



Myositis unrelated to the inoculation site after COVID-19 vaccination: a case report

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We describe the case of a 49-year-old right hand-dominant woman with myositis of the biceps brachii muscle unrelated to the inoculation site following Pfizer-BioNTech COVID-19 vaccination on the deltoid muscle of the left shoulder. Coronavirus disease 2019 (COVID-19) pandemic has involved global spread, and different vaccines including inactivated, protein, vectored, and nucleic acid vaccines have been developed and administered. Common side effects of COVID-19 vaccines include general manifestations such as headache, fever, and fatigue, and various musculoskeletal symptoms. Here, we present a case of myositis occurring in the biceps brachii muscle unrelated to the inoculation site, which has not been reported previously, accompanied by a literature review.

Keywords: COVID-19; Vaccination; Myositis; Adverse effects

Coronavirus disease 2019 (COVID-19), which is caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), has spread rapidly worldwide, resulting in over 83 million cases and 1.8 million deaths [1]. Different vaccine types including inactivated (composed of dead or inactivated viruses), protein (composed of fragments of protein from viruses), vectored (composed of a modified version of viruses), and nucleic acid (composed of genetic material from viruses) vaccines have been developed. The Pfizer-BioNTech COVID-19 (Pfizer COVID-19) vaccine (Pfizer) is one of the most widely used nucleic acid vaccines [2].

Complications of similar nucleic acid vaccines include myositis and headache [3]. As the injection site is commonly the deltoid muscle of the shoulder, several adverse reactions have been documented as COVID-19 vaccine-associated events, such as local inflammation and infectious reactions including bursitis and septic arthritis [1,4]. With intramuscular vaccination, the deltoid

muscle is exposed to modified contaminants through direct inoculation, which can develop into myositis at the injection site. Several cases of myositis of the deltoid muscle after vaccination have been reported [5], as has a case of myositis in a muscle remote from the injection site after administration of a vectored vaccine (ChAdOx1; Oxford-AstraZeneca, Cambridge, UK) [6]. However, to the best of our knowledge, there have been no reports of myositis in a remote muscle following the nucleic acid vaccine.

In this context, we present the first case of myositis occurring in the biceps brachii muscle unrelated to the inoculation site after Pfizer COVID-19 vaccination, with a literature review.

CASE REPORT

This case report was approved by Institutional Review Board of Ulsan University Hospital (No. 2022-03-043), and the need for

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informed consent was waived. A 49-year-old right hand-dominant woman with no relevant medical history, COVID-19 related symptoms or musculoskeletal pain presented with anterior shoulder pain and limited range of motion of the left shoulder and elbow within 48 hours of receiving the Pfizer COVID-19 vaccine. The patient did not have any other history of trauma and, after vaccination, did not experience pain in other areas or symptoms that could be considered a side effect of the vaccine, other than the symptoms described above. A painful palpable mass on the anteromedial side of the left arm at the biceps brachii muscle appeared 1 week after vaccination. The vaccine was administered appropriately at the specified location in the left deltoid muscle. She visited a local medical center and received non-steroidal anti-inflammatory drugs for 1 week, but symptoms did not improve. She was referred to our institution for further evaluation 4 weeks after onset of symptoms. At the outpatient visit, the swelling had improved and the patient had not experienced fever events, although the pain and tender mass on the biceps brachii muscle were still present. Laboratory blood tests showed a white blood cell count of $7.87 \times 10^9/\mu\text{L}$ (normal, $4.0\text{--}10.0 \times 10^9/\mu\text{L}$), erythrocyte sedimentation rate of 12.0 mm/hr (normal, 0–20 mm/hr), and C-reactive protein level of 0.04 mg/dL (normal, 0–05 mg/dL). The patient had no history of rheumatoid disease. Radiographs of her shoulder joint and humerus bone revealed no bony abnormalities. In consideration of the clinical course, magnetic resonance imaging (MRI) using a 3.0-T machine was performed to determine the lesion pattern, and an

approximately 3×3-cm-sized ill-defined intramuscular lesion with prominent signal enhancement in the distal 1/3 of the upper arm area, the medial portion of the biceps brachii muscle, was confirmed on T1-weighted enhanced imaging (Fig. 1). Elastic bandage compression and an ice pack were applied to the affected anteromedial side of the left arm and progress was observed after treatment with celecoxib 200 mg twice a day.

Ten weeks after symptom onset and 3 weeks after starting celecoxib, she returned to the outpatient clinic and pain, range of motion of the shoulder and elbow, and tenderness of the mass had all improved. At the final follow-up, she presented with no pain or tenderness of the mass, which was smaller than at first referral to our institution. The remaining soft tissue mass was followed at the outpatient clinic.

DISCUSSION

Complications have been reported following COVID-19 vaccination, of which a rare and severe event is septic arthritis, which can require surgical irrigation and debridement as well as culture-specific parenteral antibiotic therapy [7]. Massel et al. [1] described a 68-year-old woman who was not immunocompromised who developed septic arthritis 1 week after the administration of the Pfizer COVID-19 vaccine and underwent surgical irrigation and debridement. Several case reports of subacromial-subdeltoid bursitis following COVID-19 vaccination have been described [8]. Boonsri and Chuaychoosakoon [9] reported

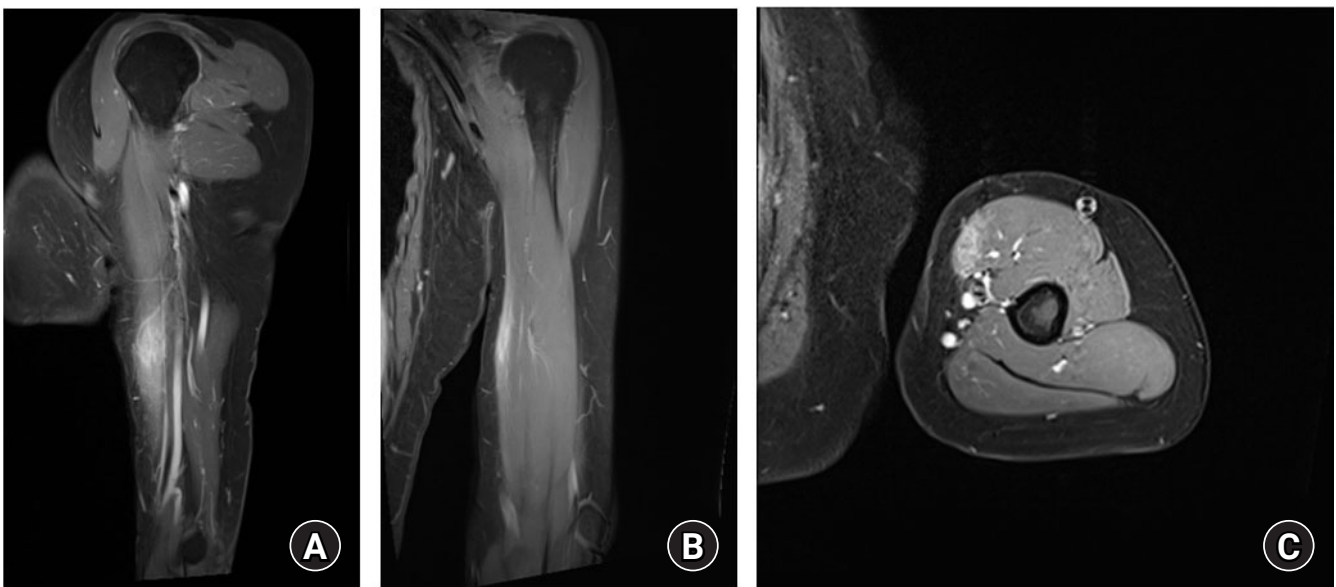


Fig. 1. Initial magnetic resonance imaging of the upper extremity with enhancement (A, sagittal; B, coronal; C, axial view). Approximately 3×3-cm-sized ill-defined intramuscular lesion with prominent signal enhancement on the biceps brachii muscle of the left arm on T1-weighted enhanced imaging.

a 51-year-old woman who developed combined subacromial-subdeltoid bursitis and supraspinatus tendon tear following the second dose of the Oxford-AstraZeneca COVID-19 vaccine diagnosed via ultrasonography. Arthritis also may be a complication of COVID-19 vaccination, including reactive arthritis involving a remote joint such as the knee. An et al. [3] described a 23-year-old woman who experienced acute reactive arthritis of the left knee after COVID-19 vaccination.

Myositis refers to a group of conditions that share common features of muscle inflammation, resulting in muscle weakness and damage. Several cases of myositis of the deltoid muscle over the vaccine injection area have been reported [5,10]. Direct inoculation exposes the muscle to modified contaminants, which can trigger an immunological reaction to the injected antigen. Induced muscle toxicity, if it occurs, may be related to the host's immune system or inflammatory response [5].

Inflammatory myositis after COVID-19 vaccination is a rare, life-threatening adverse event. Maramattom et al. [6] reported three cases of myositis after ChAdOx1 nCoV-19 (Oxford-AstraZeneca) vaccination. The ChAdOx1 nCoV-19 vaccine is a vectored vaccine. All three cases of myositis occurred in the calf muscle, unrelated to the inoculation site. Nucleic acid COVID-19 vaccination can also lead to myositis. Ramalingam et al. [10] described an 81-year-old man with deltoid muscle myositis at the inoculation site after mRNA COVID-19 vaccination. To the best of our knowledge, the present study describes the first case of myositis in a muscle that is remote from injection area following nucleic acid vaccination.

The mechanism of inflammatory myositis after COVID-19 vaccination is unclear; however, cytokine-mediated direct muscle cell injury and viral cell invasion have been suggested [11]. The SARS-CoV-2 full-length spike protein is encoded by the mRNA vaccine (Pfizer-BioNTech COVID-19), which is enclosed in lipid nanoparticles. The viral protein translated from Pfizer COVID-19 vaccine may follow a similar path [12]. Therefore, inflammatory myositis can occur after vaccination. COVID-19 can lead to type 3 hypersensitivity with vascular immune complex deposition, activation, and widespread immune cell recruitment. Compared to COVID-19 itself, the COVID-19 vaccine leads to considerably fewer frequency major systemic immune-mediated adverse events; these events can include myositis or vasculitis [6,13]. The present study indicates that COVID-19 vaccination could lead to post-infectious immune-mediated myopathy, the causes of which are still unclear [14]. This immune response can occur anywhere in the body, which could explain myositis occurring in a muscle remote from the vaccination site.

Shoulder Injury Related to Vaccination Administration (SIR-

VA) was first defined in a report published in 2011 by the U.S. Department of Health and Human Services as shoulder pain with limited range of motion within 48 hours of vaccination without prior pain or dysfunction [15]. SIRVA most commonly presents with rotator cuff diseases and/or subacromial bursitis, involving the supraspinatus, infraspinatus, subscapularis, and teres minor. The present case involved myositis of the biceps brachii muscle, which is a muscle near the shoulder muscle. Therefore, our case can be considered SIRVA.

Our study has several limitations. There is insufficient evidence that myositis in this case resulted directly from COVID-19 vaccination. However, vaccine-related myositis was suspected as it occurred within 48 hours after COVID-19 vaccination without any traumatic history. We could not serially confirm the inflammatory changes of myositis due to the absence of follow-up MRI, which was refused by the patient due to cost. Moreover, tissue biopsy of the palpable mass was not performed. However, myositis was confirmed through clinical symptoms and MRI. We considered biopsy as overtreatment and not indicated in the present case.

This case report suggests another possible complication of COVID-19 vaccination. Clinicians should broaden their differential diagnoses when evaluating patients with myositis remote from the injection site of COVID-19 vaccination.

NOTES

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Conflict of interest

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Data availability

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