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Management of glenohumeral synovitis secondary to influenza vaccination*

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Abstract

Glenohumeral synovitis is a rare complication of vaccination that can lead to shoulder dysfunction and prolonged pain. We report a case of florid glenohumeral synovitis after routine influenza vaccination, which we consider to have occurred because of the unintentional injection of antigenic material into synovial tissues, resulting in an immune-mediated inflammatory reaction. We provide a review of the literature for this condition and describe an invasive management approach, providing, for the first time, an arthroscopic evaluation and histopathological analysis.

Keywords

Adhesive capsulitis, bursitis, glenohumeral synovitis, shoulder, vaccination

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Introduction

Local adverse reactions of vaccination include pain, swelling and redness at the site of injection. Recently, cases have emerged where vaccination administration has led to prolonged shoulder pain and dysfunction[1–5] and a relationship between vaccine administration and inflammation of the structures underlying the deltoid muscle has been formally established.[2,4] We report a case of glenohumeral synovitis secondary to influenza vaccination and describe a novel approach to its management in the form of arthroscopic intervention. A review of the literature is presented in relation to this rare vaccine-related injury of unknown incidence.

Case report

A 50-year-old, right-handed lady underwent routine influenza vaccination at her general practice service in October 2013. She had no significant past medical, family or drug history. The vaccine was given into her left deltoid muscle. This shoulder was previously pain-free and had a full range of movement. During administration of the vaccine, she felt severe pain in the left shoulder radiating down the upper arm. The patient and her general practitioner (GP) agreed that the vaccination had been given 'too high'. The shoulder pain persisted for weeks and limited her activities of daily living, to the extent that it prevented her from being able to work as a teaching assistant. After several presentations to her GP, a referral was made to orthopaedic services. In January 2014, she presented to the shoulder clinic with a tense, swollen and tender left shoulder. Examination of the left shoulder demonstrated a painful and limited range of active and passive movement, consistent with adhesive capsulitis. Rotator cuff testing was painful but revealed no weakness. Neck examination was normal and no focal neurology was present. Plain film radiograph of the left shoulder (Figure 1) showed no bone or joint abnormality. Magnetic resonance imaging (MRI) of the cervical spine showed minor degenerative changes. MRI of the left shoulder revealed a considerable subacromial and subdeltoid bursitis, with a significant amount of fluid present in the subacromial space (Figure 2). There was no evidence of full-thickness rotator cuff tendon tear but there was

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some supraspinatus tendinopathy with intrasubstance tearing. Focal bone marrow oedema-like signal changes were seen within the humeral head.

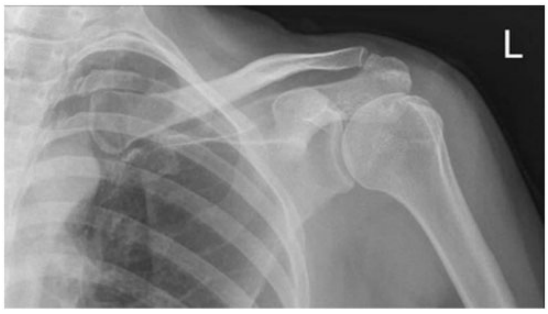

Figure 1. A normal anteroposterior radiograph of the patient's left shoulder (5 weeks after vaccination).

In March 2014 (5 months after vaccination), the patient was taken to theatre for examination under anaesthetic (EUA), with a view to proceed to arthroscopy of the shoulder, if indicated. She was still symptomatic on the day of surgery. EUA revealed a limitation of passive glenohumeral movements to 90° of forward flexion and abduction and external rotation only reaching neutral. Arthroscopy revealed a thickening of the middle glenohumeral and coracohumeral ligaments, a partial-thickness tear of the supraspinatus and extensive synovitis throughout the glenohumeral joint (Figure 3). Evaluation of the subacromial space revealed bursitis with A2 B2 impingement (according to the Copeland–Levy Classification).[6] Biopsies of the glenohumeral synovial tissue were taken, followed by synovectomy of all inflamed tissue. Arthroscopic arthrolysis of the contracted ligaments and joint washout were undertaken before subacromial decompression with bursectomy and anterior third

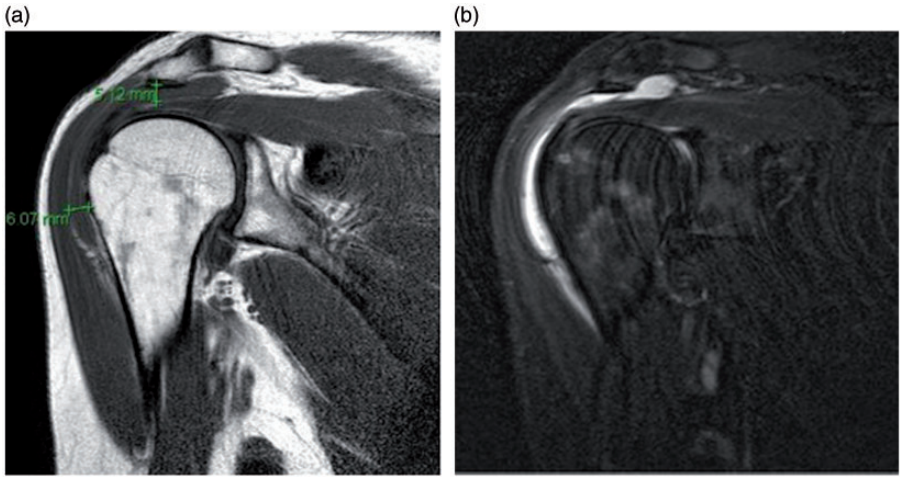

Figure 2. (a) A T1 magnetic resonance imaging (MRI) scan of the left shoulder, 7 weeks after vaccination. This demonstrates the subacromial and subdeltoid bursitis, which has been marked with the measurement tool. (b) A T2 MRI scan of the left shoulder, 7 weeks after vaccination. Here, the fluid-filled bursa appears white.

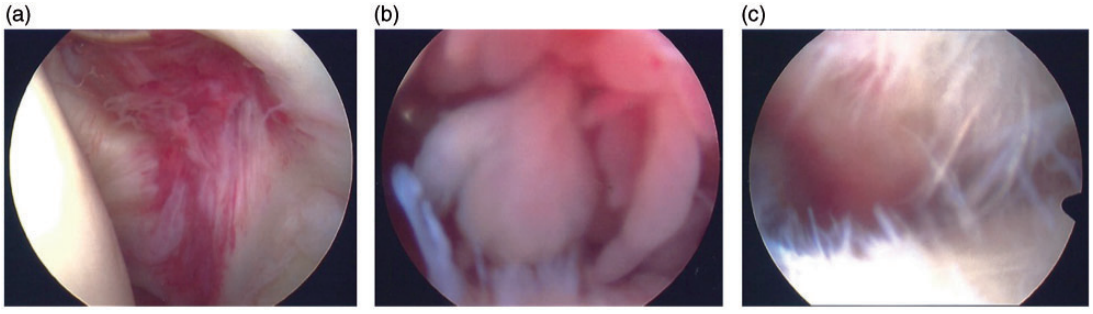

Figure 3. (a) Glenohumeral synovitis of the rotator interval with a thickened middle glenohumeral ligament. (b) Villous synovitis in the subacromial space. (c) Signs of impingement in the subacromial space with synovitis visible in the background.

acromioplasty. Corticosteroid and local anaesthetic were infiltrated into the glenohumeral joint at the end of the procedure.

Histopathological examination of the villous synovium showed synoviocyte hypertrophy and hyperplasia. The subintima was fibrotic and vascular, containing a lymphoplasmatic inflammatory infiltrate with polymorphs. These findings were consistent with an inflammatory bursitis. The postoperative rehabilitation regimen comprised fully mobilizing the shoulder immediately with physiotherapy. At 6-week follow-up, her pain had completely resolved and her range of movement had returned to normal.

Discussion

The present case report should raise awareness of the issue of shoulder dysfunction after vaccination and to discuss its optimal management. We describe a more invasive management approach, which can be considered when patients do not respond to traditional conservative measures. This is the first case report to include histopathological analysis and arthroscopic evaluation in the context of vaccine-related shoulder dysfunction.

A literature search was undertaken using PubMed and Medline in July 2014. The search terms used were 'shoulder', 'vaccination', 'synovitis' and 'capsulitis'. The search criteria were limited to studies involving human subjects. The articles and their citations were reviewed, which yielded five studies consisting of 21 cases (Table 1).

In 2007, Bodor and Montalvo were the first to describe the inadvertent injection of a vaccine into the subdeltoid bursa with subsequent inflammation of the shoulder capsule.[1] Atanosoff et al. have reported the largest series ($n = 13$ cases) of shoulder dysfunction and pain after routine vaccination, and were the first to report MRI findings.[2] The onset of pain generally occurred within 24 hours of vaccination. Similar to our case, six of the 13 cases stated that the vaccine was administered 'too high' in their shoulder. The current recommendation is that the superior third of the deltoid should be avoided in vaccine administration to avoid needle penetration into structures underlying the deltoid.[2] Common MRI findings included fluid collections in the deep deltoid or overlying the rotator cuff tendons, as well as bursitis, tendonitis and rotator cuff tears. Okur et al. reported MRI findings in four cases of abnormal shoulder pain after influenza vaccination.[5] Typical findings included an increased amount of fluid within the subacromial and subdeltoid bursae and an intrasubstance oedema-like signal in deltoid muscle. Two of the four patients demonstrated focal bone marrow oedema-like signal changes within the humeral head, as seen in our case. Routine X-rays of the shoulder appear to have limited diagnostic value in the work-up of such patients, apart from ruling out alternative shoulder pathologies.

At present, there is no consensus in the literature on how to manage this vaccine-related injury. From the 21 cases reported in the literature, 17 have been managed conservatively either with no treatment, physiotherapy or steroid injections. Four cases were initially treated nonsurgically and went on to require surgical intervention, although the details of the procedure were not provided. The patient in our case only regained a pain-free and functional shoulder after washout, arthrolysis, synovectomy and decompression of the subacromial space. We recommend invasive treatment, such as

Table 1. Reports of shoulder dysfunction after vaccination.

Study and author	Number of cases	Clinical presentation	Investigations	Management
Bodor and Montalvo (2007) [1]	2	Shoulder pain, weakness	Ultrasound	Conservative
Atanasoff et al. (2010) [2]	13	Shoulder pain, limited range of motion	X-ray MRI	Conservative ($n = 9$); Unspecified surgical intervention in four cases
Schafer and Burrough (2010) [3]	1	Shoulder pain, limited range of motion	X-ray MRI	Conservative
Barnes et al. (2012) [4]	1	Shoulder pain, restricted range of motion	X-ray Ultrasound MRI	Conservative
Okur et al. (2014) [5]	4	Shoulder pain	X-ray MRI	Conservative

MRI, magnetic resonance imaging.

that described in our case, in patients with ongoing shoulder symptoms related to vaccination that do not settle with conservative measures. MRI of the shoulder is the optimal investigation to identify patients that will benefit from arthroscopic intervention.

Our histopathological analysis and arthroscopic findings reinforce the previous hypotheses that vaccine injection into the subdeltoid bursa leads to a local inflammatory response. The anatomy of the subacromial space has been well characterized[7–8] and, undoubtedly, vaccines can be unintentionally injected into structures underlying deltoid muscle.[2,9] We propose that the most likely pathophysiological process is that first proposed by Atanasoff et al.[2] When a vaccine is injected into the subdeltoid bursa, a prolonged inflammatory process results from an immune response to a vaccine antigen, to which the recipient has previously been sensitised either naturally or via previous vaccination. Antigen injected into the synovial space in rabbits led to the formation of antigen–antibody complexes and acute inflammation.[10] We hypothesize that involvement of the glenohumeral synovium develops either secondary to a progressive local inflammatory response or if the vaccine enters the joint via small intrasubstance tears of the rotator cuff tendons.

In the UK, the system used for monitoring information on suspected adverse drug reactions (including vaccines) is the Medicines and Healthcare products Regulatory Agency's 'Yellow Card Scheme'.[11] This scheme relies on the voluntary reporting of suspected adverse drug reactions by health professionals and patients. The reporter does not have to be certain of a causal association between the drug and the reactions, and the scheme is associated with a variable level of under-reporting. Similar challenges face the equivalent system in the USA (Vaccine Adverse Event Reporting System).[12] As a result, it is difficult to measure the incidence of this vaccine-related injury. In the UK, the safety of trivalent inactivated influenza vaccines is assessed in open label, uncontrolled clinical trials performed as an annual update requirement. Information on the vaccines used in the UK does not currently list bursitis or adhesive capsulitis as possible complications.[13] Therefore, despite the growing number of cases, it appears that glenohumeral synovitis secondary to vaccination remains a rare complication. Nevertheless, with a wider availability and higher uptake of vaccinations, it is likely that this vaccine-related injury of unknown incidence will pose a larger burden on health services in the future.

Conclusions

We report a case of shoulder pain and functional limitation resulting from inadvertent administration of an influenza vaccination into the bursal tissues underlying the deltoid muscle. A florid inflammatory response within the glenohumeral joint was observed, which manifested clinically as adhesive capsulitis. This report is clinically significant because it reinforces previous hypotheses about this phenomenon by providing intra-operative images and histopathological analysis. Furthermore, we have shown that arthroscopic intervention was of clinical benefit in our case where conservative treatment had failed.

Declaration of Conflicting Interests

None declared.

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