بسم الله الرحمن الرحيم

CLINICAL

FINAL | Lecture 1

Adult Respiratory Cases

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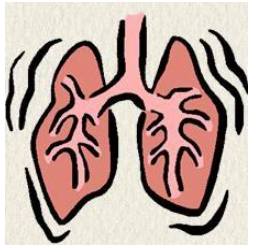
﴿وَلَقَدْ نَعْلَمُ أَنَّكَ يَضِيقُ صَدْرُكَ بِمَا يَقُولُونَ ﴿٩٧﴾ فَسَبِّحْ بِحَمْدِ رَبِّكَ وَكُن مِّنَ السَّاجِدِينَ﴾

سبحان الله وبحمده، سبحان الله العظيم

Adult Respiratory cases

Dr Asma Albtoosh Respiratory and sleep medicine

Case 1



History:

45 years old lady, previously healthy.

Presented to emergency department with **fever** for 5 days, reaching **39.5** C.

Fever for 5 days is indicative of acute illness (any symptom that continues less than 2 weeks is considered an acute illness & the DDx are acute causes).

Associated with productive cough and shortness of breath.

so you might think about LRTIs (pneumonia) as a main diagnosis.

Physical examination

General : looks unwell, has increased WOB (RR 40 b/m, PR 110, temp 39) RR is increased → tachypnea, PR is increased → tachycardia, temp is increased → the patient is febrile

subcostal and intercostal retractions; indicate that she is in respiratory distress

During normal (tidal) breathing, expiration is passive & the diaphragm is the main muscle involved. Accessory muscles of expiration (including the subcostal, intercostal muscles & sternocleidomastoid) play little to no role. When a patient becomes tachypneic or has increased WOB, these accessory muscles are recruited to assist respiration. Their excessive effort leads to visible **subcostal and intercostal retractions**, where soft tissues are drawn inward between the ribs

Chest :

Auscultation: decreased air entry on Rt lower side, bronchial breathing, increased tactile vocal fremitus, few inspiratory crackles Rt side.

Percussion: dull to percussion

WOB: work of breathing

What are the Clinical Investigations needed ?

CXR, CBC, Blood culture, inflammatory markers,...etc

See next slides for further explanation

Clinical investigations

1) **CBC (complete blood count):** WBCs & especially neutrophils are expected to be:
- increased in some types of pneumonia secondary to infections (more precisely the bacterial ones).
- decreased in cases of anemias, like mycoplasma pneumonia infection, due to IgM cold agglutination that causes hemolytic anemia. Also, it is expected to decrease significantly in cases of severe sepsis.

2) **Blood culture:** it is indicated in specific cases:
- If the patient is **febrile** at the time of presentation
- The patient isn't responding to treatment.

➢ This determination is due to low diagnostic yield of culture (20-30%), & because in practice we start empirical antibiotics based on clinical presentation.

3) **Inflammatory markers:** are very important indicators
- Elevated CRP (C-reactive protein) → indicates infection

➢ patients who present with other differential diagnoses that are similar in terms of symptoms to pneumonia (like pulmonary embolism) will be afebrile or may have low-grade fever with normal to mildly elevated CRP.

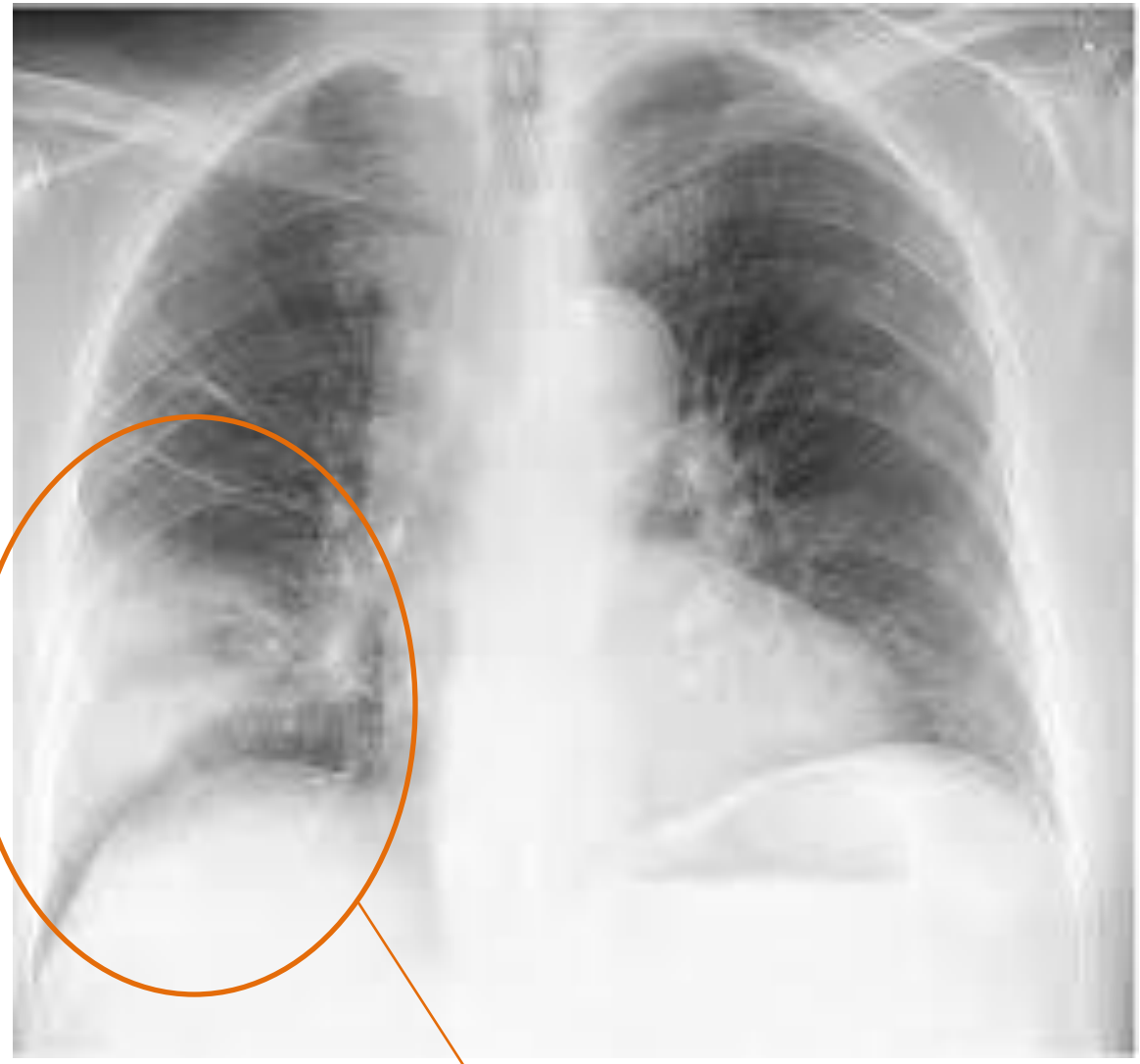
Clinical investigations

4) CXR (chest x-ray): patchy opacity involving part of the mid & lower zones of right lung (in this image)

- Note: With X-rays, we prefer describing the lung by zones instead of lobes; the lung is divided into 3 equal zones.

❖ So according to previous history, clinical presentation (fever, dyspnea, cough) & CXR, What is your diagnosis ?

- **It should be pneumonia or LRTI.**



Lobar infiltration is more characteristic to pneumonia

What is your diagnosis ?

Pneumonia

Pneumonia

Definition

Inflammation of the parynchyma of the lungs (alveoli and terminal airspaces) in response to invasion by an infectious agent introduced into the lungs through hematogenous spread or inhalation.

Causes :

1. Infectious; mostly (Strept Pneumonia ,staph aureus , Mycoplasma p.)

2. Noninfectious:

A- aspiration of food or gastric juice (especially in patients who drink alcohol, have stroke, or neurological disorders & are unable to stay conscious all the time)

B- Hypersensitivity reactions

C- Foreign bodies

D- Hydrocarbons & lipoid substances like cigarettes & vapes (also they are well-known to cause hypersensitivity pneumonia)

E- Radiation-induced pneumonitis in cancer patients

COMPLICATIONS

- When a patient is admitted to the hospital & fails to improve after 2-3 days of IV antibiotic therapy, he might develop one of the following **complications**:

- **Pleural effusion:** patient comes with worsening dyspnea, fever recurrence, chest pain & inflammatory markers will go up after being down in the first few days. In addition to physical findings including dull percussion & absent TVF.

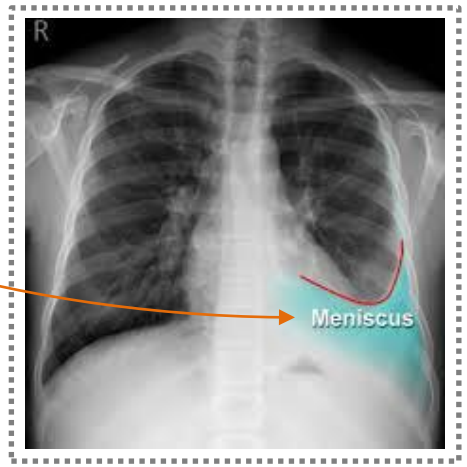
- **Direct invasion: Empyema, pericarditis**
  - Empyema is the direct invasion of the bacterial antigen into the pleural space, while pleural effusion is a reactive process to pneumonia.

- **Hematogenous spread: Meningitis, suppurative arthritis & osteomyelitis (rare).**
  - Sometimes the patient has distant spread of the bacteria or virus. However, it is rare because most patients of pneumonia complain early & because pneumonia treatment is established as soon as possible empirically.

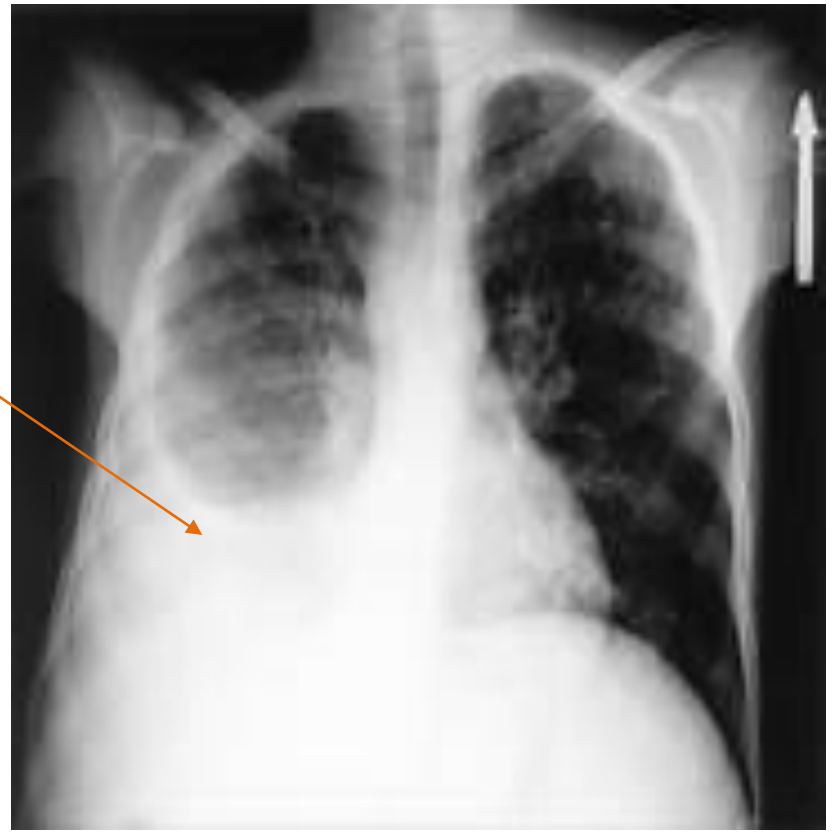
Complicated pneumonia

- This CXR shows collection of fluid in the pleural space with a sign called: Meniscus sign.
- Fluid rises higher along the edge of pleural effusion, producing an upside down “U” or meniscus shape

Additional



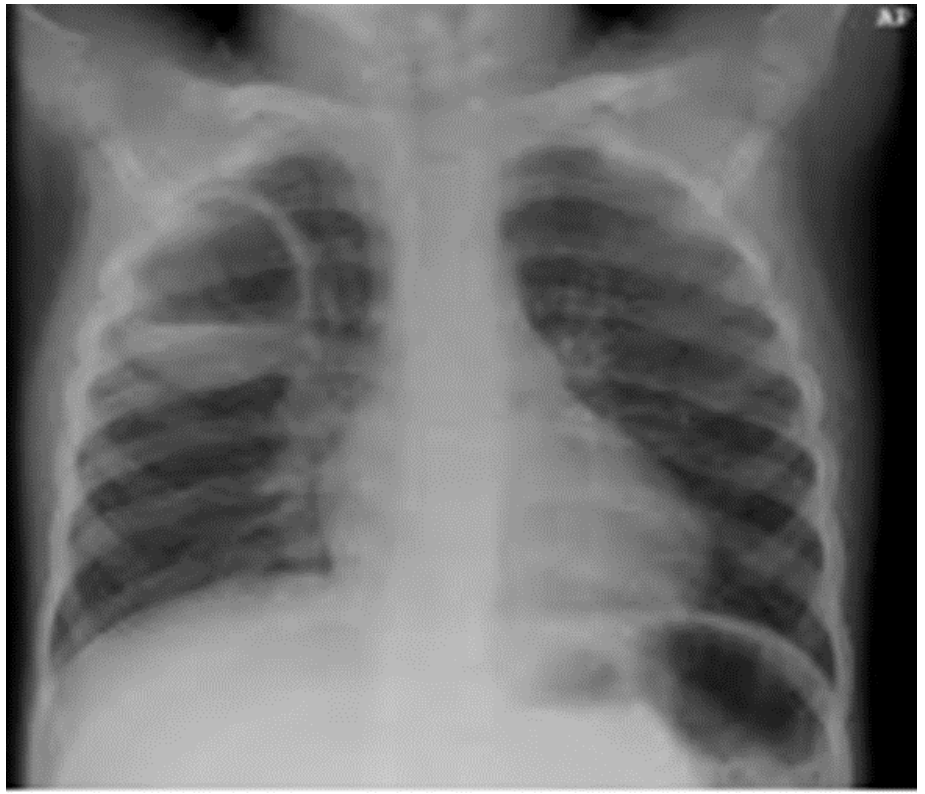
Pleural effusion



Complicated pneumonia

- There is a cavity filled with fluid indicates abscess formation, a complication of untreated or delayed treatment of pneumonia.
- There is only one study that shows that mortality increases significantly if you start antibiotics after 6 hrs of presentation to ED, so treatment should be initiated within 6hrs because all what is needed is physical examination, history, CXR & sometimes blood test – which should take less than 6hr

Necrotizing pneumonia with cavitation



TREATMENT

- **Typical pneumonia:** **mild, out-patient Mx: oral amoxicillin, cefuroxime, amoxicillin/clav.**

- **Atypical pneumonia:** **macrolide like azithromycin or levofloxacin**
- **Sick, hospitalized patients:** **parenteral cefuroxime, if staphylococcus aureus suspected (pneumatocele ,empyema) clindamycin or vancomycin .**

See the next two slides

Typical Pneumonia

- Caused by: Microorganisms that can be identified by Gram staining & culture (although this is not commonly done in practice).

- Examples: Streptococcus pneumoniae, Staphylococcus aureus, etc.

- Symptoms:
  - Present with similar symptoms regardless of the microorganism.
  - Patients are very sick, typically after 3-5 days of illness.

- Blood tests: Associated with high CRP and WBC levels.

- CXR Findings: Appear less severe than the clinical presentation.

- Treatment:
  - For mild illness (outpatient management) Oral antibiotics: Amoxicillin, cefuroxime, or amoxicillin/clavulanic acid.

Atypical Pneumonia

- ❑ Caused by: Microorganisms that cannot be detected by Gram stain or culture, requiring specific tests.

- ❑ Examples & Tests:
  - Legionella pneumonia: Detected by legionella urine antigen.
  - Mycoplasma pneumoniae: Diagnosed using serology (IgM).

- ❑ Symptoms:
  - Known as "**walking pneumonia**" the patient remains physically active despite having pneumonia.
  - Patients appear less sick and typically present 5-7 days after the illness onset.

- ❑ Blood tests: They usually lack WBC elevation or neutrophils left shift.

- ❑ CXR Findings: Appear worse than the clinical presentation, often showing significant multilobar infection (e.g., COVID pneumonia).

- ❑ Treatment:
  - For mild cases (outpatient management): Macrolides like azithromycin or levofloxacin.

Case 2

- **History :**
- 45-year-old gentleman presents for evaluation of dyspnea of 6 months duration , associated with chronic minimally productive cough . He is police officer . He is current smoker of 40 pack year. He has unremarkable past medical, surgical and drug history. He has no history of childhood Asthma, atopy or family history of Asthma.

➢ **The clues are:**

✓ 6 months duration of cough, dyspnea; it indicates chronic disease (>2 weeks) can be:

❖ Acid reflux (GERD), Asthma, COPD (Chronic bronchitis + Emphysema)

✓ Smoker: significant smoking history.

✓ No previous history of asthma, atopy, childhood asthma: doesn't seem to have risk factors for asthma though it doesn't negate it, although; patients can develop asthma without any previous history of asthma or allergy.

Physical examination

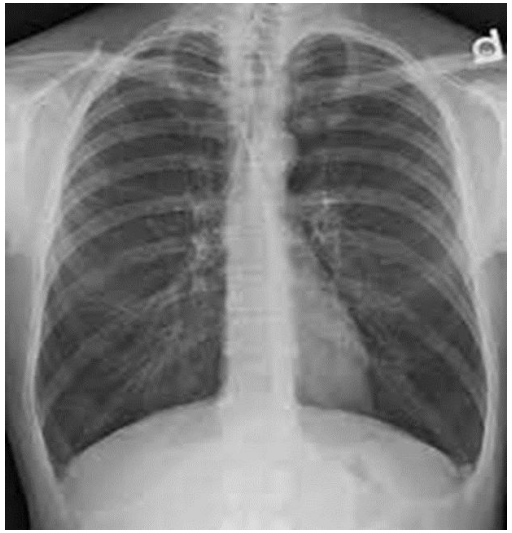
- Afebrile ,RR 35 (12-20 normally) ; the patient is tachypneic
- Pulse rate 100 . Tachycardia
- SPO2 89%.
- Intercostal and subcostal retractions .
- Chest :diffuse Expiratory wheeze (indicative to an obstructive disease), prolonged expiratory phase with decreased air entry .
- CVS :normal ,liver not palpable (no evidence of abdominal mass)
- hands : no finger clubbing .

RR: Respiratory Rate
SPO2: Saturation

What is the next investigation ?

1. Chest X-ray:

Hyperinflation is seen, which can be recognized by:



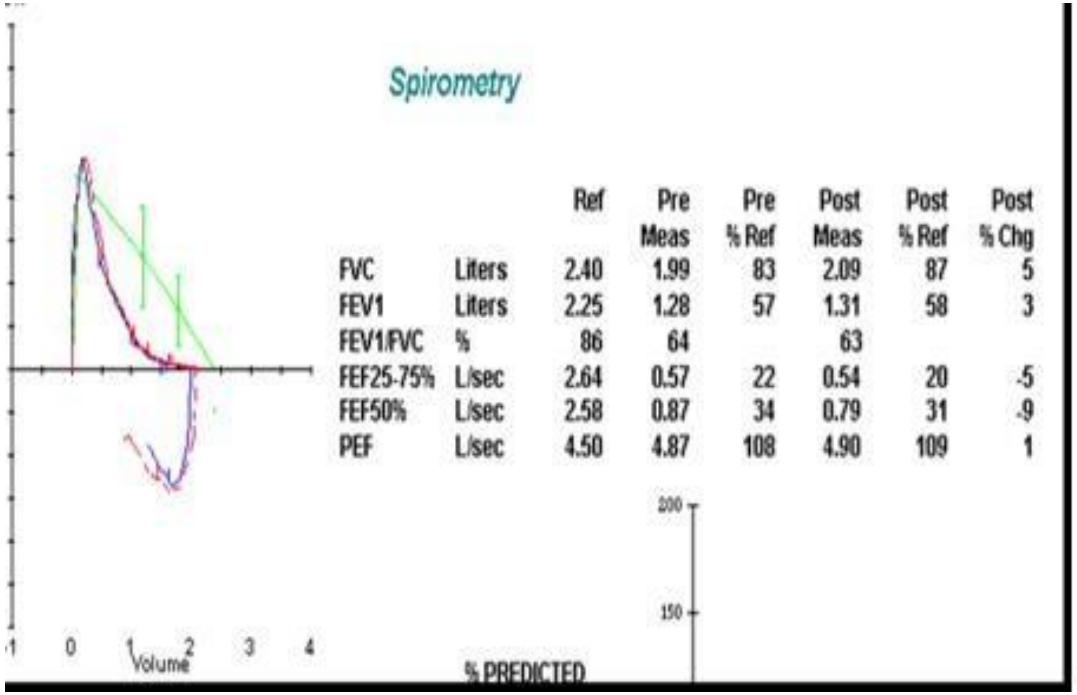
- ✓ We count the number of posterior ribs (the oblique ones), here in this example we can see 9 ribs. Normally, we should see 6 ribs anteriorly, and 8 ribs posteriorly, anything more indicates **over inflation**.
- ✓ Another clue is that the diaphragm is pushed downward.
- ✓ Small heart.

Other investigation:

2. Spirometry:

It is one of lung function measurements, which is an instrument in which the patient exhales forcefully to measure expiratory flow, it is helpful in airway and restrictive lung diseases diagnosis.

See the next slide



This part is a physiology lab revision:

- ✓ The **straight black line**: air expelled out of large airways, starts from the TLC at the X-axis until it reaches the Peak flow.
- ✓ The **green line**: air expelled out of small airway (normal), continues until the residual volume.
- ✓ The curve below the x-axis is the inspired air in the patient, the green line is deviated with more curving (coving) giving the **red curve**: indicates that the problem is in expired air of small airways→ airway narrowing mainly which would cause taking more time to exhale → good clue to think of COPD - airway obstruction.
- ✓ Then look at FEV1 ratio pre-bronchodilators = 64%, and post-bronchodilators = 63% --> **both are less than 70%.**
- ✓ The pre- and post-FVC are normal (83 % and 87%).
- ✓ For FEV1: It is 57% less than normal (80-120%) and after the reversibility test (using bronchodilator) it stays low, indicating definite airway obstruction.

What is the diagnosis:

After the history, physical examinations, X-ray and spirometry, we diagnose the patient with COPD

Definition

is a **common**, **preventable** and **treatable** disease.

It is characterized by **persistent** respiratory symptoms and airflow limitation that is due to airway and/or alveolar abnormalities usually **caused** by significant exposure to noxious particles or gases.

- ✓ Obstructive spirometry (obstructive airflow) : **FEV1/FVC < 70%**, caused by specific risk factors like smoking.

The chronic airflow limitation that is characteristic of COPD is caused by a mixture of **small airways disease** (e.g., obstructive bronchiolitis) and **parenchymal destruction** (emphysema), the relative contributions of which **vary** from person to person.

Treatment

- Reducing risk factor exposure
- Appropriate assessment of disease
- Patient education
- Pharmacological and non-pharmacological management of stable COPD
- Prevention and treatment of acute COPD exacerbations see the next slide for more details

✓ Vaccination, smoking cessation, pulmonary rehabilitation.

- ✓ **Exacerbation** is defined by the worsening of clinical symptoms that were stable and require a change in medications.

- ✓ You need to treat acute exacerbations because it is linked to mortality, morbidity, and lung function reduction.

- ✓ Patients with COPD who come having exacerbations or more flares up of their disease are more likely to die, they have very bad outcomes and very severe disease, and even if they are stable, sometimes, they tend to progress very quickly because every time they have exacerbation, there will be more worsening of their disease and lung function.

- ✓ COPD patients always complicate persistent dyspnea and cough when they exacerbate, they will suffer more cough, more sputum and change in sputum color, worsening dyspnea and they usually seek medical evaluation or go to ED (emergency department) for treatment change, or steroids administration, they also maybe admitted.

- ✓ If the patient has suffered from 2 exacerbations in the last 12 months it indicates a poor outcome.

Pharmacological treatment

- ✓ Inhaled B2 agonist(short acting)(SABA)
- ✓ Inhaled B2 agonist(long acting)(LABA)
- ✓ Inhaled anticholinergic(short acting)(SAMA)
- ✓ Inhaled anticholinergic(long acting)(LAMA)
- ✓ Inhaled corticosteroid (ICS)
- ✓ Combination inhalers
- ✓ Methylxanthine Like theophylline, is indicated in special cases but in general, we don't use them because of their toxicities.
- ✓ Phosphodiastrase-4 inhibitor Have been used recently for exacerbation management, so it is added to inhaled bronchodilators.

➢ The steps are inhaled bronchodilators initiation then ICS +/- phosphodiesterase inhibitors addition in case of more complicated exacerbations.

Pharmacological treatment

- ✓ Should be started with inhaled medications: B2 agonists and Anticholinergics.
- ✓ Both have short acting and long acting effects.
- ✓ Usually, short-acting drugs are used in exacerbations, while long acting are used in stable chronic patients.
- ✓ We usually start with LAMA then add LABA, or the combination of both may be the first course. Although, we don't usually start with ICS, because if you have asthmatic patient, you would start with ICS at the upfront treatment.
- ✓ So, in asthma we start with ICS, then add other inhaled bronchodilators, while in COPD, we start with muscarinic antagonist (anticholinergics) and B2 agonists then add ICS if necessary.
- ✓ When is ICS usage indicated in COPD? If the patient has suffered from 2 exacerbations in the last 12 months, if the FEV1 is less than 50%, if peripheral eosinophilia is presented, and with overlapping asthma.

Case 3

64 years old female patient with longstanding history of type 2 DM and recently treated breast cancer presented to the ER with fever,cough and dyspnea.

Her COVID19 swap is positive .

- ✓ The background of the patient: DM, breast cancer survivor.
- ✓ Symptoms: fever, cough, dyspnea.
- ✓ Covid patient → she has COVID pneumonia (tested positive).

Physical examination

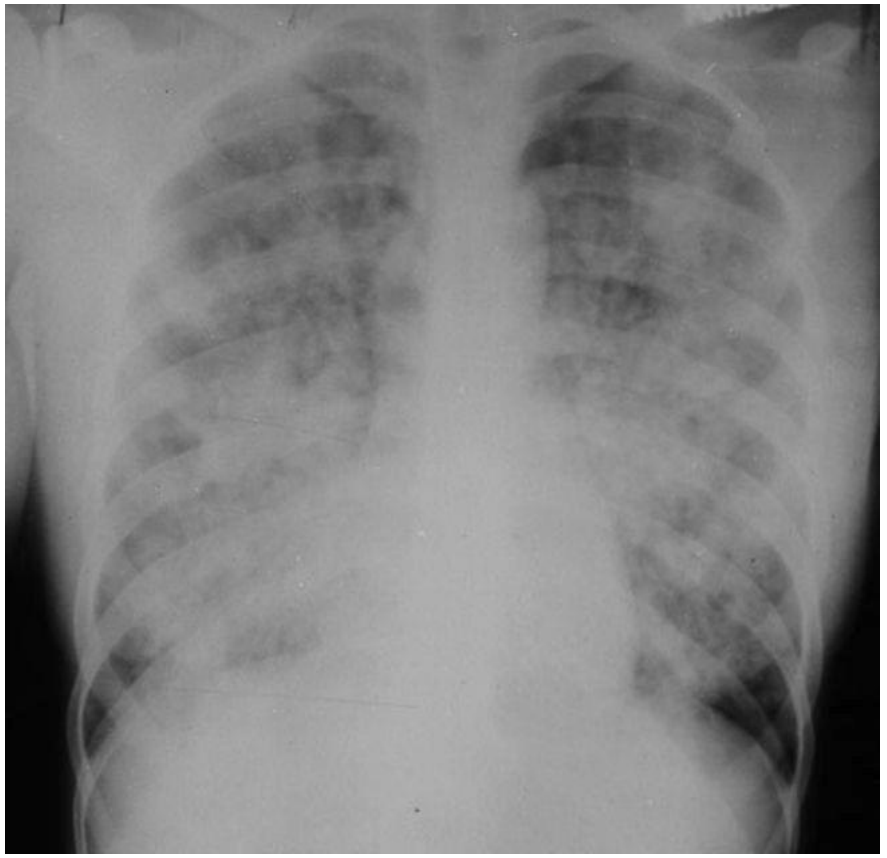
- BP is 130/70 .
- RR 18 .
- HR 98 .
- SO2 86% on room air.
- temp 38.6 C.
- Chest : bilateral inspiratory crackles and bronchial breath sounds.
- Increased TVF and dull percussion to auscultation

Investigation

- **CXR: which indicated the following:**

✓ Bilateral patchy opacities involving most of the lung fields.
✓ Normal heart.
✓ Acute symptoms.

*You must think of ARDS



Investigation

ABG on room air

PH: 7.42

PaCO2: 33 mmHg

PaO2: 40 mmHg

SPO2: 80%

PF ratio: Pao2/Fio2

40/0.21=190

- ✓ We use PF ratio to define ARDS, PaO2 (partial pressure of oxygen from blood gas) is obtained from ABGs, and FiO2 depends on the O2 breathed by the patient.
- ✓ If it is room air, it will equal 0.21, if we let the patient expire 32% of O2 , FiO2=0.32

Diagnosis

ARDS

Adult respiratory distress syndrome

Definition

Acute respiratory distress syndrome (ARDS)
It is a clinical syndrome characterized by an acute, diffuse, inflammatory form of lung injury resulting from diffuse injury to the alveolo-capillary membranes. , (characterized by increased pulmonary vascular permeability, and loss of aerated tissue, increased work of breathing and impaired gas exchange.)

Ranieri VM, Rubenfeld GD, Thompson BT, et al; ARDS Definition Task Force. Acute respiratory distress syndrome: the Berlin Definition. *JAMA*. 2012;307(23):2526-2533

ETIOLOGIES AND PREDISPOSING FACTORS

2 main categories

DIRECT LUNG INJURY	INDIRECT LUNG INJURY
Pneumonia	Sepsis
Aspiration of gastric contents	Multiple trauma
Pulmonary contusion	Cardiopulmonary bypass
Fat, amniotic fluid, or air emboli	Drug overdose
Near-drowning	Acute pancreatitis
Inhalational injury	Transfusion of blood products
Reperfusion pulmonary edema	

✓ Pulmonary contusion:
- Caused by trauma, blunt injury.

✓ Inhalation injury:
- CO inhalation = chemical pneumonitis, Inhalation of flames from burns.

✓ Reperfusion pulmonary edema:
- Seen usually when we drain pleural effusion that has been there for long time or drain too much fluid at the same time, so the lung that has just expanded is reperfused-->increasing alveolar capillaries permeability (ARDS cause).

➢ ARDS is related to inflammatory cytokines releasing and systemic response from the body.

Treatment

Treatment for ARDS typically aims to:

Increase blood oxygen levels.

Provide breathing support. (Ventilators)

Treat the underlying cause of the disease.

- ✓ IV fluids support.
- ✓ Anti-virals in case of viral pneumonia
- ✓ Steroids in case of severe ARDS.

رسالة من الفريق العلمي

اللهم إن عمر عطية في ذمتك وحبل جوارك، فقِه من فتنة القبر وعذاب النار،
أنت أهل الوفاء والحق، فاغفر له وارحمه إنك أنت الغفور الرحيم.

عن روح الزميل عمر عطية

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