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Case Studies of Adverse Reactions to COVID-19 Vaccine and How They Affect Imaging Outcomes

 United Medical Imaging Healthcare
August 03, 2021

Adverse Reactions and Imaging Pitfalls of COVID-19 Vaccination

Jamshid Tehranzadeh, M.D., Chief Radiologist at [United Medical Imaging Healthcare \(UMIH\)](#), and Randy Fanous, M.D., Lead Radiologist of Breast Imaging at UMIH, co-authored the following article outlining some of the side effects of the COVID-19 vaccine and how they may affect imaging outcomes.



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Introduction:

The vaccination against COVID-19 was introduced to the public in the fourth quarter of 2020 and it has over 95% effectiveness. The short term onset of adverse reactions to COVID-19 vaccination may include swelling, redness, and soreness at the injection site. Some may report fever, headache, tiredness, muscular pain, chills, and nausea.¹



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According to a recent Mayo Clinic Report, more advanced side effects of the Janssen/Johnson & Johnson COVID-19 vaccine can occur within three weeks of vaccination. The possible symptoms of such side effects may include shortness of breath, persistent stomach pain, severe or persistent headaches or blurred vision, chest pain, leg swelling, easy bruising, or tiny red spots on the skin beyond the injection site.²

The United States Centers for Disease Control and Prevention (CDC) has reported rare occurrences of serious allergic reactions such as anaphylactic reactions. Thrombosis and thrombocytopenia syndrome (TTS) were reported with Johnson & Johnson vaccines. Women younger than 50 years old should especially be aware of the increased risk for this rare adverse event. This side effect is occurring at a rate of about 7 per 1 million vaccinated women between 18 and 49 years old. For women 50 years and older and men of all ages, this risk is even less common.¹

Researchers at the Institute of Hematology at Tel Aviv's Yitzhak Shamir Medical Center also found a "chronological connection" between the Pfizer vaccine and thrombotic thrombocytopenic purpura.³ Another potential risk that has been identified is the increased risk of myocarditis and pericarditis in adolescents and young adults following COVID-19 vaccination.¹ The good news is that vaccination studies in Israel showed pregnant women are passing antibodies (Immunity of COVID-19 vaccination) to their fetuses.⁴

Case example 1:

We observed a 73-year-old diabetic man who suddenly developed weakness of both legs and presented with signs and symptoms of ascending Myelitis, 2 weeks following the second dose of Moderna vaccine. It is, of course, always debatable whether these findings can be attributed to COVID vaccination. This patient—in a course of less than a few days—lost the ability to walk or stand and became bedridden, gradually developing weakness of the arms. He soon lost the ability to speak clearly, followed by his voice becoming incomprehensible. Cerebrospinal fluid (CSF) results showed that increased level of protein and early steroid treatment was ineffective. The patient responded to intravenous gamma globulin treatment and gradually improved. With the help of physiotherapy, the patient regained some muscular strength, and 3 months following treatments, he is gradually improving and has started speaking clearly, however he still uses a walker.

Authors have recently reported COVID-19 related muscle denervation atrophy and Guillain Barre Syndrome.⁵ However, the phenomenon described in this case has not been previously reported with COVID-19 vaccination. Swan has reported a case of encephalomyelitis 16 days following smallpox vaccination.⁶ Additionally, adverse reactions of the central nervous system following H1N1 influenza or Japanese encephalitis have been reported.^{6,7} A few cases of encephalitis, myelitis, and acute disseminated encephalomyelitis (ADEM) were reported following vaccination.⁸

Imaging values and pitfalls:

Gholamrezaezhad, et al. reported values of molecular imaging studies for tracking of immune cell dynamic in the host body, which has been a valuable tool showing the efficacy of vaccines in their research and development. Serial CT, PET-CT, MRI, and ultrasound (US) similarly proved to be important tools in this research.⁸ Lymph node activation following vaccination is a direct effect of antigen localization⁸ and it can be used as a sign of vaccine efficacy. However, this could also present as an imaging pitfall and be a

source of confusion. This is especially true in the setting of ipsilateral axillary lymphadenopathy in breast imaging. Clinicians and radiologists should be cognizant of this phenomenon when interpreting mammography, US, and MRI, and be careful not to mistake or overcall this phenomenon for new pathological metastasis. Similar reactive lymph nodes may appear in FDG-PET-CT. False-positive results have been reported in FDG PET-CT studies.⁸⁻¹⁰

Case example 2:

We have more recently seen an increase in diagnostic breast imaging studies. An example of such a case we provided a clinical image report on, which we would like to share, is that of a 40-year-old woman who showed reactive lymph nodes on both mammography and breast US located in her left axilla, 2 weeks following COVID-19 vaccination in her left arm. These lymph nodes were absent from her prior studies.

It is recommended that routine studies, including screenings, should be scheduled either before a patient's second dose of the COVID-19 vaccine or 6 weeks afterward. False-positive reactive lymph nodes should not be interpreted as metastatic.¹¹

At UMIH we routinely record the date and sites of the first and second vaccination prior to screening or diagnostic breast imaging studies.

Case example 3:

Another radiology case we recently observed is a 39-year-old woman who presented with severe left arm and left shoulder pain for 5 weeks following the COVID-19 vaccination in her left arm. MRI revealed tendinitis and bursitis of supraspinatus and infraspinatus associated with focal bone marrow edema of the humerus.

In literature, there are reports of other vaccine-induced myositis and intramuscular sterile abscesses.^{8,12}

Conclusion:

COVID-19 vaccinations have over 95% effectiveness. The adverse reaction of COVID-19 vaccinations may range from less severe flu-like effects to more severe allergic and anaphylactic reactions, thrombosis and thrombocytopenia syndrome (TTS) to myocarditis and pericarditis, and possible ascending myelitis. Tendonitis and bursitis at the injection site have been observed. Radiologists and clinicians should be aware of the presence of reactive lymph nodes in breast imaging (mammography, US, and MRI) which may mimic pathology. These reactive lymph nodes could be a pitfall in PET-CT or PET-MRI or other imaging studies such as US, CT or MRI of neck, shoulder, chest, and abdomen.

Refer a patient

About United Medical Imaging Healthcare

United Medical Imaging Healthcare was founded in 2006 evolving from its predecessor organization. Over the last 15 years, the organization has expanded from 15 to 26 locations, with a distinct focus on the Los Angeles and Orange County, CA markets. They plan to continuously enhance their geographic footprint, upgrade imaging center equipment to offer the latest technology, and work hard to create a comfortable and modern clinical interior for the patients they serve.

The team at UMIH are continuously purchasing and upgrading their imaging equipment and offer the full spectrum of radiology services such as PET-CT, MRI (Open High Field MRI for claustrophobic patients, high quality Closed MRI, 3 Tesla, and MRI wide bore), Breast MRI, Stereotactic and US Guided Breast Biopsy, CAT Scan (128 and 64 Slice), Nuclear Medicine, Thyroid Biopsy, Ultrasound (including Arterial Doppler and Echocardiograms), Digital Mammography, Fluoroscopy, DEXA Scans, and Digital X-Rays.

UMIH puts their patients at the center of everything they do. With patient convenience in mind, they have created full-service radiology centers that provide one location necessary for all diagnostic exams. UMIH provides a comfortable patient environment and advanced diagnostic technology throughout its 26 out-patient imaging facilities. Their staff is culturally diverse and multi-lingual which enables them to be sensitive to the needs of those living in the diverse Southern California communities they serve.

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