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Pulmonary inflammatory pseudo tumor in a severe superimposed pneumonia patient with Sars-Cov-2

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ABSTRACT

Background: COVID-19 is known to induce a wide range of symptoms, most likely as a result of fast respiratory deterioration, which leads to rapid decompensation of the patient's clinical condition. Surprisingly, some patients have both the novel virus and a secondary bacterial infection, which makes disease management even more difficult. **Case report:** We reported a case of a patient with a positive polymerase chain reaction (PCR) test for SARS-CoV-2 presenting a rapidly worsening clinical course due to superimposed pneumonia diagnosed by laboratory markers and radiologic findings. The first Chest X-ray revealed a voluminous dense homogenous mass located in the middle lobe of the right lung and scattered alveolar opacities in the left lung field. Non-enhanced chest computed tomography (CT) scanner showed nonspecific imaging features of COVID-19 pneumonia by consolidation with multifocal, diffuse, perihilar ground-glass opacities. Repeated chest X-ray showed this mass on the right is larger and more prominent of the alveolar opacities scattered across the two lung fields. **Conclusion:** CT findings are critical in assisting radiologists in quickly recognizing the characteristics of pulmonary lesions and their consequences. One of the imaging findings consistent with lung super infection consequences is the advancement of consolidation and multifocal nodular opacities, which presents the clinical symptom and laboratory testing required in these individuals.

Keywords: SARS-CoV-2 variants, X-rays, Multidetector Computed Tomography.

1. INTRODUCTION

COVID-19 was caused by SARS-CoV-2 which has resulted in a pandemic that continues to have socioeconomic and health ramifications around the world. The virus can present itself in a variety of ways, from asymptomatic infections to severe acute respiratory syndrome that necessitates mechanical ventilation in the intensive care unit (ICU). Bacterial superinfections and coinfections have been seen in COVID-19, as they have in other respiratory viral infections. Patients with COVID-19 are at risk for superimposed pneumonia, which

affects about 10% of hospitalized patients (Huang et al., 2020; Huttner et al., 2020). The most prevalent cause of bacterial pneumonia is *Streptococcus pneumoniae* (Clancy et al., 2021). Identifying bacterial superinfections and coinfections in COVID-19 patients might be difficult due to overlapping symptoms, posing a risk to patient treatment. As a result of test indicators and radiologic anomalies, a SARS-CoV-2 patient developed acute respiratory distress syndrome (ARDS) and bacterial pneumonia.

2. CASE REPORT

A 45-year-old male patient developed cough sputum, shortness of breath, and increase in the evening, and is easier to breathe when sitting. The RT-PCR test findings for SARS-CoV-2 were positive on day 3 after symptom start, and he was moved to an isolation area. History of arterial hypertension, type 2 diabetes, and chronic renal failure. Several months ago, a health check chest X-ray was normal.

On day 9 at 17:20, the respiratory symptoms worsen; he was transferred to a hospital specializing in covid treatment. At the time of admission, the patient presented contactable status, contraction breathing pulls the accessory respiratory muscles, jugular vein distention, warm limbs, and radial pulse with 105 beats/minute. The temperature is 37 Celsius degree, blood pressure 140/90 mmHg, and respiration rate 24 beats/minute, SpO₂ 77% / air. He was admitting diagnosis: SARS-CoV-2 infection 10 days after symptom onset – Manifestations of decompensated heart failure / Hypertension – Chronic kidney failure – Type 2 diabetes. The patient was treated immediately by lying with head elevated (Fowler's position); oxygen through cannula 6 L/min then 10 L/min; NaCl 0.9% 500ml 1 bottle for IV LX drops per minute; AT – Furosemide 20mg 1 tube for IV; Dexamethasone 4mg 1.5 tubes for IV. Chest X-ray at 20:40 showed a voluminous dense homogenous mass located in the middle lobe of the right lung and scattered alveolar opacities in the left lung field (Figure 1).

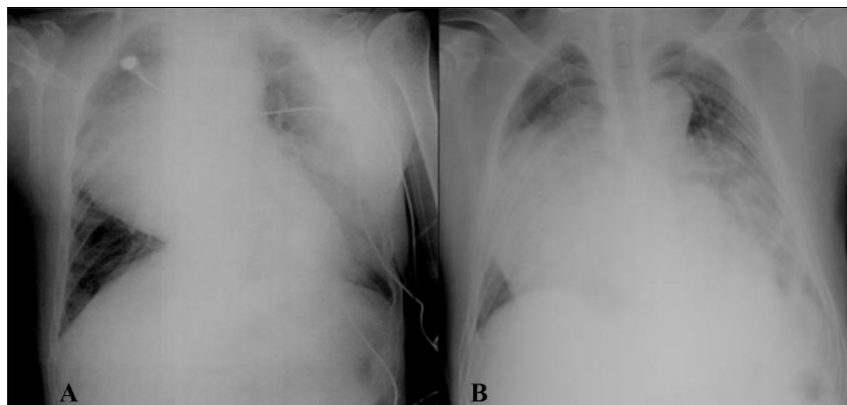


Figure 1 Chest X-Ray of day 9 after symptom onset (A) prominently showed a voluminous dense homogenous mass located in the middle lobe of the right lung and diffuse heterogenous reticulo-alveolar opacities in left lung. And day 9 after symptom onset (B) shows that this mass on the right is larger and more prominent of the alveolar opacities scattered across the two lung fields. Note that no sign of pleural effusion was seen on both plain.

On day 10, the clinical condition did not improve. White blood cells $9,02 \times 10^9/L$ (normal range $4.5 - 11.0 \times 10^9/L$) with high neutrophils (84,1%). The patient was treated with antibiotics (ceftriaxone, moxifloxacin), dexamethasone, lovenox. Non-enhanced chest CT scanner performed at 13:38 shows nonspecific radiologic findings of COVID-19 pneumonia by consolidation with multifocal, diffuse, perihilar ground-glass opacities (Figure 2). Patient contactable but languid status.- Radial pulse 100 beats/minute;- Blood pressure: 120/70 mmHg;- SpO₂: 92% (oxy mask 10L/min) - shortness of breath, mild exertion breathing, two strokes, rate 30 breaths/min, no chest pain. Patient is referred to ICU and treated by 1. Conduct intubation, mechanical ventilation; 2. Paciflam 5mg x 5 ampules, Fentanyl 0,1mg x 2 ampules and NaCl 0,9% x 50ml, electric injection pump 5ml/h; 3. Rocuronium 5ml x 2 ampules and NaCl 0,9% x 50ml, electric injection pump 10ml/h x 2. Repeated chest X-ray at 20:28, shows this mass on the right is larger and more prominent of the alveolar opacities scattered across the two lung fields.

On day 11, patient with anesthetized/sedated patient; Radial pulse 140 beats/minute; Blood pressure: 110/60 mmHg; SpO₂: 95% (normal mechanical ventilation) and Placement of Central Venous Catheter > 30 cmH₂O. High white blood cells counts $12,12 \times 10^9/L$ (normal range $4.5 - 11.0 \times 10^9/L$) with high neutrophils (90,6%). High pro-calcitonin 0.33 ng/ml (normal <0,05 ng/ml). High C – reactive protein 25,7 mg/L (normal < 3 mg/L). High NT-proBNP 228,1 pg/mL (normal <125 pg/mL).

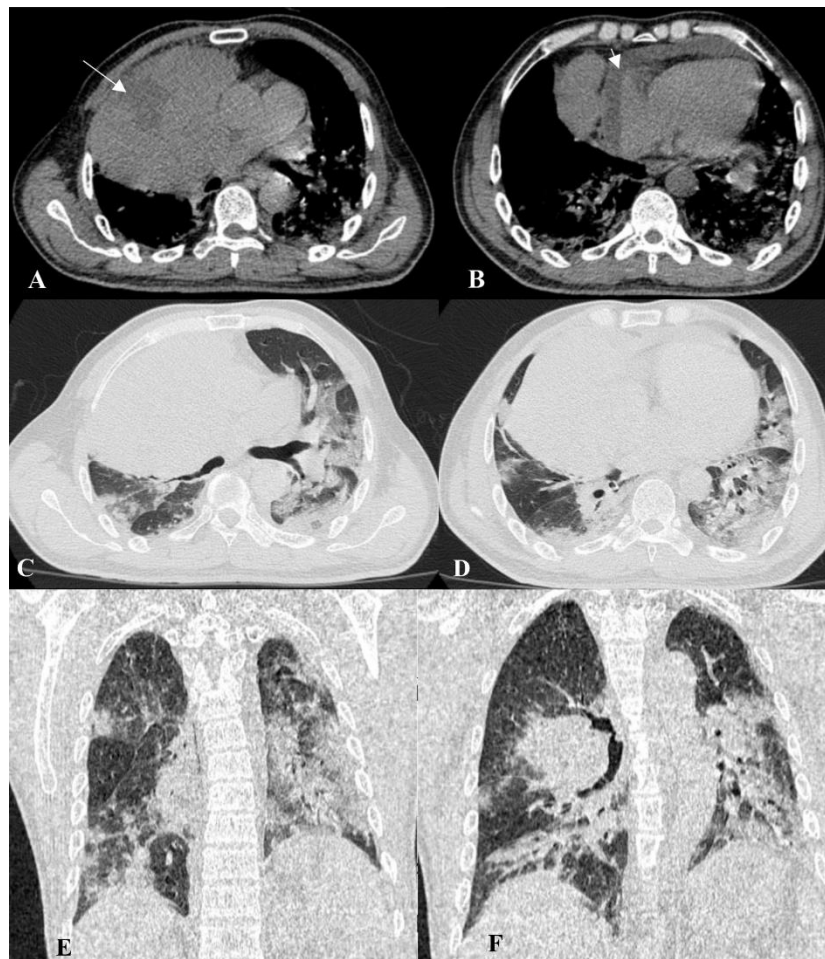


Figure 2 Chest non-enhanced CT scanner of day 10 after symptom onset. A, B: Thin-section axial (mediastinal window) images shows a significant consolidation, as a mass-like with hypodensity of central necrosis, measuring 98 x 120 x 125 mm (arrow) in the middle lobar of the right lung, a finding more consistent with lobar pneumonia than COVID-19 (long arrow). Note that presented pericardial effusion, localized anteriorly, the thickest 11mm (B, short arrow). Axial (C, D) and coronal multiplanar reformatted (E, F) of the lung window images shows bilateral, multifocal consolidations distributing along the subpleural and perihilar area and a partial round-glass opacities with superimposed inter- and intra-lobular septal thickening (crazy-paving pattern). According to the RSNA chest CT classification system, the findings were classified as atypical appearance for COVID-19 pneumonia.

3. DISCUSSION

The Fleischner Society's consensus statement suggests imaging to discover underlying cardiopulmonary abnormalities in patients with SARS-CoV-2 in the following situations: 1) mild symptoms (no evidence of significant pulmonary dysfunction or damage) combined with risk factors of disease severity, such as age >65 years and comorbidities; and 2) moderate to severe symptoms (eg, hypoxemia and dyspnea) presented by evidence of damage or pulmonary dysfunction or (eg, hypoxemia and dyspnea) (eg, cardiovascular disease, diabetes, chronic bronchitis, hypertension, and immunocompromised individuals) (Rubin et al., 2020).

For SARS-CoV-2 patients who require chest imaging, this statement does not indicate whether radiography or CT should be used. Chest radiographs are nonspecific on admission, and up to 41% of cases have normal results (Guan et al., 2020), but severe patients admitting to ICU have 95% of cases are found abnormal radiographs (Arentz et al., 2020). As a result, radiography is the most used method for determining disease progression and alternate diagnoses (eg, lobar pneumonia suggestive of bacterial superinfection, pneumothorax, and pleural effusion) (Rubin et al., 2020). Early parenchymal lung illness and alternative diagnoses such as abrupt heart failure due to COVID-19 myocardial injury are all more sensitive with chest CT (Driggin et al., 2020). Non-enhanced chest computed tomography (CT) should be done using a low-radiation-dose technique whenever possible to reduce radiation exposure (Kwee and Kwee, 2020). For suspected pulmonary thromboembolism, an intravenous contrast substance may be used (Woodard, 2021).

According to recent literature, the results of chest CT scan in pneumonia patients due to COVID-19 frequently exhibit three main signs: ground-glass opacities (GGO), consolidation, and reticular (crazy-paving pattern); GGO is the most common sign, accounting for up to 100% of cases (Guan et al., 2020). The frequency of occurrence of these signs varies over time from symptom onset and is roughly described in four stages: 1) early stage (0-4 days): mainly GGO; 2) progressive stage (5-8 days): GGO predominant with or without associated consolidation or reticular; 3) advanced stage (9-14 days): GGO with consolidation (as well as our case) and possibly repairing signs on CT (bronchus distortion, subpleural line, and fibrotic strips); 4) Absorption stage (>14 days): GGO and consolidation gradually decreased (Zhou et al., 2020b; Wang et al., 2020; Pan et al., 2020).

Typical appearance, ambiguous appearance, and atypical appearance are the four categories established by the RSNA for reporting chest CT results that could be associated to COVID-19 pneumonia. Imaging characteristics with increased specificity for COVID-19 pneumonia, such as peripheral, bilateral ground-glass opacities (GGO) with or without apparent crazy-paving pattern or consolidation; or multifocal rounded GGO with/without consolidation with surrounding GGO, were widely reported by usual impressions. Influenza pneumonia and organizing pneumonia are the most common differential diagnoses (such as can be seen with drug toxicity and connective tissue disease). Indeterminate presentations in COVID-19 pneumonia include multifocal, diffuse, perihilar, or unilateral GGO with or without consolidation that lack a defined distribution and are non-rounded or non-peripheral, or a few very small GGO with a non-rounded and non-peripheral distribution. These imaging characteristics can be seen in a wide range of infectious and noninfectious processes (such as acute hypersensitivity pneumonitis, pneumocystis infection, and diffuse alveolar hemorrhage).

Atypical features include segmental consolidation of isolated lobar of bacterial pneumonia (as in our case), cavitation from necrotizing pneumonia (Klebsiella or nontuberculous mycobacterial infection), and tree-in-bud opacities with centrilobular nodules, which are more commonly associated with other diseases (Simpson and Newburger, 2020). Other nonspecific lesions such as lymphadenopathy, pleural effusion, nodular lesions may suggest infectious pneumonia rather than COVID-19 (Kanne et al., 2020). If secondary respiratory deterioration occurs with COVID-19 treatment, investigate the likelihood of superimposed pneumonia and acquire lower respiratory tract cultures as well as chest imaging (Huttner et al., 2020).

In our case, although there were no signs of bacterial fever, no respiratory culture (this test is usually nonspecific because it can be negative), but in symptomatic covid-19 pneumonia patient with progressive clinically to severe respiratory distress and combined with two important parameters, as laboratory markers and radiologic findings, are sufficient to confirm the superimposed bacterial pneumonia. At the last days of the patient, laboratory results presented elevated white blood cell and neutrophils, and especially procalcitonin. Levels procalcitonin are normal in COVID-19 patients with mild disease, and may be elevated in severe disease patients and elevated levels correlate with a nearly 5-fold higher risk of severe SARS-CoV-2 infection (Zhou et al., 2020a; Yang et al., 2020). As our case, pro-calcitonin 0.33 ng/ml (normal < 0.05ng/ml) and this level represent usually a SIRS. CRP and ESR may both be elevated in pneumonia patients due to covid-19, which are nonspecific inflammatory markers and therefore not useful in differentiating it from bacterial infection (Wu et al., 2020).

Typical radiographic features of superimposed bacterial pneumonia on chest radiography: lobar or segmental air-space opacification, and on CT: segmental or lobar focal dense consolidation with or without ground-glass opacities (Figure 2) (Simpson and Newburger, 2020; Wu et al., 2020). In an estimated 5.2 percent of COVID-19 patients, pericarditis is an inflammatory illness that affects the sac surrounding the heart and is most typically caused by severe viral infections (Adams et al., 2020). A significant tamponade, pericardial effusion, myopericarditis, and high CRP or NT-pro-BNP are also poor prognostic markers (Tung-Chen, 2020). Although nonspecific pericardial effusion, radiologists should investigate the possibility of COVID-19-related cardiac injury when chest CT scans presenting pericardial effusion.

Finally, prognostic factors that increase the risk of death on admission in covid-19 patients pneumonia generally include older age (>65 years) with comorbidities associated with organ function damage and development of acute respiratory distress syndrome (Zhou et al., 2020a; Yang et al., 2020). In which, pulmonary superinfection is the cause of death accounting for 16% of potential cases and 3% of total patients with COVID-19 (Clancy et al., 2021).

4. CONCLUSION

Pneumonia in patients with SARS-CoV-2 can be severely developed, especially in patients with comorbidities (such as high blood pressure and diabetes) and especially with pulmonary superinfection. To follow-up the disease, laboratory markers and radiologic findings, especially on non-contrast CT, help radiologists efficiently identifying the characteristics of pulmonary lesions and their complications. The progression of consolidation and multifocal nodular opacities is one of the imaging findings consistent with pulmonary superinfection complications presenting the clinical manifestation and laboratory testing sought in these patients.

Patient consent statement

Written informed consent has been obtained from the patient for the publication of this case report and any accompanying photographs. This case report is an incidental finding in the course of clinical work and has no ethical implications.

Author's contribution

PNTV and NTA contributed equally to this article. Each author gave a substantial contribution in acquisition, analysis, and data interpretation. Each author had a part in preparing article for drafting and revising it critically for important intellectual content. Each author gave the final approval of the version to be published and agreed to be accountable for all aspects of the work, ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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Conflicts of interest

The authors declare that there are no conflicts of interests.

Data and materials availability

All data associated with this study are present in the paper.

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