



RS

PBL

MODIFIED NO. 1



كتابة: دكتور 021

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Adult Respiratory cases

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Respiratory and sleep medicine

Color code

Slides

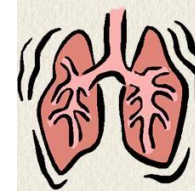
Doctor

Additional info

Important



Case 1



History:

45 years old lady ,previously healthy .

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

Associated with productive cough and shortness of breath.

- Fever for 5 days: is indicative of acute illness (any symptom that continues less than 2 weeks is considered an acute illness and the DDx are acute causes).
- productive cough, shortness of breath.
- you must think about LRTIs (pneumonia) as a main diagnosis.



Physical examination

General : looks **unwell**, has **increased WOB** .(RR 40 b/m,PR 110 ,**temp 39**).

subcostal and intercostal retractions .

Chest :

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

Percussion : dull to percussion

Extra: Let's remember the normal ranges and medical definitions to compare with:

-RR normally=12-20 breath/min in adults

-PR=60-100 beats/min



RR is increased→tachypnea, PR is increased→tachycardia, temp is increased, the patient is febrile, subcostal and intercostal muscles indicate that she is in respiratory distress (extra: hence accessory muscles of expiration: Subcostal, intercostal muscles and sternocleidomastoid. Accessory muscles of expiration work minimally during tidal (normal) breathing, when the patient becomes tachypneic, they assist in breathing, so in physical examination, subcostal and intercostal muscles enter between the ribs in respiration (because they try to work to compensate for the work of breathing), while in resting, the major working muscle is the diaphragm).

What are the Clinical
Investigations needed ?



CXR

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



1) CBC: complete blood count, **WBCs and especially neutrophils are expected to be increased in some types of pneumonia secondary to infections more precisely the bacterial ones.** On the other hand, it is expected to **decrease in cases of anemias**, like mycoplasma pneumonia infection, which is known with IgM cold agglutination causes hemolytic anemia. Also, it is expected to decrease significantly in cases of severe sepsis.

2) Blood culture: it is indicated only in specific cases culture decision is taken, examples: if the patient is febrile at the time of presentation or not responding to treatment. This determination is due to low diagnostic yield of culture about 20-30%, and because in practice we start empirical antibiotics based on clinical presentation.

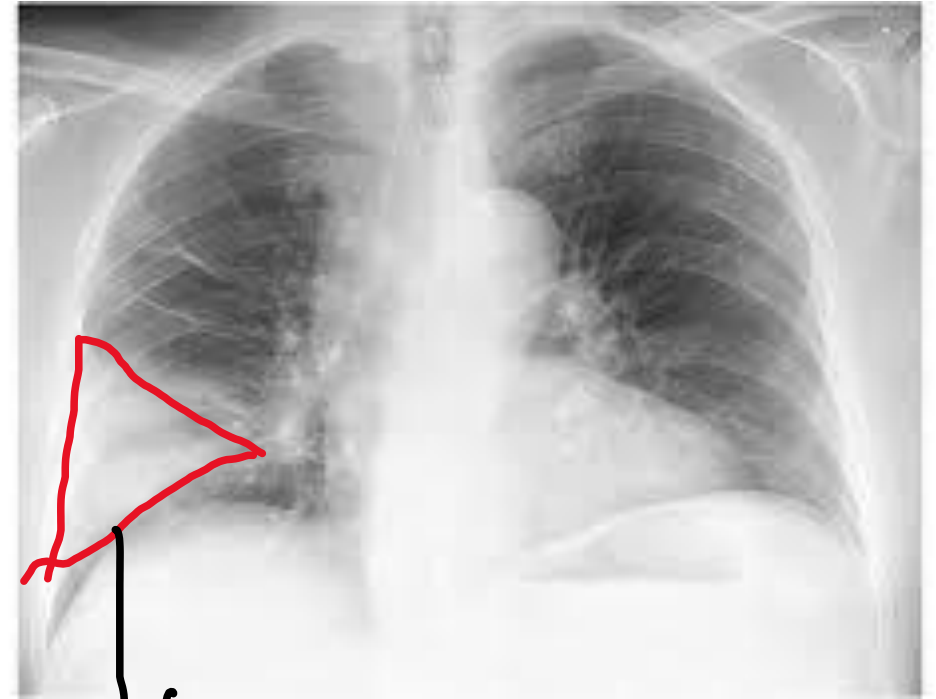
3) Inflammatory markers: are very important indicators

- raised CRP→indicates infection**
- patients who present with other differential diagnosis that are similar in terms of **symptoms to pneumonia (like pulmonary embolism) will be afebrile or maybe low-grade fever with normal to mildly elevated CRP.**

4) CXR: patchy opacity involving mid and 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) and 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: less likely cause:**

a-**aspiration of food or gastric juice: especially in patients who drink alcohol, have stroke, or neurological disorders, and are unable to stay conscious at all.**

b-**hypersensitivity reactions**

c-**foreign bodies (children)**

d-**Hydrocarbons and lipoid substances: like cigarettes and vapes (also they are well-known to cause hypersensitivity pneumonia)**

e-**radiation-induced pneumonitis (in cancer patients)**



COMPLICATIONS

- **Pleural effusion**
- **Direct invasion: Empyema, pericarditis**
- **Hematogenous spread: Meningitis, suppurative arthritis and osteomyelitis (rare).**



- When patients admit to the hospital on the 2nd or 3rd day of IV antibiotics administration and not improving, so he might develop one of the following:
 - Lobar infiltration is more characteristic to pneumonia
 - Pleural effusion: comes with worsening dyspnea, fever recurrence, chest pain, and inflammatory markers will go up after being down in the first few days. In addition to physical findings including dull percussion note and absent TVF.

Direct invasion: Empyema, pericarditis

- The direct infection is caused by the infection itself, and causes infection in the pleural space by the microorganisms or the infectious process.
- So, empyema is direct invasion of the bacterial Ag to the pleural space in inflammation, while pleural effusion is a reactive process to pneumonia.

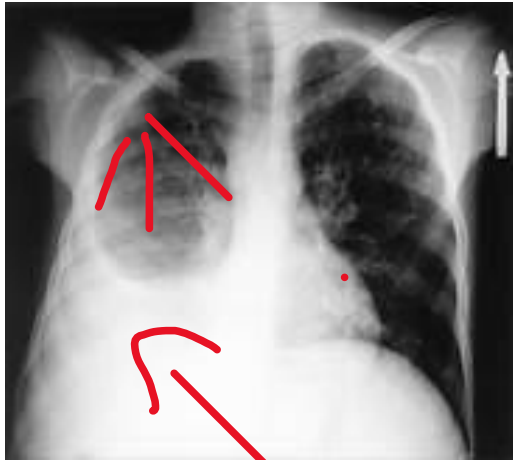
- Sometimes the patient has distant invasion for the bacteria or virus: Hematogenous (through bloodstream) spread: meningitis, suppurative arthritis and osteomyelitis (rare).
- However, it is rare because most patients of pneumonia complain early and because pneumonia treatment is established empirically.

- **Extra: Empirical treatment means initiating therapy based on clinical judgment and available information before a specific diagnosis is confirmed.**

- So you need to start antibiotics ASAP, once symptoms appear and new infiltration on CXR, you don't need to wait for culture or blood test.

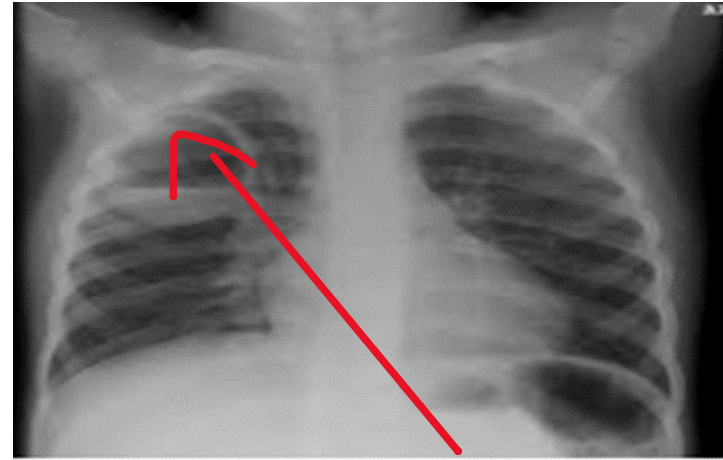
Complicated pneumonia

Pleural effusion



Red arrow = 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

Necrotizing pneumonia : cavitation



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 Abx after 6 hrs of presentation to ED, so txt should be initiated before 6hrs because all what is needed is PE, history, CXR, and sometimes blood test - which should take less than 6hrs



TREATMENT

- **Typical pneumonia:** mild ,out-patient Mx :oral amoxicillin ,cefuroxime, amoxicillin/clav.
- **Atypical pneumonia:**macrolide like azithromycin or levofloxacin
- **Sick ,hospitalised patients ;**parenteral cefuroxime .if staph. aureus suspected (pneumatocele ,empyema) clindamycin or vancomycin .



Typical Pneumonia:

- **Caused by:** Microorganisms that can be identified by **Gram staining** and **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.
 - 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 and Tests:**
 - *Legionella pneumoniae*: Detected by **legionella urine antigen**.
 - *Mycoplasma pneumoniae*: Diagnosed using **serology** (IgM).
- **Symptoms:**
 - Known as “walking pneumonia.”
 - Patients appear **less sick** and typically present **5-7 days** after the illness onset.
 - They usually lack **WBC elevation** or **neutrophil 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 factor for asthma though it doesn't negate it - patients can develop asthma without any previous history.

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Physical examination

Afebrile ,RR 35 (12-20,

normally):tachypnea

Pulse rate 100 (110):

tachycardia.

SPO2 89%.

Intercostal and subcostal retractions .

Chest :

diffuse Expiratory(indicative to an obstructive disease)

wheeze,prolonged expiratory phase with decreased air entry .

CVS :normal ,

liver not palpable (no evidence of abdominal mass),

hands : no finger clubbing .



What is the next investigation ?

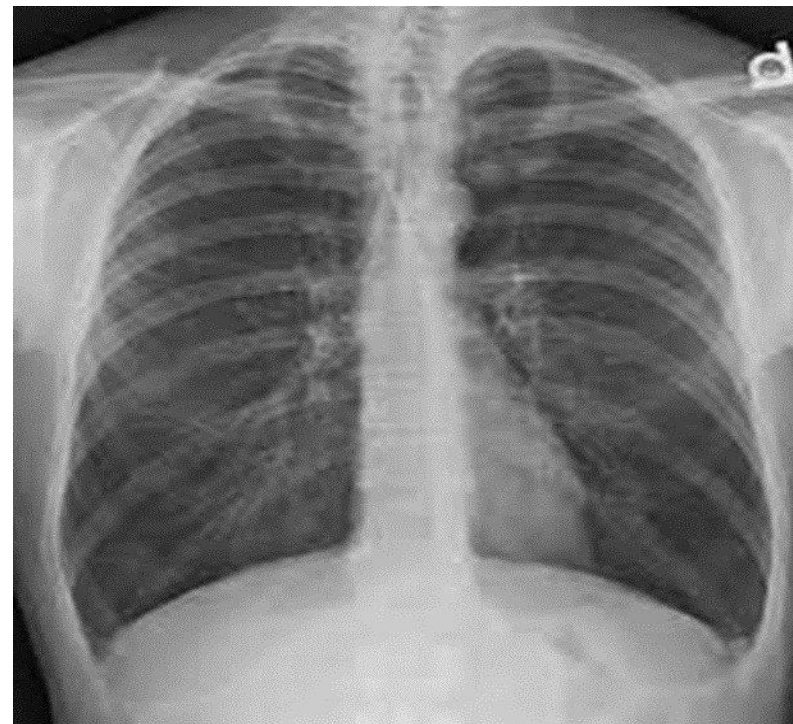
1-chest x-ray:

Hyperinflation is seen, which can be recognized by:

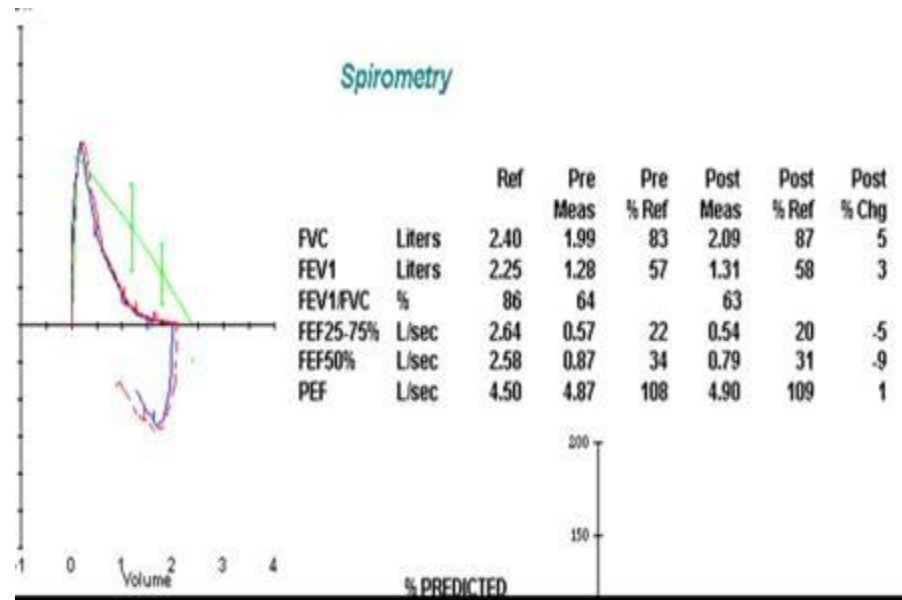
1- We count the number of posterior ribs (the oblique ones), here in this example we can see 9 Ribs, Normally, we should see 6 ribs anteriorly, and 8 ribs posteriorly, anything more indicates overinflation

2- Another clue is that the diaphragm is pushed downward

3- 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.

This part is physio 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 FEV1R pre-bronchodilators = 64%, and post-drug = 63%--> both are less than 70%.
- also, 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 as **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-: $FEV_1/FVC < 70\%$, 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

- vaccination, smoking cessation, pulmonary rehabilitation

Appropriate assessment of disease

Patient education

Pharmacological and non-pharmacological management of stable COPD

- Prevention and treatment of acute COPD exacerbations



- **Prevention and treatment of acute COPD exacerbations:**

- 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 for treatment change, or steroids administration, they also may be admitted.

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



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.
- but 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.
- so 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.



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
Phosphodiesterase-4 inhibitor

-Methylxanthine:

Like theophylline, is indicated in special cases but in general, we don't use them because of their toxicities.

-Phosphodiesterase-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.



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

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

Pulmonary contusion:
Caused by trauma, blunt injury

Inhalation injury:
CO inhalation = chemical pneumonitis,
Inhalation to flames of burn

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	

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)



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



Thank you



Additional sources

1. Book pages
2. Youtube videos
3. Webpages...etc

كفاك متابعةً وتقليبًا، أهلكت نفسك!
يا فتى قد جاءك الخبر، وعلمت الأثر، وعرفت الطريق، وأدركت الغاية،
وفهمت المعنى، وأيقنت أن الأمة تحتاج أهلها، فكن أهلًا لها.

VERSIONS	SLIDE #	BEFORE CORRECTION	AFTER CORRECTION
V1→V2			
V2→V3			



امسح الرمز و شاركنا بأفكارك لتحسين أدائنا !!