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Prolonged shoulder dysfunction after coronavirus disease vaccination: A case of shoulder injury related to vaccine administration

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Abstract

Shoulder pain is a common symptom after intramuscular vaccination. However, only a few cases of shoulder joint injury have been reported after coronavirus disease 2019 vaccination. A 52-year-old woman experienced clinically significant pain in the left shoulder joint after receiving the first dose of a coronavirus disease 2019 vaccine. She neglected the shoulder pain, hoping that it would spontaneously improve without medical attention. However, the pain continued with obvious limitations in shoulder movement and function. After 8 months, she presented to the outpatient clinic with a frozen left shoulder. Such rare consequences of vaccinations, known as shoulder injury related to vaccine administration, can be prevented by using an appropriate needle gauge and length according to the patient's sex and weight with the correct injection site away from shoulder structures.

Keywords

Coronavirus disease, vaccination, frozen shoulder, shoulder injury related to vaccine administration

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Introduction

Shoulder pain is a common short-term symptom after intramuscular vaccination. If it continues for more than 48 h, shoulder injury related to vaccine administration (SIRVA) should be considered.[1,2] SIRVA usually results from injection-related errors, such as incorrect needle size, needle direction, site of injection, or depth of penetration. Mechanistically, it apparently occurs when injection of antigenic material into the synovial tissues causes an immune-mediated inflammatory reaction that may be improved by using oral analgesics and physiotherapy.[3]

Two years after the coronavirus disease 2019 (COVID-19) pandemic started, COVID-19 vaccines are now widely administered worldwide. To date, only a limited number of cases have reported shoulder joint injuries after COVID-19 vaccination. These cases include a 51-year-old Thai woman with severe right shoulder pain 3 h following injection of the Oxford/AstraZeneca vaccine,[4] a 52-year-old Thai man with right shoulder pain 3 days following injection of the Sinovac vaccine,[5] and a 61-year-old woman with right shoulder pain within half an hour of injection of the Oxford-AstraZeneca vaccine.[6] Two additional cases involved health care workers: a 42-year-old right-handed man who developed severe left shoulder pain within 2 days after receiving the first dose of Moderna's mRNA 1273 vaccine, and a 38-year-old right-handed man who developed severe left shoulder pain 2 weeks after receiving the second dose of the Pfizer/BioNTech vaccine (BNT162b2).[7]

In this article, a case of a Saudi female patient presenting with prolonged SIRVA after the first dose of the Oxford/AstraZeneca COVID-19 vaccine is reported.

Case presentation

A 52-year-old Saudi woman not known to have any degree of shoulder pain or shoulder-related complaints received the Oxford/AstraZeneca COVID-19 vaccine in her left shoulder.

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A 25-gauge needle, 1 inch in length, was used by the nurse for vaccination. With a weight of 58 kg and a body mass index of 22.9 kg/m^2, the patient was lean and physically fit. She had no major medical history or allergies that she was aware of. One day after vaccination, her left shoulder became painful and rigid, with limited movement and significant dysfunction that hindered her usual daily activity, especially overhead activities. Patient denied history of any other trauma or increase in body temperature during the course of this complaint.

The patient ignored the pain with the expectation of spontaneous relief. However, the pain persisted for 8 months, at which time she visited the outpatient clinic. By examination, there was a marked decrease in passive and active abduction of the left compared with the right shoulder, and limited flexion and internal and external rotation of the left shoulder joint. The rest of motor and neurological examinations were normal. Magnetic resonance imaging (MRI) revealed synovial capsule thickening with mild adhesive capsulitis (frozen shoulder) (Figures 1 and 2). The patient was diagnosed with SIRVA and was started on common non-steroidal anti-inflammatory drugs and physical therapy, with satisfactory improvement achieved.

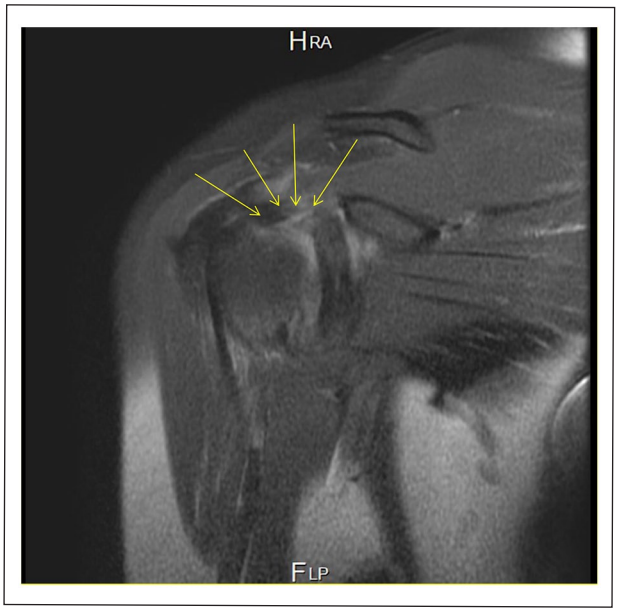

Figure 1. Magnetic resonance imaging of the left shoulder showing synovial capsule thickening.

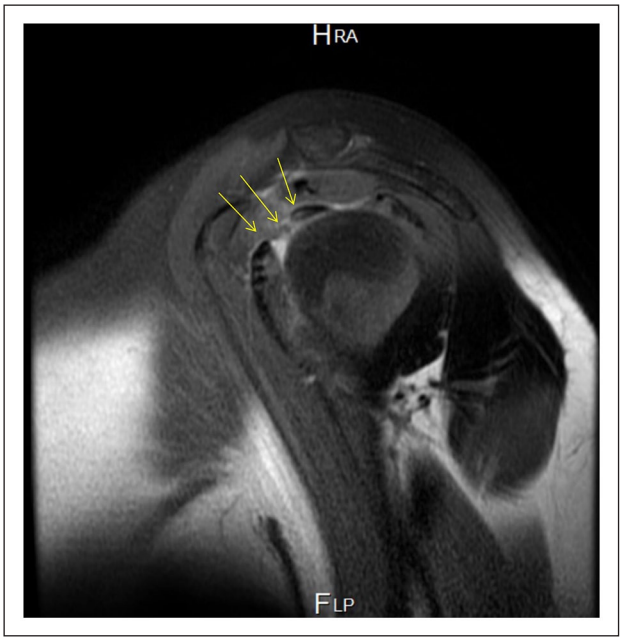

Figure 2. Magnetic resonance imaging of the left shoulder showing soft tissue thickening of the rotator interval.

Discussion

Table 1 presents the summary of coronavirus disease vaccination case reports involving SIRVA. In this case, the rapid onset of pain after intramuscular vaccine administration in a patient with no prior history of chronic pain or inflammatory diseases in the affected shoulder, combined with findings consistent with a local immune-mediated inflammatory reaction, led to the diagnosis of SIRVA. The key to detecting SIRVA is noting when the pain begins (generally within 48 h after vaccination) and how long it lasts (often for months). Associated symptoms include weakness and reduced movement that do not resolve spontaneously or respond to common analgesics.

During the COVID-19 pandemic, millions of vaccinations for the prevention of COVID-19 were administered to adults worldwide.[8] As of 18 February 2021, the COVID-19 vaccine from Oxford/AstraZeneca (ZD1222) has been approved by the Saudi Food and Drug Authority from three production sites: EU Nodes, Serum Institute of India, and South Korea Bio.[9] A qualified vaccinator should provide this vaccine in two doses as an intramuscular injection, ideally into the deltoid muscle. Tenderness (63.7%) and discomfort (54.2%) at the injection site are the most reported adverse effects of Oxford/AstraZeneca COVID-19 vaccination, which may affect more than 1 in 10 people. The most prevalent adverse musculoskeletal effects recorded are myalgia (44.0%) and arthralgia (26.4%).[10] The majority of side effects recorded during clinical trials were mild to moderate; most disappeared within a few days, although some lingered up to a week following vaccination. Adverse reactions were milder and less common following the second versus the first dose.[10]

Shoulder stiffness can be primary (idiopathic) or secondary (caused by other factors). It is referred to as secondary when a recognized precursor produces shoulder discomfort and eventual general stiffness. Rotator cuff lesions are one of the most prevalent causes of secondary stiffness. Age, diabetes, heart ailments, lung problems, neurological issues, and

Table 1. Summary of coronavirus disease vaccination case reports involving shoulder injury related to vaccine administration.

Author	Year	Patient	COVID-19 vaccine	Findings
Chuaychoosakoon et al.[5]	2021	52-year-old Thai man	Sinovac	Right shoulder pain and fever 3 days after vaccination
Boonsri and Chuaychoosakoon[4]	2021	51-year-old Thai woman	Oxford/AstraZeneca	Severe right shoulder pain 3 h after vaccination, with subacromial-subdeltoid bursitis and a supraspinatus tendon tear
Honarmand et al.[7]	2021	42-year-old man	Moderna's mRNA 1273 vaccine, 1st dose	Severe left shoulder pain within 2 days after vaccination
		38-year-old man	Pfizer/BioNTech, 2nd dose	Severe left shoulder pain after 2 weeks after vaccination
Cantarelli Rodrigues et al.[6]	2021	61-year-old woman	Oxford/AstraZeneca, 1st dose	Excruciating pain and tenderness at right shoulder within 30 min after vaccination

trauma are all risk factors for both primary and secondary shoulder stiffness.[11]

Ernest Codman first coined the phrase "frozen shoulder," describing it as "difficult to define, treat, and explain from the view of pathology."[11] Like rotator cuff lesions and arthritis, frozen shoulder can present with shoulder stiffness and discomfort; however, unlike the other two, it lacks radiological abnormalities. The joint spaces in frozen shoulder are normal, but shoulder mobility is restricted and uncomfortable owing to an irritated and constricted joint capsule. In view of these considerations, the diagnosis of frozen shoulder (adhesive capsulitis) is exclusionary: clinical presentation of shoulder stiffness and discomfort with no radiographic, laboratory, or history evidence supporting other diseases.[12]

Since frozen shoulder is a diagnosis of exclusion, other diagnoses should be ruled out. In this case, negative MRI scans ruled out rotator cuff tears. However, MRI at a later time revealed minor abnormalities, which were also observed in multiple other studies, as described by Paul J. Cagle in a systematic review of shoulder injury after vaccination.[13]

The possible reason for shoulder stiffness in this case is injury due to incorrect needle penetration and/or an immunological response to the vaccine content. Based on the thickness of the deltoid fat pad, as assessed via ultrasound, a 1-inch needle should be used for men, and a 5/8-, 1-, and 1.5-inch needle should be used for women weighing less than 60, 60–90, and more than 90 kg, respectively.[14] A correlation between persistent shoulder pain after vaccination and needle size was observed by Atanasoff et al.[3] in 13 case series. The effect of needle length at vaccination and risk of shoulder injury was also discussed by Lippert and Wall[15] for pediatric patients and by Cook et al.[16] for elderly patients. Multiple studies have addressed the role of injections high in the shoulder joint (less than 3 cm from the lateral edge of the acromion) in causing SIRVA.[13]

Conclusion

In conclusion, this study demonstrated the need to evaluate shoulder discomfort following immunization. Future research is needed to identify the vaccination standards (needle size and anatomical site of injection) that best prevent SIRVA. This is especially important when vaccinations are performed in mass, as are COVID-19 vaccinations.

Declaration of conflicting interests

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Ethics approval

Our institution does not require ethical approval for reporting individual cases or case series.

Informed consent

Written informed consent was obtained from the patient for her anonymized information to be published in this article.

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