NONTRAUMATIC ACUTE SUBDURAL HEMATOMA EIGHT DAYS AFTER COVID-19 VACCINATION: A CASE REPORT

Rihito Yamamura 1,a

1 Department of Cerebrovascular Medicine and Surgery, Saiseikai Kumamoto Hospital, Kumamoto City, Kumamoto, Japan

ABSTRACT Nontraumatic acute subdural hematoma is rare, and no associations with the COVID-19 vaccine have been reported. This report presents the case of a 77-year-old woman who developed a nontraumatic acute subdural hematoma eight days after vaccination with the BNT162b2 COVID-19 vaccine. The patient took 50 mg/day of clopidogrel and was diagnosed with a severe acute subdural hematoma and brain herniation at admission. Although the BNT162b2 vaccine has not been determined as a risk factor, intracranial haemorrhage has been reported in Japan after its administration. Therefore, nontraumatic acute subdural hematoma may be an extremely rare adverse event of the BNT162b2 vaccine. Still, more data may be needed to confirm this.

KEYWORDS nontraumatic, acute subdural hematoma, COVID-19, vaccination, BNT162b2

Introduction
Acute subdural hematoma (ASDH) is typically caused by trauma. Other rare non-traumatic causes may include cerebrovascular lesions, such as cerebral aneurysms; coagulation abnormalities; and drug abuse [1,2]. COVID-19 vaccines have significantly reduced SARS-CoV-2 infections but are also associated with rare adverse events. A PubMed search revealed no associations between the COVID-19 vaccine and nontraumatic ASDH. Though this report does not prove causality, it does, however, present a case of nontraumatic ASDH that occurred shortly after the administration of the BNT162b2 COVID-19 vaccine.

Case Report
A 77-year-old woman was admitted to our hospital in an unconscious state. She had a headache for approximately six hours and vomited several times before admission. She had been administered the first and second doses of the COVID-19 vaccine (BNT162b2) twenty-nine and eight days prior, respectively. After the second vaccination, she experienced malaise. Her daily medication included 50 mg/day of clopidogrel to prevent recurrent cerebral infarction. Upon arrival at our hospital, her Glasgow Coma Scale (GCS) was E1V1M2. The patient’s breathing pattern was agonal, and her pupils were 7 mm on both sides without a light reflex. No skin trauma was observed, such as contusions, bruises, or subcutaneous blood spots. Her platelet count was 226,000 per microliter of blood, which was within the normal range. Computed tomography (CT) of the head revealed a large, left-sided acute subdural hematoma and complete brain herniation without bone fractures (Figure 1). Magnetic resonance imaging (MRI) from 13 years prior showed no cerebral aneurysms, arteriovenous fistulas, or other abnormal findings (Figure 2).

Our team carefully collected information from the family members who lived with her, but no traumatic events were reported. No indication for surgery was present. Consequently, conservative treatment and palliative care were provided, and about five hours later, the patient died.

Discussion
Nontraumatic ASDH is rare, accounting for 0.7 to 6.7% of all ASDH cases, and is characterized by a mortality rate of 37.2% [1].

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1Corresponding author: Rihito Yamamura, GRACE CHIKAMI 803, 8-10-92 Chikami, Minami-ku, Kumamoto 861-4101, Japan. Phone: 080-2728-2387. E-mail: rihito.yamamura@protonmail.com
Ruptured cerebral aneurysms, arteriovenous fistulas, ruptured arachnoid cysts or vascular structures, haematological malignancies, coagulation abnormalities, and cocaine abuse have been reported as causes of nontraumatic ASDH [1,2]. Pre-hospital history suggested that the patient had developed the ASDH approximately six hours prior to her arrival. Although the head CT showed marked ASDH, there were no bone fractures or skin trauma findings, and no history of trauma was reported.

As in a previous case of a patient receiving fondaparinux and aspirin who developed nontraumatic ASDH [3], the present case could have been affected by clopidogrel, which may have worsened the ASDH and resulted in the fatal condition. Similarly, an MRI from 13 years prior showed no cerebral aneurysms, arteriovenous fistulas, or other abnormal findings. However, there is still a possibility that these developed later and were a cause of the ASDH. Moreover, on arrival, the patient’s severe condition did not allow for contrast-enhanced CT or an MRI. Since palliative care was promptly decided upon, minimal routine blood tests were performed, including any additional coagulation testing. If the details of the COVID-19 vaccination had been known in our emergency room, more extensive blood tests might have been performed.

BNT162b2, an mRNA vaccine for COVID-19, has contributed significantly to the reduction in SARS-CoV-2 infections. In a study conducted by Barda et al. based on data from Israel, the BNT162b2 vaccine was associated with a risk of myocarditis, lymphadenopathy, appendicitis, and herpes zoster infection [4]. Furthermore, SARS-CoV-2 infections were associated with a risk of intracranial haemorrhage [4]. The study suggested that the BNT162b2 vaccine prevented SARS-CoV-2 infection, thus reducing and preventing intracranial haemorrhage [4]. Additionally, in a study by Schulz et al. using data collected from German institutions, four cases of intracranial haemorrhage within one month of vaccination with the ChAdOx1 (adenoviral vector type) COVID-19 vaccine were reported [5]. Three of the four cases in that study were women [5]. Shimazawa et al. further noted that in Japan, 4 out of 10 deaths in the period around BNT162b2 vaccinations were due to intracranial haemorrhage in women [6]. These included intracerebral, subarachnoid, or intraventricular haemorrhages, but ASDH was not identified in the study [6]. The present case is similar in that the patient was a Japanese woman. Although SARS-CoV-2 cases may decrease, the BNT162b2 vaccine may potentially increase intracranial haemorrhages. However, this may be influenced by demographic factors, such as race or sex. In the present case, a rare, nontraumatic ASDH developed shortly after administration of the BNT162b2 vaccine, which may suggest some association.

**Conclusion**

The effect of the BNT162b2 vaccine on intracranial haemorrhage remains unclear. Still, nontraumatic ASDH may be included among its rare adverse events. Further data collection and analysis are required to determine the influencing factors.

**Abbreviations**

| Abbreviation | Description |
|--------------|-------------|
| ASDH         | Acute Subdural Hematoma |
| CT           | Computed Tomography |
| MRI          | Magnetic Resonance Imaging |

**Ethics Approval and Informed Consent**

Due to the patient’s inability to communicate, the author obtained consent from a family member who had the right to make the decision. This manuscript contains no personally identifiable patient information.

**Conflict of Interest**

The author had no conflicts of interest.

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