# Subacute thyroiditis after the third dose of the COVID-19 mRNA vaccine. Case report

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*Keywords:* Subacute thyroiditis
- COVID-19
- COVID-19 mRNA vaccine

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*Received:*
26 June 2022
*Accepted revised:*
13 July 2022

**Abstract**
Subacute thyroiditis (SAT) is a thyroid inflammatory disease, whose pathogenesis is still unclear. We report a 52-year-old female with SAT after the third dose of COVID-19 mRNA vaccine BNT162b2 (Pfizer–BioNTech). This case was documented with laboratory tests and ultrasound examination. She needed therapy during the acute phase and subsequently thyroxine supplementation.

*Hell J Nucl Med 2022; 25(2): 210-212* *Epub ahead of print: 3 August 2022* *Published online: 29 August 2022*

## Introduction

Subacute thyroiditis is a thyroid inflammatory disease, thought to have a viral origin, whose pathogenesis and determinants of the clinical course are still unclear. There have been many clinically significant new data in the last few years regarding its epidemiology, pathogenesis and management [1].

Subacute thyroiditis, also known as de Quervain or granulomatous thyroiditis, is thought to be caused by a viral infection, especially (but not exclusively) of the upper respiratory tract or by post-viral inflammation. The female/male ratio is 5 to 1 and the incidence is 12.1/100,000 people/year. It follows a tri-phasic clinical presentation: first-hyperthyroidism, second-transitory hypothyroidism that is remitted in 90%-95% of cases, and the third phase-normal thyroid function, except for 5%-10% of cases with permanent hypothyroidism requiring lifelong levothyroxine substitution [2]. Investigation typically shows thyroid function abnormalities, positive inflammatory markers and highly suggestive heterogeneously hypoechoic ultrasound features. The condition is self-limiting and non-steroidal anti-inflammatory drugs or a short course of glucocorticoid therapy are recommended for symptomatic relief. Beta blockers may be also required.

Since 2020, this entity has been associated with the coronavirus disease 2019 (COVID-19) infection, [3] and since 2021 it has been related to the vaccine against the virus [4]. The exact mechanism is unknown but the relationship with vaccination was reported also following influenza vaccination [5].

## Case presentation

A 52-year-old female who presented with rapid onset painful swelling of the thyroid gland, dizziness, weakness and tachycardia. The onset of symptoms occurred few days after the third dose of the COVID-19 mRNA vaccine BNT162b2 (Pfizer-BioNTech). She received the first and second dose in January and February 2021 without any complains except with pain in the area of the injection for couple of days and feeling unwell during the day of the vaccination.

She received the third dose of vaccine 3rd December 2021. The onset of symptoms was 3 to 5 days after the vaccination. There was no significant past medical history and the patient was not taking any medications. October 2021 (one month before vaccination) thyroid function tests were normal including thyroid antibodies.

After suspicion of thyroid involvement, laboratory tests were performed:

09/12/21 TSH=0.030μIU/mL fT4=20.20pmol/L with normal thyroid antibodies.

C reactive protein (CRP) was 30.21mg/mLand ESR was 29mm/hr, both elevated.

At the same day, thyroid ultrasound showed: "An area of low echogenicity with increased vascularity measuring approximately 16x12mm is noted in the middle of the right lobe. Adjacent to the above is a 9mm nodule with cystic degeneration. Small hypoechoic areas are also noted in the left thyroid lobe. No pathologically enlarged cervical lymph-nodes are observed. The above findings are suggesting thyroiditis".

Due to the obvious diagnosis, we did not perform thyroid scintigraphy.

She was treated with methylprednisolone 16mg once a day between 20/12/2021 and 02/01/2022.

TSH on 03/01/2022 was 0.005μIU/mL and due to marked tachycardia she received propranolol 10mg twice a day for one month.

After medications her clinical appearance showed significant improvement.

On 02/02/2022,TSH= 6.104μIU/mL fT4=8.21pmol/L. She was subsequently started on 75μg thyroxine on 05/02/2022.

02/03/2022 TSH=2.027μIU/ml fT4=13.42 pmol/l, under 75μg thyroxine.

12/4/2022 TSH= 0.978μIU/ml fT4=16.15 pmol/l, under 75μg, thyroxine.

She is currently under close surveillance to avoid any iatrogenic hyperthyroidism.

An ultrasound performed 31/05/2022 showed "signs of mild inhomogeneity, with no obvious nodules at the present examination. Recession of the findings of the 09/12/2021 examination. The above findings, taking into consideration the given therapy, are highly suggestive of the first diagnose of thyroiditis".

## Discussion

The connection of COVID-19 infections and thyroid gland malfunction is well established and reported. Nevertheless, there are few cases reported regarding the association with COVID-19 mRNA vaccine. Older reports, even only few, showed connection of thyroiditis with influenza vaccination. The exact mechanism of thyroid inflammation after vaccination is unknown. Interestingly, in our case, the first two doses of vaccine did not have any adverse impact on the thyroid. We hypothesize that the first two doses caused latent thyroiditis that became evident and clinically significant after the third dose.

*In conclusion*, vaccination with COVID-19 mRNA vaccine can cause subacute thyroiditis. Patients presenting with thyroid symptomatology post vaccination should be clinically evaluated and laboratory tests, ultrasonography and eventually thyroid scintigraphy should be performed. Nonsteroidal anti-inflammatory agents or a short course of glucocorticoids during the acute phase may be required. Thyroxine substitution may be required if the patient becomes hypothyroid.

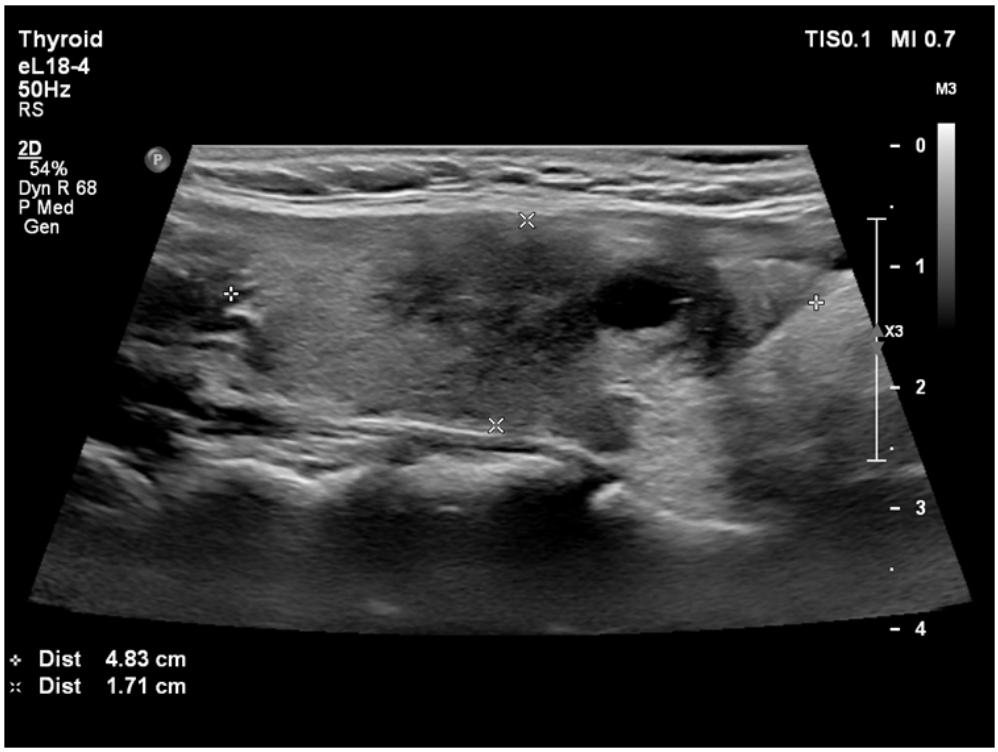


**Figure 1.** Hypoechoic area in the thyroid gland in the first ultrasound on 09/12/2021.

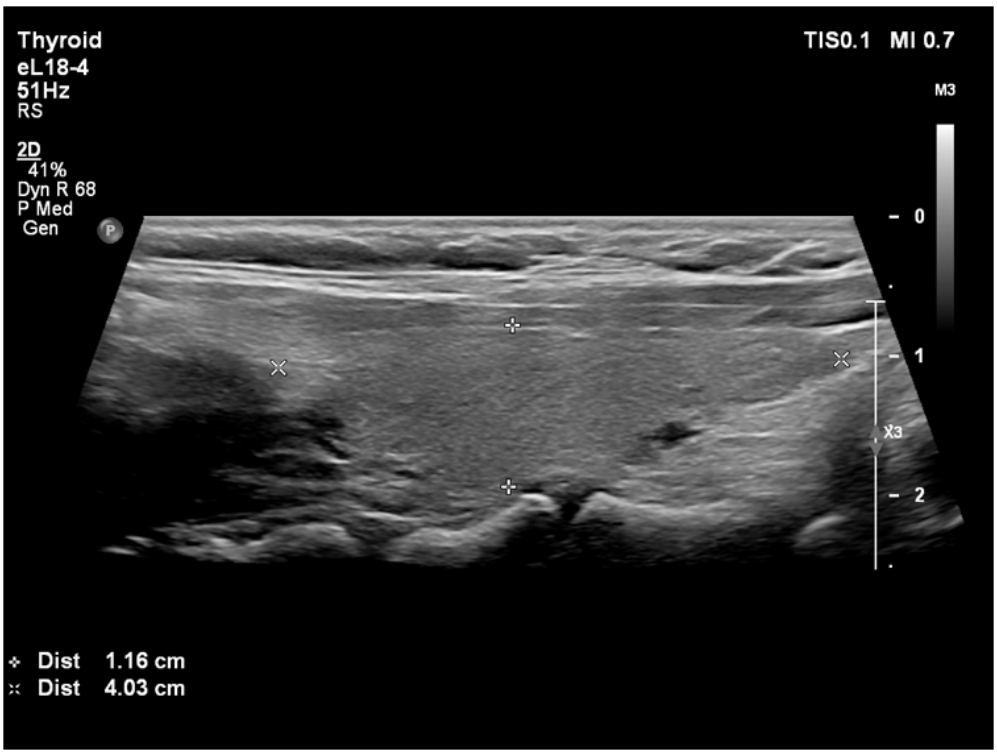


**Figure 2.** Normalisation of the appearance of the thyroid gland in the second ultrasound on 31/05/2022.

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