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CASE REPORT **Open Access**

Case report: Septic Arthritis of the Knee in a Pediatric Patient: A Complex Case of Delayed Diagnosis and Multidisciplinary Management

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Abstract

Septic arthritis, a severe joint infection, often presents as acute joint pain, swelling, erythema, and systemic symptoms. A prompt diagnosis and treatment are crucial to prevent irreversible joint damage and systemic complications. This report highlights a complex case of septic arthritis of the right knee (septic arthritis genu) in a 4-year-old boy with a history of untreated trauma and inappropriate traditional therapy. The patient initially presented with fever, joint pain, and progressive lower limb weakness. Laboratory findings revealed leukocytosis, elevated C-reactive protein (CRP), and erythrocyte sedimentation rate (ESR). Imaging studies, including ultrasound and MRI, confirmed joint effusion and abscess formation. Arthrocentesis demonstrated purulent synovial fluid, confirming septic arthritis. Despite systemic infection and respiratory complications requiring intensive care and mechanical ventilation, surgical intervention, including debridement and synovectomy, combined with tailored antibiotic therapy, achieved significant clinical improvement. This case underscores the importance of integrating clinical, laboratory, and imaging data for timely intervention in pediatric septic arthritis. Additionally, public education on the risks of inappropriate traditional practices following trauma is essential to prevent similar cases. Comprehensive multidisciplinary management remains pivotal in optimizing outcomes for septic arthritis.

Keywords:

Septic arthritis, arthrocentesis, debridement, synovectomy

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Introduction

Septic arthritis is a critical medical condition characterized by the infection of a joint space, leading to inflammation, rapid joint destruction, and systemic complications if untreated (1). Among its common presentations, septic arthritis of the knee (septic arthritis genu) is frequently encountered due to its vulnerability to trauma, hematogenous spread, and direct inoculation (2). This condition requires prompt recognition and management, as delayed intervention significantly increases the risk of irreversible joint damage, reduced mobility, and systemic sequelae. The knee's highly vascularized synovial environment provides an ideal medium for microbial growth, exacerbating the inflammatory process and accelerating cartilage destruction (3).

The incidence of septic arthritis varies by age group, with higher prevalence in young children, the elderly, and immunocompromised individuals. Common pathogens include Staphylococcus aureus, Streptococcus sp., and Gram-negative bacteria, often introduced through hematogenous spread or direct trauma (4). Clinically, patients present with acute onset of joint pain, swelling, erythema, and fever, along with systemic symptoms like malaise and chills in severe cases. Laboratory markers such as elevated leukocyte count, increased erythrocyte sedimentation rate (ESR), and C-reactive protein (CRP) often support the diagnosis, while synovial fluid analysis remains the gold standard for confirmation (5). Early imaging modalities, including plain radiography and ultrasound, may identify joint effusion, although advanced imaging like MRI provides detailed visualization of soft tissue and osseous involvement (5,6).

The pathogenesis of septic arthritis genu is marked by the rapid infiltration of neutrophils into the synovial fluid and tissue, triggering the release of cytokines and proteolytic enzymes (4). This cascade contributes to the breakdown of cartilage and subchondral bone, potentially resulting in permanent joint deformity. Without timely intervention, patients face complications such as chronic osteomyelitis, ankylosis, and systemic spread of infection, including septicemia (4,7). The joint damage sustained during septic arthritis can have profound implications on a patient's mobility and quality of life, necessitating a multidisciplinary approach to treatment.

Despite its potential severity, septic arthritis genu is often misdiagnosed or overlooked, especially in patients presenting atypically or with comorbid conditions that mask the classic symptoms (8). This underscores the importance of high clinical suspicion and a thorough diagnostic approach to ensure timely intervention. The therapeutic goal is to eradicate the infection, preserve joint function, and prevent systemic complications, requiring both pharmacological and surgical strategies.

Debridement and synovectomy represent cornerstone surgical interventions in the management of septic arthritis genu, particularly in cases refractory to initial medical therapy or presenting with extensive joint involvement (9). Debridement involves the removal of infected and necrotic tissues, reducing the microbial load and inflammatory mediators within the joint space. Synovectomy, the surgical excision of inflamed synovium, further assists in controlling infection, especially in recurrent or chronic cases. Together, these procedures aim to restore the structural integrity of the joint while minimizing the risk of long-term sequelae.

In acute cases, arthroscopic debridement and synovectomy have become preferred techniques due to their minimally invasive nature and reduced postoperative morbidity. These procedures enable direct visualization of the joint, ensuring thorough decontamination and drainage (9). Open debridement remains an option for severe or complicated presentations, particularly when abscess formation or extensive soft tissue involvement is evident. Both techniques complement systemic antibiotic therapy, which is tailored based on microbiological findings to ensure comprehensive infection control (10).

Ultimately, combining surgical and medical approaches provides an effective strategy for managing septic arthritis genu. By promptly addressing the infectious process through debridement and synovectomy, alongside adjunctive antibiotic therapy, clinicians can achieve improved clinical outcomes, preserving joint function and minimizing the risk of complications. This case highlights the importance of a multidisciplinary approach in the diagnosis and management of septic arthritis genu, with a focus on timely surgical intervention as a critical component of care.

Case Presentation

A 4-year-old boy was admitted with the primary complaints of nausea, vomiting, fever, and pain in both legs. These symptoms persisted for over a week before the patient presented to a healthcare facility. Initially, the patient experienced a fall resulting in a seated impact one month prior but did not seek immediate medical attention. In response to the trauma, the family opted for traditional massage therapy on the left thigh, which was followed by decreased motor function in the lower limbs. The patient exhibited difficulty straightening both legs and progressively avoided walking.

Upon initial presentation to the healthcare facility, a radiological examination of the lower extremities was performed on May 21, 2024. However, the results did not reveal significant abnormalities. Over time, the patient’s condition deteriorated, with the development of systemic symptoms such as high fever, pallor, and altered consciousness. Subsequently, the patient was referred to a hospital for further management.

On admission to the intensive care unit, the patient was critically ill, presenting with dyspnea, chest retractions, and pallor. The patient’s consciousness was reduced to a somnolent state. Vital signs indicated tachycardia and signs of hypoxia, prompting the initiation of invasive mechanical ventilation to support respiratory function. Initial evaluations suggested a systemic infection, suspected to be a complication of the prior trauma. As part of the management, the patient underwent debridement to address a potential source of infection.The disease progression from the ER to post-operative patients will be shown in Tables 1 and 2.

Table 1. Physical Examination Findings (Vital Signs and Clinical Findings)

Phase	Physical Examination Findings (Vital Signs and Clinical Examination)	Results
Emergency Room (ER)	Vital Signs: Temperature 38.5°C, tachycardia 110 bpm, blood pressure 100/60 mmHg. Right knee: Severe pain on palpation, swelling (joint effusion), limited mobility. Local signs of inflammation: Warmth over the right knee.	Indicates acute infection and inflammation in the knee.
ICU	Vital Signs: Temperature 39°C, tachycardia 120 bpm, blood pressure 90/55 mmHg. Right knee: Increased swelling, and fluctuance (suggestive of purulent fluid). Severe pain in the right knee: The patient cannot move the knee.	Supports the diagnosis of septic arthritis with increased inflammatory response.
Surgical Phase	Right knee: During surgery, purulent fluid, synovitis, and extensive inflammatory tissue were observed.	Observations during surgery confirm septic arthritis and tissue infection.
Post-Surgery	Vital Signs: Temperature normalized to 37°C, blood pressure 110/70 mmHg, stable after debridement and synovectomy. Right knee: Swelling decreased, and the patient reported reduced pain after the procedure.	Indicates improvement post-surgery and reduced signs of infection.

Table 2. Diagnostic Investigations (Laboratory and Imaging)

Phase	Diagnostic Investigations	Results
Emergency Room (ER)	Leukocytes: 15,000/µL (leukocytosis) CRP: 120 mg/L ESR: 50 mm/hour Arthrocentesis: Purulent fluid, yellowish in color. X-Ray: No obvious bone fractures, only showing joint effusion in the right knee. Ultrasound (USG): Large joint effusion in the right knee, with possible abscess formation.	Leukocytosis and elevated CRP/ESR indicate acute infection. Imaging confirms effusion and possible abscess.
ICU	Leukocytes: 18,000/µL (neutrophilia) CRP: 180 mg/L ESR: 70 mm/hour Arthrocentesis: More purulent fluid drained. MRI: Synovitis, abscess formation in the right knee.	Further elevation of inflammatory markers and MRI confirms septic arthritis with abscess formation.
Surgical Phase	Arthrocentesis: Additional purulent joint fluid was drained during debridement. MRI: Improvement after debridement, with reduction of abscess and inflammation.	Purulent fluid confirmed during surgery and imaging shows resolution after debridement.
Post-Surgery	Leukocytes: 10,000/µL (normalizing) CRP: 15 mg/L ESR: 20 mm/hour USG/MRI: Decreased swelling, no more purulent fluid present.	Laboratory results suggest recovery. Imaging shows reduced inflammation and no residual infection.

After several days of intensive care, the patient's condition improved. The dyspnea subsided, vital signs stabilized, and the patient regained full consciousness, becoming alert and able to communicate effectively. Physical examination revealed no fever, cough, or other respiratory symptoms. Gastrointestinal function also improved, allowing the patient to tolerate oral intake. However, pain in the lower extremities remained a significant concern, particularly during mobilization efforts.

Table 3. Diagnosis and Therapy during Hospitalization

Stage	Diagnosis	Therapy
Emergency Room (ER)	Gas exchange disturbance (Pneumonia). Acute respiratory distress syndrome Septic arthritis (genu dextra).	Infusion D5 ½ 1400cc/24h Ondansetron 3x2mg Antrain 3x200mg Entolin N 2x20mg Midazolam 2mg extra maintenance Transfusion PRC 180cc 1x Heparin 10iu/kg/hour

		Observation for vomiting, dehydration, low intake, femur contracture, suspected septic arthritis Monitoring of vital signs (TTV)
ICU	Pneumonia Septic arthritis Acute respiratory distress syndrome (ARDS) Post-op debridement and synovectomy of septic arthritis genu dextra	Oxygen therapy with mask IV Ceftriaxone 2x900 mg Nebulizer with Entolin Fluid management with D5 ½ NS 900 cc/24h N-acetylcysteine (NAC) 3x1/3 tab Santagesik 3x200 mg Sildenafil 4x9mg Fluid monitoring (Nutren Jr) Paracetamol and Dexa for inflammation Ranitidin for gastric protection
Surgical Phase (debridement and synovectomy)	Septic arthritis genu dextra Pneumonia Impending respiratory failure Post-debridement and synov ectomy of knee	Pre-surgical prophylaxis Anaesthesia monitoring CVC Subclavia insertion Chest X-ray Synovium culture for pus Anesthesia for surgery Intraoperative management with monitoring of vital signs
Post-Surgery	Pneumonia (severe) Septic arthritis genu dextra GEA with moderate dehydration	Oxygen therapy (mask) Ventilator management IV Fluids (D5 ½ NS, 600cc/24h) IV Ceftriaxone Fluconazole Azithromycin Dexamethasone Ranitidin, Santagesik Sildenafil 4x9mg Zinc, Lacto B, OAT supplements Nutritional management (Nutren Junior, soft diet) Extubation and ventilation weaning Post-op assessment and monitoring of parameters
Additional Notes	Diagnosis Trends: GEA (gastroenteritis) → proven. ARDS → proven. Pneumonia → proven. Septic arthritis → proven. TB suspicion over time → not proven	Therapy Adjustments: Close monitoring of vital signs and fluid balance Gradual weaning off ventilator Continuing systemic antibiotics (Ceftriaxone, Fluconazole) and steroids (Dexamethasone) Post-operative physiotherapy and joint management

This case illustrates a complex disease progression, originating from seemingly mild initial trauma but escalating into a severe condition due to inappropriate intervention and delayed diagnosis. Prompt and appropriate interventions, including mechanical ventilation, debridement, and antibiotic administration, played a critical role in the patient's clinical improvement.

Community education regarding the risks associated with traditional massage in cases of bone and joint trauma is an essential preventive measure to reduce the likelihood of similar occurrences in the future.

Discussion

The diagnosis of septic arthritis, particularly in pediatric patients, is often complicated by atypical presentations and the overlap of symptoms with other systemic conditions. In this case, the patient presented with fever, joint swelling, and systemic symptoms, which were initially misattributed to general systemic infection rather than a localized joint pathology (7,11). Despite elevated inflammatory markers such as CRP, ESR, and leukocytosis, the initial imaging studies, including plain radiography, failed to reveal significant abnormalities (5). This highlights the diagnostic challenge of septic arthritis in its early stages, where joint effusion or abscess formation may not be readily apparent without advanced imaging modalities such as ultrasound or MRI (6). Arthrocentesis proved critical, with the presence of purulent fluid confirming the diagnosis and guiding subsequent management (9).

Arthrocentesis findings, including the yellowish purulent fluid, underscored the severe nature of the joint infection. Combined with MRI findings indicating synovitis and abscess formation, these diagnostics provided a comprehensive understanding of the extent of the infection. MRI was pivotal in delineating soft tissue involvement, which guided the decision for surgical intervention (12). This case reinforces the importance of integrating clinical, laboratory, and advanced imaging data for an accurate and timely diagnosis, particularly in pediatric patients where delayed intervention risks permanent joint damage.

Surgical intervention, in the form of debridement and synovectomy, remains a cornerstone in the management of refractory or advanced septic arthritis (13). In this case, debridement effectively removed purulent material and necrotic tissue, reducing microbial load and inflammatory mediators within the joint space. Synovectomy, involving the removal of inflamed synovial tissue, further facilitated the resolution of infection, particularly given the chronicity suggested by extensive synovitis. The combined surgical approach not only controlled the infection but also preserved the structural integrity of the joint, minimizing the risk of long-term complications such as ankylosis or deformity (14).

The timing and choice of surgical intervention are critical, as delays can result in irreversible cartilage destruction and systemic spread of infection. While arthroscopic procedures are often preferred for their minimally invasive nature, open debridement was necessitated in this case due to the presence of significant abscess formation and soft tissue involvement (10). The intraoperative findings of purulent fluid and inflamed synovium validated the decision to proceed with surgery, and the subsequent clinical improvement underscored its efficacy in addressing the severe infection (10,14).

Antibiotic therapy is integral to the management of septic arthritis, complementing surgical interventions to ensure the eradication of the causative pathogen. Empiric therapy with ceftriaxone was initiated in this case due to its broad-spectrum activity against common pathogens like Staphylococcus aureus and Streptococcus sp., pending culture and sensitivity results (11,15). The use of adjunctive therapies, including corticosteroids like dexamethasone, played a role in modulating the inflammatory response, while antifungals were introduced to address potential secondary infections. This case highlights the importance of tailoring antimicrobial therapy based on microbiological findings to optimize outcomes and minimize resistance risks (3).

The multidisciplinary approach employed in this case underscores the complexity of managing advanced septic arthritis. The coordination between intensivists, orthopedic surgeons, and infectious disease specialists ensured comprehensive care, addressing both the systemic manifestations of the infection and the localized joint pathology. Nutritional support and physiotherapy further contributed to the patient's recovery, emphasizing the holistic nature of the management plan (11).

Post-surgical outcomes in this case were favorable, with significant reductions in inflammatory markers such as CRP and ESR, alongside clinical improvements including reduced joint swelling and pain. However, residual discomfort during mobilization highlights the need for continued physiotherapy and monitoring for potential complications such as joint stiffness or recurrent infection. Early mobilization under guided physiotherapy protocols is crucial to prevent long-term functional limitations (13,14).

This case highlights the critical role of early and accurate diagnosis, timely surgical intervention, and a multidisciplinary approach in the successful management of pediatric septic arthritis. While the initial delay in diagnosis posed significant risks, the prompt integration of surgical and medical therapies following confirmation of the diagnosis was pivotal in achieving a positive clinical outcome. These findings emphasize the need for heightened clinical suspicion and a systematic approach to managing joint infections, particularly in pediatric populations.

Conclusion

Septic arthritis genu is a severe condition that can progress rapidly if not diagnosed and treated promptly. This case highlights the critical importance of early recognition, especially in pediatric patients, where symptoms may initially be misattributed to other systemic issues. The combination of advanced imaging, such as MRI, and arthrocentesis played a pivotal role in diagnosing the infection and determining the appropriate surgical intervention. Debridement and synovectomy proved effective in managing the infection and preserving joint function. This case underscores the need for timely, comprehensive management, including surgical debridement and targeted antibiotic therapy, to prevent long-term complications and improve clinical outcomes.

Conflict of Interest and Acknowledgement

The authors have no conflicts of interest to declare.

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