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LETTER

COVID-19 vaccine and autoimmune diabetes in adults: report of two cases

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Dear Editor,

A novel Coronavirus, the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), brought out at the end of 2019 in Wuhan, China, and caused a severe illness, the Coronavirus Disease 19 (COVID-19). Although most patients with COVID-19 have a favorable prognosis, older patients and those with chronic diseases may have worse outcomes [1]. Recently, new-onset diabetes and a worsening glycemic state in patients previously diagnosed with diabetes have been related to COVID-19 [2–4].

A great number of prevention strategies have been adopted to limit COVID-19 spread, and thanks to accelerated emergency programs and authorizations, COVID-19 vaccine is available since December 2020. Currently, in Italy, four COVID-19 vaccines, two mRNA vaccines and two viral vectors vaccines, are available. In this report, two cases of new-onset autoimmune diabetes after administration of Comirnaty—BioNTech/Pfizer and Vaxzevria ChAdOx1-S vaccine between March and April 2021 are described.

A 57-year-old Caucasian woman with polydipsia, elevated blood glucose values (> 300 mg/dL), glycosuria (> 1000 mg/dL), and ketonuria (> 80 mg/dL) was admitted to the Emergency Room on March 26th, 2021. The patient complained of asthenia, developed a few days after receiving the first dose of Vaxzevria ChAdOx1-S vaccine on March 19th, 2021.

She reported first degree family history for type 2 diabetes (T2D) and for autoimmune diseases (vitiligo and Hashimoto thyroiditis). At the Emergency Department, the patient was conscious and well oriented; she denied any chest or abdominal pain or any signs or symptoms suggesting infection, such as fever, chills, cough, dyspnea, urgency, or hesitancy. SARS-Cov-2 mRNA testing revealed a negative result. Circulating volume was replaced with 0.9% NaCl solution and the hyperglycemic state was corrected with rapid insulin administration. Since she refused hospital admission, she was discharged on March 27th, 2021 with a basal-bolus insulin therapy regimen. Glycosylated hemoglobin (HbA1c) was 90 mmol/mol (10.38%) when dosed for the first time on April 15th, 2021. Elevated levels of anti-glutamic acid decarboxylase antibodies (Anti-GAD), anti-tyrosine phosphatase antibodies (Anti-IA2), and anti-transglutaminase IgA antibody (Anti-TransGlut IgA) were found.

The second patient was a 61-year-old Caucasian woman complaining of polyuria, polydipsia, and asthenia since the administration of the second dose of Comirnaty BioNTech vaccine on June 4th, 2021. A few days later, the patient developed severe dyspnea, nausea, and abdominal pain, and she was admitted to the Emergency Room on June 30th, 2021. She reported medical history of acquired hypothyroidism. At the Emergency Department, physical examination suggested an acute abdomen. SARS-Cov-2 mRNA testing revealed a negative result. Blood analysis showed elevated levels of FPG (640 mg/dl) and metabolic acidosis. Physiologic 0.9 NaCl solution was infused, and the hyperglycemic state was corrected with rapid insulin administration. On June 6th, 2021, the patient was discharged with basal-bolus insulin therapy regimen. The patient was first evaluated in the outpatient clinics of Endocrinology and Diabetes on July 9th, 2021. HbA1c was 102 mmol/mol (11.5%) when dosed for the first time on July 5th, 2021, and elevated levels of anti-GAD and anti-thyroid peroxidase antibodies (Anti-TPO) were found. One month after first evaluation (and two months after vaccine administration) the patient developed cutaneous maculopapular erythematous lesions associated with edema to arms and legs. Skin biopsy showed

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lymphocytic invasion of dermis, mostly peri vasal; corticosteroid therapy was initiated with resolution.

COVID-19 vaccines are the most effective tool against severe disease and death so far, and they have largely demonstrated to have a good safety profile. Although causality cannot be proven and the pathophysiological mechanisms underlying the putative link between COVID-19 vaccine administration and decompensated diabetes are still unclear, it can be speculated that COVID-19 vaccine may trigger immunological response that may lead to an overproduction of different cytokines, like the SARS-CoV-2 infection, worsening an already subclinical altered glycemic state [5]. However, it has been observed that immune response triggered by COVID-19 vaccines leads to the production of different pro-inflammatory cytokines, which play a pivotal role in the pathogenesis of insulin-resistance and pancreatic beta-cell autoimmune damage [6]. The increased circulating levels of these pro-inflammatory cytokines observed after vaccine might overlap an already imposed autoimmune process, exacerbating pancreatic beta-cell inflammation and contributing to clinically manifest diabetes. Further studies are needed to deepen the understanding of the pathophysiological basis of this putative relationship.

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Data availability The data are available from the corresponding author upon reasonable request.

Declarations

Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval All procedures performed during this retrospective study were in accordance with the ethical standards of institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. The ethical committee approval is not required for case reports.

Informed consent Signed consent was obtained from the patients. Data were anonymized.

Consent for publication The participants have consented to the submission of the case report to the journal.

References

1. Filardi T, Morano S (2020) COVID-19: is there a link between the course of infection and pharmacological agents in diabetes? J Endocrinol Invest 43(8):1053–1060. https://doi.org/10.1007/s40618-020-01318-1
2. Rubino F, Amiel SA, Zimmet P, Alberti G, Bornstein S, Eckel RH, Mingrone G, Boehm B, Cooper ME, Chai Z, Del Prato S, Ji L, Hopkins D, Herman WH, Khunti K, Mbanya JC, Renard E (2020) New-onset diabetes in Covid-19. N Engl J Med 383(8):789–790. https://doi.org/10.1056/NEJMc2018688
3. Khunti K, Del Prato S, Mathieu C, Kahn SE, Gabbay RA, Buse JB (2021) COVID-19, hyperglycemia, and new-onset diabetes. Diabetes Care 44(12):2645–2655. https://doi.org/10.2337/dc21-1318
4. Boddu SK, Aurangabadkar G, Kuchay MS (2020) New onset diabetes, type 1 diabetes and COVID-19. Diabetes Metab Syndr 14(6):2211–2217. https://doi.org/10.1016/j.dsx.2020.11.012
5. Mishra A, Ghosh A, Dutta K, Tyagi K, Misra A (2021) Exacerbation of hyperglycemia in patients with type 2 diabetes after vaccination for COVID19: report of three cases. Diabetes Metab Syndr 15(4):102151. https://doi.org/10.1016/j.dsx.2021.05.024
6. Sahin U, Muik A, Derhovanessian E, Vogler I, Kranz LM, Vormehr M, Baum A, Pascal K, Quandt J, Maurus D, Brachtendorf S, Lorks V, Sikorski J, Hilker R, Becker D, Eller AK, Grutzner J, Boesler C, Rosenbaum C, Kuhnle MC, Luxemburger U, Kemmer-Bruck A, Langer D, Bexon M, Bolte S, Kariko K, Palanche T, Fischer B, Schultz A, Shi PY, Fontes-Garfias C, Perez JL, Swanson KA, Loschko J, Scully IL, Cutler M, Kalina W, Kyratsous CA, Cooper D, Dormitzer PR, Jansen KU, Tureci O (2020) COVID-19 vaccine BNT162b1 elicits human antibody and TH1 T cell responses. Nature 586(7830):594–599. https://doi.org/10.1038/s41586-020-2814-7