A Case of Primary Meningococcal Pericarditis Caused by *Neisseria Meningitidis* Serotype Y with Rapid Evolution into Cardiac Tamponade

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Primary meningococcal pericarditis (PMP) is a rare form of acute purulent pericarditis that often evolves into cardiac tamponade and usually requires pericardial drainage. PMP is a rare, difficult to diagnose, rapidly progressive form of meningococcal infections. PMP is typically caused by *Neisseria meningitidis* of serotype C, or, less commonly, B or W135. We report the second case of PMP caused by *Neisseria meningitidis* of serotype Y. Our patient was not critically ill at presentation, and her presentation could have been consistent with viral uncomplicated pericarditis with the exception of the mild leukocytosis with a left shift in the differential. Clinicians should be aware that early in the course of PMP, the illness may not be severe. Mild leukocytosis with a left shift or bandemia in the setting of what otherwise seems to be a case of uncomplicated viral pericarditis should prompt suspicion for PMP and further evaluation and/or monitoring.

KEY WORDS: pericarditis; meningococci; *Neisseria meningitidis*; tamponade.

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INTRODUCTION

Primary meningococcal pericarditis (PMP) is defined as purulent pericarditis caused by *N. meningitidis* without initial clinical evidence of meningococcemia, meningitis, or other foci of meningococcal infection. Cardiac tamponade develops in many cases. Differentiation of PMP from viral pericarditis is important because it usually requires pericardial drainage in addition to antibiotics. The diagnosis of PMP is generally made from pericardial fluid with cultures or DNA-based techniques. The meningococci have been serotype C or, less commonly, B or W135. We report the second case of PMP caused by *Neisseria meningitidis* serotype Y with rapid evolution into cardiac tamponade.

CASE REPORT

A 46-year-old female presented to the emergency room with pleuritic chest pain, low-grade fevers, and shortness of breath for the last 24 h. The patient denied headache or neck stiffness. Her past medical history included only hypothyroidism, for which she was on levothyroxine. The patient was a nurse working in a mental health clinic, but did not recall recent contact with anyone with similar symptoms.

On physical examination, the patient looked slightly uncomfortable, but not in respiratory distress. She was afebrile with a blood pressure of 133/70 mmHg and a pulse rate of 87 per minute. The heart sounds were regular with no audible murmur or pericardial rub, and the jugular veins were not distended. The patient had no rash or meningeal findings. The rest of the examination showed no abnormalities. On admission, the white blood cell count (WBC) was mildly elevated at 14,300/ μ l [normal range (NR) 4,000–11,000/ μ l] with a left shift on the differential (80% neutrophils and 17% bands). The hematocrit was 46% (NR 35–47%), the platelet count was 246,000/ μ l (NR 150,000–450,000/ μ l). The blood chemistry panel showed the following: creatinine was 1.0 mg/dl (NR 0.7–1.2 mg/dl), blood urea nitrogen (BUN) 11 mg/dl (NR 8–20 mg/dl), sodium 138 meq/l (NR 135–145 meq/l), potassium 3.9 meq/l (NR 3.2–5.2 meq/l), chloride 102 meq/l (NR 98–108 meq/l), calcium 10.2 meq/l (NR 8.5–10.2 meq/l), and glucose 124 mg/dl (NR 65–110 mg/dl). A liver function panel was not ordered on admission. The electrocardiogram (EKG) showed regular sinus rhythm with no ST segment changes. A portable chest X-ray showed no infiltrates, but a computed tomography (CT) scan of the chest showed a mild pericardial effusion. An echocardiogram confirmed the presence of a small pericardial effusion with no evidence of tamponade (Fig. 1—upper panel). Subsequently, the patient was admitted for monitoring with a presumptive diagnosis of acute viral pericarditis and was started on ibuprofen.

After admission, the patient continued to have the chest pain and shortness of breath, but the patient remained hemodynamically stable with no significant change in the physical examination, and the cardiac enzymes and the repeated EKGs still showed no abnormalities. Consequently, the symptoms were attributed to the ongoing viral pericarditis, and the ibuprofen dose was increased. Approximately 48 h after presentation, the chest pain and dyspnea significantly worsened, and the patient became tachycardic (heart rate of 155 beats/min) with a mild drop in the blood pressure to 85/55 mmHg. Repeat physical examination at this point showed

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Figure 1. Upper panel: Subcoastal echocardiographic view obtained on presentation, showing a mild pericardial effusion. Lower panel: The same echocardiographic view obtained 48 h later showing the rapid progression into a large pericardial effusion with cardiac tamponade. P: pericardial effusion, RV: right ventricle, LV: left ventricle.

the patient to be in mild distress, with a respiratory rate of 24, and a pulse oximetry of 92% at room air. She had jugular venous distension. Auscultation of the lungs revealed bibasilar crackles, while the heart exam showed distant heart sounds with tachycardia, and no murmurs were appreciated. Evaluation for pulsus paradoxus was not done.

Repeat blood work at this point, 49 h after admission, showed the creatinine to have increased to 4.3 mg/dl. There were no intervening chemistry panels performed. The WBC increased to 23,000/ μ l with significant bandemia (30% bands), and the blood smear showed toxic granulation and Doehle bodies. The liver enzymes alanine aminotransferase (ALT) and

aspartate aminotransferase (AST) increased to 4,992 and 4,982 U/l, respectively (normal ranges, ALT: 20–65; AST: 7–37 U/l), and the total bilirubin increased to 2.9 mg/dl (normal range up to 1 mg/dl), consistent with shock liver. A repeat echocardiogram that was obtained emergently showed a large pericardial effusion with right ventricular diastolic collapse and paradoxical septal motion consistent with evolution into cardiac tamponade (Fig. 1-lower panel).

Subsequently, the patient received 1 g of cefazolin intravenously and underwent an emergent pericardial window 52 h after initial presentation. Approximately 400 cc of bloody pericardial fluid was obtained. The analysis of the pericardial fluid showed 108,000 nucleated cells/ μ l, the majority of which were neutrophils. The LDH level was 6,909 U/l, and the glucose was 16 mg/dl. The gram stain of the pericardial fluid showed many nucleated cells with intracellular gram-negative diplococci (Fig. 2). Subsequently, 2 h after the surgery and around 54 h after presentation, the patient received 1 g of vancomycin and 2 g of ceftriaxone intravenously, with a plan to continue the same doses every 24 h.

Over the next 2 days, the pericardial fluid grew *N. meningitidis* serotype Y, and the patient significantly improved. A lumbar puncture was not performed. The blood cultures that were obtained on presentation and 24 h later remained negative. The vancomycin was discontinued on day 5 of the admission, while the ceftriaxone was continued at 2 g intravenously daily for 12 days. By the time of discharge, the patient had achieved a complete resolution of the renal failure, with the creatinine down to 0.9 mg/dl (NR 0.7–1.2 mg/dl).

Since terminal complement factor deficiency is a well-known risk factor for meningococcal infections, screening assays for CH50 and complement factors C3 and C4 were performed 5 days after admission and were within normal limits. In addition, specific assays for C5, C6, C7, and C9 were also performed 11 days after presentation and were within the normal range as well.

Figure 2. Gram stain of the pericardial fluid showing many nucleated white blood cells with intracellular gram-negative diplococci.

DISCUSSION

Acute pericarditis is an acute inflammatory process of the pericardium. Classically it manifests with a sharp positional chest pain and a pericardial friction rub on examination, with other symptoms depending on the cause. Acute pericarditis has many different etiologies, both infectious and non-infectious. Suspected acute pericarditis with a typical, uncomplicated presentation, a low risk of other clinically significant causes of chest pain, and with absence of significant pericardial effusion on echocardiogram can be usually managed on an outpatient basis with NSAIDs or steroids. On the other hand, those acute pericarditis patients with findings suggestive of clinical instability, significant pericardial effusion, or suspicion of bacterial etiology should be admitted and considered for pericardiocentesis.

Meningococcal pericarditis can be classified into three categories: a local manifestation of disseminated meningococcal disease (DMP), an immunoreactive pericarditis (IRP), and a primary meningococcal pericarditis (PMP).¹ Meningococci account for 5.9% of purulent pericarditis cases, ranking fourth after staphylococci, pneumococci, and streptococci.² DMP typically occurs early in the course of meningococcal infection, usually the result of hematogenous seeding of the pericardium. On the other hand, IRP, which usually occurs later in the disease course, is a hypersensitivity reaction that produces a sterile inflammation of the pericardium and typically responds to anti-inflammatory agents rather than antibiotics.³⁻⁴

Primary meningococcal pericarditis (PMP) is defined as purulent pericarditis caused by *N. meningitidis*, without clinical evidence of meningococcemia, meningitis, or other foci of meningococcal infection.⁵⁻⁶ Approximately 25 cases of PMP have been reported in the literature. The most common presenting features have included chest pain, fever, and shortness of breath. The patients usually had, on average, a 2-day history of symptoms before a cardiac cause was noted.^{3, 4, 6, 7} In a review of 17 of these cases by Baevsky et al.,⁶ the average age of the reported patients was 28 years (95% CI 18–38) with equal gender distribution. The authors noted that underlying immunosuppression and chronic illness did not appear to be risk factors.⁶ Most patients had leukocytosis on presentation.^{5, 7} Cases were reported where the chest X-rays showed the cardiac silhouette to be increased in dimensions. EKG tracings displaying diffusely elevated ST-segment changes consistent with pericarditis were also described.⁸ Echocardiogram usually shows evidence of pericardial effusion or tamponade.⁶ Features of cardiac tamponade have been described in 62–88% of the cases, while blood cultures were positive in 44–75% of the cases.⁶⁻⁷ The diagnosis of PMP is usually suggested from pericardial fluid with careful evaluation of the gram stain and confirmed with cultures, polymerase chain reaction (PCR), or counter-immunelectrophoresis assays.^{2, 6-9} Differentiation of PMP from viral pericarditis is important because it usually requires a drainage procedure. It is worth noting that patients with PMP may not be severely ill on presentation, like the patient in our case, and their symptoms could be initially mistaken for uncomplicated viral pericarditis. Unfortunately, there is no real way of differentiating between the two short of invasive procedures. The presence of some warning features could help selecting patients for further evaluation and/or observation. Such possible warning features include patients who are at risk for *N. meningitidis* infections, e.g., young college students and military recruits, and the presence of other

symptoms or findings consistent with bacterial infection, e.g., leukocytosis with left shift or bandemia. Blood cultures should be obtained on presentation when there is a suspicion for the condition.

The meningococci causing PMP are usually of serotype C (88% of cases in one series) or, less commonly, serotypes B or W135.^{2, 4, 6} We have found one other report of PMP caused by meningococcus serotype Y.¹⁰ Unfortunately, the only clinical details available were that the patient was a 52-year-old man.¹⁰ Therefore, it is difficult to conclude whether there are any significant differences between PMP caused by meningococcus serotype Y versus PMP caused by the meningococcal serotypes, although this does not seem to be the case.

Several mechanisms were postulated to explain the susceptibility of certain individuals to PMP, given its rarity. Among those proposed mechanisms are: the lack of circulating antibodies against the pathogenic strains prevalent in the environment, the presence of blocking antibodies, some defects in the complement system, and disease states associated with decreased complement levels.⁴ De Souza et al. demonstrated elevated levels of cytokines IL-4, IL-6, IL-10, and INF- γ in the pericardial fluid from a patient with PMP.⁸ The authors proposed a pathogenetic mechanism involving a compartmentalized inflammatory process in which fluid buildup in the pericardial sac results from cytokines released from inflammatory cells recruited to the pericardium by *N. meningitidis*.⁸

The management of PMP usually included antibiotics and pericardial drainage with a pericardial window or pericardiocentesis. There is no evidence that administration of steroids alters the acute clinical course.¹¹ Despite rapid progression of complications of PMP, and in contrast to purulent pericarditis of other causes, all the patients that have been reported have survived.^{2, 4, 6} The favorable prognosis of PMP is probably related to the young age of patients, lack of comorbidity, and sensitivity of meningococci to antibiotics.⁶ It is worth mentioning that meningococcal vaccinations that cover serotypes A, C, Y, and W-135 are available.

CONCLUSIONS

We report a case of primary meningococcal pericarditis in a previously healthy female that rapidly evolved into life-threatening cardiac tamponade. PMP is an extremely rare, difficult to diagnose, rapidly progressive form of meningococcal infections. Differentiation of PMP from viral pericarditis is important because it usually requires drainage in addition to antibiotics. PMP should be included in the differential diagnosis of otherwise healthy young adults presenting with fever, leukocytosis, chest pain, and dyspnea. Clinicians should be aware that early in the course of PMP, the illness may not be severe. Leukocytosis with left shift or bandemia in the setting of what otherwise seems to be a case of uncomplicated viral pericarditis should prompt suspicion for PMP or other bacterial forms of pericarditis.

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