Case report

Child with serogroup W135 primary meningococcal septic arthritis

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SUMMARY

Over the last decade, there has been a concerning increase in the number of invasive meningococcal serotype W infections in Europe. Although sepsis and meningitis are the most feared complications, focal complications of systemic disease such as pneumonia, pericarditis and arthritis can also occur. We present a rare case of isolated meningococcal W135 arthritis of the hip without invasive meningococcal disease in a 6-year-old patient.

BACKGROUND

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.[1] Focal infections such as arthritis incidentally occur as a complication of systemic disease. We describe a rare case of primary meningococcal W135 arthritis in a 6-year-old patient.

CASE PRESENTATION

A 6-year-old girl was referred to the paediatric emergency department with a 1-day history of fever and progressive pain in her left leg.

Her medical history mentioned Hirschprung's disease for which she had undergone Duhamel surgery during infancy. Neither she nor her direct family members had been ill in the days prior to the development of her symptoms. There was no history of a tick bite, foreign travel, animal exposure or trauma. She had received routine immunisations.

On physical examination, her temperature was 38.5°C (after acetaminophen), the heart rate 121/min, her respiratory rate 26/min and her blood pressure was 108/65 mm Hg. There was no visible redness or swelling of her joints. The range of movement of her leg was limited and she kept it slightly flexed. She was not able to bear weight on her left leg. Passive internal rotation of the hip was very painful. There were no movement abnormalities of the other joints. She had no rash or lymphadenopathy. Examinations of her ears, nose and throat, as well as the heart, lungs and abdomen were normal. Neurological test was unremarkable, we found no stiffness of the neck or other signs of meningeal irritation.

Investigations on admission revealed a peripheral white blood cell count of 16.6×10^9/L (normal range $4-10\times10^9$/L) with 14.1×10^9/L neutrophils. The serum C reactive protein was elevated at 118 mg/L (normal, 0–5 mg/L), the erythrocyte sedimentation rate was 36 mm/h. A blood culture was taken. Because there were no clinical signs of meningitis, a lumbar puncture was not performed. The patient scored 3 out of 4 points on the Kocher criteria indicating a 93% likelihood of septic arthritis of the hip.[2] Due to the high probability of septic arthritis, an ultrasound of the hip was not performed. A preoperative X-ray of the hip revealed hydrops of the joint. Therefore, according to national guidelines, an arthrotomy was performed with aspiration of what was found to be purulent synovial fluid, followed by washout of the joint and empiric treatment with intravenous flucloxacillin and gentamicin.[3] Cytological evaluation of the synovial fluid showed elevated white blood cells, predominantly (95%) polymorphonuclear leukocytes. The next morning the patient had improved and her fever had disappeared. Because the synovial aspirate showed Gram-negative cocci, antibiotics were switched to ceftriaxone. The first days her leg was immobilised. On the third day after the surgery, the causative organism was identified as *Neisseria meningitidis* and subsequently typed as serogroup W135. The blood cultures and poststreptococcal serology remained negative, resulting in a final diagnosis of a primary monoarticular meningococcal type W septic arthritis of the hip. The patient received 2 weeks of intravenous ceftriaxone, followed by a 2-week course of high-dose oral amoxicillin/clavulanic acid. We contacted our Public Health Services and close contacts were treated with antibiotic chemoprophylaxis.

OUTCOME AND FOLLOW-UP

After surgical and antibiotic treatment, the patient recovered quickly and was discharged from the hospital within a week. She received physiotherapy and was able to walk normally within 3 weeks. She was closely monitored in the outpatient clinic and made a full recovery without sequelae. Due to the unusual presentation, we performed a detailed immunological workup 1 year after admission (table 1). We found no argument for an innate or acquired immunodeficiency with normal white blood cell count, lymphocytes subsets, quantity of immunoglobulins, complement components and tetanus/diphtheria antibody titres.

Table 1 Laboratory test results

Blood test	Result	Age-corrected reference values
Immunoglobulins		
IgA (g/L)	1.9	0.5–2.2
IgG (g/L)	9.2	5.4–13.6
IgM (g/L)	1.6	0.5–1.9
IgG subclasses		
IgG1 (g/L)	6.9	4.0–11.5
IgG2 (g/L)	2.3	0.98–4.8
IgG3 (g/L)	0.52	0.15–1.49
IgG4 (g/L)	1.60	0.03–2.10
Lymphocyte subpopulation*		
B cells ($\times10^9$/L)	0.4	0.3–0.7
T cells ($\times10^9$/L)	1.9	1.1–2.8
CD4 T cells ($\times10^9$/L)	1.2	0.5–1.8
CD8 T cells ($\times10^9$/L)	0.6	0.4–1.2
NK cells ($\times10^9$/L)	0.2	0.1–0.6
Complement system		
AP50† (%)	123	67–128
CH50‡ (%)	128	68–133
Complement factor C3 (mg/dL)	134	80–150
Complement factor C4 (mg/dL)	24	13–37
Complement factor C1q (IE/L)	126	81–128
Vaccination response titres		
Antidiphteria toxoid antibodies (IU/L)	0.26	>0.1 IU/mL: normal response to protein antigens
Antitetanus toxoid antibodies (IU/L)	1.57	>0.1 IU/mL: normal response to protein antigens

*Reference value from ref. 25.
†Complement alternative pathway (AP50) activity: screening assay for the activation of the alternative complement pathway.
‡Total haemolytic complement (CH50) activity: screening assay for the activation of the classical complement pathway.
Ig, immunoglobulin; NK, natural killer.

DISCUSSION

Neisseria meningitidis is a pathogenic Gram-negative intracellular diplococcus. Transmission of the bacterium occurs through the direct contact with respiratory droplet secretions. Thirteen distinct serogroups have been identified, but almost all cases of invasive meningococcal disease are caused by the 6 serotypes A, B, C, W, X and Y.[4]

In general, the nasopharyngeal meningococcal carriage is most frequent in young adults with a prevalence of approximately 24%, approaching 100% in closed or semi-closed populations such as military recruits and university students. The incidence in older adults and infants is much lower (5%–8%).[5]

In 2002, routine conjugate Meningococcal-C immunisation was implemented in The Netherlands for the 14-month-old age group resulting in a significant decline of invasive meningococcal infection. However, following similar trends in the UK, a dramatic increase of invasive meningococcal disease from a clonal complex variant of serogroup W (cc11) was seen in our country, The Netherlands.[6] From 2014 to 2016, incidence rates increased from 0.03 cases to 0.15 cases per 100.000 with a reported mortality rate of approximately 10%.[7] An outbreak occurred in 2018 with an incidence of up to 0.66 per 100.000, especially in the adolescent age group.[8] This led to the replacement of the Men-C vaccine by the Men-ACWY vaccine in our national immunisation programme.[9]

Neisseria meningitidis infections may cause severe meningitis and/or sepsis, of which the latter is especially renowned for the Waterhouse-Friderichsen syndrome.[10]Localised infections most often occur as a complication of systemic disease, whereas primary localised infections (pneumonia, epiglottitis, endophthalmitis, pericarditis and arthritis), as in our patient, are rare.[11] Arthritic involvement resulting from direct haematogeneous spreading of circulating bacteria is not an uncommon feature of invasive meningococcal disease, in particular for serotype W.[12] Reported incidence rates vary from 5% to 7% in The Netherlands and the UK to 18% in Australia.[7 13 14]

Two other clinical patterns of meningococcal arthritis have been described, an immune-mediated arthritis and a primary meningococcal septic arthritis (PMSA). The pathophysiology of PMSA involves an acute transient bloodstream infection with a subsequent invasion of the synovia. *Neisseria meningitidis* can be isolated from synovial fluid while signs of meningitis or septicaemia are absent. In approximately 50% of all cases, the arthritis is preceded by symptoms of upper respiratory tract infection. It is believed that mucosal damage may lead to bacterial translocation with the migration of the bacterium to the synovium.[15]

PMSA is most often monoarthritic, affecting either the knee or ankle joint.[16–20] It occurs in <3% of meningococcal infections. Combining adult and paediatric literature, <50 cases have previously been described.[21] PMSA by serogroup W135 is extremely rare. To the best of our knowledge, only three such cases have been described in the paediatric literature. All cases involved a monarthritis of the hip, as was the case in our patient.[22–24]

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 meningococcemia defined by the combination of fever, rash and haemodynamic instability.[23]

When the diagnosis of PMSA is established, prompt treatment should be initiated with a third-generation cephalosporin as the antibiotic of choice. We performed a direct arthrotomy with synovial fluid aspiration and washout of the hip joint.[2] Although there are no clear guidelines for PMSA, early surgical approach has also been successful in other cases. There is limited evidence for corticosteroids and drainage of the joint.[16] With proper treatment, the prognosis of PMSA is excellent, as most patients recover fully without joint deformity or impairment within 1 month of their initial presentation.

To conclude, we presented a rare case of a young patient with a serogroup W135 PMSA of the hip. Due to the alarming increase in the number of meningococcal W infections, it is important that physicians become more aware of unusual presentations of

Learning points

- Primary meningococcal septic arthritis (PMSA) is a rare presentation of meningococcal disease.
- In light of the alarming increase of meningococcal serotype W worldwide, awareness of PMSA should be raised.
- Even in urgent situations, obtaining bacteriological samples before any initiation of antibiotic therapy is crucial as it allows isolation of rare micro-organisms which may require specific treatment and potentially even epidemiological measurements.
- With prompt treatment, the prognosis of PMSA is excellent.

meningococcal disease such as PMSA. With prompt diagnosis and initiation of treatment, the prognosis is excellent.[20]

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