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Case report

CASE REPORT

Thyroid eye disease following administration of the BNT162B2 COVID-19 vaccine

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Learning points for clinicians

Coronavirus disease 2019 (COVID-19) vaccine administration may be considered a triggering factor for thyroid autoimmune disorders. Clinicians should be aware of thyroid eye disease when a patient presents with lid swelling and diplopia following COVID-19 vaccination.

Case presentation

A 31-year-old man presented with diplopia and swelling of the left eyelid 2 weeks after receiving a second dose of the BNT162b2 mRNA coronavirus disease 2019 (COVID-19) vaccine. His COVID-19 vaccination history is noteworthy. On the night of receiving the first dose of the BNT162b2 mRNA COVID-19 vaccine, the patient experienced swelling of the left eyelid, which resolved within 3 weeks. Three hours after receiving the second dose of the BNT162b2 mRNA COVID-19 vaccine, the patient experienced swelling of the left eyelid again, which persisted until the initial visit. He was a non-smoker, and his personal and family histories, as well as physical examination results, were unremarkable. His best-corrected visual acuity was 1.2 bilaterally. Intraocular pressures were 23 and 18 mmHg in the right and left eyes, respectively. The Hertel exophthalmometer measured 14 mm bilaterally. Slit-lamp and funduscopic examinations showed no abnormal findings. The prism cover test demonstrated 8 prism diopter (PD) hypertropia and 14 PD exotropia in the left eye. The upward movement of his right eye was mildly restricted (Figure 1A), which was confirmed by the Hess screen test (Figure 1B). Magnetic resonance imaging of the orbits demonstrated an enlarged right inferior rectus muscle and a high intensity around the left superior rectus muscle (Figure 1C). Thyroid function tests results were as follows: thyroid stimulating hormone (TSH) was 0.018 μIU/ml (reference range: 0.38–4.31), free thyroxine was 1.36 ng/dl (reference range: 0.82–1.63) and free triiodothyronine was 2.90 ng/dl (reference range: 2.17–3.34). Her anti-thyroid peroxidase (anti-TPO) and anti-thyroglobulin (anti-Tg) results were negative (anti-TPO, 2.6 IU/ml [reference range, <3.2]; anti-Tg 6.1, IU/ml [reference range, <13.6]). The TSH receptor antibody level was elevated to 6.0 IU/l (reference range, <2.0). Based on the patient's history and the aforementioned examinations, a tentative diagnosis of thyroid eye disease (TED) related to COVID-19 vaccination was made. The patient was administered a thiamazole dose of 5 mg daily. Subsequently, thyroid function improved, but his diplopia persisted, and strabismus surgery is planned.

Discussion

TED is an autoimmune disorder that most commonly presents with hyperthyroidism and seropositivity for autoantibodies against the thyrotropin receptor.

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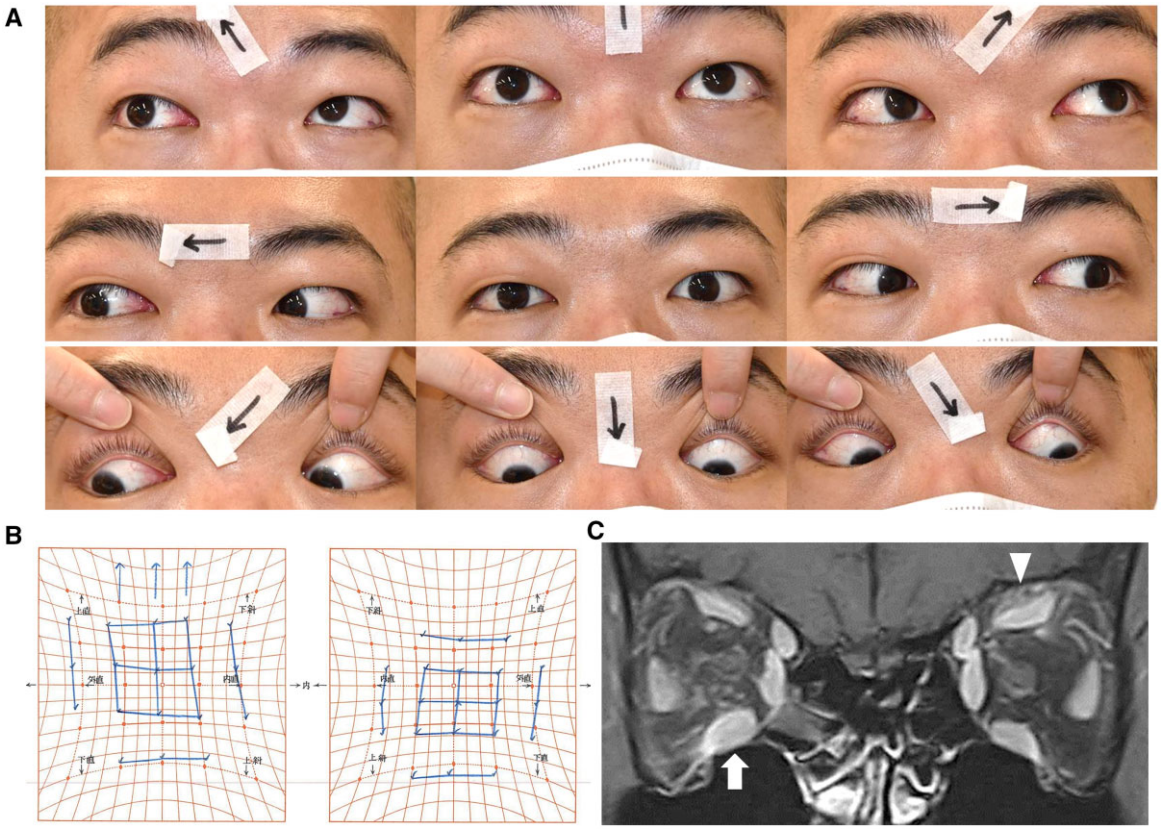

Figure 1. Ocular motility photographs (**A**) in nine gaze positions and Hess screen test (**B**) demonstrate mild restriction of the upward movement of the right eye. Magnetic resonance imaging of the orbits (**C**) shows an enlarged right inferior rectus muscle (arrow) and a high intensity around the left superior rectus muscle (arrowhead).

COVID-19 vaccine administration has not been fully considered a triggering factor of thyroid autoimmune disorders. However, a potential association between COVID-19 vaccination and the development or recurrence of thyroid dysfunction has been suggested.[1–6] Triantafyllidis *et al.*[1] reported the first systematic review of the association between COVID-19 vaccination and the onset or exacerbation of Graves' disease. They identified 57 patients from 21 eligible articles; the symptoms developed 14.8 days after administration of the vaccine, irrespective of the dose. A significant proportion of the patients developed symptoms after the first dose (55%), followed by the second dose (38%). To our knowledge, TED following COVID-19 vaccination is extremely rare in the literature.

Although the exact mechanism between COVID-19 vaccination and Graves' disease remains to be elucidated, several theories have been proposed. The autoimmune/inflammatory syndrome induced by adjuvants is the most frequently cited theory.[1,3] The formation of autoantibodies or systemic/localized inflammation is commonly reported within the first 3 weeks post-vaccination. Additionally, the presence of the ACE-2 receptor in the thyroid gland could offer direct inflammatory or immune-mediated injury to thyroid cells following severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection or COVID-19 vaccination, as it constitutes an entry point for the virus into host cells.[1] Furthermore, TPO peptide sequences in thyroid tissues share similarities with SARS-CoV-2 protein sequences. This could lead to cross-recognition between the SARS-CoV-2 spike protein encoded in the mRNA vaccine and thyroid target proteins, resulting in autoimmunity.[1]

Although TED following COVID-19 vaccination is quite rare and the causality has not yet been confirmed, the patient in the current case experienced eyelid swelling 3 h after the second vaccination, suggesting a possible side effect of the vaccine. Clinicians should be aware of TED when a patient presents with eyelid swelling and diplopia following COVID-19 vaccination.

Conflict of interest: The authors have no conflicts of interest to declare that are relevant to the content of this article.

Ethics statement

Written informed consent was obtained from the patient for the publication of any potentially identifiable images or data included in this article.

Data availability

No datasets were generated for this case report.

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