

Laryngeal Trauma

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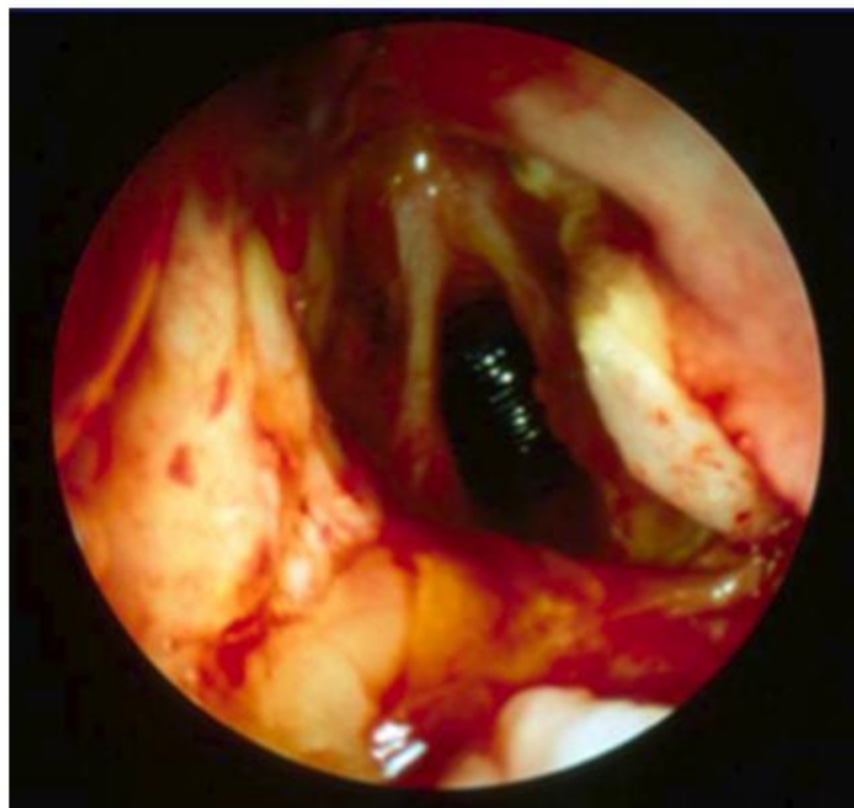
Evaluation: External Examination

- Abnormal voice quality
- Stridor
- Ecchymosis, haematoma, contusion, abrasion
- Distortion of laryngeal landmarks (laryngeal prominence)
- Tenderness
- Subcutaneous emphysema



Evaluation: Flexible Laryngoscopy

- Assess
 - Airway
 - Oedema
 - Haemorrhage
 - Haematoma
 - Mucosal lacerations
 - Exposed cartilage
 - VF mobility
- Determines next step



Initial Management

- **Secure the airway**
- *Beware cervical spine injury*

- Complete secondary survey
- Determine order & timing of definitive treatment of injuries

How should the airway be secured?

■ Orotracheal intubation

- Pros
 - Quick
 - Familiar
- Cons
 - Failure to intubate/loss of airway
 - False passage creation
 - Further laryngeal injury
- Indications
 - Endolaryngeal mucosa intact
 - Minimally displaced fractures
 - Skilled personnel

■ Cricothyroidotomy

- Pros
 - Quick
- Cons
 - Not helpful cricoid injury
 - Further laryngeal injury

■ Tracheostomy

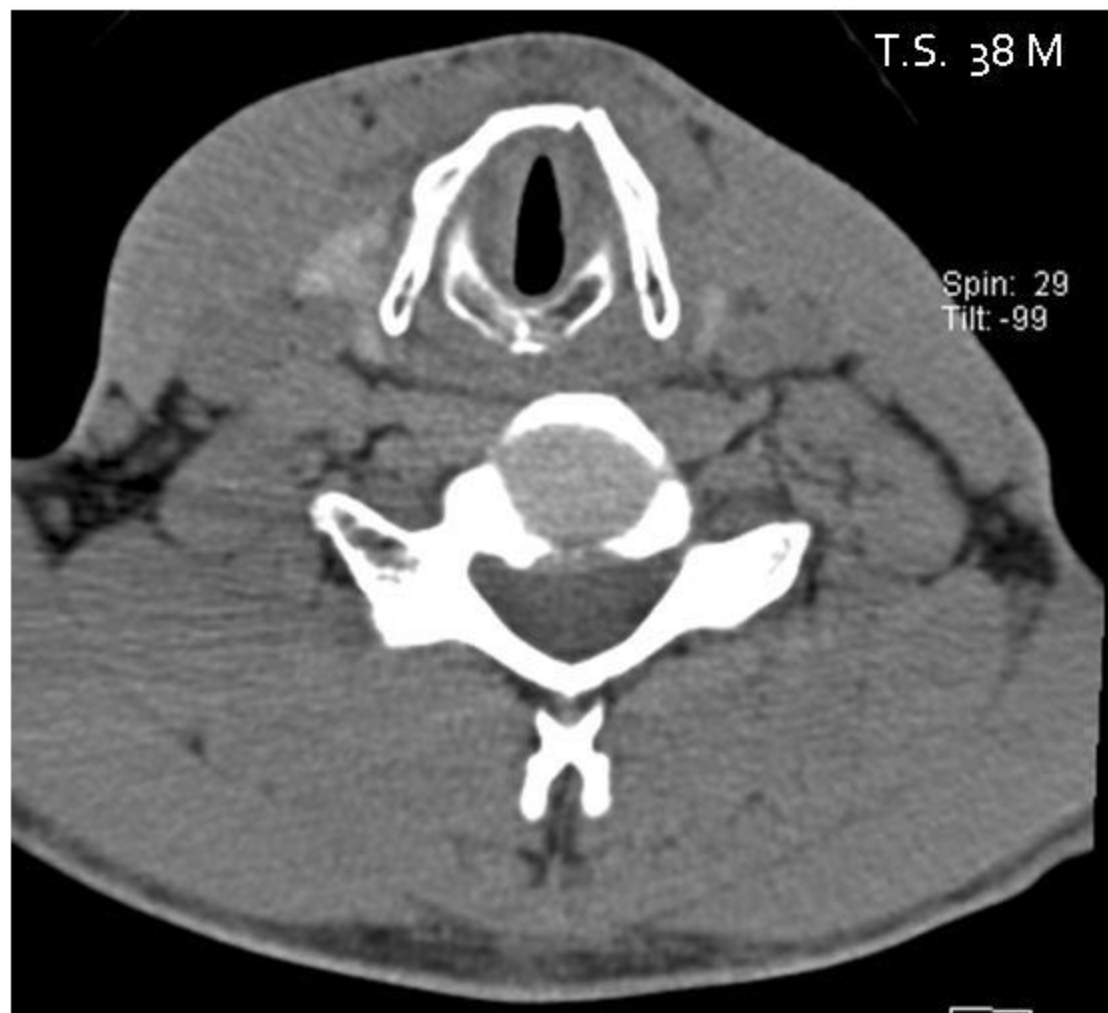
- Awake LA

Further Management

- Observation
- CT scan
- Tracheostomy
- Direct laryngoscopy
- Open repair

Imaging

- Cervical spine
- CT neck
 - Detect occult #
 - Determine extent of suspected #
- Angiography



Classification of Laryngeal Injury

Group	Injury
I	Minor haematomas or lacerations, no fracture, minimal airway compromise
II	Oedema, haematoma, minor mucosal tear, no exposed cartilage, non-displaced fracture
III	Massive oedema, large mucosal lacerations, exposed cartilage, displaced fracture, VF immobility
IV	Similar to III with multiple fractures, massive mucosal disruption, instability of anterior larynx or cricoid
V	Cricotracheal separation

Treatment: Non-Surgical

- Mild trauma
 - Stable airway
 - Minor lacerations
 - No exposed cartilage
 - Minor haematoma/oedema
 - Single undisplaced # of thyroid cartilage
- Treatment
 - Admit for airway observation
 - Humidification
 - Steroids

Treatment: Surgical

- Moderate-severe trauma
 - Unstable airway/impending obstruction
 - Extensive mucosal lacerations
 - Anterior commissure injury
 - Exposed cartilage
 - Multiple, comminuted, unstable or displaced #s
 - Disrupted CA Joint/Impaired VF motion
 - Uncontrolled subcutaneous emphysema
 - Cricotracheal separation
- Treatment
 - Tracheostomy
 - Direct laryngoscopy
 - Open repair

Goals of Treatment

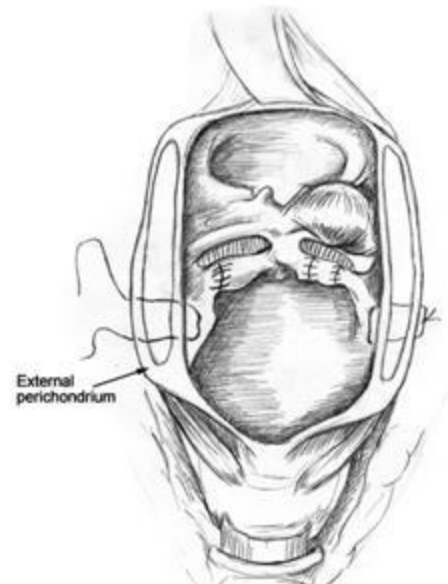
- Maintain airway
- Prevent aspiration
- Restore voice

Laryngeal Trauma

- Endolaryngeal
 - Iatrogenic
 - Intubation, Endolaryngeal surgery
 - Caustic ingestion
 - Inhalational injuries (thermal)
- External
 - Blunt external trauma
 - Penetrating external trauma
 - Iatrogenic
 - Tracheostomy, Thyroidectomy, Laryngeal surgery

Surgical Repair

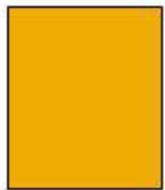
- 32% required open surgery (Jewett 1999)
- Timing
 - Early repair: 24-48 hours
 - Better results esp. if exposed cartilage, extensive lacerations
 - Delayed repair: 3-5 days
- ORIF #s
- Closure of mucosal lacerations
- Covering exposed cartilage
- Reduction/reposition of arytenoids
- Resuspension of AC
- Stent placement



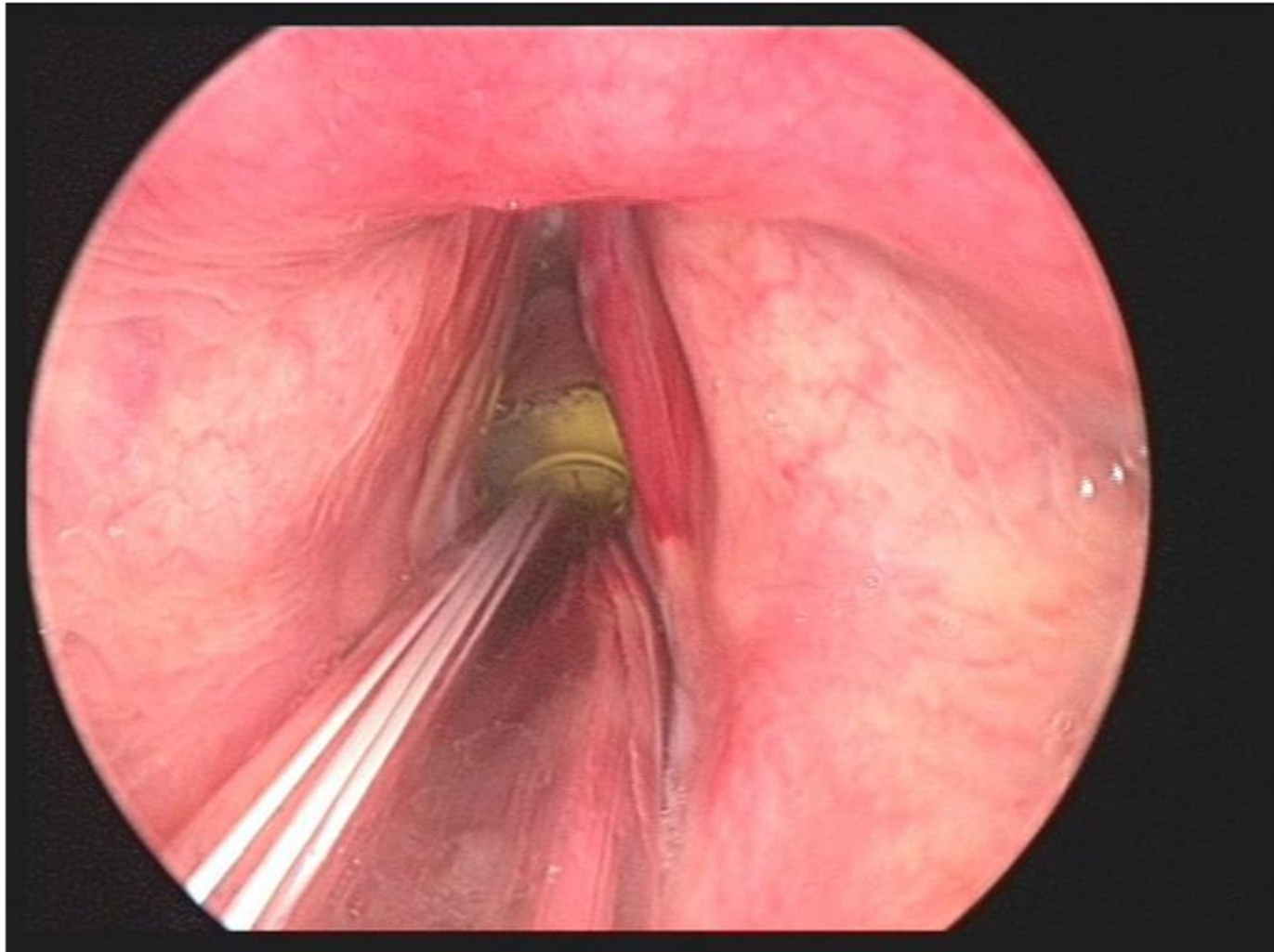
ORIF Cartilage Fractures: Indications

- Displaced #
- Comminuted #
- Unstable #

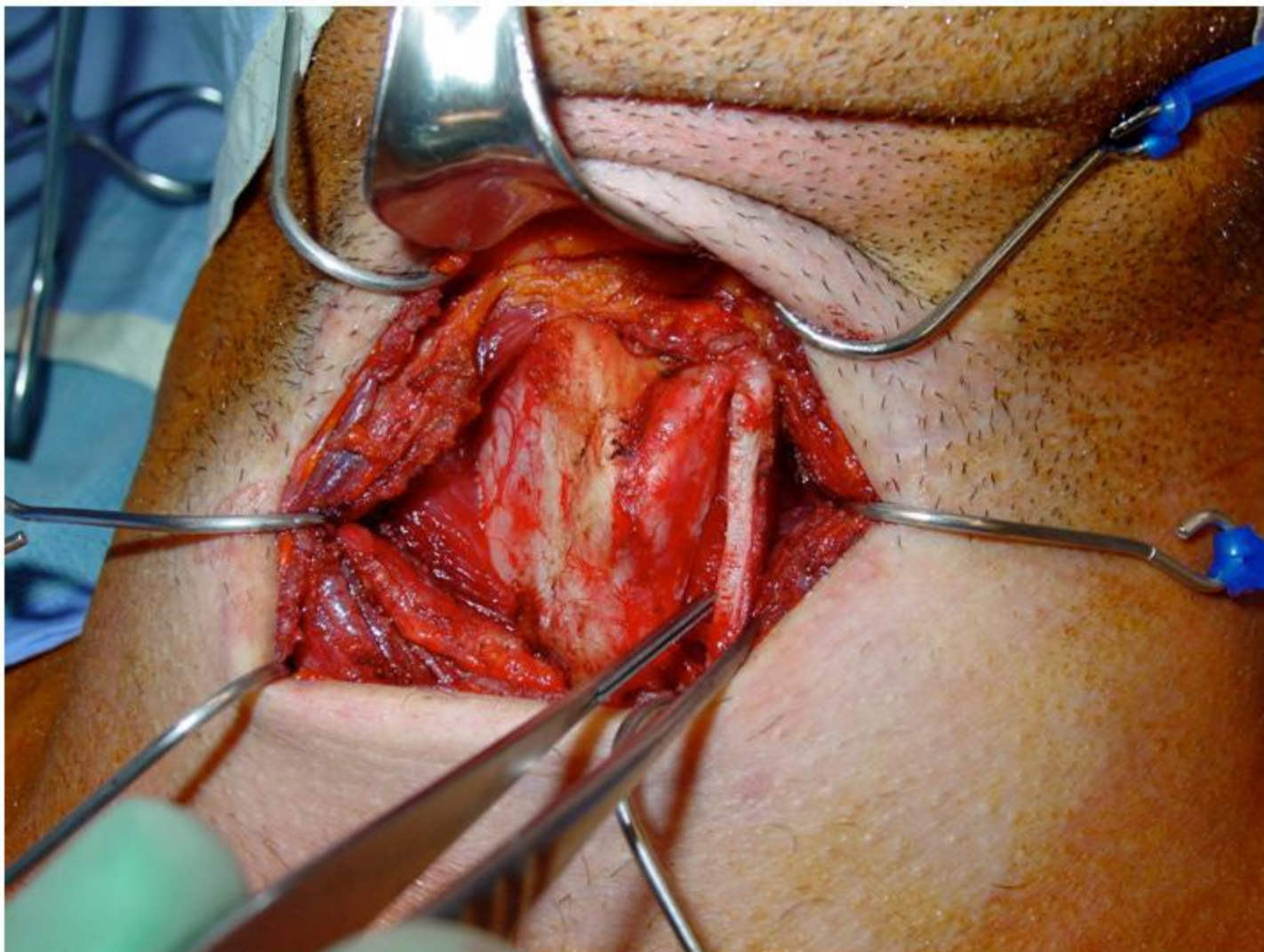
ORIF:T.S. 38 M



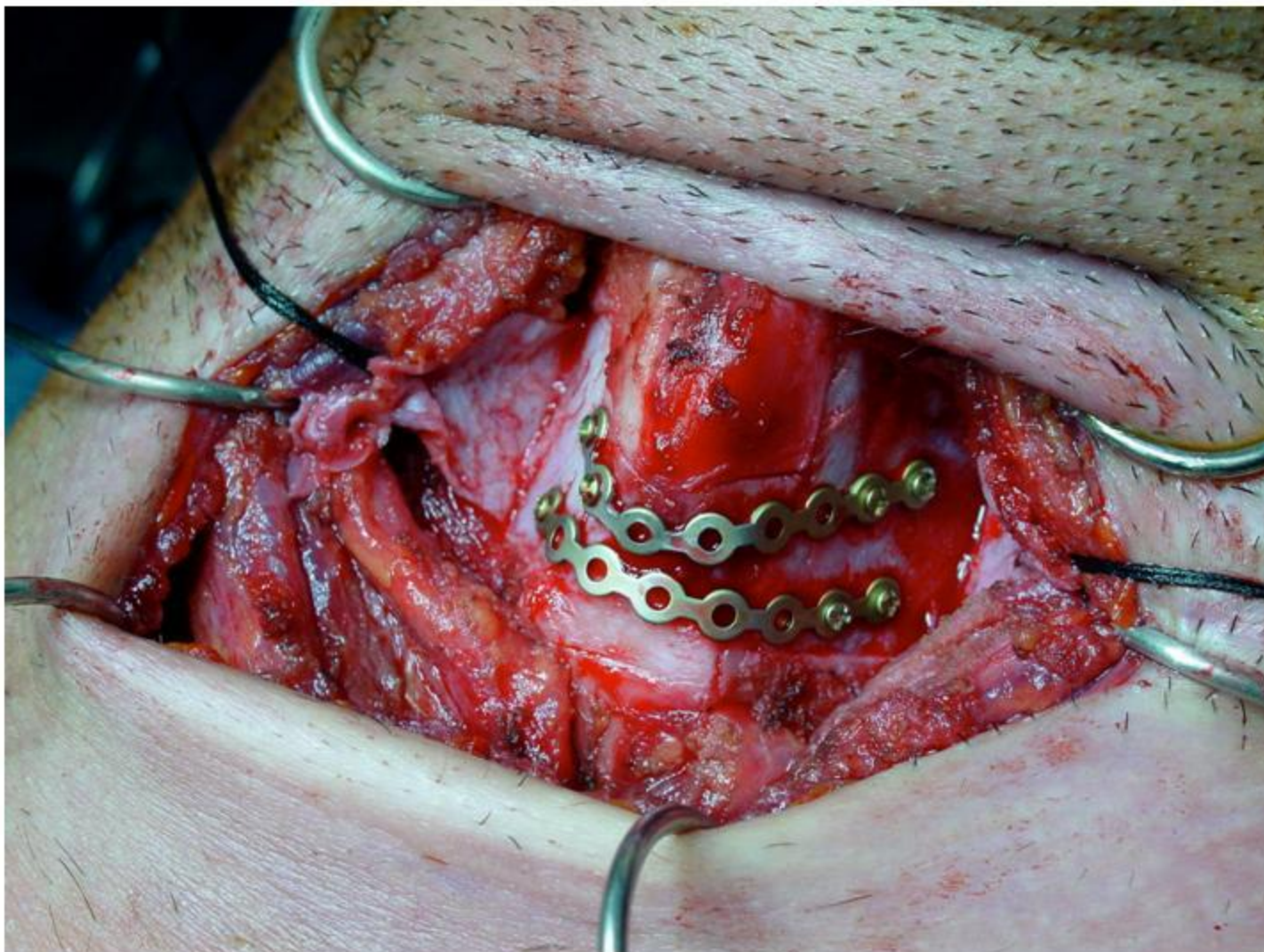
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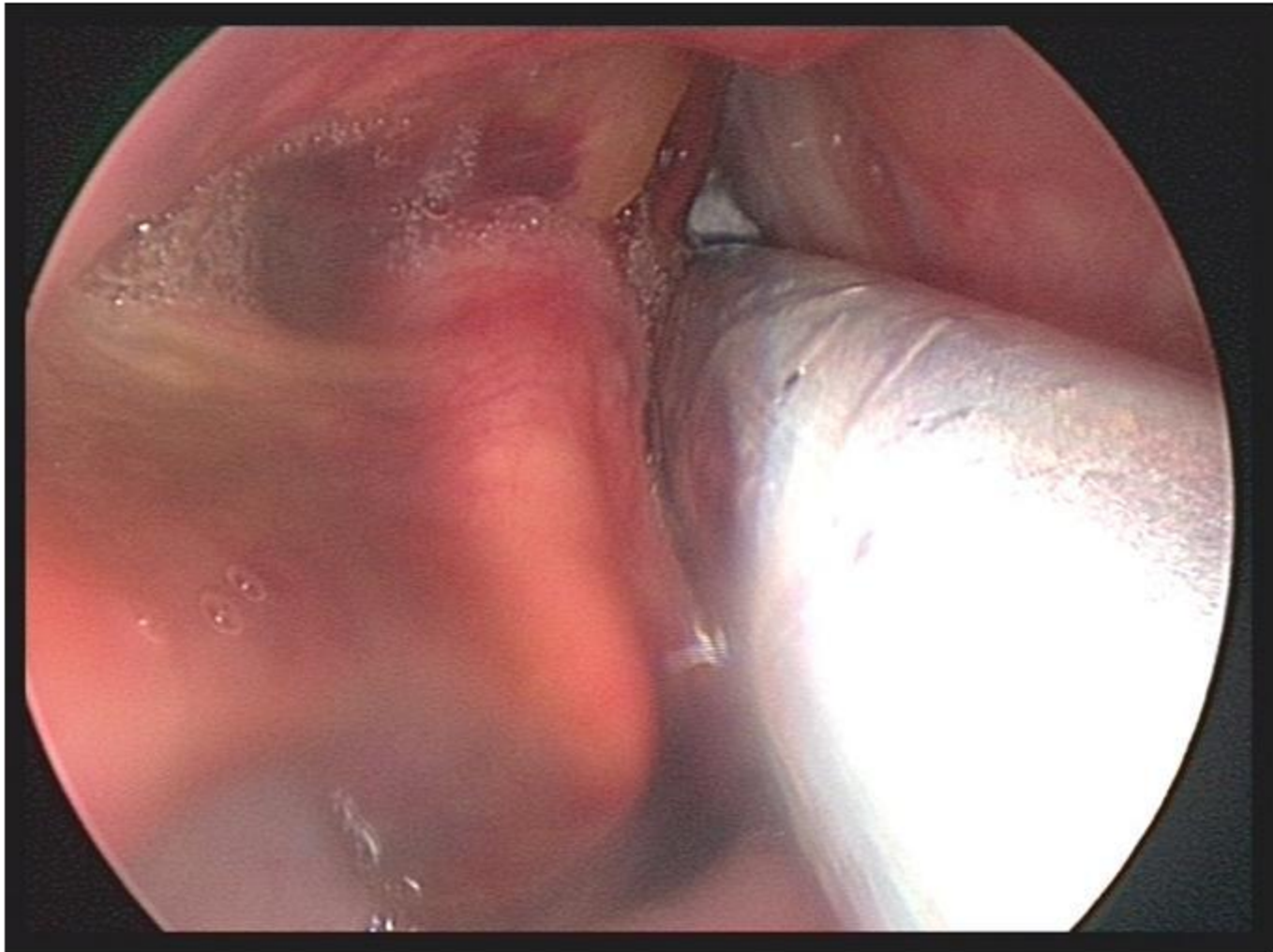
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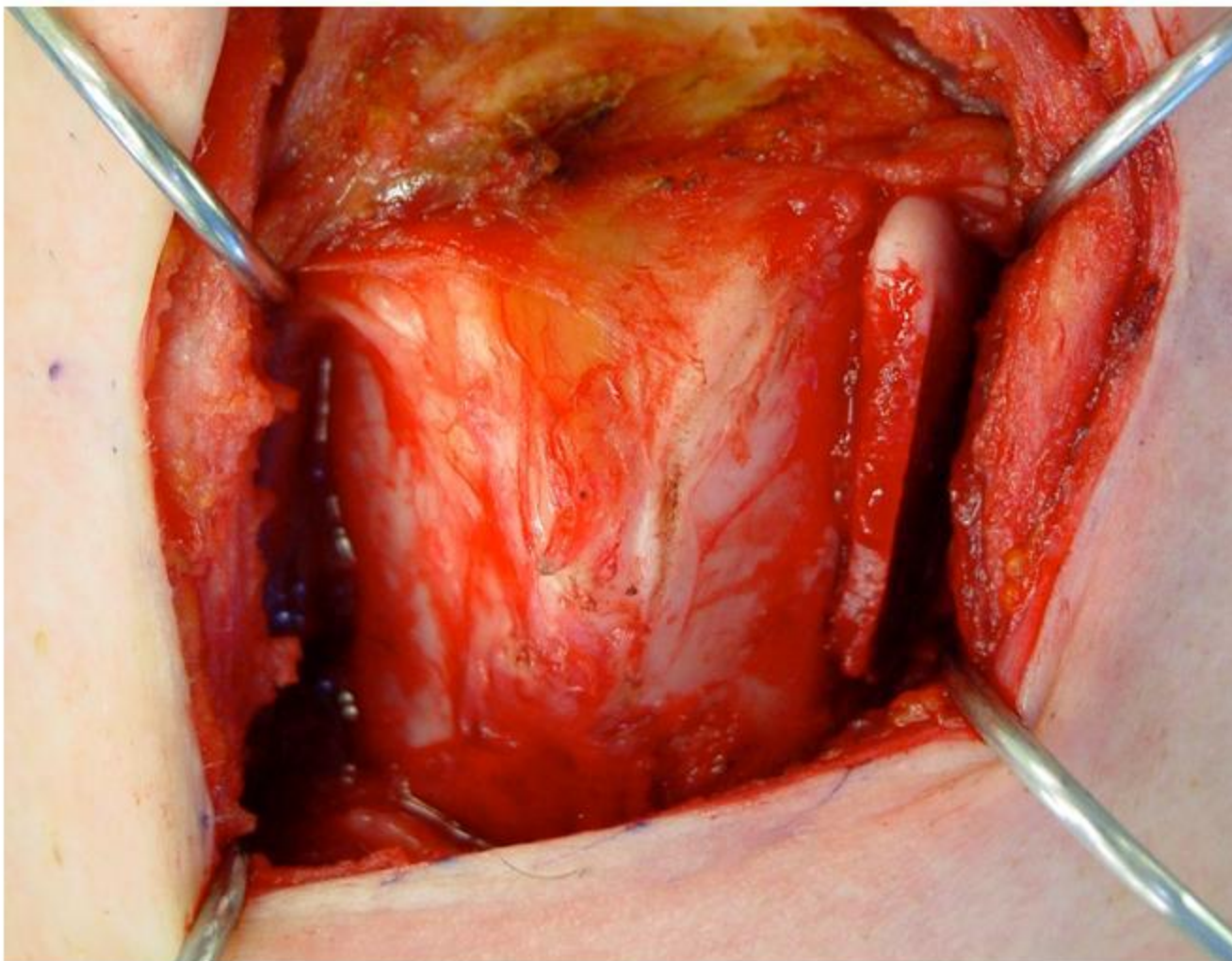
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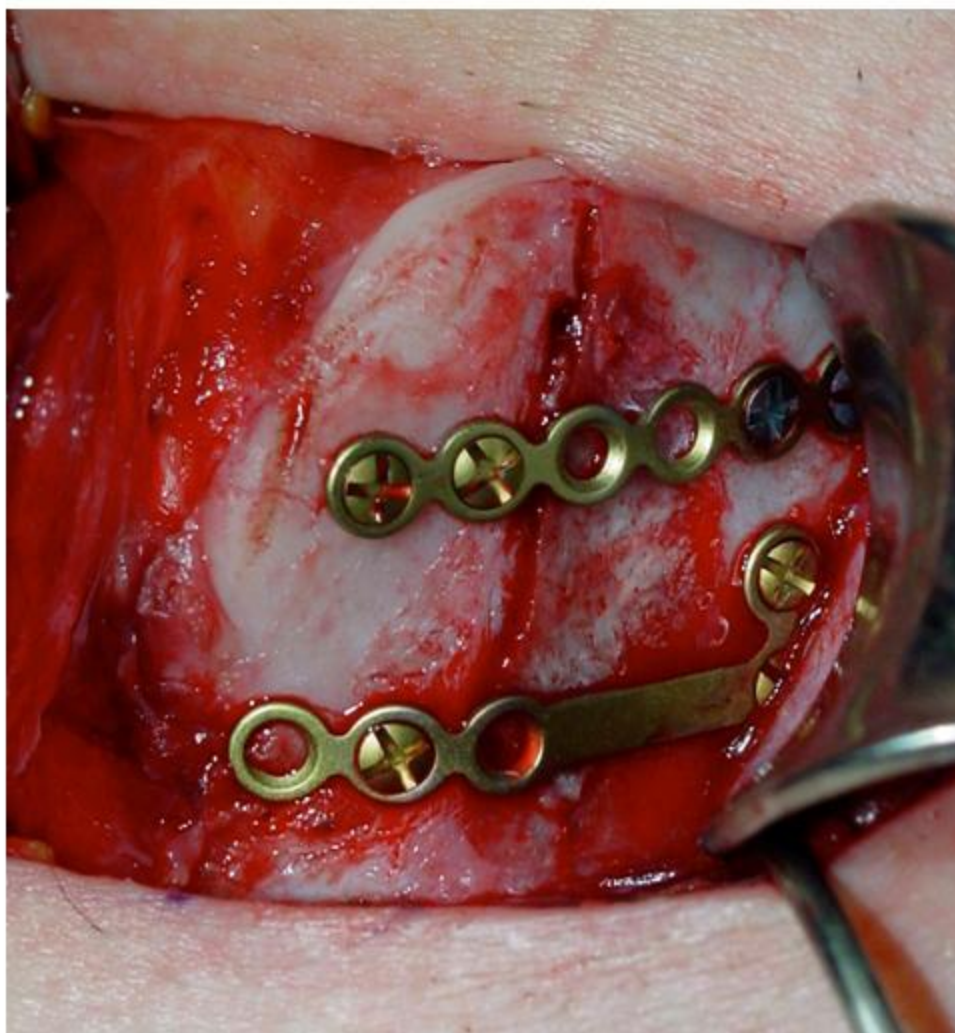
ORIF: K.M. 28 M



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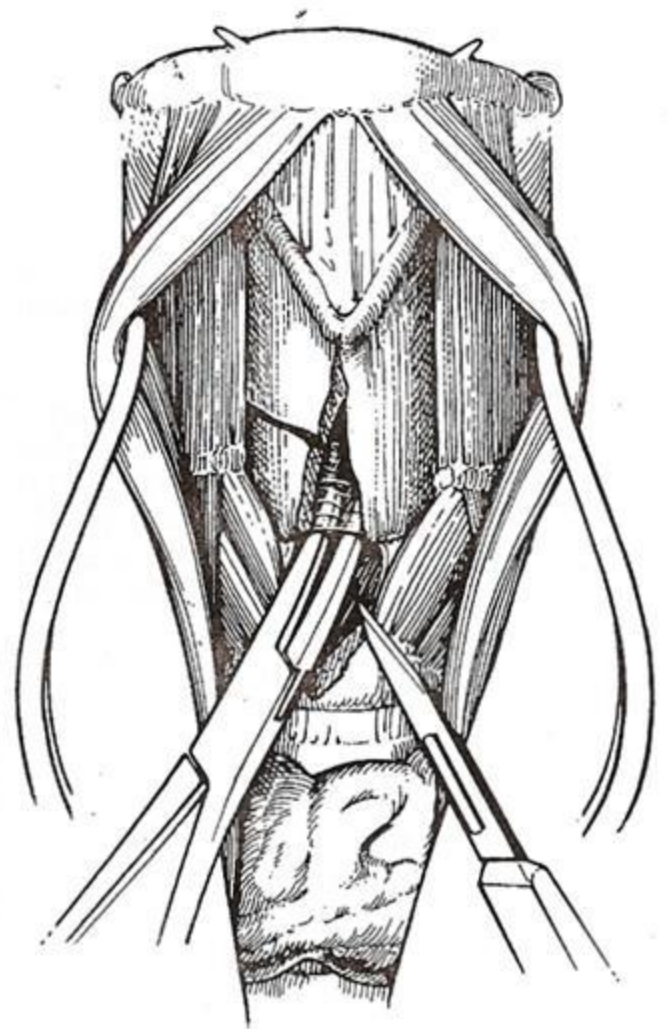


ORIF: K.M. 28 M



Laryngotomy: Indications

- Extensive mucosal lacerations
- Exposed cartilage
- Disrupted CA joint
- Anterior commissure injury
- Stent placement



Blunt & Penetrating External Laryngeal Trauma

- Uncommon
 - 1/5,000 – 1/30,000 ED visits (US)
- Important
 - 2nd most common cause of death in patients with trauma of the head & neck
 - Assoc injuries (Jewett 1999)
 - Intracranial 17%
 - Cervical spinal 13%
 - Pharyngoesophageal 3%
 - Long term sequelae

Outcomes

- Late sequelae
 - Laryngeal stenosis
 - Dysphonia
 - Dysphagia
- Possible treatments
 - Vocal fold augmentation
 - Thyroplasty
 - Arytenoid Repositioning
 - Cordotomy
 - Endoscopic Dilation
 - Resection
 - Laryngeal transplant (!)

Conclusion

- Uncommon injury
 - Blunt > penetrating
- Assess & secure the airway if required
 - Orotracheal intubation or tracheostomy
- Evaluation
 - History, Laryngoscopy, CT
 - Early detection important
- Treatment
 - Mild injury: non-surgical treatment
 - Moderate-severe injury: surgical treatment
- Follow up important for functional sequelae

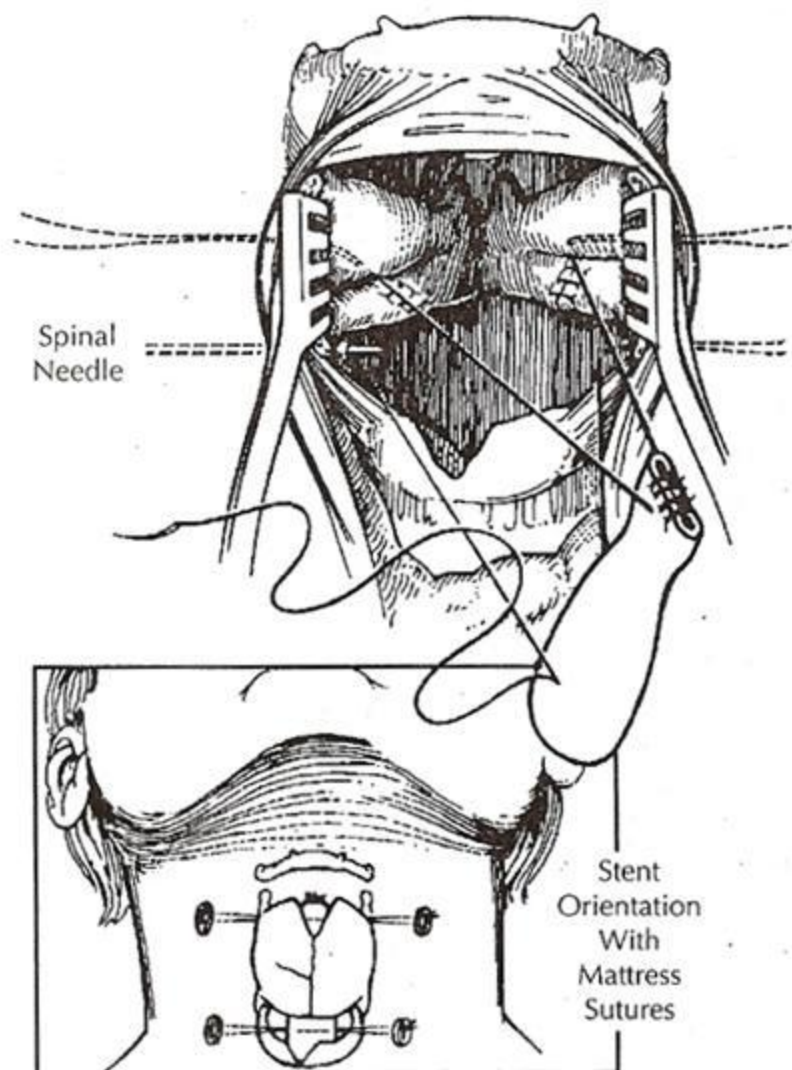
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Endoscopy (GA)

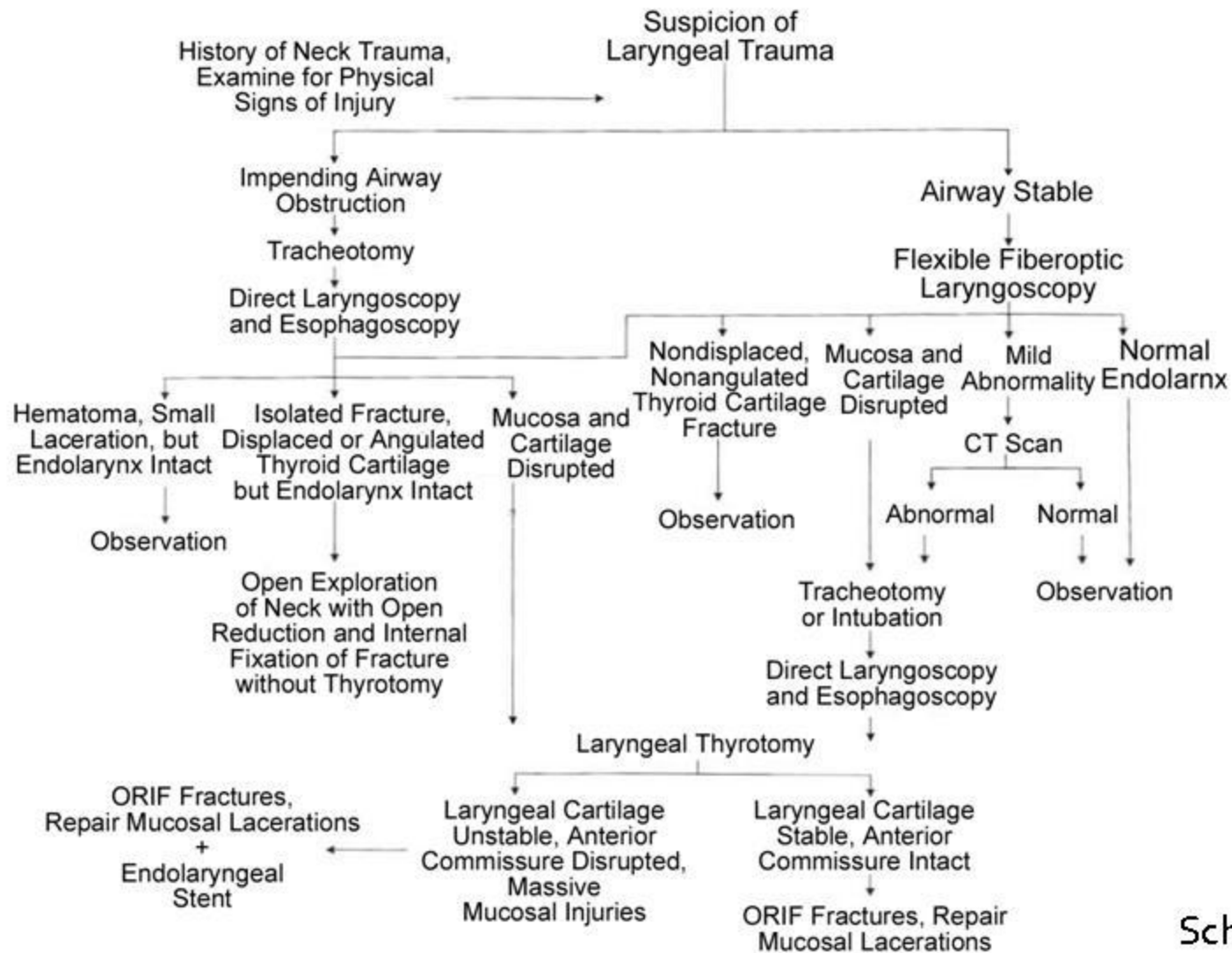
- Direct laryngoscopy
 - Haematoma
 - Oedema
 - Mucosal lacerations
 - Exposed cartilage
 - Passive ROM of arytenoids
- Tracheoscopy
- Pharygo-oesophagoscopy

Stent Placement

- Goals
 - Prevention of webs
 - Support of grafts & flaps
 - Internal support
- Indications
 - Anterior commissure injury
 - Comminuted, unstable cartilage #s
- Disadvantages
 - Pressure necrosis, mucosal injury, scar

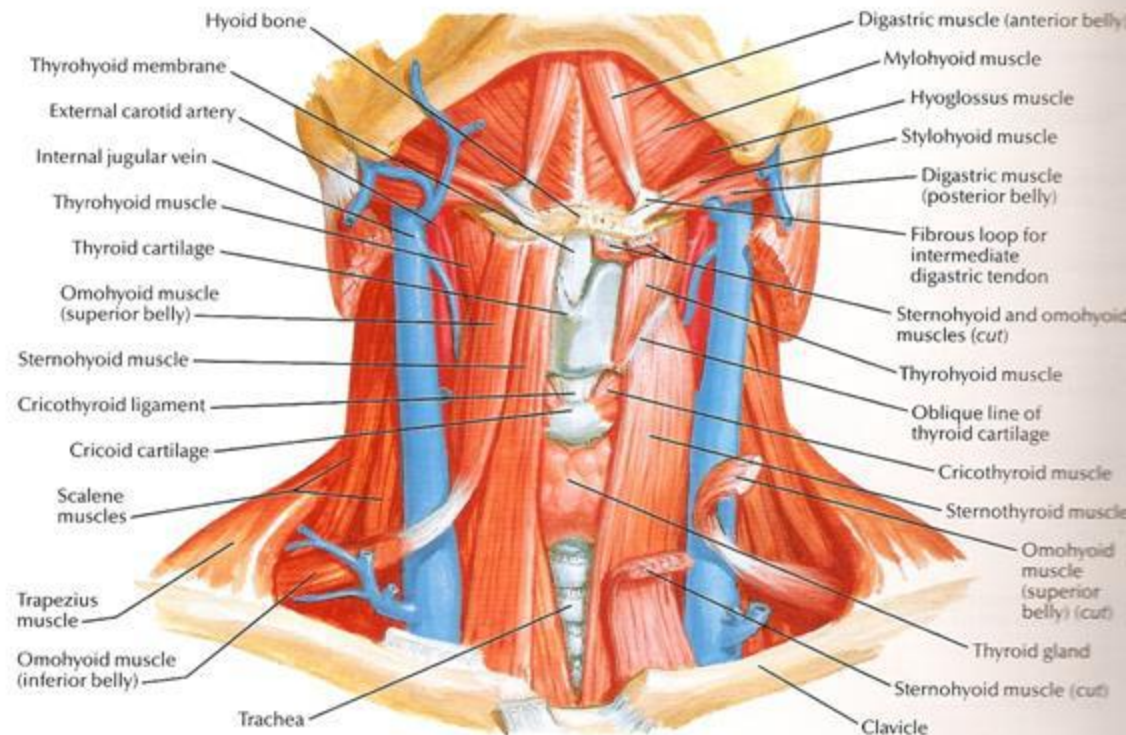


Treatment Algorithm



Laryngeal Anatomy

- Zone II of neck
- Protected
 - Mandible
 - Cervical spine
 - SCM
 - Sternum



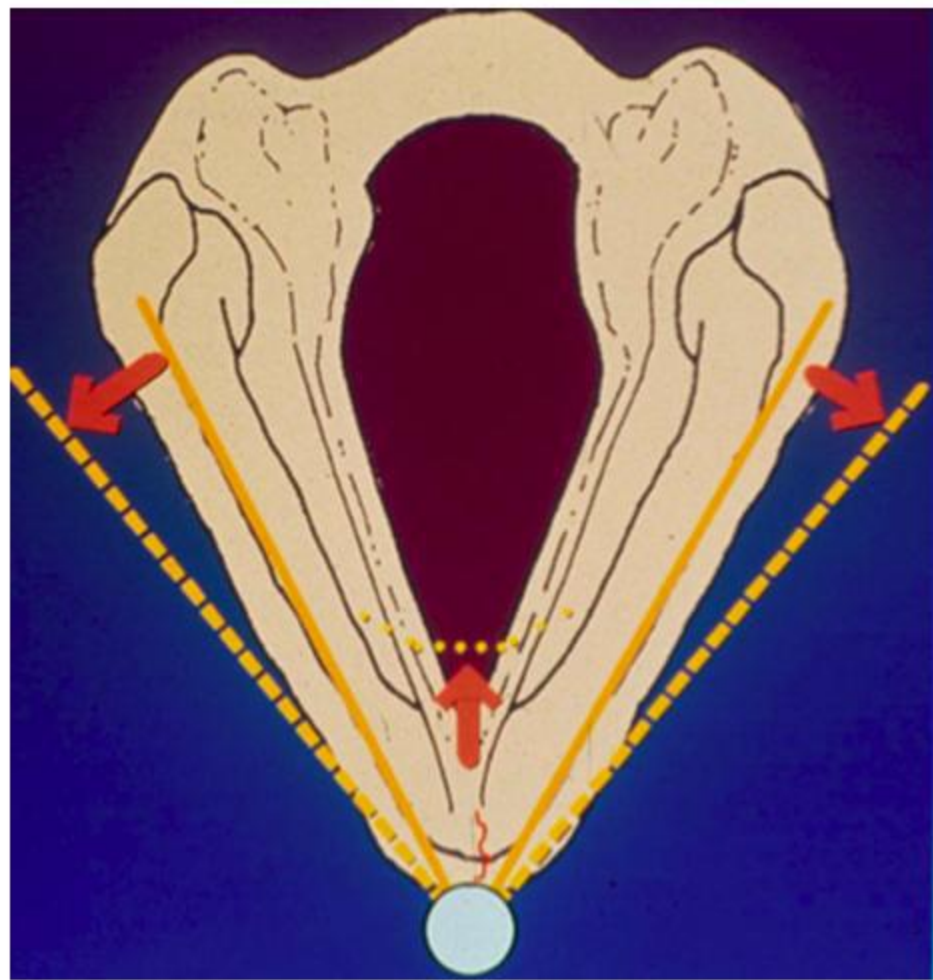
Mechanisms of Injury

- Blunt
 - MVA
 - Assault
 - Sport
 - Fall
 - Horse kick
 - Clothesline
 - Crush
- Penetrating
 - GSW
 - Knife



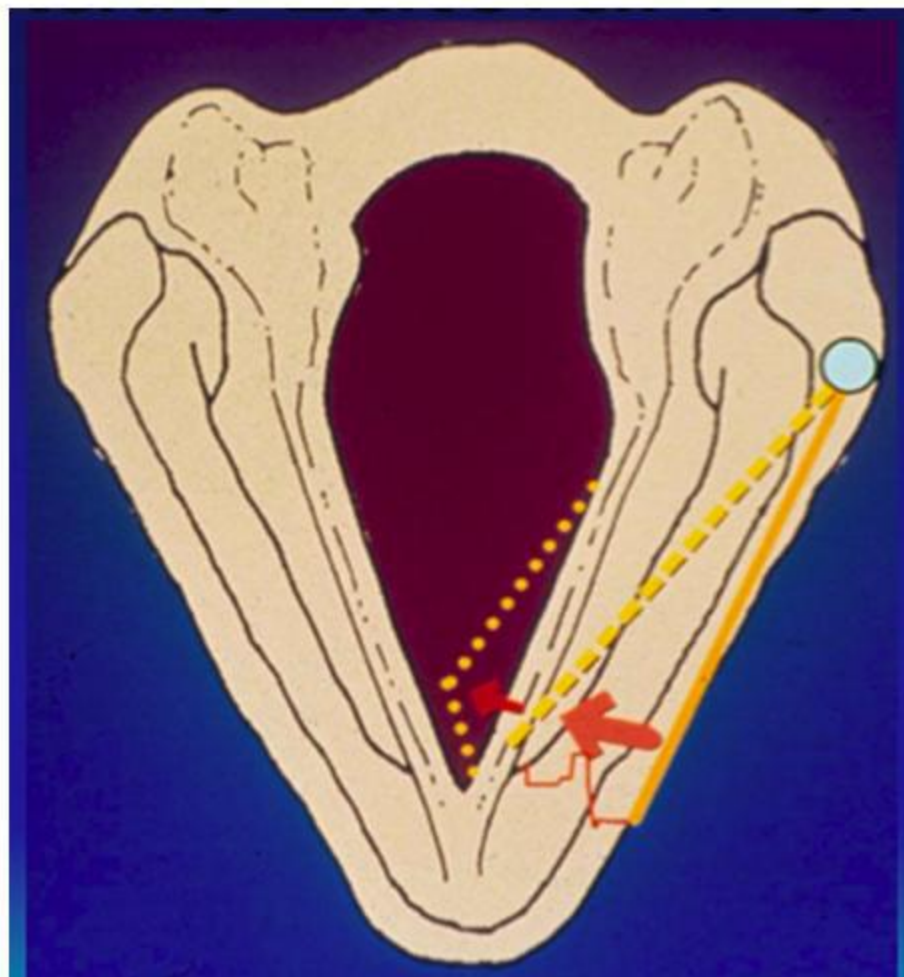
Blunt: Compression against Vertebral Column

- Anterior blunt trauma
- Fracture
- Arytenoid dislocation
- Pharyngeal tear
- Cricotracheal separation



Blunt: Lateral Force

- Fracture
- Haematoma



Penetrating Injury

- Knife, GSW
- High vs low velocity
- Extent underestimated

- Associated injuries
 - Vascular
 - Neurological
 - Pharyngoesophageal



Evaluation: History

- Mechanism of injury
- Dysphonia
- Dyspnoea
- Odynophagia
- Dysphagia
- Pain
- Haemoptysis

