UPDATE ON COMMON PEDIATRIC UPPER AIRWAY CONDITIONS

Kenneth A. Geller, MD, MS Ed., FACS, FAAP
Division of Pediatric Otolaryngology--Head and Neck Surgery
Children’s Hospital of Los Angeles
Associate Professor of Clinical Otolaryngology
Keck School of Medicine of USC
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Declaration

I have no commercial conflicts of interest to report.

Objectives

At the end of the activity, participants should be able to:

1. Develop a differential diagnosis of stridor in infants/children
2. Implement new AAO-HNS guidelines on tonsillectomy and/or adenoidectomy
3. Assess and manage peritonsillar abscess
ARS Question #1
The definition of stridor is?

1. Coarse inspiratory and expiratory sound with breathing
2. High pitched inspiratory noise with crying
3. Generalized noisy breathing
4. Loss of phonatory quality

Case #1
Your last patient of the day is a 4wk/old male infant with no previous peri-natal issues who is brought in by his mother and father because of noisy breathing. It began 5 days ago and is present all the time; there is no change with positioning; he tends to choke and cough with almost every feed (breast fed). No fever; no increased irritability; gets slightly “dusky” when he is coughing.

Case #1(continued)
PE pertinent physical findings:
► Normal appearing child in no acute distress
► Normal cry
► Low pitched fluttering inspiratory stridor at rest not worse with crying
► Normal suck and swallow at beginning of feed with intermittent choke and cough later on in the episode of feeding
► Mild pectus excavatum
ARS Question #2
Your preliminary diagnosis is?
1) Vocal cord paralysis
2) Laryngeal web
3) Laryngomalacia
4) Vallecular cyst
5) Tracheal Stenosis

ARS Question #3
Your recommendation should be?
1) Change formula
2) Change position of feeding
3) CT scan of the head and neck
4) Laryngoscopy and Bronchoscopy
5) Advise the patient: “Don’t worry, he’ll outgrow this in three months”

Case #2
You are called by an Emergency room physician to see a 10 week old female infant with normal peri-natal history who is presenting to the ED for the second time in 14 days with worsening breathing. The symptoms began gradually at 8 weeks of age associated with the onset of a mild URI manifest with a low grade fever of 100.2 F.
CASE #2 (CONTINUED)

On the first visit to the ED the child had increased work of breathing and a “croupy” cough. He was given the following: Amoxicillin; racemic epinephrine with some improvement; a dose of decadron (0.5mg/kg IM) and sent home. He returns 10 days later with the same symptoms; perhaps slightly worse.

CASE #2 CONTINUED

► PE pertinent physical findings:
Mild tachypnea with supra-clavicular and sub-costal retractions;
Normal voice;
High pitched inspiratory stridor which is bi-phasic;
“Barky” cough;
Small, 3 mm. strawberry mark on the left parotid area.

ARS Question #4
Your next step is?

1) Give another dose of decadron and send child home with follow up in one month
2) Lateral neck xray
3) CT scan of head and neck with contrast
4) Barium swallow
5) Laryngoscopy and Bronchoscopy
CASE #3

A 6 month old male child is referred for a “croupy” cough lasting a month. About 4 weeks ago the child had an upper respiratory infection and developed this cough. The cold subsequently resolved; however, the cough, although intermittent, still has that “croupy” sound. There are no choking episodes with feeding and he has good weight gain; it is not worse at night or in the morning. He has no cyanotic spells with crying or with feeds.

ARS Question #5

Your next step would be?

1) Albuterol and Decadron for the wheezing
2) CT Chest with contrast
3) Laryngoscopy and Bronchoscopy
4) Watchful waiting for one month to see if symptoms resolve
5) MRI of the Chest with Gadolinium

Answer Now

Evaluation and Diagnosis of the Child with Stridor
Introduction

A. Breathing is a quiet, almost noiseless state.
B. Noisy breathing signals obstruction.
C. Stridor = Noisy breathing.
D. Presentation - Purpose
   1. Localization of stridor to an anatomic location so that:
      2. A proper differential diagnosis, work up and treatment plan can be developed.

Evaluation of Stridor

History
1. Birth History
   a. Apgar  b. Umbilical cord  c. Forceps  
   d. Breach e. Prolonged labor f. Polyhydramnios
2. Intubated (how long; how many times?)
3. Recurrent croup
4. Choked on foreign body
5. URI; Fever, Cough
6. Skin test: Chest X-ray
7. Family history

Evaluation of Stridor

Physical Examination

The Four Questions
1. Is stridor present?
2. What is the voice quality?
3. What is the cough quality?
4. Are there any swallowing or feeding issues?
Imaging Studies

The appropriate studies are ordered in order to help confirm or refute your impression of the anatomic location of the cause of the stridor. Try to avoid a "shot-gun" approach.

- Lateral neck and AP and lateral Chest X-Rays
- Barium esophagram
- MRI and CT scans
- Angiography
- Echocardiography

Laryngoscopy and Bronchoscopy

1. Fiber optic flexible trans-nasal under local anesthesia.
   a. Excellent for nasopharynx and lesions above the glottis.
   b. Not helpful for anything below the glottis.
2. Fiber optic flexible exam under general anesthesia.
3. Rigid endoscopic video laryngoscopy and bronchoscopy under general anesthesia.

Anatomic Location
1. Stridor
   a. Both Inspiratory and Expiratory
   b. Coarse and stertorous
   c. Decreases with crying
   d. Sound is localized to that area i.e. you hear it there.
2. Voice - Normal or slightly hoarse if has URI
3. Cough - Normal or productive; non-specific
4. Swallowing - If less than 3 mo. can have dysphagia and even apnea because of obligate nose breather status.
Hypopharynx and Supraglottic Larynx

1. Stridor
   a. Inspiratory
   b. Usually low pitched; occasionally high
   c. Coarse quality and often fluttering

2. Voice is normal

3. Cough is normal

4. Swallowing can be normal or abnormal depending on the etiology (e.g., Acute supraglottitis is accompanied by painful swallowing leading to drooling; laryngomalacia results in choking because of partial obstruction and “air hunger”)

Vallecular Cyst
Subglottis

1. Congenital
   a. Hemangioma.
   b. Congenital subglottic stenosis.
   c. Overriding first tracheal ring.

2. Acquired
   a. Laryngo-tracheal bronchitis (viral, bacterial, fungal).
   b. Post intubation subglottic stenosis (fibrous, membranous, ductal cyst)
   c. Post traumatic (granulation tissue, hematoma).
   d. Foreign body.
   e. Neoplasia (chondroma, chondrosarcoma).

Subglottis

1. Stridor
   a. Inspiratory if mild or moderate obstruction.
   b. Biphasic if moderate to severe obstruction.
   c. Absent of severe to total obstruction.

2. Voice is usually hoarse or at least coarsened.

3. Cough is “barky” (croupy).

4. Swallowing is normal but patient fatigues quickly.

Croup

Courtesy of Debra Don, MD
Tracheal Obstruction

1. Congenital
   a. Vascular rings
   b. Foregut Cysts
   c. Complete Tracheal Rings
   d. Tracheo-esophageal Fistula
   e. Tracheomalacia
   f. Thyroid Teratoma

2. Acquired
   a. Foreign body of the trachea
   b. Foreign body of the esophagus!!
   c. Bacterial tracheitis
   d. Post-intubation stenosis (fibrous or membranous)
   e. Tuberculosis with lymph node erosion or compression
   f. Benign or malignant neoplasm (thymic cyst, neuroblastoma, lymphoma, thyroid carcinoma)

Stridor

1. Biphasic
2. Medium to high pitch
3. Fine quality but can be coarsened by retained secretions.

Voice is normal

Cough is “brassy” (NOT “croupy”)

Swallowing is normal (e.g. innominate artery compression syndrome) or abnormal (e.g.) double aortic arch or TEF) depending on etiology
Tracheal Obstruction

Conclusions

1. Proper history and physical will help you to anatomically localize the cause of the stridor which will then enable you to appropriately select imaging studies or diagnostic procedures to confirm your initial impression.

2. Use this approach with every patient with stridor to build up a frame of reference of normal and abnormal to increase your percentage of correct diagnosis.

3. If things do not seem to fit, there may be more than one lesion.

Clinical Practice Guideline: Tonsillectomy in Children
Tonsillectomy

1) Second most common ambulatory surgical procedure performed on children in the USA
2) In 2006, there were 530,000 tonsillectomies performed on children less than 15 y/o
3) Accounts for 16% of all ambulatory surgery in this age group
4) Most common procedure is myringotomy with tubes which accounted for 667,000


Tonsillectomy

“Sleep-disordered breathing (SDB) is characterized by abnormalities of respiratory pattern or the adequacy of ventilation during sleep, which include snoring, mouth breathing, and pauses in breathing. SDB encompasses a spectrum of obstructive disorders that increases in severity from primary snoring to obstructive sleep apnea (OSA).”

Tonsillectomy

1) Children with tonsillar disease, including throat infections and SDB showed significantly lower scores on several QoL subscales.

2) Children with SDB compared to controls, have a significantly higher rate of antibiotic use, 40% more hospital visits and 215% elevation in health care usage mainly from increase URI’s.

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30–40% of children with clinically diagnosed SDB exhibit behavioral problems that include:

1) Enuresis
2) Hyperactivity
3) Aggression
4) Anxiety
5) Depression
6) Somatization disorder
7) Poor school performance


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Cultural Awareness

Systematic Analysis of Cephalometry in OSA in Asian Children

Chang et al. from Taiwan reviewed cephalometric x-rays and compared them with respect to areas of obstruction compared to studies of Caucasian children.

1. No difference between them at level 4, the retro-glossoal space, which was the most consistent location of obstruction.
2. However segment 2 (skull base) parameters affect AHI in Asian children less often.
3. Some significant difference in length of mandibular body but less affect on Asian children
4. Recommended further study.
Function of the Tonsils

What are the tonsils? Lymphoepithelial organs at the junction of the oral cavity and the oropharynx.

What do they do? Act as secondary lymphoid organs initiating immune responses against antigens entering the body through the mouth and nose.

When are they most active? Between 3-10 years of age.

IgA is the most important product of the tonsillar immune system.

M cells lining the crypts take up antigens into vesicles and transport them to the extra follicular region or the lymphoid follicles where they are presented to helper T cells which then stimulate antibody expressing B lymphocytes and plasma cells.

1) With chronic or recurrent tonsillitis, the controlled process of antigen transport and presentation is altered due to shedding of the M cells from the tonsil epithelium.

2) There are no studies to date that demonstrate a significant clinical impact of tonsillectomy on the immune system.
Function of the Tonsils

Complications of Tonsillectomy

Operative:
1) Risk of anesthesia: traumatic intubation, airway compromise, apnea and death
2) Risk of surgery: trauma to teeth, larynx, pharyngeal wall, soft palate. Aspiration, respiratory compromise, airway fire with or without ignition of ET tube, burn to lips, face and buccal membrane from cautery, injury to the eyes, fracture of the mandibular condyle.

Complications of Tonsillectomy

Post operative complications:
Nausea and vomiting
Pain
Dehydration requiring hospitalization
Bleeding (primary rare; secondary 0.5%-3% reported); with or without possible death of child
VPI
Chronic throat pain
Paradise Criteria for Tonsillectomy

Frequency:
- 7 or more episodes in preceding year;
- OR 5 or more in last 2 yrs;
- OR 3 or more in last 3 years.

Clinical Features:
- Temp. > 38.3 C
- OR cervical adenopathy (tender nodes > 2cm.)
- OR tonsillar exudate
- OR positive culture for GABHS

NEJM 310:674, (1984), Paradise et al.

Paradise Criteria for Tonsillectomy

Treatment:
- Antibiotics for proven or suspected GABHS

Documentation:
- Each episode is substantiated by notation in clinical record.
- If not documented, subsequent observance by clinician of 2 episodes with patterns of frequency and clinical features consistent with the initial history.

NEJM 310:674, (1984), Paradise et al.

AAO-HNS GUIDELINES

1. Watchful waiting for recurrent throat infections (per the Paradise criteria) “recommended”
2. Recurrent throat infections with documentation
3. Tonsillectomy for recurrent infection with modifying factors in those not meeting criteria
   a) Multiple antibiotic allergy/intolerance
   b) PFAPA
   c) History of peritonsillar abscess
AAO-HNS GUIDELINES

4) Tonsillectomy for SBD and tonsillar hypertrophy based on:
   a) History and Physical (FTT, short stature, enuresis, behavioral problems)
   b) audio/video taping
   c) pulse oximetry
   d) Polysomnogram (oxygen sat <92%; AHI >5; pCO2 >50) Parameters remain controversial!

Be sure to counsel patient that SBD can persist after surgery!
Peritonsillar Abscess