

CASE REPORT OF MENINGOCOCCAL PNEUMONIA

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ABSTRACT

Meningococcal pneumonia, an infrequent presentation of invasive meningococcal disease. We report a case of an elderly patient with a medical history of chronic obstructive pulmonary disease (COPD) and prostate cancer undergoing chemotherapy, who presented with pneumonia, hypoxemia, and respiratory failure. The causative pathogen for the pneumonia was identified as a multi-drug resistant strain of *Neisseria meningitidis*. The patient did not show signs of meningitis or bacteremia. The patient received high-flow nasal cannula oxygen therapy and appropriate antibiotics, and was discharged after a ten-day hospitalization. Isolation and prophylaxis measures were implemented for healthcare workers and close contacts, with no secondary infections observed. This clinical case highlights the importance of considering meningococcal pneumonia as a potential cause of pneumonia in at-risk populations such as elderly patients, immunocompromised individuals, or those with chronic lung disease. Additionally, the antimicrobial resistance of the bacterium may have implications for current treatment and prevention strategies.

Keyword: *Neisseria Meningitidis, meningococcal pneumonia, Invasive meningococcal disease.*

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I. INTRODUCTION

Pneumonia caused by *Neisseria meningitidis* is an uncommon manifestation of invasive meningococcal disease [1], [2] and has only been reported in a few countries worldwide, including some Asian countries such as Japan and Hong Kong. In managing a patient with invasive meningococcal disease, apart from treating the patient, isolation and preventive measures to avoid transmission to contacts and healthcare workers are also important. Understanding the clinical characteristics and antimicrobial resistance profile of *Neisseria meningitidis* helps us gain additional knowledge, enhance vigilance for this pathogen in high-risk patients, and provide more effective treatment and prevention strategies, especially in the absence of antibiotic susceptibility results.

II. CLINICAL CASE REPORT

An 86-year-old male patient was admitted for difficulty breathing. The patient had a history of chronic obstructive pulmonary disease (COPD) and underwent 6 cycles of chemotherapy for prostate cancer, which was currently stable. The patient had not received the meningococcal vaccine. In the 2 days prior to admission, the patient had productive white sputum, fatigue, and dyspnea but no fever. The patient had been using bronchodilator inhalers at home without relief and presented to the Emergency Department of Vinmec Central Park

Hospital. On admission, the patient was alert, had good contact, and spoke in interrupted phrases due to shortness of breath. Blood oxygen saturation (SpO₂) was 90% on 5 liters per minute nasal cannula oxygen supplementation. Vital signs recorded a heart rate of 100 beats per minute, blood pressure of 130/70 mmHg, and a temperature of 38.5°C. Physical examination revealed crackles in the right lung field but no wheezes or stridor. The patient received high-flow nasal cannula (HFNC) respiratory support with a flow rate of 40 liters per minute, fraction of inspired oxygen (FiO₂) of 70%, and achieved a SpO₂ of 96%. Initial laboratory tests showed increased white blood cell count ($17 \times 10^9/L$ with 90% neutrophils) and C-reactive protein (CRP) level of 84 mg/dl. Arterial blood gas analysis indicated hypoxemic respiratory failure with a pH of 7.41, PaO₂ of 70 mmHg on FiO₂ 70%, PaCO₂ of 38 mmHg, and HCO₃ of 26 mmol/L. Chest X-ray revealed new infiltrates

in the right lung compared to a previous X-ray taken one month earlier during a routine examination (see Figure 1). Other biochemical tests were within normal limits, including red blood cell count (RBC) of $4.26 \times 10^{12}/L$, platelet count (PLT) of $167 \times 10^9/L$, urea of 4.88 mmol/L, creatinine of 89 $\mu\text{mol}/L$, aspartate aminotransferase (AST) of 17 U/L, alanine aminotransferase (ALT) of 28 U/L, N-terminal pro-B-type natriuretic peptide (NT-proBNP) of 689 pg/mL, and procalcitonin of 0.1 ng/mL.

The patient was diagnosed with hypoxemic respiratory failure and pneumonia. The patient was admitted to the Intensive Care Unit (ICU) for critical care management. In the ICU, the patient received empirical antibiotic therapy based on the antimicrobial spectrum for community-acquired pneumonia in COPD patients, which included Piperacillin/tazobactam (Tazocin) and Levofloxacin.



Figure 1. Chest X-ray image at admission showing newly acquired infiltrate in the right lung

After 3 days, the sputum culture revealed *Neisseria meningitidis* resistant to Ceftriaxone and the Fluoroquinolones group (See Figure 2). Blood culture results were negative. Therefore, the patient's Piperacillin/tazobactam and Levofloxacin were discontinued, and he was switched to oral Amoxicillin/clavulanic acid based on the antibiotic susceptibility profile.

By the 5th day after admission, the patient's condition improved, the high-flow nasal cannula (HFNC) was discontinued, and he was transferred to the Respiratory Internal Medicine department for an additional 5 days of treatment before being discharged. At the time of discharge, the patient had no respiratory distress, the chest X-ray showed improvement, and infection markers such as white blood cell count and CRP returned to normal levels.

Yêu cầu/Test Name: **Vi khuẩn nuôi cấy, định danh và kháng thuốc hệ thống tự động/ Culture, identification and antimicrobial resistance of bacteria by automated system**

KHẢO SÁT TRỰC TIẾP/DIRECT EXAMINATION

Đại thể/Gross examination	Nhót đục.			
Vi thể/Microscopy:				
Tế bào biểu mô/Squamous cell	10 - 25			
Số lượng bạch cầu/WBC count	>25			
BARLETT	+ 1			
Kết quả/Result	DƯƠNG TÍNH/POSITIVE			
Tên Vi khuẩn/Bacteria	Neisseria meningitidis			
	Kháng sinh (Antibiotic)	Nhạy (Sensitivity)	Trung gian (Intermediate)	Kháng (Resistance)
	- Chloramphenicol	S		
	- Ciprofloxacin			R
	- Ceftriaxone			R
	- Levofloxacin			R
	- Meropenem			R
	- Trimethoprim/Sulfamethoxazole			R
	- Amoxicillin/Clavulanic acid	S		
	- Tetracycline			R

Đề kháng/ Resistance:

Figure 2. Antibiotic susceptibility test results indicating the causative agent as *Neisseria Meningitidis* and its resistance to multiple antibiotics

In addition to treating the patient, immediate isolation measures (contact and droplet precautions) and prophylaxis (prophylactic Augmentin) were implemented for close contacts, including family members and healthcare personnel. No secondary cases of transmission were recorded.

III. DISCUSSION

The incidence of invasive meningococcal disease in Vietnam is relatively low. According to a study by Pham Van Chung et al., from 2014 to 2021, 69 cases of invasive meningococcal disease were reported, with the majority being bloodstream infections or meningitis, and no cases of meningococcal pneumonia were documented [1].

Meningococcal pneumonia is an uncommon form of invasive meningococcal disease, first described in 1970, accounting for about 5-10% of all meningococcal infections [2], with a worse prognosis compared to meningococcal meningitis, with a mortality rate of 16% versus 14% for meningococcal meningitis, as reported by Feldman et al. [3].

Cases of meningococcal pneumonia have been sporadically reported worldwide, including in some Asian countries such as Japan and Taiwan [2]. Recognized risk factors include smoking, hematologic malignancies, immunodeficiency, chronic lung disease, and living in crowded environments such as military barracks [3]. The clinical symptoms of meningococcal

pneumonia are nonspecific, commonly presenting with fever, chills, pleuritic chest pain, with cough and sputum production being less common symptoms. Chest X-rays in these cases typically show unilateral infiltrates in 74% of cases, with the remaining cases exhibiting bilateral infiltrates or pleural effusion [2]. The disease can lead to complications such as septicemia and multiorgan failure. Poor prognostic factors for meningococcal pneumonia include advanced age, multiple comorbidities, and immunosuppression. Our patient had several risk factors (chronic lung disease, immunosuppression), atypical clinical symptoms (productive cough, respiratory distress), and severe risk factors (advanced age, multiple comorbidities, immunosuppression).

Regarding treatment, the antibiotic choices for meningococcal disease according to the Vietnamese Ministry of Health's protocol are the Beta-lactam group or Fluoroquinolones [4]. However, in this case, the bacteria were resistant to the aforementioned antibiotics, so the patient was treated with Amoxicillin/clavulanic acid according to the antibiotic susceptibility profile.

For prophylaxis, the Centers for Disease Control and Prevention (CDC) guidelines recommend Ceftriaxone or Ciprofloxacin as the antibiotics of choice [5]. However, both of these antibiotics were resistant in this case, so they were not viable options. Azithromycin or Amoxicillin/clavulanic acid could be considered in this case, and we chose Amoxicillin/clavulanic acid based on the antibiotic susceptibility profile and reports of its effectiveness in eradicating respiratory tract carriage [6].

IV. CONCLUSION

Meningococcus is a potential causative agent of pneumonia in cases with multiple risk factors such as smoking, chronic lung disease, hematologic malignancies, and immunosuppression. Early diagnosis of meningococcal pneumonia helps in selecting appropriate antibiotics and implementing preventive measures against transmission. With the current issue of antibiotic resistance, meningococcus can also emerge as a resistant pathogen, affecting current treatment and prevention strategies.

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