CASE REPORT

Primary meningococcal septic arthritis with multiple native joint involvement

Connor Boyle,^{1,2} Thomas Howard,² David Griffith,³ Jonathan Cowie²¹Division of Health Sciences, University of Edinburgh, Edinburgh, UK²Department of Trauma and Orthopaedic Surgery, NHS Fife, Kirkcaldy, UK³Department of Microbiology, NHS Fife, Kirkcaldy, UK

Correspondence to

Dr Connor Boyle,
connorboyle@doctors.org.uk

Accepted 25 April 2018

SUMMARY

A previously healthy 18-year-old woman presented with an acutely painful, swollen right ankle joint, with similar symptoms subsequently developing in the right hip and right wrist. Microbiological samples from the ankle aspirate grew *Neisseria meningitidis*. She had had no preceding clinical symptoms of meningitis or previous contact with a patient with meningitis. She was treated with intravenous antibiotics and surgical drainage. On follow-up, her symptoms had resolved, inflammatory markers had returned to normal and she has no long-term sequelae of septic arthritis. Primary meningococcal septic arthritis in the adult population is extremely uncommon, and makes up approximately 1% of all cases of primary septic arthritis.

BACKGROUND

Arthritis as a sequelae to meningococcal disease is a well-described, if infrequent, cause of septic arthritis.¹ Meningococcal arthritis can manifest in three different forms: primary meningococcal arthritis (PMA), which is defined as acute septic arthritis without meningitis or the classical syndrome of meningococcaemia (defined as the combination of fever, rash and haemodynamic instability)¹; secondary meningococcal arthritis, which is a complication of acute meningococcaemia and which is the most common presentation; and tertiary meningococcal arthritis, an uncommon arthritis associated with chronic meningococcaemia.^{2,3}

Although there have been periodic case reports of septic arthritis as a result of *Neisseria meningitidis*,²⁻⁴ other micro-organisms, such as *Staphylococcus aureus*, *Streptococcus pyogenes* and *Haemophilus influenzae* remain more common and well-described causes.⁵

We present a case report of a young woman with polyarticular PMA.

CASE PRESENTATION

An 18-year-old, previously healthy woman presented to the emergency department with a 2-day history of acute erythema and worsening pain over the right ankle. One week previously, she had fallen on the stairs and hurt the same ankle. There was no known history of exposure to infectious patients.

She felt systemically unwell, with malaise and anorexia. She had severe pain in the affected ankle and there was erythema noted over the joint, as well

as a mild effusion. There was a very limited range of movement of the right ankle and a complete inability to weight bear.

On systemic examination, her temperature was 39.4°C, with a sinus tachycardia of 114 bpm and mild hypotension (97/43). She had no clinical signs or symptoms of respiratory, intra-abdominal, neurological or urinary infection, and had no history of a preceding sore throat. At this point, she did not have similar symptoms in any other joints.

She had no other medical history of note, and had no previous admissions to the hospital. She was sexually active and took the combined contraceptive pill/oral contraceptives; other than this, she was on no regular medication.

INVESTIGATIONS

Investigations on admission revealed a peripheral white cell count of $13.1 \times 10^9/L$ (normal range $4-10 \times 10^9/L$), neutrophil count of $10.90 \times 10^9/L$, lymphocyte count of $1.14 \times 10^9/L$, monocyte count of $1.06 \times 10^9/L$, eosinophil count of $0.00 \times 10^9/L$ and basophil count of $0.02 \times 10^9/L$. She had a C reactive protein (CRP) of 297.1 mg/L (normal range 0–5 mg/L).

The radiographic findings showed marked soft tissue swelling at the ankle anterolaterally, with no bony abnormalities (figure 1). Joint aspiration yielded 4 mL of serosanguinous fluid, in which moderate numbers of polymorphs, but no organisms, were observed on microscopy.

Swabs taken from the throat and nose on admission were negative for Methicillin-resistant *Staphylococcus aureus*. There were no sputum samples taken during her admission.

DIFFERENTIAL DIAGNOSIS

As with any case of a unilateral hot, swollen, erythematous joint, septic arthritis was the main differential diagnosis, and the working diagnosis until investigations proved otherwise. A reactive arthropathy, secondary to a gastrointestinal or sexually transmitted infection, was also a differential diagnosis at this point, due to the young age of the patient.

TREATMENT

She was commenced on an antibiotic regimen of flucloxacillin (2g intravenously, 6-hourly) as per local guidelines, with regular observations and monitoring. Twenty-four hours after admission, the Microbiology department reported that the aspirate from the ankle had grown Gram-negative

To cite: Boyle C, Howard T, Griffith D, et al. *BMJ Case Rep* Published Online First: [please include Day Month Year]. doi:10.1136/bcr-2017-223197

Figure 1 Anteroposterior and lateral X-ray imaging of the right ankle on admission.

diplococci, and advised changing the antibiotic therapy to ceftriaxone (2 g intravenously, 24-hourly).

The pain in the ankle continued to worsen, and the erythema advanced proximally up the right leg. She was taken to the theatre (36 hours after admission) for an arthrotomy and washout of the ankle joint. Later that day, the patient reported pain in her right wrist, and examination revealed erythema on the dorsal surface, with pain on both active and passive flexion and extension. She also reported significant pain in the right hip and lumbar spine on even slight movement.

Due to concerns about possible *Neisseria gonorrhoeae* infection, the patient was discussed with Gynaecology, who advised a single dose of azithromycin (1 g PO) to cover for possible coinfection with *Chlamydia trachomatis*. She also had a pelvic ultrasound scan, which was normal.

Seventy-two hours after admission, extended cultures identified the responsible organism as *Neisseria meningitidis*. The organism was identified locally using the VITEK 2 system (Biomérieux), the standard commercial identification system used throughout the region. The matrix-assisted laser desorption/ionisation time-of-flight mass spectrometry system (Roche) was used to confirm the identification. It was phenotypically and genotypically identified as *N. meningitidis* Group W. The patient had previously completed the full course of meningococcal vaccinations.

This finding was notified to the Health Protection Team, and ceftriaxone was continued after Microbiology and Infectious Diseases review. She was clinically improving at this point, and had been afebrile for 48 hours. While her white cell count had risen from $13.1 \times 10^9/L$ to $20.0 \times 10^9/L$, her CRP had decreased from 297.1 mg/L to 194.0 mg/L.

Due to ongoing hip and spine pain, she had an MRI scan of the hip and lumbar spine. This showed bilateral sacroiliac inflammation, right hip synovitis and a fluid collection overlying the right lateral thigh muscles (figures 2 and 3). Conservative management was continued.

After 10 days of treatment with intravenous ceftriaxone, she developed a widespread maculopapular rash, on her trunk and upper limbs, which a Dermatology review deemed to be a consequence of her antibiotic treatment. As both her clinical condition and inflammatory markers were improving (peripheral white cell count of $8.9 \times 10^9/L$, with neutrophils, lymphocytes, monocytes, eosinophils and basophils all within normal ranges), her therapy was changed to ciprofloxacin (750 mg PO, 12 hourly).

Figure 2 Coronal Short TI Inversion Recovery (STIR) sequence from the MRI scan of the hip and spine, with the fluid collection in the right thigh indicated with a white arrow.

OUTCOME AND FOLLOW-UP

She continued to respond well to antibiotics (receiving 19 days in total), with symptoms in the ankle, wrist and hip being minimal on discharge from the hospital. On discharge, her white cell count was 8.1×10^9 and her CRP was 17.4 mg/L.

She was reviewed in an outpatient clinic 2 weeks later, at which she confirmed her symptoms had continued to improve. There was no pain in the ankle, and both her white cell count and CRP at that point were within normal limits. In the following 15 months, she has had no sequelae from this episode, and has not been routinely followed up under Orthopaedics or Infectious Diseases.

DISCUSSION

PMA, like other forms of septic arthritis, is a surgical emergency that requires prompt assessment, source control and targeted antimicrobial treatment. Although other organisms, such as *Staphylococcus aureus*, *Streptococcus pyogenes* and *Haemophilus influenzae* are more recognised causes,⁵ there have been sporadic reports of cases involving *N. meningitidis*, with 19

Figure 3 Axial Short TI Inversion Recovery (STIR) sequence from the MRI scan of the hip and spine, with bilateral sacroiliitis indicated with white arrows.

described cases in the literature before 1980,⁶ and a subsequent 42 cases between 1980 and 2014.⁷

Although cases of septic PMA tend to be monoarthritic,^{1 2 4 7} cases with polyarthritis (as with this patient) have been reported.^{8 9} As with more recognised forms of septic arthritis, the knee is the most commonly affected joint, but there have been two other reported cases in the literature of PMA originating in a native ankle joint.^{2 4} The most common causative serotype in adults is Group B,¹⁰ and to our knowledge, there have only been two other cases, in the adult population, caused by the Group W serotype.^{10 11} Although she had previously received the full programme of vaccinations against meningococcal disease, it has been reported that the efficacy of the meningococcal conjugate vaccine (MenACWY, covering the Group W serotype) decreases after the first year.¹²

Due to the rarity of the condition, there are no widely accepted guidelines for the specific management of PMA. However, as with any case of suspected septic arthritis, joint aspiration and source control, followed by the commencement of intravenous antibiotics, should be instigated as the initial management plan (ideally broad-spectrum; however, the use of empirical broad-spectrum antibiotics for septic arthritis in this region has been reduced, in an effort to target the most likely pathogens and to try and reduce rates of *Clostridium difficile* infections. If there are specific risk factors for Gram-negative organisms, appropriate antibiotics are commenced empirically as well).¹³ The antibiotic choice should then be adjusted based on culture findings, as was the case with this patient.

With regards to PMA in particular, the use and timing of surgical exploration and drainage is variable. Two recent case reports^{2 14} advocate early arthroscopy, and in both cases, the patients in question required two arthroscopies (in addition to intravenous antibiotics) before discharge to treat and manage the PMA. Although the patient in our report only had one arthroscopy and joint washout, the clinical and biochemical improvement subsequent to this is consistent with the findings of the other reports; early surgical washout would thus seem like a prudent management strategy in patients in which there arises a clinical suspicion, with or without further microbiological evidence.

The clinical improvement, with the aforementioned management plan, would also suggest that conservatively managing the hip synovitis and fluid collection was the appropriate decision; this is consistent with other cases of PMA with sacroiliac involvement.¹⁵

There is only limited evidence in the literature for the use of corticosteroids¹⁶ or the placement of surgical drains¹⁷ in the management of septic arthritis, and we did not use either in our treatment plan.

Of note, it is important that any underlying cause for the infection should be thoroughly investigated. In this case, there was a prior history of trauma, but no exposure to *N. meningitidis* or any symptoms that may have suggested this was chronic meningococcaemia, rather than a primary infection. As *N. meningitidis* is a notifiable disease, local public health services should be notified and advice sought about managing contacts, as was done with our patient. Primary septic arthritis due to *N. meningitidis* is initially indistinguishable from septic arthritis due to *N. gonorrhoeae*, and is likely to be treated as such initially (as was the case with our patient), but prompt identification of the underlying organism as *N. meningitidis* has significant implications for clinical management, contact tracing and public health policy.

Although there have been no formal long-term studies carried out, long-term outcomes after PMA appear to be favourable.

Patient's perspective

My stay in hospital was very frightening for me, as I had never really been unwell or needed an operation before. After a couple of days it did not seem like things were getting better, but thankfully they did and I am very grateful to all the staff on the ward for helping me get home. It is interesting to see that this has not happened many other people - I wish I knew how it happened in the first place!

Learning points

- ▶ A patient can be infected with *Neisseria meningitidis* despite no apparent contact with a carrier of the disease.
- ▶ A lack of response to recommended antibiotic therapy in septic arthritis should prompt further consideration of an atypical organism or cause.
- ▶ *N. meningitidis* is a rare but important cause of primary septic arthritis.
- ▶ Source control is a key aspect of appropriate management in septic arthritis.

There are no reports in the literature of any major sequelae due to the infection, and in this case, the patient has recovered without any complications.

Contributors CB, TH, DG and JC were all involved in the clinical management of the patient. DG identified the case as worth sharing. CB and DG were involved in the conception of the article and literature search. CB was responsible for the drafting of the article, with all authors responsible for the subsequent revision of the article and approval of the submitted draft.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None declared.

Patient consent Obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

© BMJ Publishing Group Ltd (unless otherwise stated in the text of the article) 2018. All rights reserved. No commercial use is permitted unless otherwise expressly granted.

REFERENCES

- 1 Harwood MJ, Womack J, Kapur R. Primary meningococcal arthritis. *J Am Board Fam Med* 2008;21:66–9.
- 2 Gee C, Tandon T, Avasthi A, et al. Primary meningococcal septic arthritis of the ankle joint: a case report. *J Foot Ankle Surg* 2014;53:216–8.
- 3 Kazmi M, Kilding R, Akil M. 19. Primary Meningococcal Arthritis Presenting as Symmetrical Polyarthritis. *Rheumatology* 2014;53(suppl_1):i63.
- 4 Murphy D, Ryan D, Atwal N. Primary Meningococcal Arthritis of a native ankle joint. *Bone Joint J* 2015;1:19.
- 5 Dubost JJ, Soubrier M, De Champs C, et al. No changes in the distribution of organisms responsible for septic arthritis over a 20 year period. *Ann Rheum Dis* 2002;61:267–9.
- 6 Schaad UB. Arthritis in disease due to *Neisseria meningitidis*. *Rev Infect Dis* 1980;2:880–8.
- 7 Giamarellos-Bourboulis EJ, Grecka P, Petrikos GL, et al. and Katsilambros N: Primary meningococcal arthritis: case report and review. *Clin Exp Rheumatol* 2002;20:553–4.
- 8 Rodríguez CL, Octavio JG, Isea C, et al. Acute polyarthritis as sole manifestation of meningococcal disease. *J Clin Rheumatol* 2012;18:42–3.
- 9 Nihonyanagi S, Sunakawa K, Cui L, et al. A very rare case of primary meningococcal arthritis in an adult male. *Clin Case Rep* 2015;3:76–80.
- 10 Steele L, Bechman K, De Barra E, et al. Meningococcal arthritis and myopericarditis: a case report. *BMC Infect Dis* 2017;17:751.
- 11 Moll-Manzur C, Faúndez F, Araos-Baeriswyl E, et al. [Septic arthritis of the knee by *Neisseria meningitidis* serogroup W-135: First case reported in adults]. *Med Clin* 2016;147:225–6.

- 12 Cohn AC, MacNeil JR, Harrison LH, *et al.* Effectiveness and Duration of Protection of One Dose of a Meningococcal Conjugate Vaccine. *Pediatrics* 2017;139:e20162193.
- 13 Patient. Septic arthritis. <https://patient.info/doctor/septic-arthritis-pro> (accessed 19 Jun 2017).
- 14 Barahona M, Catalan J, Sato Y, *et al.* Primary meningococcal type C arthritis: a case report and literature review. *Case Rep Orthop* 2017;2017:1–3.
- 15 Sahu S, Mohanty I, Narasimham MV, *et al.* Primary meningococcal arthritis of sacroiliac joint: a rare case report. *Indian J Med Microbiol* 2013;31:87.
- 16 Cabellos C, Nolla JM, Verdaguer R, *et al.* Arthritis related to systemic meningococcal disease: 34 years' experience. *Eur J Clin Microbiol Infect Dis* 2012;31:2661–6.
- 17 Ateschrang A, Albrecht D, Schroeter S, *et al.* Current concepts review: septic arthritis of the knee pathophysiology, diagnostics, and therapy. *Wien Klin Wochenschr* 2011;123:191–7.

Copyright 2018 BMJ Publishing Group. All rights reserved. For permission to reuse any of this content visit <http://group.bmj.com/group/rights-licensing/permissions>.
BMJ Case Report Fellows may re-use this article for personal use and teaching without any further permission.

Become a Fellow of BMJ Case Reports today and you can:

- Submit as many cases as you like
- Enjoy fast sympathetic peer review and rapid publication of accepted articles
- Access all the published articles
- Re-use any of the published material for personal use and teaching without further permission

For information on Institutional Fellowships contact consortiasales@bmjgroup.com

Visit casereports.bmj.com for more articles like this and to become a Fellow