

## CASE REPORT

# Shoulder Pain and Injury after COVID-19 Vaccination

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Shoulder injury related to vaccine administration (SIRVA) is a term given to describe shoulder pain and dysfunction arising within 48 hours after vaccine administration and lasting for more than one week. While SIRVA is most commonly seen after influenza and tetanus vaccines, there have been a few recent case reports describing SIRVA-like symptoms after COVID-19 vaccine administration. Two patients presented to the shoulder surgeon's practice center with complaints of shoulder stiffness and pain following the COVID-19 vaccine. The first patient was a 33-year-old man; he presented within 2 days of onset of the pain and 14 days from the vaccine date. He had a complete restriction of shoulder motion (0° flexion, and no external or internal rotation) at presentation. This patient was treated with non-steroidal anti-inflammatory drugs (NSAID) and rested in a sling for a week. The second patient was a 53-year-old woman; she presented with a 6-week duration of mild restriction of active shoulder motion and shoulder pain. Her magnetic resonance imaging (MRI) revealed the presence of subacromial-subdeltoid bursitis. She was treated with subacromial steroid injection and range of motion shoulder exercises. Both patients recovered a near-normal range of motion recovery within a month, and their pain improved significantly. The main lessons from this case report were: (1) patients presenting with a recent increase in pain and acute loss of shoulder movements after vaccination may be managed conservatively with rest and NSAID medications and (2) in case of a subacromial-subdeltoid bursitis in the MRI, subacromial injection of steroid may provide good pain relief.

## INTRODUCTION

Vaccination against SARS-CoV-2 (Severe Acute Respiratory Syndrome Coronavirus-2) has shown effectiveness in combatting severe infections and reducing hospitalizations. Many countries worldwide have an ongoing massive vaccination drive that aims to vaccinate a large proportion of their population at a rapid pace. The common side effects of the COVID-19 vaccine after an intramuscular injection may include transient mild pain, soreness, fever, and weakness for the initial 1-2 days [1]. Shoulder injury related to vaccine administration (SIR-

VA) refers to shoulder pain and stiffness arising after vaccine administration, most commonly seen after influenza and tetanus vaccines [2]. An inadvertent injection of the vaccine antigen in the subdeltoid bursa could lead to an inflammatory response. In some cases, a 1-inch needle could also reach the subacromial bursa and induce an inflammatory response due to pre-existing antibodies. Compensation claims related to SIRVA have steadily increased since the entity was first described in 2010 [2]. There are apprehensions that compensation claims after the COVID-19 vaccine may also increase because of the large-scale vaccination drive. However, only a few case

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Abbreviations: COVID-19, coronavirus disease 2019; MRI, magnetic resonance imaging; SIRVA, shoulder injury related to vaccine administration; VAS, visual analogue scale; ROM, range of motion.

Keywords: COVID-19, vaccine, SIRVA, shoulder pain

Author Contribution: DS contributed to the design, investigation and writing of the manuscript. The study received no funding.

reports have been published of any prolonged shoulder pain or dysfunction due to the vaccine [3,4]. Hence, compensation claims have not increased, and knowledge regarding any prolonged shoulder pain or dysfunction and the management of the problem is currently limited. Data regarding SIRVA and description of the potential causes behind the injury and of the treatment are needed for the education and awareness of the physicians. The purpose of this case report is to report two cases that presented with shoulder pain and restricted shoulder motion after the COVID-19 vaccination. Informed consent was obtained from both the patients for study participation and publication.

## CASE REPORTS

### Case 1

A 33-year-old man presented to the shoulder surgeon's practice with a 2-day history of complete loss of all shoulder motion and severe pain in his left shoulder. He had been administered intramuscular Covaxin® vaccine (inactivated whole virus vaccine, Bharat Biotech International Limited, India) [5] in the same shoulder 16 days earlier. The patient had complaints of rhinorrhea, nasal congestion, and cough for 3 days before the vaccine administration; however, immediately after the vaccine, he had a severe cold, cough, and fever that lasted for 8 days. The patient was never tested for SARS CoV-2 infection. He also had no prior history of shoulder injury or any shoulder surgery. Six days after his fever and cough subsided, he developed severe shoulder pain and shoulder stiffness. His pain score on the visual analogue scale (VAS) was 8 out of a maximum of 10. On physical examination, his shoulder forward flexion was 0°, and he could not internally or externally rotate at the shoulder joint. A shoulder strength examination was not possible at this stage because of loss of all movement and severe pain. Anteroposterior X-ray revealed calcification in the supraspinatus insertion area (Figure 1). He was treated by resting his upper limb in a shoulder sling and a non-steroidal anti-inflammatory drug (Naproxen 250 milligram twice daily) for 7 days. The patient was compliant with all the treatment recommendations. At a 7-day follow-up, he reported 90% relief in pain with an elevation of 160°, external rotation of 70° and internal rotation till twelfth thoracic vertebrae. After 1 month, he had no pain in the shoulder, and his range of shoulder motion was normal and identical to the opposite normal shoulder. Thus, he was considered to have a normal recovery.

### Case 2

A 53-year-old woman with diabetes presented with a 6-week history of left shoulder pain; her pain started

immediately after Covishield® vaccination (non-replicating viral vector type vaccine, Serum Institute of India) [5]. She had no prior history of any shoulder injury, disability, or other injury. Evaluation of her shoulder motion using a goniometer revealed that she had mild limitation of active and passive shoulder motion (as compared to opposite normal shoulder) (forward flexion 135°, normal side 160°; external rotation with elbow adducted 60°, opposite normal 90°; internal rotation till seventh thoracic vertebra both sides. Her pain score was 8 out of a maximum of 10 on the VAS pain scale. In view of the severe pain, a strength examination was not done. She had no abnormal findings on anteroposterior and axial radiographs. However, a magnetic resonance imaging (MRI) of her shoulder revealed the presence of subacromial and subdeltoid bursitis (Figure 2). She had received a short course (2 weeks) of NSAID medication already by her primary physician, but her pain symptoms had not improved. Therefore, we proceeded with a steroid injection (1 milliliter of 40 milligram triamcinolone mixed with 4 milliliter of 0.5% bupivacaine) in the subacromial space of the shoulder; her mild restriction was due to pain, and hence her motion improved transiently after the steroid injection. Thereafter, she reported 50% pain relief within a week and 90% pain relief within a month. A shoulder range of motion (ROM) examination revealed full ROM that was identical to the opposite normal shoulder (elevation 160°, external rotation with elbow adducted 60° and internal rotation till seventh vertebrae) after 1 month of follow-up. The patient was fully compliant with the treatment regimen.

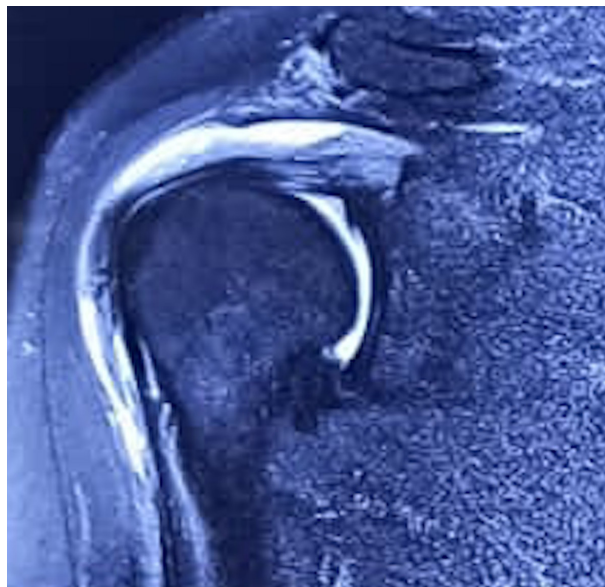
## DISCUSSION

The majority of the patients with SIRVA seek treatment from a musculoskeletal specialist and orthopedic surgeons [6]. Hence, a clinical description regarding shoulder injury and persistent pain after the COVID-19 vaccine are important for the physician's awareness. The first patient recovered completely with rest and NSAID medicines in our study. Before the vaccination event, this patient already had a mild cough and cold and developed severe symptoms of fever and cough post-vaccination that lasted for a week. Then, he presented to us with complete loss of all shoulder movements for 2 days. The pathology may have been an example of antibody-dependent enhancement. Earlier existing antibodies due to prior infection or another strain of coronavirus (pre-existing cold and cough symptoms) may have cross-reacted with the inadvertently injected antigen in the bursa. This may have increased the viral reproduction potential, and the antigen-antibody reaction may have produced enhanced symptoms [1]. His radiographs revealed the presence of supraspinatus calcification that may have existed even



**Figure 1. Case 1**—Anteroposterior X-ray of the shoulder showing calcification in the supraspinatus area (denoted by broken white arrow)

before the vaccination event. The overlying bursae may have had an inflammatory reaction to the vaccine antigen. It is recommended that a proper landmarking technique for vaccination in the deltoid muscle should be followed; the needle should be aimed in the center of the triangle formed by the acromion and deltoid muscle insertion [7]. A higher injection site may injure the underlying bursa, bone, or the nerve. An injection too far to the posterior side may injure the axillary nerve. A too short needle may introduce the antigen in the subcutaneous tissue while a too long needle may injure the underlying bursa. Thus, a correct length of the needle according to the individual's body habitus and weight should be chosen [8]. Patients who weigh less than 60 kilograms (kg) (132 lbs.) may be vaccinated with a 16-mm (5/8-inch) needle; while patients who weigh 60-70 kg (132-154 lbs.) may be vaccinated with a 25-mm (1-inch) needle. A 25-mm (1-inch) or 38-mm (1.5-inch) needle may be chosen for individuals who weigh more than 70 kg (154 lbs.). Several reports suggest that SIRVA stems from improper immunization techniques [2,3,9,10]. Therefore, these patients may develop SIRVA because of improper immunization techniques rather than because of the inherent properties of the vaccine itself. The second patient had been detected with subacromial and subdeltoid bursitis on MRI. Subacromial bursitis may develop due to the inflammatory reaction against the inadvertent antigen injection. The subdeltoid bursa communicates with the subacromial



**Figure 2. Case 2**—Magnetic resonance imaging of the shoulder: coronal section in T2 imaging protocol showing subacromial-subdeltoid bursitis (white area in T2 denotes inflammation)

bursa; and a vaccine antigen introduced in the subdeltoid bursa could potentially elicit an inflammatory response in the subacromial bursa also. Alternatively, a wrong technique of vaccination in the upper deltoid region, whereby the needle directly pierces the subacromial bursa that is deep to the deltoid muscle, could potentially lead to bursitis as well. There may be pre-existing antibodies in the surrounding peri-connective tissues that may react with the antigen leading to antigen-antibody complex and an acute inflammatory reaction that lasts for a few weeks. However, a steroid injection in the subacromial space is an effective treatment because it may act locally against the inflammation and improve pain symptoms. Our patient's symptoms (case 2) also improved after injecting steroids in the subacromial space. Some authors have advocated the use of steroid injection in subacromial space after SIRVA due to the influenza vaccine [11], while others have been uncertain about its effectiveness [9]. However, in our experience, subacromial steroids may be effective in improving pain symptoms if subacromial bursitis is detected in the MRI. MRI has not helped in diagnosing the pathology in SIRVA [11], but MRI may be a reasonable next step if the patient's symptoms persist beyond a few weeks, even after NSAID treatment.

SIRVA has been defined as any shoulder pain that starts within 48 hours after vaccine administration and that lasts for more than 7 days; it has been most frequently reported after influenza and tetanus vaccination [9]. Petitioners' (patients') complaints due to SIRVA under the National Vaccine Injury Compensation Program

(VICP) have steadily increased in the last 10 years [2]; this increase in the number of cases started after the first series of 13 patients was published by Atanasoff et al. in 2010 [9]. The patients' symptoms persisted for more than 6 months in their series. They reasoned that pre-existing antibodies could react to the vaccine antigen if the vaccine is inadvertently injected into the subacromial bursae. In a report published in 2020, the authors noted that the symptoms did not resolve in the large majority of the patients even at their last clinic visit, but many of the patients were seeking compensation and were disincentivized not to reveal the true nature and severity of their pain [2]. Subacromial bursitis after COVID-19 vaccines has been reported as case reports. In the earlier reports, bursitis developed after 8 weeks [4] (Oxford-AstraZeneca COVID-19 injection (Serum Institute of India, India)) and after 3 days [3] (Sinovac vaccination (Sinovac Biotech, China)) of COVID vaccine administration in two separate publications. In another case report [10], pain developed 3 hours after the vaccine (Oxford-AstraZeneca (Serum Institute of India, India)). Honarmand et al. reported 2 cases of subacromial-subdeltoid bursitis after Moderna's mRNA 1273 and Pfizer-BioNTech's BNT162b2 vaccine [12]. In their report, symptoms developed within 2 days after the vaccination, and resolved after a few days of oral steroids in the first patient; and symptoms developed 2 weeks after the vaccine and resolved within a few weeks with conservative therapy in the second patient. In our cases, symptoms developed after 2 weeks in the first case and immediately after the vaccination event in the second case.

Although SIRVA is defined as pain that develops within 48 hours after the vaccine event, this definition is for medicolegal purposes only, and shoulder dysfunction may occur a few weeks after the vaccine. Earlier authors have used oral steroids [4] and antibiotics [10], but we recommend local subacromial steroids because of good clinical benefits and fewer systematic side effects.

## CONCLUSION

To conclude, errors in vaccine administration may sometimes lead to local inflammatory reactions and subacromial bursitis. The best way to avoid such problems is to use proper techniques, especially in individuals with pre-existing cold and cough symptoms. Patients presenting with an acute and recent increase in pain and loss of shoulder movements after vaccination may be managed conservatively with rest and NSAID medications. After vaccine administration, shoulder pain and dysfunction due to local inflammatory pathology in the subacromial bursa should be recognized and treated early with subacromial steroids and NSAID medications.

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