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Short communication

Vaccination-related shoulder dysfunction

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Abstract

We present two cases of shoulder pain and weakness following influenza and pneumococcal vaccine injections provided high into the deltoid muscle. Based on ultrasound measurements, we hypothesize that vaccine injected into the subdeltoid bursa caused a periarticular inflammatory response, subacromial bursitis, bicipital tendonitis and adhesive capsulitis. Resolution of symptoms followed corticosteroid injections to the subacromial space, bicipital tendon sheath and glenohumeral joint, followed by physical therapy. We conclude that the upper third of the deltoid muscle should not be used for vaccine injections, and the diagnosis of vaccination-related shoulder dysfunction should be considered in patients presenting with shoulder pain following a vaccination.

Keywords: Vaccination; Shoulder; Adhesive capsulitis; Bursitis; Bicipital tendinitis; Vaccine; Influenza; Pneumococcal; Triamcinolone

Shoulder pain is a common musculoskeletal problem with an annual incidence of 1–2% among those aged 40–45 years and a 26% prevalence among those over the age of 65 [1]. Vaccinations for influenza and pneumococcus are also common, with approximately 50% of the US population over the age of 65 having received an annual influenza vaccination in 2003 and 30% having received a pneumococcal vaccination [2]. Thus, the presentation of shoulder pain and dysfunction other than muscle soreness shortly after a vaccination is likely to be attributed to coincidence.

We present two cases of shoulder and arm pain, weakness and loss of range of motion following influenza and pneumococcal vaccine injections, whose similarities suggest a causal relationship via a common mechanism.

1. Case 1

A healthy 71-year-old woman received a pneumococcal vaccine injection (Pneumovax, Merck) high into the right deltoid muscle at a local pharmacy. Within 2 days her shoulder began to hurt and she had difficulty moving her arm. She took a dose of acetaminophen and a dose of ibuprofen with no relief. She saw her family physician, who diagnosed her with subacromial bursitis. She declined a corticosteroid injection and was referred to physical therapy.

Five months later she continued to have shoulder and arm pain and weakness. Her daughter, a neurologist, raised the possibility of brachial plexopathy and advised an electrodiagnostic consultation.

On physical examination, she was a pleasant lady who appeared younger than her stated age and had markedly decreased glenohumeral and slightly increased scapulothoracic range of motion. She was tender to palpation below the posterior edge of the acromion, at the bicipital tendon, at the anterior glenohumeral joint and the trapezius muscle. Her strength was 4/5 grade for shoulder abduction, internal and external rotation, elbow flexion and extension. Her sensation was slightly reduced for pin-prick in the right thumb, index and middle fingers. The bilateral biceps, triceps and brachioradialis reflexes were normal.

Nerve conduction studies and electromyography revealed a mild carpal tunnel syndrome, with median latencies of 4.7 ms (peak) sensory, 5.1 ms motor, normal amplitudes, and a skin temperature of 31.6 °C at the dorsum of the right hand.

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There was no electrodiagnostic evidence of a right upper extremity radiculopathy, plexopathy or other neuropathy.

We diagnosed her with adhesive capsulitis or frozen shoulder. She initially agreed to diagnostic lidocaine 2% (2% Lidocaine HCl, multiple-dose, Hospira, Inc.) injections provided sequentially several minutes apart as follows: (1) 4 ml to the subacromial space via a posterolateral approach with 20% pain relief; (2) 4 ml to the glenohumeral joint using an anterior approach with 60% cumulative pain relief; and (3) 2 ml to the bicipital tendon sheath using 8–16 MHz ultrasound guidance (Diasus, Dynamic Imaging) with 100% cumulative pain relief.

A week later after discussing it with her daughter, she agreed to triamcinolone acetonide 40 mg/ml 1 ml (Kenalog-40, Bristol-Myers Squibb) mixed with lidocaine 2% 9 ml (2% Lidocaine HCl, multiple-dose, Hospira, Inc.) injections to the same sites. Four weeks later and following renewed physical therapy, she reported no pain in her shoulder and her active range of motion had improved from 120° to 140° flexion, 85° to 130° abduction, 45° to 70° external rotation, and 55° to 80° internal rotation. Six months later she remained pain free.

2. Case 2

A healthy 89-year-old man was provided with an influenza vaccine injection (Fluzone, Aventis Pasteur) high into the right deltoid muscle by a visiting health care worker. Within 2 days, he experienced severe right shoulder pain and loss of range of motion. Although he had experienced some mild occasional shoulder pain in the past, he never had severe pain or loss of range of motion.

He took acetaminophen to relieve some of his pain, but did not seek medical help until 2 months later when he developed numbness in his forearm. His internist referred him to an orthopedic surgeon, who provided him with a subacromial corticosteroid injection that relieved approximately half of his pain and sent him for an electrodiagnostic consultation.

On physical examination, he was a thin man with moderate weakness (3/5 grade) for shoulder abduction and elbow flexion, and severely reduced range of motion. Sensation was slightly decreased to pin-prick in the right thumb and radial forearm. Tenderness was present to palpation of the bicipital tendon at the intertrochanteric sulcus. Radiographs of the shoulder and cervical spine showed mild degenerative changes. Electrodiagnostic studies showed no evidence of a right upper extremity radiculopathy, plexopathy or other neuropathy.

We diagnosed him with bicipital tendonitis, subacromial bursitis and a mild C6 sensory radiculopathy. We provided him with an injection of triamcinolone acetonide 40 mg/ml 1 ml (Kenalog-40, Bristol-Myers Squibb) mixed with lidocaine 2% 2 ml (2% Lidocaine HCl, multiple-dose, Hospira, Inc.) next to the bicipital tendon at the intertrochanteric sulcus of the humerus using 8–16 MHz ultrasound guidance (Diasus, Dynamic Imaging). Within several minutes of this injection he reported complete resolution of his shoulder pain.

Four weeks later following physical therapy, he reported very little shoulder pain, and his active shoulder range of motion improved from 100° to 170° abduction, 95° to 150° flexion, and 45° to 80° external rotation, while his shoulder abduction and elbow flexion strength improved from 3/5 to 4/5 grade.

A month later, he still had some shoulder pain. We thus provided him with a third corticosteroid injection with triamcinolone acetonide 40 mg/ml 1 ml (Kenalog-40, Bristol-Myers Squibb) mixed with lidocaine 2% 2 ml (2% Lidocaine HCl, multiple-dose, Hospira, Inc.) using an anterior approach to the glenohumeral joint. Within several minutes of this injection he reported complete resolution of pain. One month later he remained pain free.

3. Discussion

In comparing the two cases, we note some interesting similarities. First of all, both patients reported receiving injections high into the deltoid muscle, within a centimeter or two of the acromion.

We researched the length and type of needles used, noting them to be 1 in. (2.5 cm) and #23 and #25 gauge. Then using 8–16 MHz ultrasound (Diasus, Dynamic Imaging), we measured how far the subdeltoid bursa extended distally from the acromion in each patient, noting this to be 3.5 cm for our female and 4.0 cm for our male patient. We also measured the skin to subdeltoid bursa distance in each patient, noting this to be 1.3 cm for our female and 0.6 cm for our male patient.

For comparison, we made similar measurements in 21 normal healthy volunteers, ranging in age from 23 to 65 (average 41.7, S.D. 13.8), consisting of 7 men and 14 women, whose height ranged from 152 to 193 cm (average 170, S.D. 10), and body mass index from 19 to 31 kg/m^2 (mean 25, S.D. 4.1).

We defined the subdeltoid bursa as being located in the potential space between the deltoid muscle and supraspinatus tendon extending from the acromion to the insertion of the supraspinatus tendon at the anatomical neck of the humerus. Based on this definition, our measurements of the extent of the subacromial bursa ranged from 3.0 to 6.0 cm (mean 4.1, S.D. 1.0) in our subjects, although in many the bursa was visible as a hypoechoic line extending farther than this by a centimeter or more. Our measurements of the skin to subacromial bursa depth ranged from 0.8 to 1.6 cm (mean 1.1, S.D. 0.3).

We hypothesize that in both of our two cases vaccine was injected into the subdeltoid bursa, causing a robust local immune and inflammatory response. Given that the subdeltoid bursa is contiguous with the subacromial bursa, this led to subacromial bursitis, bicipital tendonitis, and inflammation of the shoulder capsule.

In the first patient, this resulted in adhesive capsulitis or frozen shoulder. In the second patient, this resulted in a simi-

lar moderate to severe reduction of shoulder range of motion, and both patients experienced moderate pain.

A second similarity between patients is that in both cases the problem involved multiple shoulder structures – the subacromial space, the bicipital tendon and the glenohumeral joint – requiring multiple injections for all pain to resolve, consistent with a primary inflammatory etiology rather than a mechanical overuse problem.

Although there have been reports of rare neurologic sequelae and autoimmune arthritis following vaccinations [3], we are unaware of any describing isolated shoulder bursitis, bicipital tendonitis or adhesive capsulitis. We cannot say whether this is a rare or common occurrence, but can say that in our community of 70,000 we have heard of two similar cases, including one in a young construction worker.

We hope that in the future influenza and pneumococcal vaccination guidelines will specify that injections should not be performed in the upper third of the deltoid muscle. Furthermore, we hope that the diagnosis of vaccination-related shoulder dysfunction, consisting of subacromial bursitis, bicipital tendonitis and adhesive capsulitis, be considered in patients presenting with shoulder pain and weakness following a vaccine injection.

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