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Case report

Neisseria meningitidis pneumonia with bacteremia without meningitis: An atypical presentation

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ABSTRACT

Neisseria meningitidis remains the most important cause of bacterial meningitis worldwide. The second most common and potentially severe end-organ manifestation of invasive meningococcal disease is meningococcal pneumonia. It occurs between 5 % and 15 % of all patients with invasive meningococcal disease. *N. meningitidis* sepsis and meningitis continue to be associated with high morbidity and mortality, however, meningococcal pneumonia is uncommon and often underreported. We describe a case of sepsis secondary to pneumonia with *N. meningitidis* bacteremia, without any evidence of meningitis. This case reports aims at highlighting pneumonia as a presentation of *N. meningitidis* bacteremia, and the need for a high level of clinical suspicion to establish the diagnosis.

Introduction

At least 13 serogroups of meningococci have been identified by immunologic specificity of capsular polysaccharides [1]. Transmissibility, invasiveness, and virulence vary enormously between strains. Most strains are incapable of causing disease in immunocompetent individuals. Older children and adults less commonly develop systemic infection [1]. The most important serogroups associated with disease in humans are A, B, C, X, Y, and W-135. Humans are the only natural hosts for whom meningococci are pathogenic. The nasopharynx is the portal of entry from where the organism can reach the bloodstream producing bacteremia. Whereas meningitis is the most common complication of meningococcemia [2], pneumonia is an uncommon presentation. There have been only about 344 cases reported worldwide from 1906 to 2015 with the first case reported by Jacobitz in 1907 [3]. Other infrequent meningococcal infections include pericarditis, conjunctivitis, endophthalmitis, septic arthritis, pelvic infection, or chronic low-grade septicemia [1].

The exact incidence of meningococcal pneumonia remains unknown but is estimated to be 5%–15 % in patients with invasive meningococcal disease. The mortality in promptly treated meningococcal meningitis is about 2–4 %, whereas mortality in septicemia without meningitis is 20–40 %. Most deaths occur within the first 24–48 h [1].

Case report

A 30-year-old previously healthy male presented to the Emergency Department with a 5-day history of productive cough, fever, shortness of breath, and severe pleuritic chest pain. The fever was associated with chills and decreased appetite and was responding partially to over the counter antipyretics. The patient had traveled to India within 4 weeks prior to the presentation. Upon presentation, the patient appeared acutely ill. Vital signs included tachycardia of 112 beats per minute, respiratory rate of 26 breaths per minute, with an oxygen saturation of 94 % on room air. Laboratory investigations showed leukocytosis of 32,800/μL with neutrophilia, high procalcitonin of 16.5 ng/mL, and CRP of >300 mg/L.

A chest x-ray revealed a right upper lobe patchy consolidation, with no cavitation, associated with prominent perihilar and infrahilar markings. There was no pleural effusion or pneumothorax (Fig. 1).

The patient was initially admitted as a case of community-acquired pneumonia (CAP). Sputum and blood cultures were collected. Since his illness was during the COVID-19 pandemic, nasopharyngeal swabs were taken to rule out COVID-19 infection. The patient was started on piperacillin-tazobactam and Azithromycin as per local empiric antibacterial guidelines for CAP. Within a day of incubation, the blood culture grew gram-negative diplococci in the aerobic bottles. The final culture results identified *Neisseria meningitidis* which was sensitive to benzylpenicillin,

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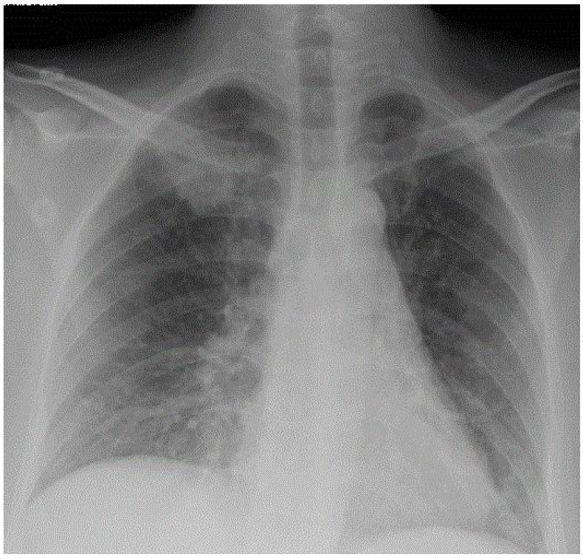

Fig. 1. Chest x-ray.

ceftriaxone, ciprofloxacin, and meropenem, but resistant to trimethoprim- sulfamethoxazole. The antibacterials were initially changed to ceftriaxone 2 g every 12 h to cover possible meningitis. However, due to the absence of any risks for meningococcemia and its complications, the antimicrobial dose was decreased to 1 g of ceftriaxone every 12 h. The patient denied any headache or neurologic symptoms and was free of any meningeal signs on multiple physical examinations. The patient had no other end-organ complications. Routine liver and renal function laboratory tests were normal and an abdominal ultrasound was unremarkable.

HIV testing was negative. Active pulmonary tuberculosis was ruled out with 3 negative samples of sputum acid-fast bacillus (AFB) smears, negative *Mycobacterium tuberculosis* PCR, and negative Quantiferon test. Sputum culture isolated light growth of normal upper respiratory flora. COVID-19 PCR was negative.

Repeat blood cultures were drawn 48 h after the initial culture and showed no growth. The patient was afebrile within 72 h of admission and remained hemodynamically stable throughout the hospital stay with no complications. The patient completed a 10-day course of ceftriaxone and was discharged home safely and in good health. Adequate infection control precautions were maintained throughout his hospitalization.

Discussion

Meningococcal pneumonia occurs mainly with serogroups Y, W-135 and B. Risk factors for meningococcal pneumonia have not been well characterized, but appear to include older age, smoking, people living in close contact, preceding viral and bacterial infections, hematological malignancies, chronic respiratory conditions and various other non-communicable and primary and secondary immunodeficiency diseases [4]. Primary meningococcal pneumonia occurs in 5–10 % of patients with meningococcal infection and is indistinguishable clinically from pneumonia caused by other common pathogens [4]. Fever, chills, and pleuritic chest pain are the most common symptoms, occurring in > 50 % of cases. Productive sputum and dyspnea are less common. Diagnosis of meningococcal pneumonia may be made by the isolation of the organism in sputum, blood, or normally sterile site cultures, but is likely to underestimate the frequency of meningococcal pneumonia.

Previous case series showed that more than 50 percent of patients had a history of cough, chest pain, chills, and previous upper respiratory tract infection. Almost all of the patients had crackles on lung exam and fever, and accompanying pharyngitis occurs in over 80 percent. Chest x-ray abnormalities may include unilateral infiltration (70 % of cases), bilateral infiltrations (20 %), and pleural effusion (10 %) [5]. Meningococcal bacteremia rarely occurs without sepsis. Blood culture positivity rates in the setting of diagnosis of meningococcal pneumonia are variable, ranging from 6 to 79.3 % [5].

Early recognition and treatment are critical as the case fatality rate for N. meningitidis pneumonia has been reported to be higher, as compared with meningococcal meningitis (16 % versus 9%–14 %) and of equal importance is antibacterial prophylaxis for close contacts of these patients to prevent meningitis or septicemia [6]. Complications of meningococcal pneumonia are uncommon and include septic shock, lung abscess, pleural effusion, and pericarditis [7].

Empiric therapy for patients with suspected (e.g. gram stain with gram-negative diplococci) or culture-proven meningococcal infection consists of a third-generation cephalosporin (such as ceftriaxone or cefotaxime given their excellent efficacy, convenient dosing, and affordability. Before 1991, penicillin was the treatment of choice for meningococcal infections [6], however, with the emergence of penicillin-resistant strains and in the setting of the high mortality associated with invasive meningococcal disease, the empiric treatment recommendation was changed to a third-generation cephalosporin [6]. Alternative drug choices include meropenem (unavailability of a third-generation cephalosporin), chloramphenicol (for severe beta-lactam allergy), aztreonam (if chloramphenicol is unavailable in the case of severe beta-lactam allergy), or a fluoroquinolone, such as moxifloxacin [7,8].

Conclusion

Despite being an unusual presentation of *N. meningitidis*, the ability of the meningococcus to cause pneumonia has been appreciated for many years and should always be considered when blood or sputum cultures identify gram-negative diplococci. The diagnosis may be challenging because of the low sensitivity of blood cultures and lack of specificity of the sputum sample because of the carrier status of asymptomatic people [9], however, it remains an important diagnosis to consider, as prompt treatment is required to improve the outcome of meningococcal infections and reduce related morbidity and mortality.

Ethical approval

Patient's written consent has been obtained before writing and submitting this manuscript.

Declaration of Competing Interest

The authors of this manuscript have no conflicts of interests

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