

# Missed Early Glenohumeral Septic Arthritis During Emergency Department Visit Owing to Low Virulence *Streptococcus Mitis*: A Case Report

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## Abstract

Glenohumeral joint septic arthritis in a native joint is uncommon but can be debilitating if not treated early. Septic arthritis does not always present with the typical clinical findings, especially in immunocompromised patients. We report a rare case of glenohumeral septic arthritis from *Streptococcus mitis* infection in a diabetic woman that was initially missed on first presentation in the emergency department (ED). The exact cause of infection in this case remains unclear but is likely due to poor dentition and possible transient bacteremia in the setting of large rotator cuff tear in an immunocompromised patient (diabetes). The patient had a good outcome after returning to the ED three days later and undergoing shoulder arthroscopy, irrigation, and initiation of intravenous antibiotics. It is important to keep a high clinical suspicion for septic arthritis in immunocompromised patients with atraumatic shoulder pain.

## Introduction

Atraumatic shoulder pain with limited range of motion has many causes. A high index of suspicion should be maintained to avoid missing critical diagnoses such as infection. Although glenohumeral joint septic arthritis in a native joint is uncommon, occurring in 10% to 15% of septic arthritis cases, it can be debilitating if not treated early due to bone and cartilage destruction, osteonecrosis and secondary arthritis.<sup>1</sup> An atypical presentation of septic arthritis can prolong the time to diagnosis. One

case report<sup>2</sup> described an atypical presentation of septic glenohumeral arthritis in a patient with diabetes mellitus and liver cirrhosis. The patient had 2 months of limited range of motion and stiffness, with no known trauma. She was found to have Methicillin-resistant *Staphylococcus aureus* after joint aspiration, and findings of severe inflammation, fibrinous changes, and erosion of the joint on arthroscopic lavage. Septic arthritis of the glenohumeral joint can mimic other causes of shoulder pain and can occur in pathological features of concomitant rotator cuff tear.

We report a rare case of glenohumeral septic arthritis from *Streptococcus mitis* infection in a 52-year-old woman, in which the diagnosis was missed on initial presentation to the emergency department. To our knowledge, this is the second case report of septic arthritis in the glenohumeral joint from this bacteria.<sup>1</sup> Given the numerous potential causes of shoulder pain and limited range of motion in a middle-aged adult, it is important to keep septic arthritis high in the differential and look for sources of infection on initial evaluation. The patient was informed that the data concerning the case would be submitted for publication, and she provided verbal consent.

## Case Report

A 52-year-old woman with hypertension, diabetes mellitus, and severe anxiety presented to the emergency department with acute onset left shoulder pain. She woke up in the morning on the day of presentation, with severe pain throughout her shoulder described as sharp, radiating

throughout her arm, made worse with movement, and had severely limited range of motion. She did not report any previous injury to the shoulder and never had any pain or loss of range of motion in the past requiring evaluation. She had no fevers or chills. The use of nonsteroidal anti-inflammatory drugs slightly alleviated her pain.

On physical examination, the patient had a blood pressure of 142/73 mm HG, afebrile at 36.9° C, and heart rate of 86 beats per minute. Examination of her left shoulder indicated no deformity or swelling but tenderness to palpation throughout the anterior and posterior aspects. Her range of motion was limited, with flexion and abduction less than 90°, inability to extend or internally rotate because of pain, and painful active and passive external rotation limited to 45°. Results of strength tests (eg, rotator-cuff tests on the supraspinatus and provocative biceps tests such as the Speed and labral tests with active compression) were notably limited owing to pain. Findings of her neurovascular examination were otherwise normal.

A radiograph of the left shoulder was obtained and revealed a large subacromial spur with moderate/severe degenerative changes of the left acromioclavicular joint (Figure 1). Laboratory studies showed the following values: white blood cell count, 8000/mL (nl range 4000-11000 ml); C-reactive protein, 2.1 mg/L (nl <0.3mg/dL); erythrocyte sedimentation rate, 5 mm/hour normal range 0-33mm/hr); glucose, 211 mg/dL; and normal values of other electrolytes and delta troponin. The differential diagnosis at this point included adhesive capsulitis, rotator-cuff disease, infection of muscle or joint, or other non-musculoskeletal cause such as cardiac problems or neck/cervical spine pain.



**Figure 1.** Radiograph of the left shoulder at initial presentation, showing anteroposterior view in external rotation.

An anterior approach glenohumeral intra-articular injection with 5mL of 1% plain lidocaine was performed in the emergency department; the injection resulted in reduced pain. Corticosteroid was not used owing to

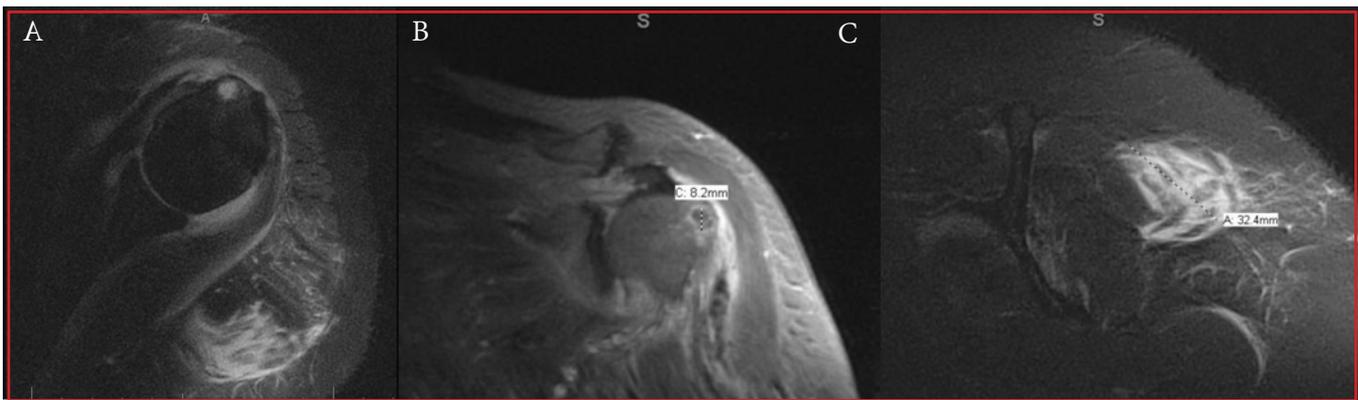
unclear cause of pain. The patient was given a prescription for ibuprofen, an outpatient referral for a shoulder magnetic resonance imaging (MRI), and follow-up with an orthopaedic sports-medicine physician upon discharge. Orthopaedic physicians were not consulted during the emergency department visit.

The patient returned to the emergency department 3 days later with persistent left shoulder pain and new onset symptoms of swelling and subjective fever. She was tachycardic at 103 beats per minute, afebrile in the emergency department (temperature 36.7° C), and had severe tenderness to palpation of the entire left upper extremity, with ongoing limited range of motion. Laboratory studies were repeated, and the patient was found to have leukocytosis with a white blood cell count (13700/mL, or  $13.7 \times 10^9/L$ , nl range 4000-11000 ml). Additionally, C-reactive protein level was 26.9 mg/dL (26.9 nmol/L, nl <0.3mg/dL) and erythrocyte sedimentation rate was 81 mm/hour (normal range 0-33mm/hr).

Orthopaedic physicians were consulted and recommended an MRI, revealing a 3.2-cm area of high signal in the posterior deltoid, indicating the presence of abscess rather than myonecrosis. The MRI also showed a full-thickness tear of the supraspinatus and portions of the infraspinatus, with fatty atrophy, retraction, and moderate joint effusion without evidence of osteomyelitis (Figures 2A through 2C). The physicians elected not to perform a joint aspiration immediately owing to possible overlying myonecrosis, but the patient was started on broad spectrum antibiotics vancomycin and ceftriaxone and admitted. An aspiration was performed the next morning and synovial fluid showed a total nucleated cell count of 92,800  $mm^3$ , at which point the patient was taken to the operating room for treatment of a septic left glenohumeral joint with left shoulder arthrotomy and irrigation. The synovial fluid and tissue culture grew *Streptococcus mitis*. There were no notable cartilage lesions or erosions.

The source of infection was evaluated during the patient's hospital stay, with two blood cultures performed before antibiotic administration. Results of the blood cultures indicated no growth of the bacteria. Findings of a panoramic dental scan showed no apical lucencies but revealed multiple missing teeth. Findings of a transthoracic echocardiogram were normal. At 5 days postoperatively, the patient was discharged from the hospital.

The patient completed 6 weeks of intravenous ceftriaxone based upon a recommendation from the infectious disease service, with a course of physical therapy and did not receive any oral antibiotics. ESR and CRP were normal 2 months later. Complete resolution of symptoms was noted at 4 months postoperatively with no



**Figure 2.** (A) Magnetic resonance imaging of the left shoulder in axial view, with short-TI inversion recovery blade sequence, showing a high signal in posterior deltoid and glenohumeral joint effusion. (B) Magnetic resonance imaging of the left shoulder in paracoronal view, with T1 spin-echo sequences after water-fat shift, showing cystic changes of the humeral head near supraspinatus insertion. (C) Magnetic resonance imaging of the left shoulder in parasagittal view, with short-TI inversion recovery blade sequence, showing a 3.2-cm area of high signal in the posterior deltoid.

residual pain or weakness. She was counseled on the risk of developing osteoarthritis of the glenohumeral joint.

## Discussion

Septic arthritis typically presents as a hot, swollen, tender joint or joints, with a reduced range of motion and pain with axial loading. Symptoms are usually present for less than 2 weeks at presentation, but considerable delays may occur, particularly with low virulence organisms, tuberculosis, and prosthesis infection.<sup>3</sup> In the case presented above, the patient had reduced range of motion and a tender joint with symptoms present for less than 2 weeks. There was no obvious swelling or warmth to the joint on initial evaluation. Infection was a consideration at initial presentation to the emergency department, with evaluation of serum white blood count, C-reactive protein, erythrocyte sedimentation rate, and vital signs. No abnormal findings were noted, except slight elevation of C-reactive protein levels.

Margaretten et al<sup>4</sup> reviewed the use of these serum markers in clinical studies. The authors noted a limited diagnostic accuracy of septic arthritis when assessing abnormal findings in peripheral white blood cell count, erythrocyte sedimentation rate, and C-reactive protein; this limitation was mainly a result of the low specificity of laboratory values. One prospective study included 75 patients who presented with a white blood cell count of more than 10,000/mL ( $10 \times 10^9/L$ ), which minimally increased the likelihood of septic arthritis. The study showed that an erythrocyte sedimentation rate of more than 30 mm/hour minimally increased the likelihood of septic arthritis.<sup>4,5</sup> Similarly, a retrospective case-control series found that a markedly elevated C-reactive protein of more than 100 mg/L (952.4 nmol/L) increased the

likelihood of septic arthritis slightly.<sup>4,6</sup>

All of these studies<sup>4-6</sup> concluded that serum tests were not sufficient to predict septic arthritis, although none commented on whether combination of these laboratory values increased likelihood of the condition. The studies agreed that synovial fluid analysis of total nucleated cell and percentage polymorphonuclear cells had the highest predictive value in diagnosis of septic arthritis while waiting for gram stain and culture results. The patient had a low virulent strain of bacteria in *Streptococcus mitis*, which is a gram-positive coccus, anaerobe subgroup of *Streptococcus viridians*, belonging to normal flora residing predominantly on the surface of teeth. *Streptococcus viridians* is known for its ability to colonize heart valves but is rarely associated with septic arthritis. In the only other case report<sup>1</sup> on *Streptococcus mitis* causing glenohumeral septic arthritis, no chondral injury was reported and the patient healed successfully after treatment. In the current case, this low virulence bacteria may have contributed to the lack of early systemic symptoms at initial presentation.

Another consideration on the initial presentation to the emergency department could have been to evaluate for joint effusion. Although the radiograph of the shoulder did not show signs of a large effusion, there was no ultrasound or MRI performed on initial presentation. Effusion can be less evident on physical examination of a shoulder compared to other joints such as that of the knee. Had a more thorough investigation for joint effusion and aspiration been pursued on initial presentation an earlier diagnosis may have been made. Synovial white blood cell counts are another way to evaluate for septic arthritis. Progressively higher synovial white blood cell counts increase the likelihood of septic arthritis.<sup>4</sup> White blood cell counts greater than 25,000/mL ( $25 \times 10^9/L$ ) show a likelihood ratio of 2.9, synovial white blood cell counts

greater than 50000/mL ( $50 \times 10^9/L$ ) show a likelihood ratio of 7.7, and synovial white blood cell counts greater than 100,000/mL ( $100 \times 10^9/L$ ) show a likelihood ratio of 28.

Risk factors for development of joint sepsis include: rheumatoid arthritis or osteoarthritis, prosthetic joints, low socioeconomic status, intravenous drug abuse, alcoholism, diabetes mellitus, previous intra-articular corticosteroid injection, and cutaneous ulcers.<sup>3</sup> The patient in this case had diabetes. Additionally, several teeth were missing owing to poor dentition. Although she had not had a recent dental procedure, studies have indicated that most causes of septic arthritis are the result of direct inoculation from trauma or bacteremia.<sup>1</sup> We found a massive rotator-cuff tear in our patient, with fatty atrophy and involvement of the glenohumeral joint during arthrotomy. No related symptoms were evident, with no known trauma in the past. It is important to keep a high clinical suspicion of septic arthritis in immunocompromised patients with atraumatic shoulder pain. Systemic and serum markers are not specific enough in many cases for accurate diagnosis. Further imaging and synovial aspiration can greatly contribute to diagnosing this disease that can cause significant morbidity if not treated promptly.

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## Conflict of Interest

The authors report no conflicts of interest.

## References

1. Feder OI, Gruson KI. Glenohumeral joint sepsis caused by streptococcus mitis: a case report. *Am J Orthop (Belle Mead NJ)* 2016;45(6):E343-E346.
2. Sambandam SN, Atturu M. A case of septic arthritis of shoulder presenting as stiffness of the shoulder. *J Orthop Case Rep* 2016;6(2):31-33.
3. Mathews CJ, Kingsley G, Field M, et al. Management of septic arthritis: a systematic review. *Ann Rheum Dis* 2007;66(4):440-5.
4. Margaretten ME, Kohlwes J, Moore D, Bent S. Does this adult patient have septic arthritis? *JAMA* 2007;297(13):1478-88.
5. Jeng GW, Wang CR, Liu ST, et al. Measurement of synovial tumor necrosis factor-alpha in diagnosing emergency patients with bacterial arthritis. *Am J Emerg Med* 1997;15(7):626-9.

6. Söderquist B, Jones I, Fredlund H, Vikerfors T. Bacterial or crystal-associated arthritis? Discriminating ability of serum inflammatory markers. *Scand J Infect Dis* 1998;30(6):591-6.