

Streptococcus gordonii septic arthritis of the glenohumeral joint following deltoid intramuscular vaccination

Robert Costigan Flowers ^{1,2}, Beatriz Rivera Rodriguez,^{1,2} Kelly Corbitt²

¹Internal Medicine, Jackson Memorial Hospital, Miami, Florida, USA

²Internal Medicine, University of Miami Health System, Miami, Florida, USA

Correspondence to

Dr Robert Costigan Flowers; robert.flowers@jhs.miami.org

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SUMMARY

A 68-year-old woman presented for left shoulder pain, decreased range of motion (ROM) and fever 7 days following COVID-19 vaccination. Investigations showed a tender left deltoid mass, decreased shoulder ROM and elevated inflammatory markers. MRI demonstrated a large glenohumeral effusion with synovitis, and arthrocentesis confirmed septic arthritis (SA). She required subtotal bursectomy. Intraoperative joint cultures grew *Streptococcus gordonii*. She completed 6 weeks of antibiotics and is undergoing physical therapy for post-infectious adhesive capsulitis. SA is most commonly due to *Staphylococcus aureus* and β -haemolytic streptococci, and rarely due to viridans group streptococci including *S. gordonii*. To avoid inadvertent injection into the glenohumeral joint, vaccination should be performed posteriorly and inferiorly into the deltoid musculature. Progressive pain, fever or decreased passive ROM following vaccination should raise concern for SA. Given its rarity, however, concern for secondary SA should not affect the general population's consideration for vaccination.

BACKGROUND

Septic arthritis (SA) is defined as joint infection demonstrated by arthrocentesis with positive synovial fluid Gram stain or culture, or suggested by significant synovial fluid leucocytosis in the appropriate clinical setting.¹ Acute SA occurs most commonly due to bacterial pathogens. Significant risk factors are bacteraemia, pre-existing joint disease and immunosuppression, including poorly controlled diabetes.² It typically involves a single large joint, most commonly the knee.³ SA occurs most commonly from haematogenous seeding and less frequently from direct inoculation of bacteria into the joint, such as orthopaedic surgery or intra-articular steroid injections.⁴

The organisms implicated in the majority of bacterial SA are skin flora, particularly *Staphylococcus aureus* and β -haemolytic streptococci.⁵ Viridans group streptococci, on the other hand, is a large group of α -haemolytic streptococci including *Streptococcus anginosus*, *S. mitis*, *S. mutans*, *S. salivarius* and *S. sanguinis* groups. They are present in oral flora and are notorious for causing subacute bacterial endocarditis.⁶ Rarely, the viridans group are implicated in SA.^{7–11} *S. gordonii* (a member of the *S. sanguinis* group) has been identified in rare case reports of SA, including SA of the knee—both spontaneously and in the setting of aortic

endocarditis with a prosthetic joint¹²—and of the hip in association with a prosthetic joint.¹³ This is a case of *S. gordonii* causing SA of the glenohumeral joint following vaccination against COVID-19.

CASE PRESENTATION

A 68-year-old woman presented to our institution in January 2021 for left shoulder pain. She had a medical history of hypertension, hyperlipidaemia, recurrent uncomplicated diverticulitis and iatrogenic hypothyroidism following resection of a benign thyroid tumour. She was a lifetime non-smoker and denied recreational drug use. Her family history was unremarkable. The patient reported a 7-day history of progressive shoulder pain following left deltoid intramuscular administration of the Pfizer-BioNTech mRNA vaccine against COVID-19. She experienced localised swelling with tenderness and pain over the injection site that progressed to severe diffuse left shoulder pain with decreased range of motion (ROM) at the shoulder, as well as fever and rigours. She denied other arthralgias, rash, weight loss, night sweats, palpitations, chest pain, syncope, pre-existing joint or valvular disease, recent trauma, a history of intra-articular injections, new sexual partners, intravenous drug use, recent dental work, travel or known sick contacts.

In the emergency department, oral temperature was 37.3°C with a normal heart rate and blood pressure. Body mass index was 22.3 kg/m². Physical examination demonstrated a tender, fluctuant mass over the anterior left deltoid with warmth and glenohumeral joint tenderness but no overlying erythema. Passive ROM of the left shoulder was limited to 30° flexion, 40° abduction, 10° external rotation and 40° internal rotation. Active ROM was negligible secondary to pain. Her left hand was warm and well perfused without rashes or lesions of the fingers or nails. Cardiac and pulmonary examinations were unremarkable.

INVESTIGATIONS

Laboratory analysis showed a normal white cell count and a normal comprehensive metabolic profile. Erythrocyte sedimentation rate (ESR) was 60 mm/hour (normal 0–20) and C-reactive protein (CRP) 24.2 mg/dL (normal 0–0.5). A1c haemoglobin was 5.7%. Peripheral blood cultures were drawn from separate sites and remained negative. Plain radiograph of the left shoulder showed mild degenerative changes at the acromioclavicular joint. MRI of the left shoulder with and without



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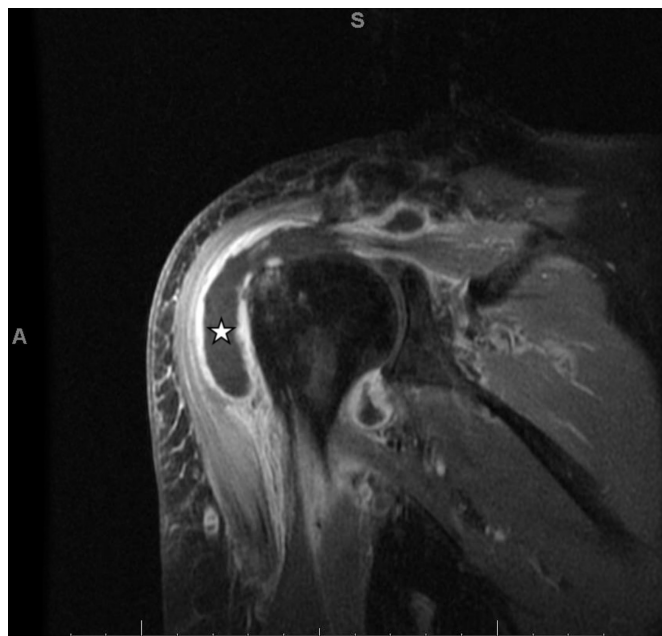


Figure 1 Post-contrast coronal T1-weighted MRI of the left shoulder with fat suppression and fast-spin echo demonstrating large glenohumeral joint effusion (star) with moderate synovitis and thickened synovial enhancement.

intravenous contrast showed a large glenohumeral joint effusion (star, [figure 1](#)) with synovitis concerning for SA. There was no evidence of osteomyelitis. Additionally, there was multifocal rotator cuff tendinosis with tearing of the supraspinatus (arrow, [figure 2](#)), subscapularis and transverse humeral ligaments.

DIFFERENTIAL DIAGNOSIS

At this point, the differential diagnosis of 1 week of left shoulder monoarticular arthritis included primarily infection and less

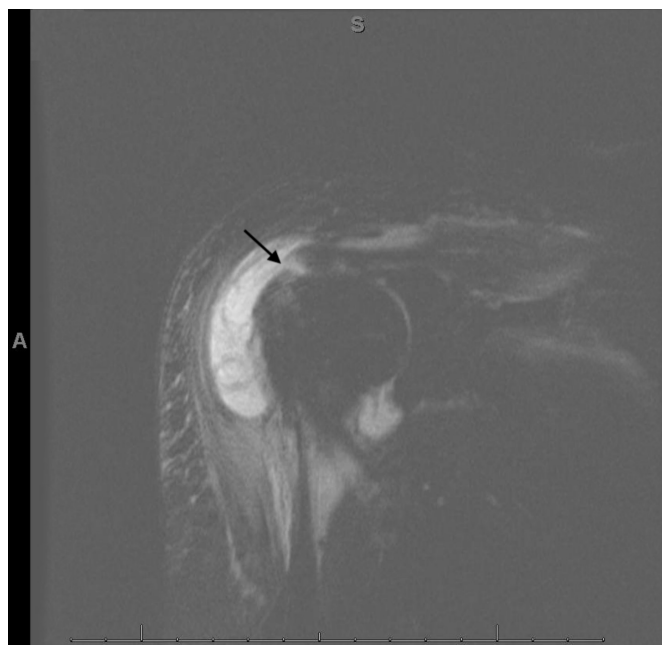


Figure 2 Coronal T2-weighted MRI of the left shoulder with fat suppression demonstrating 20 mm near full-width undersurface tear of the supraspinatus (arrow).

likely crystal-induced arthritis. Reactive arthritis was possible but unlikely in an upper extremity monoarticular arthritis without preceding insult or extra-articular manifestations. Infiltrative disease and neoplastic processes were likely unlikely given the presentation acuity and lack of other systemic symptoms. Simple trauma or adverse reaction to vaccination remained possible due to recent vaccine administration, and aseptic inflammation including effusion could have resulted from inadvertent injection deep to the deltoid musculature. Overall, considering her reported fevers at home, demonstrated limitation in passive ROM at the shoulder, and concerning MRI findings, SA was at the top of the differential diagnosis.

In terms of infectious processes, bacterial SA was considered the most likely diagnosis. Purulent gonococcal arthritis was considered; however, in an older patient without new sexual partners or distal joint arthritis, this was unlikely. Viral arthritis may be considered in a polyarticular presentation with extra-articular manifestations, which did not fit our patient's presentation. Fungal causes would be unlikely in acute arthritis without a history of immunosuppression, and our patient had a negative HIV test 4 months prior to presentation. Lyme disease and tuberculosis were also unlikely given no exposure history or travel to endemic areas. Furthermore, the palpable tender deltoid collection was consistent with a locally invasive infectious process, particularly with the history of recent intramuscular vaccination at that site. However, given that she was objectively afebrile on presentation and lacked a predisposing condition for bacteraemia, there remained diagnostic uncertainty. She was therefore admitted with the plan for immediate direct sampling of the glenohumeral effusion.

TREATMENT

Orthopaedic surgery performed bedside arthrocentesis revealing yellow fluid with white cells $130\,000/\text{mm}^3$ (95% neutrophils), red cells $20/\text{mm}^3$ and no crystals. Gram stain was negative. She was given empiric antibiotics with intravenous vancomycin and cefepime, in addition to analgesia with scheduled oral acetaminophen and celecoxib, with oxycodone available as needed. She was taken to the operating room and on standard deltopectoral approach, significant purulence was encountered both of the bursal soft tissue and in the glenohumeral joint deep to the subscapularis tendon, suggesting possible secondary septic bursitis in addition to SA. Copious irrigation and subtotal bursectomy were performed. Postoperatively, she continued on vancomycin and ceftriaxone—for empiric coverage of methicillin-resistant *Staphylococcus aureus* and streptococci, respectively—until intraoperative joint cultures grew *S. gordonii* sensitive to benzylpenicillin and fluoroquinolones. She transitioned to ceftriaxone therapy alone. She continued inpatient physical therapy during this time with strict limitations per surgical recommendations. Blood cultures finalised as negative after 5 days. Synovial fluid culture from initial joint aspiration ultimately speciated viridans streptococci with the same sensitivity profile. She was discharged on intravenous ceftriaxone followed by oral levofloxacin to complete 4 weeks of therapy after surgery. Final orthopaedic plan of care included non-weight bearing to the left upper extremity, no passive external rotation manoeuvres and sling for comfort with close outpatient follow-up. She was referred to outpatient physical and occupational therapy for subscapularis repair protocol.

OUTCOME AND FOLLOW-UP

The patient was followed in orthopaedic and infectious disease clinics and continued outpatient physical therapy. On initial

orthopaedic visit 2 days after discharge, she was doing well and voiced no complaints, and on examination, her shoulder ROM had increased to 70° of passive abduction. She continued on oral

Patient's perspective

After the first COVID vaccine shot, I started to feel more tired than usual, with some mild pain in my left shoulder. At the beginning, I thought it might've been a transient pain that would eventually go away. The pain would subside with Tylenol in the first days, however, to my surprise, it started to get so bad to the point I was unable to move my arm without having excruciating pain and I had to go to the emergency department. The first time I went, I had some reassurance. They gave me some pain medications and then sent me home. I felt like I was actually somewhat improving. However, I had to come back in the next few days as nothing seemed to work anymore. When they hospitalized me, I didn't think this process would be so frustrating as it has been.

My hospitalization went really well. With the procedure and the antibiotics, I thought I was properly recovering. The pain was still there, but with the physical therapy and the antibiotics, I thought I was improving. I felt eager to come back home and continue to recover, as the doctors thought it would happen. So far, everything was going according to plan. Nevertheless, when I went back home, the pain wasn't subsiding. The antibiotic therapy finished and I still wasn't able to return back to my normal living due to the pain at rest and with movement. I had to go back to infectology, tried different antibiotics, but the pain didn't seem to go away. I already started my physical therapy, which hasn't helped much yet, but I know it'll eventually get better.

Since I came home, I've had to rely on my family members to help me do everything, as I'm unable to do my daily chores. I'm very thankful I have them supporting me; however, I used to be an independent woman, work, and earn my own living. Now that I have to rely on everyone else to do the things I could easily do in the past, I feel frustrated, tired and I want to recover as soon as possible. It's taken a toll on my personal wellbeing. Even though the process has turned out to be longer and more painful than I expected, I feel very thankful for every doctor who's tried their best to give me great care. I know everyone has done more than expected and that we've tried everything possible, but it just hasn't worked as expected. Overall, I wish everything would be done and go back to being myself once again.

Learning points

- ▶ Septic arthritis (SA) is commonly caused by *Staphylococcus aureus* and β -haemolytic streptococci, and rarely the viridans group streptococci.
- ▶ Following vaccination, musculoskeletal pain around the injection site is expected; however, progressive or protracted pain, fever or decreased passive range of motion should raise concern for SA.
- ▶ Intramuscular vaccination should be performed more posteriorly and inferiorly into the deltoid musculature to avoid the glenohumeral joint.
- ▶ Given its rarity, concern for secondary SA should not affect the general population's consideration for vaccination.

levofloxacin. However, 1 week later in the orthopaedic clinic, she reported increased pain and swelling at the shoulder. Laboratory analysis showed CRP of 3.1 (from 24.2 during admission) and ESR of 55 (from 60). Repeat MRI demonstrated interval decrease of effusion with improving oedema and synovitis without complete resolution. There was no drainable fluid collection or evidence of osteomyelitis. Due to concern for residual infection, her course of oral levofloxacin was extended by 2 weeks to complete 6 weeks after surgery. A subsequent MRI showed persistence of ill-defined fluid, oedema and synovial enhancement in the subdeltoid subacromial bursa, worrisome for active infectious bursitis. Given the lack of drainable collection, she continued oral antibiotic therapy and completed her course in early March. She was seen in orthopaedic clinic later in March and diagnosed with post-infectious adhesive capsulitis and is currently pursuing conservative management with oral non-steroidal anti-inflammatory medications and manipulative physical therapy.

DISCUSSION

Musculoskeletal pain around the injection site is an expected reaction following deltoid vaccine administration. In the safety analysis of the Pfizer-BioNTech BNT162b2 mRNA vaccine against COVID-19, 66%–83% of study participants reported injection site pain, with <1% reporting severe pain.¹⁴ Additionally, 11%–16% of participants reported fever, which typically resolved after 1–2 days. Alternatively, SA associated with vaccination appears to be an extremely rare phenomenon. There are prior reports of glenohumeral SA after influenza^{15 16} and pneumococcal vaccinations.¹⁷ These cases were secondary to *S. aureus* or had negative synovial cultures. To the best of our knowledge, this is the first case report of viridans streptococci SA associated with vaccination, as well as the first case of SA from any organism following COVID-19 vaccination.

The diagnosis of SA associated with vaccination may be considerably delayed due to the overlap of local reactions and clinical symptoms of SA. Because bacterial arthritis causes devastating and rapid joint destruction of the ball-and-socket joints of the hip and shoulder,¹⁸ rapid diagnosis and prompt initiation of antibiotic therapy and orthopaedic consultation for source control are vital. A high index of suspicion is necessary to avoid morbidity in these cases. Prolonged fever, decreased passive ROM and severe or prolonged pain should all prompt consideration of SA and further workup. In this case, because the patient had no risk factors for endocarditis, had no persistent fevers or signs of septic emboli, and blood cultures remained negative after 5 days, further workup for endocarditis was not pursued. In the setting of bacteraemia or other signs of systemic embolic disease, however, transoesophageal echocardiography may be warranted. Very likely, this patient had inadvertent intra-articular or subacromial injection of the vaccine. The glenohumeral joint space may be avoided by directing the vaccine more posteriorly and inferiorly into the deltoid musculature.¹⁹ Finally, it must be emphasised that given the rarity of this complication, the risk for secondary SA should not affect the general population's consideration for COVID-19 vaccination.

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ORCID iD

Robert Costigan Flowers <http://orcid.org/0000-0003-2799-0270>

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