Methicillin-resistant *Staphylococcus aureus* infection of the subacromial bursa: an unusual complication following subacromial corticosteroid injection (a report of two cases)

Kar H Teoh, Sian A Jones, Subramaniam Gurunaidu and Mark G Pritchard

Abstract

Subacromial corticosteroid injections are frequently used for both diagnostic and therapeutic purposes in shoulder pain. Subacromial septic bursitis is a recognized but rare complication. There have been no reports of methicillin-resistant *Staphylococcus aureus* infections of the subacromial bursa after subacromial injections in the literature. We describe case reports of two patients who presented with subacromial methicillin-resistant *Staphylococcus aureus* septic bursitis following subacromial corticosteroid injections in the community and highlight the diagnostic and management challenges of this condition.

Keywords

iatrogenic, MRSA, subacromial septic bursitis

Date received: 4th July 2014; accepted: 9th September 2014

Introduction

Subacromial corticosteroid injections are frequently used for both diagnostic and therapeutic purposes in shoulder pain. They are administered by a range of medical staff, including physiotherapists, general practitioners, radiologists and orthopaedic surgeons. They can be performed blind or ultrasound-guided with similar accuracy. A recent Cochrane systematic review was unable to establish any advantage in terms of pain, function, shoulder range of motion or safety of ultrasound-guided glucocorticoid injection for shoulder disorders over either landmark-guided or intramuscular injection.¹ Associated risks of subacromial injection include bleeding, allergic reaction, tendon rupture, muscle necrosis, osteomyelitis and infection.^{2,3} It is rare to develop infection or septic arthritis following shoulder injections and *Staphylococcus aureus* is usually the most common causative organism.^{4,5} To date, there has only been one reported case series of four patients with methicillin-resistant *S. aureus* (MRSA)

injection-induced pyogenic arthritis of the shoulder joint.⁴ However, to our knowledge, there are no reports of MRSA infections of the subacromial bursa after subacromial injections. We describe the first case series of two patients who presented with subacromial MRSA septic bursitis following subacromial corticosteroid injections in the community.

Case Report

Two patients presented to our local accident and emergency department within 1 month of each other with right shoulder pain after receiving subacromial

Department of Trauma and Orthopaedics, Morriston Hospital, Heol Maes Eglwys, Morriston, Swansea, UK

Corresponding author:

Kar H Teoh, Morriston Hospital Heol Maes Eglwys, Morriston, Swansea, SA6 6NL UK.

Email: karhao@gmail.com

Tel: +44 (0)1792 703185.

injections from two separate general practitioners in different medical practices within our catchment area. They were both referred onto the orthopaedic on-call team to exclude septic arthritis of the shoulder joint. Coincidentally, they both attended 10 days after the procedure was performed.

Case 1

The first patient (patient A) was a 53-year-old male with no co-morbidities who presented with increasing pain in his right shoulder. He was systemically well with normal observations. On examination, shoulder movements were globally limited and painful with no palpable collection. Radiographs were normal (Fig. 1a), although his white blood cell count (WBC) and C-reactive protein (CRP) were elevated (17.3 and 22, respectively). He was investigated with an urgent magnetic resonance imaging (MRI) scan to rule out a septic arthritis. This showed a collection within the subacromial bursa but no involvement of the glenohumeral joint (Fig. 2). He was commenced on intravenous flucloxacillin and benzylpenicillin in accordance with local microbiology guidelines.

Patient A proceeded to spike a temperature of 38°C despite antibiotics and was taken to theatre on day 2 for a subacromial arthroscopic washout. This revealed a florid bursitis with a collection of material (resemblance to crystals) in the posterior aspect of the bursa but no pus (Fig. 3). A drain was inserted at the site of the collection. Both blood and tissue cultures grew MRSA and,

following advice from microbiology, the antibiotics were changed to vancomycin and fusidic acid. Patient A failed to improve clinically and, 2 days later, underwent a second arthroscopic washout of the subacromial space, including his glenohumeral joint to rule out a concomitant septic arthritis. The findings were similar to the first operation and there was no involvement of the glenohumeral joint. The cavity within the posterior inferior aspect of his shoulder was packed. Unfortunately, the patient was admitted to intensive care unit immediately

Figure 2. Shoulder magnetic resonance imaging of patient A, illustrating a collection in the subacromial space, which is tracking posteriorly towards the skin.

Figure 1. Shoulder anteroposterior radiographs of patients A (a) and B (b), respectively, illustrating an increase in the subacromial space in patient B.

Figure 3. Arthroscopic images of patient A with a) florid inflammation of subacromial bursa and b) a collection postero-inferiorly.

post-operatively because he developed symptoms suggestive of a septic storm and required respiratory support overnight. He responded well to treatment and was discharged back to the general orthopaedic ward the next day. He subsequently underwent two further open washouts of this cavity. His antibiotics were again changed to rifampicin and intravenous teicoplanin after discussion with microbiologist because his vancomycin levels remained suboptimal despite increasing the dose.

He was discharged home after 2 weeks. He was advised to complete a further 2-week course of these antibiotics, with regular district nurse packing of his cavity.

Case 2

The second patient (patient B) was a 69-year-old male who was on warfarin for a previous pulmonary embolism. Apart from increasing right shoulder pain following the subacromial injection, he had associated systemic symptoms, which included fever, rigors, nausea and vomiting, as well as a whole body rash. His temperature on admission was 37.6°C. On clinical examination, he was tender posteriorly with limited shoulder movements. Radiographs showed an obvious increase in the subacromial bursa space (Fig. 1b). His WBC count was normal, although his CRP was elevated at 151. An aspiration of the glenohumeral joint was attempted by the orthopaedic consultant upon admission but this was negative. The joint was instead injected with lignocaine 1% but there was no improvement in his pain, suggesting the site of infection was not within his glenohumeral joint. An urgent MRI showed a collection within the subacromial bursa but no

involvement of the glenohumeral joint. He was also commenced on intravenous flucloxacillin and benzylpenicillin in accordance with local microbiology guidelines.

With the benefit of hindsight, patient B was initially managed with an ultrasound-guided aspiration of his subacromial collection. Samples yielded growth of MRSA. He did not improve clinically and underwent an arthroscopic washout of his subacromial space but with a formal incision made over the collection site and a drain inserted. The glenohumeral joint was avoided because there was no indication to expose the joint. He subsequently underwent a second washout and packing of the remaining cavity. His whole body rash improved following these procedures. He completed a 3-week course of intravenous teicoplanin and rifampicin in accordance with the advice of the microbiologist.

At last follow-up in clinic, both patients had no evidence of residual infection, and their inflammatory markers had returned to normal. However, both patients complained of ongoing pain because they developed adhesive capsulitis that required protracted aggressive regime of stretching exercises by outpatient physiotherapists.

Discussion

Infection of the subacromial bursa is rare because it is located deep to the deltoid muscle and the coracoacromial arch. It is usually secondary to haematogenous spread or injection contamination, unlike the more superficial bursae such as the olecranon and pre-patellar bursa, which is usually infected through transcutaneous inoculation from minor trauma.⁶ An infection of

the subacromial/subdeltoid bursa (SSB) should be high on the list of differential diagnoses in a patient with acute shoulder pain if the patient had received a recent subacromial injection. In our case, both patients presented at day 10. Although infection of the subacromial is more common in the immunocompromised, it has been reported in healthy patients.^{6,7} The route of spread in immunocompromised patients is usually haematogenous with an unusual organism such as *Streptococcus viridians*, *Mycobacterium tuberculosis* and *Candida*.⁷⁻⁹ The two cases in the present study occurred in fit and healthy middle-aged men, where *S. aureus* is the most common causative organism.^{4,5} However, there have been no case reports in the literature that have described infections of the subacromial bursa with the more virulent MRSA strain.

The main finding of these two case reports suggests that there is little role for conservative treatment with intravenous antibiotics in MRSA septic subacromial bursitis and they are difficult to treat. Both patients failed to improve clinically with the correct intravenous antibiotics and needed surgical decompression and washout. They also needed several return to theatre for further washout to reduce the bacterial load. The literature on surgical drainage and washout is not well described as a result of the rarity of subacromial septic bursitis, although *S. aureus* subacromial septic bursitis has been reported to be successfully treated conservatively with intravenous antibiotics only.⁶ We would also recommend a formal incision over the area of maximum collection to allow drainage of the infective fluid if arthroscopic washout was performed. It is advisable to avoid the glenohumeral joint, particularly if the MRI does not show any evidence of glenohumeral joint involvement. Patient A required a period of intensive care unit stay from the overwhelming sepsis, suggesting that MRSA septic subacromial bursitis is not a benign disorder, even in the fit and well, and needs to be treated promptly and aggressively. We also found that it was common to develop adhesive capsulitis following subacromial septic bursitis, which occurred in both our patients.⁶ Patients should also be warned that resolution of the infection will not eliminate the pain immediately as a result of the risk of developing adhesive capsulitis.

The subacromial bursa is contiguous with the subdeltoid bursa in 95% of the population and forms the SSB. The SSB extends laterally beyond the humeral end of the rotator cuff tendons anteriorly to overlie the intertubercular groove, medially to acromioclavicular joint and posteriorly over the rotator cuff. Under normal circumstances, the SSB does not communicate with the glenohumeral joint unless there is a partial or complete tear of the rotator cuff. With this in mind, a subacromial space infection/abscess may also masquerade

as (or accompany) glenohumeral or acromioclavicular joint pyarthrosis, adding to the diagnostic challenge. It is usually difficult to distinguish glenohumeral septic arthritis from subacromial septic bursitis because, clinically, they are similar.¹⁰ If the clinical suspicion for glenohumeral septic arthritis is high in an unwell septic patient with no easy or quick access to radiological investigations such as MRI or ultrasound scanning, a diagnostic aspiration of glenohumeral joint could be attempted. If the aspiration is negative, an injection with local anaesthetics such as lignocaine into the glenohumeral joint can help distinguish where the source of pathology is (e.g. patient B). However, we would only recommend this with caution and in senior hands because this could potentially convert a septic bursitis to a septic arthritis.

From our experience, we found that MRI of the shoulder is the most valuable investigation in this difficult clinical setting. It can clearly delineate the extent of the shoulder infection/collection and the contiguous involvement of adjacent structures and, most importantly, whether the glenohumeral joint is involved. Although radiographs could show an increase in the space of the subacromial bursa, as with patient B, many patients may have radiographs that do not show any abnormalities.⁴ Rhee et al. found that MRI scans provided a decisive clue for diagnosis and treatment in his case series and allowed them to pre-operatively assess the extent of collections and avoid unnecessary glenohumeral joint washout.⁴ If the MRI does not show any glenohumeral joint involvement, ultrasound-guided aspirations by the radiologists can help guide diagnosis and antibiotic treatment by providing an accurate fluid sample, as in patient B. It is imperative to take cultures for microbiology before antibiotics are given when sepsis is suspected.

Inflammatory markers have a role in diagnosis and monitoring the progress of the septic bursitis. However, they should be interpreted with caution. The CRP was raised in both our patients, although the WBC was normal in patient B at presentation. Rhee et al. reported a similar finding amongst their patients who developed injection-induced pyogenic arthritis of the shoulder joint, where the CRP levels were elevated in all patients but the WBC remained normal in some.⁴ This was similar again in the case series of Hiemstra et al. who reported three healthy patients with staphylococcus infection of the subacromial bursa, where the WBC was normal in two patients.⁶ An elevated CRP in the presence of a normal WBC does not exclude a septic bursitis.

A final point to consider is the potential source of infection in these cases. The two patients included in the present case report were treated by two separate general practitioners at two separate practices. MRSA

was isolated from cultures obtained from both men. The clinical presentation of MRSA infection can range from asymptomatic colonization to cutaneous and invasive involvement and it is often difficult to identify the source and mode of transmission.¹¹ Murray et al. described an outbreak of MRSA infection associated with percutaneous procedures performed by a medical practitioner who was colonized with the same MRSA clone.⁵ They concluded that the outbreak was likely caused by a breakdown in hand hygiene and/or sterile technique during procedures.⁵ There is lack of evidence regarding the precautions that should be taken to avoid infection during percutaneous procedures. Charalambous et al. surveyed the antiseptic precautions taken during intra-articular injections of the knee.¹² These ranged from using alcohol swabs or chlorhexidine/betadine, using sterile or nonsterile gloves, or using sterile towels to isolate the area. They concluded that the trend appears to be towards minimal use of antiseptic techniques, although septic arthritis of the knee joint is probably rare despite this finding. However, we would recommend that subacromial injection need to be performed under sterile conditions (sterile gloves and skin preparation with antiseptics) to minimize the risk for septic complications because there can be a communication between the subacromial bursa and the shoulder joint in patients with rotator cuff tears. An injection into a bursa should be no different from an intra-articular joint injection.

Conclusions

This is the first case report in the literature of MRSA proven infection of the subacromial bursa. Clinicians should have high index of suspicion of a subacromial septic bursitis when assessing patients with worsening shoulder pain who have recently received a subacromial injection. MRI of the shoulder is the most useful investigation to identify the exact location and extent of the collection, as well as to rule out involvement of the glenohumeral joint. Although *S. aureus* is the normal causative organism, the possibility of MRSA should be considered when there is no clinical improvement with empirical antibiotics because MRSA is now more common. MRSA septic subacromial bursitis is not a benign disorder and needs to be treated promptly and aggressively with surgical washout and formal drainage.

Declaration of conflicting interests

None declared.

Funding

No funding for research or publication.

References

1. Bloom JE, Rischin A, Johnston RV and Buchbinder R. Image-guided versus blind glucocorticoid injection for shoulder pain. *Cochrane Database Syst Rev* 2012; 8: CD009147.
2. Buckley SL, Alexander AH and Barrack RL. Scapular osteomyelitis. An unusual complication following subacromial corticosteroid injection. *Orthopaed Rev* 1989; 18: 321–4.
3. Rutten M, Maresch B, Jager G, de WAAL and Malefijt M. Injection of the subacromial subdeltoid bursa: blind or ultrasound-guided? *Acta Orthop* 2007; 78: 254–7.
4. Rhee YG, Cho NS, Kim BH and Ha JH. Injection-induced pyogenic arthritis of the shoulder joint. *J Shoulder Elbow Surg* 2008; 17: 63–7.
5. Murray RJ, Pearson JC, Coombs GW, et al. Outbreak of invasive methicillin-resistant *Staphylococcus aureus* infection associated with acupuncture and jointinjection. *Infect Control Hosp Epidemiol* 2008; 29: 859–65.
6. Hiemstra LA, Macdonald PB and Froese W. Subacromial infection following corticosteroid injection. *J Shoulder Elbow Surg* 2003; 12: 91–3.
7. Khazzam M, Bansal M and Fealy S. Candida infection of the subacromial bursa. A case report. *J Bone Joint Surg Am* 2005; 87: 168–71.
8. Lan S, Lin C, Wang C, Lo S, Jou I and Su W. Synchronous subacromial and subdeltoid bursal abscess and pyomyositis of rotator cuff muscles caused by viridans streptococcus. *Shoulder Elbow* 2012; 4: 196–8.
9. Pookarnjanamorakot C and Sirikulchayanonta V. Tuberculous bursitis of the subacromial bursa. *J Shoulder Elbow Surg* 2004; 13: 105–7.
10. Ward WG and Eckardt JJ. Subacromial/subdeltoid bursa abscesses. An overlooked diagnosis. *Clin Orthop Relat Res* 1993; 288: 189–94.
11. Hansra NK and Shinkai K. Cutaneous community-acquired and hospital-acquired methicillin resistant *Staphylococcus aureus*. *Dermatol Ther* 2011; 24: 263–72.
12. Charalambous CP, Tryfonidis M, Sadiq S, Hirst P and Paul A. Septic arthritis following intra-articular steroid injection of the knee – a survey of current practice regarding antiseptic technique used during intra-articular steroid injection of the knee. *Clin Rheumatol* 2003; 22: 386–90.