Lingula pneumonia: the importance of computerized tomography to diagnose

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Abstract. Diagnosing pneumonia still presents obstacles since around 30% of patients have little or no symptoms. Furthermore, this specific type, lingula pneumonia, is barely evident or not visible on posteroanterior radiography because the lingula is located behind the heart. Lingula pneumonia may be visible on lateral radiography. However, computed tomography is the best imaging exam to diagnose this type of pneumonia. From the analysis of radiographs and tomography extracted from the Portal Pneumoimagem website, it was possible to conclude that tomography prevents the heart from compromising the visualization of consolidation in the lingula, which happens in radiography. This happens because the tomography image is made as if it were sections seen from above. This circumstance qualifies the diagnosis of pneumonia in the lingular region, allowing the correct treatment to be fulfilled.

Keywords. Pneumonia, Radiography, Lingula, Tomography.

1. Introduction

Pneumonia is an inflammation caused by a microorganism of the lung parenchyma [1]. Pneumonia classifies by its anatomy, exposure profile, and etiology. In 2019, this disease killed around 2.5 million people, affecting 672,000 children [2]. It is considered a disease with high mortality and highly costly treatment.

The clinical presentation of pneumonia is varied and may present signs and symptoms for days or weeks. Symptoms may include chills, chest pain, pleuritic pain, productive mucopurulent cough, hemoptysis, dyspnea, tachypnea, fever, cough, loss of appetite, and drowsiness [1]. The physical examination has low specificity and sensitivity since clinical signs may or may not be present; for example, the presence of rumbling, wheezing, or crackling rales on auscultation is very characteristic of pneumonia, in some cases, the person may present normal auscultation [3]. Therefore, it is possible to observe the importance of imaging tests to confirm pneumonia. Accordingly, the diagnosis of pneumonia is only made based on when there is a compatible clinical picture and lung imaging showing consolidation [4].

Lung tomography, lung radiography and ultrasound are the only imaging exams to date that are capable of observing consolidation caused by pneumonia. Radiography is the most used due to its low cost and greater accessibility. On radiography, everything that contains air is black, and everything denser, such as organs, bones, and some vessels, presents a greyish and even white color because the density prevents the passage of X-rays [5].

There is a place where pneumonia initially sets in that it is impracticable to identify or see the extent of the disease cannot be assessed on lung radiography; it is better view using tomography [6]. This location is known as the lingula, located in the lower segment of the left lung behind the heart. Because it is behind the heart, lingula pneumonia is difficult to visualize on radiography since the heart, a dense organ, already presents opacity, which makes it impossible to view the opacity caused by pneumonia in the lingula region [7].

Therefore, if the X-ray image appears normal, but the patient presents signs and symptoms associated with pneumonia and leukocytosis on the leukogram, the doctor needs to request a tomography in order to observe the pneumonia in the pulmonary lingula.

Accordingly, the importance of performing a lung tomography is normal after presenting a normal lung x-ray, leukocytosis and signs and symptoms characteristic of pneumonia since if the doctor does not identify lingula pneumonia, the microorganisms will continue to spread, increasingly affecting more, which can cause a series of complications including death.

2. Research Methods

Thirty articles were collected, and after the literature review, only sixteen were approved to be used as study material in this article. The exclusion topics were unreliable information, little content necessary for the study, and publication date less than ten years old. In addition, five academic medical books were used for more reliable information. The study was based on the articles and books present in the references.

The articles were taken from Google Scholar, and the books were consulted through the online library at Souza Marques College.

To achieve this result were used lung radiography images and lung tomography of lingula pneumonia were evaluated. These images are presents in the article "Radiografia simples do tórax: noções de anatomia" by author Gustavo de S. P. Meirelles and on the website "Portal Pneumoimagens" managed by pulmonologist Mauro Gomes.

3. Results and Discussion

3.1 LUNGS

Human beings have two lungs, the right and the left. The right lung has ten segments and three lobes upper, middle, and lower. The left lung has nine segments and two lobes, upper and lower. In the upper lobe of the left lung, there is a region called the lingula. The heart, anatomically, is located anterior to the lungs; as the heart is located in the left center, it is in front of the lingula [8].

Hematosis is the principal role of the lung, which allows the entry of oxygen into the blood and the exit of carbon dioxide from the blood. Oxygen is a vital molecule for humans, as it participates in cellular respiration and energy production. Carbon dioxide in the human body preserves the acid-base balance, but large amounts of carbon dioxide are toxic to humans and can even cause death.

3.2 PNEUMONIA

Pneumonia is an infection of the lung parenchyma caused by microorganisms [1]. This disease occurs when there is a reduction in defense mechanisms capable of preventing the arrival of or neutralizing microorganisms. According to the Forum of International Respiratory Societies, pneumonia is one of the leading causes of death at extreme ages; it is a disease with high mortality, with two child deaths due to pneumonia every minute [9].

Upon reaching the pulmonary alveolus, the microorganism begins its uncontrolled multiplication, activating the mechanisms of acute inflammation, generating the production of cytokines and recruitment of neutrophils, forming an exudate in the lumen of the alveolus, which will prevent lung ventilation. Therefore, there is a deficiency in hematosis, so the lungs cannot remove the carbon dioxide in the blood and cannot release oxygen into the blood [1].

It is classified by etiology, exposure profile, and anatomy/radiology. As for the etiology, it can be divided into typical bacterial, atypical bacterial, viral, and fungal, being the most common bacterial infection. Regarding the exposure profile, it is characterized by community, nosocomial, and associated with ventilation; as the last two are examples of healthcare-associated pneumonia, this form of the disease generally presents resistant pathogens. Regarding anatomy/radiology, it is divided into interstitial, bronchopneumonia/lobular, and segmental/lobar [1].

The clinical presentation of pneumonia varies from days to weeks, and it can contain leukocytosis, persistent fever, chills, chest or pleuritic pain, productive mucopurulent cough, hemoptysis, dyspnea, tachypnea, drowsiness, inappetence, among other symptoms [1].

On physical examination, the patient may present signs of increased thoracic vocal fremitus on palpation, rumbling, wheezing, and, or crackling rales on auscultation, signs of strain on inspection [3].

According to the article "Community-acquired pneumonia" by author, Rodrigo A. B. Neto, around 30% of patients with pneumonia, especially elderlies, do not present signs and symptoms of pneumonia or present non-specific symptoms, which makes it difficult to confirm the disease with just physical examination and anamnesis [10]. Therefore to diagnose pneumonia it is necessary to combine a clinic compatible with lung imaging with consolidation [5].

3.3 IMAGE EXAMINATION

To date, the imaging tests used to confirm pneumonia are lung radiography, chest tomography, and ultrasound [6]. Since radiography is more accessible and less expensive, its use for diagnosis is more common.

The posteroanterior and lateral positions of the radiograph are the most used to confirm this diagnosis [11]. On radiography, everything that contains air is black, and everything denser is grayish-white. The lung is an organ filled with air. On an x-ray, a healthy lung appears black [5].

Due to the anatomical arrangement of the heart, the opacity of this dense organ is in front of the lingula, which hinders the opacity in the lingular region, making it difficult to recognize any diseases in the pulmonary lingula. This visualization difficulty is much worse in the posteroanterior position compared to the lateral position.

Compared to radiography, chest computed tomography presents a clearer image of the lung

parenchyma. Furthermore, tomography provides better visualization of certain areas of the lung, such as the lingula, since it is an image in slices, which prevents the heart from obstructing the visualization of the pulmonary lingula [6].

Normally ultrasonography is used for pediatric and critical patients, that is, patients who can not maintain an adequate and static position for radiography and tomography [6].

Tab. 1 - Analysis of images of clinical cases present on the Portal Pneumoimagem website

Clinical case	X-Ray	CT scan
Community pneumonia	noticeable	no image
Mycobacterium paraffinicum	no image	noticeable
Mycoplasma pneumonia	noticeable	better view

In association with table 1, the cases demonstrated a much clearer image of lingula pneumonia in cases that presented a tomography image. While the X-ray image only showed pneumonia around the heart area, it was not possible to visualize the pneumonia directly in the pulmonary lingula [12], [13], [14].

4. Conclusion

The study aimed to demonstrate the importance of performing computed tomography to help confirm the diagnosis and observe the extent of lingula pneumonia. The purpose of this paper is to increase reliable diagnoses of lingula pneumonia, which consequently reduces the mortality rate from pneumonia.

It is exceedingly important to find measures to reduce mortality from pneumonia, as it is a disease that causes many deaths and affects many people across the globe.

From the image analysis in Table 1, it was possible to demonstrate that tomography has a better reach when the lingular area is affected and that radiography cannot show the focus of opacity in the lingula region, only around the heart.

5. Acknowledgement

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