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Subacute Thyroiditis Secondary to Moderna COVID-19 Vaccine: A Case Report of a Rare Manifestation

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Subacute Thyroiditis Secondary to Moderna COVID-19 Vaccine: A Case Report of a Rare Manifestation

Abstract

The SARS-CoV-2 led to a global pandemic, infecting millions of lives within only a short period of time. The symptoms of the disease vary with a subset of the population developing debilitating sequelae. Through the emergency use authorization (EUA), multiple vaccines have been released against the novel virus in record time. Long term and rare sequelae from the vaccine are poorly understood. DeQuervain's subacute thyroiditis is a self-limiting and painful inflammation of the thyroid gland usually associated with viral infections. We report a rare case of subacute thyroiditis in a healthy 46-year-old woman presenting with a painful swelling in the neck after receiving the Moderna mRNA-1273 SARS-CoV-2 vaccine. We seek to elucidate a better understanding of rare vaccine side effects by documenting one of the first reported cases of subacute thyroiditis induced by the SARS-CoV-2 vaccine.

Keywords

COVID-19, Thyroiditis, Covid-19 vaccine, subacute thyroiditis, DeQuervain's, SARS-CoV-2 vaccine

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Cover Page Footnote

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Introduction

The SARS-CoV-2 virus has been deemed a global pandemic by the World Health Organization. The virus began in Wuhan, China with the first case officially reported to the WHO on December 31, 2019. The global pandemic was declared on March 11, 2020, the first global pandemic since the H1N1 influenza outbreak in 2009.¹ As of May 2021, there have been an estimated 162 million confirmed cases with 3.3 million deaths worldwide.² The majority of COVID-19 cases manifest with respiratory symptoms with increasing reports of gastrointestinal, neurological, cardiac, and nephrological manifestations as well. The Food & Drug Administration has streamlined the approval of multiple SARS-CoV-2 vaccines, namely from Pfizer and Moderna. On December 18, 2020, the FDA issued an EUA for the Moderna mRNA-1273 SARS-CoV-2 vaccine for individuals 18 years of age and older.³ The phase 3 randomized, observer-blinded, placebo-controlled trial was conducted at 99 centers in the United States with 30,420 participants with median follow-up duration of 63 days.⁴ The majority of local and systemic adverse events included injection site pain, erythema, swelling, lymphadenopathy, fever, headache, fatigue, myalgia, arthralgia, nausea, vomiting, and chills.⁴ One of the key limitations of the clinical trial was the short duration of safety follow-up, limiting the ability to detect rare adverse events.⁴ We present a case of a patient who developed subacute thyroiditis after receiving the mRNA-1273 SARS-CoV-2 vaccine.

Case Report

An immunocompetent 46-year-old woman presented with right-sided neck pain accompanied by low-grade fevers for several days after vaccination. The patient is a healthcare worker with no prior COVID-19 diagnosis. She received her first dose of the vaccine followed by mild neck pain, fever and myalgias. She did not need treatment as these symptoms were self-resolving in 72 hours. 32 days later, she received her second dose followed by persistent neck pain. There was no reported history of respiratory symptoms, anosmia, dysgeusia, or any gastrointestinal symptoms. Her past medical history includes chronic migraines for which she takes over-the-counter medication. She has no history of an allergic reaction to previous vaccinations. Family history is notable for her mother who underwent a thyroidectomy for unknown cause. On examination, the patient was afebrile (98.8°F) with pulse rate of 119 beats per minute. Her blood pressure was 147/76 mm Hg, respiratory rate 18 per minute, and oxygen saturation 100% on room air. A tender, swollen area with increased warmth and firm consistency was noted to the anterior neck with normal overlying skin, clinically resembling a nodule on the right thyroid gland. No signs of compression could be elicited. There was no palpable lymphadenopathy, exophthalmos, pharyngeal erythema, irregular heart rhythm, hepatosplenomegaly, peripheral or pretibial edema, tremors, or skin lesions. Other general and systemic examinations were unremarkable.

Investigations

Thyroid function tests on admission revealed an undetectable (0.00 mU/L) level of thyroid stimulating hormone (TSH) with elevated serum T3 and T4.

Computed tomography with contrast of the neck revealed a heterogeneous thyroid gland with asymmetric enlargement of the right thyroid lobe and no lymphadenopathy. Ultrasonographic imaging with color flow Doppler confirmed asymmetric enlargement of the right thyroid lobe with two hypoechoic nodules in the inferior and superior poles with no internal vascularity measuring 9 cm and 3 mm in the greatest dimension, respectively (Figure 1). Reverse transcriptase real-time qualitative polymerase chain reaction (RT-PCR) for SARS-CoV-2 from nasopharyngeal swabs

was negative. Subsequent viral testing for respiratory syncytial virus, influenza A and B, coxsackie A and B serology, and rapid strep A antigen was also negative. Levels of serum thyroglobulin and thyroid peroxidase antibodies were undetectable. Levels of serum C-reactive protein (CRP) and erythrocyte sedimentation rate (ESR) were 8.6 mg per dL (normal <3.0 mg/dL) and 49 mm per hour (normal <29 mm/hr), respectively.



Figure 1. Ultrasound of the right thyroid lobe performed during the thyrotoxic phase showing areas of hypoechogenicity.

Differential Diagnosis

From the history, physical examination and thyroid function tests; the possible causes of painful thyroid with thyrotoxicosis were evaluated. A differential of Grave's disease, toxic multinodular goiter, toxic adenoma, follicular thyroid carcinoma, iodine toxicity, Hashimoto's thyroiditis, and DeQuervain's subacute thyroiditis was considered. Thyroid peroxidase and thyroglobulin antibodies were negative along with a lack of associated, systemic clinical findings effectively eliminating Graves disease and autoimmune thyroiditis. The timing of symptoms and elevated inflammatory markers make multinodular goiter, toxic adenoma, follicular carcinoma and iodine toxicity less likely. The ultrasound findings and elevated ESR/CRP were strongly indicative of subacute thyroiditis. The negative viral panel, lack of recent viral infection, and post-vaccination symptomatology indicate a suspicion of DeQuervain's subacute thyroiditis induced by the mRNA-1273 SARS-CoV-2 vaccine.

Treatment

The patient was treated with analgesics, oral dexamethasone at 6 mg/day, and propranolol at 20mg/day. After one day of inpatient hospitalization, the patient clinically felt better with improvement in her heart rate and neck pain. She was prescribed an oral methylprednisolone 4mg taper for 6 days and propranolol upon discharge from the hospital.

Follow-Up

The patient's neck pain resolved with steroid medications. On 1 month follow up, her thyroid function resolved back to normal (TSH 0.365 uIU/mL; T4 1.02 ng, dL; T3 2.96 pg/mL). She was advised to periodically follow up for monitoring of her thyroid function.

Discussion

As of May 2021, an estimated 1.34 billion vaccines have been administered against the COVID-19 infection. As more people get the vaccine, the side effect profile is becoming more understood.⁵ Rare complications from the vaccine are coming to light, as in the instance of our patient.⁶

Traditionally, painful subacute thyroiditis is frequently preceded by an upper respiratory tract infection, therefore a viral cause is implicated. The typical course is a period of thyrotoxicosis followed by hypothyroidism for several months. Thyroid function subsequently begins to normalize in the majority of patients between 6 to 12 months after onset.¹ However, our patient resolved in the next four weeks. The incidence of subacute thyroiditis is observed to increase during summer when viral outbreaks are higher, especially of coxsackievirus and echovirus.^{7,8} In fact, a whole range of viruses including adenovirus, orthomyxovirus, EBV, CMV have been linked to subacute thyroiditis.⁶

During the 2002 SARS outbreak, autopsy reports demonstrated thyroid injury. Cytotoxic effect in subacute thyroiditis is postulated to be the result of cytologic T- cell recognition of follicular viral antigens. The follicles that are infiltrated will often rupture due to an unstable basement membrane.⁹

Data on the relationship between SARS-CoV-2 virus and the thyroid has been emerging and rapidly increasing since March 2020. It is known that the thyroid gland and the virus are associated in complex interplay. It is thought that the SARS-CoV-2 virus seems to be working on the ACE2 receptors as the main receptor to invade human cells.¹⁰ More research is showing that the expression levels of ACE2 on the thyroid gland are more than in the lungs.⁴ It is suspected that SARS-CoV2 has the capacity to infiltrate the thyroid and lead to subacute thyroiditis.

There are spike proteins on the surface of SARS-CoV-2 which bind to the ACE2 cell receptors. As of now the exact makeup of the COVID mRNA vaccine is not available. However, the vaccine that is made is programmed to encode for these spike proteins, inducing the humoral production of antibodies against these conduits.¹¹

It is theorized because these spike proteins have a strong affinity for the ACE2 receptor, the subsequent antibody may also have an affinity. This would cause an antibody-mediated inflammatory response to any tissue with the ACE2 receptor.¹² Further, this can lead to infiltration of the thyroid follicles causing activation of cytologic T-cell response to a virus-like antigen at the thyroid follicle.¹²

The CDC recommends reporting these rare side effects to the Vaccine Adverse Event Reporting System. Anecdotal reports of subacute thyroiditis have been reported following the SARS-CoV-2 mRNA vaccine, however no accounts have been published. Based on the presented case, we believe subacute thyroiditis should be a consideration with all patients who present with similar findings after receiving the vaccine.

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