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CASE REPORT

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Arthroscopic debridement for acute hemorrhagic subacromial bursitis following COVID-19 vaccine administration: A case report

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Abstract

The rapid rollout of vaccinations in response to the COVID-19 pandemic has led to their widespread distribution and administration throughout the world. The benefit of these vaccinations in preventing the spread of the disease and diminishing symptoms in patients who contract COVID-19 has been fervently studied and reported. While vaccinations remain an effective and generally safe method of limiting disease transmission and virus-related mortality, vaccine administration is not completely without risk. Shoulder injuries related to vaccine administration (SIRVA) have been described with previously available vaccines but have yet to be widely reported in the COVID-19 vaccination population. We present a case report of a young, high-functioning patient who presented with acute subacromial bursitis after COVID-19 vaccine administration due to improper vaccination technique. The patient was treated with arthroscopic shoulder surgery and had near immediate relief of shoulder symptoms.

Keywords

shoulder arthroscopy, SIRVA, COVID-19 vaccine, subacromial bursitis, rotator cuff

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Introduction

Even though the COVID-19 vaccinations are exceedingly safe and highly effective, both localized and systemic adverse reactions have been reported. Fortunately, the overwhelming majority of these are mild and transient. Injection site pain, redness, swelling, and pruritus may be observed in addition to headache, low-grade fevers, chills, myalgia, and joint pain. While more severe allergic and anaphylactic type adverse reactions have been described, these are rare events.[1] In clinical trials of the COVID-19 mRNA-based 2-dose vaccines, the greatest reactogenicity was observed after the second dose.[2]

A less well-known complication of vaccine administration is known as SIRVA, shoulder injury related to vaccine administration.[3–5] SIRVA is defined as "shoulder pain with limited range of motion within 48 h after vaccine receipt in individuals with no prior history of pain, inflammation, or dysfunction of the affected shoulder before vaccine administration."[6] The etiology of SIRVA is related to inadvertent introduction of vaccine contents into the subdeltoid/subacromial space or even the glenohumeral joint causing formation of antigen-antibody complexes in the synovial tissue and subsequent acute/chronic inflammation.[5,7–9] This may manifest as subacromial bursitis, adhesive capsulitis, or glenohumeral synovitis depending on the injection site. While this injury pattern has been well-described in patients receiving the influenza vaccine, information on SIRVA in the COVID-19 vaccination population is limited.

To our knowledge there has been one other report of a SIRVA-related subacromial bursitis after a COVID-19

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vaccine administration, which was treated conservatively with observation.[10] Similar to the presently reported case, the authors speculated that the mechanism of the injury was related to improper vaccination technique resulting in direct bursal injection.[10] However, the present report documents a case of SIRVA due to aberrant injection of a COVID-19 vaccination dose as well as the subsequent surgical management. As millions of people world-wide are set to receive this vaccine, it is important to raise awareness of this preventable injury and reduce vaccine-related morbidity.

Case report

The patient is a 26year old left hand dominant male active-duty military soldier who presented to our emergency department (ED) with a 48 h history of acute onset right shoulder pain that began several hours after receiving his first dose of the Moderna mRNA COVID-19 vaccination. The pain was located over the superolateral aspect of his right shoulder without radiation. It was dull, constant, and exacerbated by movement. The pain was increasingly severe, limiting the patient's function and sleep. He did not have any numbness, weakness, or paresthesia in the affected extremity. He had no prior history of shoulder injuries and no antecedent shoulder pain. The patient initially consulted with his primary care physician, who directed him to present to the ED for further evaluation. At the time of the initial vaccination, the patient felt the injection site had been "too high" up on his arm and indicated a location that was just 1 cm distal to the lateral edge of the acromion (Figure 1). In addition, the patient reported subjective low-grade fevers and generalized malaise the day following his vaccine. The patient was otherwise healthy without any pertinent medical, surgical, or family history. He did not take any medication regularly and was a nonsmoker.

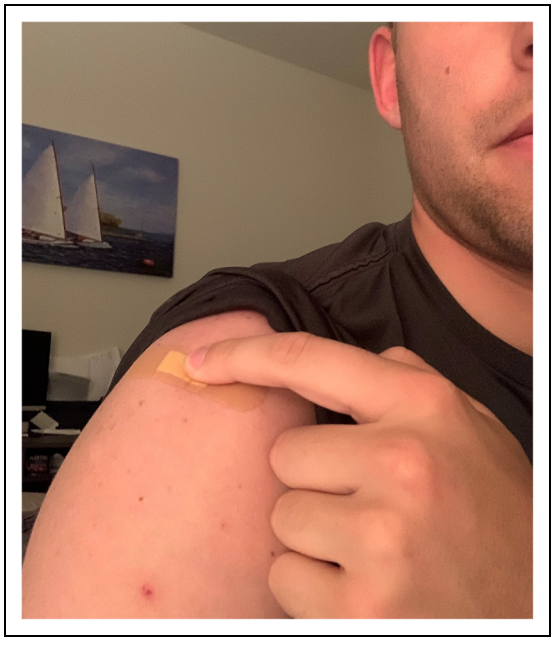

Figure 1. Patient finger and bandage indicating position of suboptimal injection site.

On arrival to the ED the patient was afebrile with stable vital signs. On exam, the patient's skin was intact with minimal swelling or erythema of his right shoulder. There was evidence of a prior vaccine injection site lateral to the edge of the acromion. The shoulder was exquisitely tender to palpation along the sub-deltoid bursa. The patient had severe pain with all motion and was able to actively forward flex less than 10 degrees. He could internally rotate to his abdomen and externally rotate to neutral. There was a positive Neer's and Jobe's test, further provocative maneuvers deferred due to patient discomfort.

His laboratory workup was significant for a white blood cell count of 7500/uL (normal), erythrocyte sedimentation rate of 5.0 mm/hr (normal), and C-reactive protein of 1.2 mg/dL (elevated). There were no other significant abnormalities on his blood count or metabolic panel.

Imaging workup of the right shoulder included three-view plain radiographs (Figure 2), which did not demonstrate any acute abnormality. Subsequent imaging with an MRI demonstrated a trace subacromial-subdeltoid effusion with adjacent synovial thickening (Figure 3). There was no evidence of rotator cuff injury nor other acute abnormality on imaging.

SIRVA-related subacromial bursitis was the most likely diagnosis given the acute onset of right shoulder pain, erroneous vaccine injection location, and MRI evidence of subacromial effusion and synovial thickening. This was further supported by the absence of severe systemic symptoms on clinical exam and lack of robust elevation in his infectious and inflammatory markers.

Our differential diagnosis also included septic glenohumeral arthritis considering the acute onset of severe right shoulder pain and difficulty with motion. However, this was less likely given the absence of a robust systemic immune response or joint effusion on MRI. A fracture or dislocation was also ruled out as there was no acute osseous pathology seen on plain radiographs or MRI. While pain and difficulty with motion can support a rotator cuff tear, this was also less likely in the absence of trauma or imaging correlation on MRI.

The patient was admitted from the ED for further evaluation and management. All treatment options, including conservative measures such as anti-inflammatories and physical therapy versus arthroscopic decompression of his subacromial bursitis, were discussed with the patient. Given the demands of his occupation, specifically an upcoming training deployment in three months, he elected

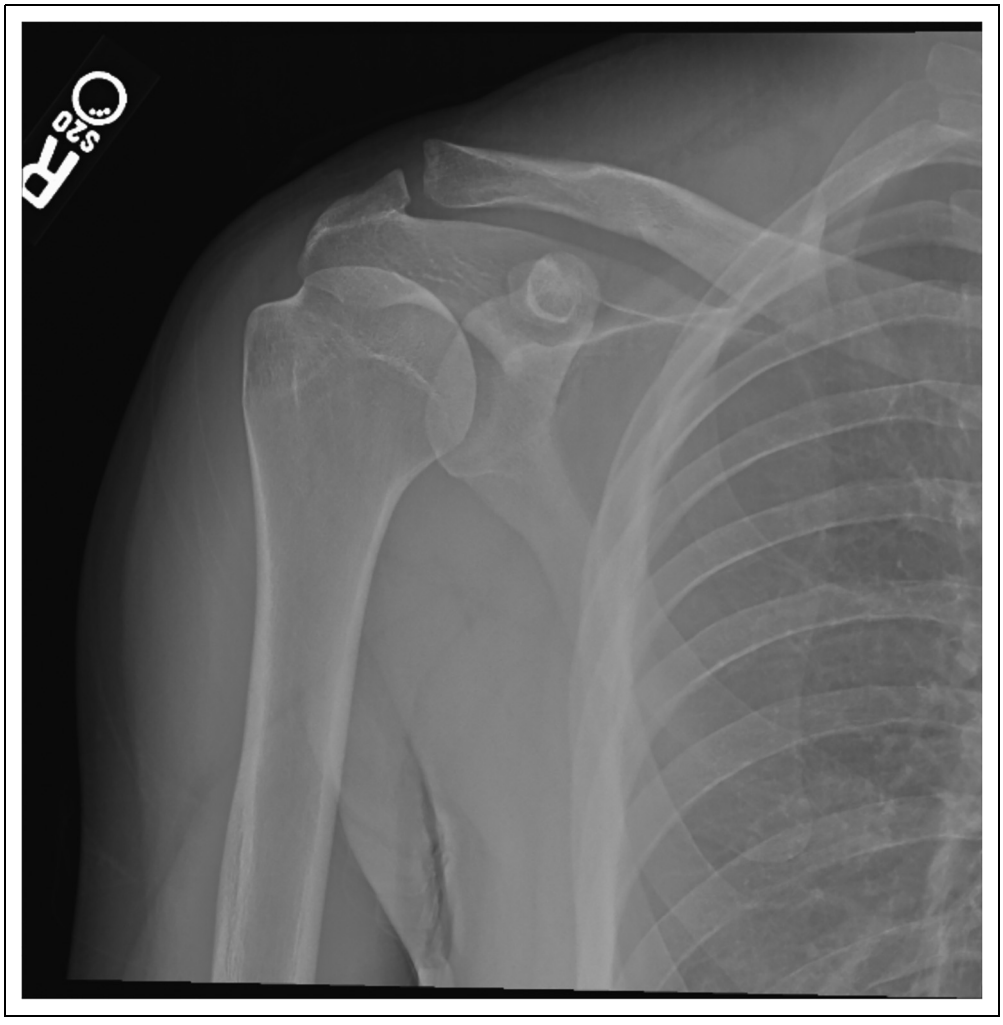

Figure 2. Right shoulder AP radiograph – no osseous abnormality.

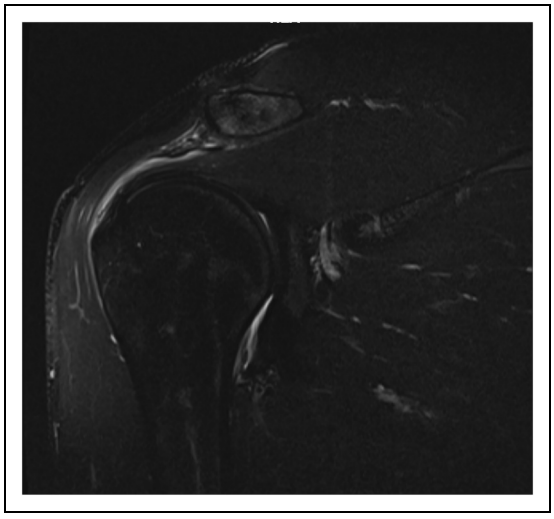

Figure 3. Right shoulder T2 coronal MRI – subacromial effusion with an intact rotator cuff and no intraarticular pathology.

to proceed with surgical intervention in order to recover in time for these professional responsibilities.

The patient was brought to the operating room on hospital day two. General anesthesia was administered, and he was placed in the beach chair position. Standard antibiotic prophylaxis was administered. A posterolateral arthroscopic viewing portal was created one centimeter lateral to the posterolateral corner of the acromion. The intraarticular space was not entered due to preoperative imaging and the mechanism of injury. Upon entry into the subacromial space, a large hemorrhagic bursitis was visualized without signs of infection (Figure 4). A lateral portal was established midway through the anterior-posterior diameter of the deltoid, and an arthroscopic shaver was used to debride the subacromial bursa (Figure 5). At the completion of the subacromial decompression the rotator cuff was found to be completely intact (Figure 6). An examination under anesthesia was performed which demonstrated full ROM. All instruments

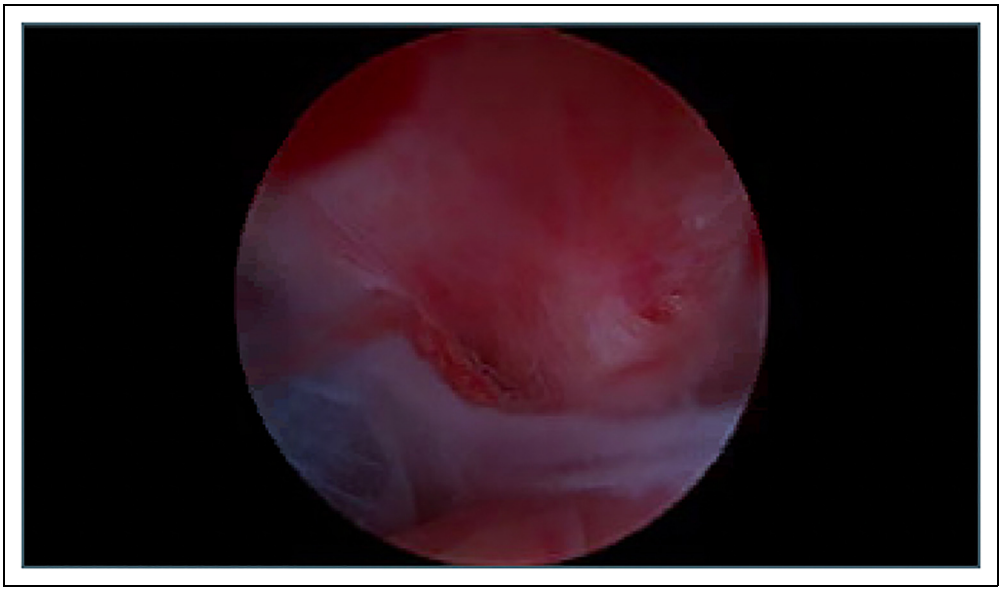

Figure 4. Intra-operative arthroscopic image – hemorrhagic bursitis of the subacromial space.

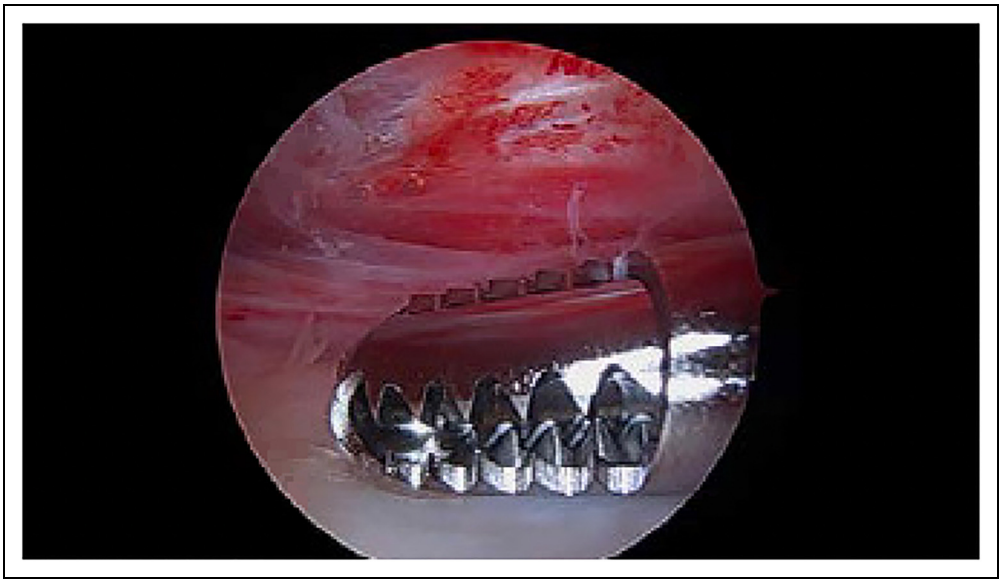

Figure 5. Intra-operative arthroscopic image – introduction of arthroscopic shaver and debridement of bursa/hematoma.

were then removed, and skin closure was performed using 3-0 nylon portal stitches. The wounds were cleaned and then covered with sterile dressing. The patient was placed in a simple sling and then was awoken from anesthesia.

Postoperatively, the patient had nearly complete resolution of his pain by the following day. Therapy began on postoperative day 1, consisting of active and active-assisted shoulder range of motion without restriction. He achieved functional range of motion from 0-120 degrees with occupational therapy. He was discharged home on hospital day three in improved condition. At discharge, the patient was prescribed a non-steroidal anti-inflammatory, celecoxib 200 mg, to be taken twice daily for 14 days in addition to standard multimodal pain medications.

At the patient's first postoperative visit, two weeks following surgery, the patient had recovered well. He achieved full, painless range of motion and strength in his right shoulder. He had no signs of fevers or chills. All sutures were removed, and the incisions were healing well without signs of infection. He was cleared for all activity as tolerated at that time.

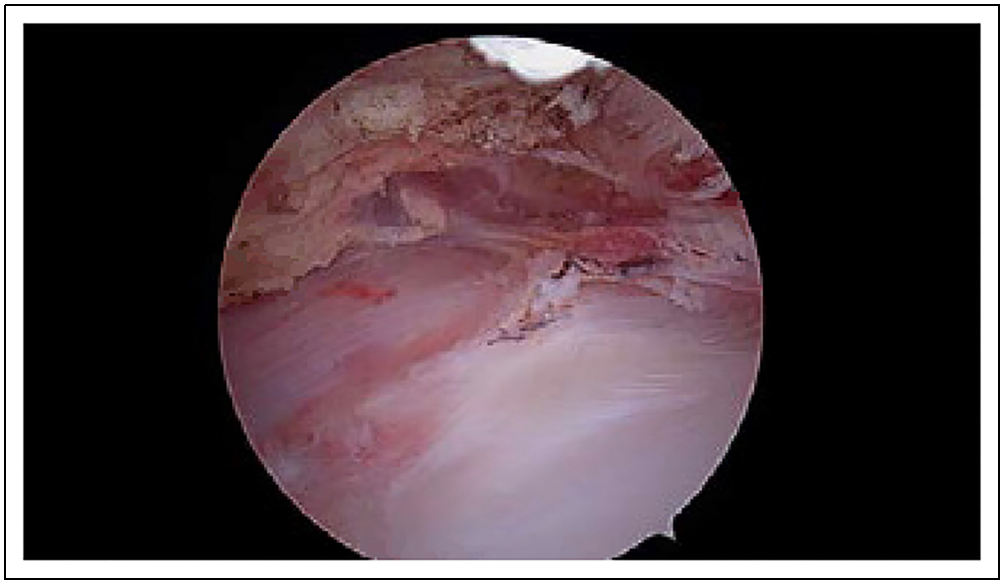

Figure 6. Intra-operative arthroscopic image – post-bursectomy, shoulder with no evident rotator cuff pathology; normal appearance of supraspinatus tendon.

At subsequent follow-up six weeks after surgery, the patient continued to recover well. He had returned to all activity without pain in his right shoulder. He did not have any further signs of infection. He was able to fully participate in his training deployment three months following his surgery.

After consultation with infectious disease specialists, we decided to not repeat his first vaccination dose despite requiring the decompression surgery. The patient elected to have his second vaccination dose administered in the contralateral shoulder, which occurred without incident.

Discussion

Reports of SIRVA related to influenza vaccination and other intramuscular inoculations are well described. Although these rarely require operative management, there are several reports of good results after surgical intervention.[11,12] To date, there is very little information on the management of SIRVA after COVID-19 vaccine administration.[10] To our knowledge, this report represents the first case of COVID-19 vaccine related SIRVA that underwent acute operative management.

We were only able to identify one other report of SIRVA related to COVID-19 vaccination.[10] The case, described by Rodrigues et al., presented a patient with very similar history to our own: severe pain at the injection site which began hours after vaccine administration with suspected erroneous needle site/trajectory. In their report, the patient was initially treated with ice packs, topical diclofenac cream, and a combination of caffeine, carisoprodol, sodium diclofenac, and paracetamol for 5 days. However, eight weeks after vaccination the patient was still experiencing significant pain with reduced shoulder range of motion leading to an inability to perform daily activities. The patient was subsequently treated with oral prednisone, vitamin D supplementation, and physical therapy range of motion exercises. No further follow up was reported in their case history. Had we elected to proceed in a similar manner, it would have been very difficult for the patient to return to his military training if symptoms persisted for weeks or months.

Continuation of pain and shoulder dysfunction for months or even years despite conservative, nonoperative treatment is consistent with reports of SIRVA from other non-COVID vaccines. Considering the high occupational demands of our patient and inability to tolerate continued pain, reduced range of motion, and swelling for an extended period of time, we elected to forego non-operative management and treat with surgical irrigation and debridement (I&D). Although surgery comes with its own risks, given the patient's excellent health, young age, and minimally invasive arthroscopic approach to the procedure, we felt the benefits outweighed the risks compared to non-surgical management. While there is no evidence regarding time to return to work or sport after SIRVA for operative versus nonoperative treatment, the Center for Disease Control and Prevention showed 65% of 859 patients with SIRVA had pain lasting over 1 month, and 25% of patients had pain lasting longer than 3 months.[4] Our experience suggests that patients who may otherwise not tolerate a trial of conservative management may expect rapid relief of symptoms and a quick return of normal shoulder function with arthroscopic I&D.

Proper shoulder intramuscular injection technique that minimizes risk of iatrogenic subdeltoid or subacromial injection involves avoiding the upper 1/3 of the deltoid muscle. Instead, palpating three finger breadths (approximately 7 to 13 cm) distal to the tip of the acromion and injecting at a trajectory of 70 to 90° relative to the skin avoids intra-bursal and intra-dermal release of syringe contents. As the vaccine rollout continues globally, it is important that vaccine administrators be trained in the proper technique to minimize risk of iatrogenic injury (Figure 7).

SIRVA represents a relatively rare complication for patients receiving vaccinations. The Vaccine Adverse Event Reporting System database reported that SIRVA only represented 2.0% of all AE after inactivated influenza vaccination from 2010 to 2017.[4] While the incidence and prevalence of SIRVA after COVID-19 vaccination is unknown, an analysis of petitioner claims to the National Vaccine Injury Compensation Program from 2010 to 2016 identified 476 medical reports of suspected SIRVA after any vaccination. Nearly half of these claims were thought to be related to administration error, and 36.1% of all cases reported 'injection too high' on the arm.[13] Most patients received physical or occupational therapy (80.0%), 60.1% had at least one steroid injection, and 32.6% required surgery. Interestingly, only 24.3% of cases had complete resolution of symptoms according to the latest available medical record. This is consistent with other large sample vaccine AE monitoring programs where up to 81.2% of SIRVA reports indicated that the vaccine had been given "too high" and 86.6% had not experienced resolution at the time of report submission.[4] While be there may be sample selection bias given that patient with persistent symptoms may be more apt to report AEs to safety monitoring organization, this data suggest that, for many patients, nonoperative management may fail to resolve their symptoms in an expeditious manner.

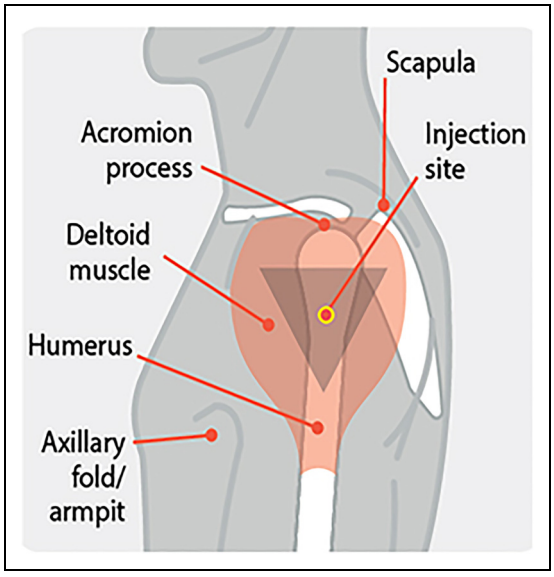

Figure 7. Intra-muscular deltoid injection location and technique - The correct injection site is approximately 2 inches below the acromion process and above the axillary fold/armpit. Providers should insert the needle at a 90-degree angle into the middle and thickest part of the muscle and inject all the vaccine. Image courtesy of the United States Center for Disease Control.

Although there are no established guidelines for treating SIRVA, most treatment initially involves some combination of oral anti-inflammatory and non-narcotic pain medications, corticosteroid injections, and range of motion exercises (to prevent development of adhesive capsulitis), and watchful observance. A case report of two military personnel treated with early corticosteroid injection after SIRVA had complete resolution of symptoms within 1 month.[11] A case report of SIRVA managed arthroscopically in a patient who had 3 months of persistent symptoms despite medical management showed similar efficacy with immediate improvement in shoulder symptoms.[11] While we did not send any tissue samples for gross or microscopic pathology analysis, surgeons considering surgical debridement for SIRVA may consider utilizing this diagnostic tool to better understand the underlying pathophysiology of this condition.

Conclusion

The COVID-19 vaccination is exceedingly safe and highly effective. Rarely, however, AEs such as SIRVA may occur. While nonoperative management remains the mainstay of SIRVA treatment, arthroscopic subacromial decompression for acute subacromial bursitis due to an aberrant injection site can result in rapid recovery and resumption of high-level activities.

Proper injection technique, emphasizing consistent patient positioning, injection entry site, and needle trajectory can decrease the risk of SIRVA after COVID-19 vaccination. Shoulder surgeons should be aware of this clinical entity and the available treatment options, including arthroscopic subacromial decompression.

Disclaimer

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Ethical considerations

IRB exempt

Declaration of Conflicting Interests

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