Case Report

Introduction

*Neisseria meningitidis* is the leading cause of bacterial meningitis in children and young adults (Durand et al., 1993; Edmond et al., 2010; Abio et al., 2013). The incidence of meningococcal disease in the USA between 2005 and 2011 was 0.3 cases per 100000 of the population (Cohn et al., 2013). A wide spectrum of clinical presentations has been described, including acute purulent meningitis, arthritis, pneumonia, conjunctivitis and epiglottitis (Edmond et al., 2010). However, cardiac arrhythmias and electrocardiogram (EGC) abnormalities have rarely been reported. Here, we report a case of meningococcal meningitis without bacteraemia in a human immunodeficiency virus (HIV)-infected man who has sex with men, who developed myopericarditis and atrial fibrillation. To the best of our knowledge, this is the first reported case of atrial fibrillation complicating meningococcal meningitis.

Case presentation:

A 48-year-old African-American man presented to the Emergency Department with a 1 day history of confusion. On admission, the patient was alert but confused. Initial vital signs included a temperature of 36.8°C, blood pressure of 103/70 mmHg and a pulse of 103 beats min⁻¹. He developed a fever of 39.1°C later the same day. Physical examination showed no nuchal rigidity. Cardiac and lung examinations were normal. No skin rash was observed. The patient was a homosexual man with multiple male partners during the last 2 years.

Blood and chemistry tests revealed a white blood cell count of $13.5 \times 10^9$ l⁻¹ with 92.4% neutrophils. A rapid HIV test was positive at admission. His CD4⁺T-lymphocyte count was 334 mm⁻³. His troponin level was elevated to 5.36 ng ml⁻¹ (0.0-0.034 ng ml⁻¹). Computed tomography of the head was negative. Treatment with intravenous ceftriaxone at 2 g every 12 h, vancomycin at 1.5 g every 12 h, ampicillin 2 g every 4 h and 10 g dexamethasone was initiated empirically in the Emergency Department for sus-
pected meningitis. A lumbar puncture was performed immediately, which revealed turbid, yellow cerebrospinal fluid with an opening pressure of 34 cm of water. The patient was admitted to the intensive care unit (ICU). Further examination of the cerebrospinal fluid showed a protein content of 1080 mg l\(^{-1}\) with 4975 white blood cells mm\(^{-3}\), predominantly polymorphonuclear neutrophils (87 %). A Gram stain was positive for diplococci. A latex agglutination assay showed a positive reaction with *N. meningitidis* serotype W135. Therefore, the antibiotics were switched to penicillin G (3 \(\times\) 10\(^6\) U every 4 h) intravenously according to sensitivity. Five sets of blood cultures taken during hospitalization remained sterile. Most strikingly, the 12-lead ECG at admission showed a normal sinus rhythm with widespread concave ST elevations (Fig. 1), which led to the concern of pericarditis. A transthoracic echocardiogram revealed a left ventricle ejection fraction of 44 %, moderate hypokinesis of the basal to middle septum and moderate anterior pericardial effusion. The echocardiogram results together with the elevated troponin level suggested a diagnosis of myopericarditis secondary to *N. meningitidis* infection. Ibuprofen (600 mg every 8 h) was initiated and later colchicine (0.6 mg every 12 h) was added. Serial ECGs showed slow normalization of the ST segment without development of abnormal Q waves or T-wave inversion. The troponin level decreased to below 0.01 ng ml\(^{-1}\) within 5 days of hospitalization. The patient was transferred from the ICU to a telemetry monitoring ward. However, from the day 3 of his hospital stay, although neurologically intact, haemodynamically stable and with all serum electrolytes normal, he developed atrial fibrillation with a rapid ventricular response (heart rate 139–165 beats min\(^{-1}\)) (Fig. 2). The patient was put on metoprolol (25 mg every 12 h), diltiazem (30 mg every 6 h) and an amiodarone drip (150 mg bolus over 10 min, then 1 mg min\(^{-1}\) for 6 h, followed by 0.5 mg min\(^{-1}\) for 18 h) for rate control. Diltiazem and amiodarone were discontinued after 4 and 8 days, respectively. Subsequent telemetry monitoring and serial ECG analysis from day 8 showed a normal sinus rhythm and no further atrial fibrillation. Repeat echocardiograms showed normal cardiac anatomy and function. A coronary angiography was not done due to the favourable outcomes. The patient was discharged without complications.

**Discussion**

Research has shown that HIV-infected individuals are at increased risk of meningococcal infection (Cohen et al., 2010). In addition, the incidence of meningococcal meningitis among men who have sex with men was reported to be 50-fold greater than the age-adjusted rate for the general population (Simon et al., 2013). Among the multiple complications associated with meningococcal meningitis, pericarditis and myocarditis have been recognized and reported since 1960 (Saslaw and Diserens, 1960; Wansbrough-Jones and Wong, 1973; Morgan et al., 2002).

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**Fig. 1.** Normal sinus rhythm with diffused concave ST-segment elevation most prominent in the inferior and anterolateral leads observed at hospital admission.
Zeidan et al., 2008). The peculiarity of this care report lies in the cardiac involvement without evidence of bacteremia, which made the pathophysiology less clear. This could have been secondary to a localized immunological inflammatory response to the infection or due to increased sympathetic tone resulting from the meningitis, as reported previously (Fuglsang Hansen and Johansen, 2013).

Several cardiac arrhythmias in patients with N. meningitidis infection have been reported including sinus bradycardia, QT prolongation, ventricular tachycardia, atrioventricular dissociation and atrioventricular block (Detsky and Salit, 1983; Etherington et al., 1995; Shapira et al., 1997; Gach et al., 2001). Cardiac arrhythmias can happen as early as the same day of admission (Detsky and Salit, 1983; Etherington et al., 1995) or several days later during hospitalization (Detsky and Salit, 1983; Shapira et al., 1997). To the best of knowledge, this is the first reported case of atrial fibrillation complicating N. meningitidis infection. Interestingly, despite the significant ECG changes and cardiac arrhythmias associated with meningococcal meningitis, they usually resolve with improvement of symptoms. Rarely, deadly cases of arrhythmia such as complete heart block as well as life-threatening cardiac tamponade have been reported. Shapira et al. (1997) reported a patient with normal ECG during hospitalization who developed marked sinus bradycardia and later atrioventricular dissociation while recovering from N. meningitidis infection (Detsky and Salit, 1983). Interestingly, it was found that more than 50% of patients who died of meningococcal disease had various degree of myocardium involvement detected on post-mortem examination (Hardman and Earle, 1969). Therefore, the level of cardiac involvement is probably underestimated and may represent an overlooked cause of death in meningococcal infection.

In summary, myopericarditis complicates the course of meningococcal meningitis. Cardiac arrhythmias can occur during the course of meningococcal infection. Therefore, telemetry and serial ECG monitoring are recommended throughout meningococcal infection.

References


