

Medical Imaging of Military Tubercular Co-Infection and COVID-19: About a Bouake Case

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Abstract

Introduction: COVID-19 often leads to viral pneumonia. Its diagnosis is based on the isolation of the virus from nasopharyngeal samples by the RT-PCR test. It can be superinfected or associated with other pulmonary infectious pathologies, in particular tuberculosis in an endemic zone, making diagnosis by imaging complex. We report the case of a coexistence between military tuberculosis and COVID-19 in a teenager in Bouake. **Objective:** To show the radiological signs of coexistence between tuberculosis and COVID-19. **Patient and Observation:** A 17-year-old immunocompetent patient with the notion of tuberculosis contagion was consulted for febrile respiratory distress. The symptomatology went back to a month with a dry cough, chest pain and evening fever. Physical examination shows crackles. Faced with these signs, imaging and biological examinations were carried out. **Results:** The thoracic X-ray showed multiple central symmetrical diffuse micronodules without peripheral involvement. As for the scanner, it revealed bilateral micronodules and images of “ground glass” intra-parenchymal and under peripheral pleural estimated at more than 75% of the pulmonary surface. COVID-19 PCR was positive with isolation of SARS-CoV-2. In addition, Gene Xpert has been identified in gastric fluid. **Conclusion:** COVID-19 pneumonia is a new global pandemic that can coexist with other airway conditions, including tuberculosis in endemic areas. Diagnosis on imaging is difficult, but it must be known to evoke it in front of the association of the elementary signs of viral and bacterial pneumonia on CT scan.

Keywords

COVID-19, Co-Infection, Tubercular Miliaria, Medical Imaging

1. Introduction

COVID-19 most often causes viral pneumonia. It is due to the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) constituting a real public health problem. This disease led the World Health Organization (WHO) to declare a public health emergency of international concern on January 30, 2020 and then a pandemic on March 11, 2020 [1] [2]. As for tuberculosis, it already exists as a pandemic, with nearly 10 million people affected. It is one of the deadliest infectious diseases globally, with more than 1.6 million people dying of tuberculosis in 2021 [3]. The diagnosis of COVID-19 is based on virus isolation from nasopharyngeal swabs using the RT-PCR test. It can be superinfected or associated with other pulmonary infectious pathologies, in particular tuberculosis in an endemic zone, making diagnosis by imaging complex. Indeed, the first COVID-19 case in Côte d'Ivoire was notified on Wednesday, March 11, 2020. To date, on April 6, 2023, Côte d'Ivoire has 88,305 confirmed cases, 87,466 recovered cases, and 834 death cases with 5 active cases out of 1,686,226 samples taken with 27,437,317 vaccinated persons over 12 years of age. Co-infection between tuberculosis and coronavirus has already been reported since the 2002-2004 epidemic in Singapore [4]. Indeed, for Stachino *et al.* [5], this co-infection was due to a superinfection of tuberculosis by coronavirus during hospitalization. Cases of coexistence with concomitant diagnosis have been rarely reported and in the multicenter study by Tadolini *et al.*, 18.5% of patients were diagnosed with tuberculosis and COVID-19 at the same time [6].

We report a case of coexistence between miliary tuberculosis and COVID-19 in a teenager in Bouake.

2. Patient and Observation

This was a 17-year-old immunocompetent patient with the notion of tuberculosis contagion consulted for febrile respiratory distress. The symptomatology went back to a month with a dry cough, chest pain and evening fever. Physical examination revealed crackles. Given the chronic nature of the symptoms in this tuberculosis-endemic area, the hypothesis of *Mycobacterium tuberculosis* infection was raised. However, with the worsening of respiratory symptoms, especially in the context of a global viral pandemic, the hypothesis of a COVID-19 infection has also been raised. The patient was therefore classified as a suspected case of COVID-19 and isolated in the COVID unit.

The thoracic X-ray performed reveals multiple central symmetrical diffuse micronodules without peripheral involvement, reflecting a warm miliaria probably of tuberculous origin (**Figure 1**).

As for the scanner, it revealed bilateral micronodules and images of “ground glass” intra-parenchymal and under peripheral pleural estimated at more than 75% of the pulmonary surface (Figure 2 and Figure 3). These scan images are suggestive of both tuberculosis and coronavirus. A nasopharyngeal swab with COVID-19 PCR was positive with isolation of SARS-CoV-2. Besides, gastric tubing also allowed us to isolate the Gene Xpert, which is biological proof of a tuberculosis infection, thus confirming tuberculosis. At this moment, the diagnosis of a COVID-19-tuberculosis co-infection has just been made. Multidisciplinary care involving infectious disease specialists, pulmonologists, intensivists, radiologists and epidemiologists was undertaken. The evolution was marked by a negative result of the patient’s COVID-19 PCR after 27 days of hospitalization in the COVID-19 unit. She was subsequently transferred to the pulmonology unit, where nasopharyngeal swabs after 60 days were negative. The patient was therefore discharged from the hospital for outpatient treatment. A check after six months allowed us to declare the patient cured of this co-infection.

3. Discussion

Tuberculosis held first place as the deadliest infectious disease, but this mortality has been supplanted by COVID-19 [7]. *Mycobacterium tuberculosis* and SARS-CoV-2 both primarily attack the lungs and interfere with host immunity [8]. The 2 agents are mainly transmitted through the air by inhalation of Pflugge droplets [9] [10]. The incubation period is longer in tuberculosis [8]. While in general, the incubation period of SARS-CoV-2 is five days with an interval of 2 to 14 days [11]-[13]. Apart from the long incubation period reported in the elderly and children [14]. Clinically, this difference in incubation period would point towards an etiology in this COVID-19 pandemic in our tuberculosis endemic region. The cough in pulmonary tuberculosis is generally productive and sometimes hemoptoic, except in the case of miliaria, where the cough is dry. On the other hand, the cough is generally dry in COVID-19. Indeed, miliary tuberculosis, responsible for a dry cough, usually makes the clinical distinction between the two pathologies difficult.

In our case, it was an immunocompetent 17-year-old patient who presented with a dry cough and chest pain with subacute evening fever. Physical examination revealed crackles with respiratory distress. Faced with these respiratory signs in the context of the COVID-19 pandemic, a suspected case was notified and hospitalized without ruling out pulmonary tuberculosis, given the long incubation period associated with signs of tuberculosis impregnation. Nasopharyngeal swabs were taken and confirmed COVID-19 by PCR. Chest computed tomography following chest radiography observed diffuse and symmetrical micronodules associated with intra-parenchymal and peripheral subpleural ground glass images estimated at more than 75% of the lung surface characterizing COVID-19 at the imagery. The chest X-ray was carried out and revealed diffuse and symmetrical micronodules. Thus, we concluded on the basis of the clinico-radiological signs that a warm miliary was

probably of tuberculous origin. A sample of gastric secretions by gastric tube was taken, which revealed the Xpert gene. The results of various clinical and paraclinical analyses concluded that there is a concomitant infection between pulmonary tuberculosis in its miliary form and COVID-19. During the period from March 2021 to February 2023, we had 1007 confirmed cases of COVID-19 in our center with 7 cases of co-infection with tuberculosis, *i.e.* a co-infection prevalence of 0.70%, including one case, tuberculosis in the form of miliary.

Our results are similar to those of Singapore during the 2002-2004 epidemic, where a prevalence of 0.85% of co-infection of SARS and tuberculosis was described for the first time, *i.e.* an association of a virus from the Coronaviridae family with *Mycobacterium tuberculosis* [4]. Subsequently, in China in 2003, out of 83 patients followed up post-SARS infection, 3 patients were diagnosed with tuberculosis [15]. Cases of tuberculosis associated with MERS-CoV were also reported during the 2012 epidemic [16]. According to the work of Stochino *et al.* [5], the transmission of COVID-19 took place in a hospital environment among patients hospitalized for tuberculosis (contamination by nursing staff, visitors). In our study, 6 patients were hospitalized for tuberculosis and contracted COVID-19 secondarily. It is only in a single case, namely that of our study, miliary tuberculosis, where the diagnosis with COVID-19 was made concomitantly, *i.e.* 14.29% of co-infections. According to the multicenter study by Tadolini *et al.*, 18.5% of patients had been diagnosed with tuberculosis and COVID-19 at the same time [6]. The epidemic context explained the search for COVID-19 in the first place, but the radiological lesions imposed in our case the search for a Tuberculosis-COVID-19 co-infection. Our observation describes a co-infection of *Mycobacterium tuberculosis* in miliary form with SARS-CoV-2.



Figure 1. Front thoracic X-ray: Diffuse micronodules forming a grain of sand evocative of a miliary.



Figure 2. Thoracic CT scan in coronal reconstruction: Bilateral and symmetrical diffuse micronodular opacities.

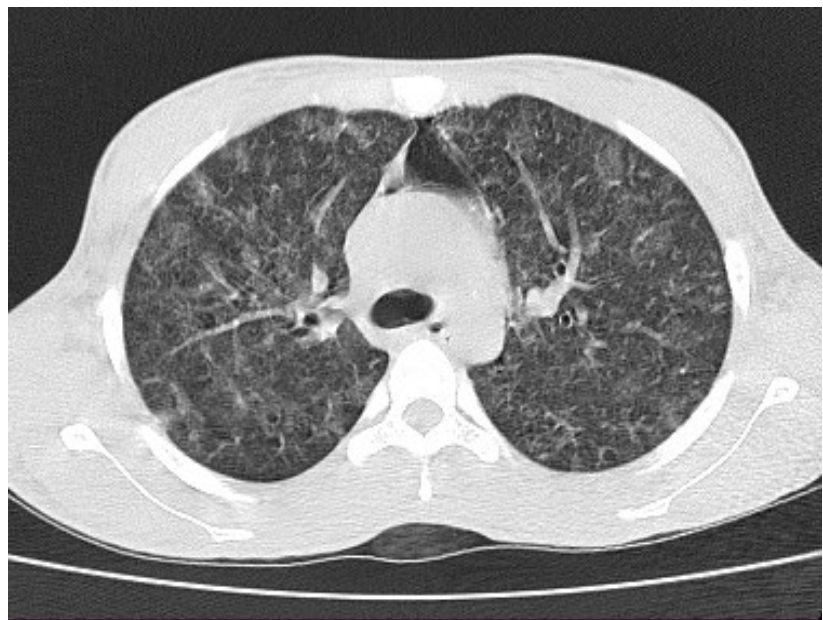


Figure 3. Thoracic CT scan in axial section: Subpleural and intra-parenchymal ground glass images of more than 75% of the lung surface.

However, these radiological lesions are underestimated by the standard X-ray, unlike computed tomography (CT).

Biologically, in this series, the diagnosis of COVID-19 is based on RT-q PCR of nasopharyngeal swabs and the diagnosis of tuberculosis on bacilloscopy of sputum in search of AFB, confirmed by the Xpert gene MTB RIF. In the study by Stochino *et al.*, the biological diagnosis of COVID-19 is also molecular and that of tuberculosis is based on the Xpert gene with confirmation by culture [5]. The therapeutic management of COVID-19 is essentially based on hydroxychloroquine and azithromycin and that of tuberculosis on standard anti-tuberculosis treatment. No side effects were observed when combining the two treatments. However, both treatments

should be managed with caution because there is a potential risk of drug interaction between rifampicin and azithromycin, hydroxychloroquine [17].

In our study, the duration of hospitalization of our patient was 22 days. Tadolini *et al.* found a comparable duration of 8-27 days [6].

The clinical, biological and radiological evolutions were favorable in our patient with a normalization of the chest X-ray at D 60. In the study by Stochino *et al.*, patients had a normalization of the X-rays on average after 30 days (7 at 88 days) [5].

4. Conclusion

The common clinical signs that COVID-19 and miliary tuberculosis share can lead to misdiagnosis. It is essential to look for co-infection COVID-19 and miliary tuberculosis during this period of the COVID-19 pandemic in certain patients presenting with dry cough and dyspnea. The symptoms of these 2 diseases are relatively similar, which highlights the problem of diagnosing comorbidities during COVID-19 infection. These two affections aggravate each other, and the differential diagnosis of these two infections of the respiratory system allows for the correct management of the patients.

Authors' Contributions

All authors have contributed to the development of this study and declared to have read and approved this manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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