STERTOR & STRIDOR

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DEFINITION

Stridor is noisy respiration produced by turbulent airflow through the narrowed air passages. It may have a musical quality .

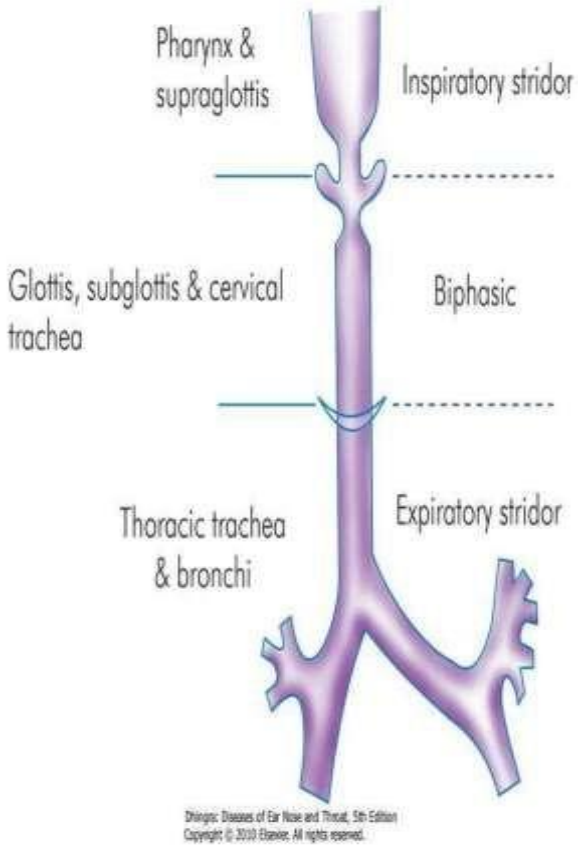
Stertor

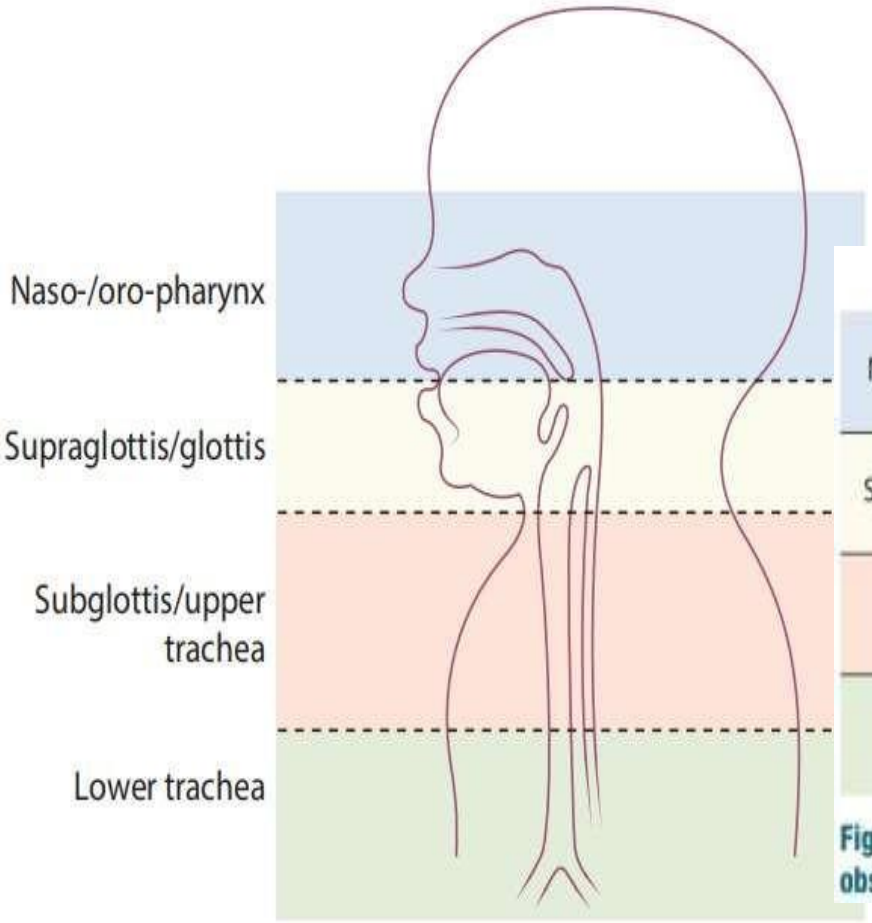
It is low-pitched snoring type of noise made by naso- and oropharyngeal obstruction (and rarely by the supraglottic larynx) has a rougher quality .

A rigid differentiation between stridor and stertor cannot always be made .

Types of Stridor

- Stridor may be inspiratory, expiratory, or biphasic depending on its timing in the respiratory cycle.
- **Inspiratory stridor** is often produced in obstructive lesions of supraglottis or pharynx, e.g. laryngomalacia or retropharyngeal abscess.
- **Expiratory stridor** is produced in lesions of thoracic trachea , primary and secondary bronchi, e.g. bronchial foreign body , and tracheal stenosis.
- **Biphasic stridor** is seen in lesions of glottis, subglottis and cervical trachea, e.g. laryngeal papillomas , vocal cord paralysis and subglottis stenosis.





	Airway noise	Voice/cry	Cough
Naso-/oro-pharynx	Stertor	Muffled	Typically absent
Supraglottis/glottis	Stridor-inspiratory	Hoarse (glottis)	Barking
Subglottis/upper trachea	Stridor-biphasic	Unchanged	Brassy
Lower trachea	Stridor-exspiratory	Unchanged	Wet sounding

Figure 28.1 Clinical presentation according to level of upper airway obstruction.

How and Why Stridor occurs

- Any reductions to the airway diameter (such as inflammation, mucosal edema , foreign object, collapsing epiglottis) can result in further narrowing or obstruction of the airway . Due to this narrowing, it causes an exponential increase in airway resistance which makes it significantly difficult for the paitent to breathe.
- Neonates and young children develop upper airway obstruction and respiratory failure more readily than older children and adults .

HISTORY

Stridor is a physical sign and not a disease. It is important to elicit:

1. Perinatal history .
2. Time of onset - To find whether cause is congenital or acquired.
3. Mode of onset - Sudden onset (foreign body, oedema) , gradual and progressive (laryngomalacia, subglottic haemangioma, juvenile papillomas).
4. Duration - Short (foreign body, oedema, infections), long (laryngomalacia, laryngeal stenosis, subglottic haemangioma, anomalies of tongue and jaw).

5.Relation to feeding - Breastfed babies with airway obstruction will characteristically ‘come up for air’; bottle-fed babies may require thickened feeds or a ‘slow teat’ (i.e. one with small holes). Aspiration suggests vocal cord palsy, tracheoesophageal fistula, neuromuscular pathology or rarely a laryngeal cleft.
6.Cyanotic spells - Indicate need for airway maintenance.
7.Aspiration or ingestion of a foreign body.
8.Laryngeal trauma - Blunt injuries to larynx, intubation , endoscopy .

EXAMINATION

- Stridor is always associated with respiratory distress . There may be recession in suprasternal notch, sternum, intercostal spaces and epigastrium during inspiratory efforts.
- Note whether stridor is inspiratory , expiratory or biphasic which indicates the probable site of obstruction.
- Note associated characteristics of stridor.

  (a) Snoring or snorting sound—nasal or nasopharyngeal cause.

  (b) Gurgling sound and muffled voice—pharyngeal cause.

  (c) Hoarse cry or voice—laryngeal cause at vocal cords. Cry is normal in laryngomalacia and subglottic stenosis.

  (d)Expiratory wheeze—bronchial obstruction.

- Associated fever indicates infective condition, e.g. acute laryngitis, epiglottitis, laryngo-tracheo-bronchitis or diphtheria.

- Pattern of Stridor

  Typically, laryngomalacia – as with other laryngotracheal causes of stridor – is better when the child is at rest or asleep but made worse by crying, feeding and excitement.

  Upper airway obstruction at the level of the pharynx(such as adenotonsillar obstruction or a craniofacial anomaly) is in contrast worse when the child is asleep and is associated with stertor.

  Improvement in the airway with crying occurs in significant nasal obstruction such as bilateral choanal atresia.

- Stridor of laryngomalacia , micrognathia , macroglossia and innominate artery compression disappears when baby lies in prone position.
- Sequential auscultation with unaided ear and with stethoscope over the nose, open mouth, neck and the chest helps to localize the probable site of origin of stridor.
- Examine the ears, nose, throat , jaw and lastly neck with the usual caution that you must not use any instrumentation to examine the throat of child in whom pathology such as epiglottitis is suspected.
- Nasal flaring and head bobbing are important and concerning signs, as is abnormal posturing .

Stridor

Congenital

- Laryngomalacia
- Laryngeal web
- Subglottic stenosis
- Haemangioma
- Vocal cord paralysis
- Tongue and jaw abnormalities

Acquired

Afebrile

- Papillomatosis
- Injury
- Foreign body
- Laryngeal oedema
- Adenotonsillar hypertrophy

Febrile

- Epiglottitis
- Acute laryngitis
- Laryngotracheitis
- Diphtheria
- Retropharyngeal abscess
- Infectious mononucleosis
- Peritonsillar abscess

CAUSES Based ON ANATOMICAL LOCATION

- Nose - Choanal atresia in newborn.
- Tongue - Macroglossia due to cretinism, haemangioma or lymphangioma , dermoid at base of tongue , lingual thyroid.
- Mandible – Micrognathia , Pierre-Robin syndrome .In these cases, stridor is due to falling back of tongue.
- Pharynx - Congenital dermoid, adenotonsillar hypertrophy, retropharyngeal abscess , tumours .

- Larynx –
  - (a) Congenital -Laryngeal web, laryngomalacia , cysts , vocal cord paralysis, subglottic stenosis
  - (b) Inflammatory. - Epiglottitis, laryngotracheitis, diphtheria, tuberculosis.
  - (c) Neoplastic - Haemangioma and juvenile multiple papillomas, carcinoma in adults.
  - (d) Traumatic - Injuries of larynx, foreign bodies, oedema following endoscopy, or prolonged intubation.
  - (e) Neurogenic - Laryngeal paralysis due to acquired lesions.
  - (f) Miscellaneous - Tetanus, tetany, laryngismus stridulus.
- Trachea and bronchi
  - (a) Congenital - Atresia, stenosis, tracheomalacia.
  - (a) Inflammatory - Tracheobronchitis.
  - (b) Neoplastic - Tumours of trachea.
  - (c) Traumatic - Foreign body, stenosis trachea (e.g. following prolonged intubation or tracheostomy)

- Lesions outside respiratory tract

  (a) Congenital - Vascular rings (cause stridor and dysphagia), oesophageal atresia, tracheo-oesophageal fistula, congenital goitre, cystic hygroma.

  (b) Inflammatory - Retropharyngeal and retro-oesophageal abscess.

  (c)Traumatic - FB oesophagus (secondary tracheal compression).

  (d)Tumours - Masses in neck.

ACUTE VS CHRONIC STRIDOR

- ACUTE ONSET STRIDOR
  - Laryngotracheobronchitis
  - Foreign body aspiration
  - Bacterial tracheitis
  - Retropharyngeal abscess
  - Peritonsillar abscess
  - Allergic reaction
  - Epiglottitis

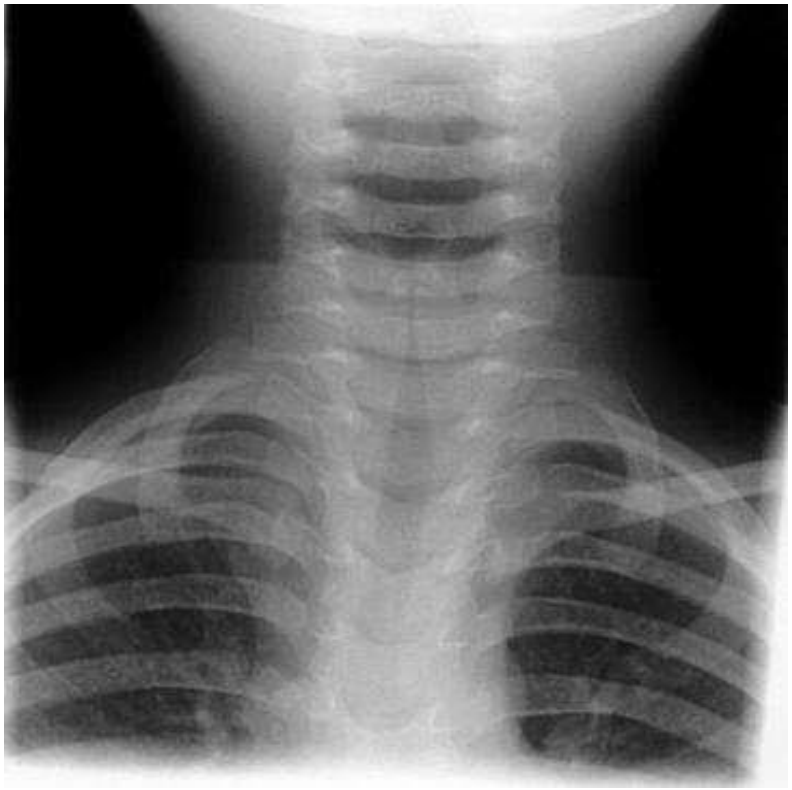
- CHRONIC STRIDOR
  - Laryngomalacia
  - Subglottic stenosis
  - Laryngeal webs , cysts
  - Laryngeal papillomas
  - Vocal cord dysfunction (unilateral or bilateral paralysis)
  - Tracheomalacia
  - Tracheal stenosis

INVESTIGATIONS

- X ray
- CT and MRI
- Respiratory function tests
- Layrngoscopy
- Endoscopy

X-RAY

- Plain X-ray: including lateral soft tissue X-ray of the head, neck & upper thorax, may show soft tissue mass obstructing the airways. Also We send the patient for plain CXR.



Steeple sign

-signifies the subglottic narrowing

-usually seen in croup

- **CT AND MRI**
  - CT and MRI can demonstrate the configuration of thoracic vasculature in cases of extrinsic tracheal compression
  - CT scan with contrast is helpful for mediastinal mass andother congenital vascular anomalies compressing the trachea or bronchi, e.g. anomalous innominate artery, double aortic arch or an anomalous left pulmonary artery forming a sling around the trachea .

- **Respiratory function tests**
  - Lung function tests such as flow-volume-loops provide a graphical representation of inspiratory and expiratory flow. This can help to localize the site of obstruction ; it may differentiate between intra- and extrathoracic obstruction .

- **Barium swallow & angiogram & thyroid scan:** to see if there is pressure on the airway from the esophagus, large blood vessels & thyroid gland respectively.

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Endoscopy :

under local or general anesthesia, using rigid or fiberoptic endoscopes. Examination of nose, post nasal space hypopharynx & larynx can be done.

- Flexible fibreoptic laryngoscopy.
  - It can be done under topical anaesthesia as an outdoor procedure and allows examination of nose, nasopharynx and larynx. It helps in thediagnosis of laryngomalacia, vocal cord paralysis, laryngeal papillomas, laryngeal cysts and congenital anomalies of larynx, e.g. laryngeal web or clefts.

LARYNGOTRACHEOBRONCHOSCOPY

- It is the gold standard in the assessment of the stridulous child .
- It is a highly technical procedure and requires a whole team of surgeon , anesthetist and nurse .
- It includes Laryngotracheoscopy and Bronchoscopy techniques.

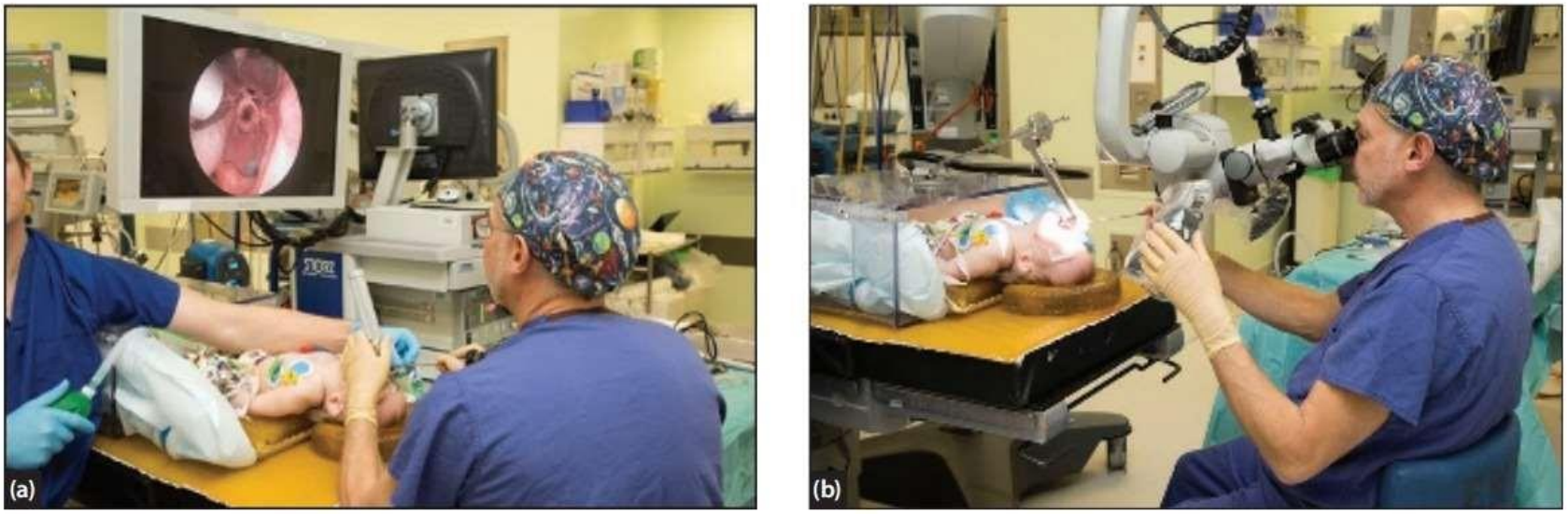
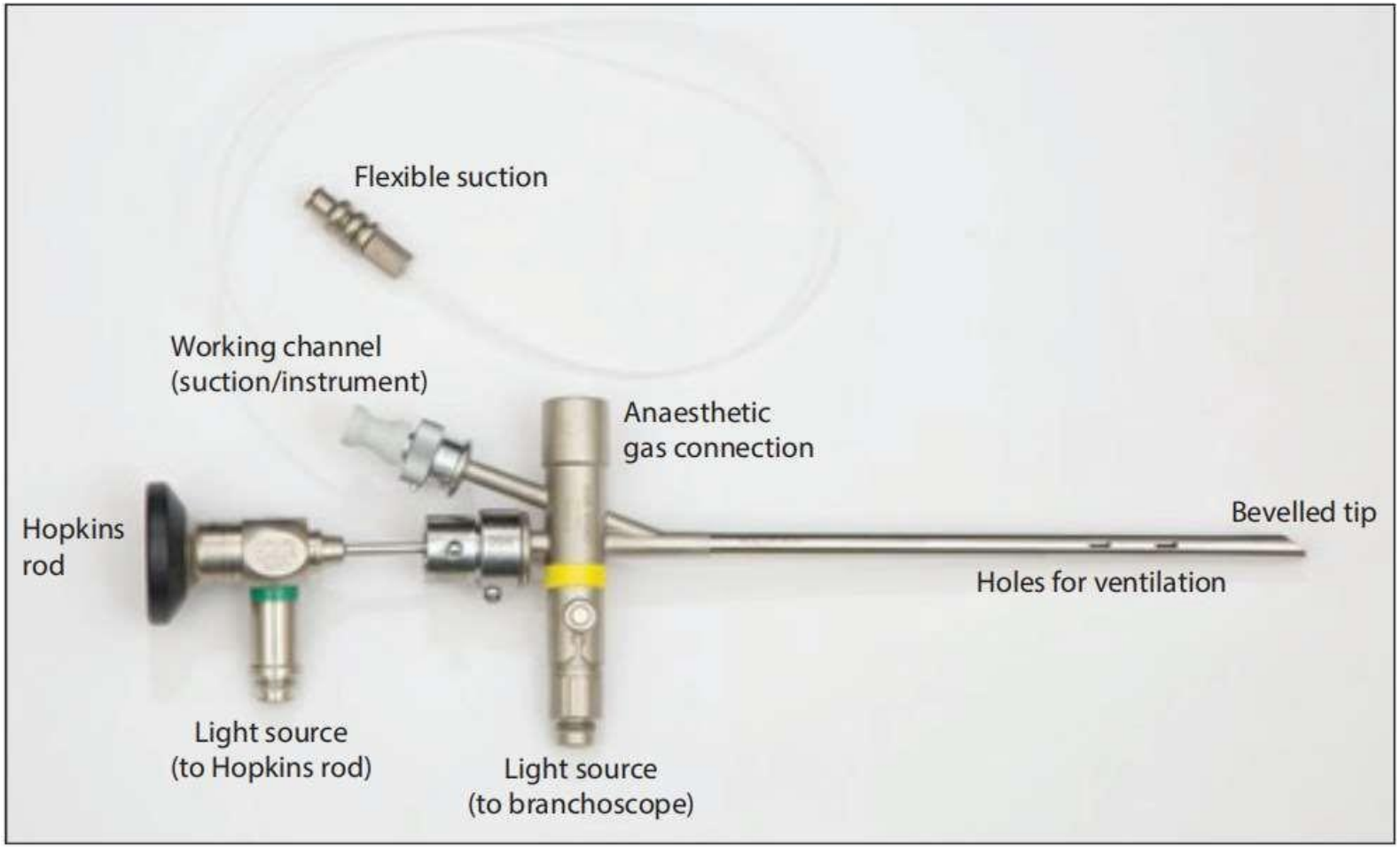


Figure 28.5 Laryngotracheobronchoscopy. **(a)** Handheld laryngoscope and Hopkins rod technique. **(b)** Supension laryngoscopy and microscope technique.

VENTILATING BRONCHOSCOPE



Management of Stridor

Medical management

- Oxygen therapy
  - With an obstruction to airflow and normal alveolar function, raising the concentration of inspired oxygen will reduce the ventilatory requirement to maintain adequate oxygen saturation levels
- Humdification therapy
- Helium-Oxygen mixtures
  - Addition of helium to inspired gases is associated with a reduction in the turbulence of flow . Thus recognized to decrease airway resistance and have been used in the management of patients with upper airway obstruction.

Pharmacotherapy

- Klassen summarizes: ‘All children with croup symptoms who demonstrate increased work of breathing in the clinics or emergency departments should be treated with glucocorticoids.
- This treatment may be with nebulized budesonide (2mg) or oral or intramuscular dexamethasone (0.15–0.6mg/kg h). Oral glucocorticoids such as dexamethasone and prednisolone may be the best options due to ease of administration, widespread availability, and lower cost.
- A nebulizer should be applied only if it does not increase the distress of the patient.

SURGICAL MANAGEMENT

- Endotracheal intubation is preferable to emergency tracheostomy . Intubation may not be possible in all cases, despite anaesthetic skill, careful planning and monitoring. Severe subglottic stenosis, impacted foreign bodies may neccesiate a tracheostomy .
- Even if an initial intubation is oral, which tends to be easier, the tube should be replaced with a nasal tube; this may be more secure and better tolerated .
- If the secretions are very tenacious or there is still an element of airway obstruction, a ventilating bronchoscope should be passed to exclude bacterial tracheitis or a foreign body.Significant tracheobronchomalacia is another reason for continuing airway difficulty after intubation and this will usually respond to CPAP.

- Emergency Tracheostomy should be done in cases where intubation is not possible

Laryngeal trauma

Three poor prognostic features in acute blunt laryngeal injuries include

1- early airway obstruction requiring tracheotomy
2- the presence of bare cartilage in the laryngeal lumen, &
3- fracture & collapse of cricoid.

The following symptoms are indicative of some derangement of laryngeal structure:

1. increasing airway obstruction with dyspnea & stridor.
2. Dysphonia or Aphonia.
3. Cough.
4. Hemoptysis.
5. Neck pain.
6. Dysphagia & odynophagia.

The signs may be

1. Deformities of the neck, including alteration in contour & swelling.

2. Subcutaneous emphysema.

3. Laryngeal tenderness.

4. Crepitus over the laryngeal framework.

Diagnosis

1. Indirect & direct laryngoscopy.

2. X-ray of the neck & chest must be taken to detect laryngeal fractures, tracheal injuries, & pneumothorax.

3. the CT scan is an excellent method of diagnosing hyoid fractures, fracture dislocation of thyroid & cricoid cartilages, & distortion of laryngeal structures.

Treatment

1. Conservative treatment if small lacerations, ecchymoses or submucosal hematomas. Conservative management includes voice rest, humidification, bed rest, & systemic steroids.

2. Laryngeal exploration.

3. Establishment of the airway by tracheotomy or cricothyrotomy.

4. Stenting.

Foreign bodies in the larynx & tracheobronchial tree

It is the sixth most common cause of accidental death. 55% of aspirated foreign bodies involve the respiratory tract in children 6 months to 4 years of age. The accident is neither observed nor suspected in more than one third of these cases.

The commonest site is right bronchial tree because it is wider& shorter than left one.

History: sudden onset of choking with paroxysmal cough, noisy breathing, persistant fever in spite of traetment, recurrent pneumonia.

Examination: respiratoy distress, cyanosis, excessive salivation, abnormal cry sound,vital sign changes,may be medistanal shifting , obstructive emphysaema,
On auscultation: poor air entry, ronchi specialy unilateral ronchi .

Investigations: x-ray of the neck &chest(A-p view, lateral view), CT scan may be required.

Treatment:

All techniques used for aiding the obstructed patient in an emergency, such as pounding on the back, Heimlich maneuver, finger probing of the throat, are dangerous & are discouraged unless the airway obstruction is unrelieved by the patient's own reflexes. These techniques may result in further impaction & the possibility of a total obstruction that was not present before these attempts. General anesthesia is recommended. Foreign body removal is facilitated by the use of the ventilating rigid bronchoscope & optical forceps, which may be used in conjunction with rigid fiberoptic telescope.


THANK
YOU