Case Reports and Series

A case of invasive meningococcal disease presenting as myopericarditis

Simon M. Durkin a,b,*, Clemency Britton b, Graham S. Cooke a,c, Ravi Mehta a,c

a Department of Clinical Infectious Diseases, Hammarsmith Hospital, Imperial College Healthcare NHS Trust, Du Cane Road, London W12 OHS, UK
b Faculty of Medicine, Imperial College London, Level 2, Faculty Building, South Kensington Campus, London SW7 2AZ, UK
c Department of Infectious Disease, Imperial College London, School of Medicine, St. Mary’s Hospital, Praed Street, Paddington, London W2 1NY, UK

ABSTRACT

Background: Neisseria meningitidis is a universally-feared Gram negative diplococcus, and infection confers high rates of morbidity and mortality despite effective antimicrobial therapy. Invasive meningococcal disease most commonly presents with meningococcaemia or meningococcal meningitis. Case report: 72-year-old female, previously fit and well, was admitted with chest pain, and associated breathlessness and diarrhoea. The clinical picture was of a myopericarditis. Results: Initial electrocardiogram (ECG) changes and elevated troponin were consistent with myopericarditis. Neisseria meningitidis W135 was cultured from blood, and subsequently from cerebrospinal fluid (CSF). Lep-tomeningeal meningitis and ventriculitis was evident on magnetic resonance imaging (MRI) of the brain. Treatment was commenced with intravenous ceftriaxone. The clinical course was complicated by pneumonia, influenza A infection, and fatal pulmonary embolism. Conclusions: This case demonstrates the range of clinical features of invasive meningococcal disease, highlighting in particular that meningococcal bacteraemia can present clinically as myopericarditis, which may be present in a substantial proportion of cases. Prompt antimicrobial therapy, as well as an awareness of potential complications, are paramount in the clinical management of meningococcal myopericarditis.

Introduction

Neisseria meningitidis is a Gram-negative, aerobic, encapsulated diplococcus bacterium, first isolated and characterised in 1887 by Weichselbaum (Weichselbaum, 1887), and the causative organism for meningococcal disease, initially described by Vieusseux (Vieusseux, 1885) in 1885. Non-pathogenic N. meningitidis is carried asymptomatically in the nasopharyngeal tissues of 8–25% of healthy adults, with respiratory droplet spread, and thirteen capsular serogroups are known to exist; for the most part, carriage does not result in disease (Read, 2019; Stephens et al., 2007; Stephens, 2009). There is variable meningococcal disease incidence dependent on epidemic and endemic transmission (particularly in areas of overcrowding), and immunity derived from vaccination campaigns, amongst other potential risk factors (Read, 2019; Stephens et al., 2007; Stephens, 2009; Rosenstein et al., 2001). In the UK, invasive meningococcal disease due to serogroup C is diminishing due to widespread vaccination, with 80% of clinical cases due to serogroup B, and an increase since 2009 of serogroup W-135 cases (England, 2016). W-135 outbreaks were associated with pilgrims returning from the Hajj in 2000 (Stephens et al., 2007). Preventive vaccines now exist for N. meningitidis serogroups A, B, C, X, Y and W-135 (Read, 2019). The 2016 schedule provides recommendations for routine childhood vaccination and immunisation of at-risk individuals (England, 2016).

Invasive meningococcal disease (IMD) carries a high morbidity and mortality, and may present not just with “textbook” signs of meningitis, but also with cardiac and rheumatological complications (Stephens et al., 2007; Rosenstein et al., 2001). Here we present a fatal case of invasive meningococcal disease presenting as myopericarditis, with several other complications illustrative of severe disease.

Case report

A 72-year-old Caucasian female, previously fit and well with no documented medical co-morbidities and no history of tobacco smoking, presented by ambulance to a tertiary heart attack treatment centre in a UK hospital with a 4-hour history of gradual-onset central chest pain, described as a feeling of pressure, worsened on inspiration and on
changing positions. The patient also reported 2 days of fatigue, loss of appetite, vomiting, diarrhoea, and some abdominal discomfort.

Initial bloods showed Hb 123 g/L, WCC $5.7 \times 10^9$ cells/L, platelets $298 \times 10^9$ cells/L, eGFR 29 mL/min, urea 16.4 mmol/L, and C-reactive protein of 500 mg/L. HIV serology negative. Electrocardiogram showed widespread saddle ST-segment elevation, and troponin-I rose from 13 to $>10,000$ ng/mL over the first 24 h of admission (Fig. 1). Transthoracic cardiac V-scan on day 1 showed no abnormalities, and on day 10 showed a small global pericardial effusion with preserved left ventricular ejection fraction.

The patient was noted to be mildly confused, presumed secondary to delirium, and developed a fever of $38.3^\circ$C at 6 h post-admission. Computed tomography (CT) brain imaging showed no acute intracranial pathology. Blood cultures were taken and empirical ceftriaxone 2 g IV once daily and metronidazole 500 mg IV three times daily were commenced to cover infection of unknown origin; 36 h post-admission, the blood cultures grew *Neisseria meningitidis*. The isolate was sent to the national reference laboratory and identified as *N. meningitidis* W135 type 2a. The ceftriaxone dose was increased to 2 g twice daily and metronidazole stopped.

The patient’s confusion worsened and cerebrospinal fluid (CSF) was collected by lumbar puncture (day 7), which showed 298 WBCs/cm$^3$ (70% polymorphs, 30% mononuclear cells), glucose 2.3 mmol/L (low compared with serum glucose), total protein of 1.48 g/L (raised) and LDH 142 IU/L. Magnetic resonance imaging (MRI) of the brain (day 20) showed meningitis with leptomeningeal involvement and ventriculitis. She was noted to be thrombocytopenic on day 2 (platelet count 60 $\times 10^9$/L), but this resolved by day 7 and low molecular weight heparin (LMWH) at a thromboprophylactic dose was commenced (day 11).

On day 14, after 13 days of ceftriaxone, the patient developed a cough and fever; ceftriaxone was stopped, and she was commenced on a 5-day course of piperacillin/tazobactam IV 4.5 g three times daily to cover hospital-acquired pneumonia. A respiratory swab was positive for influenza A (hospital-acquired), and she was treated with 5 days of oseltamivir 75 mg orally twice daily. Her oxygen requirement and inflammatory markers continued to worsen (WCC 15x10$^9$/mL, CRP 200). Chest X-ray showed bilateral pleural effusions and upper zone patchy infiltration. Piperacillin/tazobactam 4.5 g IV three times daily was recommenced and a left-sided chest drain was inserted. Despite these interventions, she continued to deteriorate and on day 31, was transferred to the intensive care unit, where she required intubation and ventilation. CT angiogram (Fig. 2) showed extensive bilateral pulmonary emboli with evidence of right heart strain. Thrombolysis was unsuccessful and the patient died the same day. A timeline summary of events during admission is shown in Fig. 3.

**Discussion**

In the majority of cases (80–85%), meningococcal infection presents with meningism; the remaining 15–20% mostly present with bacteremia or pneumonia. Pericarditis, urethritis, conjunctivitis and arthritis remain rare presentations (Al-Tawfiq et al., 2010). In our case, the patient presented with myopericarditis. Prior to antibiotic therapy, meningococcal disease resulted in a 70% mortality; despite treatments, death rates remain high at 9–12%, and up to 40% in meningococcaemia (Rosenstein et al., 2001). Various host susceptibility factors exist for invasive disease, particularly defects in the mannose-binding lectin (MBL) pathway and complement cascades (deficiencies of which may be present in up to 20% of affected adults), as well as instances of immunosuppression as with hypo- or asplenism, tobacco smoking, nephrotic syndrome, hypogammaglobulinaemia, and HIV infection (Stephens et al., 2007; Stephens, 2009). Respiratory tract infections including influenza may increase susceptibility to invasive meningococcal disease through direct mucosal damage; (Stephens, 2009) but in this case meningococcal infection preceded influenza. Even in vaccinated adults...
clinical manifestations of meningococcal disease. Further studies are required to determine the degree to which myopericarditis may be a presenting feature of invasive meningococcal disease in the present day. In all such cases, prompt antimicrobial administration and careful monitoring, as well as an awareness of potential complications, are required to guide patient care.

**CRediT authorship contribution statement**

Simon M. Durkin: Writing - original draft, Writing - review & editing. Clemency Britton: Writing - original draft, Writing - review & editing. Graham S. Cooke: Conceptualization, Writing - review & editing.
S.M. Durkin et al.

Clinical Infection in Practice 12 (2021) 100082

editing, Supervision. Ravi Mehta: Conceptualization, Writing - review & editing, Supervision.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

The Authors are grateful for the kind permission of the patient to publish their case.

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

References

Weichselbaum, A., 1887. Über die Aetiologie der akuten Meningitis cerebrospinalis. Fortschr Med. 5, 573–583.
Vieusseux, M., 1805. Memoire sur la maladie qui a regne a Geneve au printemps de 1805. J Med Chir Pharmacol. 11.

Read, B.C., 2019. Neisseria meningitidis and meningococcal disease: recent discoveries and innovations. Curr Opin Infect Dis. 32 (6), 601–608.

Stephens, D.S., Greenwood, R., Brandzaeg, P., 2007. Epidemic meningitis, meningococcaemia, and Neisseria meningitidis. Lancet. 369 (9580), 2196–2210.

Stephens, D.S., 2009. Biology and pathogenesis of the evolutionarily successful, obligate human bacterium Neisseria meningitidis. Vaccine. 27 (2), 871–877.

Rosenstein, N.E., Perkins, B.A., Stephens, D.S., Popovic, T., Hughes, J.M., 2001. Meningococcal disease. N Engl J Med. 344 (18), 1378–1388.

Public Health England (PHE) (ed. Ramsay M. Ch. 22. Meningococcal. In: Immunisation against Infectious Disease. 2016:1-24.

Al-Tawfiq, J.A., Clark, T.A., Memish, Z.A., 2010. Meningococcal disease: the organism, clinical presentation, and worldwide epidemiology. J Travel Med. 17 (Suppl), 3–8.

Dawson, L.P., Hare, J., Duffy, S.J., 2018. Myopericarditis with preserved left ventricular function secondary to Neisseria meningitidis. Diagn Microbiol Infect Dis. 92 (3), 241–244.

Finkelstein, Y., Adler, Y., Nussinovitch, M., Varsano, I., Amir, J., 1997. A new classification for pericarditis associated with meningococcal infection. European Journal of Pediatrics. 156 (8), 585–588.

Sapir, O., 1936. Meningococcus Myocarditis. Am J Pathol. 12 (5).

Keeley, A.J., Hammerley, D., Dhamrait, S.S., 2018. A case of myopericarditis caused by Neisseria meningitidis W135 serogroup with protracted inflammatory syndrome. Clin Med (Lond). 18 (3), 253–255.

Akinosoglou, K., Alexopoulos, A., Koutsogiannis, N., Gogos, C., Lekkou, A., 2016. Neisseria meningitidis presenting as acute abdomen and recurrent reactive pericarditis. Braz J Infect Dis. 20 (6), 641–644.

Bouneb, R., Mellouli, M., Regaieb, H., Majdoub, S., Chouchene, I., Bouansarsar, M., 2018. Meningococcemia complicated by myocarditis in a 16-year-old young man: a case report. Pan Afr Med J. 29, 149.

Hardman, J.M., Earle, K.M., 1969. Myocarditis in 200 fatal meningococcal infections. Arch Pathol. 87 (3), 318–325.

Garcia, N.S., Castelo, J.S., Ramon, V., Rezende, G.S., Pereira, F.E., 1999. Frequency of myocarditis in cases of fatal meningococcal infection in children; observations on 31 cases studied at autopsy. Rev Soc Bras Med Trop. 32 (5), 517–522.

McGill, F., Heyderman, R.S., Michael, B.D., Defres, S., Beeching, N.J., Borrow, R., et al., 2016. The UK joint specialist societies guideline on the diagnosis and management of acute meningitis and meningococcal sepsis in immunocompetent adults. J Infect. 72 (4), 405–438.