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Neck Trauma

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Objectives

At the conclusion of this presentation the participant will be able to:

- Recognize the mechanism of injury and associated injury patterns across the spectrum of neck trauma.
- Assess for the soft and hard symptoms of neck trauma.
- Identify the diagnostic modalities used to evaluate patients with neck trauma.
- Discuss the medical and nursing interventions appropriate for the management of the patient with neck trauma.

Epidemiology

- Mechanism of Injury
- Penetrating neck injury makes up 0.55-5% of all traumatic injuries.
- Blunt trauma is even more uncommon.
- Mortality ranges from 3-6%.
- Delayed and missed diagnosis can be fatal.

Penetrating Mechanism of Injury

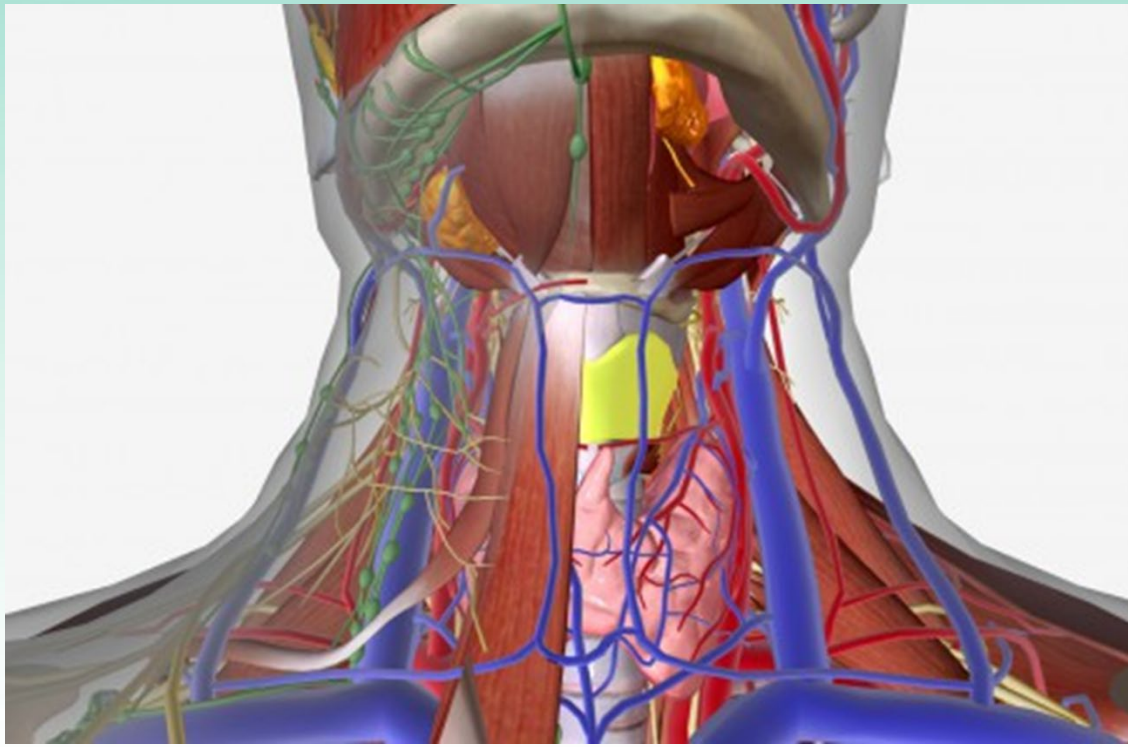
- Missile injury (bullet, knife, or other)
- Stabbing or lacerations
- Impalement
- Animal bites

Blunt Mechanism of Injury

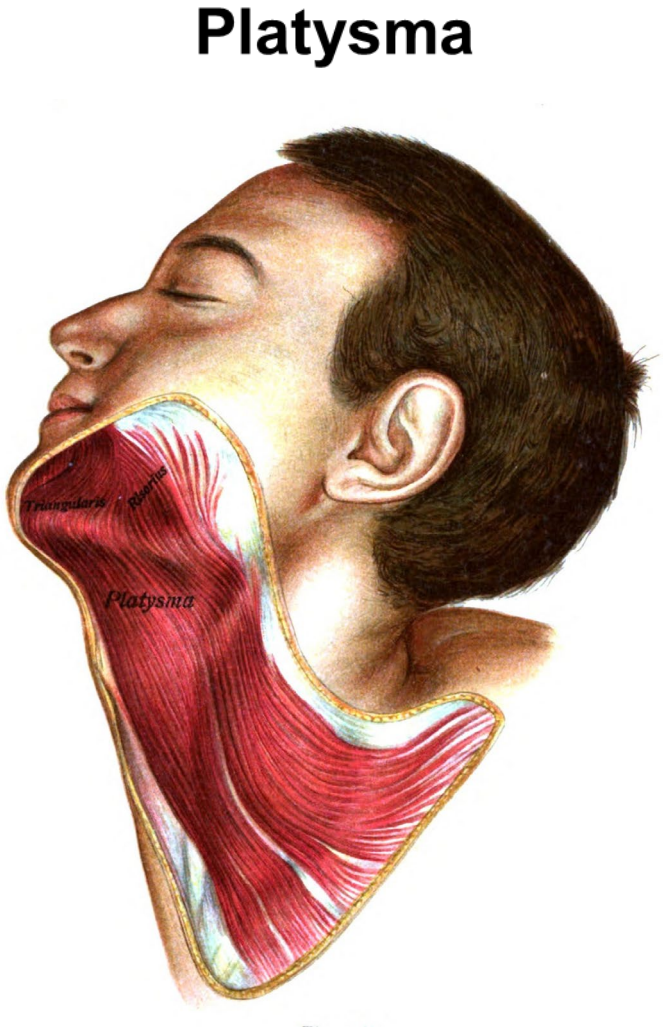
- Steering wheel
- Assault
- Strangulation/Hanging
- “Clothes line” injuries
- Other (sports, industrial)

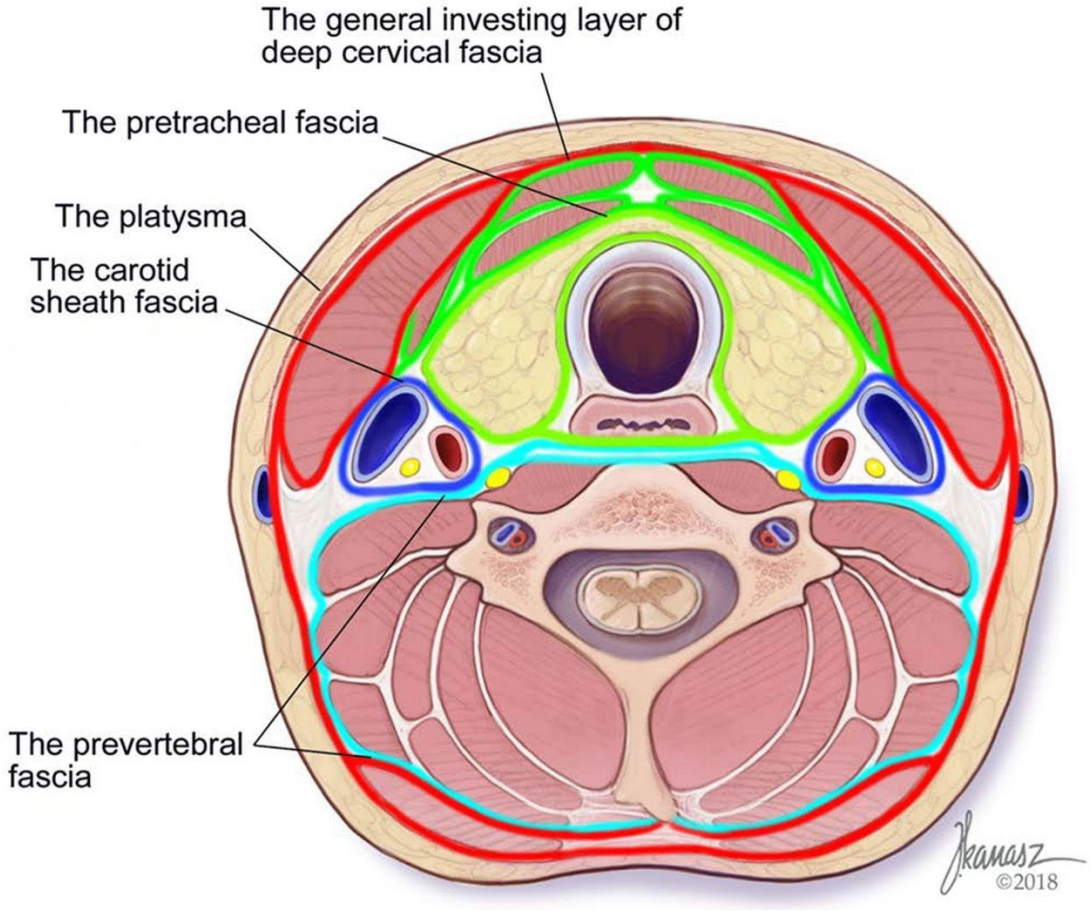
Epidemiology

- Commonly injured vessels
  - Internal jugular vein
  - Internal carotid artery
- Laryngeal and tracheal injury more common than pharyngeal and esophageal injuries



Platysma





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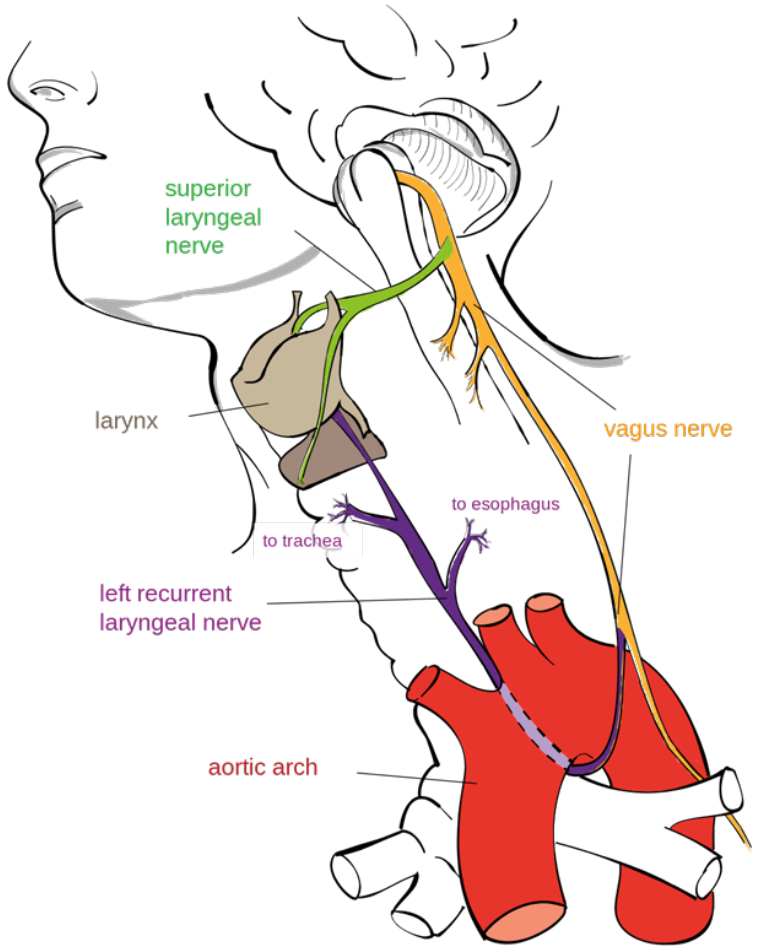
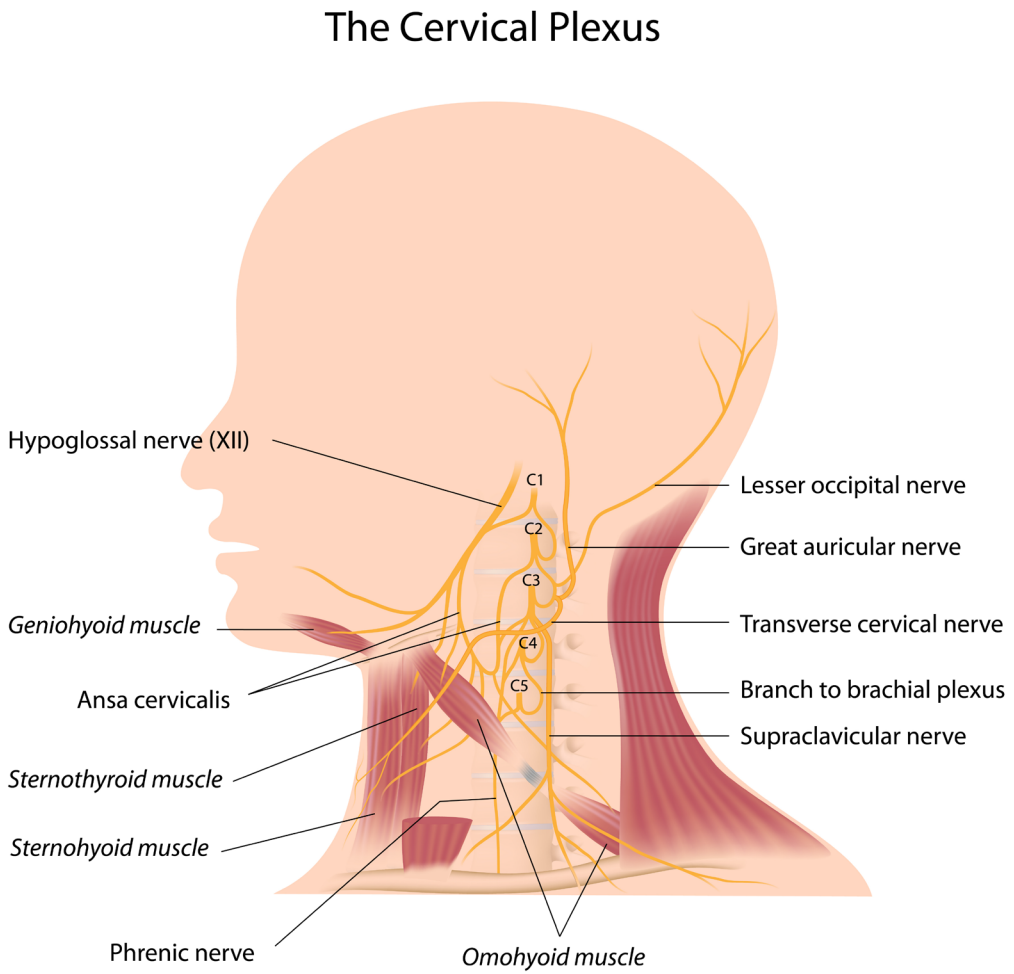
Nerves in the Neck





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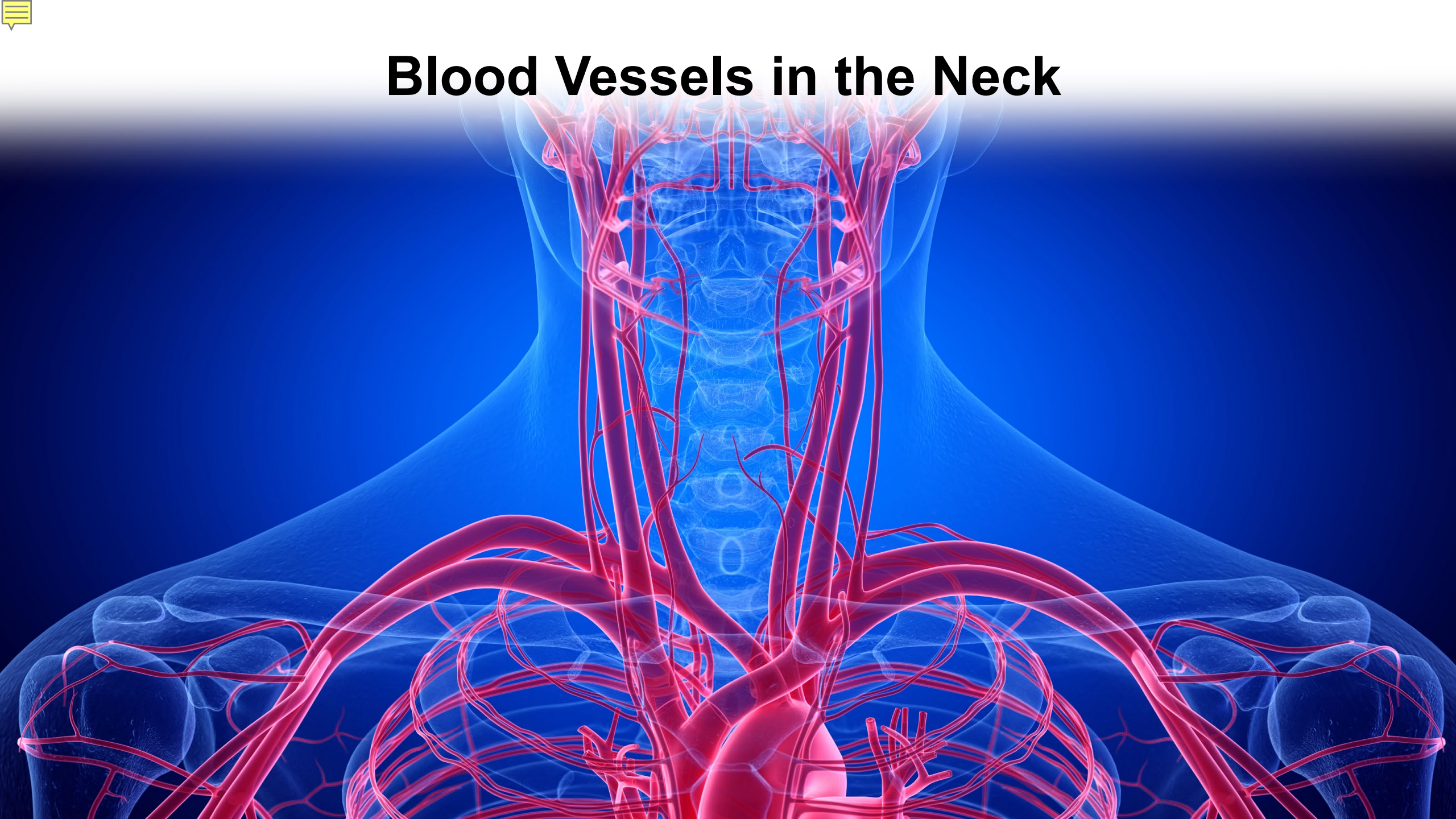
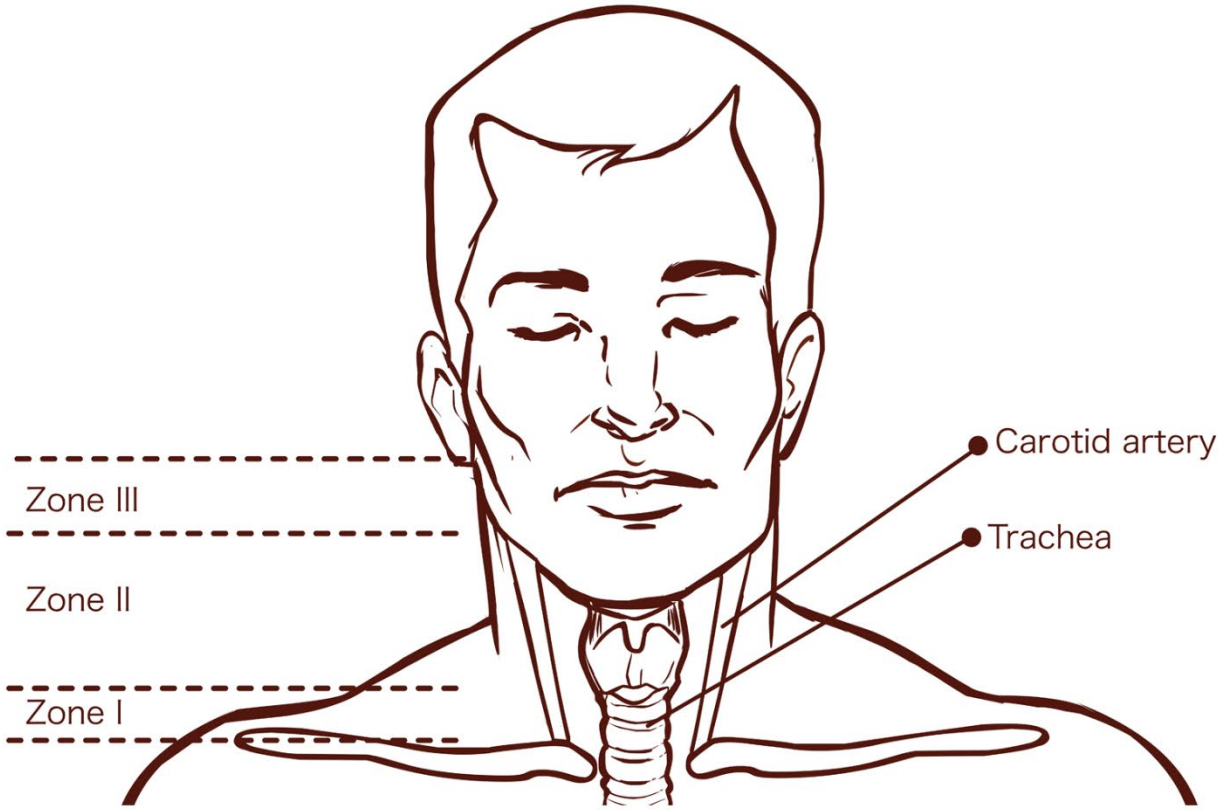
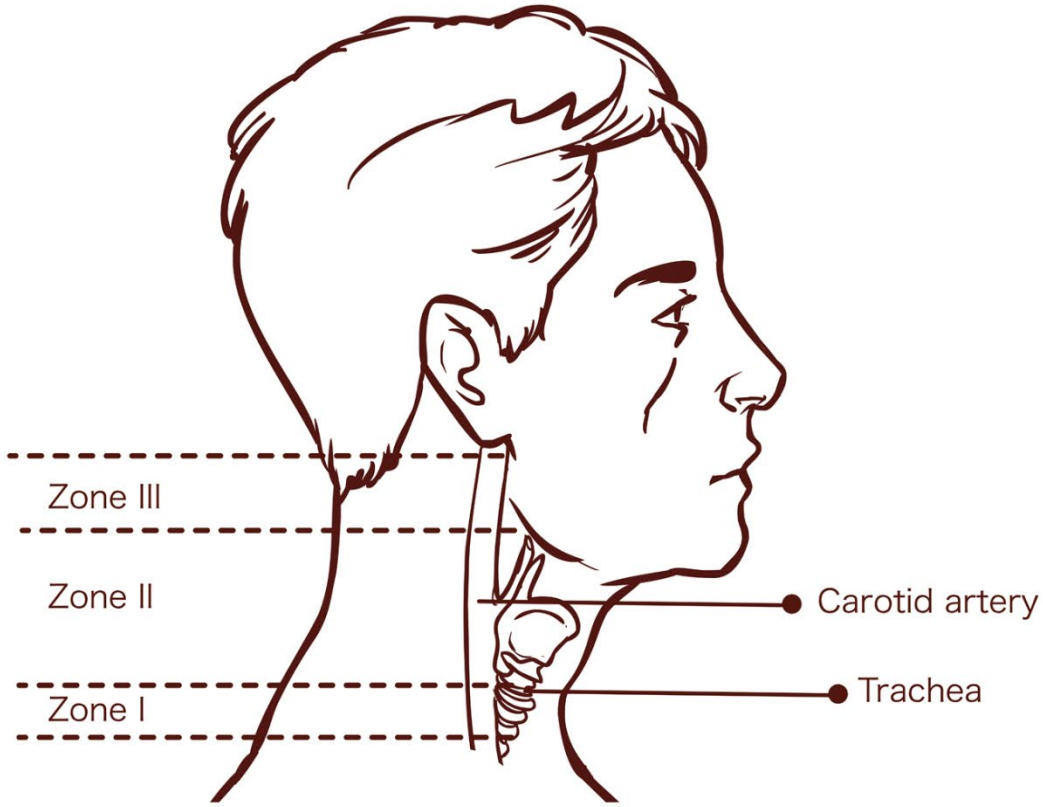
Blood Vessels in the Neck



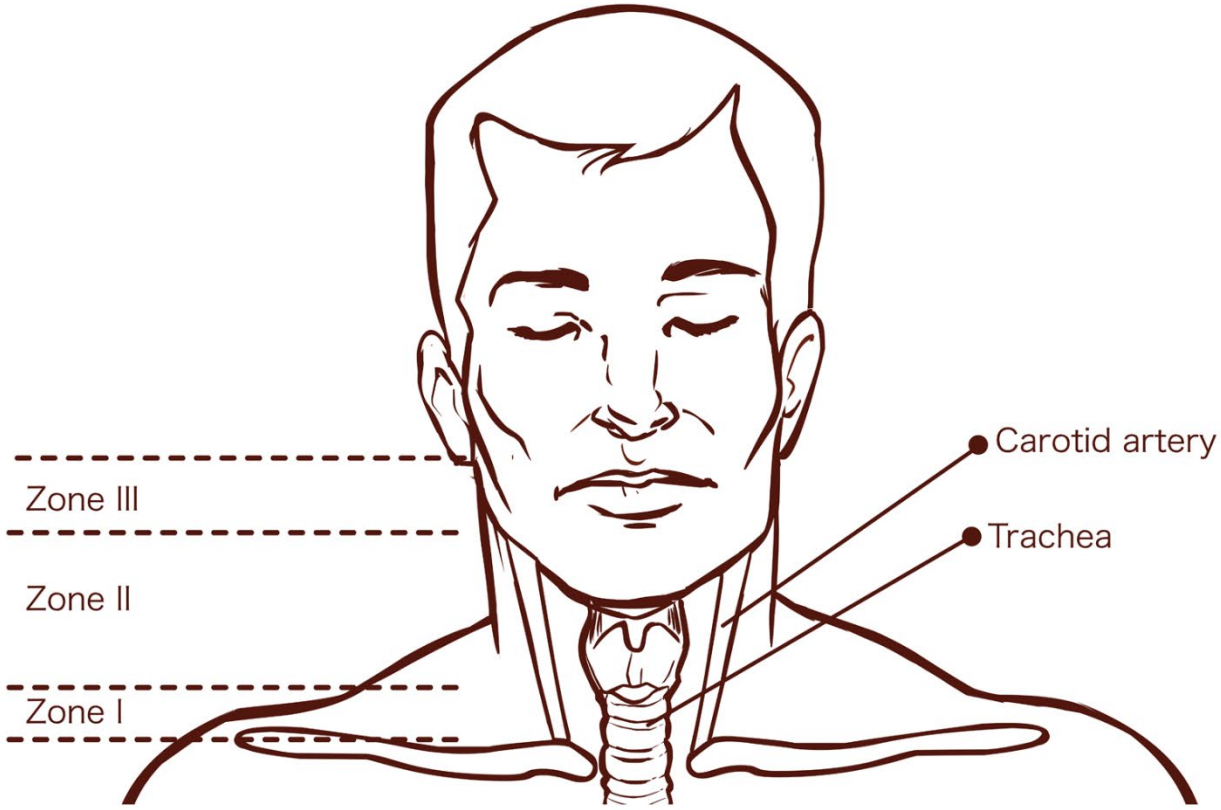
Zones of the Neck





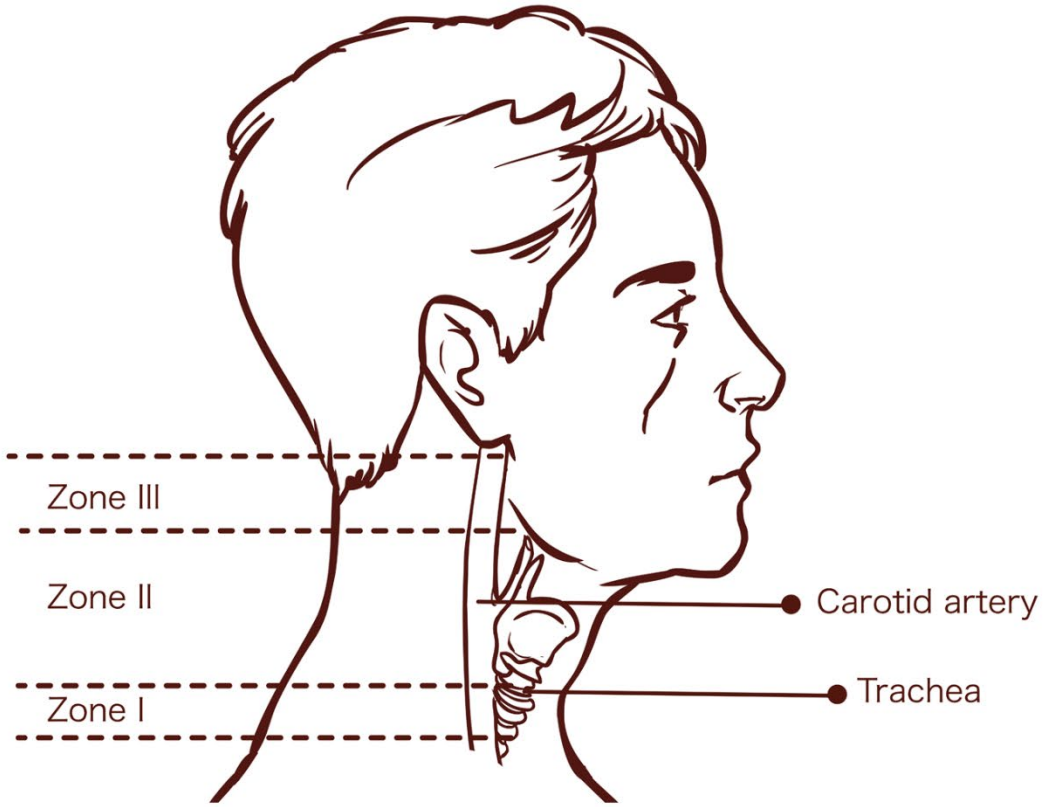
Zone 1

- Subclavian vessels
- Common carotid arteries
- Aortic arch
- Jugular veins
- Esophagus
- Lung apices
- C- spine/cord
- Cranial nerve roots
- Thoracic duct



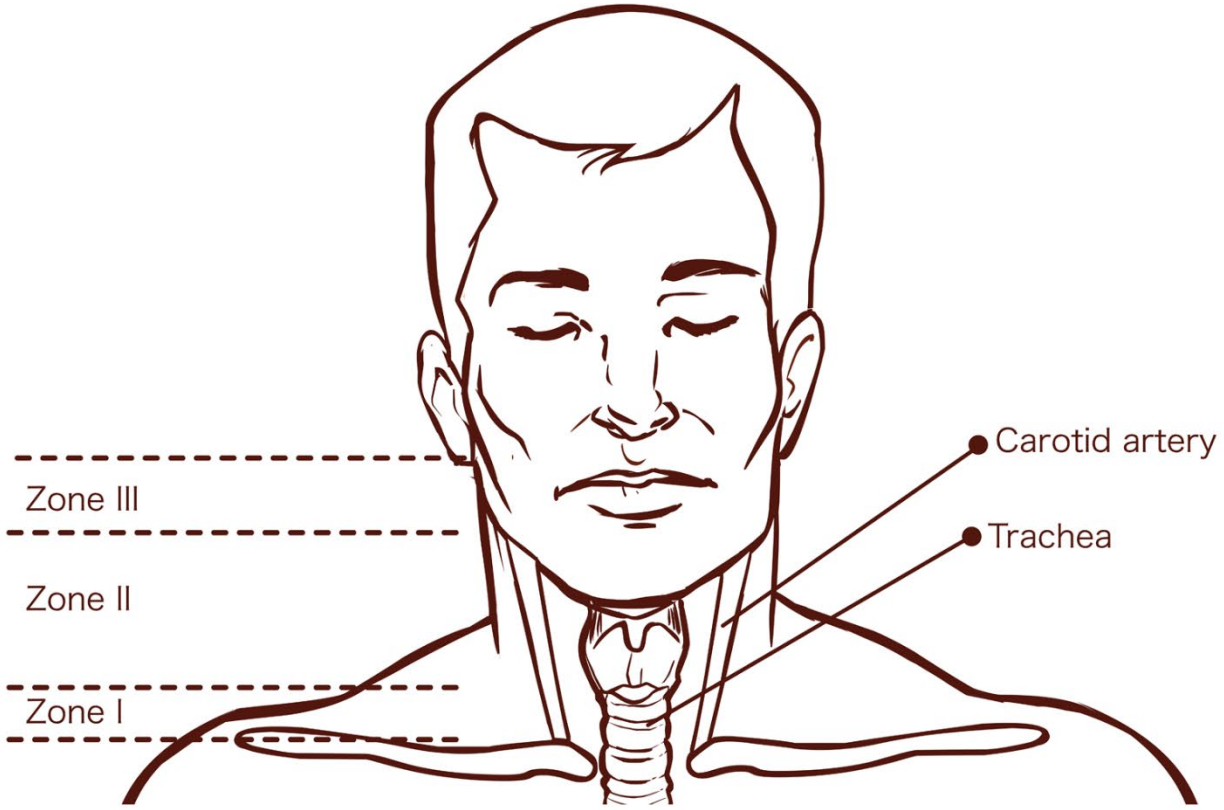
Zone 2

- Common carotid and vertebral arteries
- Jugular veins
- Pharynx
- Larynx
- Trachea
- Esophagus
- C-spine/cord
- Vagus/recurrent laryngeal nerves



Zone 3

- Salivary and parotid glands
- Esophagus
- Trachea
- Vertebral bodies
- Distal portion carotid arteries
- Jugular veins
- Cranial Nerves IX-XII



History and Physical

History and Physical

- Gun
- Knife
- Amount of blood loss
- Baseline mental status
- Baseline motor status
- Drug or alcohol ingestion
- Self-inflicted or inflicted by other

Evidence of Significant Injury

Soft Signs

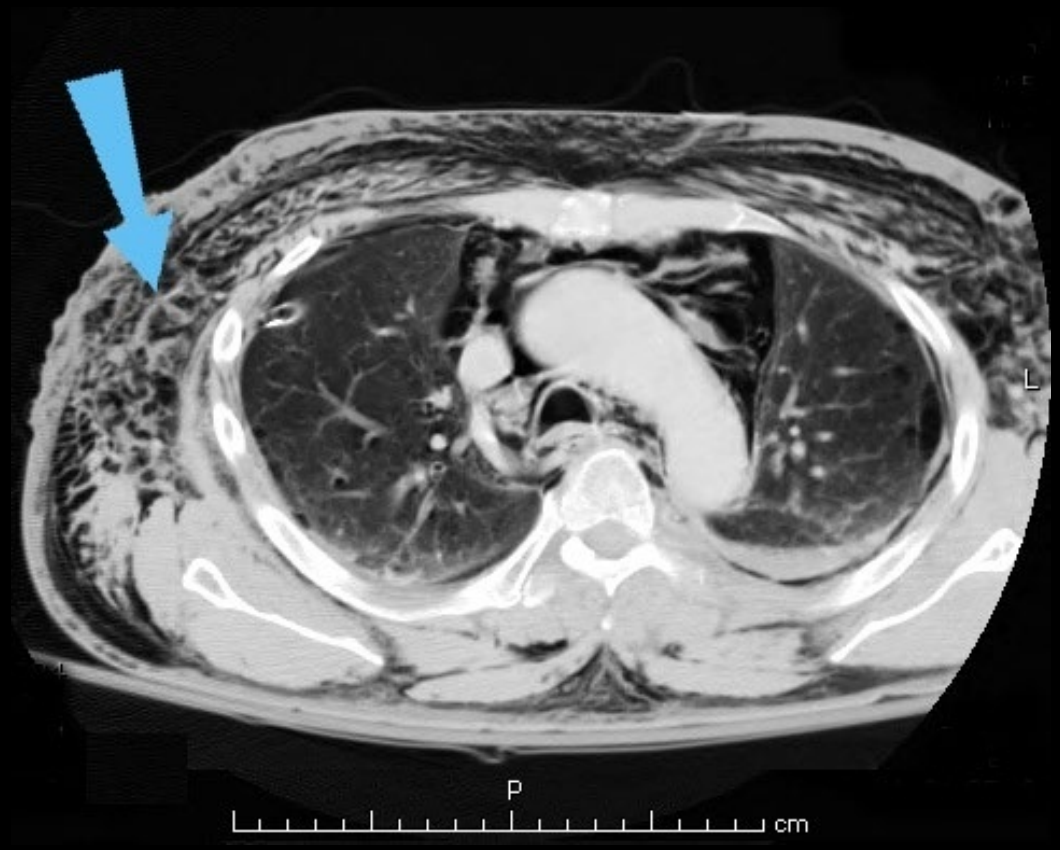
- Dysphagia
- Hoarseness
- Oro nasopharyngeal bleeding
- Neurologic deficit
- Hypotension

Hard Signs

- Subcutaneous emphysema
- Air bubbling through the wound
- Stridor or respiratory distress
- Hematoma (expanding)
- Active external hemorrhage
- Bruit/thrill Pulselessness/pulse deficit
- Distal ischemia

Primary Survey

- ABCs
- Ensure airway is patent
- Ensure patient is adequately oxygenating
- Control any obvious hemorrhaging

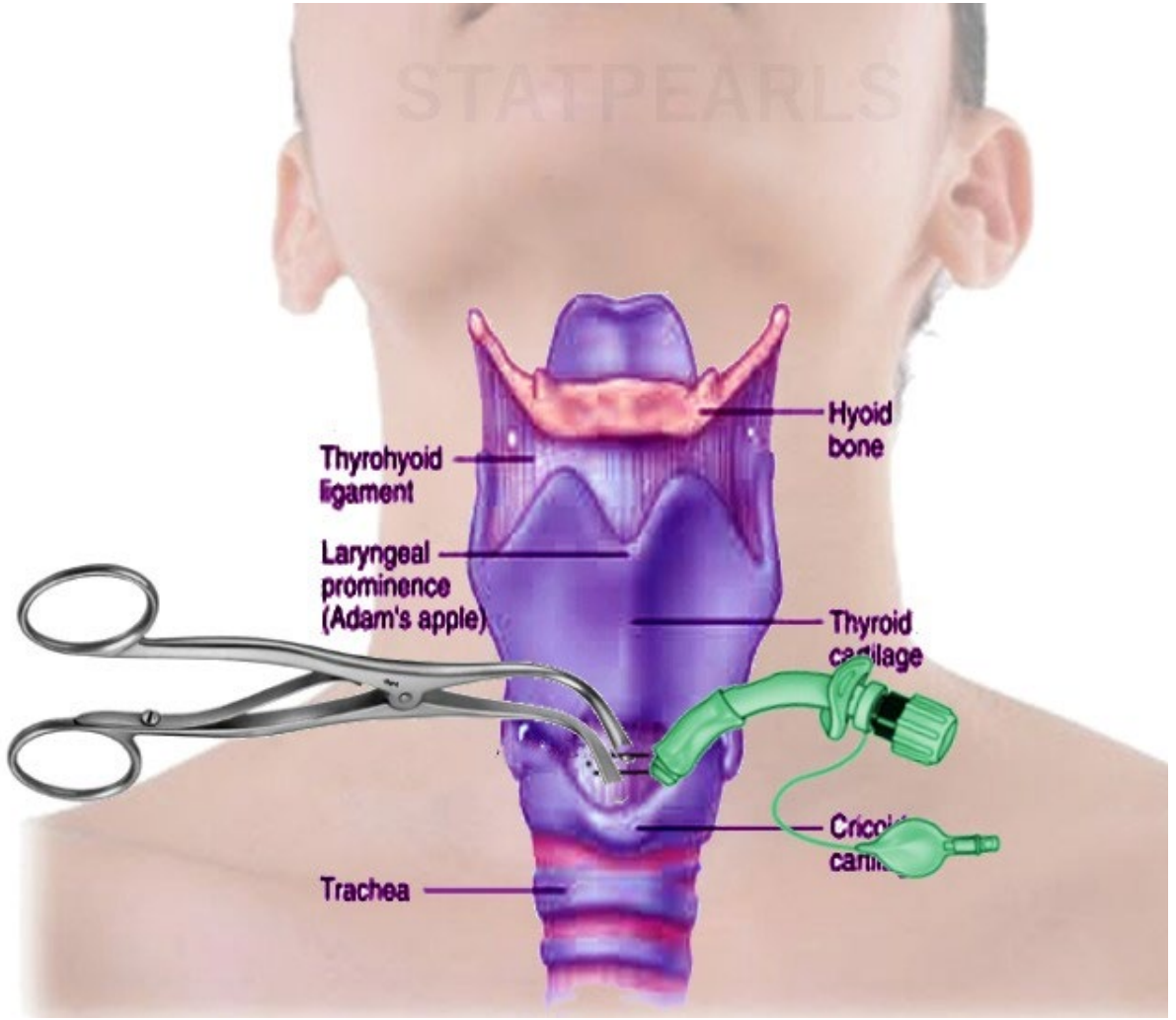


Airway Considerations

Who requires immediate intubation?

Airway Considerations

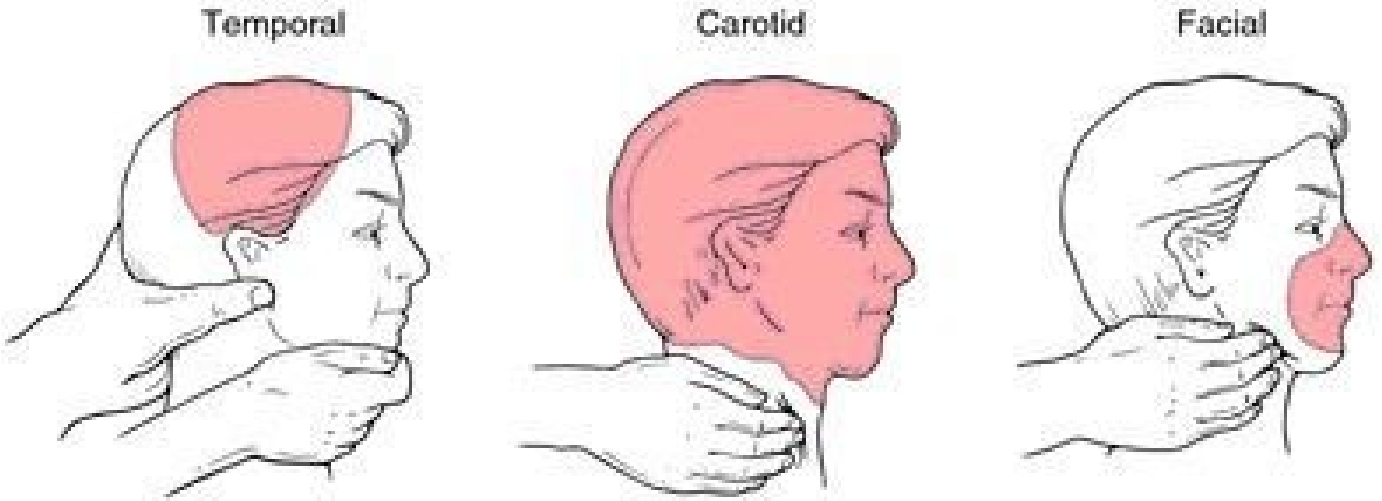
- “Wait and See”
- Avoid excessive bag-valve-mask
- Exercise caution with paralytics and sedation
- Surgical airway last resort
- Cricothyrotomy vs. tracheostomy



Cricothyrotomy. Image courtesy S Bhimji MD

Control Bleeding

- Local pressure only
- **No** tourniquets
- **No** pressure dressings
- **No** probing or blind clamp placement



Physical Exam

- Violation of platysma
- Contusions, lacerations, abrasions
- Expanding hematomas, bleeding
- Hoarseness, stridor
- Subcutaneous emphysema
- Hemoptysis, drooling
- Dyspnea
- Distortion
- Mandibular/midface instability

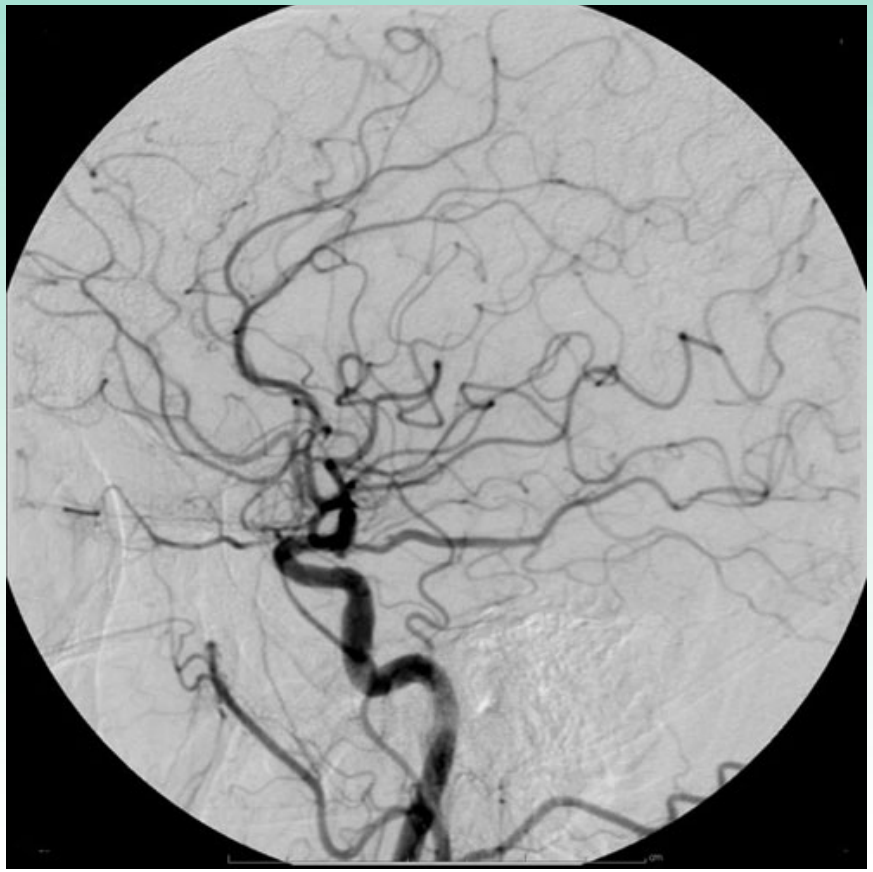
CTA

- Chest radiograph
- CT and CT angiogram
- High resolution CT is the initial diagnostic study of choice when available.
- Should only be used in stable patients

https://openneuroimagingjournal.com/contents/volumes/V5/TONIJ-5-225/TONIJ-5-225.pdf

DSA

- Invasive
- Complications
- Expensive
- Therapeutic interventions



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Diagnostic Studies

- Laryngoscopy
- Bronchoscopy
- Esophagoscopy
- Color flow doppler, duplex ultrasonography
- MRA

Specific Injuries

- Vascular
- Aerodigestive
- Cranial nerves
- Thoracic duct

Vascular Injuries

Physical Exam

- External marks
- Decreased LOC
- Hemiparesis
- Hematoma
- Hypotension
- Dyspnea
- Thrill, bruit, pulse not present

Injuries That Increase Suspicion for BCVI

- Le Fort II or III fractures
- Basilar skull fracture involving the carotid canal
- Mandible fracture
- Diffuse Axonal Injury with GCS < 6
- Cervical vertebral body fracture
- Near hanging with anoxic brain injury
- Seatbelt abrasion of anterior neck with significant swelling/altered mental status
- Thoracic injury - rib fracture and thoracic injury

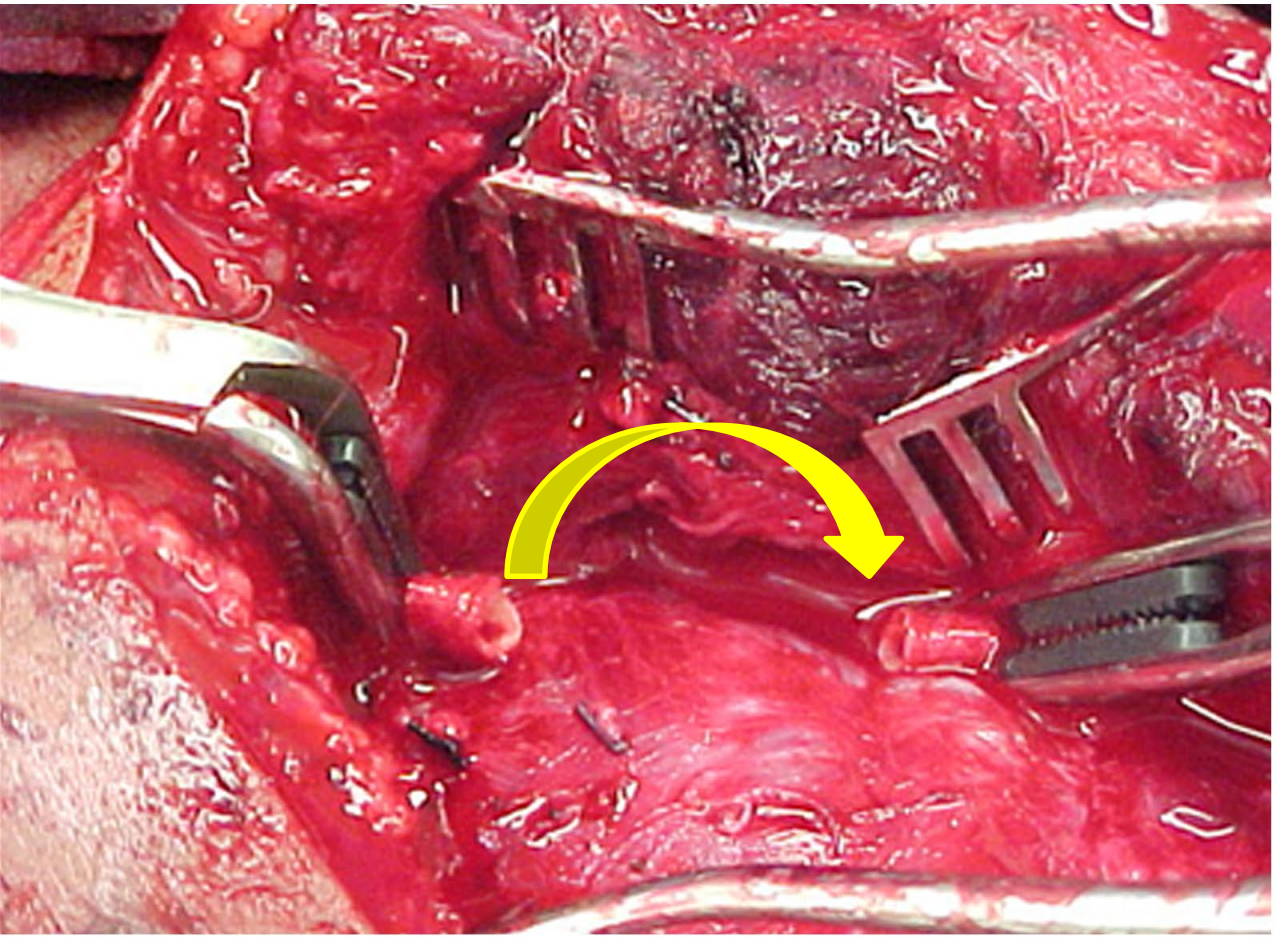
Primary Diagnostics

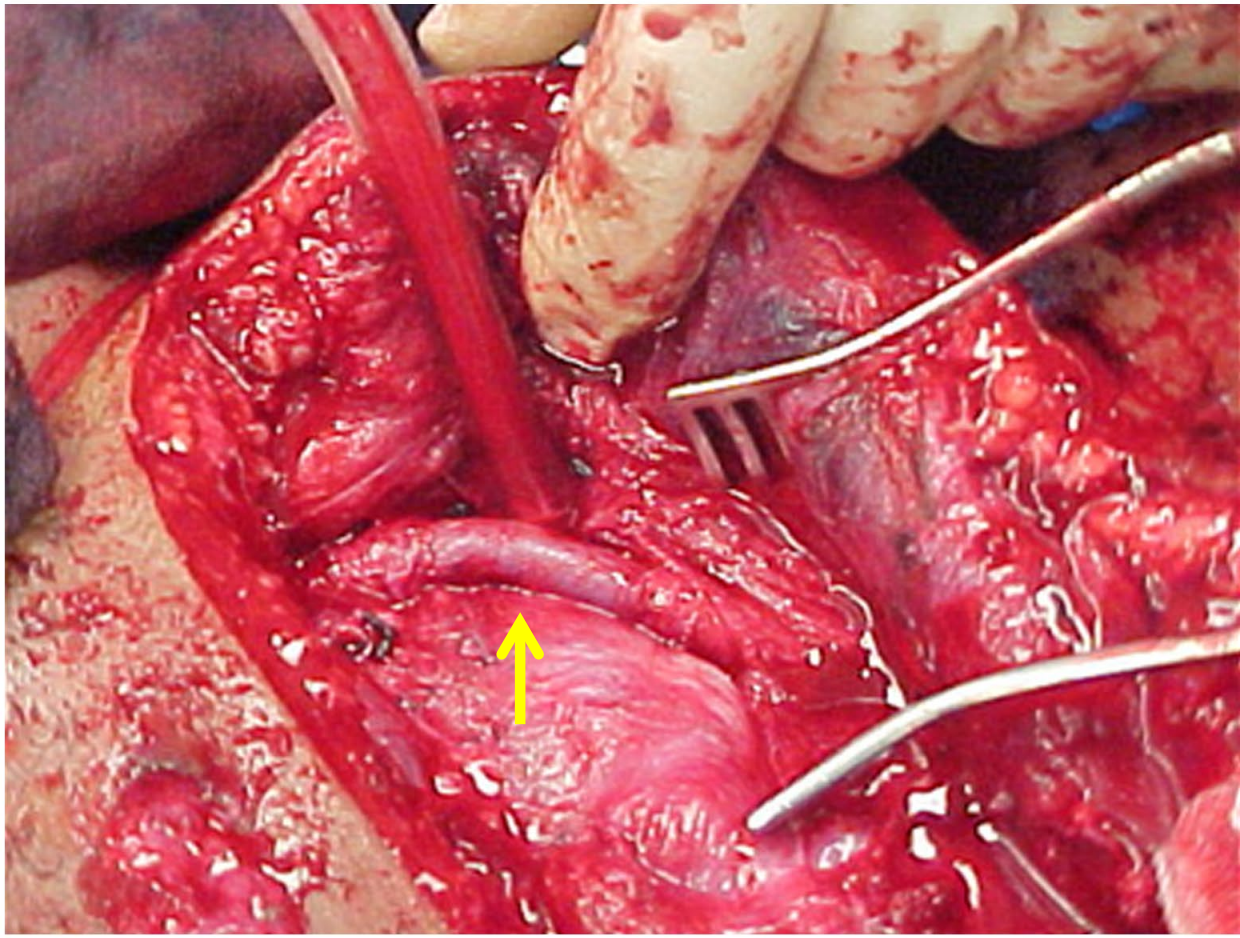
- CT angiogram of the neck
- Chest x-ray indicated in Zone I injuries because of their proximity to the chest
- Consider complete blood count, basic metabolic panel, toxicology and blood alcohol content

Vascular Injury Management: Penetrating

- Common carotid: repair preferred over ligation in almost all cases
- Internal carotid: Shunting is usually necessary
- Vertebral: Angiographic embolization or proximal ligation can be used if the contralateral vertebral artery is intact.
- Internal Jugular: Repair vs. ligation

Carotid Artery Interposition Repair



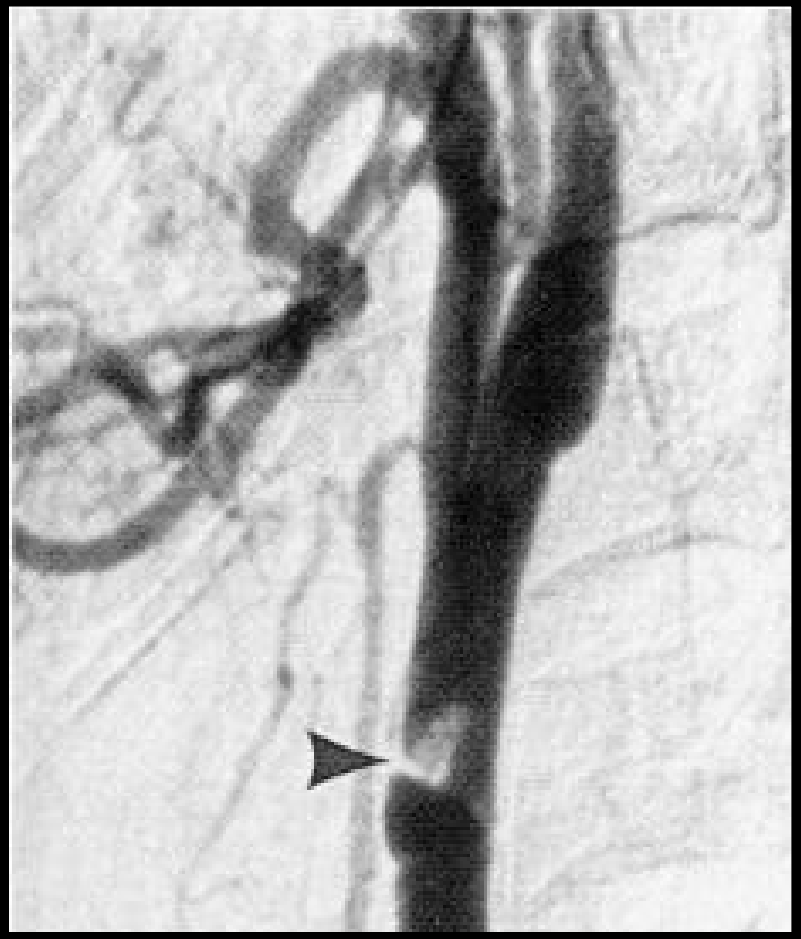


Blunt Cerebral Vascular Injuries (BCVI)

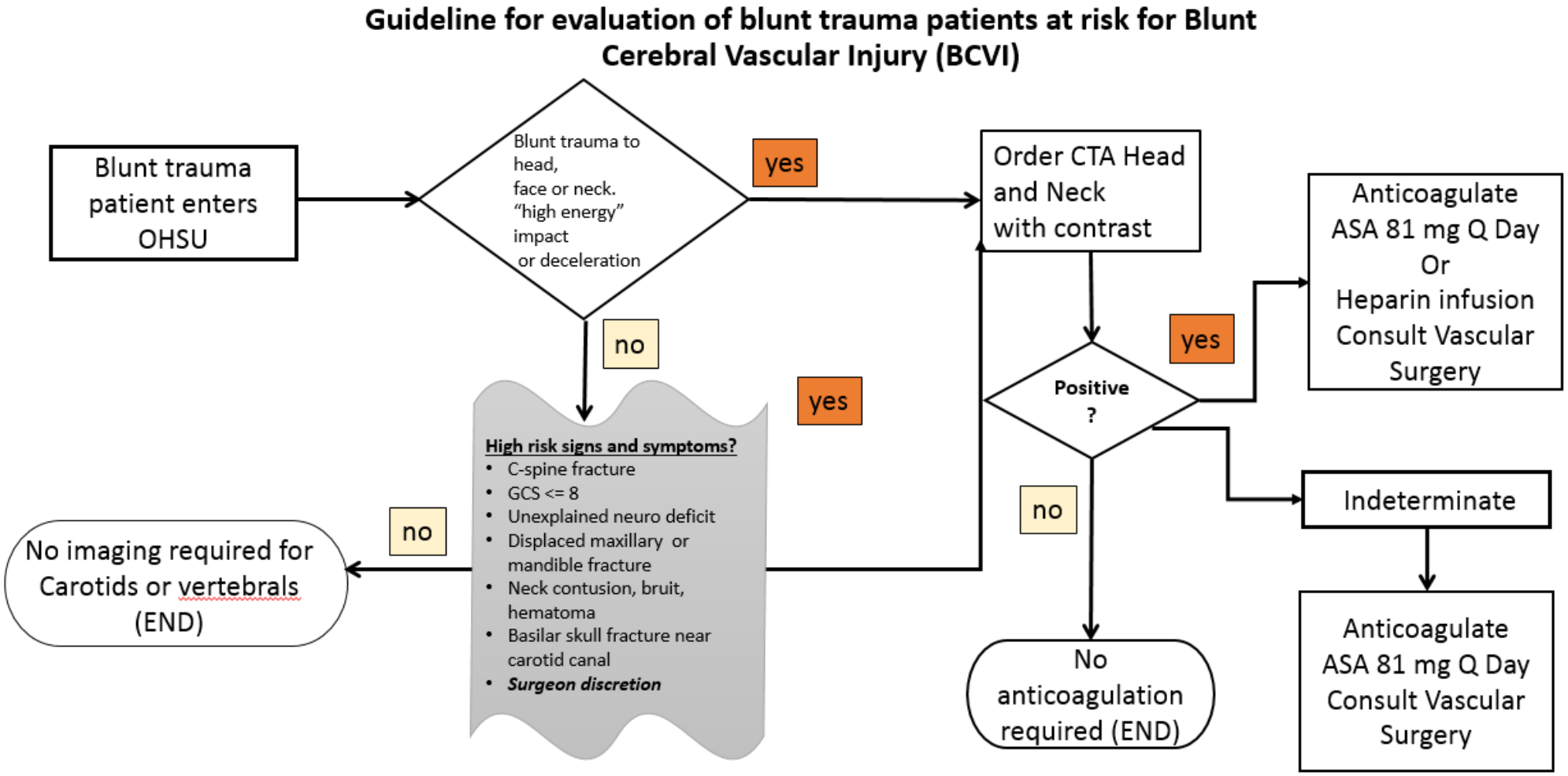
Management dependent on the grade of injury: Grade I - V

- Grade I: Irregular appearance of vessel wall or dissection/intramural hematoma with less than 25% luminal narrowing
- Grade II: Intimal flap or intramural hematoma with > 25% narrowing
- Grade III: Pseudoaneurysm
- Grade IV: Occlusion
- Grade V: Transection or hemodynamically significant injuries

Carotid Intimal Flap: Example of Grade II Injury



Example BCVI Management Protocol



Protocol from Oregon Health Sciences University Hospital- used with permission

Management Summary

Vascular Injury

- Surgical exploration unstable and stable Zone II
- CTA for Zone I and III
- Selective, nonoperative management stable Zone II
- Embolization high carotid or vertebral artery
- Endovascular stent (pseudoaneurysms)
- Anticoagulation blunt carotid/vertebral artery

Aerodigestive Injuries

- **Esophagus**
  - < 1% of all traumatic injuries
  - < 0.1% are secondary to blunt trauma
  - > 80%
    - Secondary to penetrating neck trauma
    - However, 05 – 7% of penetrating neck injuries are associated with esophageal involvement
- **Trachea**
  - 3 – 8% injure cervical trachea
  - Only 4% of all injuries related to the cervical trachea are from blunt trauma
- **Both**
  - May be as much as 28%

https://slideplayer.com/slide/10634399

Tracheal and Laryngeal Injuries

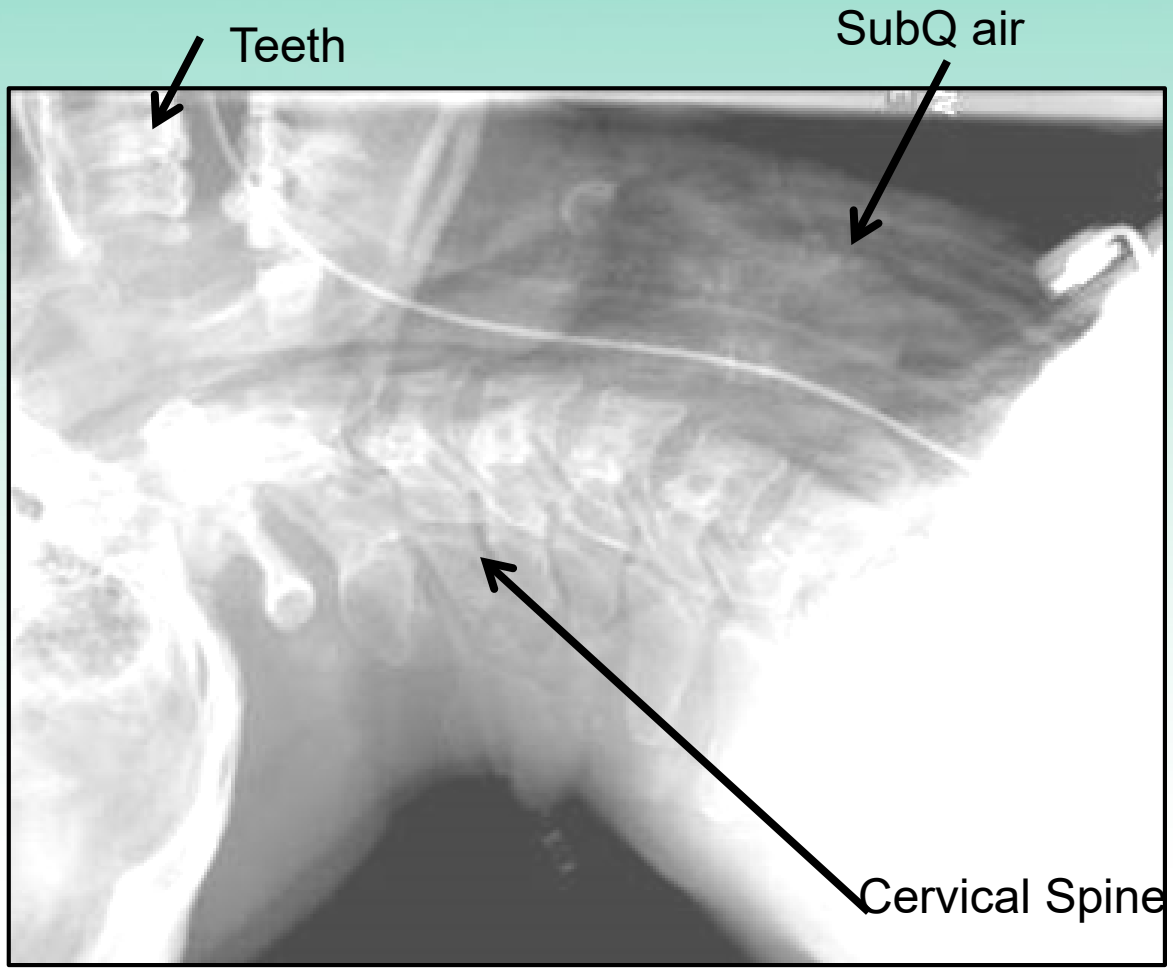
Signs of injury

- Hoarseness and dysphonia
- Hemoptysis
- Subcutaneous emphysema in the neck and trunk
- Tenderness over the trachea

Primary Diagnostics

Laryngotracheal Injury

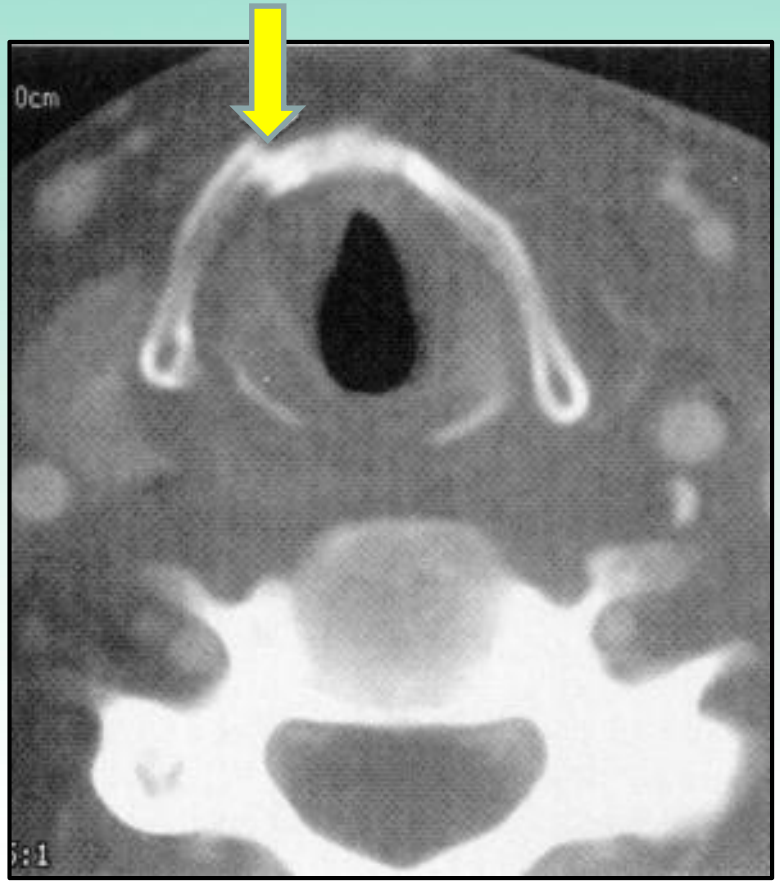
- Plain x-rays
  - Soft tissue emphysema
  - Airway compression
  - Fracture of laryngeal cartilages
- CT scan
  - 3D reconstruction
- Endoscopy
  - Flexible vs. rigid
  - Bronchoscopy/laryngoscopy



Management

Laryngotracheal Injury

- Secure the airway
- Early repair
- Laryngeal fractures
  - Thyroid cartilage fracture most common
  - Delay of reduction makes it more difficult and return of normal function unlikely



Esophageal Injury

Penetrating

- Sharp weapon (knife)
- High speed projectile (bullet)
- Iatrogenic laceration
- Lumen outward injury (ingestion of sharp object)

Esophageal Injury

Blunt

- Barotrauma
- Blast injuries
- Crush injuries
- Blow to the neck

Esophageal Injury

Signs of Injury

- Hematemesis
- Odynophagia
- Dysphagia
- Drooling, hypersalivation
- Tracheal deviation
- Sucking neck wound
- Subcutaneous emphysema
- Pain with turning neck

Esophageal Injury Diagnostics

Radiographic Findings

- Plain films
  - Air in soft tissue planes
  - Pneumomediastinum
  - Leakage of fluid into right pleural space
- Esophagoscopy
- CTA

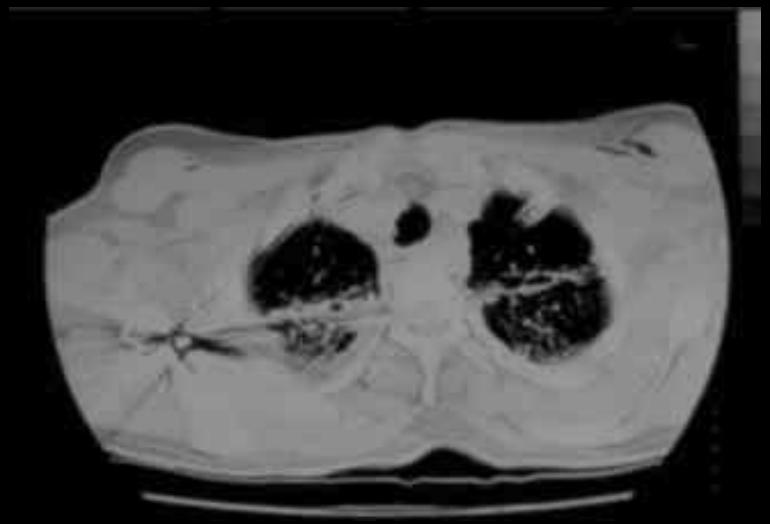
Laboratory Findings

- Markers of inflammatory response
  - Leukocytosis with left shift
  - Low oxygen saturations
  - Acidosis on ABG

Esophageal Injury Diagnostics

CTA

- Expedites diagnosis
- Trajectory of missile
- Associated injuries



Esophageal Injury

Management Summary

- Initial assessment complex
- Goal is to minimize the bacterial contamination and enzyme erosion
- Gastric decompression
- Antibiotic coverage
- Drainage of wound
- Surgical repair

Practice Guidelines

- Few published practice guidelines for the management of neck injuries
- Eastern Association for the Surgery of Trauma (EAST)
  - Neck trauma, penetrating Zone II, 2008
  - Blunt cerebrovascular injury, 2020

EAST Guidelines BCVI

- Recommend using a screening protocol to detect BCVI in adult polytrauma patients
- Perform screening CTA to detect BCVI in patients with high-risk cervical spine injuries
- Conditionally recommend performing CTA to detect BCVI in low-risk cervical spine injuries
- Recommend using ATT to prevent both stroke and mortality in adult patients with BCVI
- Recommend against the use of routine endovascular stenting in adult patients with Grade II or III BCVIs

EAST Guidelines
Zone II Penetrating Injuries

- Selective management of penetrating Zone II injuries is recommended to minimize unnecessary operations.
- High resolution CT angiography is the initial diagnostic study of choice when available.
- Either contrast esophagography or esophagoscopy can be used to rule out an esophageal perforation that requires operative repair.

Do All Patients Have to Lay Flat?

- Position patient in manner that is most comfortable.
- Patients with anterior neck trauma may want to lean forward or sit upright.
- Patients with copious secretions can be rolled on their side.

What About Cervical Spine Immobilization?

- Immobilization in penetrating injury only necessary when neurologic deficit is present or physical exam cannot be performed **and** mechanism suspicious for spinal cord injury.
- Unnecessary immobilization may actually obscure recognition of other injuries or visualization of the airway.

Potential Complications

- Loss of airway
- Swallowing problems with aspiration
- Stroke in unrecognized BCVI
- Soft tissue necrotizing infections, including mediastinitis due to delayed diagnosis of esophageal injuries
- Air embolism
- Pneumothorax, tension pneumothorax

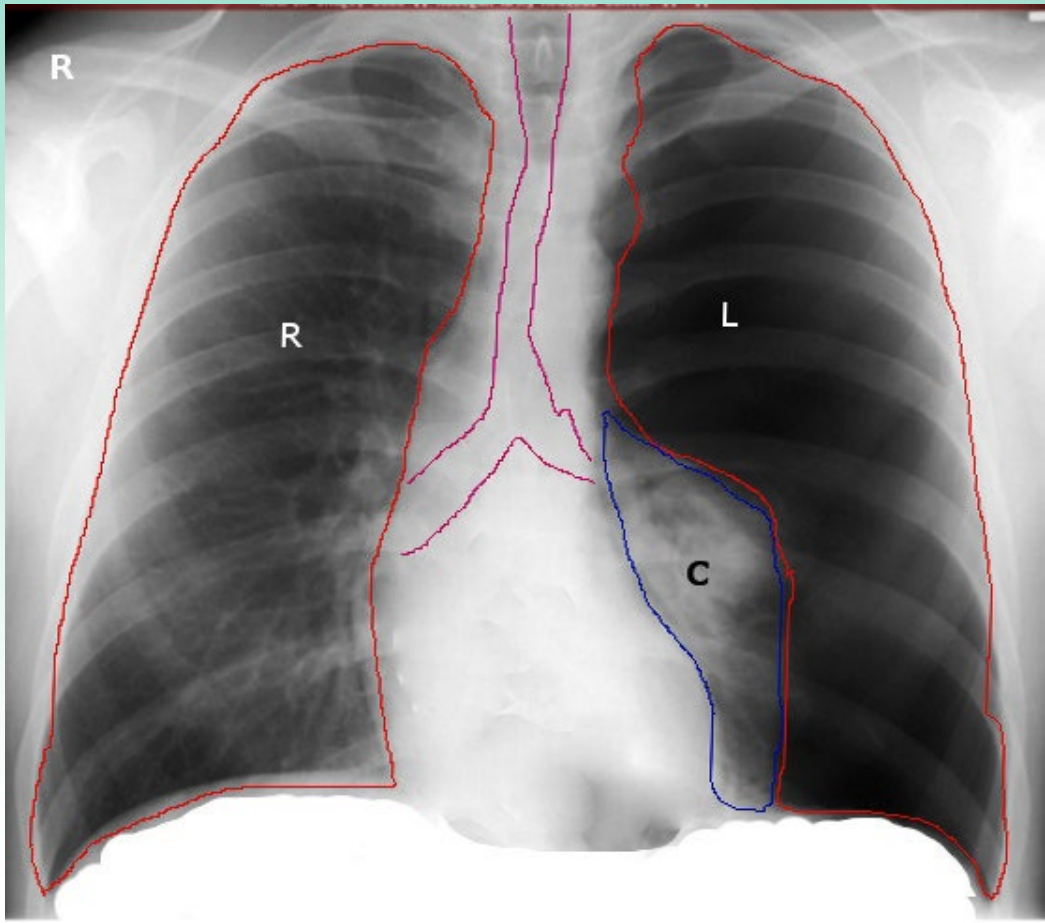


Image courtesy S.Bhimji MD. Jalota, 2021

Be Alert For:

- Mental status changes and motor deficits
- Changes in airway patency
- Onset of stridor, drooling
- Expanding hematomas
- Difficulty laying supine
- Other injuries that are highly associated with cerebral vascular injuries

Be Ready For:

- Rapid transport to CTA or operating room
- RSI and emergency intubation
- Emergency tracheostomy/ cricothyrotomy

Nursing Assessment

- Frequent neurologic and motor checks
- Frequent assessment for expanding hematomas in the neck
- Careful history documentation
- Reassurance
- Adequate pain assessment
- Anxiety reduction

Summary

- Penetrating and blunt neck trauma occurs in 5-10% of patients with serious injuries.
- Maintenance of an adequate airway
- High level of suspicion for initially benign appearing injuries
- Unrecognized vascular or aerodigestive injuries have a high mortality.