

Neisseria meningitidis Serogroup W causing primary meningococcal septic arthritis in a toddler and review of the literature

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Case Report

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Abstract

Since 2009, there has been a serious increase in the number of meningococcal infections in Europe caused by the serotype W meningococcus (MenW:cc11). Invasive meningococcal disease is typically known to cause severe sepsis or meningitis with high overall mortality rates of 10% despite adequate antimicrobial treatment. Focal infections such as arthritis incidentally occur as a complication of systemic disease.

Method We describe a rare case of primary meningococcal W135 arthritis in a 2-year-old patient.

Results Arthrocentesis of the right Ankle while patient was under anesthesia, yielded grossly purulent fluid, so we made arthrotomy and drainage. The culture from synovial fluid revealed N. meningitidis. The status of the patient improved after surgical drainage and intravenous antibiotic therapy. She recovered completely after 1 month.

Discussion. Atypical clinical presentation is associated with higher case fatality rates and can lead to misdiagnoses. An unusual presentation of invasive meningococcal infection and the early identification of the bacteria, combined with the correct treatment, prevent the complications and even death.

Keywords: Serogroup W; primary meningococcal septic arthritis; toddler; atypical presentation

Abbreviations:

1. Serogroup W meningococci (MenW),
2. Invasive meningococcal disease (IMD)
3. Primary meningococcal arthritis (PMA)
4. C-reactive protein (CRP)
5. Erythrocyte sedimentation rate (ESR)
6. Primary meningococcal septic arthritis (PMSA)

Introduction

Neisseria Meningitidis is associated with severe invasive infections such as meningitis and fulminant septicemia among others. Musculoskeletal infections associated with N. meningitidis have been reported exceptionally.

reported in 10% cases Serogroup W meningococci (MenW), also referred as serogroup W-135 meningococci, and was first identified in the 1960s [1, 2]. In the following years, MenW ST-11 cases remained low at endemic levels through most of the early 2000s. However, the prevalence of meningococemia caused by MenW have been increasing in Europe, Africa, North America and the Middle East³. Men W ST11 has been found associated with different complications including pericarditis, peritonitis, acute GI symptoms (vomiting, diarrhea and nausea), and severe respiratory tract infections and in rare cases, septic arthritis. Although most of these presentations and symptoms are described in all the Invasive meningococcal disease (IMD), its prevalence has always remained low and its presentation as presenting sign has been rarely reported [3, 4]. Since 2009, there has been a serious increase in the number of meningococcal infections in Europe caused by serotype W

Septic arthritis secondary to meningococemia has been

meningococcus (MenW: cc11) [5].

Higher fatality rates have been observed in cases with atypical presentations where diagnosis may be delayed. Such risk highlights the need to consider IMD in the differential diagnoses when acute GI symptoms, septic arthritis or bacteremia pneumonia are present, primarily in regions where serogroup W is prevalent. We report a rare clinical case of a 2-year old girl with primary meningococcal arthritis (PMA) without meningococemia [5-7].

Case Presentation

A 2-year old girl was referred to the emergency department of a third level pediatric hospital with a 24 hours history of fever, progressive pain and swelling of her right ankle. There was no previous history of overseas travel, contact with animals or trauma. She had received only two doses of meningitis type C vaccine, according to the current immunization schedule in Spain in 2019.

On physical examination, right ankle was swollen, range of motion decreased and weight bearing was impossible due to severe pain. Her body temperature was 39.8°C. No skin rash was observed and temperature measured at the ER was 39.8°C. It is noteworthy to mention that no neck rigidity or photophobia was present at the moment.

The blood works showed a white cells count of 15×10^3 with 75% Neutrophils, C-reactive protein (CRP) = 139 mg/l, normal < 15 mg/l, erythrocyte sedimentation rate (ESR) 15 mm/h, normal < 1mm/h, procalcitonin (PCT) = 8, 63ng/m, normal < 0.5 ng/m. A blood test culture was taken.

Upon clinical suspicion of septic arthritis of the ankle due to 3 out of 4 points on the Kocher criteria, A right ankle aspiration was performed at the emergency department using an equimolar 50% nitrous oxide/oxygen gas premix (Kalinox®), obtaining purulent synovial fluid. Cytological evaluation of the synovial fluid showed countless leukocytes and low glucose. The polymerase chain reaction (PCR) was positive for *Neisseria meningitidis* serotype W and the meningococcus also was grown in the synovial fluid culture. Intravenous antibiotic therapy was started with ceftriaxone for 5 days, followed by oral amoxicillin for 2 weeks. Blood cultures were negative. Infection parameters in repetitive blood tests were normalized 2 weeks later, with follow-up for 6 months; she made a full recovery without sequelae. Attending health workers who attended the patient and the parents were treated with ciprofloxacin 750mg monodoses as prophylaxis and Pediatric relatives with rifampicin.

Discussion

Neisseria Meningitidis is a pathogenic Gram-negative intracellular diplococcus. Transmission of the bacteria occurs through direct contact with respiratory droplets [5]. Thirteen distinct serogroups have been identified but invasive

meningococcal disease is only caused by serotypes A, B, C, W and Y. In young adults, a prevalence of approximately 24% has been reported [8]. Notwithstanding, incidence in older adults and infants is lower (5-8%) [9].

In 2001, routine conjugate Meningococcal-C immunization was implemented in the immunization schedule in Spain during the first 2-4-6 months of life, and repeated at the age of 10. However, a dramatic increase of invasive meningococcal disease from a clonal complex variant of serogroup W (cc11) has been observed in our country during the last decade, which forced our health system to modify the 2020 immunization schedule. This leads to replace the Men- C vaccine by the Men –ACWY vaccine in our immunization schedule against meningococci A, C, W and Y, with a scheme of one dose at 4 months of MenC-TT and one dose of Men ACWY at 12 months and another at 12-14 years of age PMA is an uncommon form of meningococcal disease, defined as acute septic arthritis without meningitis or classical syndrome of meningococemia, defined as the combination fever, rash and hemodynamic instability.

Reports of meningococcal disease presenting as septic arthritis date back to the 1980s, when Brawley et al reported a 22-month-old arriving at the hospital with a swollen and painful knee [10]. Following diagnosis of acute septic arthritis, the infectious agent was identified as MenW. The patient showed no rash or classic sign of meningococemia, giving the clinician no reason to suspect meningococcal infection, what is causing these atypical presentations? Several theories have been proposed to explain its pathophysiology, including mesenteric hypoperfusion, septic epiploic micro infarctions and immune complex deposition. It is well known that changes in virulence factors of a strain can induce a stronger inflammatory response [3]. In this case, the Polysaccharide W makes up the capsule of Men W generating a low immune response, making its clearance from the host difficult as a consequence. This may be the reason why Men W ST11 strains have been associated with unusual primary infections sites.

Previous studies have suggested a higher virulence of W-135 compared to other strains [11]. It is important to consider that polysaccharide W-135 has a reduced capacity to generate immune response, hindering the elimination of the infection in the host. The relevance of this agent is reflected in an increased fatality rate of meningococcal disease since its appearance: death rate has been reported for serogroup B around 10–12%, while a higher death rate (25%) for W-135 has been observed. With the recent rise in global W-135 and the massification of the quadrivalent vaccine, we must be aware on how this will affect the incidence of meningococcal septic arthritis.

Septic arthritis by meningococcus is uncommon. According to published records, joint disease by meningococcus would occur in up to 10% of meningococcal diseases and can manifest itself in three types according to its presentation [12]. The first type presents at the beginning with positive cultures in synovial fluid. This is called primary meningococcal arthritis and is a very rare form of presentation. The second form is a reactive

arthritis presented on average 10 days after starting treatment for meningococcal disease. The third type is a haemarthrosis by coagulopathy.

Localized infections most often occur as a complication of systemic disease, whereas primary localized infections (pneumonia, epiglottitis, endophthalmitis, pericarditis and arthritis), as in our patient, are rare. Arthritic involvement resulting from direct haematogenous spreading of circulating bacteria is not an uncommon feature of invasive meningococcal disease, in particular for serotype W. The pathophysiology of primary meningococcal septic arthritis (PMSA) involves an acute transient bloodstream infection with a subsequent invasion of the synovium. *N Meningitidis* can be isolated from synovial fluid while signs of meningitis or septicemia are absent.

PMSA is more frequently monoarthritic, affecting either the knee or ankle joint. It occurs in <3% of meningococcal infections [13]. As previously mentioned, PMSA by serogroup W135 is extremely rare. To the best of our knowledge, only 5 cases have been described in the pediatric literature, 4 cases involved a monoarthrosis of the hip and 1 case of the knee [10, 14-16]. The case we report is the first known case of primary monoarthrosis of the ankle due to *Neisseria meningitidis* W-135. In an immunocompetent child with acute ankle pain and swelling as the only symptom upon presentation at the hospital. The case reported reflects that Meningococcal infection must be considered in the diagnosis of any child presenting with arthritis, even if afebrile and without rash.

The definite diagnosis of PMSA in our patient was based on positive synovial fluid cultures without clinical signs of meningitis or the classical syndrome of meningococemia defined by the combination of fever, rash and hemodynamic instability.

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Short Title: Neisseria Meningitidis caused septic arthritis in a toddler

Conclusion

It is important that the physicians become more aware of unusual presentations of meningococcal disease such as PMSA. With prompt diagnosis and initiation of treatment, the prognosis is excellent.

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