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CASE REPORT

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# Supraventricular tachycardia and deep vein thrombosis following Moderna vaccination: A case series

**Niroj Bhandari**[1] | **Aashutosh Chaudhary**[2] | **Suyash Acharya**[2] | **Shiwani Sharma Acharya**[1] | **Kusum Paudel**[3] | **Robin Man Karmacharya**[4] | **Satish Vaidya**[4] | **Kajol Kunwar**[2] | **Swechha Bhatt**[2]

[1]Department of Surgery, Kathmandu University School of Medical Sciences, Dhulikhel, Nepal

[2]Kathmandu University School of Medical Sciences, Dhulikhel Hospital, Dhulikhel, Nepal

[3]Department of Medicine, Kathmandu University School of Medical Sciences, Dhulikhel, Nepal

[4]Cardio-Thoracic and Vascular Surgery Unit, Department of Surgery, Kathmandu University School of Medical Sciences, Dhulikhel, Nepal

**Correspondence**
Suyash Acharya, Kathmandu University School of Medical Sciences, Dhulikhel Hospital, Dhulikhel 45210, Nepal.
Email: acharyasuyash555@gmail.com

**Abstract**

There have been reports of deep vein thrombosis and supraventricular tachycardia following the Moderna vaccination. The timing of SVT and DVT just after vaccination in our case series could suggest possible temporal relationships to the vaccination. But further studies are needed to establish such evidence.

**KEYWORDS**

deep vein thrombosis, Moderna vaccine, supraventricular tachycardia

## 1 | INTRODUCTION

There have been reports of deep vein thrombosis (DVT) and supraventricular tachycardia (SVT) following the Moderna vaccination. The timing of SVT and DVT just after vaccination in our case series could suggest possible temporal relationships to the vaccination. But further studies are needed to establish such evidence.

Coronavirus disease-2019 (COVID-19) is caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) resulting in a worldwide pandemic of multisystem disease.[1] The first case of coronavirus was reported in Wuhan, China on December 31, 2019. Various vaccines received emergency use authorization over time. Moderna COVID-19 vaccine (mRNA-1273) is a lipid nanoparticle encapsulated, nucleoside-modified mRNA vaccine encoding the stabilized prefusion spike glycoprotein of SARS-CoV-2, the virus that causes COVID-19.[2]

Moderna vaccination showed mild side effects in patients including pain at the injection site, low-grade fever, headache, and myalgia that the patient often tolerates.[3] Moderna (mRNA-1273) and Pfizer (BNT162b2) are the mRNA vaccines currently available against COVID-19.[4,5] This vaccine decreases the risk of severe COVID-19 infection and has substantially reduced the number of hospitalization and death.[4,5] DVT and SVT have been rarely described among mRNA vaccines.

## 2 | CASE SERIES

### 2.1 | Case 1

A 12-year-old female presented to the Pediatric Out-Patient Department of Dhulikhel hospital with fever and palpitation. She received the Moderna vaccine 1 day before the onset of symptoms in the left deltoid region. She received the first vaccine dose 1 month back, with no notable symptoms. There is no history of chest pain, shortness of breath, swelling of the legs, or loss of consciousness.

On examination, she had a heart rate of 130 beats per minute and a respiratory rate of 40 breaths per minute, and oxygen saturation was 96% in room air. The chest examination was normal. 1st and 2nd heart sounds were heard without murmur. Electrocardiography (ECG) was done that showed features suggestive of SVT. Then the patient was shifted to the Pediatric Intensive Care Unit (PICU). Tachycardia resolved after the application of cardiac massage. Her complete blood count, thyroid function test, and renal function test were within normal limits. Echocardiography showed normal findings. Then the patient gradually improved and was shifted to the pediatric ward on the 4th day. She was discharged with advice to follow-up after 2 weeks for echocardiography.

### 2.2 | Case 2

A 15-year male presented to the Emergency of Dhulikhel hospital with a history of swelling of the right leg and shortness of breath following the administration of the Moderna vaccine. On the day of vaccination, the child complained of pain over the left arm at the injection site. Then 15 hours later, he complained of pain over the right calf region. On the second day of vaccination, he developed swelling of the right leg extending up to the right thigh. Then the child was unable to walk from the fourth day and had central chest pain followed by shortness of breath and fast breathing. He also complained of unusual awareness of his heartbeat. He had a spike in fever 1 day prior to his presentation to our hospital. There is no history of sweating, loss of consciousness, or cough. On examination, the child was ill-looking but was conscious and well-oriented to time, place, and person. He was tachypneic with a respiratory rate of 40 breaths per minute with oxygen saturation of 80% at room air. His oxygen saturation was maintained at 95% at 3 L of oxygen. He had pitting edema of the right leg extending from the foot to the upper thigh. On chest examination, bilateral equal air entry was heard with bilateral crepitations. Both heart sounds were heard without murmur. On abdominal examination, tenderness was present over the right hypochondrium and the liver was palpable 3 cm below the right midclavicular line. On examination of lower limbs, swelling of the right knee and right ankle was noted. He received an injection of enoxaparin and ceftriaxone at ER. CT scan showed features of pulmonary embolism (Figure 1).

Venous doppler of the right lower limb showed the absent flow of right popliteal vein with noncompressible right popliteal vein with echogenic thrombus within its lumen and subcutaneous edema along with minimal interspersed collection in right ankle suggestive of DVT of the right lower limb with subcutaneous edema (Figure 2).

He was admitted to the PICU. His initial laboratory report included a white blood cell (WBC) count of 7500 per cubic mm, decreased platelet count of 133,000 per cubic mm, a hemoglobin of 12.5 g/dL, a prothrombin time of 18 seconds, an international normalized ratio of 1.5, an elevated D-Dimer of 8.7 mg/dL, an activated partial thromboplastin time (APTT) of 50 s, and an elevated C-reactive protein of more than 150 mg/dL. He was started on intravenous unfractionated heparin infusion with continuous monitoring of APTT. On the second day of admission,

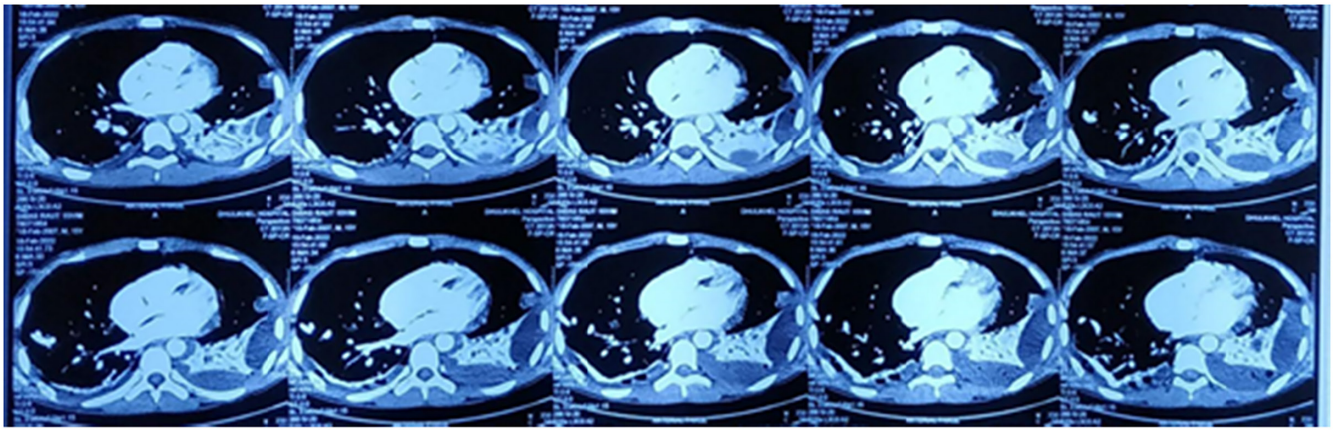

FIGURE 1 CT scan showing features of pulmonary embolism.

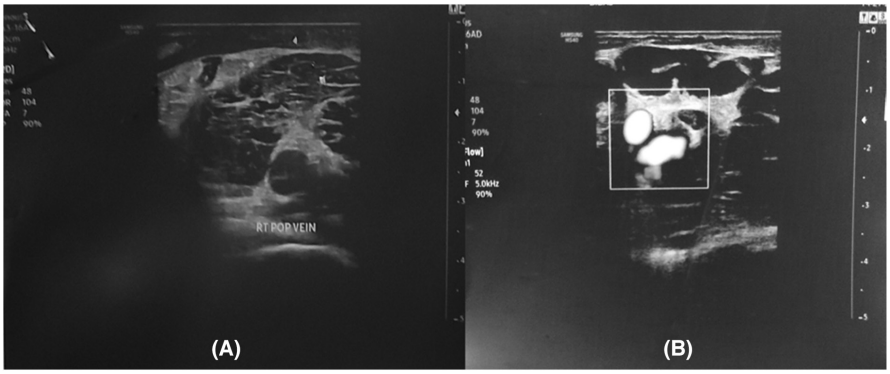


**FIGURE 2** USG venous Doppler of bilateral lower extremity showing intraluminal thrombus in right popliteal vein (A) in contrast to good flow noted on the left popliteal vein (B).

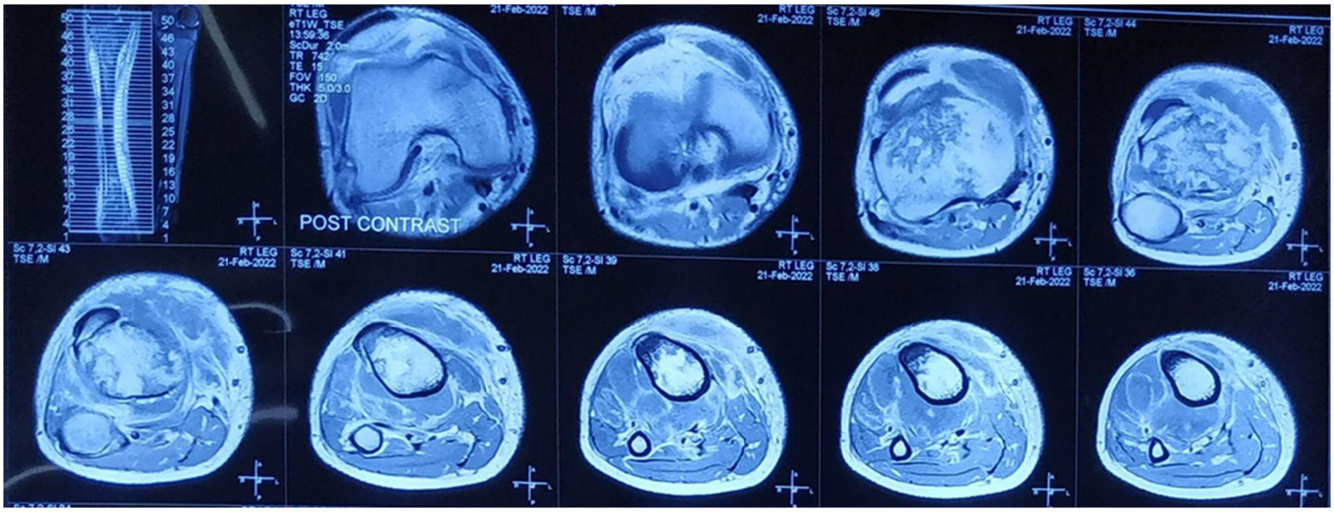


**FIGURE 3** CT scan of the right knee showing the features of acute osteomyelitis.

his APTT level was elevated to 210 s. On the fourth day of admission, his blood reports showed a raised WBC count of 24,100 cells/μL and APTT 41 s. Pus was aspirated from the right knee joint and its culture showed staphylococcal growth. Also, the X-Ray and CT scan of the right knee showed the features of acute osteomyelitis of the right tibia with septic arthritis of the right knee and right ankle (Figure 3). Then the patient was planned for the operative procedure by the orthopedics department. During his hospital stay, necrotic tissue and slough were noticed over the right leg which was tender but non-spreading (Figure 4). He underwent emergency debridement, decompression with arthrotomy, and proximal tibia corticotomy with a long leg slab. Redebridement was done twice after the emergency debridement and decompression on alternate days.

## 3 | DISCUSSION

Globally, several strategies have been adopted to reduce the spread of SARS-CoV-2. Among the different strategies, vaccines remain the most crucial measure to prevent the spread of COVID-19. As of July 3rd, 2022, there are 11 vaccinations listed on the WHO emergency use listing. These include Janssen, Pfizer, Moderna, Sinovac, Sinopharm, AstraZeneca, Covaxin, Covishield, CanSino, Novavax, and covovax.[6] To stop the pandemic early, these vaccines were developed in a relatively short amount of time.[7]

According to the Vaccine Adverse Event Reporting System (VAERS) database, 89.78% of side effects recorded till July 3rd, 2022 following COVID-19 vaccinations were classified as nonserious.[8] Some of the frequently reported symptoms following Moderna vaccinations are fatigue, local pain, headache, chills, myalgia, arthralgia, fever, nausea/vomiting, and local erythema.[8] There are reports of myocarditis, pericarditis and sensory neural hearing loss following mRNA COVID-19 vaccination but SVT is rarely reported complication following COVID-19 vaccination.[9–11]

In a study by Jeet Kaur et al., 4863 cardiovascular adverse events were noted from Pfizer, AstraZeneca, Moderna, and other COVID vaccines, the common being tachycardia, flushing, hypertension, hypotension, and peripheral coldness.[9] Out of 1130 patients having cardiovascular adverse events detected by ECG, 29 reported SVT,

FIGURE 4 Right lower limb swelling with skin changes.

occurring in all the age groups ranging from 18 to 65 years, with female predominance receiving these vaccines.[9]

Though SVT is quite common in children, DVT is rarely seen in the pediatric age group.[12] It is well documented that there is a thrombotic risk after infection with COVID-19; however, it is unclear if there is a risk of thrombosis following COVID-19 vaccination.[13] There have been few reports in the literature of acute DVT following Moderna vaccination.[1,14] mRNA COVID-19 vaccine has been suggested to bind to pattern recognition receptors in the cytosol and endosomes causing coagulopathy.[15] Though rare, studies have also shown an association of DVT with osteomyelitis and septic arthritis.[16] Likewise, in our case, DVT could have developed associated with osteomyelitis and septic arthritis unrelated to vaccination.

As of July 3rd, 2022, there have been reports of 1104 cases of DVT and 222 cases of SVT following Moderna vaccination through the VAERS database among millions of doses administered to date.[8] But these reports cannot establish a causal relationship between vaccines and any suspected adverse effects as the VAERS system is susceptible to bias and may report cases unrelated to vaccinations.[8] The cases described in this case series could represent unrelated incidences of SVT and DVT among a huge population receiving vaccines where the vaccine itself could be a confounding variable. However, the timing of SVT and DVT just after vaccination in our case series could suggest possible temporal relationships to the vaccination. But further studies are needed to establish such evidence.

## 4 | CONCLUSION

In this case series, we report SVT and DVT occurring after the Moderna vaccine administration. Most side effects following COVID-19 vaccinations were found to be non-serious. Though rare, some of the side effects following vaccination can lead to adverse outcomes. This warrants vigilant surveillance and response in tackling any adverse outcome.

### AUTHOR CONTRIBUTIONS

**Niroj Bhandari:** Data curation; writing – original draft. **Aashutosh Chaudhary:** Conceptualization; data curation; writing – original draft; writing – review and editing. **Suyash Acharya:** Conceptualization; data curation; writing – original draft; writing – review and editing. **Shiwani Sharma Acharya:** Writing – original draft. **Kusum Paudel:** Writing – review and editing. **Robin Man Karmacharya:** Conceptualization; data curation; writing – original draft; writing – review and editing. **Satish Vaidya:** Conceptualization; writing – original draft; writing – review and editing. **Kajol Kunwar:** Writing – review and editing. **Swechha Bhatt:** Writing – review and editing.

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Not applicable.

### CONFLICT OF INTEREST STATEMENT

None.

### DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available in Dhulikhel Hospital, Dhulikhel, Kavre, Nepal.

### ETHICS STATEMENT

No ethical limits were crossed during reporting of this article.

### CONSENT

Written informed consent was obtained from the patient to publish this report in accordance with the journal's patient consent policy.

## ORCID

*Aashutosh Chaudhary* https://orcid.org/0000-0002-5557-5608
*Suyash Acharya* https://orcid.org/0000-0003-2006-0724
*Shiwani Sharma Acharya* https://orcid.org/0000-0001-7687-1871
*Kusum Paudel* https://orcid.org/0000-0001-9637-221X
*Swechha Bhatt* https://orcid.org/0000-0002-2535-9322

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