Successful Intensive Care Management of a Newly Diagnosed HIV Patient
Presented with Acute Respiratory Distress Syndrome Secondary to PJP: A Case
Report and Literature Review

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Received: 31st July 2023 Accepted: 22nd January 2024 Published: 28th February 2024

Abstract

Severe Acute Respiratory Distress Syndrome (ARDS) with Pneumocystis jirovecii pneumonia (PJP) is a rare and life-threatening condition predominantly observed in immunocompromised individuals, particularly those with human immunodeficiency virus (HIV) infection. Here, we report the case of a 22-year-old man who was recently diagnosed with HIV and had a history of man-to-man sexual contacts presented with severe ARDS secondary to PJP successfully treated with vigorous ventilatory strategies and intensive care therapy. This case report highlights the occurrence of severe ARDS with PJP that can happen to individuals engaged in man-to-man sexual relations. The transmission of PJP through sexual contact in the absence of traditional risk factors presents a unique diagnostic and management challenge. Healthcare providers should be vigilant in considering PJP as a potential cause of severe respiratory distress in patients with a history of high-risk sexual behaviours. Further research is needed to better understand the transmission dynamics and risk factors associated with PJP, especially in sexually active man-to-man individuals. Increased awareness of atypical presentations of PJP is essential to ensuring early diagnosis and appropriate management in such cases.

Keywords:
ARDS, Pneumonia, HIV, Sexual, Case Report

Introduction

Previously known as Pneumocystis carinii pneumonia (PCP), the fungal infection is now more widely known as Pneumocystis jiroveci pneumonia (PJP). [1] It most frequently affects those with compromised immune systems and, in some situations, can be seriously life-threatening. Chagas discovered Pneumocystis for the
first time in the lungs of guinea pigs that had been experimentally infected with *Trypanosoma cruzi* in 1909. Patients who have an underlying disease state that affects host immunity, such as cancer, the human immunodeficiency virus (HIV), transplant recipients, or anyone using immunosuppressive therapies or drugs, are typically at risk. Patients who appear to have PJP could exhibit symptoms like fever, coughing, dyspnea, and, in serious cases, respiratory failure. In this case report, we present the case of a young man who was exposed to active man-to-man sexual relationships and developed severe acute respiratory distress syndrome (ARDS). We were challenged by this atypical presentation, which led us to diagnose PJP when HIV was detected.

**Case Presentation**

A 22-year-old Malay man, an active smoker and vaper for the last 3 years, presented to our emergency department (ED) with a complaint of shortness of breath associated with fever and cough for the past one week. He was apparently well a month prior when he suddenly developed a non-productive cough. The cough is on and off in nature. He had pulmonary tuberculosis (PTB) contact with his brother, but his brother had just completed the TB treatment that month. He went to the primary health clinic (PHC) two weeks ago for a PTB workout, but he was unsure of the result. Besides, he also developed a fever and shortness of breath a week ago. The fever was associated with chills and rigour on and off throughout the week. There was no documented temperature at home and the shortness of breath developed as he got sick. It was associated with pleuritic chest pain during inspiration, on and off in nature, not persistent all the time. He decided to go to our ED on the day of admission as the shortness of breath was worsening. Otherwise, there was no vomiting, diarrhoea, abdominal pain, central chest pain, bleeding tendency, loss of weight or appetite, or COVID-19 contact for the past 2 weeks. There is no medical, surgical, food, or drug allergy or hospitalisation history.

Upon examination, his Glasgow Coma Scale (GCS) was full, and he was able to speak in full sentences. However, he was having shortness of breath, cough, and tachypnoea with a respiratory rate of 36 breaths per minute and oxygen saturation (SpO₂) of 80% under room air; but there was no stridor or wheezing. Vital signs at the time of admission were generally normal, with a blood pressure of 119/74 mmHg, a pulse rate of 79 beats per minute, a febrile, and random blood glucose of 6.7 mmol/L. Respiratory examination revealed reduced air entry over bilateral lower zones with no added sound, and other systems were normal. He was put on a 100% high-flow oxygen mask (15 L/min) and was triaged to red zone resuscitation (SARI). Initial arterial blood gas (ABG) was taken (Table 1), and a chest x-ray showed diffuse ground glass appearance on both lungs predominantly at perihilar region (Figure 1). The white blood cell count was 9.8K/µL and intravenous (IV) ceftriaxone and Azithromycin were given in the ED. He was then changed to non-invasive ventilator (NIV) BiPAP mode 12/6, FiO₂ 0.6, rate 12, and admitted to the intensive care unit (ICU) for further monitoring in view of severe ARDS secondary to community-acquired pneumonia (CAP) to rule out PTB.

<table>
<thead>
<tr>
<th>Components</th>
<th>Result</th>
<th>Normal Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>7.51</td>
<td>7.35 - 7.45</td>
</tr>
<tr>
<td>PaO₂ (mmHg)</td>
<td>39</td>
<td>75 - 100</td>
</tr>
<tr>
<td>PaCO₂ (mmHg)</td>
<td>33</td>
<td>38 - 42</td>
</tr>
<tr>
<td>HCO₃ (mEq/L)</td>
<td>26.3</td>
<td>22 - 28</td>
</tr>
<tr>
<td>Lactate (mmol/L)</td>
<td>1.4</td>
<td>&lt;1.0</td>
</tr>
</tbody>
</table>

Table 1: Initial arterial blood gas upon admission showed severe hypoxaemia.
Figure 1: Chest radiograph on initial admission showed diffuse ground glass appearance on both lungs predominantly at perihilar region.

Nevertheless, on the next day, he became more tachypneic with SpO2 under BiPAP 92%. A chest x-ray revealed bilateral pleural effusions that predominate over the right lung. Arterial blood gas showed poor oxygenation with a PO2 of 77 mmHg. He was then intubated due to an impending respiratory collapse. He was hemodynamically supported with an intravenous infusion (IVI) of Noradrenaline, with an increasing oxygen requirement. His SpO2 was persistently less than 90% despite 100% oxygenation and ventilator dysynchrony, with PaO2 less than 100 mmHg. Therefore, he was fully sedated with IVI midamorphine, paralysed with IVI cisatracurium, and prone for 12 hours until the next day.

Upon further questioning on social history, the patient is gay and has a boyfriend. His last sexual intercourse was a few months ago, and he has been practising man-to-man unprotected sex since 2019, as his partner uses condoms occasionally. He never had rapid sexually transmitted diseases before this, such as HIV, hepatitis B and C, or syphilis, because this is the first hospitalization. Thus, it highlighted the need to take an infective screening immediately. His infective screening result turned out to be positive for rapid test HIV, IgG Toxoplasma, and cytomegalovirus (CMV), while negative for sputum acid fast bacilli (AFB) and Aspergillus. Thus, the diagnosis was changed to newly diagnosed retroviral disease (RVD) with respiratory opportunistic infection to rule out pneumocystis jiroveci pneumonia (PJP). IV trimethoprim-sulfamethoxazole and Hydrocortisone were started as PJP prophylaxis and escalated to IV piperacillin/tazobactam. A computed tomography (CT) of the brain (Figure 2) and thorax (Figure 3) was done and showed a normal brain with overall features showing infective lung changes suggestive of pneumocystis pneumonia. The polymerase chain reaction (PCR) for PJP was sent as well and turned out to be positive.
His oxygenation improved much after the prone position, and he was hemodynamically able to wean off inotropes. For diagnostic purposes, bronchoscopy was done under aseptic technique, and bronchoalveolar lavage (BAL) was sent for investigation. Blood and fungus cultures and sensitivity tests were negative. Post-bronchoscopy, he was further weaned until he was able to be extubated. He was then discharged from the ICU and moved to the medical ward for further management. HIV viral load was 810185 copies/ml with a very low CD4 of 6 cells/mm³ indicated that the patient is in AIDS stage. IV trimethoprim-sulfamethoxazole was completed for 21 days. He was discharged home after one week in the general ward with tablets of Tenofovir and Efavirenz for HIV treatment, as well as Bactrim for PJP prophylaxis.
Discussion
The presented case report describes a rare and unusual occurrence of severe acute respiratory distress syndrome (ARDS) with *Pneumocystis jirovecii* pneumonia (PJP) in an individual engaged in man-to-man sexual relations. PJP is a well-known opportunistic infection that primarily affects immunocompromised patients, particularly those with HIV infection. In this case, a 22-year-old previously healthy male presented with symptoms suggestive of severe respiratory distress, including fever, a non-productive cough, and progressive dyspnea. PJP may show mild or severe symptoms of illness. According to the literature, HIV-infected individuals will likely experience slower-onset symptoms over a longer period of time, such as non-productive and dry cough (95%), low-grade fever (more than 80%), and increasing dyspnea (95%).

The initial clinical presentation was consistent with a severe respiratory infection, and lung involvement was evident on chest radiography. In up to 39% of cases, a chest radiograph may be normal at diagnosis. Notably, the patient tested positive for HIV, Toxoplasma, and CMV after further questions were asked regarding his sexual history. In individuals with HIV, approximately 20–69% of PJP has been found in respiratory secretions without causing disease, which is known as asymptomatic carrier status or colonisation. Despite appropriate and aggressive treatment measures, the respiratory status of the patient continued to deteriorate, necessitating the implementation of a prone position and hemodynamic support. The PCR and BAL were sent to confirm the diagnosis of PJP. However, because it was resource- and time-consuming, the CT thorax was done first to make it faster for PJP diagnosis. Since PJP is extremely difficult to cultivate, the diagnosis has traditionally relied on clinical symptoms, radiographic findings, and confirmation by visualising the stained organism.

The management of severe ARDS with PJP in immunocompromised individuals poses a significant clinical challenge. A retrospective analysis over 17 years done in Germany with a large specimen total of 52,364 specimens from 7504 patients showed that about 52% of patients confirmed with PJP will be HIV positive. This study done by Julius J. Schmidt et al. also showed an overall 25.4% in-hospital mortality and a 58% increase in intensive care unit admissions. Lactate dehydrogenase (LDH) was used as a predictor of in-hospital mortality, and it showed normal in our case (170 IU/L). Of the patients, 22–40% were admitted to the intensive care unit and 13–22% required mechanical ventilation. This is shown in our case, as the patient was intubated and subsequently admitted to the intensive care unit.

The cornerstone of PJP management is antimicrobial therapy with trimethoprim-sulfamethoxazole (TMP-SMX) or Bactrim, as well as the initiation of HAART in the treatment of HIV-infected patients. For patients with mild, moderate, and severe disease, TMP-SMX is still recommended as first-line therapy, even though there are other drugs available to treat PJP. The recommended dose range above 15 mg/kg bodyweight (BW) per day, and 40% of patients who received trimethoprim-sulfamethoxazole at doses that were lower than recommended had a higher mortality risk. The current recommendation for the duration of treatment is approximately 21 days. The use of corticosteroids as adjunctive therapy in the treatment of PJP is an essential aspect. Hypoxic HIV patients have been proven to particularly benefit from this regimen. In addition, a systematic review of the literature from the early 1980s to 2004 on added corticosteroid therapy in HIV-infected patients with PJP and hypoxemia found a relative risk reduction for overall mortality at 1 month of 44%. Therefore, we started this patient with IV trimethoprim-sulfamethoxazole, corticosteroids, and HAART initiation. The IV trimethoprim-sulfamethoxazole was completed for 21 days.

The patient with PJP has an uncertain prognosis. The majority of patients will improve with appropriate therapy, but some will develop progressive respiratory failure. According to reports, up to 60% of patients...
who need to be admitted to intensive care or require mechanical ventilation die. [8] Short-term and 12-month survival among HIV-infected patients after PJP diagnosis improved, particularly after the introduction of HAART in late 1995. The history of prior episodes of PJP, increasing age, the presence of CMV, and a very low CD4 cell count were all related to poor short-term survival. [9] Therefore, despite numerous risks and an uncertain prognosis for our current case, we consider the management to be successful at the moment, given the young age of the first presentation. The successful outcome of this PJP therapy depends on proper follow-up and regular check-ups. Further research is needed to better understand the pathogenesis, risk factors, and optimal management strategies for PJP individuals.

Conclusion
In conclusion, this case report underscores the importance of considering PJP as a potential aetiology in severe ARDS, especially in high-risk behavioural individuals. The successful outcome in our case highlights the pivotal role of prompt diagnosis, aggressive ventilatory support, and targeted antimicrobial therapy. The literature review emphasises that elevated lactate dehydrogenase (LDH) levels serve as a valuable marker for critical predictors of mortality. The antimicrobial therapy with trimethoprim-sulfamethoxazole is still recommended as first-line therapy, with a dose range above 15 mg/kg bodyweight (BW) per day for a duration of 21 days. Further research is needed to develop evidence-based management strategies, and refine risk stratification models for severe ARDS with PJP in susceptible individuals. Heightened awareness among healthcare providers about atypical presentations of PJP is crucial to ensuring early diagnosis and timely intervention, leading to improved patient outcomes.

Conflict of interest
The authors declare no conflict of interest.

References