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Disseminated Meningococcal Disease Complicated with Cardiac Tamponade in a 2-month-old Infant

İki Aylık Bir Bebekte Kardiyak Tamponad ile Komplike Olmuş Yaygın Meningokok Hastalığı

İrem ERSAYOĞLU[1], Pınar YAZICI ÖZKAYA[1], Zümrüt ŞAHBUDAK BAL[2], Bülent KARAPINAR[1], Hamdi METİN[1]

[1]Ege University Faculty of Medicine Children's Hospital, Department of Pediatrics, Division of Intensive Care, İzmir, Turkey
[2]Ege University Faculty of Medicine Children's Hospital, Department of Pediatrics, Division of Infectious Disease, İzmir, Turkey

Abstract

Neisseria meningitidis is a rare and significant bacterial infection that can lead to severe morbidity and mortality if not promptly diagnosed and treated. While disseminated meningococcal infections often result in a high mortality rate due to sepsis, septic shock, and multi-organ failure, they can also cause other life-threatening complications, albeit rarely, such as pericarditis. This article presents a case study of reactive pericarditis following disseminated meningococcal infection. The patient underwent an echocardiogram due to suspicion of cardiac tamponade, which revealed the presence of pericardial effusion. Microbiology and pathology laboratories evaluated the effusion sample obtained through pericardiocentesis, leading to the diagnosis of reactive pericarditis. This case is quite remarkable in the literature due to its unique aspects, including the patient being the youngest reported case of meningitidis infection and the development of reactive pericarditis caused by the B serotype within a shorter timeframe than typically expected.
Keywords: *Neisseria meningitidis*, pericardial tamponade, pericarditis

Öz

Neisseria meningitidis, acilen teşhis edilip tedavi edilmezse ciddi morbidite ve mortaliteye neden olabilen nadir ve önemli bir bakteriyel enfeksiyondur. Yaygın menenjit enfeksiyonları, sıklıkla sepsis, septik şok ve çoklu organ yetmezliği nedeniyle yüksek bir mortalite oranına yol açarken, nadiren de olsa perikardit gibi diğer yaşamı tehdit eden komplikasyonlara da neden olabilir. Bu makale, yaygın menenjit enfeksiyonunu takiben gelişen reaktif perikarditin bir olgu çalışmasını sunmaktadır. Hastaya kalp tamponadı şüphesi nedeniyle ekokardiyogram yapılarak perikardiyal efüzyon varlığı saptanmıştır. Mikrobiyoloji ve patoloji laboratuvarlarında perikardiyosentez yoluyla alınan efüzyon örneği değerlendirilerek reaktif perikardit tanısı konulmuştur. Bu olgu, hastanın bildirilen en genç menenjit enfeksiyonu olgusu olması ve tipik olarak beklenenden daha kısa bir zaman diliminde B serotipinin neden olduğu reaktif perikarditin gelişmesi gibi benzersiz yönleri nedeniyle literatürde oldukça dikkat çekicidir.
Anahtar Kelimeler: *Neisseria meningitidis*, perikardiyal tamponad, perikardit

Introduction

Despite improvements in treatment and development of vaccines, meningococcemia is still associated with high morbidity and mortality rates, particularly in infants. Clinical manifestations can range from a mild disease to meningitis and fatal meningococcemia.

Pericarditis, a rare complication of meningococcal infections, was initially documented in 1918 by Herrick[1]. Meningococcal pericarditis manifests in the following three distinct forms: disseminated meningococcal disease with pericarditis (DMP), primary meningococcal pericarditis (PMP), and reactive meningococcal pericarditis (RMP). The former two are characterized by purulent presentations, whereas the latter,

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Address for Correspondence/Yazışma Adresi: İrem ERSAYOĞLU MD, Ege University Faculty of Medicine Children's Hospital, Department of Pediatrics, Division of Intensive Care, İzmir, Turkey
Phone: +90 232 390 15 63 **E-mail:** irem_e@hotmail.com **ORCID ID:** orcid.org/0000-0001-6965-0886
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which typically arises in the later stages of the disease, manifests as a sterile condition.

Cardiac tamponade, a rare complication of meningococcal pericarditis, can be fatal if not promptly addressed. Herein, we have presented a two-month-old infant who developed cardiac tamponade as a complication of meningococcal pericarditis.

Case Report

A two-month-old male infant was admitted to a medical facility for pyrexia, which was sudden in onset. His physical examination and hematological test parameters were normal. Thus, he was discharged. One day later he was readmitted with a history of episodic fever spikes over two days, diminished appetite, and purpuric rash that developed on the day of admission. His oral intake was poor, and he was irritable. His caregivers did not report any other symptom. There was no evidence of direct exposure to individuals diagnosed with confirmed or suspected to have condition. Additionally, there was no indication of recent travel or close proximity to individuals who had recently traveled. The infant's medical records revealed a normal birth history and normal developmental milestones. Furthermore, the administered vaccines were commensurate with the infant's chronological age.

At the time of presentation to our pediatric intensive care unit from the emergency department of another hospital, his temperature was 35.6 °C and oxygen saturation was 95% on room air. His capillary refill time was 4-5 s, and he exhibited signs of malaise and somnolence. Widespread purpuric cutaneous lesions could be visualized that extended to the extremities. Additionally, he had a bulging fontanelle. His cardiac and pulmonary examinations were normal. On abdominal examination, the liver was palpated 3 cm below the costal margin, indicating hepatomegaly. Blood investigations revealed a white blood cell count of 3,530/µL (49% neutrophils and 45% lymphocytes) and a platelet count of 28,000/µL. His chest radiograph was normal. As empirical treatment, cefotaxime (200 mg/kg/day) was administered for a suspected meningococcal infection, and vancomycin (60 mg/kg/day) was initiated for other bacterial infections, such as pneumococcus, that could potentially induce septicemia, disseminated intravascular coagulation, and meningitis. After admission, the infant was administered fluid resuscitation and vasoactive drugs, namely epinephrine, milrinone, and hydrocortisone. He was also intubated and placed on a mechanical ventilator. Plasmapheresis and continuous renal replacement therapy (CRRT) were performed because the infant developed thrombocytopenia, multiple organ failure, and fluid overload.

On the application day, the brain natriuretic peptide levels were markedly elevated (22,855 ng/l; normal range: 0-125 ng/l), and the troponin 1 levels were elevated (10.6 ng/l; normal range: 0-14 ng/ml). Additionally, the echocardiogram demonstrated decreased biventricular systolic function, a left ventricular ejection fraction of 50%, small midmusculer VSD, and no pericardial effusion. Four days after admission, the infant developed hypotension, narrow pulse pressure, and tachycardia. Arterial monitoring revealed pulsus paradoxus. Because cardiac tamponade was suspected, a bedside echocardiogram was performed again by a pediatric cardiologist. It revealed a large, complex, circumferential pericardial effusion with the diastolic collapse of the right atrium, which is consistent with cardiac tamponade (Figure 1). Pericardiocentesis was performed and 35 ml of serous fluid was drained. The pericardial fluid analysis revealed 100 leukocytes/mm^3 and 1-2 erythrocytes/mm^3. Gram staining of the pericardial fluid was negative, and the cultures were negative for bacteria, fungi, and viruses. Thus, the pericardial fluid was determined to be the result of a benign reactive effusion. The follow-up echocardiograms revealed normal left ventricular function.

On the 5th day of hospitalization, hemoculture and blood analysis by polymerase chain reaction yeilded *Neisseria meningitidis* (*N. meningitidis*) growth and serotype-b detection, respectively. As a result of hemoculture, antibiotic susceptibility was determined. Additionally, e-tests were employed for the assessment of antibiotic susceptibility in addition to the interpretive standards and minimum inhibitory concentration (MIC) breakpoints recommended by the European Committee on Antimicrobial Susceptibility Testing for the various antibiotics (Table 1). Because of the organism's sensitivity to cefotaxime (MIC=0.016 µg/ml), vancomycin was stopped. A course of dexamethasone was initiated in response to the reactive pericarditis (0.15 mg/kg/per dose every six hours for two days). Plasmapheresis and CRRT were discontinued on the 3rd and 5th day of hospitalization, respectively. On the 9th day of hospitalization, the infant was extubated and transferred to the pediatric infection service.

Discussion

Pericarditis is a very serious rare complication of meningococcal infection that was first described by Herrick[1] in 1918. The

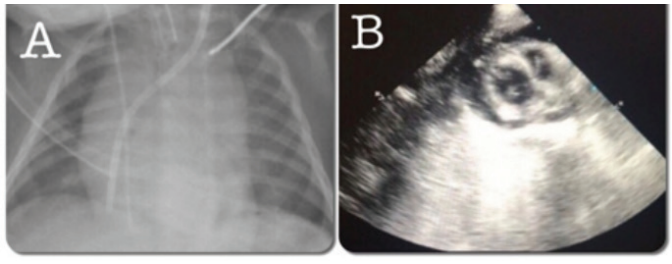

Figure 1. A) Chest X-ray showing a markedly enlarged cardiac silhouette and mediasten. **B)** The echocardiographic showing large pericardial effusion with cardiac tamponade

Table 1. Antibiotic susceptibility results of the *Neisseria meningitidis* specimen isolated from the hemoculture

Antibiotics	MIC breakpoints (µg/mL)		MIC value (µg/mL)	Susceptibility
	S	R		
Benzylpenicillin	≤0.06	>0.25	0.064	I
Ampicillin	≤0.125	>1	0.5	I
Cefotaxime	≤0.125	-	0.016	S
Ceftriaxone	≤0.125	-	0.016	S
Rifampicin	≤0.25	>0.25	1.5	R
Meropenem	≤0.25	-	0.064	S
Chloramphenicol	≤2	>4	256	R

MIC: Minimum inhibitory concentration

incidence of meningococcal pericarditis in all age groups is reportedly 4-19%[1,2]. Meningococcal pericarditis can classified into the following categories based on the pathophysiology: DMP, PMP, and RMP.

In PMP, clinical evidence of meningococcemia and meningitis are absent. Furthermore, the purulent pericarditis is usually complicated by cardiac tamponade and requires drainage[3,4]. Additionally, most cases are caused by serotype-C *N. meningitidis*[3,5]. DMP usually occurs 1 week after the meningococcal infection and rarely causes pericardial tamponade. DMP is the result of bacterial invasion and proliferation in the pericardial space and hematogenous seeding of the pericardium. The pericardial effusion culture in DMP usually yields positive results, and the disease reponds to antibiotics[5,6].

RMP is a hypersensitivity reaction toward damaged pericardial tissue that occurs 1-2 weeks after the disease begins. It occurs as a result of localized immunological inflamatory response. In meningococcal infections, the immune-mediated complications can manifest as endophthalmitis, arthritis, vasculitis, and pericarditis, exhibiting a physiopathological resemblance to reactive meningococcal arthritis[5,7]. In RMP, the pericardial fluid is sterile and serous. Additionally, it typically responds well to anti-inflammatory agents[2,5,8]. Most RMP cases have been reported in young adults. However, a few cases have been reported in children[8-11]. In these patients, all had pericardial tamponade and only one was caused by serotype-C *N. meningitidis*[11]. Our patient is the youngest to develop pericardial tamponade as a complication of RMP.

In the study by Goedvolk et al.[12], the most common secondary immune reaction in children with subacute meningococcal infection was arthritis. Furthermore, 130 patients did not demonstrate pericarditis. According to Morse et al.[2], the incidence of pericarditis during the subacute phase in young adults was 19%. In both adult and pediatric patients, serotype-C *N. meningitidis* was the most common causative organism. However, in our patient, the causative organism was serotype-B *N. meningitidis*.

In our patient, pericardial tamponade manifested on the fourth day of hospitalization. The infant had been on cefotaxime and was being monitored for disseminated meningococcal infection. The pericardial fluid was nonpurulent, and the culture did not yield any growth. Additionally, pathological analysis of the pericardial fluid confirmed a benign reactive effusion. Given the patient's previous presentation of septicemia and the absence pericardial fluid findings, PMP and DMP were ruled out. Finally, the patient was diagnosed to have RMP. The patient was administered cefotaxime, based on the antibiotic protocol for meningococcal infections, and dexamethasone for RMP-related symptoms[13,14].

Conclusion

Upon evaluating the epidemiology of meningococcal infections, it becomes apparent that this particular infection is not commonly encountered within this age group. Herein, we have presented the youngest documented patient who developed RMP. In the presence of clinical manifestations such as abrupt-onset hypotension, pulsus paradoxus, and cardiac tamponade, one should consider the possibility of rare and unforeseen complications such as reactive pericarditis. Thus, these patients require prompt echocardiographic assessment. Furthermore, in addition to appropriate antibiotic therapy, administration of anti-inflammatory agents such as dexamethasone may prove beneficial.

Ethics

Informed Consent: Consent form was filled out by all participants.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: İ.E., P.Y.Ö., Z.Ş.B., B.K., H.M., Concept: İ.E., P.Y.Ö., Design: İ.E., P.Y.Ö., Z.Ş.B., Data Collection

or Processing: İ.E., P.Y.Ö., Z.Ş.B., Analysis or Interpretation: İ.E., P.Y.Ö., B.K., Literature Search: İ.E., P.Y.Ö., H.M., Writing: İ.E., P.Y.Ö.

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