

PATHOLOGY

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Number

3

Subject

Chronic Bronchitis

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→ Before we start

- This sheet was written according to section 2 recording.
- Previously, we said that there are four examples on obstructive lung diseases:

- 1- Emphysema
- 2- Chronic bronchitis
- 3- Bronchial asthma
- 4- Bronchiectasis

And we've already discussed emphysema. In this lecture we are going to talk about the second disease, which is chronic bronchitis.

Chronic Bronchitis (chronic inflammation affecting the bronchi):

In the previous lecture we said that we can diagnose emphysema morphologically (the morphology of dilated alveoli), so emphysema has a morphologic diagnosis. Whereas, chronic bronchitis has a **clinical diagnosis**. In order to diagnose a patient with chronic bronchitis, he has to have a productive cough (cough with sputum or mucus), lasting for -at least- three months, in -at least- two consecutive years.

Q what is the difference between clinical and morphologic diagnosis?

When we diagnose something on a clinical ground, we take the signs and symptoms of the patient and according to them we make the diagnosis (that's the case of chronic bronchitis). But in case of emphysema, we can't diagnose it unless we make an x-ray, and see the dilated alveoli under the microscope, so this is a morphologic diagnosis.

→ Etiology and Pathogenesis (كيف يندخل الفيل ع الثلاجة؟)

The main cause of chronic bronchitis is **smoking** (it is extremely rare for a non-smoker to develop chronic bronchitis, only chronic exposure to very polluted air can produce the same effect of smoking, especially if it has sulfur dioxide and nitric dioxide).

The affected part of airways in chronic bronchitis is **the bronchi**. So smoking in this disease affects the large airways (trachea and main bronchi).

Smoking produces toxins which induce cell injury, and this cell injury stimulates the process of inflammation (by inflammatory mediators and inflammatory cells).

So we have a severe chronic inflammation in the wall of trachea and bronchi, and the outcome of this inflammation is **fibrosis**. Then we will have thickening of the wall and narrowing of the lumen, yet we have no obstruction.

Can this narrowing cause obstructive lung disease? Since chronic bronchitis affects large bronchi so the inflammation, fibrosis and narrowing won't cause total obstruction. So as long as the inflammation is in large bronchi, there will be no obstruction.

Then why do we consider it as an obstructive pulmonary disease?

1- Because later on, the inflammation will move to the smaller bronchioles and then we'll have "**Bronchiolitis**", only then obstruction will occur. So obstruction occurs when inflammation affects small airways (when we have bronchiolitis).

2- Another cause is that since chronic bronchitis is caused by smoking, patients will probably have emphysema too, this **associated emphysema** is what causes the obstructive pattern.

So the obstructive symptoms in patients with chronic bronchitis are the result of two things, bronchiolitis and associated emphysema.

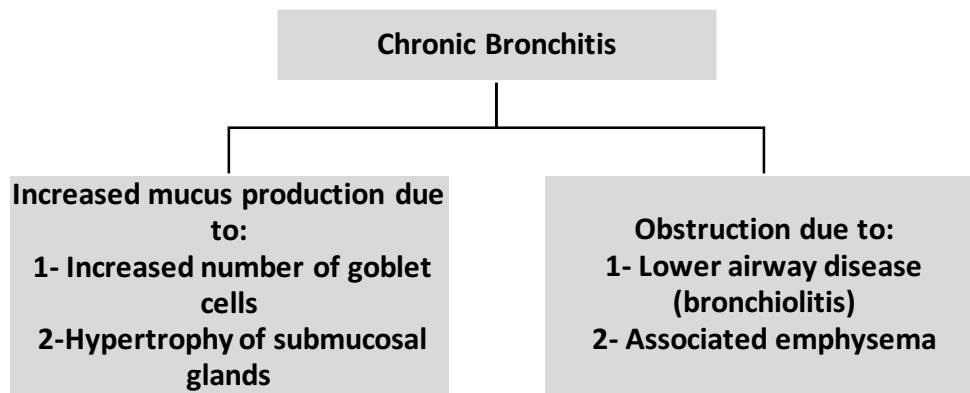
Patients with chronic bronchitis also have increased production of mucus (which further helps in the obstruction) due to:

1- Increased number of goblet cells.

2- Hypertrophy of submucosal glands → under the microscope, the percentage of submucosal glands to the entire wall is called "**Reid's index**" (the percentage of the submucosal glands as compared to the whole thickness of the bronchial wall).

Normally the index is 40% (the submucosal glands make 40% of the wall)

In chronic bronchitis it is >40%, because the glands are hypertrophied.



As we said the diagnosis is based on the chronic productive cough, so diagnosis depends on the mucus secretion (upper airway problem) NOT on the obstruction (which is a lower airway problem).

In the beginning all they have is a productive cough and no obstructive symptoms. Only when they start to have bronchiolitis and associated emphysema, the obstructive symptoms (normal inspiration and abnormal expiration) start to appear, they can inspire normally but they can't get rid of the CO₂.

In emphysema we said that O₂ and CO₂ concentrations remain normal. In emphysema, the problem is that we have reduced elastic fibers. There is no fibrosis, there is no increased mucus production, so the **obstruction is non-structural**. The problem is that the alveoli are filled with air but there is no elastic recoil to push the air out. As to compensate for the loss of elastic recoil, the patient has to put an effort to push the air out. Eventually, they can get rid of CO₂ and they won't have CO₂ retention.

But in chronic bronchitis we have **actual obstruction**, so even if the patient puts an extra effort to push the air out, there won't be good expiration. These patients will have CO₂ retention, that's why their O₂ concentration is lower than normal and their CO₂ concentration is higher than normal. These patients will be **cyanosed**, and usually they are **fat** compared to emphysema patients, therefore patients with isolated chronic bronchitis are called "**Blue Bloaters**" (Blue: because they have cyanosis, Bloaters: because they're considered fat compared to "Pink Puffers").



Pink puffers → pure emphysema.

Blue Bloaters → isolated chronic bronchitis.

- On the side: the term “Blue bloaters” has different explanations in different books. Some refer to them as bloaters because they’re overweight. Others say the term means that their lungs are expanded due to the fact that air is retained in them.

It is rare to see a patient with pure emphysema or isolated chronic bronchitis. Usually the patients have a spectrum of symptoms, because both are related to smoking. That’s why these two diseases are placed in one category referred to as “COPD, Chronic obstructive pulmonary diseases”.

So usually patients present with symptoms of emphysema and symptoms of chronic bronchitis. If the symptoms of emphysema are more than the symptoms of chronic bronchitis, this means that emphysema has a higher effect, and vice versa.

- The differences between emphysema and chronic bronchitis: (Dr. Heyam said that there will be a question about these in the exam)

Emphysema	Chronic Bronchitis
Morphologically, there is no inflammation.	There is inflammation morphologically.
No fibrosis.	Fibrosis is present.
Functional obstruction.	Structural (actual) obstruction.
Normal O2 conc. Normal CO2 conc.	Low O2 conc. High CO2 conc.
Normal color (pink).	Cyanosed.
Affects acini.	Affects upper lobes (trachea and bronchi).
Morphological diagnosis.	Clinical diagnosis.
Patients are relatively thin.	Patients are relatively fat.
Expiration is possible.	No good expiration.
Alpha-1-antitrypsin deficiency is a risk factor.	----

➔ **Complications of COPDs:**

1- **Susceptibility to infections:** because mucus makes a good medium for bacterial growth. Also, mucus affects the ciliary function and makes it less efficient in sweeping up bacteria.

2- **Cor pulmoanle:** Right sided heart failure due to pulmonary hypertension.

3- **Lung failure.**

4- **Bronchiectasis:** this is the 4th example on obstructive lung diseases, and it's considered as a complication of other diseases, so it's NOT a primary disease it is a secondary disease.

Shout out to the queen of family medicine, the one and only Dana Rida :D

Sorry for any unintended mistake

Good luck everyone