Shortness of breath

Dr. Alharbi Notes

No slides, **the recording was not from the beginning of the lecture but it starts with**:

- Exercise causes Shortness of breath
- Usually SOB signifies an acute situation, u won't see chronic pt who suffer from SOB
- We have certain receptors in the carotid that measures PH, CO2, & some times O2 levels and send afferent signals to the brain stem then it sends efferent signals to the respiratory muscles to maximize the breathing (tidal breathing)
- Tidal breathing is an involuntary process but once u expose to certain stress or effort, u need to maximize then you'll feel the discomfort

- How can we maximize our breathing?

By using our accessory muscles which increase the rate & increase the volume (increase ventilation)

- The major function of the respiratory system is 1- ventilation 2- oxygenation
- Wts maintain your breathing now is the Co2 & PH not the O2.
- Our body discard any toxic material on it by gut, breathing (gases), urination … etc
- Co2 is a gas..

Then I think he showed some pics or vids.

- This child has an upper airway problem. So, their main problem is during inspiration, they can't put the air in then CO2 accumulated and they start using the accessory muscles (sternocleidomastoid, intercostal & diaphragm).
- Once children and small infants start using the diaphragm they will push it down (to maximise the volume of the lung) so u can see the bulging of the abdomen.
- New vid showed respiratory distress signs (Intercostal retractions, Suprasternal notching, nasal flaring). So, respiratory distress is a sign while SOB is a symptom.

Why are children worse than adults?

- Small airways, high metabolic demands & lower respiratory reserve compared to adults, especially in young children.

- Respiratory failure is the most common cause of cardiac arrest in children

Assessment of child with SOB (most of the time it will be an emergency):

- HPI shortly, vital signs, certain tools to assess severity of the distress, duration & associated symptoms e.g. cough, wheezing, fever etc..
- The most worrisome symptoms of any respiratory illness is mental status. Once their mental status is altered, it means it is severe and it is the worst.

- U have to do a full respiratory examination.

Scenarios:

1) **Shortness of breath & generalized wheezing presentation:**

8 yo boy presented with SOB, dry cough & audible wheezing for 4 hrs. Vitals: RR: 36, O2 sat: 89 in room air, HR: 115, Tem: 37.8. On examination: look unwell, unable to complete one sentence, using accessory muscles. Auscultation: tight chest with generalized respiratory wheezing. Radiology: ???.

- Wheezing can be a symptom or a sign. So it's very imp. When he has a wheezing u can remove a lot of ddx. So, the ddx. Are totally based on the information from the paragraph. (I just wrote wt he exactly said and I'm sorry for that)

Pic of chest X-ray:

- Hyperinflated chest, heart centralized, flat diaphragm(so it's pushed down), clear parenchyma. So, the main finding in this x-ray is a hyperinflated chest.
- So, wts relevant questions do you want to ask?
- Duration of illness, any previous symptoms, previous attack, any chronic illnesses? Asthma (always consider it with generalized wheezing),
- So, why this presentation is not bronchiolitis. Bc his age, this is not the age where we see bronchiolitis (usually affects children younger than 2 years, with a peak in infants aged 3-6 months)
- This pt. Has asthma, how to investigate?
- We use PFT, spirometry and others in outpatient cases but in the ER, asthma attack is a clinical diagnosis, we don't even need an X-ray all the time. In severe unstable children we do need chest x-ray & VBG.
- In Young children, diagnosing asthma is very difficult, they can't even perform a PFT. so, one of the criteria to diagnose asthma in infants & young children is that they do respond to bronchodilator. Older children diagnosed clinically then by PFT.
- So, how to treat?
- Bronchodilator *beta2 agonist*(3 packs to pack in every 20 mins one dose), salbutamol, steroids, ipratropium (anticholinergic), O2, mg sulphate (cause hypotension as a side effect because it induces smooth muscle relaxation).
- Other uncommon unproven modalities for refractory cases are Heliox (a mixture of helium and oxygen) it believed to decrease the airway resistance, inhaled anesthesia, epinephrine, aminophylline (narrow safety profile)

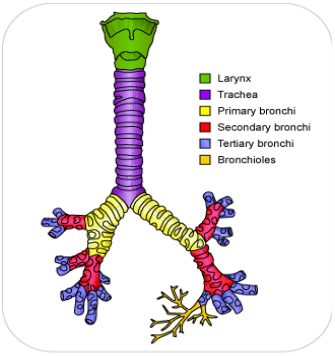
2) **Generalized wheezing**

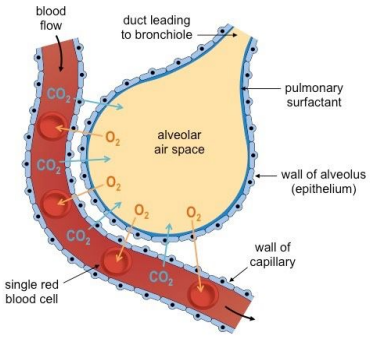
- 8 months old boy presented with 3 days Hx. of coryza (catarrhal inflammation of the mucous membrane in the nose, caused especially by a cold or by hay fever) & hx. Of Moist cough, wheezing, SOB for 1 day. Vitals: RR: 65, O2 sat: 84 on room air. Looks unwell, using accessory muscles, distress increase during feeding, generalized wheezing mainly expiratory.

- Wt further Qs u'll ask? HPI, fam Hx. of atopy, eczema in child..
- This is the most difficult presentation to detect if it's asthma or not, we don't know if this is an acute illness or the first attack of asthma. How to tell? We can test them with bronchodilator and see the response.
- So, wts the possible Dx. here? bronchiolitis, it's the typical presentation of it.
- Usually they present with fever *not high grade*, if it was high grade fever consider complicated bronchiolitis such as pneumonia.
- The upper airway starts with larynx, trachea, right & left bronchus then it subdivides to 17- 20 generations of subdivisions to reach a very small tiny airway called **<u>bronchioles</u>**.

Infection of the bronchioles doesn't mean that there is an infection of the parenchyma. gas exchange طبعا البرونكيولز تفتح في البرنكي airspace اسمها، هالسبيس مبطن بالانترستيشال لتبادل الغازات

- Pics from google :





- Viral infections differ from bacterias in the way they affect our airway, viruses to survive they must be in a host cell while bacterias don't go inside the cells.
- Depending on the part of the airway that affected the pt. Presentation will differ. Eg. URTI, croup, tracheitis, bronchitis. Sometimes, in extreme cases it goes beyond that and causes interstitial pneumonitis. That's why interstitial pneumonitis differs from normal pneumonia.
- interstitial pneumonitis: the viral infection starts from the epithelium so when it spreads and cause pneumonia it will affect all the airway while in bacteria it will cause only lower lobe pneumonia bc the bacteria after inhalation will go down without affecting anything till it lands in certain part and the pattern established there. Most of the situations immune system can handle it but when the immune system can't handle it, it will multiply itself and cause pus in this part and the lobe will be affected. Bc bacteria will go directly to the end point. That's why atypical pneumonia affects both lungs because it starts from the upper part of the airway.
- Bronchiolitis is always caused by a virus. So, how to investigate?
- It's a clinical diagnosis. The 1st wheezing episode in your life deserves a chest X-ray. nasopharyngeal aspirate (NPA) and we send it for viral study.

- The most common cause of Bronchiolitis is respiratory syncytial virus (RSV) *80-85%*. In fact Bronchiolitis is the most common cause of admissions in the pediatric ward. So, it's a very very very burden on health care.
- How to treat? اذا طلعت كيورتف تريتمنت تفوز بجائزة نوبل
- There is no treatment (supportive only like; **O2, IV fluid**, u may give bronchodilator (salbutamol) and monitor the response if there is continue on it otherwise, just stop it, nebulized racemic epinephrine, nebulized hypertonic saline)
- No role in using steroids, antibiotics or fevadol

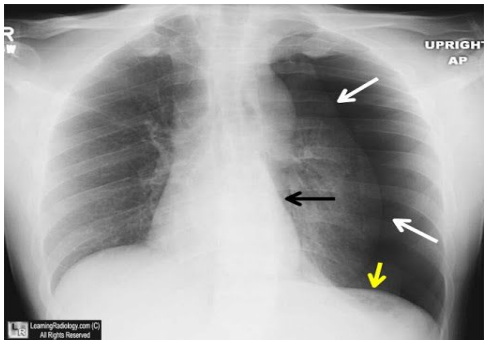
3) <u>Shortness of breath & localized wheezing:</u>

- an 18 months old boy complains of a sudden SOB & wheezing for the 1st time. RR:24, O2 sat: 97.8 on room air. He was on respiratory distress,clear ENT, audible fixed wheezing on the right lower zone. What's the possible Dx.?
- Foreign body, this is the most common age for it **(1-3 years and peaks at 18 mo)**. Why? Bc they start to explore the environment by eating them & they don't have molar teeth so if they can't chew it they swallow it.
- So, what relevant Qs u'll ask? Witness, when did it happen?(during eating or not),
- How to treat? Any child who came with foreign body do a bronchoscopy (x-ray & CT scan are not helpful) if witnesses take him to OR and do **rigid bronchoscopy.**
- Respiratory support is very imp.
- Death can happen in OR or before landing bc the foregin body can be stuck in any place. The worst scenario if it stucks in the larynx because it is the narrowest place.
- The most common materials are the non-organic ones, while organic are usually witnessed with the fam. Bc usually he'll be eating with them and that's why it's common to treat them early.
- What would happen if we left it in the airway? If it is an organic material (protein: very irritated → inflammation → swelling → narrow airway → further block *sometimes we remove all the lobe bc an old foregin body - >4 wks -*, sugar, lipid)
- Flexible bronchoscopy can be helpful to go further to the smaller areas, u can use a certain basket to take the foregin body.
- Children less than 3 years **should NOT** be given any food that's need molar teeth like nuts
- Non-organic can be missed for a long time and that's why it's a major indication for surgery.

4) <u>Shortness of breath & chest pain</u>

- 15 yo boy with sudden chest pain on the right side & SOB for 3 Hrs, RR: 32, O2 sat: 92% on room air, HR: 122 bpm, BP: 129/93. Looks on respiratory distress, trachea shifted to the left & no air entry on the right side.
- There is no cough which means the airway & the bronchi are clean. But there is pain which can come either from the pleura or the muscles. The child is in distress so it's not the muscles. So, it's a pleural disease.

- It is pneumothorax, no air entry in the right side because there is no lung tissue, it is all air.
- Pic of chest x-ray, below from dr,google of left pneumothorax, u can see the lung edge *white arrows*

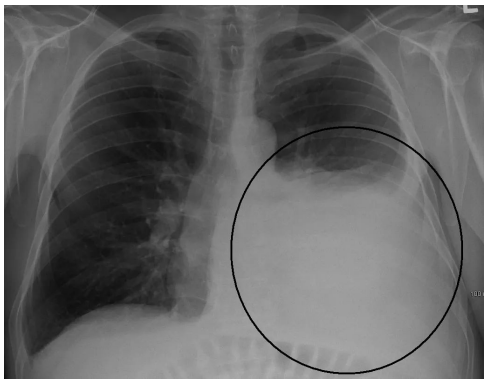


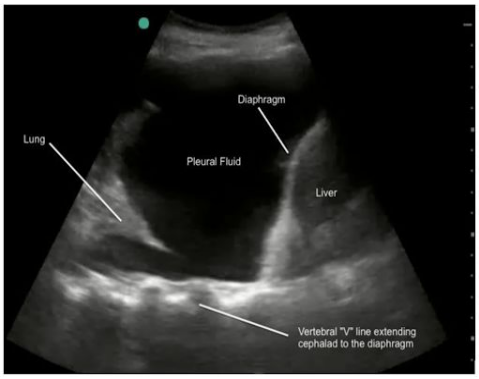
- The landmark of pneumothorax in x-ray is lung collapse *as it's clear above ^^*
- How to treat? tube thoracostomy *chest tube & drainage*
- spontaneous pneumothorax can happen in children suddenly especially in tenager, thin or athletes because they have small blebs once they take a deep breath it ruptures and they develop pneumothorax. (bleb is a small area in the lung that is filled with air, if ruptures, it causes the air to leak into the space around the lung)
- We do needle decompression in spontaneous pneumothorax only if it's big enough to cause deviation

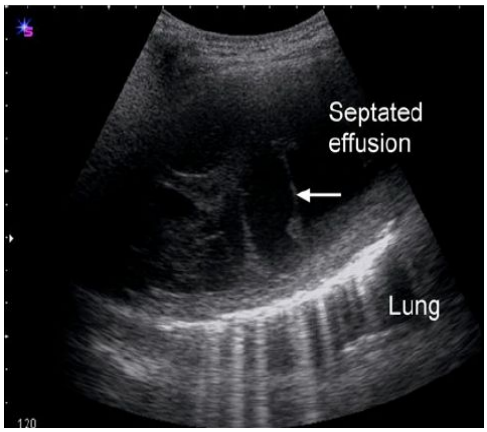
5) <u>Shortness of breath & chest pain</u>

- 7 yo child presented with Hx. of high grade fever, SOB, wet cough & chest pain in the left side worsening during lying. RR:36, Tem:38.9, HR:119, O2 Sat:82% on room air. Looks unwell, distress, in pain, using accessory muscles. Decrease air entry on the left side with fine crepitation on the lower left zone & stony dullness.
- It's Pleural effusion, there is a chest pain so the pleura is involved, the pleura is like a paper, one side is visceral innervated so when there is an expansion because of the fluid they start to rub during the bleeding so it is similar to someone who has an inflammation in the skin and we start to rub it *it is very painful* سبحان الله when the effusion becomes larger the pain goes away.
- This is a parapneumonic effusion, if we have pneumonia it's a parenchymal disease, it will go and stay down in the parenchyma this is won't cause a pleural effusion!. Sometimes, bacterias can go to the pleural space and cause infection, this is called empyema. Not every pleural effusion is an empyema! In this case it's just an effusion not empyema.

- How to investigate? Chest X-ray. The best way to get a clear radiologic imaging to assess the pleura in pediatric is ULTRASOUND, not CT scan.







- If we have empyema, the pus with time will form septation which will be hard to be removed by chest tube alone so we use fibrinolytic agents (tissue plasminogen activator: TPA) in addition to the antibiotics

- ^ Again pics from dr.gogo

6) <u>SOB & stridor:</u>

- 14 mo child woke up at night with SOB & stridor had coryza symptoms & barking cough for days RR:52, significant retraction, using accessory muscles & respiratory stridor.
- This is the classical presentation of Croup. So, always keep asking about vaccination.
- If a pakistani child comes to me I'll think of epiglottitis immediately, because it's common that they don't take vaccines there. Locally, we don't see epiglottitis.
- How to treat? Supportive & steroids, always give oral/ IM.dexamethasone:(quick onset of action) & nebulized racemic epinephrine: (very helpful but u need to watch it for 2 Hrs bc he might relapse and need another dose)
- Croup is an airway narrowing secondary to mucosal inflammation involving the upper airway (laryngotracheobronchitis), common among children, typically it is for the age of 2 years, can be divided to infectious croup or Spasmodic croup. infectious croup: start after a few days of URTI while in Spasmodic croup it starts in a previously healthy child that suddenly woke up with stridor.

7) **SOB & wet cough:**

- 4 yo child presented with high grade fever, wet cough & SOB. RR:48, O2 Sat: 85 % at room air, looks unwell, using accessory muscles, decreased air entry in the right side, bronchial breathing & crackles.
- This is the typical presentation of pneumonia, but why bronchial breathing(a hollow breathing is if the child is breathing in a hollow tube)? Alveoli collapsed. When we say vesicular breathing we mean the small airway & the airspaces are open so we can hear the breathing going in & out of the airspaces. If the alveoli collapsed, all what we hear is the air going through a **tube = bronchial** breathing.
- It's very imp. To ask about vaccination Hx. bc the pneumococcus bacteria is very devastating, pneumonia was the #1 killing cause of children less than 5 yrs before the vaccine
- How to investigate? We don't need blood culture unless it's moderate to severe case bc bacteremia prevalence during pneumonia is in a very low rate
- We do CBC w/ diff, chest x-ray
- Treated by O2, IV fluid & Iv antibiotics.
- Chest x-ray with lobar pneumonia *dr.gogi*