

# Cerebral Venous Sinus Thrombosis After Pfizer-BioNTech COVID-19 (BNT162b2) Vaccination

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Dear Editor,

While there have been reported cases of cerebral venous sinus thrombosis (CVST) related to the ChAdOx1 nCoV-19 and Ad26.COV2.S vaccines,<sup>1,2</sup> we are not aware of any previous local report of a case of CVST that is temporally associated with the Pfizer-BioNTech COVID-19 (BNT162b2) vaccine in Singapore. With 35 possible comparative cases<sup>3</sup> among 54 million recipients of the BNT162b2 vaccine reported to the European Medicines Agency, the present case had a similar clinical presentation with no other known risk factors for CVST, to which standard treatment<sup>4</sup> of anticoagulation and seizure management was applied.

A 61-year-old Chinese male with diabetes mellitus had received his first dose of the BNT162b2 vaccine on March 19, 2021. He reported soreness at the local injection site lasting for a few days, but did not experience fever, headache, or flu-like symptoms. He was asymptomatic before receiving his second dose of the BNT162b2 vaccine on April 10, 2021. Five days thereafter he complained of worsening generalized headache associated with persistent vomiting over the following 2 days, leading to his hospital presentation. He did not notice any double vision, facial droop, slurring of speech, focal limb weakness, or numbness, and there was no history of recent trauma, infection, dehydration, or constitutional symptoms. He was a nonsmoker and denied taking any other drugs apart from his diabetic medications. There was no family or personal history of prior venous thromboembolic disease. On clinical examination, he had a normal body mass index and was alert and rational. Cranial nerves, limb reflexes, and motor and sensory testing were unremarkable. There was a left extensor Babinski response. A computed tomography (CT) scan of the brain on admission revealed acute subarachnoid hemorrhage (SAH) along the left frontal lobe sulci (Fig. 1A).

On the following day, the patient was witnessed to have a focal-onset motor seizure involving left head version and left upper limb tonic-clonic jerking lasting for 5 minutes. Repeat brain CT revealed several new acute intraparenchymal hematomas in the right frontal lobe with overlying hyperdense cortical draining veins (Fig. 1B and C).

Brain magnetic resonance imaging with venography subsequently showed thrombosis of the entire superior sagittal sinus extending to the medial portion of the right transverse sinus (Fig. 1D). Additional findings included bilateral frontal lobe cortical vein thrombosis, partial thrombosis of bilateral sigmoid sinuses, right frontal lobe intraparenchymal hemorrhage with edema that was consistent with a venous infarct, and bilateral frontal and parietal convexity SAH.

The blood platelet count was normal at 333,000/ $\mu$ L, and there was no evidence of disseminated intravascular coagulopathy. A further prothrombotic workup including lupus anticoagulant, anticardiolipins, homocysteine, protein C, protein S, antithrombin III, and thyroid function produced unremarkable findings. CT of the thorax, abdomen, and pelvis did not reveal any malignancy or occult vessel thrombosis. An RT-PCR for SARS-CoV-2 was negative.

The patient was commenced on low-molecular-weight heparin at 1 mg/kg bid and convert-

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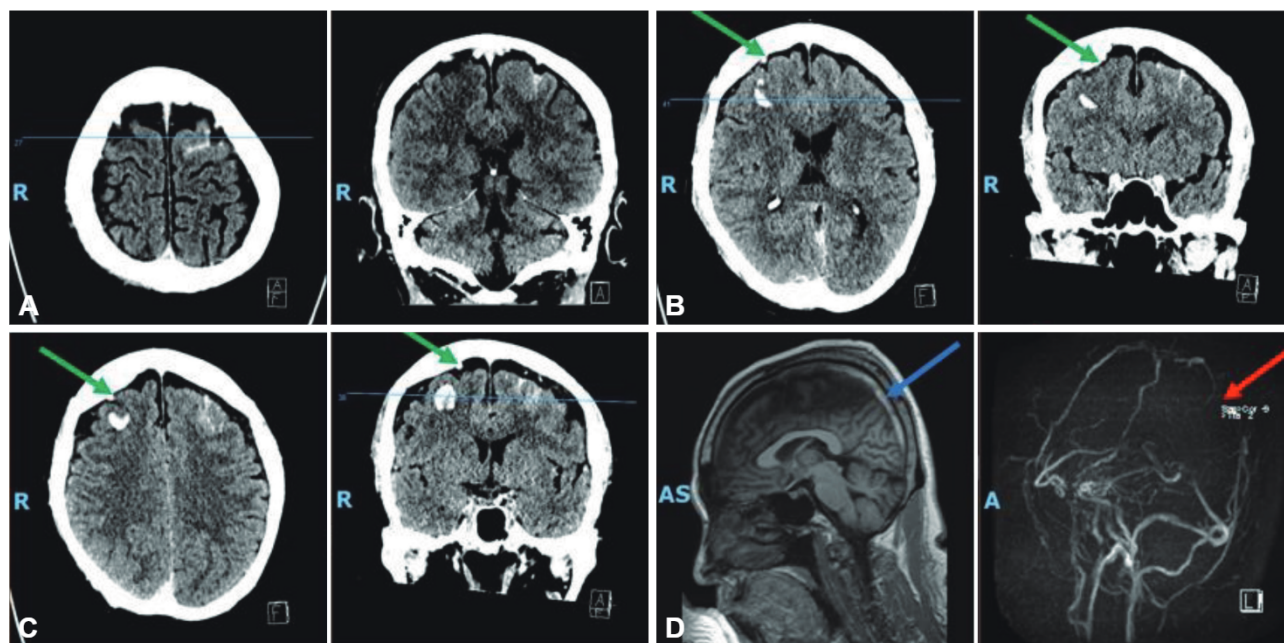
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**Fig. 1.** Neuroimaging showing intracerebral hemorrhages and cerebral venous sinus thrombosis. A: Axial and coronal brain CT on admission showing hyperdensities along the left frontal lobe sulci suggestive of SAH. B and C: Axial and coronal brain CT repeated 1 day later showing several new acute intraparenchymal hematomas in the right frontal lobe with sizes up to 1.3 cm. There were also hyperdense cortical draining veins over the right frontal lobe (green arrows). The left frontal lobe sulci SAH was stable. D: Sagittal brain T1-weighted MRI (left image) showing T1-weighted hyperintensity over the entire SSS (blue arrow) extending to the right transverse sinus, compatible with thrombus. The MRI venogram (right image) reveals that flow was absent in the SSS (red arrow). SAH, subarachnoid hemorrhage; SSS, superior sagittal sinus.

ed to oral warfarin (international normalized ratio=2–3) since he remained neurologically stable. He was also started on levetiracetam at 500 mg bid with no recurrence of seizures.

To date, more than 4 million doses of the BNT162b2 vaccine have been administered in Singapore. The present case report is the first of a local case of CVST that is temporally associated with the vaccine. There is still insufficient evidence that the rate of CVST associated with COVID-19 vaccines is higher than the background CVST incidence of 1.32–1.57/100,000/year.<sup>5,6</sup> As the world continues its vaccination efforts, the occurrence of CVST should be kept in mind as a possible significant side effect. However, in line with recommendations<sup>7,8</sup> from various major committees, its rarity suggests that the benefits of COVID-19 vaccines still outweigh their risks. Worldwide monitoring and data collection would be highly prudent as we continue to administer mRNA and other vaccines in efforts to end the pandemic.

#### Ethics Statement

Informed consent was obtained from the patient.

#### Availability of Data and Material

Data sharing not applicable to this article as no datasets were generated or analyzed during the study.

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#### Conflicts of Interest

The author has no potential conflicts of interest to disclose.

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