

# The role of computed tomography in the diagnosis of pulmonary tuberculosis

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## INTRODUCTION

Pulmonary tuberculosis is a common lung infection widespread due to *Mycobacterium tuberculosis* bacillus. The definitive diagnostic relies on the isolation or the culture of the bacillus usually in the expectoration. Its radiological semiology is generally typical enough to guide the diagnosis, but in some cases, the standard radiography presents some limitations, mainly during early stages or in subclinical pulmonary tuberculosis. However, the contribution of computed tomography (CT)-scan and its role in the diagnosis of thoracic tuberculosis is more and more well-defined (1) especially due to its superior sensitivity (2) in detecting subtle parenchymal and lymphadenopathy tuberculosis, and in differentiating active from sequelae lesions (4)(5)

## MATERIALS AND METHODS

### STUDY TYPE

A descriptive and analytical retrospective study involving patients hospitalized within the pulmonology and phthisiology department of Moulay Youssef University hospital from Mohammed V University in Rabat.

### STUDY SUBJECTS:

Among ... files of patients hospitalized between January 2024 and October 2024, we selected only those who had been diagnosed with at least a pulmonary infection by *mycobacterium tuberculosis*, confirmed bacteriologically using tuberculosis polymerase chain reaction (PCR) or microscopical examination in patients' sputum, bronchial aspiration, pleural effusions liquid or biopsy, and who have a CT-scan.

### RADIOLOGIC PRIMARY LESIONS OF PULMONARY TUBERCULOSIS

We studied chest-radiographies looking for the following lesions: unilateral or bilateral distribution of the lesions, cavitary lesions, opacities, nodules, miliary, micronodules, reticulations, alveolar syndrome, pneumothorax, pleurisy, and hydropneumothorax.

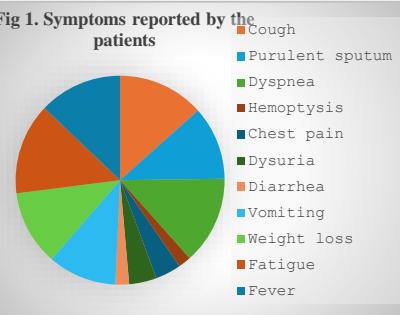
CT-scans reports were studied looking for the following lesions: unilateral or bilateral distribution of the lesions, cavitary lesions, nodules, micronodules, reticulations, bronchiectasis, emphysema, intrathoracic lymphadenopathy, necrosis presence, calcifications, ground-glass opacity, pneumothorax, pleurisy, and hydropneumothorax, pulmonary embolism.

## RESULTS

More than two-thirds (77%) of our patients are men, with a population aged from 22 to 84 years old and an average age of 50,3 yo.

28,9% of the patients in this study had at least one associated morbidity, the most significant being COPD found in 44,4%, asthma (22,2%), HIV (15%) and diabetes (13,3%) of the cases studied.

Among the symptomatic patients 90% reported cough, 76,7% had purulent sputum, dyspnea (91,7%), hemoptysis (13,3%) and chest pain (26,7%) as respiratory symptoms, while some patients reported extra-respiratory signs as vomiting, dysuria, diarrhea, weight loss, fatigue and fever, distributed as seen in the table 1. With an average onset of symptoms of 8,9 weeks, and an average weight loss of 15,2 Kg.



The diagnosis was confirmed by (PCR) 78,3% and/or microscopical examination (53,3%) in patients' sputum, bronchial aspiration, pleural effusions liquid or biopsy. The first imagery required for these patients is a standard radiography showing : Bilateral lesions in 57%, Cavitary lesion in 68%, nodules in 21,7%, a miliary pattern in 10%, an opacity in 21,7%, a reticulation in 12,2%, emphysema in 5% of the cases, Pleural effusion in 26,7% and a pneumothorax in 4% of the cases, hydropneumothorax in 10% of the patients.

Then, a chest CT scan was performed in 100% of our population. The lesions were bilateral 95% of the cases. Nodules were in 81,7% and micronodules in 76,7% of the patients. 70% of them had consolidations and 58,3% had bronchiectasis, while at least one cavitary lesion was found in 45% of the population and 35% had intrathoracic lymphadenopathy. 31,7% of the patients had ground-glass opacities associated or not to other lesions, emphysema (23,3%) septal thickening (21,7%) and 16,7% had a miliary pattern. The suspicion of pulmonary embolism associated with the tuberculosis infection was confirmed in 6% of the population.

## DISCUSSION

The radiology imaging of pulmonary tuberculosis are quite variable but are specific enough to suggest the diagnostic (1), and even though the standard radiography is sufficient tool to characterize the disease (1) it still can be normal or not precise enough, whilst the chest CT-scan provides a more precise description of the lesions, their measurements, exact localization and its activity, its evolution or even detect an underlying complication (1) such as a pulmonary embolism (PE) like it was the case in our study with 6% of PE detected.

Chest CT-scan helped characterize the lesions with precision, from its size to its precise localization (2). And like in many other studies, the lesions had multiple lobe involvement (2).

Also, the more frequent lesions found in patients were lesions of cavity, consolidation, bronchiectasis, multiple lobe involvement, and lymphadenopathy (2) like in our study. Moreover, like in other studies, there were significant differences between the chest X-rays and the CT-scans findings, showing that the latter is more sensitive (4)(5)(6) especially for the characterization of the infection as active or not and for the detection of lymphadenopathies (5) and to reveal early bronchiectasis in post-primary pulmonary tuberculosis (5).

## CONCLUSION :

Chest X-rays provide essential information for the diagnostic establishment, the management and follow-up of the patients with pulmonary tuberculosis but have limitations in diagnosing pulmonary tuberculosis in patients with negative sputum smears, they remain helpful for initial evaluation. When patients show clinical signs of active disease but have a normal chest radiograph, a CT scan is recommended.

This latest is especially useful for detecting and following parenchymal nodules, diagnosing and monitoring infectious pneumonitis, assessing secondary thoracic complications, and investigating unexplained lung conditions.

## REFERENCES :

- (1) J. Andrieu, J. Caceres, *Manifestations radiologiques de la tuberculose pulmonaire*, EMC – Radiology, volume 2, issue 1, february 2005, pages 121-132
- (2) Jong Hun Kim, Min Ja Kim, *Clinical characteristics and chest computed tomography findings of smear-positive and smear negative pulmonary tuberculosis in hospitalized adult patients*, Medicine (Baltimore) 2019
- (3) A. O Ankrah, T. S van der Werf, *PET/CT imaging of mycobacterium tuberculosis infection*, Clinical and translation imaging, 2016.
- (4) Ye Ra Choi, Jung Kyu Lee, *Chest Radiographs and CT findings during Healthcare workers' tuberculosis screening using interferon-gamma release assay : Retrospective observational study*., Taehan Yongsang Uihakho Chi, 2021 Aug 27
- (5) S. Evangelia, A. Zumla, J. Bomanji, *Imaging in tuberculosis*, international journal of infection diseases, 2015.
- (6) B.M. Boushab, S.Y. Ould-Bahiya, *Contribution of Computed Tomographyin The Diagnosis of Pulmonary Tuberculosis at Kifia Regional Hospital, Assaba*, International Journal of pulmonary and respiratory sciences. 2018