Management of the Stridulos Child

Ryan W. Ridley, MD
Faculty Advisors: Harold Pine, MD & Shraddha Mukerji, MD
The University of Texas Medical Branch,
Department of Otolaryngology
Grand Rounds Presentation
April 30, 2009
Definitions

• **Stridor**
  – Harsh sound produced by turbulent airflow through a partial obstruction
  – May be soft and tuneful/musical quality
  – *Characteristic of certain pathology but never diagnostic*

• **Stertor**
  – Snoring type of noise often made by nasopharyngeal or oropharyngeal obstruction
  – May occasionally be created by supraglottic larynx
Pathophysiology of Stridor

- Based on Venturi principle
  - When a gas passes through a narrowed tube/trachea, the lateral pressure that has held the lumen open can drop very quickly causing the tube/lumen to close.
Venturi Vulnerability (Pathophys cont’d)

- Pediatric airway more flexible
- Forces exerted by Venturi principle cause the narrowed, flexible airway to be momentarily closed during either inspiration or expiration.
  - Pattern of intermittent flow creates pattern of vibrations yielding audible sounds
Anatomy

- Infant larynx situated high in the neck with epiglottis located behind soft palate.
- Pharyngeal structures in closer proximity compared to adult.
- Hyoid bone higher.
Anatomy

• Anatomic differences associated with infant airway create a separation between airway and digestive tract.
• Air movement is predominantly transnasal
• As child grows, larynx descends
  – Larger pharynx to facilitate speech production
  – Common conduit for food and air passage
    • Increases risk for foreign bodies, food, gastric contents to enter airway
Figure 26: Pediatric Airway
Anatomy of pediatric airway

Epiglottis
(floppier, u-shaped)

Airway
(more anterior and higher)

Tongue

Hyoid bone

Vocal cords

Thyroid cartilage

Cricoid ring
(Narrowest)

Trachea
(more flexible)

Funnel

Anterior

Posterior

SUSAN GILBERT
### TABLE 78.1 SIGNS AND SYMPTOMS OF AIRWAY OBSTRUCTION BY LOCATION

<table>
<thead>
<tr>
<th>Region</th>
<th>Voice</th>
<th>Stridor</th>
<th>Retractions</th>
<th>Feeding</th>
<th>Mouth</th>
<th>Cough</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Oropharyngeal</strong></td>
<td>Unaffected but can be throaty or full</td>
<td>Inspiratory and coarse; increases during sleep</td>
<td>Sternal and intercostal, increasing to total chest when severe</td>
<td>Difficult to impossible, with drooling or saliva</td>
<td>Open; jaw held forward</td>
<td>None</td>
</tr>
<tr>
<td><strong>Supraglottic laryngeal</strong></td>
<td>Muffled or throaty</td>
<td>Snoring; inspiratory; fluttering</td>
<td>None, until very late</td>
<td>Difficult to impossible</td>
<td>Open; jaw held forward</td>
<td>None</td>
</tr>
<tr>
<td><strong>Glottic</strong></td>
<td>Hoarse or aphonic</td>
<td>Inspiratory early; expiratory also as obstruction increases</td>
<td>Xiphoid early and intercostal later; suprasternal and supraclavicular</td>
<td>Normal, except with severe obstruction</td>
<td>May be closed; nares flared</td>
<td>None</td>
</tr>
<tr>
<td><strong>Subglottic</strong></td>
<td>Hoarse, but can be husky or normal</td>
<td>Inspiratory early; expiratory also as obstruction increases</td>
<td>Xiphoid early and intercostal later; suprasternal and supraclavicular</td>
<td>Normal, except with severe obstruction</td>
<td>May be closed; nares flared</td>
<td>Barking</td>
</tr>
<tr>
<td><strong>Tracheobronchial</strong></td>
<td>Normal</td>
<td>Expiratory and wheezing; becoming to and fro with increasing obstruction</td>
<td>None, except with severe obstruction; xiphoid and sternal</td>
<td>Normal, except with severe airway obstruction or when extrinsic obstruction involves esophagus</td>
<td>May be closed; nares flared</td>
<td>Brassy</td>
</tr>
</tbody>
</table>

A = 1/2 bh
A = 1/2 x 4 x 7
A = 14 sq mm

A = 1/2 bh
A = 1/2 x 2 x 5
A = 5 sq mm

5 is 35% of 14
Evaluation

• History
  – Helpful pneumonic: *SPECS-R*
    • Severity
    • Progression
    • Eating difficulties
    • Cyanosis
    • Sleep disturbance
    • Radiologic findings

*Don’t forget to inquire about birth history, maternal STD, history of intubation*
Inspiratory stridor

Biphasic stridor

Expiratory stridor
Physical Assessment
First Things First

• Assess severity/need for emergent airway (ABC’s)
  – Noninvasive inspection
  – Indicators of severity
    • Respiratory rate
    • Level of consciousness/mental status
    • Accessory muscle use
      – Signifies significant obstruction

• Auscultation
  – Lung fields
  – Neck
  – Mouth
  – Nose
Distress

Immediately suction

Place oral airway

Mask ventilate

Obstruction persists

Use Laryngoscope to visualize larynx

Patent Airway?

yes

Small ETT placed

No improvement=cause in lower airway,lung

Further investigation

No

Obstruction relieved

Congratulations!

Pathology readily seen by direct vision
Treat accordingly
The Truth about Cyanosis

• Late & inconsistent clue about respiratory failure in infant with stridor
• If cyanotic *w/o stridor* seek other causes
  – CNS
  – CV
  – GI
  – Pulm
Further Assessment

• If child d/n have impending respiratory failure, a more detailed physical exam should be performed
  – General (weight, growth percentile, development)
  – Nasal cavity, oral cavity and oropharynx more thoroughly examined
  – Flexible fiberoptic laryngoscopy
Endoscopy

- In unusual/difficult cases to determine etiology of stridor.
- Laryngoscope, Hopkins rod-lens telescopes, bronchoscope
  - Verify all equipment/light sources work!
- Trach tray in room just in case.
- Good communication between endoscopist and anesthesiologist is a must.
Outline

I. Nose & Nasopharynx
II. Oropharynx or hypopharynx
III. Supraglottic larynx
IV. Glottic larynx
V. Subglottic larynx
VI. Tracheobronchial

- Congenital
- Infectious
- Traumatic
- Neoplastic
- Vascular
- Iatrogenic
- Toxic/metabolic
Nose & Nasopharynx
Nose and Nasopharynx

**Congenital**
- Choanal atresia
- Pyriform aperture stenosis
- Craniofacial abnormalities

**Infectious/Inflammatory**
- Polyps
- Rhinitis
- Retropharyngeal abscess
- Adenoid hypertrophy

**Traumatic**
- Foreign body

**Neoplastic**
- Encephalocele
- Dermoid
- Glioma

**Vascular**

**Iatrogenic**

**Toxic**
Choanal Atresia (CA)

- Epidemiology
  - Rare: 1 in 10,000 births
  - Females > males
  - 50% unilateral, 50% bilateral
- 2 types: membranous or bony
  - 29% bony
  - 71% mixed bony-membranous (Brown et al, Laryngoscope 1996)
- Pathogenesis controversial
Choanal Atresia (CA)

- Clinical signs & sx
  - Respiratory distress/paradoxical cyanosis
  - Feeding difficulty
  - Associated abnormalities
    - C- Coloboma
    - H- Heart anomaly
    - A- Atresia of choana
    - R- Retarded growth
    - G- Genital hypoplasia
    - E- Ear anomalies and/or deafness

- Clues to diagnosis
  - Inability to pass 8 Fr catheter beyond 3.5 cm from nasal vestibule
  - Flexible scope hits a “brick wall” during exam
  - Mirror under nares fails to fog on expiration
  - Axial CT confirms diagnosis
Choanal Atresia (CA)

• Management
  – Initial McGovern nipple
    • Oral airway or McGovern nipple
  – Surgical
    • Transpalatal
      – Better visualization, high success rate
      – Can damage palate growth plate = cross bite deformities
    • Transnasal
      – Less blood loss, faster procedure
      – Increased CSF leak and meningitis risk
  • Laser
    – CO$_2$, KTP, Holmium:YAG
    – Good success with KTP + endoscopic techniques
    – Operating microscope with CO$_2$ laser also being employed
Congenital Nasal Pyriform Aperture Stenosis (CNPAS)

- Pathogenesis
  - Premature fusion and overgrowth of medial nasal processes
    - May result in a central megaincisor (60% of cases)
    - Could represent a microform of holoprosencephaly
      - Concomitant malfunction of pituitary/adrenal axis
  - May result in a central megaincisor (60% of cases)
  - Could represent a microform of holoprosencephaly
    - Concomitant malfunction of pituitary/adrenal axis

- Clinical picture
  - Very similar to CA
    - Respiratory distress
    - Feeding difficulty
    - Cyclical cyanosis
  - Exam reveals bony obstruction of vestibule
    - Inability to pass catheter/scope into nose

- Thin cut CT with emphasis on pyriform aperture is image modality of choice
Figure 1. Axial section showing nasal fossa stenosis.
Congenital Nasal Pyriform Aperture Stenosis

• Management
  – Initial approach is conservative
    • McGovern nipple, topical decongestants, corticosteroids
  – Surgical approach
    • Aperture widened via superior gingivolabial incision/premaxillary degloving.
    • Mucosa preserved, stents left in place 1-4 weeks

• Prognosis
  – Mild cases may resolve as the child grows
  – Usually excellent long term results with surgery
Oropharynx & hypopharynx
Oropharynx/hypopharynx

**Congenital**
- Glossoptosis/Macroglossia
- Lingual thyroid
- Vallecular cyst
- Craniofacial abnormality

**Infectious/Inflammatory**
- Retropharyngeal abscess
- Tonsil hypertrophy

**Traumatic**
- Foreign body

**Iatrogenic**
- Toxic

**Neoplastic**
- Dermoid
- Hemangioma
- Lymphangioma

**Vascular**
Retropharyngeal Abscess

- **Retropharyngeal space**
  - **Boundaries**
    - Superior: skull base
    - Inferior: As far as T6
    - Posterior: prevertebral fascia
    - Anterior:
      - Buccopharyngeal fascia
      - Pharyngobasilar fascia
    - Lateral: carotid sheath
  
  *communicates with parapharyngeal space!"
Retropharyngeal Abscess

- **Epidemiology**
  - Most cases occur in childhood
  - 70% of cases in children < 6 yrs old

- **Pathophysiology**
  - Suppuration of retropharyngeal space lymph nodes

- **Clinical symptoms**
  - Odynophagia
  - Worsening dysphagia

- **Physical exam**
  - Asymmetrical, posteriolateral pharyngeal swelling
  - Torticollis
  - Fever
  - Stridor
  - Drooling

- **Labs/imaging**
  - CBC w/ diff
  - Lateral neck films
    - Retropharyngeal tissue
      - At C2: <7mm
      - At C6: <14mm
  - CT neck w/ contrast
    - Distinguish cellulitis v. phlegmon v. abscess
Retropharyngeal Abscess

• Management
  – Cellulitis
    • Trial of IV antibiotics
      – Clindamycin or ampicillin-sulbactam
      – Repeat scan in 48hrs if no improvement
  – Abscess
    • Incision and drainage in OR
Enlarged prevertebral soft tissue
Supraglottic Larynx

**Congenital**
- Laryngomalacia
- Laryngocele/saccular cyst

**Infectious/Inflammatory**
- Epiglottitis
- Angioneurotic edema

**Traumatic**
- Foreign body

**Neoplastic**
- Hemangioma
- Lymphangioma
- Papilloma

**Iatrogenic**

**Vascular**

**Toxic**
Laryngomalacia

• General
  – Most common cause of congenital stridor
  – May manifest days/weeks after birth
  – Symptoms usually resolve by 12-18 months

• Pathophysiology
  – Stridor caused by prolapse of supraglottic structures into laryngeal inlet
Laryngomalacia

• Signs/Symptoms
  – low, pitched fluttering inspiratory stridor
    • Peaks at 6-9 months
    • Positional variations
    • Exacerbated by activity (i.e. feeding, exertion)
  – Rarely produces cyanosis
    • Cyanosis should prompt suspicion for other pathology
Laryngomalacia

- Physical exam
  - Fiberoptic laryngoscopy while child is awake
  - Direct laryngoscopy/bronchoscopy sometimes needed to rule out synchronous lesions
Laryngomalacia

• Management
  – Self-limited condition; majority of cases resolve
  – Surgical treatment (~10% of cases)
    • Supraglottoplasty
      – Indicated for cases with severe stridor, failure to thrive, apneas, cor pulmonale, pulmonary HTN
Laryngeal Cysts

- Rare form of stridor in infants
- Typical symptoms
  - Stridor
  - Feeding difficulty
  - Cyanosis
- Management
  - Endoscopic excision or unroofing
Laryngeal Cysts

- **Ductal Cysts**
  - Most common type
  - Etiology
    - Obstruction of mucous glands
  - Location
    - Anywhere in larynx but most commonly in supraglottis

- **Saccular Cysts**
  - Least common
  - Location
    - Laryngeal ventricle
    - Usually congenital in infants
    - No communication with laryngeal lumen
A large cyst in the vestibule of the larynx outgrowing the left glossoepiglottic fold
Glottic Larynx

**Congenital**
- Web/atresia
- Laryngeal cleft
- Stenosis
- Vocal cord paralysis

**Infectious/Inflammatory**
- Laryngitis

**Traumatic**
- Hematoma
- Fracture
- Foreign body
- Stenosis
- Vocal cord paralysis

**Neoplastic**
- Hemangioma
- Lymphangioma
- Papilloma
- Granuloma

**Vascular**

**Iatrogenic**
- Vocal cord paralysis

**Toxic**
Congenital Laryngeal Web

• **Pathogenesis**
  – Arise from failure of recanalization of larynx in embryo

• **Location**
  – Predominantly in the anterior glottis

• **Associated findings**
  – Severe webbing assoc. with subglottic stenosis.
  – Laryngeal atresia requires trach at birth
  – Anterior glottic webs assoc. w/ velocardiofacial syndrome (22q11 deletion) *(Oto Head & Neck 2004 130: 415-17)*

• **Symptoms**
  – Present with abnormal cry, stridor
Congenital Laryngeal Web

• Diagnostic endoscopy
  – Required for diagnosis
  – Other abnormalities must be ruled out as well

• Treatment
  – Simple incision for small webs
  – Laryngofissure with stenting for severe webbing.
  – Endoscopic laser treatment also an option
Posterior Laryngeal Cleft

• Pathogenesis
  – Failure of posterior larynx to fuse (may involve trachea)

• Symptoms
  – Aspiration and hoarseness
  – Usually no stridor

• Classification
  – Correlates with severity
    • Type I-IV
Posterior Laryngeal Cleft

- **Type I**
  - Interarytenoid cleft; superior to the glottis

- **Type II**
  - Partial cricoid cleft; extends inferior to the glottis and partially through the posterior lamina of the cricoid

- **Type III**
  - Total cricoid cleft, with or without extension into the cervical tracheoesophageal wall.

- **Type IV**
  - Laryngotracheoesophageal cleft extending beyond the thoracic inlet.
Type II Cleft
Vocal Cord Paralysis

- **General**
  - 10% of congenital laryngeal lesions
  - May be congenital or acquired
  - Most often cause is idiopathic

- **Etiologies**
  - Traumatic/iatrogenic
    - Obstetric/birth trauma
    - Cardiac surgery
    - Esophageal surgery
  - Other congenital abnormalities
    - Cardiac anomalies
    - CNS origin
      - Chiari malformation

Chiari malformation
Vocal Cord Paralysis

• Unilateral
  – Breathy voice/cry
  – Mild stridor and/or dyspnea
  – Aspiration
  – Treatment
    • Speech therapy
    • If tracheotomy needed, decannulation is usually possible as child/larynx develops

• Bilateral
  – Severe stridor
  – Aspiration
  – Treatment
    • tracheotomy usually required
    • Serial endoscopies
    • Surgery after at least 1 year after trach w/o improvement
Vocal Cord Paralysis

• Evaluation
  – Can be seen with FOL while pt is awake
  – Laryngotracheobronchoscopy must be performed
    • Must palpate arytenoids
    • Exclude synchronous lesions
  – MRI brain, brain stem, neck and chest reasonable if cause not obvious (course of vagus)
  – FEES/MBS may be utilized in cases of aspiration

• Management
  – VFP in infants usually resolves in 6-18mos
  – Scheduled monitoring is reasonable for first 2 yrs
  – Temporary tracheotomy may be necessary
Vocal Cord Paralysis

- Surgical methods
  - CO\textsubscript{2} transverse partial cordotomy
  - Costal cartilage grafting
  - Arytenoidopexy w/wo arytenoidectomy
    - CO\textsubscript{2} laser
    - External approach
Recurrent Respiratory Papillomatosis

• General
  – Rare, but most common neoplasm of larynx in children
    • 4.3/100,000=incidence of newly diagnosed RRP in children<15yo
  – Childhood and adult onset
    • Childhood onset
      – Often dx 2-4 yrs old
      – boys = girls
      – No gender/ethnic difference regarding surgical frequency
      – More aggressive
      – 19.7 surgeries per child
        » 4.4 per year
Recurrent Respiratory Papillomatosis

- **Etiology**
  - HPV types 6 & 11
    - Maternal-fetal transmission

- **Clinical features**
  - Hallmark triad:
    - Progressive hoarseness
    - Stridor
    - Respiratory distress
  - Most often present with dysphonia
  - Stridor is usually 2\textsuperscript{nd} symptom to manifest
    - Inspiratory biphasic
  - 1 year = duration of sx prior to diagnosis
## RRP Locations

<table>
<thead>
<tr>
<th>Site</th>
<th>Single lesion</th>
<th>Multiple lesions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supraglottic</td>
<td>5%</td>
<td>26%</td>
</tr>
<tr>
<td>Glottic</td>
<td>92%</td>
<td>97%</td>
</tr>
<tr>
<td>Subglottic</td>
<td>2%</td>
<td>38%</td>
</tr>
<tr>
<td>Tracheal</td>
<td>0</td>
<td>14%</td>
</tr>
<tr>
<td>Bronchopulmonary</td>
<td>0</td>
<td>4%</td>
</tr>
</tbody>
</table>
Papilloma
Recurrent Respiratory Papillomatosis

Treatment Modalities

- **Surgical**
  - Microlaryngoscopy with cups forceps removal
  - Microdebrider
  - CO₂ laser
  - Phono-Microsurgical
  - KTP/Nd:YAG laser
  - Flash scan lasers

- **Adjuvant**
  - α-Interferon
  - Indole-3-carbinol
  - Photodynamic therapy
  - Cidofovir
  - Acyclovir
  - Ribavirin
  - Retinoic acid
  - Mumps vaccine
  - Methotrexate
  - Hsp E7
Subglottic Larynx
Subglottic Larynx

**Congenital**
- Stenosis
- Cysts

**Infectious/Inflammatory**
- Croup
- Stenosis

**Toxic**

**Iatrogenic**

**Vascular**

**Neoplastic**
- Hemangioma
- Papilloma

**Traumatic**
- Chondritis
- Stenosis
- Fracture
- Foreign body
Subglottic Stenosis

- **Congenital**
  - Dx made in absence of factors causing acquired stenosis
  - Moderate-severe stenosis = Stridor at birth.
  - Mild stenosis = Intermittent stridor

- **Acquired**
  - More common than congenital
  - Usually more severe and difficult to manage
  - Endotracheal intubation trauma = most common cause
Subglottic Stenosis

• Clinical signs/symptoms
  – Degree of stenosis dictates symptoms
    • Severe stenosis, infant may have stridor at birth
    • Mild stenosis may not manifest until URI takes place.
  – In acquired SGS, a clue in neonates may be failed extubation trial.
    • Older children may successfully extubate but present later with progressive worsening respiratory distress
<table>
<thead>
<tr>
<th>Classification</th>
<th>From</th>
<th>To</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade I</td>
<td>No Obstruction</td>
<td>50% Obstruction</td>
</tr>
<tr>
<td>Grade II</td>
<td>51% Obstruction</td>
<td>70% Obstruction</td>
</tr>
<tr>
<td>Grade III</td>
<td>71% Obstruction</td>
<td>99% Obstruction</td>
</tr>
<tr>
<td>Grade IV</td>
<td>No Detectable Lumen</td>
<td></td>
</tr>
</tbody>
</table>

Copyright © The McGraw-Hill Companies, Inc. All rights reserved.
Subglottic Stenosis

• Evaluation
  – Stenosis may be visualized on plain films
  – Direct laryngoscopy/tracheoscopy needed for confirmation and airway may be staged at this point.

• Prevention
  – Use of uncuffed, polyvinylchloride ETT
  – Smaller tubes
  – Nasotracheal intubation
Subglottic Stenosis

- Treatment options
  - Primary goal is to achieve decannulation (if tracheostomy present) or prevent tracheostomy
  - Conservative
    - Observation (grades I-II)
  - Temporizing measure
    - Tracheostomy

- Definitive Surgical Options
  - Endoscopic methods
    - Laser
  - Anterior cricoid split
  - Laryngotracheal reconstruction
  - Cricotracheal resection
Subglottic Hemangioma

• General
  – 1.5% of all congenital laryngeal anomalies
  – 2:1 female to male ratio
  – Most common neoplasm of infant airway

• Clinical
  – Usually asymptomatic at birth.
  – Biphasic stridor in first 6 months=presenting symptom
  – Cutaneous hemangiomas in 50% at time of dx
  – Lesion characterized by rapid growth that ceases at 12 months.
    • May resolve by 5 yrs
Subglottic Stenosis

Intubation

Pressure necrosis on subglottic mucosa

Edema & ulceration

Secondary infection & perichondritis

Granulation tissue

Fibrous tissue deposition

Stenosis!
Subglottic Hemangioma

• **Diagnosis**
  – Biopsy unnecessary due to pathognomonic appearance
    • Compressible, submucosal mass
    • Reddish or bluish hue
    • Asymmetric
    • Posterior left subglottis
  – Laryngotracheobronchoscopy is method of choice
Subglottic Hemangioma

• Objectives of treatment
  – Preserve stable airway while mitigating the long term sequelae of the treatment

• Current treatment modalities
  – Tracheotomy
    • Temporary
  – Steroids
  – Laser excision
  – Surgical excision
  – Interferon
Tracheobronchial
Congenital
Stenosis/Web
Vascular ring/sling,
Complete tracheal rings
Foregut cysts
TE fistula

Infectious/Inflammatory
Bacterial tracheitis
Bronchitis
Asthma (RAD)*

Traumatic
Foreign body

Toxic

Iatrogenic

Vascular
Vascular rings

Neoplastic
Mediastinal tumors
Thyroid
Thymus
Papilloma
Vascular Causes

• General
  – Congenital vascular anomalies = 5% of stridor cases
  – Symptoms caused by tracheal/bronchial external compression
  – Main culprits:
    • Innominate artery compression
    • Vascular ring (double aortic arch)
    • Pulmonary artery sling
    • Aberrant right subclavian artery
      – Most common anomaly in mediastinum
Vascular Causes

- **Double aortic arch**
  - Persistence of fourth branchial arch and dorsal aortic root bilaterally
  - Most common symptomatic vascular ring

- **Pulmonary artery sling**
  - Most symptomatic of noncircumferential anomalies
  - Right mainstem bronchus affected in majority of cases
  - Associated with presence of complete tracheal rings
Double Aortic Arch  Pulmonary Artery Sling
Vascular Causes

• Presentation
  – May be subtle
  – Can present with biphasic stridor/expiratory grunting
    • Chronic cough
    • Recurrent bronchitis
    • Pneumonia
    • Feeding difficulty
    • Failure to thrive
Vascular Causes

- **Diagnostic imaging**
  - Plain films of limited value
  - Barium esophagram may reveal characteristic filling defects
  - CT w/ contrast or MRI is modality of choice

- **Endoscopy**
  - Allows greater assessment of degree of compression
Contrast CT scan showing vascular ring
Vascular Causes

• Surgery
  – Absolute indications:
    • Reflex apnea
    • 48 hrs of medical mgmt failure
    • Prolonged intubation
  – Relative indications
    • Recurrent infections
    • Exercise intolerance
    • Dysphagia causing failure to thrive
    • Concomitant SGS
    • Asthma
    • CF
Tracheomalacia

- Congenital deformity of tracheal rings
- Expiratory stridor/respiratory distress
  - Depends on extent of lesion
- Diagnosis
  - Flexible bronchoscopy with awake patient
    - Collapse of anterior tracheal wall against membranous posterior portion
- Treatment rarely needed as most cases are self limited
  - Some cases may need temporary tracheotomy
  - In secondary tracheomalacia, treatment directed at underlying cause.
Tracheomalacia
Foreign Body Aspiration

• General
  – Most pts < age 3
  – Approx 150 pediatric deaths/year in US
  – Choking=40% accidental deaths in children <1yo

• Pathogenesis
  – Kids being kids…
Foreign Body Aspiration

- Most common objects
  - Coins most commonly ingested
  - Food most commonly aspirated
    - Nuts
    - Seeds
  - Fish/chicken bones in older children
Foreign Body Aspiration

- Esophageal
  - Drooling
  - Dysphagia
  - Emesis
  - Chest pain

- Airway
  - Cough
  - Stridor
  - Cyanosis
  - Wheezing
  - Asymmetric breath sounds
Foreign Body Aspiration

• Imaging studies
  – PA and lateral CXR good for radio-opaque objects
    • Still useful despite lack of obvious foreign body

• Rigid Endoscopy
  – Warranted when clinical suspicion is high despite “innocent/negative” films
  – Airway FB should be dealt with at time of presentation if pt is unstable
  – It is possible to observe esophageal foreign body in hopes of spontaneous passage (mid/distal esophagus)
    • Disc battery requires OR removal promptly
Foreign Body Aspiration

• Prevention
  – Consumer Products Safety Act 1979
    • Objects must be > 3.17 cm diameter and > 5.71 cm in length
      – Poorly enforced
  – Beware of school supplies
<table>
<thead>
<tr>
<th>Croup</th>
<th>Epiglottis</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Onset</strong></td>
<td>2yo</td>
</tr>
<tr>
<td><strong>Etiology</strong></td>
<td>Parainfluenza virus type 1</td>
</tr>
<tr>
<td><strong>Symptoms/Signs</strong></td>
<td>Barking cough, inspiratory stridor</td>
</tr>
<tr>
<td><strong>Diagnostic</strong></td>
<td>AP neck film=“steeple sign”</td>
</tr>
<tr>
<td><strong>Treatment</strong></td>
<td>Racemic epi, corticosteroid, humidified O2</td>
</tr>
</tbody>
</table>
“Steeple Sign”

“Thumb Sign”

Bailey, B. Head and Neck Surgery-Otolaryngology. 4th ed.


Harris J, Robert E, Kallen B. Epidemiology of choanal atresia with specific reference to CHARGE association. Pediatrics 1997; 99:363-367


http://emedicine.medscape.com/article/995267-overview


Kirse D, Roberson D: Surgical management of retropharyngeal space infections in children. Laryngoscope 2001; 111:1413


Yates Philip D, Anari Shahram, "Chapter 32. Stridor in Children" (Chapter). Lalwani AK: CURRENT Diagnosis & Treatment in Otolaryngology—Head & Neck Surgery, 2nd Edition
