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Clinical Insights

SARS-CoV-2 vaccine-induced cerebral venous thrombosis

Alfonso Ciccone *

Department of Neurology with neurosurgical activity and stroke unit, ASST di Mantova, Mantova, Italy

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VISUAL ABSTRACT

The nosological entity of the cerebral venous thrombosis caused by the SARS-CoV-2 vaccination differs from the common cerebral venous thrombosis in that it is due to immune thrombocytopenia triggered by vaccination. Cerebral venous thrombosis is one of several manifestations of this type of immune thrombocytopenia. Albeit many general aspects of management of cerebral venous thrombosis are similar, immune thrombocytopenia requires a specific therapeutic approach, which is not normally adopted for cerebral venous thrombosis due to other causes, therefore its early recognition is essential.

What is a cerebral venous thrombosis?

Cerebral venous thrombosis (CVT) is a rare cause of stroke and intracranial hypertension syndrome. Compared to arterial stroke, CVT affects younger people, predominantly women, has a different risk factors profile, and a subtle and multiform clinical presentation. Risk factors include pregnancy and puerperium, oral contraceptives, inherited thrombophilia, malignancy, infections, obesity, diagnostic and treatment procedures. The wide spectrum of clinical presentations make the diagnosis difficult. The three main connected syndromes are isolated intracranial hypertension syndrome (headache with or without vomiting and papilloedema), focal syndrome (focal deficit such as paresis and aphasia, seizures or both), and encephalopathy (drowsiness, delirium, and consciousness disturbances up to coma)[1].

Non-invasive imaging studies, such as MR imaging with MR venography or CT with CT venography, should be used to confirm the diagnosis; MR with T2*- weighted gradient recalled echo or susceptibility-weighted imaging, allow for the detection of intravenous thrombosis; non-contrast CT, instead, can be normal or have non-specific findings in most patients[2]. Therefore, clinical diagnostic suspicion must guide the correct neuroimaging investigations.

The main therapies for the acute phase are the anticoagulant treatment with either unfractionated intravenous heparin or subcutaneous low molecular weight heparin followed by oral anticoagulation[2] (vitamin K antagonists or dabigatran[3]), even when in presence of brain hemorrhage, and measures to reduce intracranial pressure[1,2]. Early recognition and improvement in CVT treatment has contributed to improve outcome and mortality, which declined below 5% in the last decades[4].

Why a cerebral venous thrombosis after the SARS-CoV-2 vaccine?

The clinicians like myself, who had the chance of coming across a case of CVT following severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) vaccination, realized in the field that this condition is completely different from what we had experienced before. The first clinical aspect that stroked me at the initial observation in the emergency room was the result of the blood tests: the drop of platelet count and the high D-dimers level. While hematological diseases are known risk factor for CVT, these generally include conditions such as essential thrombocythemia, myeloproliferative malignancies, primary and secondary polycythemia, paroxysmal nocturnal hemoglobinuria[5], but not typically thrombocytopenia, which is more frequently linked to hemorrhagic than thrombotic complications. However, cases of CVT have been reported in the course of thrombocytopenia in systemic lupus [6] and of immune thrombocytopenia[7]. The coexistence of thrombosis with thrombocytopenia seems paradoxical[7], unless we explain the phenomenon by a mechanism of systemic platelet consumption and sequestration through agglutination triggered by the vaccine, which ultimately leads to systemic thrombosis. In fact, the reported cases had a median platelet count at diagnosis of 20,000–30,000 per cubic millimeter and almost invariably a high title of antibodies to platelet factor 4

* Corresponding author Alfonso Ciccone, Department of Neurosciences, ASST di Mantova, Strada Lago Paiolo 10, 46100 Mantova, Italy.
E-mail address: alfonso.ciccone@asst-mantova.it.

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