Treating SIRVA Early With Corticosteroid Injections: A Case Series

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ABSTRACT Shoulder injury related to vaccine administration (SIRVA) is defined as “shoulder pain with limited range of motion within 48 hours after vaccine receipt in individuals with no prior history of pain, inflammation, or dysfunction of the affected shoulder before vaccine administration.” Corticosteroid injections (CSIs) have been proposed as a reasonable treatment modality for SIRVA, although evidence regarding efficacy is scanty. In this case series, we present two patients diagnosed with SIRVA who received CSI within 5 days of symptom onset and saw symptom resolution within 1 month. This is in comparison to a Centers for Disease Control and Prevention report that showed 65% of patients with SIRVA will have pain lasting longer than 1 month, and 25% will have pain lasting longer than 3 months. Our case series shows that CSIs may be an effective treatment modality for SIRVA. It would be reasonable to use CSIs as a first line treatment and should especially be considered in patients who have contraindications to nonsteroidal anti-inflammatory drugs.

INTRODUCTION Shoulder injury related to vaccine administration (SIRVA) is defined by the National Vaccine Injury Compensation Program (VICP) as “shoulder pain with limited range of motion (ROM) within 48 hours after vaccine receipt in individuals with no prior history of pain, inflammation, or dysfunction of the affected shoulder before vaccine administration.” Although an infrequent complication of immunizations, the number of SIRVA cases reported is increasing. In FY2013 there were 504 claims brought before the Vaccine Injury Compensation Program, and in FY2017 there were 1243 cases.1 SIRVA can have a significant impact on quality of life and job performance. Patients often suffer from severe pain that may cause prolonged inability to use the shoulder.2 Corticosteroid injections (CSIs) have been proposed as a reasonable treatment modality, although evidence regarding efficacy is scanty.

In this case series, we present two patients that were diagnosed with SIRVA at the Defense Health Agency: Immunizations Healthcare Branch. Both patients received an intraarticular steroid injection within 5 days of symptom onset, and both patients saw symptom resolution within 1 month following CSI.

CASES The first case involved a 69-year-old woman who presented to the immunization clinic with right shoulder pain and difficulty raising her right arm the day after receiving the 23-valent pneumococcal polysaccharide vaccine into the right upper arm. She previously received the pneumococcal polysaccharide vaccine 8 years prior without any adverse reactions. Her medical history included asthma, prediabetes, nonobstructive coronary artery disease, hypothyroidism, osteopenia, and bilateral knee osteoarthritis. She had no prior history of shoulder dysfunction. Physical exam revealed limited ROM and tenderness of the right shoulder; no swelling, erythema, warmth, or fever. She was treated initially with nonsteroidal anti-inflammatory drugs and referred to physical therapy. She returned 2 days later with increasing pain and significantly decreased ROM. She received a 40 mg injection of triamcinolone to the subdeltoid bursa under ultrasound guidance. This was 4 days after receiving the pneumococcal polysaccharide vaccine. At a follow-up appointment 1 month later, she was pain free and had both subjective and objective improvement in ROM.

The second case involved an 84 year old man who presented to the immunization clinic with left shoulder pain and stiffness. His symptoms had started 12 hours after receiving an injection of the recombinant zoster vaccine to the left upper arm 3 days before presentation. This was his first recombinant zoster vaccine before this presentation, but he had received the live zoster vaccine 11 years prior without serious adverse events. His medical history was significant for hypertension, chronic kidney disease stage IV, gout, and type II diabetes. He had no prior history of shoulder dysfunction and was an avid golfer. Physical exam revealed diffuse tenderness of the left shoulder and pain-limited active and passive ROM; no swelling, erythema, warmth, or fever was present. Nonsteroidal anti-inflammatory drugs were contraindicated because of the patient’s chronic kidney disease, so it was decided that CSI would be the best treatment modality, in
addition to Tylenol and physical therapy. He received a 40 mg injection of triamcinolone to the subacromial bursa via poste-
rior shoulder injection 5 days after receiving the recombinant zoster vaccine. At a follow up appointment 1 month later, he was asymptomatic. It is notable that he did not attend physical therapy as his symptoms had resolved.

**DISCUSSION**

The most widely accepted theory regarding the pathogenesis of SIRVA is that vaccine intended to be administered intra-
muscularly is improperly injected into the subdeltoid bursa, leading to a robust inflammatory and immune response within the subdeltoid bursa.³ This theory was first proposed by Bodor and Montalvo, who used ultrasound to measure the depth and location of the subdeltoid bursa in two patients with SIRVA and in 21 healthy controls. They found the bursa to be located between 0.8 cm and 1.6 cm below the skin surface, a depth that is easily penetrated by the standard one inch (2.54 cm) needle. Since the subdeltoid bursa is contiguous with the subacromial bursa, it is reasonable to expect inflammation within the bursa to cause a wide array of shoulder pathology including bursitis (both subacromial and subdeltoid), tendonitis, and adhesive capsulitis.

SIRVA is not unique to specific vaccines. In one series, influenza vaccine accounted for 62% of cases, Td for 15%, Tdap 15%, and HPV 8%, mirroring the frequency with which these vaccines are administered.⁴ In our series, one patient had a reaction with the pneumococcal polysaccharide vaccine that contains purified capsular polysaccharide antigens and phenol as a preservative and no adjuvant. The other patient had a reaction with the new Herpes Zoster subunit vaccine containing recombinant glycoprotein E and the novel adjuvant AS01. Although individual contributions from each of these vaccine components towards the local inflammation seen in our patients are difficult to tease out, these vaccines and others were developed for their immunogenicity and, therefore, are known to provoke an immune response.

Given that SIRVA likely involves an inflammatory and immune response within the subdeltoid bursa and/or subacromial bursa, direct instillation of corticosteroids to the bursa is a logical treatment modality. However, studies supporting the use of CSI in SIRVA present suggestive but insufficient data. The two patients presented by Bodor and Montalvo seemed to improve (one rapidly) with CSI into the suspect bursae, and one patient presented by Cook had resolution of symptoms within 1 month after CSI.⁵,⁶ In Atanasoff’s series, however, the response to (presumed intraarticular, although not clear) CSI was less well defined and less impressive.⁴ Both of our own patients received CSI within 5 days of vaccination, and both patients had resolution of symptoms in less than 1 month. This is in comparison to Shimabukuro’s Centers for Disease Control and Prevention report that showed 65% of 859 patients with SIRVA had pain lasting over 1 month, and 25% of patients had pain lasting longer than 3 months.⁶ Although a small sample size, the two cases we present suggest that timely CSI to the subacromial bursa after SIRVA is an effective modality of treatment. No adverse events were noted in our case series. Triamcinolone is approved by the Food and Drug Administration for intra-articular injection of acute synovitis and has a relatively low side effect profile. In each case, the risks and benefits should be weighed.

Although the focus of this report is on the treatment of SIRVA, it is important to note that with proper vaccine admin-
istration technique, this condition is entirely preventable. A study published in 2011 evaluated various anthropometric values including height, weight, upper arm length, deltoid muscle length, and distance between the mid acromion to a line drawn laterally from the apex of the anterior axilla in 536 patients.⁷ The author of this study concluded that “selection of the site midway between the acromion and the deltoid tuberosity with the arm abducted to 60° is a safe site for intramuscular vaccination.”⁷ The author went on to suggest a protocol for safe vaccine administration that involved “the vaccinee placing their hand on the ipsilateral hip, with the vaccinator placing the index finger on the acromion and the thumb on the deltoid tuberosity and administering the vaccine at the mid-point between these anatomical landmarks.”⁷ A recently published review article in 2018 supported an alternative technique where the vaccinator injects two to three finger widths below the acromion process at a 90° angle and chooses a needle length based on the patient’s weight and gender (rather than choosing a 1 inch needle for every patient).⁸ Although there are no randomized controlled trials evaluating these proposed techniques with the incidence of SIRVA, it is reasonable to conclude that SIRVA could be prevented if these techniques are followed precisely, as they make it next to impossible for injection to occur into the shoulder capsule.

In conclusion, SIRVA is a cause of debilitating shoulder pain and limited ROM occurring within 48 hours after vaccine receipt. It remains a relatively rare cause of shoulder pain and dysfunction, but one that is becoming more frequently reported. SIRVA does not occur unless the vaccine is mis-
akenly administered into the shoulder capsule, so vaccinators should be mindful of relevant shoulder anatomy, and can follow specific techniques to reduce the risk of injuring the patient.⁷,⁸ Our case series suggests that intra-articular triamcinolone injection may be an effective treatment for this condition. It would be reasonable to use CSI as an initial treatment modality and should especially be considered in patients who have contraindications to nonsteroidal anti-inflammatory drugs or who have not responded to them. Larger, randomized, placebo controlled trials are needed to further demonstrate safety and efficacy.

**CONFLICT OF INTEREST**

The authors declare no conflict of interest.
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