COVID-19: VACCINE-INDUCED IMMUNE THROMBOTIC THROMBOCYTOPENIA

Hammoud D., Myronchenko S.
National University of Pharmacy
Kharkiv, Ukraine
dohahammoud120@gmail.com

Introduction. Vaccines represent the most efficient means to control and stop the pandemic of COVID-19. COVID-19 vaccines, Vaxzevria® (AstraZeneca) and Janssen vaccine (Johnson & Johnson) are very effective but are associated with rare thrombotic complications. These vaccines consist of recombinant, replication-incapable chimpanzee adenoviral vectors encoding the Spike (S) SARS-CoV-2 glycoprotein.

Aim. The aim of this review is to provide an overview of the current knowledge on the mechanisms and new treatment methods of COVID-19 vaccine-induced immune thrombotic thrombocytopenia based on the recent publications.

Materials and methods. Data analysis of literature and Internet sources.

Results and discussion. Vaccine-induced immune thrombotic thrombocytopenia (VITT) likely begins 5-10 days after vaccination, resulting in cases being diagnosed, usually 5-30 days after vaccination. Thrombosis with VITT can occur at typical venous thromboembolism sites such as pulmonary embolism or deep vein thrombosis in the leg; however, the syndrome is characterized by thrombosis of unusual sites, including celiac (splenic, portal, mesenteric) veins, adrenal veins (risk of adrenal insufficiency), and cerebral and ophthalmic veins. VITT is triggered by antibodies that recognize platelet factor 4 (PF4, also called CXCL4) associated with platelets. These antibodies are immunoglobulins (Ig) that activate platelets through the low affinity platelet receptors FcγIIa (receptors on the platelet surface that bind the Fc portion of IgG). Preliminary theories include the possibility that components of the vaccine (including virus proteins and free DNA) bind to PF4 and generate a neoantigen. Antibodies against PF4 cause "pancellular" activation, which means that, in addition to platelet activation and clotting reactions, the antibodies activate monocytes (leading to tissue factor expression), neutrophils, and endothelial cells (leading to tissue factor expression). The activation of these other cell types further contributes to a high risk of thrombosis. A key feature that distinguishes VITT from other thrombocytopenic disorders is that anti-PF4 antibodies in these disorders are capable of activating platelets and causing thrombosis. In other diseases, such as immune thrombocytopenia, anti-platelet antibodies bind platelets but do not cause platelet activation and therefore do not cause thrombosis.

Conclusions. Thus, the administration of the COVID-19 vaccines (Vaxzevria® (AstraZeneca) and Janssen vaccine (Johnson & Johnson)) indirectly led to the activation of platelets by antibodies against PF4+heparin, which clinically mimicked heparin-induced autoimmune thrombocytopenia. Those with documented thrombosis should receive a minimum of three months anticoagulation, as for any provoked venous thromboembolism.