Airway obstruction and compromise - a clinical approach to Hoarseness, Stertor, and Stridor.

Managing a patient with acute upper airway obstruction remains one of the most challenging conditions you might face in your career. This is even more so when it is a child. This chapter aims to give you an overview of how to approach it from different angles, but also emphasises that taking a history, stabilising the patient, and deciding on the appropriate intervention happens all at once the more severe the obstruction.

Definitions

Hoarseness
A non-specific, general term used to describe any change in voice quality, perceived as rough, harsh or breathy.

Stertor
Due to vibration of tissue above the level of the larynx. An example is adenotonsillar hypertrophy. Think "English Bulldog" (low pitch, rough, snoring sound).

Stridor
Usually a high pitched, musical, or harsh sound often mistaken for "wheezing". It can be:

- Inspiratory
    - Larynx
- Expiratory
    - Distal trachea and mainstem bronchi
- Biphasic
    - Glottis, subglottis, and upper trachea

Approach

Classical – think in terms of aetiology

- Congenital
- Acquired
    - Infective
    - Inflammatory
    - Trauma
    - Neoplastic
    - Allergic
    - Medications

Time – think in terms of onset and severity

- Acute - Life threatening
    - Anaphylaxis
    - Foreign body in larynx / trachea
- Sub-acute
    - Upper airway infections
        - Laryngotracheobronchitis
        - Epiglottitis / Supraglottitis
    - Juvenile onset respiratory papillomatosis – although this is a late sign, patients frequently present with severe stridor
    - Adenotonsillar hypertrophy
- Chronic
    - Laryngeal cancers – although this is a late sign, patients frequently present with severe stridor

- Airway stenosis – often misdiagnosed and mismanaged as “asthma”

Position – think in terms of pathology

- Lumen
  - Intra-luminal
  - Luminal
  - Extra-luminal
- Level
  - Nasopharynx
  - Oral cavity / Oropharynx
  - Hypopharynx and Larynx
  - Trachea
  - Bronchial tree
  - Mediastinum

Differential diagnosis

Below follows a broad approach to possible differential diagnosis, and it should not be seen as a comprehensive list of all possible causes.

Pathological conditions – Based on aetiology and level

	Naso-, Oro-, Hypopharynx, Oral cavity	**Larynx, Trachea, Bronchi, Mediastinum**	**Other**
Congenital	• Choanal atresia • Mid nasal stenosis • Skull base dehiscence with meningocele / encephalocele • Skull base anatomical problems with syndromes such as Down’s, Pierre Robin, Treacher Collins	• Laryngomalacia • Webs • Cysts • Vocal cord palsy • Tracheomalacia • Tracheal vascular rings	• Any developmental abnormality with hypoplasia, hyperplasia, atresia, anaplasia

Infective / Inflammatory	• Adenoids
	• Tonsils
	• Diphtheria
	• Cellulitis or abscesses in potential spaces of neck
	  • Retropharynx
	  • Prevertebral
	  • Danger space
	  • Parapharyngeal
		Classical diseases
		• Epiglottitis
		• Croup
		• Bacterial tracheitis	

Trauma	• Inhalation • Thermal • Chemical • Ingestion • Foreign body • Caustic • External • Blunt • Penetrating • Crushing • Iatrogenic • Intubation • Operations		

Neoplastic	• Squamous cell carcinoma (typical) • Nasopharynx cysts	• Squamous cell carcinomas (typical) • Laryngeal papillomatosis • Haemangiomas	• Benign and malignant tumours of any tissue differentiation e.g. Minor salivary gland tumours; sarcoma; lymphoma

Allergic / Medication	• Rare	• Common
		  • Anaphylaxis
		  • Angio-neurotic oedema	

Pathological conditions – Based on Hoarseness

Organic	**Cause**
Inflammatory	Acute laryngitis, Chronic laryngitis
Neoplasia	Papillomatosis, Cancers
Neurological	CVA, Multiple sclerosis, Guillain-Barre, Myasthenia gravis, Carcinoma of the lung / mediastinum, Idiopathic (virus), Spasmodic dysphonia
Iatrogenic	Post surgery – thyroid, neck, carotid, larynx, oesophagus
Systemic	Hypothyroidism, Rheumatoid arthritis

Pathological conditions – Based on Age specific causes of stridor

Age group	**Cause**
Neonatal	Congenital cysts, webs, tumours
	Laryngomalacia
	Subglottic stenosis
	Vocal cord paralysis
Children	Laryngotracheobronchitis
	Supraglottitis (Epiglottitis)
	Acute laryngitis
	Foreign body
	Retropharyngeal abscess
	Respiratory papillomatosis
	Diphtheria
Adults	Laryngeal cancer
	Laryngeal trauma
	Acute laryngitis
	Supraglottitis (Epiglottitis)
	Laryngeal / Tracheal stenosis
	Angioneurotic oedema / Anaphylaxis
	Diphtheria

Management

History

- When did it start?
  - At birth / later in the case of a child
- How did it start?
  - Suddenly / Slowly progressive
- Is it fluctuating or constant?
- Is it stridor or stertor?

- Enquire about
    - Voice / Hoarseness
    - Feeding
    - Aspiration
    - Airway / Breathing
    - Dying spells (cyanotic spells with apnoea)
    - Cough
- The effect of
    - Exercise
    - Infections
    - Position
    - Feeding
    - Previous treatments
- Think about the possible differential diagnoses
    - Aetiological
        - Congenital
        - Acquired
    - Onset and severity
    - Anatomical level
- Look at associated symptoms and signs such as
    - Tachypnoea
    - Tugging
    - Accessory muscle use
    - Apnoea / Dying spell
    - Coughing
    - Signs of acute infections

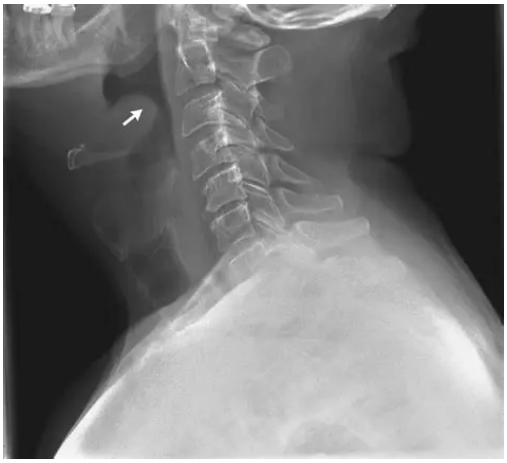
Examination

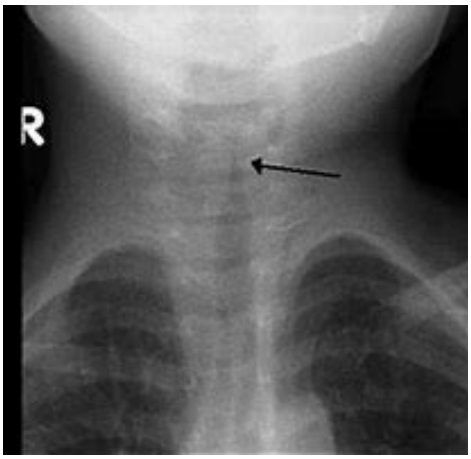
- The more acute the situation, the more focused the initial approach
    - This means to absolutely focus on securing an airway
    - The management of these patients will be discussed later
- ENT
- General (infection)
- Look specifically for
    - Cyanosis / Pallor
    - Nasal flaring
    - Use of accessory muscles
    - Tracheal plugging
    - Chest wall recession
    - Tachycardia
    - Tachypnoea
    - Cough
    - Exhaustion
        - Can paradoxically be quieter

Special investigations

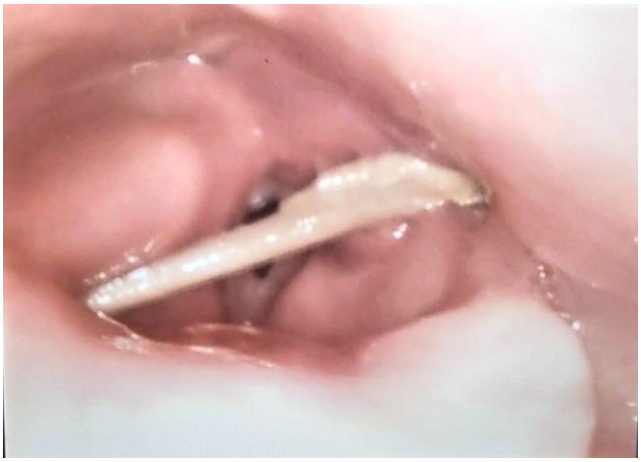
- SaO2
- Arterial blood gas
    - Should not unnecessarily delay or cause more distress in the patient (especially children)
- XR – can be useful in acute setting
    - Thumb sign – points to epiglottitis (lateral neck Xray)
    - Steeple sign – points to laryngotracheobronchitis (AP neck Xray; Not Chest Xray)
    - Foreign body

- Bedside endoscopy – only if patient is stable enough. In general, this will only be in the scope of an ENT specialist
- Examination under anaesthesia in theatre
- CT / MRI
- Bloods
- Other


Thumb sign (arrow demonstrates the swollen epiglottis)



Steeple sign (arrow demonstrates the narrow subglottis)


Foreign body (bone) in supraglottis

Management in general

This will differ depending on your level of experience, but unfortunately also whether you are working alone or in a team setting. Sometimes, you may be confronted with managing a severe airway compromise without any cover.

As a GP, you can do the following after a history and examination:

- Put the patient on oxygen
- If there is any suspicion of and anaphylaxis, use adrenaline immediately
- Steroids
- Nebulize – Adrenaline (1:1 concentration, meaning 1ml amp of adrenaline and 1 ml saline)
- Calm down / Re-assure
- Other
    - SaO_2
    - Blood gas
    - Radiology
        - XR, CT, MRI
- Get help

An ENT will, in general, do the above and:

- The most important step is visualization of the larynx
    - Flexible laryngoscopy at the bedside (only if the condition allows it)
    - Rigid laryngoscopy (direct laryngoscopy) in theatre
- Where should this be done?
    - Rooms / Theatre (OR)
    - The more severe the stridor, signs of acute infection, the younger the age of the patient – rather theatre

Management of the acute airway obstruction - Securing the airway

- If there is any doubt about the severity, rather take the patient to theatre (OR) if that is available to you and it does not cause unnecessary delays. Otherwise, you need to manage it there and then
- Always mobilise the team which can include an ENT, Anaesthesiologist, Paediatrician, Nurse, ICU staff
- Equipment – make sure that all the equipment is available
    - Various endotracheal tracheal tube sizes, laryngoscopes blades, flexible scopes, visualization scopes (C-Mac)
    - Suction and instruments such as a Magill forceps
    - If available, the tracheostomy set should be open
- Stick to ABC principles
    - AIRWAY
        - Avoid unnecessary manipulation of the airway and muscle relaxants
        - Most cases can be intubated, and a tracheostomy is rarely needed, however the most common mistake is to absolutely fixate on intubation and losing track of other means to ventilate
        - Therefore, a stepwise approach to ensuring oxygen supply is
            - Oxygen mask
            - Ambu bag
            - Laryngeal mask
            - Intubation
            - Surgical airway
                - Needle cricothyroidotomy
                - Surgical cricothyroidotomy (avoid in patients under 12 years of age due to small cricothyroid membrane, funnel shaped larynx and increased risk of subglottic stenosis)
                - Quick tracheostomy set
                - Tracheostomy

Surgical airway

Hopefully, very few of you will be confronted with performing a surgical airway. Once you get to this stage, the situation is usually dire. This is often after failed intubation(s). In children the "time" at hand is even less, and they can decompensate extremely quickly. Two acronyms are frequently used namely:

- CICO – can't intubate, can't oxygenate
- FONA – front of neck access

To complicate matters even further, the pathology leading to the airway compromise often alters the neck, hypoxic patients never lie still and is frequently combative, and there are lots of critical structure in the way

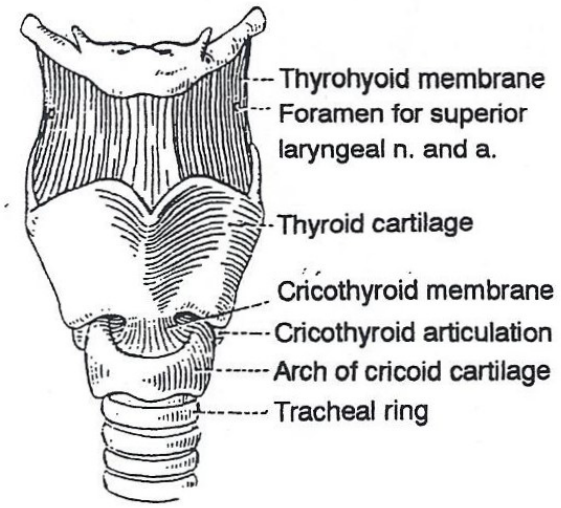
You have two options:

- Cricothyroidotomy
  - Needle
  - Scalpel (surgical)
- Tracheostomy
  - Open
  - Percutaneous

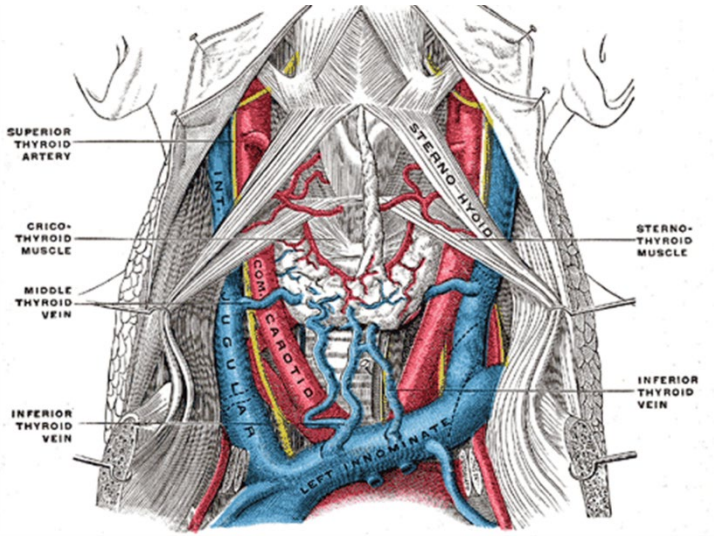
Also consult the following online resources:
https://www.youtube.com/watch?v=B8I1t1HlUac
https://youtu.be/WQOwSLWlHec

Below follows a brief outline of the anatomy and options available to you.

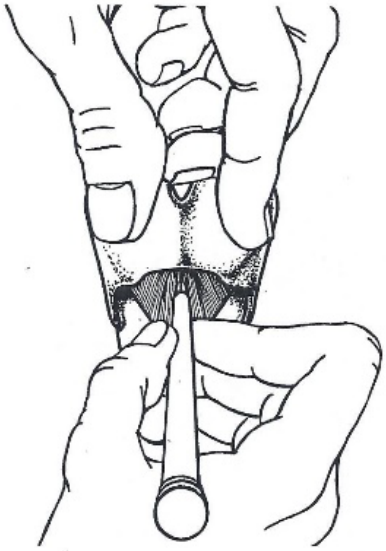
Basic anatomy



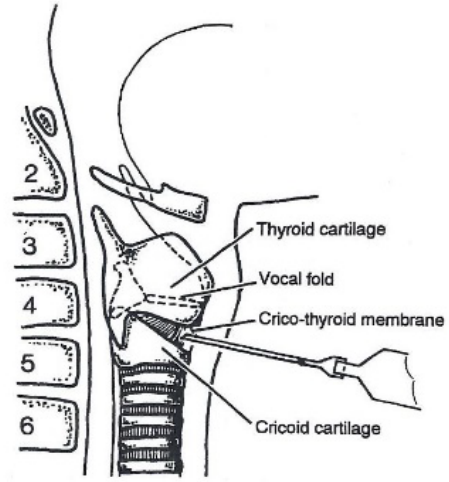
Cartilages of the larynx from the front



Needle cricothyroidotomy is done through the cricothyroid membrane, but it can also be inserted directly into the trachea. Use large bore (14 – 16 gauge) intra-venous needles attached to a syringe (5-10 ml) halve filled with water. Introduce through the skin and apply suction. As soon as you see air, advance cannula inferiorly.

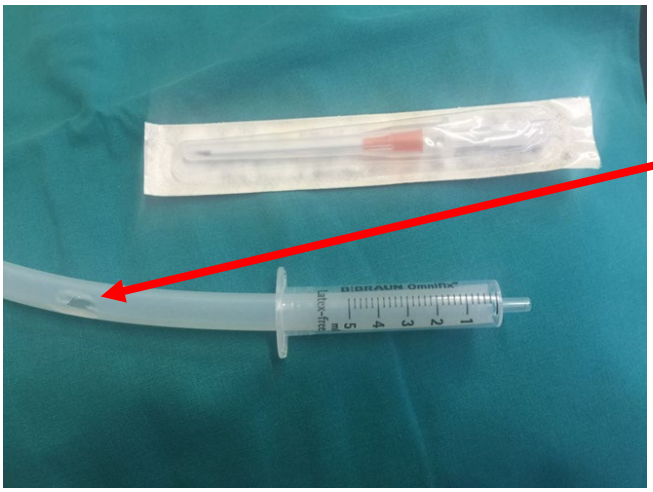


1. Identify cricothyroid cleft. Insert trocar and cannula centrally through cricothyroid ligament.



Crico-thyrotomy
Done through notch between tyroid and cricoid cartilages which can easily be felt with the finger.

To ventilate after inserting / advancing at least 3-4 needles inferiorly, you can attach a suction tube to the oxygen outlet and then onto a 5 ml syringe the fits into the back of the needle you have place. Cut an opening in the tube that acts like a valve, meaning when you close it with your finger, you force oxygen into the trachea. REMEMBER, to place another 3-4 needles in the same airway for air to escape otherwise you risk over inflating the lungs with possible pneumothoraxes. This buys you 15 – 30 minutes to do a more formal surgical airway.



Some units have “quick sets” as shown below. You may attempt to do a tracheostomy or cricothyroidotomy with such a set.

Commercially available quick tracheostomy set by Rüsch Medical (PTY) LTD company.

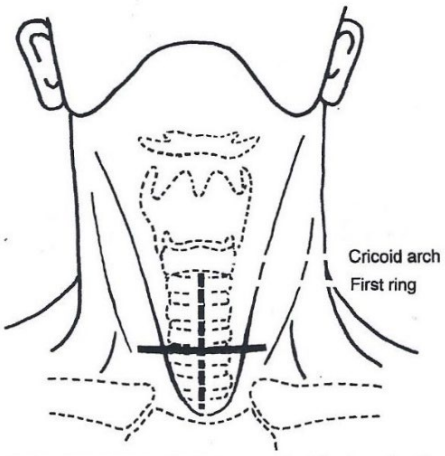
For a **surgical cricothyroidotomy** you will need a:

- Blade
- Bougie
- Endotracheal tubes (different sizes)
- Tracheal dilator
- Laryngoscope with small blade

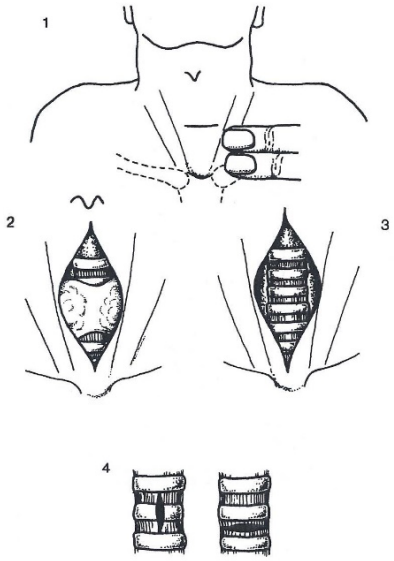
The steps are:

- Position your patient first – chin lift and neck extension and stay in the midline!
- Make a vertical incision of 6-8 cm
    - Remember, it will bleed
- Perform a laryngeal handshake with your non-dominant hand AND use your fingers to pull the tissue apart and palpate for the cricothyroid membrane
    - A laryngeal handshake is shown below, but it means holding the thyroid lamina between your thumb and fingers
- Insert scalpel blade vertically and while in-situ twist through 90^0
- While the scalpel blade is still in-situ, insert bougie and railroad endotracheal or tracheostomy tube over bougie
- Sometimes, a laryngoscopy with a small blade may come in handy. Use the blade to “hook” the tissue downwards, with the tip of the blade as close to or in the trachea. The light at the tip helps to “see” in the depths of the wound.

In the rare event that you attempt a **surgical tracheostomy**, we advise a vertical incision on the skin and in the trachea. In reality, this will only be done by very experienced ENT or Trauma surgeons.



Incisions for tracheostomy. The transverse incision is preferable for elective procedures, but the vertical one is quicker in an emergency. The thyroid isthmus usually overlies the second, third and fourth tracheal rings, and so must be divided for access to the trachea at its correct level. It is absolutely essential that the first ring is kept intact.



How to perform a tracheostomy
1. Midline incision
2.+3. Dividing the thyroid isthmus when necessary.
(Usually the latter can be retracted superiorly out of the way)
4. Incising the trachea. NB preserve 1st tracheal ring.

If you are confronted with a surgical airway:

- Try to stay calm
- Try to position the patient as best you can – neck extension / chin lift
- Stay in the midline
- "Search" for the airway with your fingers and a syringe (filled with water) and needle
- It will bleed
    - Compress once airway secured

Golden rules in Stridor

- Acute onset stridor is a late sign, and should alert you to the seriousness of the situation
- Remember the more severe the obstruction the quieter the child / stridor
    - Anxious / restless to semi-comatose
- The smallest mucus plug can cause a complete obstruction
- Take note of the possibility of supraglottitis in adults
    - Especially in the immunocompromised group
- Failure to respond to medications is usually an indication of a severe case, and / or one also needs to consider other pathologies
- Early use of adrenaline is cardinal in the treatment of anaphylaxis (within 30 minutes of onset of symptoms)

Diseases

Some disease will be briefly discussed. Please also refer to other textbooks.

Laryngotracheobronchitis

Also known as croup and is characterized by

- Most common infectious cause of stridor in children
- 3-5% of children have at least one episode
- Parainfluenza viruses (other as well)
- Clinical features
    - Nonspecific viral prodrome
    - Triad of hoarseness, stridor with a distinct expiratory barking cough, and varying degree of upper airway obstruction
    - Usually not toxic
    - 3-7 days
- Specific points / parameters to consider
    - Whether the stridor is inspiratory, expiratory, or biphasic
    - Respiratory rate
    - Chest retractions
    - Air entry into chest (auscultation)
    - Anxiety / restlessness
    - Colour or cyanosis
    - Level of consciousness
    - Oxygen saturation
- 30% admitted, and less than 5% needs intubation

Treatment / Management

- Keeping the child and the parent calm
- Steroids
    - Oral / IV / nebs
    - Oral and IV equally effective
        - Oral prednisolone 1mg/kg
        - Oral dexamethasone 0.15mg/kg
        - IV / IM dexamethasone 0.6mg/kg
    - Low vs high dose studies have been equivocal
- Adrenaline
    - Nebs
    - Remember potential rebound swelling, therefore children should be observed for at least 3-4 hours
- Humidified air
- Securing the airway
    - Intubation vs tracheostomy

Croup should be considered atypical

- If,
    - It occurs in infants younger than 6 months
    - Lasts more than 7 days
    - Is unusually severe
    - Does not respond to the appropriate treatment
- In this group consider
    - Respiratory papillomatosis
    - Supraglottitis / Epiglottitis
    - Foreign bodies
    - Thermal injuries or caustic ingestion
- This group of patients needs a laryngoscopy

Two subcategories

- Recurrent croup
    - 5% of children
    - Consider
        - Gastro oesophageal reflux disease (GERD) / Laryngo-pharyngeal reflux (LPR)
        - Congenital subglottic stenosis or haemangiomas
- Spasmodic croup
    - Nighttime acute episodes of croup-like symptoms without a preceding viral prodrome
    - It is linked to allergy reactivity and GERD / LPR
    - Responds to nebulized adrenaline

Supraglottitis / Epiglottitis

Characterised by

- Rapid progressive, life-threatening airway emergency
- Cellulitis of the supraglottic structures
- Traditionally it affects children below the age of 5 years (median 3), and was caused by *H. Influenza* type B
- After the introduction of the HIB vaccine the median age shifted from 3 years to 6 – 12 years
- In addition, a greater proportion of cases now occur in adults
    - Especially in the immunocompromised group
    - Presents with a much milder form of the classical disease
- The causative organisms have changed, and are now include *Strep pneumonia, Strep pyogenes, Staph aureus,* and other *H. Influenza*

Hallmark features include

- Dysphagia and throat pain
- Drooling
- Respiratory distress that are rapid in onset and progression
- Patients are toxic and anxious, and typically sits in the tripod position
- Shallow breathing
- Stridor and respiratory retractions are late and concerning signs of impending complete obstruction

Treatment / Management

- All patients suspected of having supraglottitis should be taken to theatre (OR), Resuscitation room
    - Except adult cases with very mild symptoms or
    - If the patient is too unstable to transport
- Securing the airway is the most important thing
    - Oedematous, erythematous epiglottis with varying degrees of airway obstruction
    - Frank ulceration, sloughing, and rarely an abscess may be present
    - Classically a cherry red epiglottis, but in the adult population one now sees a pale and swollen epiglottis
- Cephalosporin, steroids, HIB vaccine

Differential diagnosis

- Croup
- Bacterial tracheitis
- Retro- or para-pharyngeal abscess
- Diphtheria
- Foreign body

Retropharyngeal abscess

Characterized by

- Almost exclusively seen in infants and children, due to lymphadenitis in retropharyngeal nodes
    - These nodes undergo atrophy as you get older
- Sudden onset and acutely ill child
- Inspection of oral cavity – huge bulge from posterior pharyngeal wall
- Needs incision and drainage

Differential diagnosis of Upper Airway Infections in Children				
	Croup	**Supraglottitis**	**Bacterial tracheitis**	**Retropharyngeal abscess**
Age	6 months – 3 years	1 – 8 years	6 months – 8 years	1 – 5 years
Onset	Slow	Rapid	Rapid	Slow
Prodrome	URI symptoms	None / mild	URI symptoms	URI symptoms
Fever	Variable	High	High	Usually, high
Hoarseness / Barking cough	Yes	No	Yes	No
Dysphagia	No	Yes	Yes	Yes
Toxic	No	Yes	Yes	Variable
Radiographs	Subglottic narrowing – steeple sign (AP neck Xray)	Rounded enlarge epiglottis – thumb sign (lateral neck Xray)	Subglottic narrowing, Diffuse haziness	Widened prevertebral space (lateral neck Xray)

Laryngomalacia

Also see section under congenital conditions

- Most common cause of stridor in infants
- It presents with intermittent inspiratory stridor within the first two weeks of life (typically not present at birth)
- The vast majority will resolve spontaneously over the next 7-9 months (rarely after 18 months)
- It worsens with feeding, and often the infant needs to take breaks while feeding
- Mild forms will improve with crying, as opposed to moderate to severe laryngomalacia which will worsen
- Often the stridor improves when turning the infant prone
- There is a strong association with GERD / LPR
- Rarely a child requires surgery to correct this
- Refer a child if there are any of the following
    - Apnoea
    - Failure to thrive
    - Feeding difficulties

    - Aspiration
    - Cyanosis

Foreign body

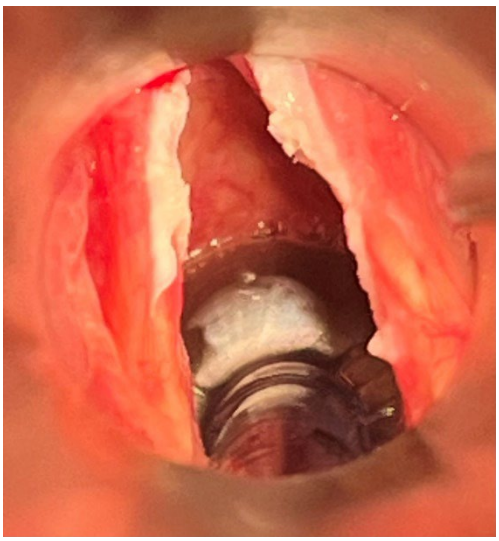
- Clinical picture depends on where the FB got stuck
- The narrowest area is at the level of the cricoid
- If it is stuck at the cricoid
    - Sudden onset of coughing, wheezing and stridor in a previously healthy child
    - Stridor can be severe
    - Needs urgent referral
- If it passes the cricoid and lodge lower down
    - Asthma type picture with repeated chest infections

Respiratory papillomatosis

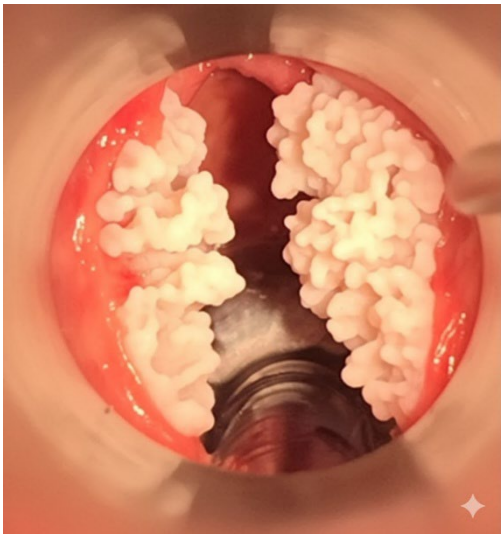
- HPV 6 & 11, 16 & 18
- Exposure
    - In utero for kids
    - Contact for adults
- Presents with dysphonia with or without stridor
- Severe cases present with life threatening stridor
- Far more common in children and more aggressive compared to adults
- Invariably missed diagnosed as “asthma” before the stridor gets severe

Laryngeal cancers

- Refer to Head and Neck cancer chapter
- Squamous cell carcinoma is the most common
- Smoking and alcohol use are the main risk factor
- Any patient with continuous hoarseness for more than 3-4 weeks needs a laryngoscopy
    - If there are any suspicious lesion(s) a biopsy is indicated
- Diseases causing acute hoarseness can lead to airway narrowing / compromise and eventually stridor



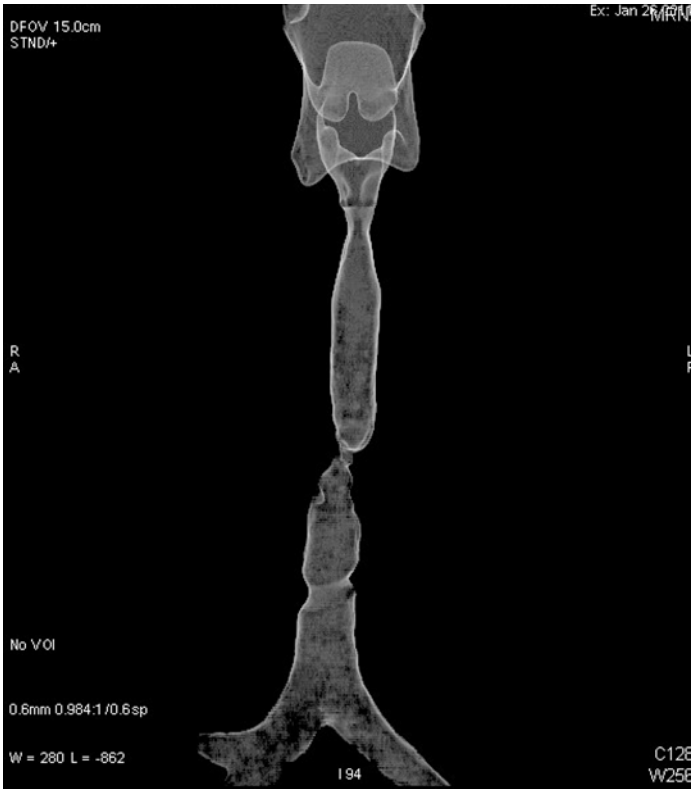
Endoscopic picture of leukoplakia of both vocal cords. This patient only had dysplasia on histology.



Same picture altered using AI to demonstrate disease progression to laryngeal cancer and airway obstruction.

Tracheal or laryngeal stenosis

- Can be congenital or acquired
- The majority you see will typically be acquired after intubation
- Risk factors associated with intubation includes
    - The time
        - The longer, the worse
    - The quality of intubation
        - Number of attempts
        - “Crash” intubation
        - Pressure of the cuff
        - Movement of the patient
    - Patient factors
        - Inherent tendency to make scar tissue (think keloids)
        - Blood pressure
        - Haemoglobin / Albumin levels
        - Infections
        - Reflux
- The pathogenesis involves necrosis of the mucosa as soon as the cuff pressure exceeds the capillary pressure
- These patients are almost invariably diagnosed as having asthma once discharged. The key is that they do not respond to medications
- Sometimes, patients present with acute stridor on extubating and require immediate airway intervention
- Tracheostomy placement in long term ventilated patients lowers the risk to develop tracheal injuries significantly. In general, the earlier a tracheostomy is done, the better



CAST reformation from a CT scan showing a tracheal stenosis.

This link is of a video of a patient with tracheal stenosis: https://youtu.be/cb0ol-C4B40

Angioneurotic oedema

- Swelling of the face, mouth, tongue, larynx, hands, or feet over a period of minutes to hours
- Can be heredity or acquired
- Triggers can be
    - Allergy to foods
    - Medications
        - ACE inhibitors
    - Specific factors in heredity angioneurotic oedema such as touch, pressure, thermal
- If it leads to airway compromise and stridor, intubation or a tracheostomy may be required

Anaphylaxis

- Causes
    - IgE mediated
        - Antibiotics
            - Penicillin, Cephalosporin, Tetracyclin, Vancomycin, Chlooramphenicol, Bacitracin, Neomycin, Amphotericin B
            - Allergens
                - Bees, Horses
            - Complement
    - Food
        - Milk, Eggs, Nuts, Fish, Legumes, Bananas, Beetroot, Mango, Kiwi fruit
    - Foreign protiens
        - Bees
        - Serum, ACTH, Insuline, PTH

    - Drugs
        - Allergen extracts, Muscle relaxants, Steroids, Vaccines, Streptokinase
    - Immune complex / Complement mediated
        - Blood, Ig, Plasma
        - Metrotrexate
    - Arachidonic acid pathway
        - Aspirin
        - NSAIDS
        - Tartrazine
        - Benzoate
    - Direct histamine release
        - Opiates
        - Curare / Alkaloids
        - Dextrose
        - Contras
        - Mannitol
- Risk factors
    - Pre-existing asthma
    - Current asthma attack
    - Food allergies
        - Especially peanuts, tree nuts, and shellfish
    - Reaction to trace amount of foods
    - Use of non-selective β-blockers
- Initially missed diagnosed and treated as asthma
- Early administration of adrenaline is of utmost importance
- Please consult the resuscitation council of South Africa's website at: https://resus.co.za/subpages/RCSA_Information/Resources/Algorithms.html

EMERGENCY MANAGEMENT OF ADULT & CHILD ANAPHYLAXIS

1 RECOGNIZE THE SUDDEN ONSET OF EITHER:

EXPOSURE TO KNOWN OR UNKNOWN ALLERGEN

- **SKIN/MUCOSAL INVOLVEMENT** (rash, swelling) **AND ANY OF:**
- **RESPIRATORY COMPROMISE** (dyspnoea, wheeze), **OR**
- **CARDIOVASCULAR DYSFUNCTION, OR**
- **SEVERE GASTROINTESTINAL SYMPTOMS** (abdominal pain, repetitive vomiting)

AFTER EXPOSURE TO KNOWN ALLERGEN

- **RESPIRATORY DIFFICULTY** (stridor, voice change, wheeze, hypoxaemia, distress)

AND/OR:

- **CARDIOVASCULAR DYSFUNCTION** (shock, hypotension, syncope, collapse)

(No need for skin or mucous membrane involvement)

2 IMMEDIATE TREATMENT:

- ⊘ REMOVE EXPOSURE
- ⓘ CALL FOR HELP

ADRENALINE

1mg/ml (1:1000) - 0.01mg/kg IM (Max 0,5ml IM) anterolat aspect of thigh
Repeat every 5-15 minutes if no improvement or use an **auto-injector**
<6yrs - 0,15ml IM; 6-12 yrs - 0,3ml IM; >12 yrs - 0,5ml IM

3 ASSESS VITAL SIGNS: OXYGEN - MONITORS - IV ACCESS

High flow oxygen, maintain patent airway (Intubate/Cricothyrotomy if necessary)
High flow IV line, BP, Sats, ECG monitoring
Lie patient supine with legs elevated if hypotensive

4 ADJUNCTIVE TREATMENT IF NECESSARY

H1 ANTIHISTAMINE
Promethazine
2-6 yrs - 6,25mg IM or slow IV
6-12 yrs - 12,5mg IM or slow IV
>12 yrs - 25mg IM or slow IV
(Avoid if <2yrs old and low BP)

CRYSTALLOID
(e.g. **Ringers/Balsol**)
Rapid infusion of 20ml/kg (max 1-2 litres)
Repeat IV infusion as necessary
Adrenaline infusion (0,1 - 1 ug/kg/min)
ONLY if unresponsive to IM adrenaline & fluids

NEBULISED BRONCHODILATORS
Every 15-20 mins if severe bronchospasm
Salbutamol 5mg
WITH
Ipratropium 0,5mg

H2 RECEPTOR ANTAGONIST
Cimetidine
IM or Slow IV
5mg/kg (Max - 300mg)
Diluted in 20ml over 2 min

CORTICOSTEROIDS
Hydrocortisone
IM or Slow IV
<1 yr - 25mg; 1-6 yrs - 50mg;
6-12 yrs - 100mg; >12 yrs - 200mg

GLUCAGON
20ug/kg (Max 1-2mg)
IM or slow IV every 5 mins if unresponsive to adrenaline (Look out for vomiting and hyperglycaemia)

RISK REDUCTION STRATEGIES

- Only discharge patient if clinically stable 4-6 hours after resuscitation (may need longer if at risk of biphasic reaction)
- Provide a written anaphylaxis emergency action plan, including how to administer IM adrenaline
- Refer to specialist for investigation and management
- Provide patient eduction (www.allergyfoundation.co.za) and medic-alert bracelet

FAQ's:

When is it appropriate to initiate treatment for Anaphylaxis?
Treat anaphylaxis at diagnosis with IMI adrenaline even if severe respiratory or cardiovascular symptoms are not (yet) present.
Why are Antihistamines considered adjunctive treatment?
H1-antihistamines may relieve itching and urticaria but do not prevent or relieve life-threatening symptoms of anaphylaxis. Antihistamines should not be used alone, or instead of adrenaline, for anaphylaxis.

Version May 2024

Ref: Cardona et al. World allergy organization anaphylaxis guidance. WAOJ;13(10):2020.

Difficult Airway Society

The following article also provides an excellent overview of the approach to a difficult airway more in the context of theatre.

Difficult Airway Society 2025 guidelines for management of unanticipated difficult tracheal intubation in adults.
https://www.sciencedirect.com/science/article/pii/S0007091225006932