CASE REPORT

Arthroscopic Capsular Release for Refractory Frozen Shoulder after COVID-19 Vaccination : A Report of Two Cases

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Abstract : Background : Shoulder injury related to vaccine administration (SIRVA) has been discussed as a complication of incorrect intramuscular vaccination technique, resulting in subacromial/subdeltoid bursitis or injury of the anterior branch of the axillary or radial nerve. Case presentation : We have encountered two cases of frozen shoulder following COVID-19 vaccination. In both cases, arthroscopic capsular release was performed after failure of conservative treatment. Arthroscopy revealed severe synovitis in the glenohumeral joint characteristic of idiopathic frozen shoulder. Conclusions : In these two cases, the synovial inflammation was predominantly intra-articular, suggesting that the pathology of frozen shoulder secondary to SIRVA was different from that reported previously. Although the postoperative course was favorable in these two cases, early diagnosis and prompt therapeutic intervention are essential to prevent development of frozen shoulder after COVID-19 vaccination. J. Med. Invest. 72 : 459-462, August, 2025

Keywords **:** *Covid-19, Vaccine, SIRVA, frozen shoulder, arthroscopic capsular release*

INTRODUCTION

Shoulder injury related to vaccine administration (SIRVA) was first described in 2010 as prolonged shoulder pain and dysfunction following influenza or tetanus-containing vaccination into the deltoid muscle.(1) Since the start of the COVID-19 pandemic in 2019, the number of reported cases of SIRVA has increased as the number of vaccinations administered has increased worldwide.(2) Unintentional injection into the subdeltoid bursa as a consequence of inappropriate needle length and/or injection technique and subsequent immune-mediated inflammatory reaction have been reported as a possible cause of SIRVA. However, the exact pathology is not yet clear.(1)

Although there is no established treatment for SIRVA, conservative treatment is often effective, including non-steroidal anti-inflammatory drugs, oral steroids, cortisone injection, and physical therapy. Surgical intervention is rarely required. Only two cases of SIRVA following COVID-19 vaccination have been reported and both underwent arthroscopic bursectomy for subdeltoid bursitis.(3, 4)

In this report, we describe two cases of refractory frozen shoulder after COVID-19 vaccination that were successfully treated by arthroscopic capsular release. In both cases, arthroscopy revealed intra-articular synovitis characteristic of idiopathic frozen shoulder without obvious subacromial bursitis. Trained nurses correctly administered the vaccine into the deltoid muscle belly rather than the subacromial bursa in both cases, suggesting that the pathology of SIRVA in these cases may have been different from that previously reported.

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CASE PRESENTATIONS

Case 1

A 49-year-old right-handed female office worker developed pain in her left shoulder several hours after receiving her first COVID-19 vaccination (BNT162b2, BioNTech/Pfizer) in the ipsilateral shoulder. Four months after the vaccination, she was started on physical and medical therapy by an orthopedic clinic because of persistent pain and limited range of motion. Seven months later, she presented to our shoulder clinic after failure of conservative treatment. At her first visit, she complained of pain on movement and at night in her left shoulder. The range of motion at the shoulder was limited ; her passive elevation, abduction, and external rotation with the arm at the side and maximal vertebral level reached by the thumb (internal rotation) were 90°, 70°, 30°, and the L4 level, respectively. The Japanese Orthopaedic Association (JOA) score, Constant score, and American Shoulder and Elbow Surgeons (ASES) shoulder score were 63, 32, and 28, respectively. An anteroposterior plain radiograph showed a bone cyst in the greater tuberosity. (Fig. 1-a). There were no abnormal findings on magnetic resonance imaging (MRI), such as rotator cuff tear or subacromial bursitis (Fig. 1-b, 1-c). A preoperative laboratory evaluation showed the following : hemoglobin of 13.2 g/dL, white blood cell count of 9,100/μL, platelets of 33.2 × 104/μL, total protein of 6.9 g/dL, albumin of 4.1 g/dL, total bilirubin of 0.39 mg/dL, blood urea nitrogen of 15.4 mg/dL, creatinine of 0.72 mg/dL, and C-reactive protein of 0.02 mg/dL. A diagnosis of refractory frozen shoulder was made, and arthroscopic capsular release under general anesthesia was planned. Arthroscopic examination revealed significant synovitis around the glenohumeral joint (Fig. 2-a) but no specific bursitis in the subacromial bursa (Fig. 2-b). The rotator cuff was intact. The capsule was released circumferentially. The patient was permitted to start active and passive range of motion exercises immediately after the surgery. The nocturnal pain disappeared immediately after surgery and pain on movement resolved within a month. At the 12-month postoperative follow-up, her forward flexion, abduction, and neutral external and internal rotation respectively improved to 150°, 140°, 45°,

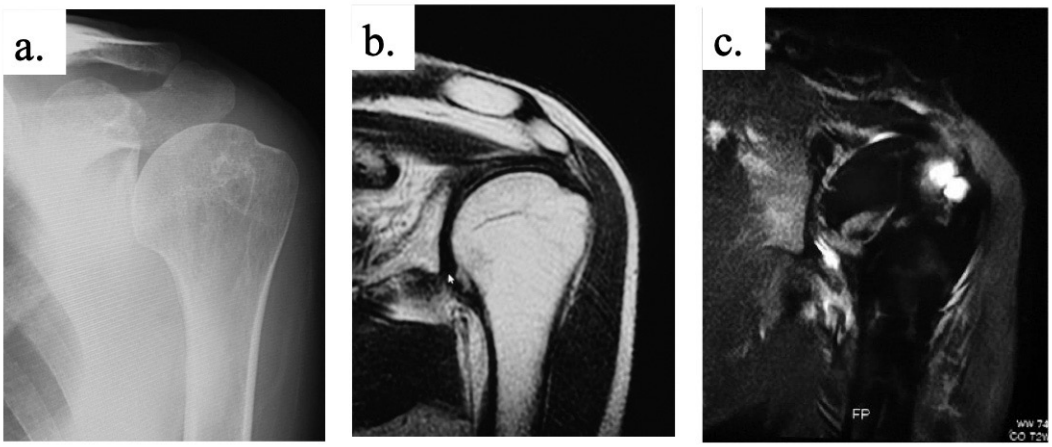

Figure 1. Preoperative imaging of the left shoulder in Case 1. Anteroposterior plain radiograph (a), coronal T2-weighted magnetic resonance image (b), and short tau inversion recovery image (c). A cystic lesion is present on all images. Magnetic resonance scans show no subacromial effusion or rotator cuff pathology.

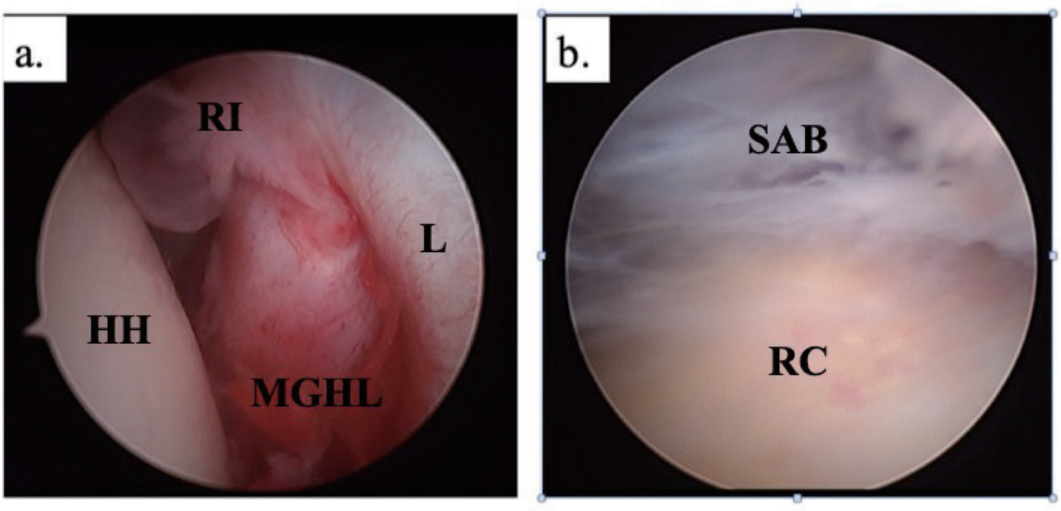

Figure 2. Arthroscopic view of the left shoulder from the posterior portal in Case 1 (left shoulder. Significant synovial redness is seen in the glenohumeral joint (a) but there is no specific bursitis in the subacromial bursa (b). The bursal surface of the supraspinatus tendon appears normal. HH ; humeral head, L ; labrum, RI ; rotator interval, MGHL ; middle gulenohumeral ligament, SAB ; subacromial bursa, RC ; rotator cuff.

and the T6 level. At that time, her JOA, Constant, and ASES scores had improved to 91, 88, and 91, respectively.

Case 2

A 51-year-old right-handed woman experienced acute pain after receiving her second dose of COVID-19 vaccine (BNT162b2, BioNTech/Pfizer) in the left shoulder. The pain persisted for 1 month, so she visited an orthopedic clinic. Conservative treatment, including two sets of steroid injections, did not relieve the left shoulder pain and range of motion was limited and interfering with her day-to-day life. She was referred to our shoulder clinic 6 months after onset. At the first visit, she complained of pain in her left shoulder at night and on movement. Her passive elevation, abduction, and external and internal rotation were 90°, 40°, 0°, and the gluteal level, respectively, and her JOA, Constant, and ASES scores were 58, 31, and 33. As in Case 1, the rotator cuff and subacromial bursa were intact on the preoperative MRI scans (Fig. 3-a, 3-b). A preoperative laboratory evaluation showed the following : hemoglobin of 13.5 g/dL, white blood cell count of 4,190/μL, platelets of 25.0 × 104/μL, total protein of 7.5 g/dL, albumin of 4.6 g/dL, total bilirubin of 0.49 mg/dL, blood urea nitrogen of 12.4 mg/dL, creatinine of 0.50 mg/dL, and C-reactive protein of 0.13 mg/dL. Arthroscopic capsular release was performed 1 month after the first visit to our clinic. Diagnostic arthroscopy detected significant synovitis in the glenohumeral joint, which is a typical finding for idiopathic frozen shoulder (Fig. 4-a). The subacromial space looked normal without rotator cuff pathology (Fig. 4-b). After diagnostic arthroscopy, circumferential capsular release was performed. The shoulder pain was relieved within a month postoperatively. At the 12-month postoperative visit, her active forward flexion, abduction, and external and internal rotation were 150°, 150°, 45°, and the T12 level, respectively. At this time, the JOA, Constant, and ASES scores had improved to 91, 78, and 90, respectively.

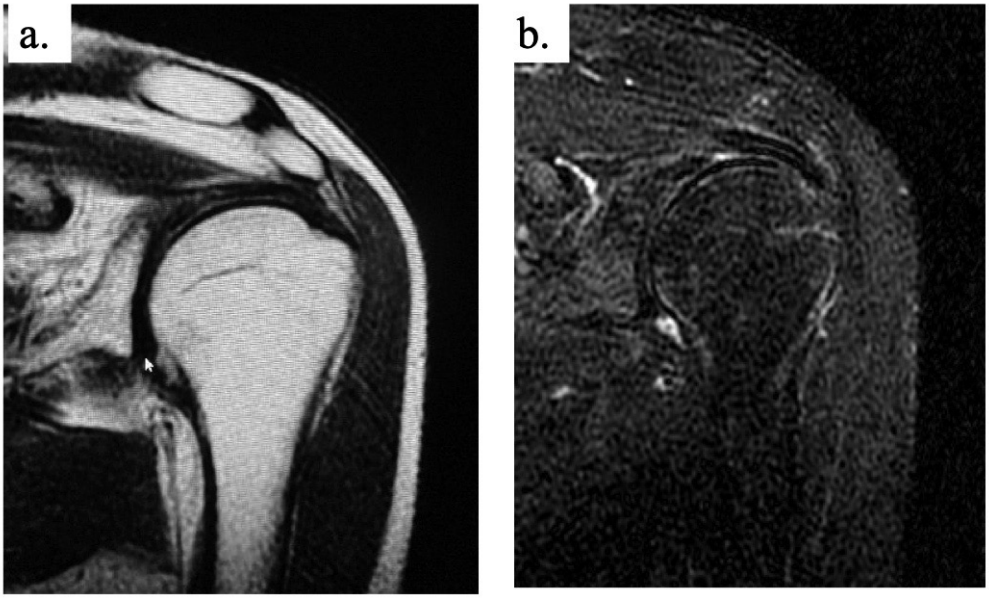

Figure 3. Preoperative imaging of the left shoulder in Case 2. As in Case 1, coronal T2-weighted (a) and short tau inversion recovery (b) magnetic resonance images show no rotator cuff tear or specific bursitis.

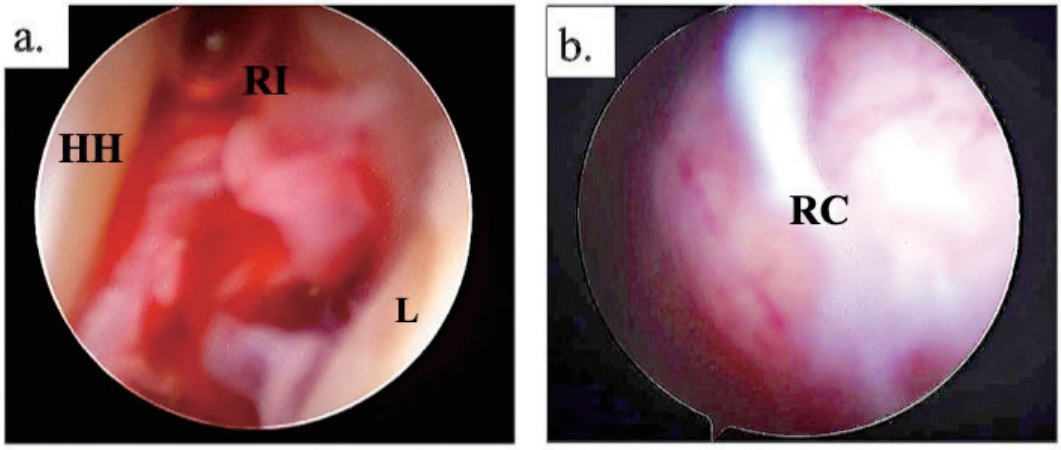

Figure 4. Arthroscopic findings in Case 2 (left shoulder from the posierior view). The glenohumeral joint shows significant synovial redness (a), but no specific inflammation is seen in the subacromial view from the posterolateral portal) (b). HH ; humeral head, L ; labrum, RI ; rotator interval, RC ; rotator cuff.

DISCUSSION

Vaccination is an effective and efficient way of preventing morbidity and mortality from a number of infectious diseases. In particular, vaccination has been reported to reduce the rates of severe illness, hospitalization, and mortality due to COVID-19.(5) In Japan, nationwide vaccination has been implemented since February 2021, and more than 80 percent of the Japanese population had received a second dose of COVID-19 vaccine as of March 2023.(6) SIRVA is a well-known entity, particularly with the influenza vaccine, but is not widely recognized in Japan, where the influenza vaccine is administered subcutaneously rather than intramuscularly, and the COVID-19 vaccine is the first to be delivered nationwide by intramuscular injection.

The pathophysiology of SIRVA has been considered to be inappropriate injection of vaccine into the subacromial bursa, resulting in bursitis.(1, 7, 8) Atanasoff *et al*. speculated that the risk of SIRVA could be reduced by careful selection of an appropriate injection site and needle length based on individual patient characteristics.(1) However, the two cases described in this report were vaccinated at an appropriate site in the deltoid by experienced nurses who were proficient in intramuscular injection. Therefore, injection into the subacromial bursa could be ruled out. Normal findings in the subacromial bursa on preoperative MRI and under arthroscopy also indicate that the vaccination procedure was correct in these cases.

Although most cases of SIRVA respond well to conservative treatment, some have required surgical intervention. Mayer *et al*. (3) reported a case of acute subacromial bursitis after COVID-19 vaccination as a result of incorrect vaccination technique in which The shoulder symptoms were relieved immediately by arthroscopic bursectomy. However, the glenohumeral joint

was not examined arthroscopically in that case. In another report, a case of acute septic arthritis after administration of the COVID-19 vaccine was treated by a combination of arthroscopic debridement and intravenous antibiotic therapy.(4) However, the arthroscopic findings were not described in detail. Wong *et al*. (9) reported a case of severe bursitis with bursal foreign body reaction that presented 12 weeks after administration of the influenza vaccine that was managed by arthroscopic subacromial bursectomy after failed conservative management. Furthermore, Hexter *et al*. (10) reported a case of glenohumeral synovitis resulting from inadvertent administration of influenza vaccine into the subacromial bursa, which was treated by arthroscopic synovectomy and joint debridement. The common feature in all the previous reports has been significant synovitis in the subacromial bursa, suggesting incorrect injection of the vaccine into the bursa.

This is the first report of arthroscopic capsular release for isolated glenohumeral pathology caused by SIRVA. In both cases, the arthroscopic findings were similar to those of idiopathic frozen shoulder and not characteristic of SIRVA with predominantly bursal pathology. Although the pathogenic mechanism of frozen shoulder is still not clear, an immune reaction at the injection site in response to the vaccination may trigger frozen shoulder secondary to SIRVA. Bulgen *et al*. (11) found that patients with frozen shoulder had increased levels of circulating immune complex and C-reactive protein and decreased lymphocyte transformation. They subsequently measured the serum immunoglobulin levels in these patients and found a significant reduction in their serum immunoglobulin A level.(11-13) These findings suggest an immune basis for this condition. Thompson *et al*. (14) reported a case of bilateral frozen shoulder caused by SIRVA, which also supports the theory of a systemic immune response to vaccination as a cause of SIRVA.

The COVID-19 pandemic seems to waning, and it may become a seasonal infectious disease like influenza. SIRVA may well be seen more frequently in the future with routine vaccination. Although most cases of SIRVA are caused by incorrect vaccination technique, the cases reported here indicate that education in correct vaccination technique cannot completely prevent SIRVA. The prognosis of SIRVA is good if conservative treatment such as oral prednisolone and physical therapy is performed early, but surgical intervention may be required if treatment is delayed. Clinicians should be aware of SIRVA as a rare complication of intramuscular vaccination and treat it promptly to prevent development of frozen shoulder.

CONCLUSION

We have encountered two cases in which arthroscopic capsular release was required for frozen shoulder caused by administration of a vaccine. In these two cases, the synovial inflammation was intra-articular without any signs of subacromial bursitis. Our cases suggest a pathology distinct from that of bursitis caused by injection of the vaccine directly into the subacromial bursa.

SOURCE(S) OF SUPPORT

None.

ETHICAL STATEMENT

Written informed consent was obtained from both patients for publication of this case report.

DECLARATION OF COMPETING INTEREST

The authors declare no competing interests.

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