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Case report

Rare case of postpartum septic arthritis of the shoulder caused by multi-drug resistant *Kingella kingae*: A case report

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ABSTRACT

Introduction: Septic arthritis is a severe joint infection that can cause permanent damage if not promptly treated. Although the shoulder is an uncommon site for this condition, *Kingella kingae*, typically associated with pediatric infections, can occasionally be a causative agent. Postpartum septic arthritis is rare, making this case particularly unique.

Presentation of case: We report a case of a 28-year-old woman who developed severe pain, swelling, and restricted movement in her left shoulder three weeks postpartum. Septic arthritis due to multi-drug resistant *Kingella kingae* was diagnosed via PCR analysis of the synovial fluid. The patient was successfully managed with intravenous antibiotics and arthroscopic drainage.

Discussion: This case represents a rare instance of postpartum septic arthritis of the shoulder caused by *Kingella kingae*. The unusual presentation highlights the importance of considering septic arthritis in postpartum women presenting with shoulder pain, even without typical risk factors. The multi-drug resistance observed in this strain underscores the necessity for comprehensive antibiotic susceptibility testing and individualized treatment strategies.

Conclusion: This case demonstrates that successful management of postpartum septic arthritis caused by *Kingella kingae* can be achieved through early diagnosis, targeted antibiotic therapy, and minimally invasive surgical intervention. It emphasizes the importance of a multidisciplinary approach, thorough diagnostic evaluation, and heightened clinical suspicion in postpartum women with shoulder pain to prevent long-term complications.

1. Introduction

Septic arthritis is a critical joint infection that can lead to irreversible damage and disability if not promptly diagnosed and treated. While the knee and hip joints are the most commonly affected, the shoulder is the third most frequent site, accounting for 10–15 % of cases. The primary causative organisms are typically *Staphylococcus aureus*, *Streptococcus pyogenes*, and gram-negative bacilli. However, rarer pathogens such as *Kingella kingae* can also cause septic arthritis, particularly in children and immunocompromised individuals [1,2].

Kingella kingae is a gram-negative coccobacillus belonging to the Neisseriaceae family, commonly found as part of the normal oral flora. Although usually benign, it can cause severe invasive infections, including bacteremia, endocarditis, osteomyelitis, and septic arthritis. This bacterium is resistant to beta-lactams and quinolones and is typically susceptible only to aminoglycosides and macrolides. Diagnosing *Kingella kingae* infections is particularly challenging due to its difficult isolation from blood and synovial fluid cultures, often requiring advanced molecular methods such as polymerase chain reaction (PCR) for accurate identification [3].

Postpartum septic arthritis is an uncommon complication related to pregnancy and childbirth, with an incidence of 0.02 % to 0.05 %. This condition can arise from hematogenous spread of bacteria originating from the genital tract or through direct bacterial inoculation during delivery or invasive obstetric procedures. While the knee and hip are the most commonly involved joints in postpartum septic arthritis, shoulder involvement is exceedingly rare [4,5].

To our knowledge, there are no documented cases of postpartum septic arthritis of the shoulder caused by *Kingella kingae* in the literature. We report a rare case of a 28-year-old woman who developed septic

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arthritis of the shoulder due to *Kingella kingae* infection, occurring 21 days postpartum. This report highlights the clinical presentation, diagnostic approach, treatment, and outcome, and discusses potential risk factors and mechanisms contributing to the infection. The case is reported in accordance with the SCARE Criteria [6].

2. Case presentation

A 28-year-old woman with an unremarkable medical history presented to our emergency department with severe pain, swelling, and restricted mobility of her left shoulder. The symptoms began three days earlier following a minor injury sustained while carrying her newborn. Since then, her pain had progressively worsened. She denied systemic symptoms such as fever, chills, night sweats, weight loss, or other complaints. Obstetric history included four pregnancies: three live births and one miscarriage. During her most recent pregnancy, she experienced premature rupture of membranes at 7 weeks, treated with tocolytics and a 10-day course of amoxicillin-clavulanic acid. She delivered a healthy baby girl at term via spontaneous vaginal delivery and was breastfeeding without complications such as mastitis or nipple infection.

2.1. Clinical examination and initial investigations

On examination, the patient was afebrile with stable vital signs. Her left shoulder was swollen, erythematous, and tender to palpation, with a notable reduction in both active and passive ranges of motion, particularly in abduction and external rotation. There were no signs of skin lesions, lymphadenopathy, or joint effusion. The remainder of her musculoskeletal, neurological, and systemic examinations was unremarkable, as shown in Fig. 1.

Laboratory investigations revealed leukocytosis with a white blood cell count of 14.2 × 10^9/L (reference range: 4.0–10.0 × 10^9/L), predominantly neutrophilic (82 %). Inflammatory markers were elevated, with an erythrocyte sedimentation rate (ESR) of 68 mm/h (normal: 0–20 mm/h) and a C-reactive protein (CRP) level of 112 mg/L (normal: <5 mg/L). Hemoglobin was low at 10.2 g/dL (normal: 12.0–16.0 g/dL), with a mean corpuscular volume of 78 fL, indicating mild microcytic anemia. Platelet count, renal function, liver function, electrolytes, and coagulation profile were within normal ranges. Blood cultures were negative, as shown in Table 1.

Imaging of the left shoulder showed no fractures, dislocations, or signs of osteomyelitis. Ultrasound revealed moderate synovial fluid accumulation in the glenohumeral joint, with no evidence of rotator cuff tear or bursitis. Ultrasound-guided aspiration yielded 15 mL of cloudy, slightly sero-hematic synovial fluid with a leukocyte count of 50 × 10^9/L (normal: <2 × 10^9/L), composed of 90 % neutrophils. Gram stain demonstrated mixed gram-positive and gram-negative bacteria, but cultures remained negative after 48 h of incubation, as highlighted in Fig. 2, and Fig. 3.

2.2. Management and diagnosis

The patient was admitted with a provisional diagnosis of septic arthritis of the left shoulder. Empirical intravenous antibiotics were initiated with ceftriaxone 2 g once daily and vancomycin 1 g twice daily, alongside analgesics, anti-inflammatory medications, and shoulder immobilization.

On the second day, PCR of the synovial fluid confirmed *Kingella kingae*, a rare pathogen associated with septic arthritis. Antibiotic susceptibility testing showed resistance to beta-lactams and quinolones but susceptibility to aminoglycosides and macrolides. The antibiotic regimen was switched to intravenous erythromycin 500 mg four times daily and gentamicin 5 mg/kg once daily, as indicated in Table 2.

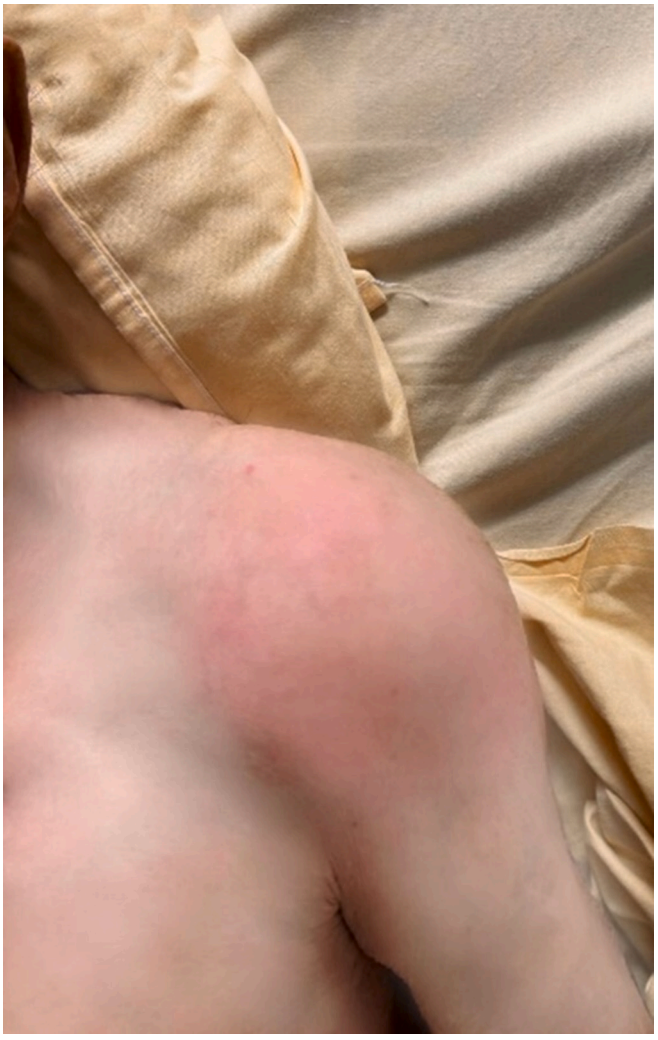

Fig. 1. Clinical appearance of the shoulder showing swelling, and erythema.

2.3. Surgical intervention

On the third day, the patient underwent shoulder arthroscopy under general anesthesia. The procedure involved positioning the patient in a beach-chair configuration, with her arm in 30° of abduction and 20° of forward flexion. The arthroscope was introduced through a posterior portal, revealing erythematous and hypertrophic synovium with areas of fragile membranous layers loosely adherent to the cartilage. The joint was classified as stage II according to the Gächter classification. Synovectomy was performed using a shaver and radiofrequency probe, removing synovial tissue while preserving cartilage and ligaments. The joint was irrigated and debrided, and the portals were closed with sutures, as shown in Fig. 4.

Histopathological analysis of the synovial biopsies confirmed marked inflammation consistent with septic arthritis, characterized by prominent neutrophilic infiltration and microabscess formation. Colonies of gram-negative coccobacilli were observed, consistent with *Kingella kingae* infection as shown in Fig. 5, and Fig. 6.

2.4. Postoperative course and follow-up

The patient had an uneventful postoperative recovery.

The patient was discharged on the seventh day with oral erythromycin 500 mg four times daily and gentamicin 80 mg once daily for the remaining 3 weeks of therapy. Shoulder immobilization was

Table 1
Laboratory results over time demonstrating changes in inflammatory markers, blood cell counts, and hematological parameters throughout the course of the illness.

Time point	WBC (white blood cells count)	ESR (erythrocyte sedimentation rate)	CRP (C-reactive protein)	Hb (hemoglobin)	MCV (mean cell volume)
Day 0	14.2 × 10^9/L (normal: 4.0–10.0 × 10^9/L)	68 mm/h (normal: 0–20 mm/h)	112 mg/L (normal: <5 mg/L)	10.2 g/dL (normal: 12.0–16.0 g/dL)	78 fL (normal: 80–100 fL)
Day 7	8.5 × 10^9/L (normal: 4.0–10.0 × 10^9/L)	32 mm/h (normal: 0–20 mm/h)	28 mg/L (normal: <5 mg/L)	11.4 g/dL (normal: 12.0–16.0 g/dL)	80 fL (normal: 80–100 fL)
Month 3	6.2 × 10^9/L (normal: 4.0–10.0 × 10^9/L)	12 mm/h (normal: 0–20 mm/h)	3 mg/L (normal: <5 mg/L)	13.2 g/dL (normal: 12.0–16.0 g/dL)	82 fL (normal: 80–100 fL)

WBC: White blood cells count.
ESR: Erythrocyte sedimentation rate.
CRP: C-reactive protein.
Hb: Hemoglobin.
MCV: Mean cell volume.

maintained, with plans for gradual physiotherapy initiation after 2 weeks.

At follow-up visits (2 weeks, 4 weeks, 3 months, 6 months, and 12 months post-surgery), the patient showed significant improvement in pain, swelling, and shoulder function, with no recurrence of infection. Laboratory tests showed normalization of inflammatory markers and hemoglobin levels. Radiographs revealed no joint damage or osteonecrosis. Functional assessments, including DASH, EQ-5D, VAS for pain, and shoulder range of motion (ROM), were within normal limits at the final follow-up, as indicated in Table 3.

3. Discussion

This case report presents a rare instance of postpartum septic arthritis of the shoulder caused by *Kingella kingae*, a pathogen typically associated with pediatric infections. To our knowledge, this is the first documented case of such a condition in the literature.

Septic arthritis in the postpartum period is infrequently reported and usually involves pathogens from the urogenital tract, such as *Staphylococcus aureus*, *Staphylococcus hominis*, or Group B Streptococcus. These infections are often observed following cesarean sections, with the sacroiliac joint or pubic symphysis being more commonly affected due to potential contamination via direct or contiguous spread [7].

3.1. Pathophysiology and mechanisms of infection

The primary hypothesis for the pathogenesis of postpartum septic arthritis is hematogenous spread of bacteria from the urogenital tract following childbirth or cesarean section, underscoring the importance of prophylactic antibiotics in genital surgeries, even though they may not cover all potential pathogens. Additionally, staphylococcal breast abscesses from breastfeeding microtrauma have been reported as potential sources of contiguous joint infections [8–10].

Bonasoni et al. documented a case of *Kingella kingae* infection causing miscarriage in a patient with underlying undifferentiated connective tissue disease (UCTD) and neutropenia, suggesting that these conditions may increase susceptibility to infection. In contrast, our patient had no underlying medical conditions and no history of miscarriage, with her infection presenting later at three weeks postpartum. Despite these differences, both cases emphasize the importance of considering *Kingella kingae* as a potential pathogen in pregnancy-related infections [3].

The unusual timing of septic arthritis in our patient may be related to heightened maternal immune response postpartum, which could reveal previously subclinical infections. [11]

3.2. Possible mechanisms of infection in this case

Several hypotheses can explain the infection in this patient:

1. **Transmission from the Newborn**: The patient may have acquired the infection from her newborn, who could have been colonized with *Kingella kingae* in the oral cavity. Bacteremia during delivery or the postpartum period could have facilitated hematogenous spread to

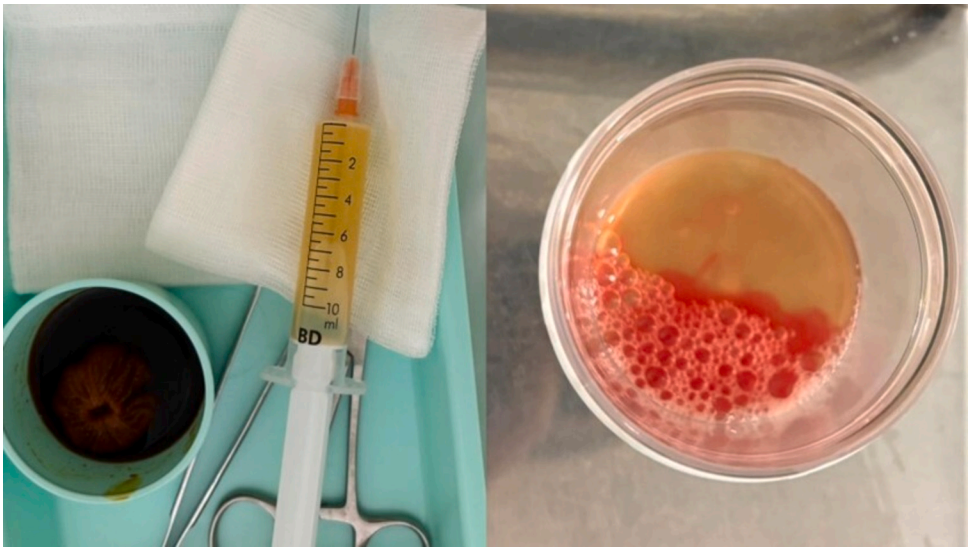

Fig. 2. Macroscopic appearance of the joint fluid following ultrasound-guided aspiration, showing cloudy, slightly sero-hematic fluid.

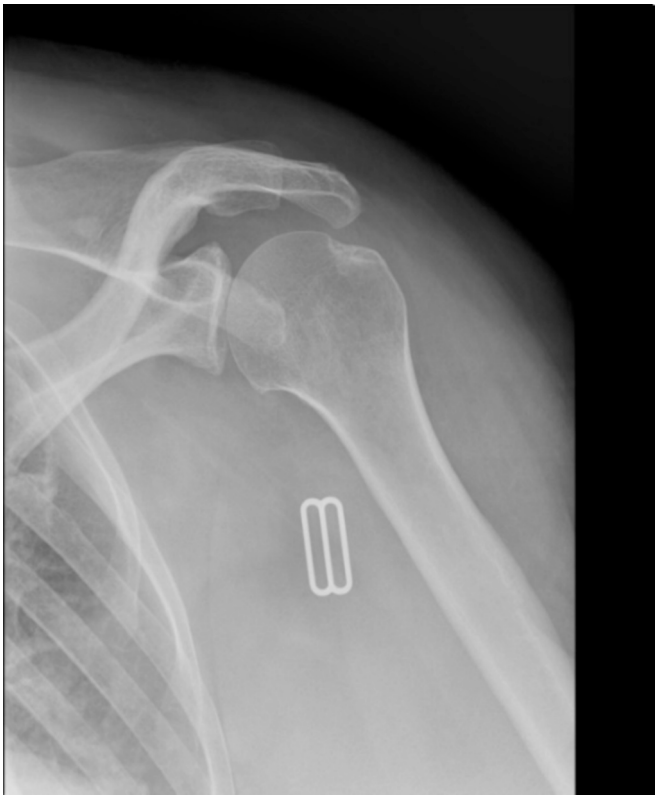

Fig. 3. X-ray of the left shoulder shows no abnormalities.

Table 2
Antibiotic susceptibility profile of *Kingella kingae* showing resistance and sensitivity patterns.

Antibiotic class	Antibiotic	Susceptibility
Penicillins	Penicillin G	Resistant
	Ampicilin	Resistant
Cephalosporins	Cefuroxime	Resistant
	Ceftriaxone	Susceptible
Macrolides	Erythromycin	Susceptible
	Azithromycin	Susceptible
Aminoglycosides	Gentamicin	Susceptible
Fluoroquinolones	Ciprofloxacin	Resistant
Tatracyclines	Tetracyclin	Susceptible
Others	Trimethoprim-Sulfamethoxazole	Resistant
	Chloramphenicol	Susceptible
	Clindamycin	Resistant
	Vancomycin	Resistant

the shoulder joint, with minor shoulder trauma potentially aiding bacterial invasion.

2. **Latent Joint Infection Reactivation**: The infection may have been latent in the shoulder joint prior to pregnancy, with hormonal and immunological changes during and after pregnancy triggering reactivation.
3. **Subclinical Genital Tract Infection**: The patient might have had a subclinical genital tract infection with *Kingella kingae*, which spread to the shoulder during delivery or an invasive procedure, such as an epidural or blood transfusion.

These hypotheses are speculative, and further studies are necessary to elucidate the exact transmission pathways of *Kingella kingae* in postpartum women [12].

3.3. Clinical presentation and diagnosis

Septic arthritis of the shoulder can mimic conditions such as rotator cuff tears, bursitis, or rheumatoid arthritis, requiring a high index of suspicion, especially postpartum when pain and inflammation could be attributed to other sources. Diagnosis is based on clinical assessment, laboratory findings, imaging, and microbiological identification of the causative organism [13,14].

Typical lab findings include elevated white blood cell count, ESR, and CRP, indicating systemic inflammation. Synovial fluid analysis usually shows purulent fluid with a high leukocyte count and neutrophil predominance. Gram staining and culture of the synovial fluid are essential for identifying bacteria and guiding antibiotic therapy; however, cultures may be negative in *Kingella kingae* infections, necessitating PCR for confirmation [15,16].

Imaging modalities include plain radiographs, ultrasound, CT, and MRI. Radiographs can rule out fractures or dislocations but lack specificity for septic arthritis. Ultrasound is useful for detecting synovial fluid and guiding aspiration. CT provides detailed views of bony structures and complications like abscesses, while MRI offers the most comprehensive evaluation of joint inflammation and damage, although availability and contraindications can limit its use [13,17,18].

3.4. Management

Treatment of septic arthritis of the shoulder combines antibiotics and surgical drainage. Antibiotic therapy should begin promptly, with adjustments made based on susceptibility testing. Typically, intravenous antibiotics are administered for at least two weeks, followed by oral antibiotics for an additional 2–4 weeks, depending on the response [19,20].

Surgical drainage can be performed arthroscopically or through open techniques. Arthroscopy offers advantages such as reduced tissue damage, shorter hospital stay, and quicker recovery but requires specialized skills and may risk incomplete debridement. Early intervention within 48 h of symptom onset is crucial to prevent permanent joint damage [20,21].

3.5. Outcomes and prognosis

The prognosis of septic arthritis of the shoulder depends on factors including patient age, comorbidities, pathogen type, antibiotic regimen, and timing of surgical intervention. Complications include chronic or recurrent infection, joint instability, stiffness, and long-term functional impairment. The functional outcomes, assessed by DASH, EQ-5D, VAS, and ROM, often indicate a worse prognosis for shoulder involvement compared to other joints [22,23].

The multidrug-resistant profile in this case highlights the importance of thorough susceptibility testing. The choice of gentamicin and erythromycin, guided by susceptibility results, was effective in clearing the infection and preventing complications [13,19].

4. Conclusion

In our case, the patient achieved a favorable outcome with no complications or recurrence and full restoration of shoulder function at the final follow-up. Key factors contributing to this success included early diagnosis and targeted treatment based on clinical suspicion and PCR confirmation of *Kingella kingae*, appropriate antibiotic selection and duration guided by susceptibility testing, timely and thorough arthroscopic drainage and debridement of the joint, and adherence to postoperative care, including shoulder immobilization and physiotherapy. This case underscores the need for vigilance in diagnosing rare pathogens like *Kingella kingae* in postpartum septic arthritis and highlights the importance of personalized, timely intervention to achieve optimal outcomes.

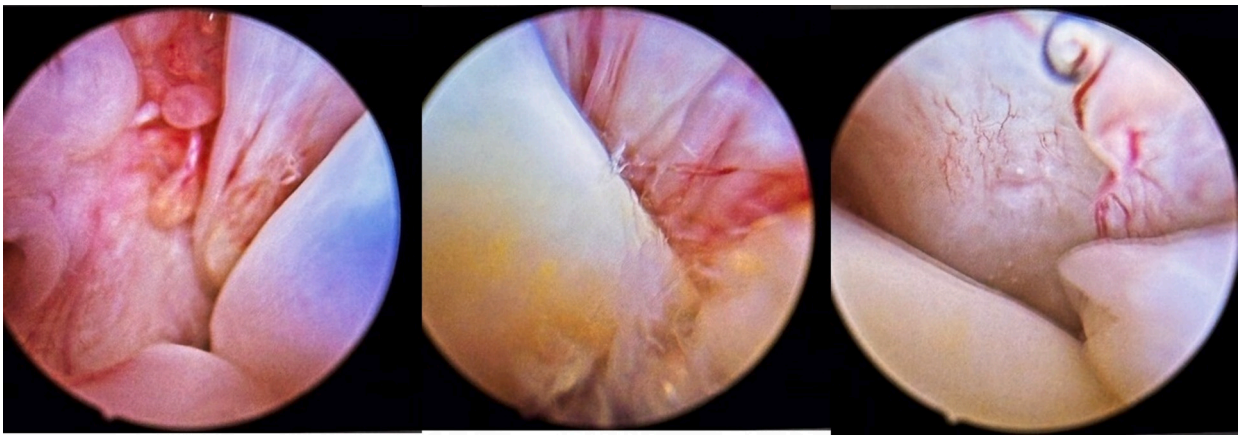

Fig. 4. Arthroscopic findings showing patchy hypertrophy of the synovium with fragile and false membranous layers.

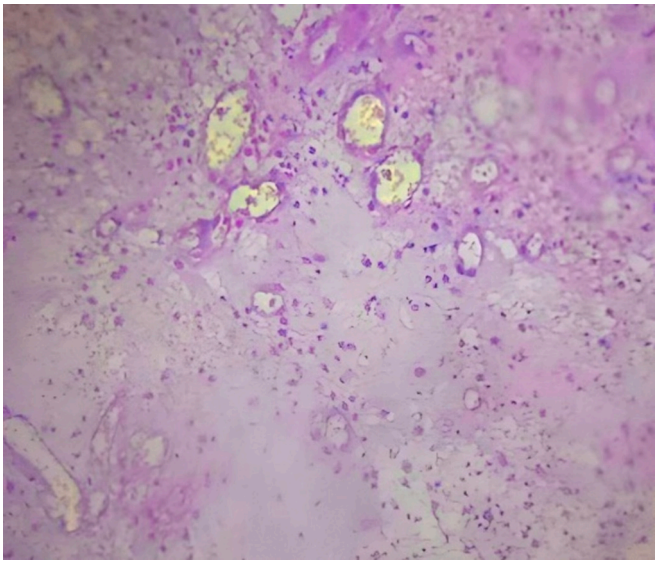

Fig. 5. biopsy fragments at ×200 magnification indicating inflammatory synovium with neutrophil polynuclear cells and macrophages with presence of coccobacillus colonies.

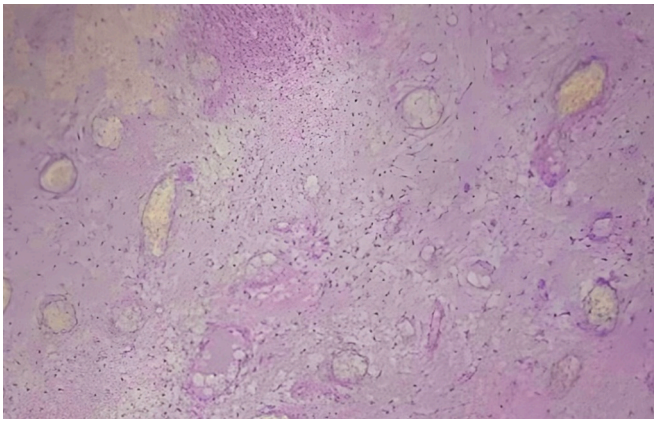

Fig. 6. synovium biopsy at ×100 magnification clearly shows irregular inflammatory cells effusion with irregular synovium hypertrophy.

Table 3
Follow-up data on functional outcomes and pain levels, including DASH score, EQ-5D Score, VAS for pain, and range of motion over time.

Time point	DASH score (0–100)	EQ-5D SCORE (0–1)	VAS score (0–100)	ROM of the shoulder (normal ranges: abduction 0–180°, flexion 0–90°, extension 0–50°, internal rotation 0–90°, external rotation 0–90°)
Month 3	15	0.8	20	Reduced
Month 6	5	0.9	10	Near-normal
Month 12	0	1.0	0	Normal

Statement of human and animal rights

All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (both institutional and national) and with the 1975 Helsinki Declaration, as revised in 2008. Informed consent was obtained from the patient for inclusion in the study.

Statement of informed consent

Written informed consent was obtained from the patient for their anonymized information to be published in this article.

Ethical approval

All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (both institutional and national) and with the 1975 Helsinki Declaration, as revised in 2008. Informed consent was obtained from the patient for inclusion in the study.

Guarantor

Mohamed Moussadiq

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Author contribution

All authors have made substantial contributions to the following: conception and design of the study (M.M.), acquisition of data (M.M., Z. C., and A.S.), analysis and interpretation of data (M.M.), and drafting the article or revising it critically for important intellectual content (E.M.B., M.A.B., and I.A.). All authors approved the final version to be submitted.

Declaration of competing interest

The authors declare that there is no conflict of interest.

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