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Case Report

Subacute thyroiditis after receiving the COVID-19 vaccine

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ABSTRACT

Since the emergence of the coronavirus disease 2019 (COVID-19). Several autoimmune and subacute thyroiditis (SAT) cases are on the rise all over the world. COVID-19 vaccine-associated SAT cases have also been reported. In this article, we present our data on 5 vaccine-associated SAT cases. We evaluated the type of vaccine received, the time between vaccination and the onset of SAT symptoms, laboratory findings, treatments administered, and response to treatment. The age of patients ranged from 31 to 43 years old. Three (60 %) patients had been diagnosed as SAT after the first dose, and tow (40 %) after the second dose. Patients' symptoms appeared approximately 25.2 days (2–44) after vaccination. Subacute thyroiditis occurring after COVID-19 vaccination is rare, we hope practitioners should be early aware of post-vaccine SAT, that can improve clinical evolution and outcome.

1. Introduction

At the end of 2019, a rapidly spreading outbreak of severe acute respiratory distress syndrome caused by the novel coronavirus (SARS-CoV-2), known as COVID-19, emerged within a short period of time. As of August 2023, millions of confirmed cases have been reported globally, resulting in numerous deaths [1]. As the clinical experience of COVID-19 increases, this disease can cause acute respiratory distress syndrome and even death. Moreover, it not only affects the respiratory system but also has the potential to impact other organ systems, including the endocrine system. Among them, thyroid dysfunction after infection is a common issue [2]. Some researchers have reported that subacute thyroiditis occurred after COVID-19 infection [3,4]. Like in other subacute thyroiditis cases, that is thought to be associated with the viral infection and post-viral inflammatory responses. Safe and effective vaccines need to be developed to cover susceptible populations. However, vaccines may also bring some side effects. Several autoimmune and subacute thyroiditis (SAT) cases have been reported associated with the COVID-19 vaccine [5–9]. Along with the vaccination process in our country, we had seen several cases of subacute thyroiditis after receiving the COVID-19 vaccine. In this article, we present five cases diagnosed with subacute thyroiditis after the COVID-19 vaccine.

2. Material and methods

Our COVID-19 vaccine-associated SAT patients were diagnosed between May 2021 and August 2021 in the Endocrinology and Internal Medicine outpatient clinics of Affiliated Zhongshan Hospital of Dalian University. The age, gender, history of alcohol consumption, history of COVID-19, history of thyroid disease, time to the occurrence of SAT after the COVID-19 vaccine (CoronaVac®, Sinovac Life Sciences, Beijing), temperature, symptoms, administration, recovering time, and response to treatment were analyzed. The laboratory indicators of the patients, including thyrotropin (TSH), free triiodothyronine (FT3), free thyroxine (FT4), erythrocyte sedi-

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mentation rate (ESR), thyroid autoantibodies, and imaging studies (99mTc pertechnetate thyroid scintigraphy imaging), were evaluated.

3. Results

The age of patients ranged from 31 to 43 years old. Three (60 %) of the patients were male, and two (40 %) were female. Three (60 %) patients had a history of alcohol consumption. None of patients with history of thyroid disease and COVID-19. Three (60 %) of the patients had fever. All the patients had neck pain. Three (60 %) patients had been diagnosed as SAT after the first dose, and two (40 %) after the second dose. Patients' symptoms appeared approximately 25.2 days (2–44) after vaccination. Three patients (60 %) were treated with prednisone, two (40 %) of the patients were treated with nonsteroidal anti-inflammatory drugs (NSAID). The average resolution time was approximately 42.4 days (30–58). In the follow-up of one patient (20 %), levothyroxine replacement was started due to symptomatic hypothyroidism, but we have not reached enough follow-up time to talk about permanent hypothyroidism. Clinical features of the patients are summarized in Table 1.

All patients had suppressed TSH, four (80 %) patients had elevated FT3 and FT4 levels. Elevated ESR was found in all cases. Anti-thyroid peroxidase antibody (TPOAb) was positive in one of the patients (20 %). Anti-thyroglobulin antibodies (TgAb) were positive in three of the patients (60 %). Nasopharyngeal swab tests for SARS-CoV-2 were negative in all patients. The laboratory of the patients are summarized in Table 2. All the patients had the results of thyroid scintigraphy imaging. Typical imaging characteristics of SAT were observed in 100 % of patients (Fig. 1).

4. Discussion

Recent studies have shown that SARS-CoV-2 and other respiratory viruses have an antibody dependent enhancement (ADE) effect, thus causing disease exacerbation upon reinfection [10]. Therefore, effective COVID-19 vaccines are the best choice for protection against the virus.

SAT is typically caused by a viral infection and is characterized by inflammation of the thyroid gland. It is manifested by pain in the thyroid lodge and thyrotoxicosis as a result of follicle destruction [11]. Thyroid autoimmunity does not have a primary role in the development of SAT, and the exact etiology remains unclear. Recently, there have been reports of several cases of SAT following exposure to COVID-19 vaccines.

Table 1
Clinical features of patients.

	Age	Sex	History of alcohol consumption	Previous COVID-19 history	Pre-existing thyroid disease	Type of vaccine	Time to onset of symptoms of the vaccine	Temperature	Clinical features	Treatment	Resolution time	Need for levothyroxine
Case 1	43	male	Yes	No	No	Sinovac-CoronaVac®	21days, after 1 dose	36.8 °C	Neck pain, and palpitations	prednisone	58days	No
Case 2	38	male	Yes	No	No	Sinovac-CoronaVac®	2days, after 1 dose	37.6 °C	Neck pain, fever	NSAID	35days	No
Case 3	31	female	No	No	No	Sinovac-CoronaVac®	44days, after 2 dose	38.0 °C	Neck pain, fever, and palpitations	prednisone	30days	Yes
Case 4	40	female	No	No	No	Sinovac-CoronaVac®	16days, after 2 dose	36.2 °C	Neck pain	NSAID	36days	No
Case 5	37	male	yes	No	No	Sinovac-CoronaVac®	43days, after 1 dose	38 °C	Neck pain, fever, and palpitations	prednisone	53days	No

Table 2
Laboratory tests results of cases.

	TSH	FT4	FT3	ESR	TPOAb	TgAb	TrAb
Case1	0.049	24.6	8.11	30	60.1	336.8	1.17
Case2	0.013	43.78	14.62	102	38.2	81.4	1.45
Case3	0.08	20.23	5.65	114	34.8	22.3	1.19
Case4	0.02	25.56	7.68	51	<28.0	16.2	1.2
Case5	0.017	43.3	15.12	68	<28.1	184.6	<0.8

TSH thyroid stimulating hormone(0.55–4.78 uIU/ml). FT4 free thyroxine (11.5–22.7 ng/dL). FT3 free triiodothyronine (3.5–6.5 pg/mL). ESR erythrocyte sedimentation rate (0–20 mm/h). TgAb Anti-thyroglobulin antibodies (0–60 IU/mL). TPOAb Thyroid peroxidase antibodies (0–60 IU/mL). TRAb TSH receptor autoantibodies (0–1.75 U/L).

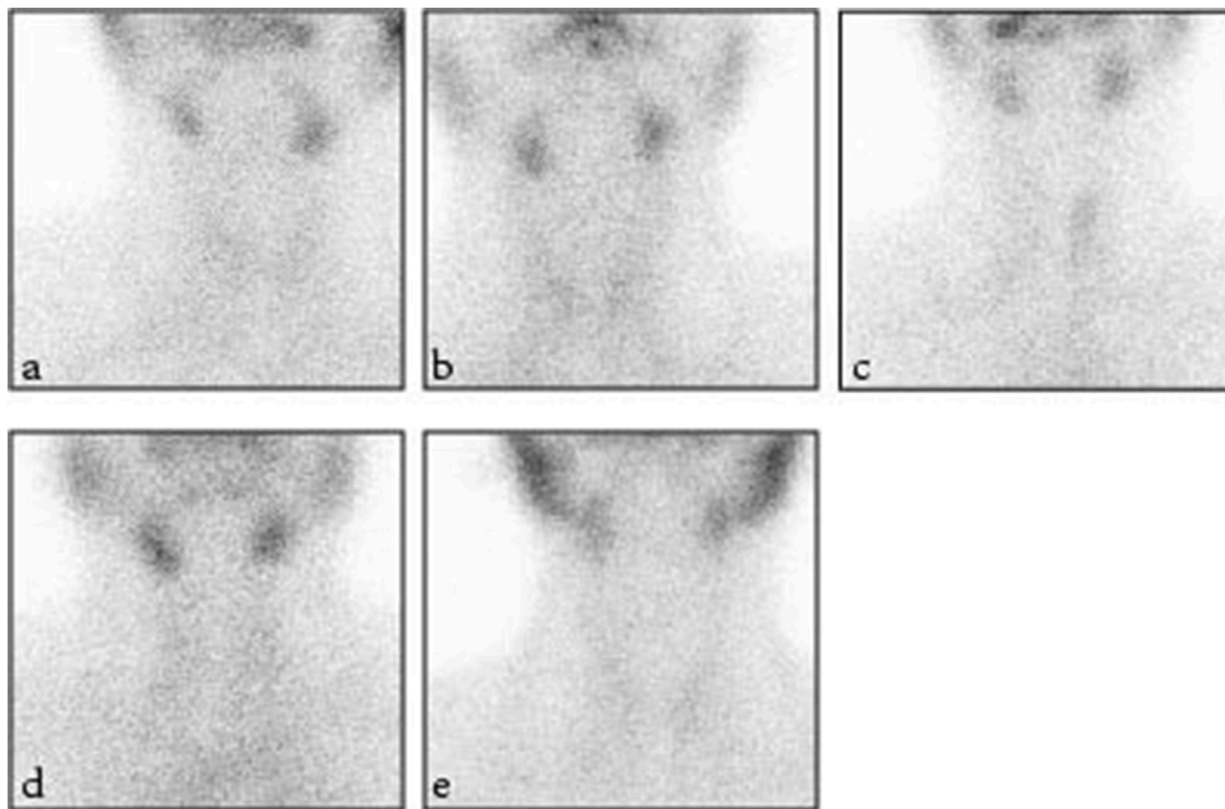


Fig. 1. Thyroid scintigraphy images of the cases (a.b.c.d.e). the suppressed thyroid gland was detected in 99mTc pertechnetate thyroid scintigraphy imaging.

In this article, we introduced 5 cases about COVID-19 vaccine-associated SAT. Among them, two patients were diagnosed with SAT after receiving the second dose. One possible reason may be that the concentration of viral proteins in the body does not reaches its peak after first dose, but after the second dose and triggers autoimmunity [12].

In addition, we found that 3 cases had autoantibodies. It has been reported that transient increase of thyroid autoantibodies can often be observed in the subacute stage of subacute thyroiditis [13]. However, COVID-19 vaccines also can cause Hashimoto's thyroiditis. These antibodies may promote the occurrence of subacute thyroiditis. Thus, the possibility of both diseases coexisting cannot be ruled out.

The mechanism for postvaccination subacute thyroiditis or thyroid dysfunction is still unknown. However, it is hypothesized that adjuvants present in vaccines, which are primarily used to enhance the immune response in the general population, could potentially contribute to the development of various unwanted autoimmune and inflammatory responses, such as ASIA (autoimmune/inflammatory syndrome induced by adjuvants) [14]. Another possible factor is the cross-reactivity between viral spicule proteins produced by the mRNA vaccine and antigens expressed on the surface of the healthy thyroid follicular cell [15].

It is worth noting that SARS-CoV-2 receptors (angiotensin-converting enzyme 2) abundantly expressed in many endocrine organs, such as follicular thyroid cells, suggests that the thyroid could potentially be a target organ of SARS-CoV-2 infection [16].

Furthermore, studies have demonstrated that thyroid dysfunction during COVID-19 is associated with an “cytokine storm” that is an uncontrolled systemic immune and inflammatory response [17]. Previous research has shown that an increase in IL-6 secretion and/or cytotoxic effects of T-cells as part of a hyperinflammatory condition has been described in patients with thyroiditis during COVID-19 [18]. Therefore, hyperinflammatory response due to an excessive innate immune response to COVID-19 vaccine in genetically susceptible individuals, might be implicated.

5. Conclusion

Indeed, there have been a growing number of reported cases of subacute thyroiditis (SAT) associated with COVID-19 vaccination. Although it remains relatively rare, practitioners should be early aware of post-vaccine SAT, that can improve clinical evolution and outcomes. Meanwhile, better understanding the immune-associated mechanisms of COVID-19 vaccine-associated SAT will contribute to patient management. It is essential to recognize that as subsequent waves of COVID-19 infections emerge, the benefits of COVID-19 vaccines still outweigh the potential risks associated with SAT. Vaccination remains a crucial tool in controlling the spread of the virus and reducing the severity of illness. Therefore, the recommended approach is to continue promoting and administering COVID-19 vaccines while closely monitoring and addressing any potential vaccine-related side effects, including SAT.

Disclosure statement

No potential conflict of interest was reported by the authors.

Consent for publication

Written informed consent was obtained from the patient for publication of this case report and accompanying images.

Data availability statement

The datasets used are available from the corresponding author on reasonable request.

CRediT authorship contribution statement

Yingshuo Zhong: Writing – original draft. **Chang Di:** Data curation. **Xiaohui Yang:** Formal analysis. **Yang Yu:** Writing – review & editing.

Declaration of competing interest

No conflict of interest.

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