Shifting Atelectasis:
A sign of foreign body aspiration in a pediatric patient

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Objectives:

- Discuss when foreign body aspiration should be considered as a differential diagnosis in the pediatric patient.

- Discuss when a bronchoscopy should be performed to rule out migration or bilateral foreign bodies.
Hey! I think Fred needs some help giving a treatment in pediatrics!
Case

- Eighteen month old, previously healthy male, presents to outlying facility with a cough that had persisted for 1-2 weeks before becoming productive and progressing to subsequent respiratory distress.

- At the outlying facility, the patient was noted to have perioral cyanosis, tachycardia, cough, and increased work of breathing.
• Patient has been febrile.

• There is no history of asthma.

• Parents have been giving a medication from Mexico that treats a cough with phlegm.
• Patient was placed on 10 liters via a mask with a SpO2 of 95%.

• Aerosolized Xopenex, Pulmicort, and Atrovent were given and the patient was deep suctioned.

• Rapid RSV was completed and was reported as negative.
• A dose of Rocephin and Solu-Medrol were administered.

• BMP, blood cultures, and chest x-ray were all obtained.

• He was started on D5 quarter-normal saline after 2 boluses had been given.
• ABG results revealed pH 6.96, PaCO2 101, PO2 272, and HCO3 22.4

• The patient was intubated and eventually transferred to Wesley Medical Center.

• Auscultation reveals crackles on the right with decreased air exchange on the right.
• Minimal intercostal retractions are noted.

• Tachycardia weak and rapid pulses, with prolonged cap refill is also noted.
• Arrival at WMC PICU
• VBG - PH 7.10 / PCO2 71 / PO2 63 / HCO3 17.0 / BE 9.2
• WBC 27.0 / Band % 20 / Lymph% 21 / Meta % 2
• Sputum Culture – Positive Staphyloccus Aureus
Hospital Course – Day 1 (0430)
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- Ventilator Settings:
  
  PRVC/SIMV VT 80/ R 24/ IT 0.8/ P 10/ PS 10

- 10 mg Albuterol Continuous

- Chest physiotherapy every 2 hours
Hospital Course – Day 3
Hospital Course

Day 5 (0637)
• VBG – PH 7.30 / PCO2 66 / PO2 32 /HCO3 27.3 / BE 3.8
• 1030 – Desaturates to 50% while on 80% FIO2
• 1330 – Desaturates to 70% while on FIO@ of 1.0
• Numerous desaturations continue to occur
• Breath sounds- Course with wheezes on the left; diminished breath sounds on the left.
• STAT CXR - Ordered

Hospital Course
Day 5
Hospital Course

Day 5 (1400)
• Patient noted to be dusky

• 1500 – Prostacyclin (Flolan)

• 1505 – Pediatric Pulmonologist to bedside for fiberoptic bronchoscopy
• 1710 – Patient taken to OR for rigid bronchoscopy for removal of foreign body.

• 1745 – Patient returned to PICU post removal of pinto bean from left mainstem bronchus.

• Patient’s breath sounds now noted to be coarse, equal with scattered wheezes.

Hospital Course
Day 5
Hospital Course

Day 5 (1855)
Hospital Course

Day 6 (0653)
Hospital Course
Day 7 (0700)
• Patient transitioned to CPAP

• Extubated later that morning

Hospital Course
Day 7
• Patient transferred to General Pediatric floor
• Patient discharged to home
"Sometimes you need to look at Life from a different perspective."
• 225 patients were seen with foreign bodies in the larynx, trachea, bronchi, 77% were 36 months of age or less.
• Male to female ration 2:1
• 70% of the cases were food or food derivative related
• 38% were due to a portion of a nut.

• Right and Left bronchus involvement with equal frequency
• Most common presenting complaint, choking episode followed by audible wheezing (56%)
• A radio-opaque object was seen in 13%.
• Two hundred ten foreign objects (93%) were removed by endoscopy.
• Five patients expelled the foreign body spontaneously
• One foreign body was not recovered.
• There was no mortality.

Aspiration of a Foreign Body in Children
Aspiration of a Foreign Body in Children

• Frequent

• Serious

• Life threatening
Common Symptoms:

- Coughing
- Fever
- Wheezing
- Pneumonia
- Dyspnea

Aspiration of a Foreign Body in Children
Common Symptoms:

- Cyanosis
- Hemoptysis
- Stridor
- Hoarseness
- Retractions
- Total respiratory obstruction

Aspiration of a Foreign Body in Children
Diagnosis

- Patient history
- Physical exam
- Chest X-ray
- Ultrasound
- CT
- MRI

Aspiration of a Foreign Body in Children
Aspiration of a Foreign Body in Children

**X-Ray Evaluation**

- X-Ray indicated for all suspected FB aspirations
- Negative radiographic result does not exclude FB presence.
- Radiolucent objects are not detected by plain radiography. (e.g. rubber objects, beans)
- CXR’s may show unilateral lobar hyperlucency, localized atelectasis, and localized pulmonary infiltrate.
Aspiration of a Foreign Body in Children

Suggestive Radiological Views

• AP – Anteriorposterior

• PA – Posterioranterior- expiratory and inspiratory

• Lateral of soft tissues of the neck

• Lateral decubitis for uncooperative patients

Aspiration of a Foreign Body in Children
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“Ball-valve effect”
- Air flow around object on inspiration.
- Hyperaeration of involved lung or lobes
- Subtle or absent on inspiratory view
- Hyperlucent or air trapping on expiratory view

Aspiration of a Foreign Body in Children
Migration of FB

• Movement of an aspirated foreign body less commonly reported.

• Only 3 published cases of movement from one lung to another.
Aspiration of a Foreign Body in Children
Aspiration of a Foreign Body in Children

• Chang-Teng Wu, Chan-Jan Wang, alternate lung collapse in a 9 year old boy with peanut aspiration. Pediatric Radiology, 2006:36 (12): 1327-1327.(s)

• Parray T, Abraham E, Apuya J, Ghafoor A, Siddiqui, M.S. Migration of a foreign body from right to left lung. The Internet Journal of Anesthesiology, 2010:24 (1)

Movement of an Aspirated Foreign Body in a Child
Mechanism of Migration

- High expiratory flow generated with coughing
  1. Initial peak of expiratory flow lasts about 30-50 milliseconds.
  2. Flow rates may reach as great as 12L/sec.
  3. Expiratory flow may be sufficient to expel or displace the FB.
Shape and Chemical Nature

- Irregularly shaped/sharp pointed are less likely to migrate
- Inorganic FBs are usually inert-evoke less inflammatory response if the migrate
- Organic FBs can cause severe inflammatory response
- Organic FBs tend to migrate.

Movement of an Aspirated Foreign Body in a Child
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• Diagnosis:
  * Hx of cough, wheezing, dyspnea
  * Peak bronchiolitis season

• Treatment:
  * Bronchodilators
  * CPT
  * Supportive care - ventilator

Discussion
• Mechanism of Movement:
  * Positioning
  * Chest physiotherapy (CPT)

• Shape and Chemical Nature:
  * Smooth shaped
  * Organic

Discussion
• Chest X-Ray
  * Radiolucent FB difficult to detect
  * Appearance of hyperinflation and/or atelectasis
• Foreign body aspiration should be considered:

1. Patient exhibits unexplained symptoms consistent with airway obstruction.


3. Shifting atelectasis

Conclusion
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Questions?