

Septic Arthritis of the Knee and Necrotizing Fasciitis in a Young Immunocompetent Adult: A Case Report

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ABSTRACT

Septic arthritis is uncommon in immunocompetent young adults. It typically presents in individuals with underlying risk factors. Isolation of *Group A Streptococcus* (GAS) as the causative agent of septic arthritis is usually associated with autoimmune diseases, chronic skin infections or trauma. Here we report a case of a young lady who is immunocompetent without any prior history of trauma, who presented with an abrupt onset of left knee pain and swelling to the emergency department. An initial diagnosis of acute gout was made and she was treated with non-steroidal anti-inflammatory drug (NSAID). She presented again two days later to a primary care clinic with worsening knee pain and severe left calf pain. A clinical diagnosis of septic arthritis was suspected and the patient was urgently referred to the Orthopaedic team. Synovial fluid from the knee joint aspiration showed growth of GAS. A diagnosis of necrotizing fasciitis was also made as the culture taken from the left calf during incision and drainage (I&D) procedure showed a mixed growth. She eventually underwent surgical debridement twice, together with the administration of several courses of intravenous antibiotics leading to her full recovery after 45 days. This case demonstrates the challenge in making a prompt diagnosis of septic arthritis and probable Type II necrotizing fasciitis in an immunocompetent adult without underlying risk factors. Any delay in diagnosis and treatment would have increased the risk of damage to her knee joint and this may be fatal even in a previously healthy young adult.

KEYWORDS: septic arthritis, immunocompetent, Group A streptococcus, necrotizing fasciitis

INTRODUCTION

Septic arthritis is an orthopaedic emergency that requires prompt identification followed by treatment. Within days of its onset, it can lead to a devastating outcome as it has the potential to cause joint destruction [1]. Septic arthritis including the monoarticular type is uncommon in immunocompetent adults [2]. It usually occurs in patients with known risk factors; the extreme ages (elderly or young children), pre-existing rheumatic joint diseases, joint prostheses, diabetes, previous intra-articular corticosteroid injection, cutaneous ulcers or skin infection [3]. The streptococcal group was found to be the second most common causative agent of septic arthritis, of which

13% of these were identified as Group A *Streptococcus* (GAS) [4].

Monoarticular septic arthritis may be associated with necrotizing fasciitis [2, 5]. GAS has been found to be one of the causative agents for necrotizing soft tissue infections [5], which is typically found in young and healthy adults. However, the most common type of necrotizing fasciitis is of the polymicrobial type [5, 6, 7]. This case reports the challenge of diagnosing monoarticular septic arthritis and necrotizing fasciitis in a young immunocompetent adult promptly and discusses the importance of timely management of these conditions to reduce complications and the risk of long-term joint damage in view of the current literature.



CASE PRESENTATION

A 23-year old lady presented to the emergency department (ED) with a 1-day history of severe left knee pain. The pain score was 9/10. She had no known medical illness. There was no history of trauma, insect bite or injury to the left lower limb. She was afebrile with a recorded blood pressure of 136/78 mmHg and a pulse rate of 87 beats per minute. Examination of the knees revealed tender and swollen left knee joint, with full range of movements. From the assessment made in ED, a clinical diagnosis of acute gout was made. No investigation was done at this stage and she was discharged home with a non-steroidal anti-inflammatory drug (NSAID). On day 3 of illness, she presented to our primary care clinic with worsening of symptoms. The left knee pain was associated with swelling, redness which extended down to the left calf resulting in difficulty to ambulate. Her pain score was 10/10. She also developed chills and rigors on the morning of presentation to the clinic. This was associated with nausea and two episodes of vomiting. Interestingly, she reported having sore throat and headache two weeks prior to the development of the left knee pain and was treated symptomatically as upper respiratory tract infection (URTI). She was not prescribed any antibiotics as it was not clinically indicated. Her URTI subsequently improved with symptomatic treatment. Aside from that she had been well with no significant past medical history.

Upon examination in our primary care clinic, she appeared to be ill-looking. However, there was no pallor. As the pain in her knee and calf were restricting her movements, she mobilized with the aid of a wheelchair. She had a temperature of 37.9°C and her vital signs were normal. Examination of the left lower limb revealed a swollen left knee with overlying erythema. On palpation, the joint was warm, tender at the lateral and medial side with evidence of suprapatellar effusion. There was also tenderness of the left calf with oedema up to the left middle shin posteriorly. Due to the pain the range of movement (ROM) of her left knee was limited to 10 to 20 degrees. Her peripheral pulses were intact and there was no significant neurological deficit found. She was unable to weight bear on the left lower limb.

A diagnosis of left knee septic arthritis was suspected due to the worsening symptoms and her physical examination findings. This led to an urgent referral made to the Orthopaedic team at the nearest hospital. She was seen by the Orthopaedic team on the same day of the referral. Initial blood investigations revealed a leukocytosis of $15.72 \times 10^9/L$ with a C-Reactive Protein (CRP) of 25.42 mg/L. A left knee X-ray showed reduced joint space with significant soft tissue swelling (Figure 1).



Figure 1 Anterior-posterior and lateral view of the left knee X-ray showing reduced joint space

Table 1 Laboratory Risk Indicator for NECrotizing fasciitis (LRINEC) Score

Parameters (unit)	Value	Score
C-reactive protein (mg/dL)	25.42	4
WBC (per mm ³)	15.72	1
Haemoglobin (g/dL)	10.5	2
Sodium (mmol/L)	136	0
Creatinine (mmol/L)	87	0
Glucose (mmol/L)	4.8	0
Total LRINEC Score		7

An ultrasound of the left knee and calf revealed a left calf intramuscular collection as well as hypoechoic lesions on the medial aspects of the left knee indicating thickened synovium or effusion. Serological tests for HIV, hepatitis B, hepatitis C and syphilis were non-reactive. Her fasting glucose level and HbA1c were 4.8 mmol/L and 5.8%, respectively.

Liver enzymes and kidney function tests were within normal parameters. There was no abnormality detected in her urine analysis. These parameters allowed the calculation of the Laboratory Risk Indicator for Necrotizing fasciitis (LRINEC) as shown in Table 1. Her total LRINEC score was 7, indicating a moderate risk of necrotizing fasciitis [8].

She underwent left knee aspiration and arthrotomy washout with incision and drainage of the left calf. Intraoperatively, the Orthopaedic team aspirated pus from the left knee and between the soleus and gastrocnemius muscle. She was treated as left knee septic arthritis complicated by left gastrocnemius abscess and was put on several courses of antibiotics. She was initially started on empirical intravenous (IV) cefuroxime 750mg while waiting for the pus culture and sensitivity (C&S) result.

Unfortunately, on day 4 post-operatively, the patient developed worsening of the left lower limb swelling. Her left calf was erythematous and warm. However, she was afebrile and had no other systemic symptoms suggestive of sepsis. She underwent a wound debridement and wound exploration of the left gastrocnemius in the operation theatre and the team evacuated about 500ml of seropurulent fluid from the posterior compartment of the left calf. At this point, intra-operatively, a diagnosis of left leg necrotizing fasciitis was made.

The C&S result from the joint aspiration of the left knee showed growth of GAS while mixed organisms were identified from the left calf. At this point of time, her antibiotics were changed to IV clindamycin 600mg as per C&S result and IV piperacillin/tazobactam in view of her clinical deterioration resulting in necrotizing fasciitis. The Infectious Disease (ID) team was consulted and they suggested changing to oral clindamycin 300mg with the coverage of IV C-penicillin for a total duration of six weeks. However, she developed a rash following ten doses of C-penicillin and the antibiotic was stopped. She was re-challenged with IV amoxicillin/clavulanic acid 1.2gram because of the doubt of a true penicillin allergy. She responded well without any allergies or side effects. She made a full recovery after several weeks and was finally

discharged home after a total of 45 days of hospital stay.

DISCUSSION

Septic arthritis typically occurs in individuals with underlying risk factors. The overall prevalence of septic arthritis was found to be in the range of 8-27% as reported by a meta-analysis looking at two prospective studies of patients presented with painful and swollen joints [1].

In this case report, we describe an uncommon presentation of left knee septic arthritis complicated by necrotizing fasciitis of the left calf in a young and immunocompetent lady. The infective screening results for HIV, hepatitis and syphilis were negative in this patient. She did not have diabetes mellitus, therefore rendering her immunocompetent. The absence of underlying risk factors for developing septic arthritis in this patient posed a challenge in making the correct diagnosis at an early stage. In this case, the diagnosis of septic arthritis was only considered at her second presentation due to the presence of fever, chills and rigors, nausea and vomiting, worsening joint symptoms despite treatment, the “out-of-proportion” pain to the left knee joint and left calf resulting in difficulty with mobilization. These clinical features are consistent with symptoms for septic arthritis as described in the literature [3].

The fluid aspirated from the left knee joint of this patient grew GAS. *Staphylococcus aureus* remains the most common causative agent for septic arthritis accounting for up to 60% of cases, and *Streptococcus* group being the second most common organism accounting for 30% of cases [4]. Among the *Streptococcus* group, Dubos et. al. reported that GAS accounted for 13% of the cases. As exhibited in this case, it has a predilection towards younger females and causes an abrupt onset with prominent signs of infection such as high grade fever, leukocytosis and increased ESR level [4]. Systemic involvement is also more common with GAS [9].

There have been case reports demonstrating septic arthritis in young immunocompetent adults. The first case involved a 21-year-old man who presented with increasing pain, swelling and decreased range of motion of the right elbow, with a documented fever of

39.5⁰C. He had no history of trauma. An elbow arthrocentesis was performed and the fluid C&S grew *Staphylococcus aureus* [10]. Another case reported septic arthritis of the manubriosternal joint. A 28-year-old man was referred to the ED with a 2-week history of painful anterior chest wall swelling with malaise and fever. The result from purulent fluid C&S evacuated from a mini-thoracotomy of this patient was also positive for *Staphylococcus aureus*. No risk factors were identified and the patient was otherwise healthy prior to presentation [11].

Retrospectively, history from our patient revealed that she had URTI symptoms two weeks prior to the presentation of the left knee symptoms. This case may represent an atypical complication of GAS pharyngitis caused by the haematogenous spread that led to the sequelae of septic arthritis and necrotizing fasciitis in the knee and calf, respectively. Goto et. al. reported a similar case of a 70-year old healthy lady who presented with a 2-day history of left knee pain and had symptoms of a common cold with pharyngeal pain 1 week prior to her presentation [9]. The synovial fluid culture in this case was positive for GAS. Another case described septic arthritis in the sternoclavicular joint (SCJ) in a 62-year old healthy man [12]. He initially presented with fatigue and cough for 3 weeks with a history of exposure to documented GAS pharyngitis from his children. He subsequently developed right shoulder pain and was later found to have a positive culture of GAS from his SCJ aspiration.

This lady did not have any risk factors to develop necrotizing fasciitis. The risk factors for developing necrotizing fasciitis are similar to the risk factors for developing septic arthritis. Wong et. al. in his review reported that only 13.5% of patients did not have any risk factors or underlying comorbidities for developing necrotizing fasciitis [13]. This is further supported by evidence from Garcia et. al. who reported that 2 out of 3 cases of necrotizing fasciitis did not have any risk factors for the condition [14]. Necrotizing fasciitis is classified according to its microbiology i.e. Type I (polymicrobial), Type II (monomicrobial) and Type III (gas gangrene) [6, 13]. Type II monomicrobial necrotizing fasciitis is less

common and typically affects healthy individuals who often have a history of trauma [6]. Type I polymicrobial necrotizing fasciitis mostly occurs in immunocompromised individuals [6]. However, the microbes isolated from the left calf of our young immunocompetent patient were of mixed organisms on three different cultures, making this case a rare presentation.

It is also worth highlighting that our patient had received NSAID on her first presentation to the ED visit, where she was initially diagnosed to have acute gout. Evidence has shown that NSAID contributes towards the worsening of necrotizing fasciitis [5]. The proposed mechanism was that NSAID inhibited the chemotaxis, phagocytosis and bactericidal activity against gram-positive cocci including GAS [5]. Therefore, a thorough clinical assessment at first presentation is vital to ensure that necrotizing fasciitis is excluded before NSAID is given.

This patient received several courses of antibiotics during her total stay of 45 days in the hospital. The initial empirical antibiotic of choice was chosen according to the most common organism reported in the literature as causing septic arthritis, which is gram-positive cocci. Therefore, the empirical antibiotic of choice was cefuroxime with a broad-spectrum property. Guidelines have suggested that the final choice of antibiotics should be based on the C&S result [15]. For this patient, the antibiotics were later changed once the C&S results were obtained.

In this case, the patient received a total duration of 5 weeks of IV antibiotics on the ward. A systematic review by Matthew et al. reported that there is no specific guideline recommending the exact duration of antibiotics therapy in cases of septic arthritis [16]. However, recommendation from the UK guidelines suggested a duration of 2 weeks of parenteral therapy followed by 4 weeks of oral antibiotics [15]. The local Malaysian guideline also does not specify the exact duration [17]. With regards to this patient, the decision on antibiotics duration was based on her clinical progress in the ward and the consensus opinion between the surgeons and physicians managing her.

CONCLUSION

In conclusion, recognizing a septic joint and necrotizing soft tissue infection for health care providers at the frontline of care i.e. ED physicians and primary care physicians can be challenging [16, 18, 19] especially in patients with no documented risk factors. The British Society of Rheumatology (BSR) has published a structured approach to guide the assessment and management of a hot swollen joint [15]. The absence of documented risk factors cannot reliably exclude the diagnosis [1] and unfortunately there is no reliable test in diagnosing septic arthritis [16]. Furthermore, due to the potential worsening effect of NSAID on necrotizing fasciitis, NSAID should be used in caution in such cases. This case highlighted the importance of a thorough assessment in primary care which led to the high index of suspicion of septic arthritis and necrotizing soft tissue infection and resulted in the timely management in this patient.

Learning / Key Points

1. In the absence of risk or predisposing factors, physicians at the frontline of care cannot reliably exclude the diagnosis of septic arthritis.
2. A structured and thorough assessment of patients presenting with hot swollen joint is pivotal to ensure that the diagnosis of septic arthritis is not missed.
3. Accurate diagnosis and timely management of patients with septic arthritis would reduce the risk of long-term joint damage and other complications.

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Conflict of Interest

Authors declare none. Verbal informed consent for patient information was obtained from the patient herself.

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