Stertor, Stridor, and Squeaky Babies: A Practical Approach

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Disclosures

• None
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Objectives

• Adequately assess and characterize normal and abnormal pediatric airway sounds
• Form a differential diagnosis for children with abnormal airway sounds
• Understand diagnostic and practical approaches in evaluating and treating children with noisy breathing
• Review management of specific diagnoses
Anatomy Prone to Obstruction

- Obligate nasal breathers
- Prominent occiput
  - Flexion of the neck in a supine position
- Low skull base
- Immature support, tone and sensation
- Large tongue
- Anterior and cephalad larynx
- Epiglottis
  - Soft, omega shaped, vertically positioned
- Developing lymphoid system
- The cricoid is the narrowest portion
  - Non-distensible
- **THE PASSAGEWAYS ARE JUST SMALL!!!!**
So where do the sounds come from?

- Nose
- Oral cavity/Oropharynx
- Hypopharynx/Supraglottis
- Subglottis
- Trachea
- Lower airway
Airway Noises

• Stertor-low pitched inspiratory
• Supraglottic Lesions
  – Inspiration
• Tracheal/intrathoracic lesions
  (Tracheomalacia)
  – Expiration
• Fixed (vocal fold paralysis, croup, laryngeal mass or web)
  – Biphasic
• Wheeze-musical, high pitched, expiration
Where from here?

• A good ear
• Watch the child
• Pay attention to the clues
Workup

• Clinical exam is KEY
  – May not be time for labs, imaging or blood gasses
• HPI
  – Sudden/acute/intermittent
  – Relation to feeding or choking
  – Positional
  – Cry
  – Apnea
  – Cyanotic events
• Associated symptoms (fever, voice changes, swelling)
• Allergen or smoke exposure
PMH

• Birth history
  – Gestation < 32 weeks
  – Intubation
  – Nasogastric feeding
  – Nasal CPAP
  – Cardiac

• Other problems
  – Bronchopulmonary Dysplasia
  – Syndromic
  – Craniofacial anomalies

• Surgery
  – PDA/Cardiac
Exam

- Respiratory rate
- Posture
- Drooling
- Saturation
- Craniofacial abnormalities
- Neck masses or adenopathy
- Retractions
- Complete exam
  - HEENT
  - Lungs
  - Heart
Start thinking.....

• Sudden onset: foreign body or anaphylaxis
• Fever/toxic appearing/drooling/leaning forward: epiglottitis, tracheitis, retropharyngeal abscess
• Previous intubation: subglottic stenosis
• Surgery: vocal fold immobility
Physical Examination

Let parent hold child

Mirror for nasal airflow
Physical Examination

• “Headless” stethoscope
Flexible Fiber optic Nasolaryngoscopy

- Gold standard of office evaluation
  - Dynamic assessment
  - Easy to do
  - Minimal morbidity
  - Well tolerated

Pearl: Let the parent do the holding. But always have an assistant available
Record if possible
Differential diagnosis
Nasal

- Neonatal rhinitis
- Nasolacrimal duct cyst
- Low skull base/adenoid
- Pyriform aperture stenosis
- Choanal stenosis/atresia
Oral Cavity / Oropharynx

- Congenital cysts
- Ranula
- Enlarged tongue base
- Retrognathia
Vallecular Cyst
Hypopharynx/Supraglottis

- Reflux
- Laryngomalacia
  - Floppers
  - Curlers
Glottis

- Vocal Fold Immobility
  - Bilateral
  - Unilateral
- Webs
- Congenital cyst
- Trauma/granuloma
- Neurologic
Subglottis / trachea

- Croup
- Subglottic stenosis
- Subglottic hemangioma
- Subglottic cyst
- Tracheoesophageal fistula
- Vascular compression
Lower airway

- Reactive airway disease
- Asthma
- Bronchopulmonary dysplasia
- Restrictive lung disease
So what do you do?
The child does not look stable.

Initial Management

• Keep the child comfortable
• Avoid tongue depressor, IVs
• Apply oxygen by the least threatening method
• Wait for a secure environment before sedation
• Do not rely on pulse oximeter
  – Poor indicator of airway obstruction
Special Challenges During Airway Procedures

• Anesthesia
  • Patient requires alveolar ventilation and adequate gas exchange via an (often) compromised airway

• Otolaryngology
  • Unobstructed view of airway
  • Surgical access to airway
  • Preservation of dynamic airway function

• Nurses and techs
  • Organized and available equipment
  • Focus on the patient
Successful Airway Management

• Cooperation
• Communication
• Understanding
  – Concerns/Needs
  – Techniques
• Proper Instrumentation
To bronch or not to bronch?

- Unable to explain based on physical exam
- Out of proportion to physical exam
- Risk factors for subglottic or tracheal obstruction by history
- You suspect lower airway pathology
- What if the bronch is normal?

Pearl: Anxiety (yours or caretaker) is an indication for bronchoscopy
Admit for an Airway Watch?

- Full monitoring especially while asleep and during feeds
- Polysomnography?
- pH or impedance probe?
- Interventions
  - Nasal airway
  - Nasal cannula
- Does it improve safety?
Apparent Life Threatening Event (ALTE)

- NIH Consensus conference 1986
  - “an episode that is frightening to the observer and that is characterized by some combination of apnea (central or occasionally obstructive), color change (usually cyanotic or pallid but occasionally erythematous or plethoric), marked change in muscle tone (usually marked limpness), choking, or gagging. In some cases, the observer fears that the infant has died.”
ALTE

- Common
  - 0.6 cases/1000 live births
  - 0.6%-0.8% of ED visits for children under 1 year of age
- Definitive diagnosis in less than 50%
- Numerous reports of airway abnormalities
ALTE

• So who needs to see ENT
  – Visibly obstructed breathing correlated with event
  – Risk factors for airway lesions
    • Prematurity, intubations, syndromic
Disposition

• When can we go home?
• What is normal?
• Home apnea monitor?
  – Diagnostic capability
Symptomatic Treatment

• When can we go home?
• What is normal?
• Home apnea monitor?
  – Diagnostic capability
An Algorithm

H&P
(Diagnosis? Severity?)

High Severity
(cyanosis, FTT, repeated ALTEs)

Moderate Severity
(prolonged feeding, single ALTE, noisy breathing without persistent distress)

Low Severity
(noisy breathing alone, minimal feeding issues, no ALTE)

+Airway watch
+/-inpatient bronchoscopy
+/-imaging,
+/-pH probe/impedance
+/- PSG

+/-Imaging based on history
+/- outpatient bronchoscopy
+ Symptomatic treatment vs. “tincture of time”
+ Close follow up

Observation and reassurance
High Severity (cyanosis, FTT, repeated ALTEs)

- Overnight Airway Watch
  - Continuous cardiopulmonary monitoring
- Consideration for inpatient bronchoscopy
- History and exam based imaging
- Consideration for pH/impedence or PSG
High Severity (cyanosis, FTT, repeated ALTEs)

- Events occurring during 24 hour period
  - Correlate to activity at that time
  - Cardiac concerns
  - Bronchoscopy

- No events
  - Education with family
  - Symptomatic treatment
  - Close follow up
Moderate Severity
(prolonged feeding times, single ALTE type event, noisy breathing without persistent distress)

- Imaging based on history
- Consider outpatient bronchoscopy
- Symptomatic treatment vs. “tincture of time”
- Close follow up
Low Severity
(noisy breathing in isolation, minimal feeding issues, no ALTE events)

• Observation and reassurance
What can we do??

Infectious
Laryngotracheobronchitis aka Croup

- Most common infectious cause of upper airway obstruction in children
- Usually viral (parainfluenza)
- Age 1-6 (MC 12-24mo)
- Barking cough->stridor
- Steeple sign
- Tx:
  - Steroids
    - Nebulized, oral, IM are equally effective
    - Dexamethasone 0.5mg/kg IM
  - Nebulized epinephrine 1:1000
    - 0.3-0.5 ml/kg (max 5 ml)
Epiglottitis

- Acute onset-rapidly progressive
- *H. influenzae*, *Streptococcus* and *Staphylococcus*
- 4D’s
  - Drooling, Dysphagia, Dysphonia, and Dyspnea
- Tripod position, thumb sign
- Transfer to PICU/OR asap
  - Elective intubation
- IV abx
  - 3rd generation cephaolsporin (*Ceftriaxone, Cefotaxime*) 7-10 days
  - Add MRSA coverage in certain areas
Bacterial Tracheitis
aka pseudomembranous croup
aka bacterial croup

- S. aureus
- Median age 5 years
- Croup->increasing respiratory distress->toxic appearance/dysphagia
- Diagnosis/treatment
  - Endoscopy under general anesthesia
    - Remove exudative pseudomembrane
  - Intubation rates from 38-100%
  - IV antibiotic (3rd generation cephalosporin and antistaphylococcal PCN)
Tracheitis

Repeat Bronchoscopy after 48 hours of Antibiotics

Before

After 48 hours of antibiotics
Non-Infectious
Foreign Body
Foreign Body

- MC <3
- Male predilection
- Food is most common (peanuts)
- Witnessed choking episode 76-92% sensitive
- Aphonia with inability to cough=complete airway obstruction
  - Heimlich maneuver (older children) or alternate back blows (infants)
- Classic triad: cough, wheeze, unilateral diminished breath sounds observed in 57% of cases
Vocal Cord Paralysis

- Unilateral vs bilateral
- Congenital vs acquired
- Idiopathic, iatrogenic, neurological abnormality, birth trauma
- Bilateral present with early symptoms where unilateral may be missed
- Weak cry, stridor, recurrent aspiration, feeding problems
Vocal Cord Paralysis (cont)

- Imaging from brain stem to mediastinum
  - MRI for bilateral
    - Arnold-Chiari, tumors
  - Exclude intrathoracic lesions for unilateral

- Treatment
  - Unilateral
    - Supportive with NG feeds until safe swallow
  - Bilateral
    - Tracheostomy, cordotomy (CO2 laser)
      - Spontaneous recovery rates of up to 70%
      - Avoid airway widening procedures for a year
Subglottic Stenosis

• Acquired is the most common form
  – History of endotracheal intubation or laryngeal trauma
• Congenital-abnormality of cricoid cartilage
• Presents with recurrent croup-like illness
Laryngomalacia

- Most common congenital laryngeal abnormality
- Most common cause of stridor in infancy
- Onset usually in the first few weeks of life
- Laryngoscopy to confirm diagnosis and rule out synchronous airway lesions
  - Reports vary from 12-64%
    - Skewed populations???
  - Most commonly tracheomalacia, subglottic stenosis, and vocal cord paralysis
  - 4.7% required additional intervention (Mancuso, 1996)
• Flexible laryngoscopy
• Magnified airway fluoroscopy
• Barium swallow
  – 65-100% of infants have coexisting GERD
  – Breathing against an obstructed airway->negative intrathoracic pressure->higher likelihood of reflux through lower esophageal sphincter
  – Edema from acid can worsen airway collapse
• Direct laryngoscopy with rigid bronchoscopy
• Polysomnogram
• Echocardiogram
Management

• Reassurance for mild to moderate laryngomalacia without feeding difficulties
  – Monitor for appropriate weight gain or worsening of respiratory symptoms
• Feeding
  – Positional therapy
  – Thickened feeds
  – Treatment of GERD
• Average age of resolution is 7.6 months (Wright, 2012) with most resolution compete by 18-24 months
• Surgical management in 10%
  – When they present with apparent life threatening events, severe dyspnea, recurrent cyanosis with feedings or failure to thrive
  – Supraglottoplasty, aryepiglottoplasty, tracheostomy
    • Consider associated neurological or neuromuscular conditions
  – Microlaryngeal instruments vs micro-debrider vs CO2 laser
    • Similar success rates regardless of technique (Rastatter, 2010)
Conclusions

• It is not as scary as it seems
• Need a methodical approach
• Balance between provider comfort, parental comfort and ensuring a child’s safety.
References


Questions???