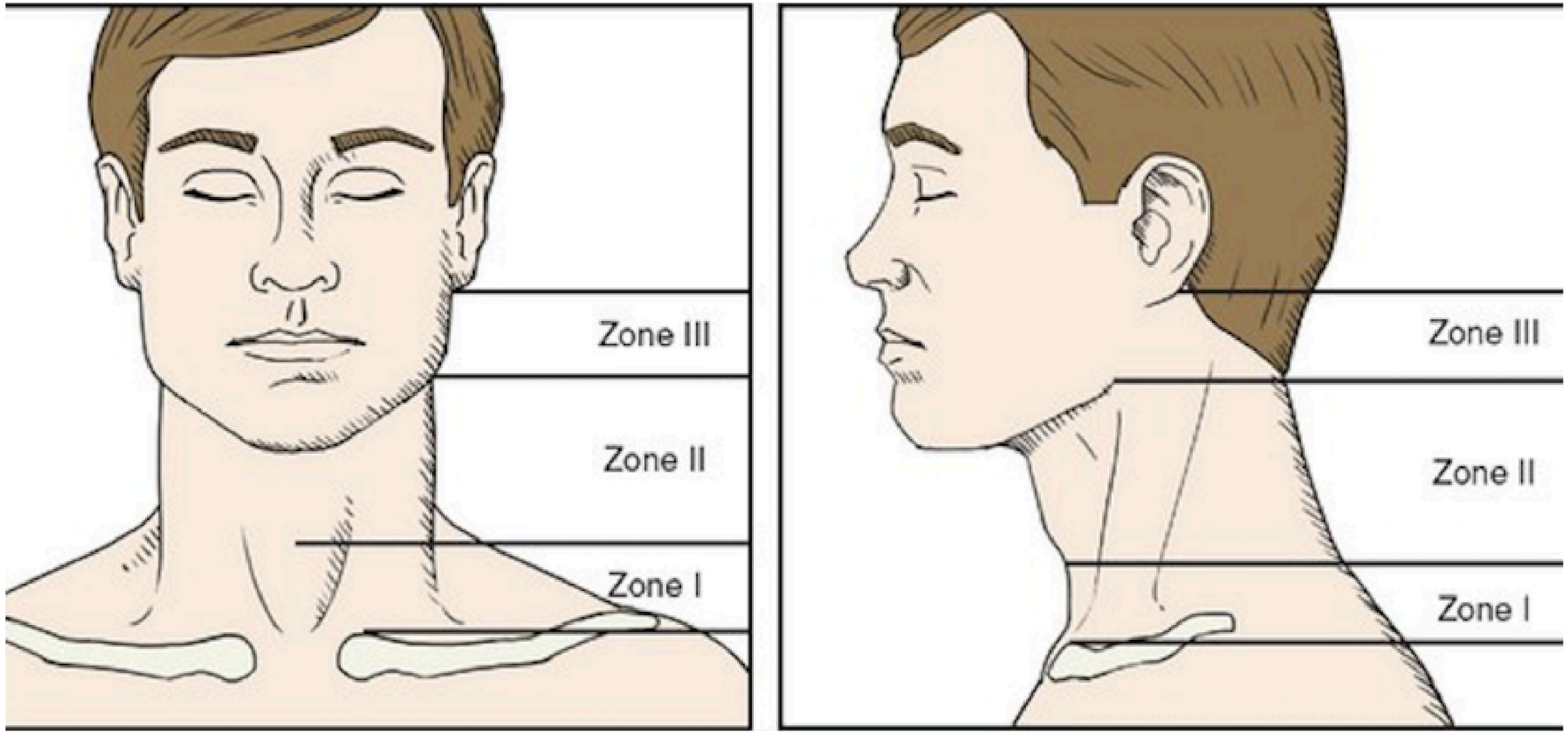


The three structures located in the carotid sheath include the common
-carotid artery
- internal jugular vein
-**vagus** nerve

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.

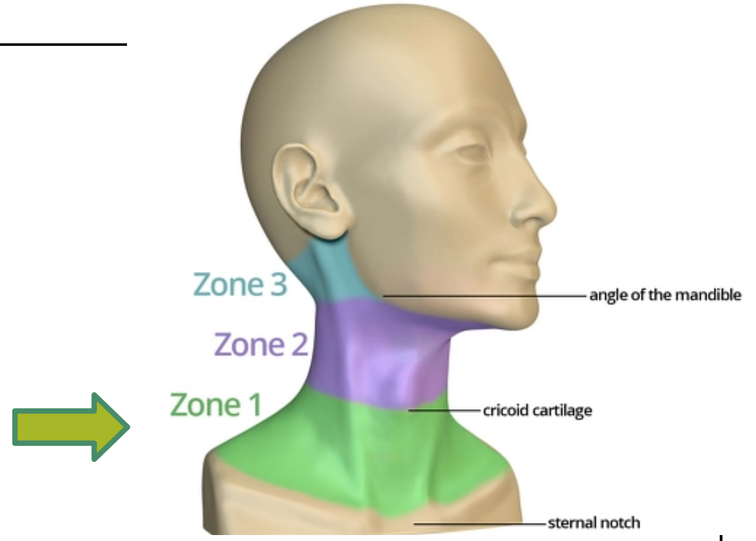
- Remember that the neck zones are numbered in the direction of carotid blood flow.



Anatomical zone	Features
Zone I	- From clavicles to cricoid cartilage - Defines area containing major vital structures - Is considered to be well protected
	Contains: intrathoracic major vessels subclavian veins and arteries, the proximal vertebral and carotid arteries oesophagus, proximal trachea, larynx brachial plexus, spinal cord superior mediastinum, pleura
Zone II	- From cricoid cartilage to the angle of the mandible - Defines area containing all vital structures - Is considered to be least protected, very superficial
	Contains: Carotid arteries, jugular veins, vertebral arteries Trachea, larynx, oesophagus Spinal cord

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

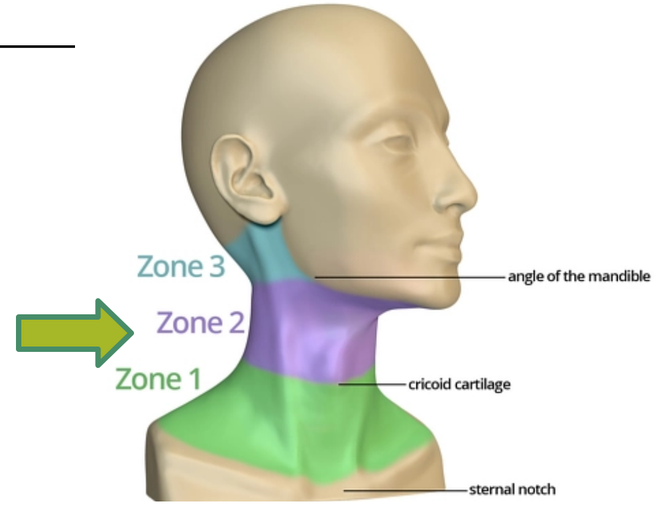
Digestive: esophagus

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

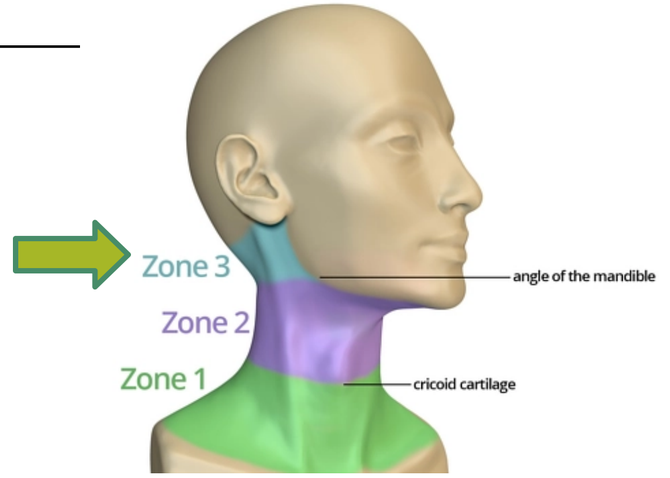
Nerves:vagus, recurrent laryngeal, phrenic nerve

Respiratory: Trachea, larynx

Digestive: esophagus

Anterior triangle-Zone III

Borders :Angle of mandible, Base of skull

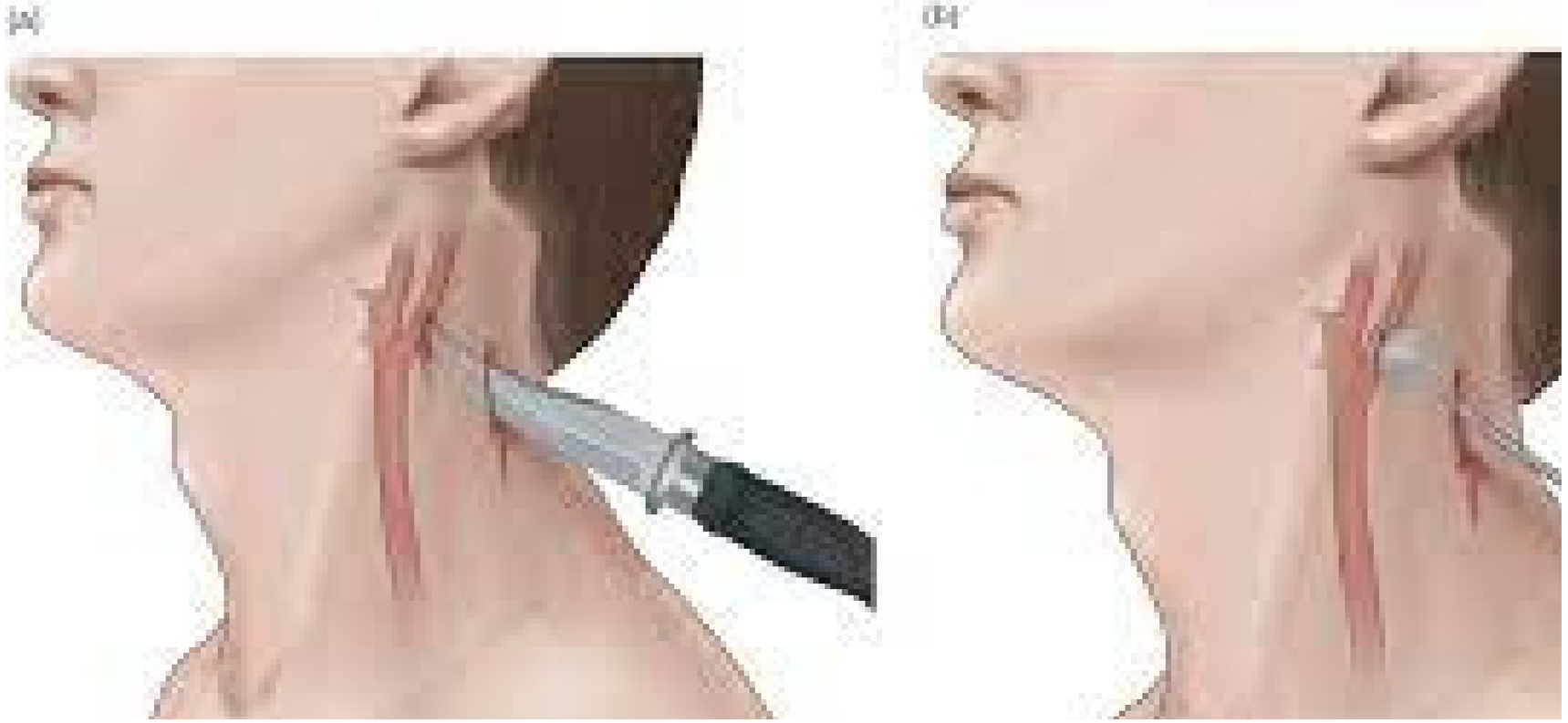


Blood vessels :
carotid vessels, internal jugular vein

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**

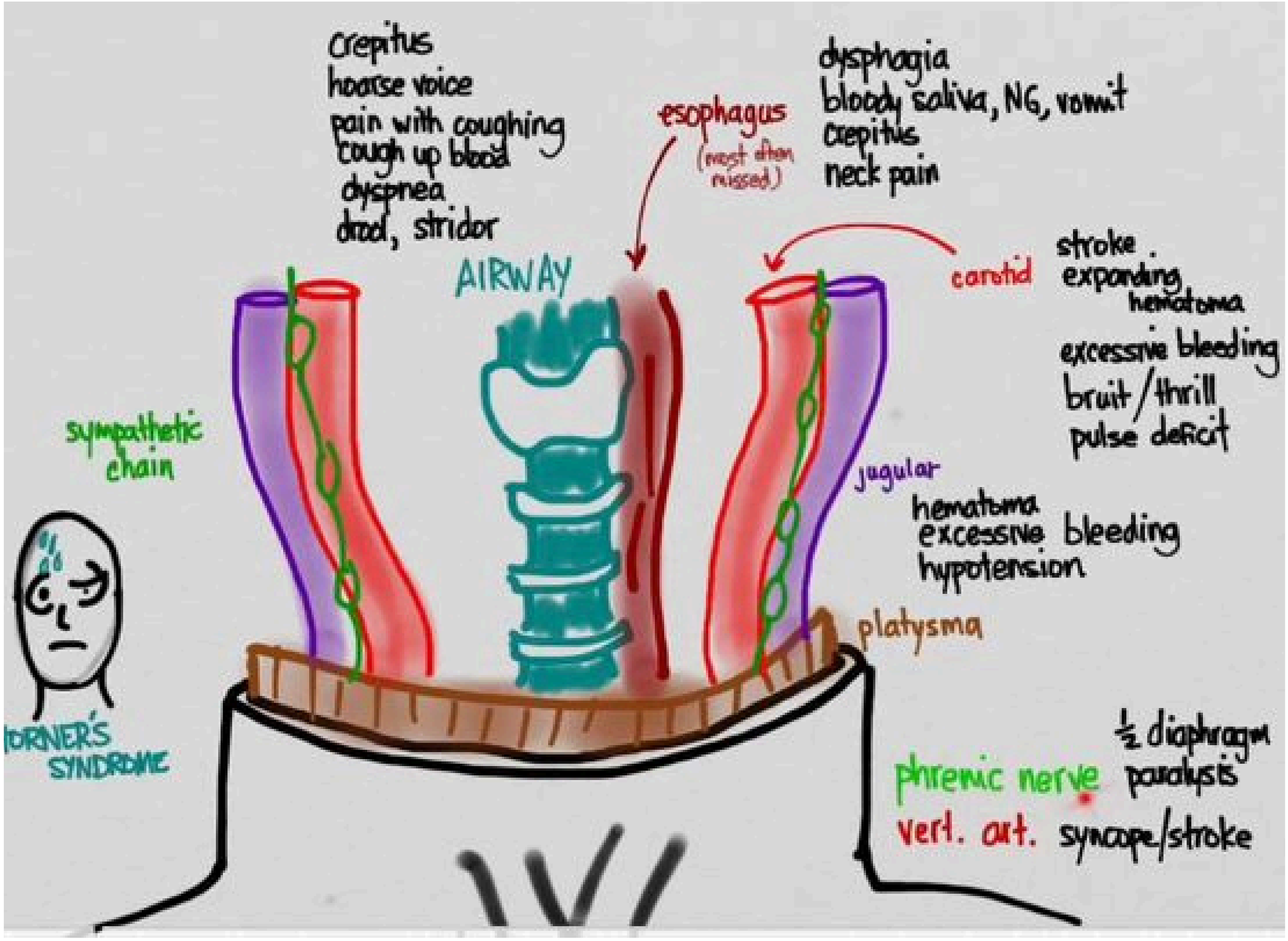
The anterior triangle is subdivided into zone I, zone II and zone III

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
drool, stridor
esophagus
(most often missed)
dysphagia
bloody saliva, NG, vomit
crepitus
neck pain
AIRWAY
carotid
stroke
expanding hematoma
excessive bleeding
bruit/thrill
pulse deficit
sympathetic chain
jugular
hematoma
excessive bleeding
hypotension
platysma
HORNER'S SYNDROME
½ diaphragm paralysis
phrenic nerve
vert. art.
syncope/stroke

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

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

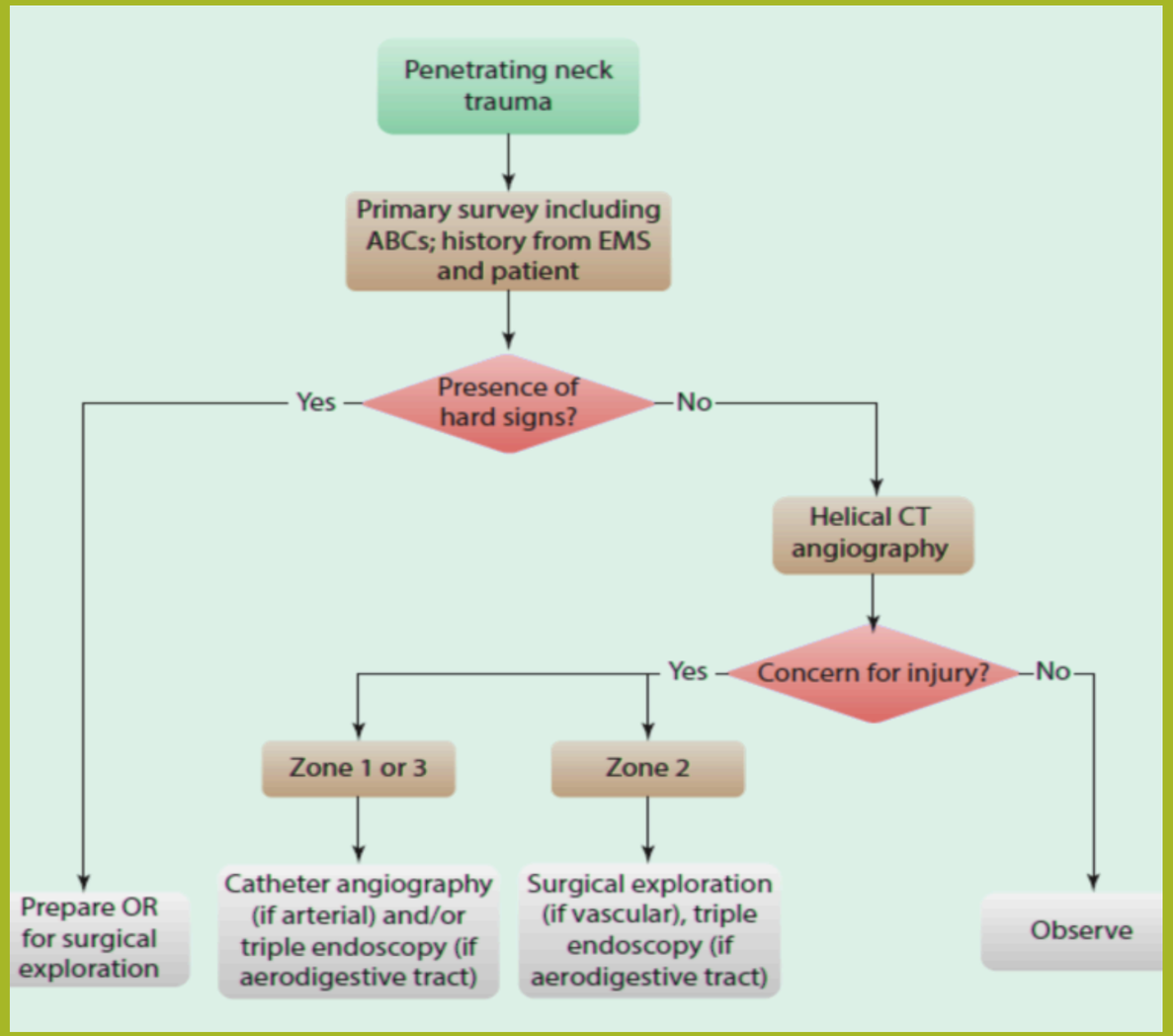
06

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

Definition: Non-penetrating injury to the neck caused by impact, compression, or deceleration forces.

easily under-diagnosed because their onset can be delayed

Mechanisms of Injury

Road traffic accidents (seatbelt, dashboard, steering wheel)

Sports injuries (hockey stick, clothesline injury)

Assault / strangulation

Falls or industrial accidents

Important Structures at Risk:

Airway: Larynx , Trachea

Vascular :carotid and vertebral arteries , jugular veins

Digestive: pharynx , Esophagus

Neurological: Cervical spine, cranial nerves

Soft tissues : Muscle ,fascia , glands

Clinical features:

Hoarseness, stridor, Hematoma, bruit, Dysphagia, odynophagia , Cranial nerve palsy, Ecchymosis, seatbelt mark

LARYNGEAL INJURIES BY ANATOMICAL LOCATION

Anatomical Level	Structures	Main Features	Major Risk	Management Priority
Supraglottic	• Epiglottis • Aryepiglottic folds • False vocal cords	Dysphagia, muffled voice	Edema, aspiration	Observe ± airway
Glottic	• True vocal cords • Anterior and posterior commissures	Hoarseness, stridor	Cord paralysis	Voice rest / repair
Subglottic	Cricoid, trachea	Stridor, emphysema	Stenosis	Tracheostomy + repair
Transglottic	Glottic + subglottic	Severe obstruction	Airway collapse	Surgical repair
Laryngotracheal separation	Cricoid–trachea junction	Aphonia, emphysema	Airway loss	Immediate tracheostomy

- **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 exposur	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**