



Vaccine Administration Leading to Subacromial Bursitis

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Abstract

Shoulder injury related to vaccine administration (SIRVA) describes the condition of injury to the shoulder joint after incorrect or inaccurate placement of intramuscular injections intended for the deltoid muscle. Vaccine placement inherently carry multiple risks given the vasculature, neural intervention and anatomy of the shoulder joint.

We present a patient that presented with a chief complaint of left shoulder pain occurring for two months. This patient failed conservative management with non-steroidal anti-inflammatory drugs and oral steroids which were recommended by his primary care physician. He was ultimately referred to orthopedics given his lack of improvement and persistence of pain with active range of motion and overhead movements. After significant work up including history taking, physical examination and imaging this patient was diagnosed with SIRVA. This patient was treated successfully with subacromial cortisone injection with complete resolution of his symptomatology.

Our aim with this case is to urge clinicians to maintain a high index of suspicion for SIRVA in individuals presenting for acute shoulder pain. It is important to consider recent administration of vaccines through a thorough history and physical exam in order to accurately diagnose SIRVA in patients. This is especially true with the increased prevalence of vaccinations against COVID-19 which we will see in the upcoming months.

Keywords: Vaccine; Subacromial Bursitis; Shoulder Injury Related to Vaccine Administration (SIRVA)

Background

Vaccine Administration has improved drastically in the past year given the widespread availability of COVID-19 vaccination. As of August 2021, almost 4.5 billion COVID-19 vaccinations have been administered globally [6]. Given the increased number of vaccine administrations, it follows that the possibility of SIRVA inherently increases as well. A review of the Health Resources and Services Administration data demonstrated that COVID-19 vaccination alone does not account for all cases of shoulder injury re-

lated to vaccine administration. Specifically, these include influenza vaccination tetanus vaccination and several other routine vaccinations that take place on an annual basis.

Vaccinations into the deltoid inherently carry their own risks which range from nerve damage, injection site reaction and shoulder injury related to vaccine administration (SIRVA). This has typically been defined as acute shoulder pain 48 hours following vaccine administration to the deltoid [9]. Oftentimes SIRVA is related to injection into the subacromial space and routine administration

into the deltoid muscle, leading to shoulder pain, inflammation and weakness [1]. Our aim with this case is to demonstrate an apparent case of SIRVA, its diagnosis and management. We review the differential diagnosis, and initial approach to management.

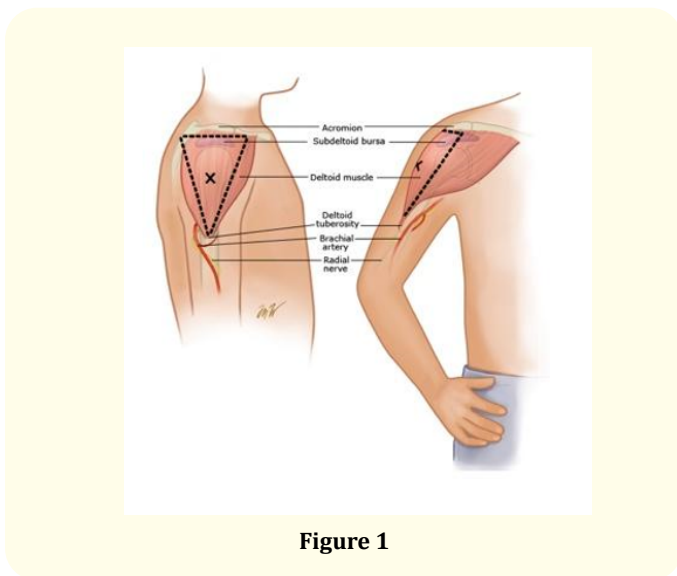


Figure 1

Case Presentation

We present a 66-year-old male with a past medical history of hyperlipidemia and congestive heart failure who presented to the sports medicine clinic for evaluation of left shoulder pain. Two months prior he received an influenza vaccine into the left shoulder with onset of shoulder pain five hours later. His primary care provider initially managed the shoulder pain with an oral steroid regimen and non-steroidal anti-inflammatory drugs with minimal improvement.

Upon presentation to the sports medicine clinic, the patient described a 7 out of 10, constant throbbing pain localized to the anterior lateral aspect of his shoulder. Our initial approach to this patient was to take a detailed history of any inciting events as well as aggravating or alleviating factors which may be contributing to shoulder pain. Next physical exam included a gross examination of the joint to identify any deformities, muscle atrophy or muscle imbalances as well as an array of special tests to help generate a differential. Finally, we utilized radiographic studies in order to identify any acute fracture, dislocations or signs of impingement.

Initially, the history revealed that the patient had received an influenza vaccination to the left shoulder and began to have an aching pain five hours after vaccine administration. We utilized a numerical scale in order to characterize the patient's pain level for which he stated that his pain was 7 out of 10. The patient stated that his pain was worsened with overhead movements and while he was sleeping on the affected joint. He denied any weakness or stiffness in the left upper extremity. Of note he did complain of a tingling sensation on and off in the left upper extremity.

Next on the physical exam, the initial inspection of the patient's left shoulder demonstrated no gross deformities or overlying erythema. There was no tenderness to palpation over the sternoclavicular joint, clavicle, acromioclavicular joint, acromion or bicipital groove. Range of motion was intact in all directions with pain at the extremes of motion. The patient was taken into forward flexion (to 90 degrees) at the left shoulder which elicited pain which suggested signs of impingement by the Neer's test (Table 1). Similarly, when the patient's left shoulder was flexed up to 90 degrees and elbow joint was flexed to 90 degrees, internal rotation at the joint also led to pain indicative of a positive Hawkin's. Patient had further range of motion testing against resisted shoulder abduction, adduction and extension which did not reproduce pain which indicated the rotator cuff muscle integrity was still intact.

Special Testing	Result
O'Brien	Negative
Hawkin's Impingement Test	Positive
Neer's Impingement Test	Positive
Speeds Test	Negative
Empty Can Test	Negative

Table 1: Physical exam findings.

Finally, our diagnostic imaging of choice was x-ray of the left shoulder joint. We evaluated the left shoulder in the internal rotation, external rotation maxillary and scapular Y views of the shoulder. After reviewing the imaging there was no signs of acute fracture or dislocation; however, we were able to identify moderate degenerative changes of the acromioclavicular joint.

Ultimately our assessment of the patient was subacromial bursitis of the left shoulder secondary to influenza vaccination which

may have been inadvertently administered into the subacromial space which triggered an inflammatory process. Some of the treatment options that were discussed with the patient included continued oral medication therapy, physical therapy and subacromial cortisone injection. Initially, patients can be trialed on oral medications such as non-steroidal anti-inflammatory, acetaminophen or steroids. The use of oral medications may just be providing temporary pain relief and not adequately addressing the underlying cause of the patient’s symptomatology. Given that this patient failed these conservative measures in the past, he elected for more aggressive management. We offered the patient a cortisone injection into the subacromial space and explained to him that this would decrease the inflammation in the area. Multiple case studies have highlighted success with cortisone injection as a treatment for SIRVA. The benefits of this treatment option are the relative low cost of cortisone injections, low risk especially when done under ultrasound guided technique and overall tolerability of this procedure. Oftentimes patients have immediate relief of their shoulder pain within 24 hours of injection, the importance of this being that these injections can both be diagnostic and therapeutic for the patient. Furthermore, secondary to pain in the shoulder joint, individuals may be limiting their range of motion over the course of weeks to months. We believe these patients can benefit from physical therapy afterwards to help recover range of motion and address any underlying adhesive capsulitis that may have started developing.

Outcome and follow-up

The patient was reevaluated three weeks later after receiving subacromial cortisone injection. He reported his shoulder pain resolved with no residual pain. He was able to perform overhead activities and sleep in any position without pain. On re-examination Hawkin’s and Neer’s exams were negative, and no longer had pain with rotator cuff testing (Table 2).

Special Test	Before Cortisone Injection	After Cortisone Injection
O’Briens	Negative	Negative
Hawkin’s Impingement Test	Positive	Negative
Neer’s Impingement Test	Positive	Negative
Speed’s Test	Negative	Negative
Empty Can Test	Negative	Negative

Table 2: Physical exam findings before and after cortisone injection.

Discussion

Our aim with this case is to urge clinicians to maintain a high index of suspicion for SIRVA in individuals presenting for acute shoulder pain. It is important to consider recent administration of vaccines through a thorough history and physical exam in order to accurately diagnose SIRVA in patients. This is especially true with the increased prevalence of vaccinations against COVID-19 which we will see in the upcoming months.

Shoulder injury related to vaccine administration may result due to error in vaccine delivery at a site other than the deltoid muscle alone [8]. Though vaccines may result in acute shoulder pain, SIRVA constitutes persistent pain that may lead to decreased range of motion and strength at the shoulder joint. In one review of the vaccine adverse event reporting system from 2010 to 2017 86% of adverse events related to SIRVA were a result of the vaccination being inappropriately administered above the deltoid muscle. Another study published in the Annals of Internal Medicine examined two million patients receiving the influenza vaccine between 2016 and 2017 [5]. In this study, the median age of patients affected by subacromial bursitis was 57, 69% of those being women [11]. The attributable risk was 7.78 with a confidence interval of 2.19 to 13.38 per one million persons [6]. Several cases have been documented via PubMed search which demonstrate SIRVA may be related to immune response of the host to foreign antigens being inappropriately administered to the subacromial space.

SIRVA can cause injury to multiple parts of the shoulder joint and surrounding tissues. Specifically, the vaccine that would be administered into subacromial bursa can cause an inflammatory response leading to adhesive capsulitis and even biceps tendonitis. It is important to identify those affected by SIRVA early to allow for prompt treatment with non-steroidal anti-inflammatory drugs, physical therapy and corticosteroids.

One case in particular documented photographs of an elderly woman receiving a COVID-19 vaccination directly into the subacromial bursa rather than the deltoid muscle [3]. This case, through photographic evidence further supports that to those inexperienced with vaccine administration, they could be inadvertently delivering vaccines to the unintended anatomic locations. That case is also one of the first documented reports of SIRVA following COVID-19 vaccination. This leads us to expect further reports of

SIRVA following the continuing number of mass vaccinations that are occurring on a global basis.

Many factors may contribute to the incidence of SIRVA. Anatomical variations may lead to increased chances of misplacing the injection [2]. Individuals with less adipose tissue around the deltoid may allow for the injector to better localize landmarks and decrease chances of inappropriate vaccination administration. We must take into account that the ultimate cause of SIRVA is human-error and it is generally a preventable entity. It may be mitigated with proper exposure of the joint, identifying landmarks prior to injection, identifying the deltoid muscle and taking special care to avoid the bursa. Another option is to use image guidance during the procedure such as ultrasound. Some urge avoiding vaccine administration within the upper third of the deltoid muscle to decrease the chances of SIRVA. It is important to consider needle size when performing intramuscular injection as 22 to 25 gauge needles are recommended to properly inject and avoid damage to the underlying muscle [4].

The most common vaccines that result in SIRVA were found to be inactivated influenza and pneumococcal. This however may be confounded by the fact these vaccines are more widely administered and for influenza administered on an annual basis.

In the initial work up of SIRVA, it is important to rule out acute and maybe life-threatening pathology. This can include ruling out shoulder dislocation, fracture, septic joint, cervical radiculopathy, thoracic outlet syndrome and multiple other diagnoses. Both a detailed history and physical exam are vital to the correct diagnosis of SIRVA.

It is important to elicit from the patient history if there is a history of vaccination administration in the days or months leading up to the onset of the patient's shoulder pain. Other historical clues that are vital in the initial work up are chronicity of the shoulder pain, occupational risk, recent trauma and associated symptoms. History taking is a vital step in diagnosing SIRVA, as a proper history can help rule out other diagnoses that may be more likely given the patient's history.

Additionally, a detailed physical examination is important to correctly diagnose SIRVA. Initial inspection of the shoulder should include examination of both shoulders exposed to identify any gross deformities, rashes, lesions or signs of erythema. Active and

passive range of motion and strength testing bilaterally is important to assess the patient's shoulder function. Special testing can aid in diagnosing pathology. Neer's and Hawkins signs can help identify shoulder impingement, O'Briens labral pathology and Speeds biceps tendon involvement [8].

Diagnostic testing should begin with x-rays. X-rays of the shoulder are simple, cost-effective and have low radiation burden which can provide useful information in ruling in and out multiple diagnoses [7]. We recommend internal and external rotation views, maxillary and scapular Y views. Ultrasound of the shoulder may be useful in identifying subacromial bursa thickening and can be done in an office setting by an experienced clinician. MRI of the shoulder may be required if pain persists and further imaging is clinically indicated.

The initial management of SIRVA may include a trial of non-steroidal anti-inflammatory medications to decrease inflammation and pain. Physical therapy is important to restore range of motion and strengthen the rotator cuff and surrounding musculature. Patients may be offered corticosteroid injection to decrease subacromial inflammation [8]. It is important to have the patient in a seated position with the forearm placed in the lap to increase the subacromial space. Either a lateral approach below the lateral acromial border or posterior approach below the posterolateral aspect of the acromion would be appropriate. After successful injection to the subacromial bursa, patients should be encouraged to perform range of motion exercises to preserve function.

With the continued increase in vaccine administration that we will see in the upcoming months and years, this area is important to study. Specifically, creating a protocol that can help better identify anatomy to avoid inappropriate placement of vaccines. This would help to improve the efficacy of these vaccines to ensure they fully penetrate the intended areas as well as decrease the number of SIRVA cases. It may also be helpful to study other management strategies to understand the best course of action from those experiencing bursitis like symptoms after vaccination.

Conclusion

Our aim with this case is to urge clinicians to maintain a high index of suspicion for SIRVA in individuals presenting for acute shoulder pain. It is important to consider recent administration of vaccines through a thorough history and physical exam in order to

accurately diagnose SIRVA in patients. This is especially true with the increased prevalence of vaccinations against COVID-19 which we will see in the upcoming months.

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