

Cases of Septic Arthritis During Meningitis Infection at Zinder National Hospital, Niger Republic

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Abstract: septic arthritis is the consequence of bacterial aggression of the articular synovium, which can occur during meningitis. We report two cases of arthritis in patients hospitalized for meningitis in the infectious and tropical diseases department of Zinder National Hospital. Two cases admitted initially for meningitis at the Zinder National Hospital, developed secondary localized arthritis. Laboratory confirmation was carried out using QIAstat-Dx Meningitis/Encephalitis Panel kit (QIAGEN) on cerebrospinal fluid and joint fluid for the respective diagnosis of meningitis and arthritis. While *Haemophilus influenzae* and *Neisseria meningitidis* were confirmed in the cerebrospinal fluid, the presence of *Haemophilus influenzae* and co-infection with *Neisseria meningitidis* and *Streptococcus pyogenes* was established in the joint fluid. Both patients were cured after antibiotic treatment and symptomatic management. Meningitis can lead to osteoarticular localization in severe forms. Dual antibiotic therapy may improve the prognosis.

Keywords: septic arthritis, meningitis, purpura, Zinder, Niger Republic

Introduction

Septic arthritis is a medical emergency resulting from microbial invasion of the synovial membrane, most commonly affecting large joints such as the knee, hip, and ankle.¹ It is usually caused by hematogenous spread during bacteremia and may occur concurrently with other invasive infections, including bacterial meningitis. The association between septic arthritis and meningitis, particularly meningococcal meningitis, is well documented, occurring in approximately 2–10% of cases.^{1–5} This association reflects simultaneous dissemination of bacteria into several sterile compartments rather than a direct causal relationship.^{4,6} Two main forms of meningococcal arthritis have been described: early septic arthritis due to direct bacterial invasion during bacteremia, and late immune arthritis, occurring a few days to a few weeks after the onset of meningitis and often presenting as oligoarthritis.⁷

This condition may be associated with severe neurological complications, including intracranial abscesses.⁸ Biological diagnosis of septic arthritis involves isolation of the bacteria from joint puncture fluid, mainly by culture or PCR.^{1,5} Rarely, meningococcus can be isolated from sterile sites. In some studies, reported cases of invasive meningococcal infections corresponded to the presence of meningococcus in other sterile sites.^{9,10} Septic arthritis is often monoarthritis affecting large joints such as the knee, hip or shoulder. In the Republic of Niger, epidemics of bacterial meningitis are recorded every year, as the country is located in the African meningitis belt. The main causes of meningitis are *Neisseria meningitidis* (*N. m.*), *Streptococcus pneumoniae* (*S. p.*) and *Haemophilus influenzae* type b (*Hi b.*)^{11,12} However, these same pathogens have been implicated in the occurrence of arthritis during meningitis. Recently, Nm serogroup C was responsible for a meningitis epidemic in Niger, characterized by some *purpuris fulminans*-like syndrome following meningococemia. This syndrome is characterized, for example, by hemorrhagic skin infarction

caused by disseminated intravascular coagulation and dermal vascular thrombosis,^{13–15} and can develop into septic arthritis through hematogenous dissemination of the bacteria.¹⁶ Arthritis complicating meningitis has been recognized.

This study examined two cases of arthritis in patients hospitalized for meningitis at the Infectious and Tropical Diseases Department of Zinder National Hospital. Laboratory diagnosis of meningitis and arthritis were carried out using QIAstat-Dx Meningitis/Encephalitis Panel kit (QIAGEN) which can detect 15 different pathogens implicated in the pathogenesis of meningitis and/or encephalitis by qRT-PCR techniques at Institut Pasteur of Dakar. Different controls including internal, positive and negative were used for assay validation. Positivity was determined for any sample with a cycle threshold value < 38.

Case Description

Case 1

A 17-year-old student patient, unvaccinated against meningitis, with no known pathological history and a history of community contact, admitted to the infectious and tropical diseases department of Zinder National Hospital for meningitis. Questioning revealed notions of intense headache on headphones, easy vomiting in spurts, constipation, neck pain and fever that had persisted for six days despite initial treatment at an integrated health center (IHC). Clinical examination revealed an obtunded patient with a Glasgow score of 15/15, altered general condition, stained mucous membranes and conjunctivae, temperature 38.9°C, blood pressure 128/80 mm Hg, heart rate 108bpm/min, respiratory rate 23 cycles/min, pulse oxygen saturation 99%. Absence of focus ENT and pulmonary infections. Cardiovascular and skin examinations were unremarkable. Lumbar puncture revealed purulent cerebrospinal fluid (CSF), with gram-negative bacilli on direct examination, *Haemophilus influenza* found after molecular biology of cerebrospinal fluid. A complete blood count (CBC) showed hyperleukocytosis at 26,100 cells/mm³, predominantly neutrophils (18,300 cells/mm³), normal hemoglobin and normal platelets. Renal function was normal. Clinical management consisted of Ceftriaxone at meningitis dose (100mg/kg/day), Dexamethasone 0.15mg/kg/day, saline 0.9% 500mL×2/day, glucose 10% 500mL×2/day, injectable paracetamol 60mg/kg/day or 1g×4/day. After 7 days of hospitalization, in view of the slow progression of the meningitis, a cerebral CT scan with ICP injection was performed, revealing two cocardial images surrounded by a halo of edema. The central hypodense areas were surrounded by a thick, regular, hypodense, contrast-accepting ring. These images suggested the presence of two abscess foci. Puncture of the abscesses yielded RT-PCR isolations of *H. influenzae* and varicella-zoster virus (VZV). The patient underwent an external ventricular bypass. At the same time, the patient developed ankle joint swelling (Figure 1), with local heat and pain on palpation. Quantitative C-reactive protein (CRP) was very high at 108 mg/l. An X-ray of the ankle showed hyperclarity, and ultrasound revealed an intra-articular effusion. Joint puncture revealed cloudy fluid, and RT-PCR showed *Haemophilus influenzae* infection consistent with CSF. Ankle lavage-drainage (Figure 1) was instituted, with antibiotic therapy based on Ciprofloxacin 30 mg/kg/day for 4 weeks, Acyclovir 10 mg/kg every 8 hours, for 7 days. Recovery was achieved after 38 days in hospital.

Case 2

A 14-year-old student at the Zinder Koranic School, not up to date with his meningitis vaccination and with no known pathological history, was admitted to the infectious and tropical diseases department of the Zinder National Hospital on May 8, 2023 with meningitis. On examination, the patient presented with violent headaches, insomniac, exaggerated by noise and light, not soothed by paracetamol, easy vomiting in jet form, not preceded by nausea, favored by changes in position, evolving for 5 days, in a context of fever without figures. On admission, the patient was conscious with a Glasgow score of 15/15, general condition altered, mucous membranes and conjunctivae well stained, temperature 38.5°C, blood pressure 100/70 mmHg, heart rate 110bpm/min, respiratory rate 29 cycles/min, pulse oxygen saturation 98%. There were confluent petechial lesions that did not fade on in vitro pressure, giving ecchymoses with extensive areas of blue-black hemorrhagic necrosis localized to both pelvic limbs (Figure 2). Lumbar puncture revealed cloudy cerebrospinal fluid (CSF), with gram-negative diplococci on direct examination (Figure 3). Blood count (CBC) revealed hyperleukocytosis at 30,400/mm³, predominantly neutrophils (24,100/mm³), anemia (hemoglobin 9.4 g/dl), microcytic



Figure 1 17-year-old patient hospitalized for meningitis, joint localization, *H. influenzae* was isolated in CSF and joint fluid.



Figure 2 Purpura fulminans lesions in patient with septic arthritis.

(GMV 74.4 fl) normochromic (35.6 g/dl), platelets normal. Renal function was normal. Quantitative C-reactive protein (CRP) was elevated to 36 mg/l.

Clinical management of the case consisted of ceftriaxone at the meningitis dose (100mg/kg/day), gentamicin 100mg/day, dexamethasone 0.15mg/kg/day, 0.9% saline 250mL×2/day, 10% glucose 250mL×2/day, injectable paracetamol 500mg×3/day. After 3 days of treatment, the patient developed warm, painful swelling of the right ankle and knee



Figure 3 Microscopic appearance of cerebrospinal fluid after Gram staining, presence of Gram-negative diplococci.

with positive patellar shock. Knee X-ray was normal, while ultrasound had shown intra-articular effusion and swelling of the synovial capsule. Exploratory puncture revealed cloudy joint fluid, and RT-PCR revealed *Neisseria meningitidis* and *Streptococcus pyogenes* co-infection. Daily saline lavage and drainage of the affected joints were instituted, with antibiotic therapy based on Ciprofloxacin 30 mg/kg/day for 4 weeks. The patient was discharged after 19 days in hospital.

Discussion

These cases illustrate septic arthritis occurring during invasive bacterial meningitis, most likely resulting from hematogenous dissemination during bacteremia.¹ Such associations are well described in meningococcal disease and are not exceptional.^{2,3,5}

In this study, we report two cases of septic arthritis occurring after meningitis. *Neisseria meningitidis* is known for its meningeal tropism, but it can cause extra-meningeal manifestations, notably bacteremia and pneumopathy. Osteoarticular involvement occurs in 20% of cases, in the form of septic arthritis, reactive arthritis and osteomyelitis.

The detection of *S. pyogenes* in synovial fluid in Case 2, despite Gram stain showing only Gram-negative diplococci, raises the possibility of false-positive molecular detection or transient polymicrobial seeding. Similarly, VZV detection in Case 1 may reflect viral reactivation during severe systemic infection rather than active encephalitis, as no chronic immunodeficiency was identified. These findings highlight the need for cautious interpretation of molecular results in the clinical context.

Management of meningococcal arthritis remains debated. While antibiotic therapy is the cornerstone of treatment, the role of systematic joint lavage is controversial and should be individualized based on clinical severity, response to antibiotics, and local expertise.

This joint co-infection by *Neisseria meningitidis* and *Streptococcus pyogenes* revealed by RT-PCR (Ct values of 28.3 and 32.9 respectively) is not frequent and relatively underestimated according to the literature. This association in joint fluid could reflect transient immunosuppression, a respiratory portal of entry, such as simultaneous hematogenous dissemination such as meningococemia.¹⁶ *H. influenzae* used to be the main cause in children, but is still involved in countries where vaccination coverage is low. This case of meningitis illustrates severe multi-system involvement in *H. influenzae*.¹⁷ The association with VZV in brain abscesses is unusual and could be explained by transient immunosuppression or opportunistic viral reactivation.¹⁸

The incidence of arthritis is higher in patients with meningococcal meningitis than in those with meningitis due to other bacterial species.¹⁹ Arthritis complicates acute meningococcal infection in 2–10% of cases, and mainly affects the large joints, as in the patient presented in our study.^{19,20}

The diagnosis of arthritis was made on the basis of a clinical picture of fever and pain, with oedema and heat in the affected joints. Exploratory joint punctures revealed the presence of cloudy joint fluids. Septic arthritis may be primary, following direct invasion of the joint by the germ, or secondary to hematogenous dissemination from an initial septic focus, often meningeal, via the synovial vascular network. It manifests as an inflammatory joint effusion and a noisy infectious syndrome dominated by general signs.²¹ Patients were discharged with a favorable outcome. Treatment of septic arthritis requires appropriate antibiotic therapy.¹⁶

Conclusion

Meningitis can colonize synovial tissue through hematogenous dissemination of the germ, leading to septic arthritis. Although a specific and early diagnosis is necessary, management based on early and appropriate antibiotic therapy. This work opens up the prospect of a larger-scale study enabling long-term follow-up of patients affected by meningitis, in order to improve our knowledge of its localization.

Informed Consent for Publication

This study was conducted in compliance with ethical and deontological standards. In accordance with the policies of the Ethics Committee of the Faculty of Health Sciences, André Salifou University; ethical committee approval was not required for the publication of anonymized case reports. Written informed consent for publication was obtained from the parents of both patients.

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Disclosure

The authors declare that they have no conflicts of interest in relation to this article.

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