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Case Report

Shoulder Pain Related to Covid-19 Vaccine Administration: A Case Study from a Physiotherapy Perspective

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Abstract

Background: Shoulder injury related to vaccine administration (SIRVA) is a significant musculoskeletal issue that causes shoulder pain and disabilities and leads to low productivity and poor quality of life. Physiotherapy is one of the treatments of SIRVA; however, there is limited evidence in this area. This case study is therefore aimed at providing a better understanding of physiotherapy management of SIRVA.

Method: This is a single case report of a patient with SIRVA that was treated with education and advice on scapular retraction during elevation, pendulum exercises, isometric exercises, supported and unsupported shoulder movements. These exercises were performed slowly in pain-free range, 2 × 5 repetitions, 3 times per day and 4 - 5 times per week.

Results: Baseline shoulder pain (VAS) and SPADI scores were 8 (out of 10) and 87% respectively. At 3-month follow-up, the patient made significant improvements with pain resolved 0 (out of 10), achieved normal shoulder movements restored and he could perform his shoulder daily activities such as lying on it and lifting pain free.

Conclusion: This study has shown that using evidence based conservative treatment improves clinical outcomes of SIRVA at 3 months. However, further randomised control trial is needed to provide long term effectiveness.

Keywords: *SIRVA; Covid-19 Vaccine; Shoulder Pain; Rotator Cuff Tendinopathy; Physiotherapy*

Introduction

Shoulder injury related to vaccine administration (SIRVA) is a significant musculoskeletal issue that causes shoulder pain and disabilities during lifting, reaching and lying on the injected arm [1]. It also leads to low productivity and poor quality of life. The term SIRVA was first coined by Atanasoff., *et al*. [2] following their study of 13 cohorts with shoulder injury due to post-vaccination. MacMahon., *et al*. [3] in a recent systematic defined SIRVA as an immune-mediated inflammatory response to a vaccine injection in the territary of the subacromial bursae or synovium, leading to shoulder pain and loss of function. However, the authors concluded that there is currently no concrete evidence supporting the theory of an immune-mediated inflammatory response to vaccine antigens. Although COVID-19 vaccine injection side effects include transient mild pain, soreness, muscle ache, feeling tired and fever that lasts usually for 1 or 2 days [4], there are cases where participants symptoms persisted for more than 6 months [2]. Some of the vaccination-related shoulder dysfunctions

reported by shoulder studies include subacromial bursitis, rotator cuff tendinopathies, adhesive capsulitis, subcortical bone osteitis, and fluid accumulation in the deltoid [2,5-8]. Some authors [1], have argued that SIRVA is due to lack of proper needling techniques of the vaccine injection into the subdeltoid or shoulder joint, which triggers inflammatory response to the tissues in the shoulder region. Klabklay., *et al*. [9] attributes poor vaccination techniques to lack of identification of landmarks, or incorrect needle positioning and/or depth of needle penetration. Physiotherapy is common in the treatment of SIRVA [1,3] however, there is a lack of comprehensive formation on it. This case study is therefore aimed at providing a better understanding of the management of SIRVA from a physiotherapy stand-point.

Case Presentation

A male, 54 years of age, developed severe reactive left shoulder pain, with loss of shoulder range of movement and function few days after receiving a pneumococcal 23-variant vaccine in the left deltoid region. He was injected with COVID-19 vaccine (mRNA) in the same region about 9 days before receiving the antipneumonia vaccine. His past medical history included allergic rhinoconjunctivitis, irritable bowel syndrome and vitamin D deficiency. Clinical examination revealed severe tenderness in the left superior-lateral arm (See figure 1) with limited and painful active and passive ranges of motion. He described a catching sensation around the attachment of rotator cuff tendons during 90 degrees elevation of the left shoulder. He tested positive to Neers, Hawkins-Kennedy and painful arc sign tests. Neurovascular examination of the left shoulder and arm were normal, however, he had loss of muscle power - 4/5 in the left shoulder and arm. He had no cardiopulmonary, constitution or other red flag symptoms.

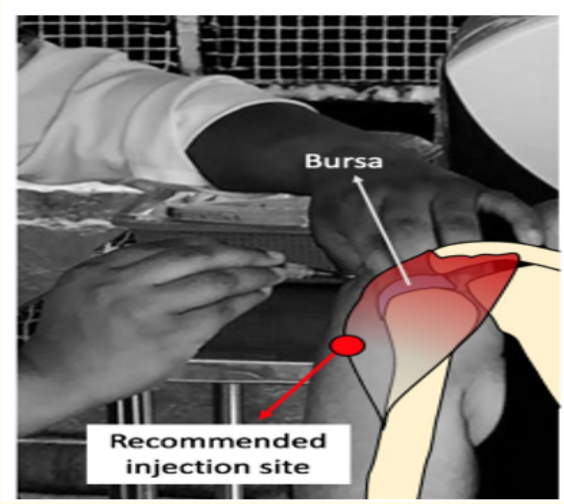

Figure 1: *Recommended site for Covid-19 injection.*

Biochemical evaluation was unremarkable including white cell count. X-ray of the left shoulder was normal, with alignment well maintained, no fractures, no gross soft tissue abnormalities and the articular surface of the shoulder joint was smooth (Figure 2). Ultrasound guided injection was performed under aseptic technique with lidocaine 5 mL, 50 mg Kenalog into the left glenohumeral joint via posterior portal. The ultrasound scan of the left shoulder (Figure 3) showed that the rotator cuff tendons - supraspinatus, infraspinatus, subscapularis tendons including the long head of biceps tendon were intact. There was no glenohumeral joint effusion or subacromial subdeltoid bursitis. The posterior labrum was grossly unremarkable with no sizable paralabral cyst. The acromioclavicular joint was within normal limits. However, there was limited external rotation, and mild distention of the biceps tendon sheath most likely indicating adhesive cap-

sulitis/frozen shoulder. The sonogragher suggested that the patient might benefit from fluoroscopic guided steroid injection and distention in addition to physiotherapy.

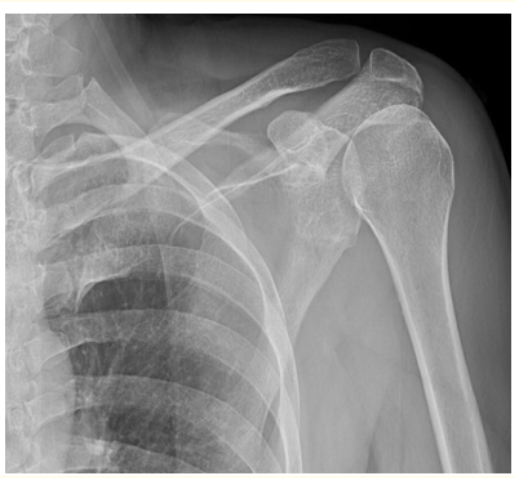

Figure 2: *Anterioposterior (AP) plain radiographs of the patient left shoulder joint that was normal.*

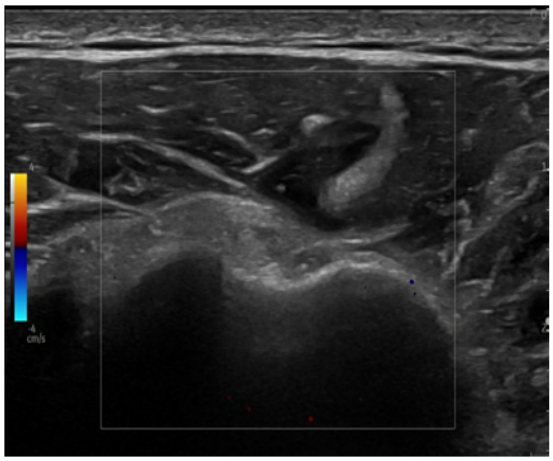

Figure 3: *Ultrasound left shoulder showed there was limited external rotation, and mild distention of the biceps tendon sheath most likely indicating adhesive capsulitis/frozen shoulder.*

Physiotherapy approach

The physiotherapy treatment was based on the work of Lewis., *et al*. [10] on the management of reactive tendinopathy. These included education and advice on the potential pathoanatomical correlation between the patient's diagnosis and the COVID-19 injection, relative

rest to reduce rotator cuff tendon loading, use of pain relief modalities such as acupuncture. Others were Codman pendulum exercises to maintain existing ranges of shoulder movements, isometric exercises in direction of symptoms, biomechanical unloaded interventions - supported short-lever shoulder movements such as sliding forward/backward, external rotation with forearm supported on a surface at an angle of 45 degrees in pain-free range) and shoulder symptom modification techniques such as scapular retraction during elevation. These exercises were performed slowly in pain-free range, 2 × 5 repetitions, 3 times per day (3 - 5 minutes of rest between repetitions) and 4 - 5 times per week from baseline to 4 weeks follow-up. At 6 weeks follow-up, the patient reported that he was able to load the shoulder tendons by performing active long-lever shoulder movements in a pain free range with no irritation. Therefore, he advised to progress to unsupported shoulder flexion, external rotation and horizontal abduction using red color resistance band in standing and side lying. He was advised to exercise in pain to 5/10 VAS within the limits of their tolerance [11]. At 12 weeks follow-up, the patient reported that he had regained full function of their shoulder and were able to perform their normal daily activities pain-free; therefore, the patient was advised to continue as normal.

Results

At baseline, the patient's left shoulder pain was 10/10 VAS, and the shoulder pain disability index (SPADI) score was 92.3%. At 4 weeks post intervention the patient's symptoms were slightly reduced; he reported a pain score of 8/10 VAS and the SPADI score was 87%. However, at 6 weeks follow-up, the patient made significant improvements with pain decreased to 2/10 VAS, and the SPADI score reduced to 11.5%. At 12 weeks follow-up the patient returned to his baseline shoulder functions and could complete his daily activities such as lifting and lying on it pain free (See table 1 and figure 4).

Measures	Week 0	Week 4	Week 6	Week 12
Visual Analogue Scale (VAS) (0 - 10)	10	8	2	0
SPADI score (0 - 100%)	92.3	87	11.5	0

Table 1: *VAS and SPADI baseline and outcome measures at week 0, 2, 4, 6 and 12.*

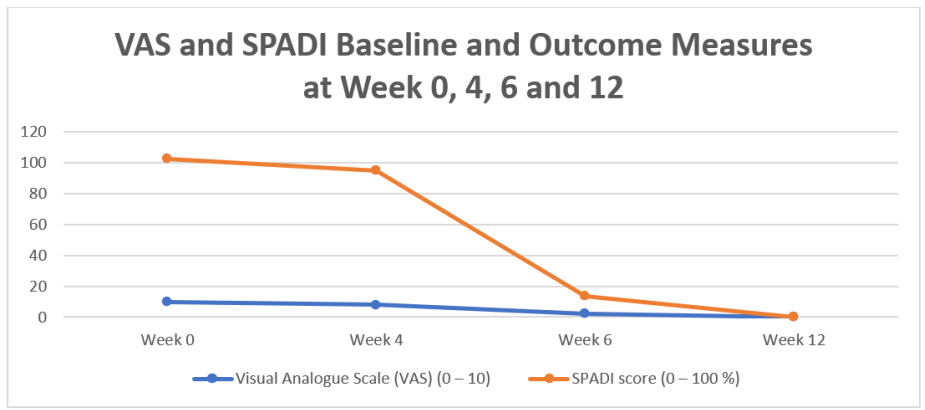

Figure 4: *VAS and SPADI baseline and outcome measures at week 0, 4, 6 and 12.*

Discussion

This is a single case study of a patient with reactive inflammatory left shoulder pain and dysfunction following a COVID-19 injection. The relationship between vaccine injection into soft tissues of the shoulder and possibility of developing inflammatory conditions of the shoulder such as reactive rotator cuff tendinopathy and adhesive capsulities has been well reported in the literature [1]. However, to-date there is no exact understanding of the pathoaetiology of this link because there is insufficient confirmatory experimental evidence [3], therefore on-going scientific inquiry is necessary. Various theories have been proposed to explain the association between the inflammatory conditions of the shoulder and vaccination. These include improper needling of vaccine into the subdeltoid bursa or shoulder joint, thin body habitus, small deltoid muscle bulk and female gender [1,6]. However, injection technique is a modifiable risk factor if the vaccine is administered properly using measures such as adequate exposure, correct patient positioning, accurate anatomical landmarks and appropriate needle lengths [1]. In this case study, the participant had thin body habitus and small deltoid muscle bulk. We are unable to confirm if the needling technique was proper or not.

The study demonstrates that physiotherapy management of reactive inflammatory rotator cuff related shoulder pain and adhesive capsulitis - (without the typical frozening of the shoulder capsule) using evidence based guidance such as those suggested by Lewis., *et al*. [10] is successful at improving shoulder clinical outcomes such as reduced pain and improved function. These include education and advice, relative rest to reduce rotator cuff tendon loading, use of pain relief modalities, biomechanical unloading and loading of shoulder interventions, as well as shoulder symptom modification techniques.

Several qualitative studies involving shoulder patients [12-14], have shown that patients who received individual education and advice concerning their condition not only improved but also achieved self efficacy. For example, a qualitative study that investigated the experiences of participants with primary adhesive capsulitis found that participants were more satisfied about the outcome of their treatment because of the information and advice they received regarding their problem [15]. While it is important to provide a shoulder pain patient with information and advice regarding their problem, it is also vital to take into account the benefits that lifestyle changes (stress, smoking, diet sleep hygiene) have on treatment outcomes [16]. Evidence exists that dietary control has the potential to improve tendon healing and symptoms [17], however, smoking has detrimental effects on rotator cuff tendons [18]. The patient in our study was a non-smoker, but we could not establish his nutritional status.

In this single case study, load reduction, together with pain relieving modalities and manual therapy were considered key strategies in the management of reactive shoulder tendinopathy in order to reduce pain, restore movement and function. This is supported by previous work of Lewis., *et al*. [10] and Lewis [19]. However, these management approaches for symptomatic rotator cuff tendon rehabilitation, require rigorous further scientific investigation such as randomised control trial to prove their long term effectiveness. The patient was given isometric shoulder and arm contraction to facilitate the contraction of scapulothoracic muscles in order to provide stabilisation of the scapular and static control of rotator cuff tendons [19,20]. Evidence suggests that sustained isometric contractions performed in the direction of the pain and weakness may help to alleviate shoulder pain [21,22]. After performing unloaded (supported) interventions, biomechanical re-loading of the shoulder was performed in a controlled and graduated manner using scapular and scapulohumeral (deltoid and rotator cuff) strengthening exercises in flexion/extension and external rotation to improve motor control and function [23]. Holmgren., *et al*. [11] in a study of the effect of specific exercise strategy in patients with subacromial impingement syndrome recommended that these exercises are performed up to a pain level of 5/10 VAS (where 10 represented maximal pain) [24].

Conclusion

SIRVA such as reactive rotator cuff tendinopathy and adhesive capsulitis are possible complications of COVID-19 vaccine adminstration. Further scientific enquiry is needed to establish the pathogenesis link between vaccine injection into the shoulder and inflammation of the soft tissues of the shoulder. Using evidence based treatment guidance has shown to improve the clinical outcomes of SIRVA with

significant reduction in shoulder pain and improved movement and function. We advice caution in the interpretation of the findings of this study because it is a single case, however, serves a motivation for future studies, particularly when it is difficult to conduct experimental studies such as randomised controlled trial.

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Contributors

Both CO and KSS conceived and managed the study. CO was the clinical consultant and guarantor for the study. CO and KSS contributed to the design of the study. CO collected the data and provided additional important input on all drafts. All authors contributed to the re-drafts of the manuscript.

Ethical Approval

Not required, but publication approval was received from the Officer of Research Affairs with approval number 2235096.

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Conflict of Interests

The authors have declared that no competing interests exist.

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