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Case Report

An Uncommon and Severe Presentation of a Common Virus – A Case of Varicella Zoster Virus Pneumonia

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Abstract: Chickenpox is a maculovesicular-papular exanthematic disease caused by primary infection with varicella zoster virus (VZV) and pneumonia is one of its most severe complications, associated with significant morbidity and mortality. A 46-year-old male presented to the emergency department with fever, dyspnea, myalgia and asthenia for the past 24 hours. He had a pruritic maculovesiculo-papular rash on the trunk and scalp, evolving over 4 days, and his 5-year-old daughter had recently been diagnosed with chickenpox. Initial imaging revealed diffuse bilateral pulmonary infiltrates, raising suspicion of viral pneumonia. Based on clinical presentation, radiological findings and epidemiological link, aciclovir therapy was initiated. During the first 24 hours, the patient's worsening hypoxemia and increased respiratory effort required intensive care unit admission for high-flow nasal cannula oxygen therapy. Polymerase chain reaction (PCR) testing for VZV of skin vesicles and respiratory secretions confirmed the diagnosis. The patient showed clinical improvement within 5 days and was discharged 10 days after admission. This case underscores the importance of high clinical suspicion for VZV pneumonia and prompt treatment. PCR testing remains the gold standard for diagnosis. Early recognition and treatment of VZV-related complications are essential to reduce mortality.

Keywords: Varicella Zoster Virus; Chickenpox; Pneumonia; Immunocompetent.

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1. Introduction

Chickenpox is a maculovesicular-papular exanthematic disease caused by the primary infection of varicella zoster virus (VZV), a member of the Herpesviridae family [1]. The World Health Organization estimates the annual global burden of varicella to be approximately 140 million cases with 4.2 million severe complications requiring hospitalization and 4200 deaths [2]. It is a highly contagious disease that generally follows a benign course in childhood but can present more severely in adults and immunocompromised individuals [3]. Pneumonia is one of the most serious complications, associated with significant morbidity and mortality worldwide.

This case is of particular interest due to a severe presentation of VZV as pneumonia in an immunocompetent adult, emphasizing the importance of high clinical suspicion and timely therapeutic intervention [4] even without classical risk factors, to optimize outcomes.

2. Case Report

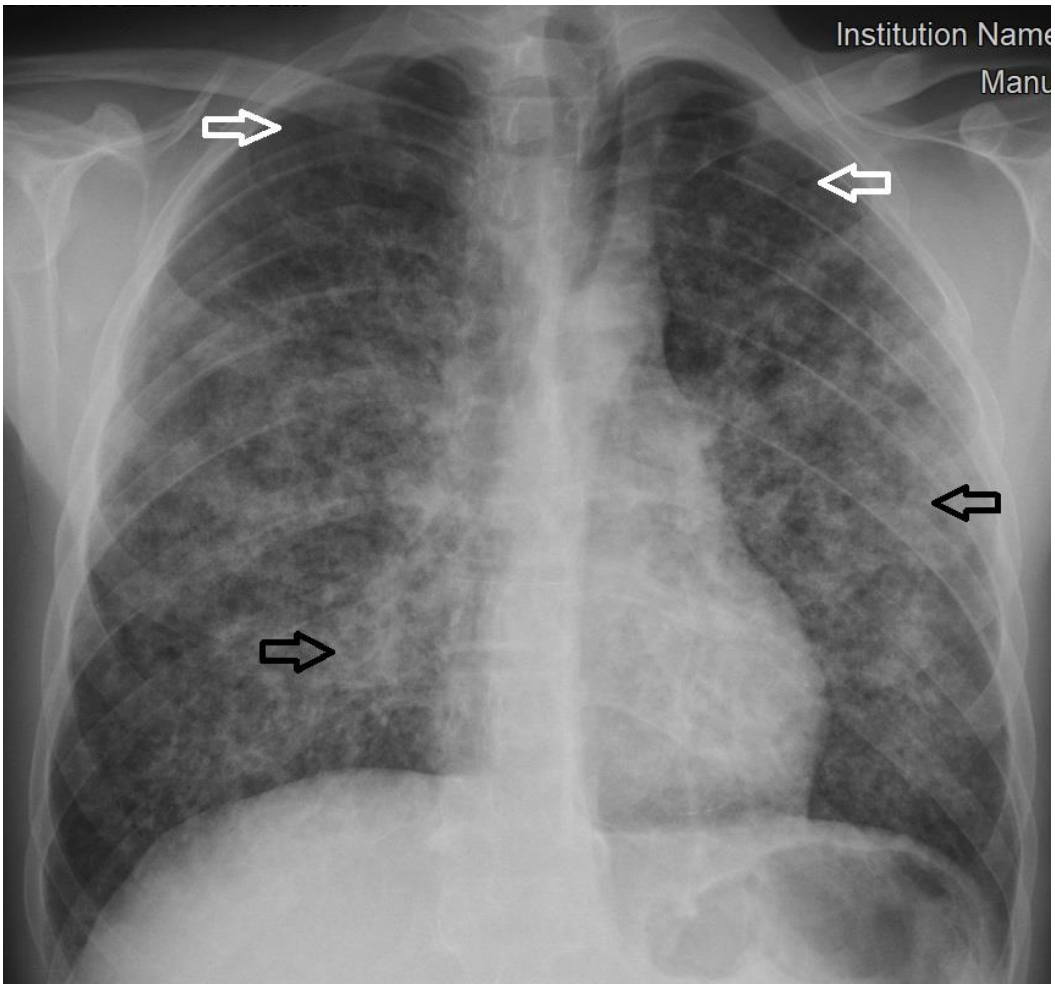
A 46-year-old male agricultural worker, with no relevant medical history except for active smoking (45 pack-years), presented to the emergency department (ED) with fever (38.3ºC tympanic temperature), dyspnea on moderate exertion, myalgia, and asthenia,

evolving over the past 24 hours. Four days prior, he developed a pruritic maculopapular rash with vesicles on his trunk and scalp. The epidemiological history revealed close contact with pigeons and recent exposure to his 5-year-old daughter, who had been diagnosed with chickenpox. The patient's vaccination record was up to date according to the national immunization program, which does not include the varicella vaccine and there was no history of prior varicella infection. He denied consuming unpasteurized food, untreated water, engaging in water activities, or recent travel.

Upon examination, the patient was conscious, oriented, cooperative, febrile (38.5ºC), blood pressure 115/80mmHg, respiratory rate 26 breaths per minute, with peripheral oxygen saturation (SpO_2) of 90% in room air and decreased breath sounds bilaterally. He also had a pruritic rash on his trunk and scalp with coexisting macular, vesicular, and crusted lesions. Laboratory findings showed mild lymphocytosis (3,790/uL) and thrombocytopenia (132,000/uL), elevated C-reactive protein (8.27 mg/dL), lactate dehydrogenase (LDH: 933 IU/L), creatine kinase (CK: 325 U/L), alanine aminotransferase (ALT: 56 IU/L), and aspartate aminotransferase (AST: 61 IU/L). Arterial blood gases revealed alkalemia due to respiratory alkalosis (pH 7.54, pCO_2: 31 mmHg, HCO_3: 26.5 mmol/L), severe hypoxemia (PaO_2: 46 mmHg) with a PaO_2/FiO_2 ratio of 219.05, and hyperlactatemia of 2.4 mmol/L.

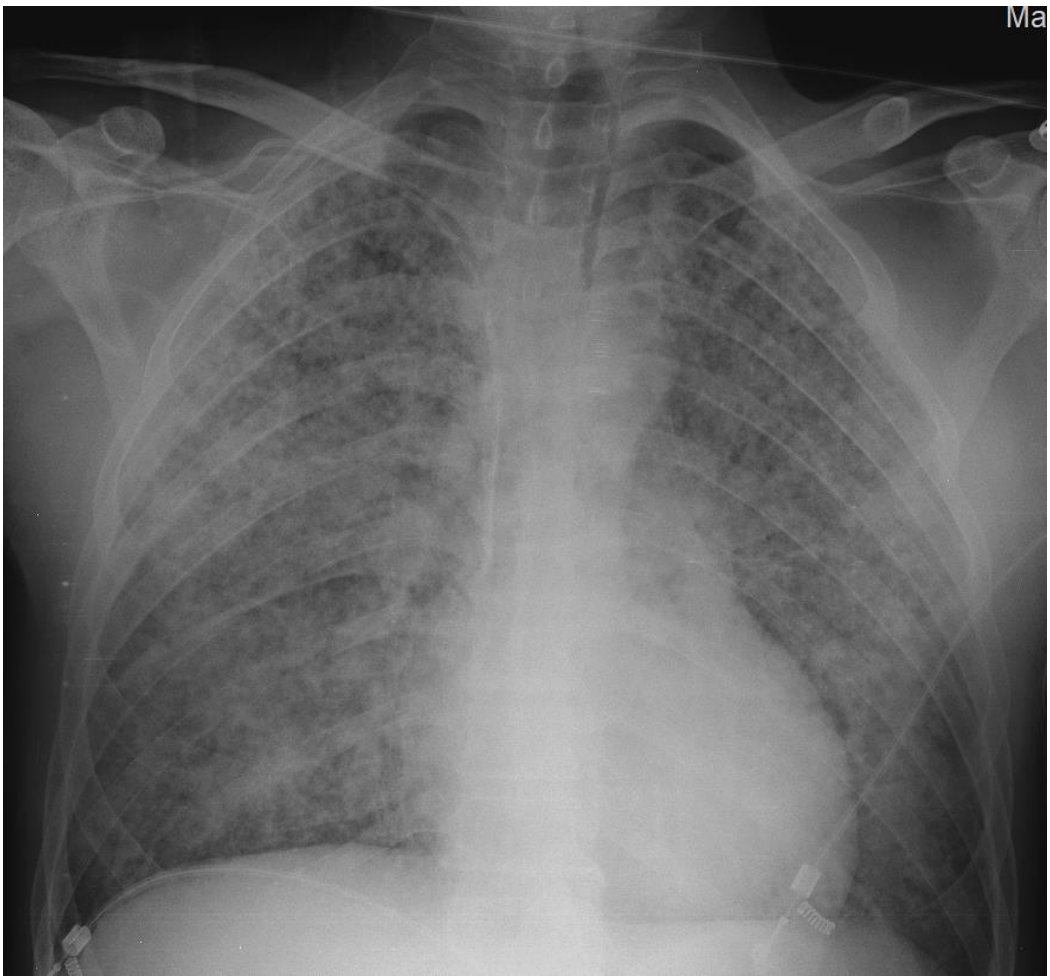
The initial chest X-ray showed a diffuse bilateral micronodular ill-defined infiltrate with some areas of the lung parenchyma remaining spared (Figure 1).

Figure 1. Initial chest X-ray. Black arrows indicate diffuse bilateral micronodular ill-defined infiltrate, and white arrows indicate spared areas of the lung parenchyma.



Based on the clinical, laboratory and radiological findings, viral pneumonia was suspected, likely due to varicella zoster virus, given the rash and epidemiological link. Acyclovir was initiated at 10 mg/kg every 8 hours. The patient was initially admitted to the Internal Medicine ward. However, within 24 hours, his condition worsened, with increasing oxygen requirements and worsening hypoxemia. A new chest X-ray was performed, showing a more diffuse involvement of both lungs with multiple fleeting micronodules (Figure 2).

Figure 2. Chest X-ray performed 24 hours after admission, showing worsening of lung involvement, with multiple fleeting micronodules.



Chest computed tomography (CT) was performed on the same day and revealed extensive areas of patchy ground-glass opacity, areas of consolidation and nodules with a surrounding halo of ground-glass opacity – figures 3 and 4. These findings were consistent with an ongoing inflammatory/infectious process. Due to clinical and radiological worsening, the patient was transferred to the Intensive Care Unit (ICU), where supplemental oxygen was administered via a high-flow nasal cannula (HFNC) at 100% FiO_2 and 45L/min flow. Within the first 48 hours, there was a significant reduction in respiratory effort, with improvement in hypoxemia and radiological changes. On the fourth day, HFNC was discontinued, and the patient was transferred back to the Internal Medicine ward.

Figure 3. Chest CT performed 24 hours after admission (axial view). Black star – patchy ground-glass opacity. Black arrows – nodules with a surrounding halo of ground-glass opacity. White arrow – area of consolidation.

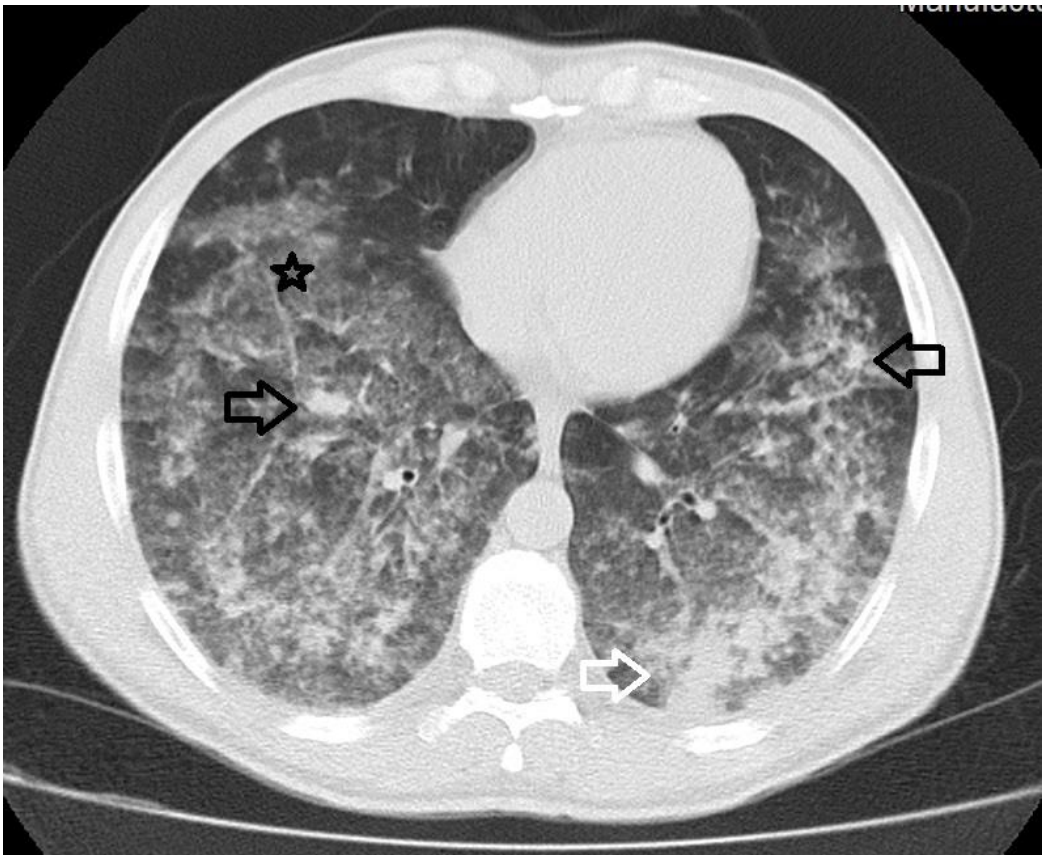
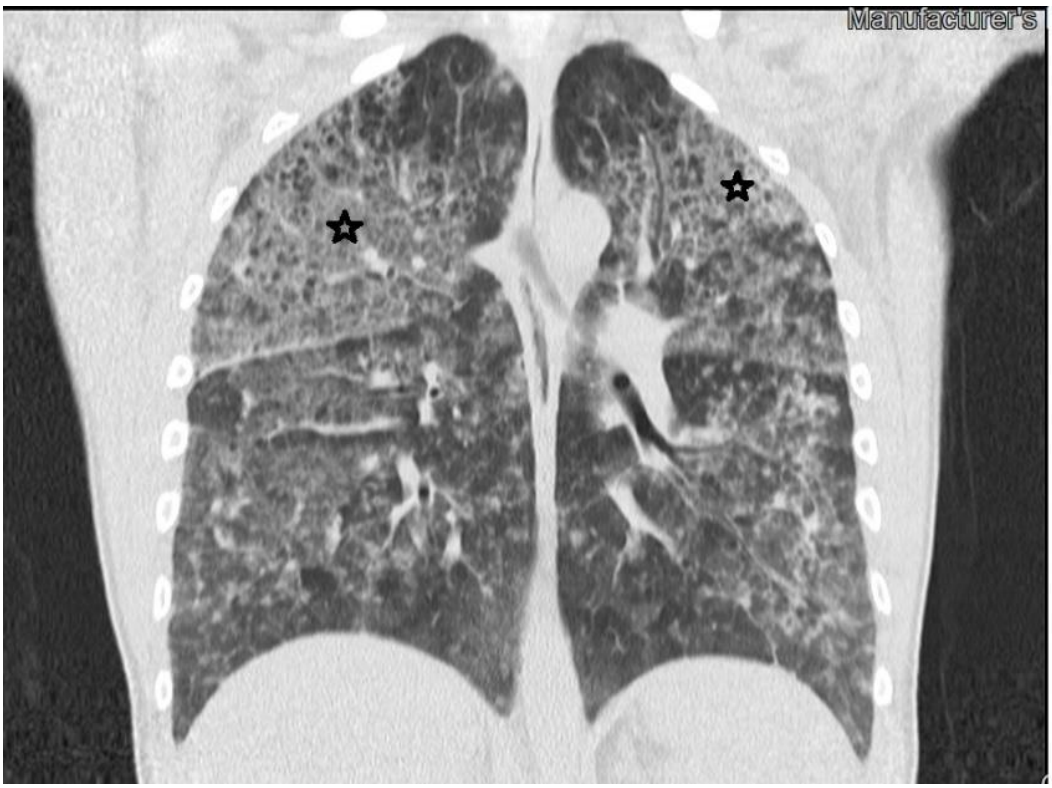


Figure 4. Chest CT performed 24 hours after admission (axial view). Black star – patchy ground-glass opacity. Black arrows – nodules with a surrounding halo of ground-glass opacity. White arrow – area of consolidation.



For etiological investigation, biological samples were collected for blood, urine and bronchial secretion cultures. Nasopharyngeal antigen detection tests for Influenza A/B and SARS-CoV-2, as well as urinary antigen tests for *Streptococcus pneumoniae* and *Legionella pneumophila* where all negative. Serological tests for *Chlamydophila pneumoniae*, *Mycoplasma pneumoniae*, *Toxoplasma gondii*, *Rubella*, *Epstein Barr virus*, *Coxiella burnetti* and *Rickettsia coronii* were also negative. Blood and urine cultures were also negative. Human immunodeficiency virus (HIV) infection and hepatitis B and C were excluded.

Polymerase chain reaction (PCR) testing for VZV was performed on samples from skin vesicles and respiratory secretions during the ICU stay and the results were both positive, confirming the diagnosis of VZV pneumonia. Over the following 5 days, the patient demonstrated progressive clinical improvement, allowing for a gradual reduction in supplemental oxygen therapy, which was ultimately discontinued. All laboratory abnormalities (lymphocytosis, thrombocytopenia, elevated C-reactive protein, LDH, CK, ALT and AST) had been resolved by the time of discharge. The patient was discharged 10 days after his admission, without any recurrence of symptoms or further visits to the ED.

3. Discussion

Although rare, pneumonia is the most common complication of primary VZV infection in adults, with an incidence of approximately 1 in 400 cases in immunocompetent individuals [5-8]. Frangides et al. [10] described these pneumonias as severe, requiring mechanical ventilation in about 36% of cases. In Cohorte de Mirouse et al. [4], comprising 102 patients admitted to the ICU, the incidence of acute respiratory distress syndrome (ARDS) reached 80% of cases. In this case, the source of transmission was likely the patient's daughter, diagnosed with chickenpox 15 days before the onset of his rash, consistent with the incubation period of VZV, which ranges from 10-25 days [3, 5-6, 11-12].

Bilateral pulmonary infiltrates suggestive of viral pneumonia have a broad differential diagnosis, as numerous viruses can present with a similar clinical picture. This case highlights the need for a comprehensive clinical history, including details of sick contacts and their diagnoses, as epidemiological clues were key to our prompt diagnosis and treatment. Additionally, a thorough skin examination is essential. Although no classical risk factors for VZV pneumonia such as immunosuppression or chronic lung disease were present, male gender and smoking are known predisposing factors for severe disease [5-8, 13].

Symptoms, including fever and dyspnea, appeared 4 days after the rash, which is typical of pulmonary involvement following VZV infection [1, 6, 12, 14]. The laboratory findings of a mild increase in transaminases and LDH levels can be attributed to liver involvement in varicella infection, which can range from mild transaminase elevations to rare cases of fulminant acute hepatic failure [15]. CK could be increased due to VZV-induced rhabdomyolysis [16], as its normalization was consistent with the convalescent phase of VZV infection. Radiologically, the most common finding is diffuse bilateral interstitial infiltrates, predominantly in the lung bases and perihilar regions. Pleural effusion and mediastinal adenopathy are rare [5].

VZV pneumonia is challenging to diagnose as symptoms are nonspecific. High clinical suspicion, coupled with epidemiological context, is often sufficient for presumptive diagnosis [14, 17]. In severe cases, confirming the diagnosis through PCR testing of material collected from respiratory samples, as performed in this case, is the gold standard for the diagnosis, as PCR testing has the highest yield and is more sensitive than conventional diagnostic methods (culture, antigen detection and serological assays) [14, 17].

Mortality in immunocompetent individuals with VZV pneumonia ranges from 10-30% and may reach almost 50% in those requiring invasive mechanical ventilation [4]. Early initiation of antiviral therapy, as well as advancements in ICU care, have contributed to reduced mortality [4]. Acyclovir at 10 mg/kg every 8 hours is the standard treatment. In this case, prompt treatment initiation was likely associated with a less severe disease course, avoiding the need for mechanical ventilation.

The effects of steroid treatment in VZV pneumonia are unclear and findings from the literature are controversial. On one hand, steroids may reduce pulmonary inflammation, potentially mitigating some ARDS-related lung damage, lowering the need for mechanical ventilation [4, 18]. On the other hand, they may intensify immunosuppression, prolong viral replication, and increase the risk of bacterial superinfection4. Additionally, long-term steroid use has been reported to exacerbate varicella infection and increase disease severity [19].

4. Conclusion

This case highlights the importance of high clinical suspicion and early treatment in patients with VZV infection, as timely initiation of therapy led to a successful outcome. It underscores the need to consider uncommon viral causes of severe respiratory infections, especially when considering epidemiological clues, such as close contact with infected individuals. Further research is needed to assess the benefits and risks of adjunctive therapies, such as steroids, in severe cases of VZV pneumonia. Additionally, optimizing vaccination programs, expanding its coverage, should be considered, particularly among high-risk populations or unimmunized adults in close contact with potential sources of infection, which could significantly reduce the incidence of VZV-related complications.

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Research Ethics Committee Approval: We declare that the patient approved the study by signing the informed consent form, and that the study followed the ethical guidelines established by the Declaration of Helsinki.

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Conflicts of Interest: The authors declare no conflicts of interest.

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