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Acute Arterial Occlusion Following ChAdOx1 nCov-19 (Oxford–AstraZeneca) Vaccination

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To the Editor, there have been documented cases of rare thrombotic events associated with venous thrombosis and thrombocytopenia post vaccination with ChAdOx1 nCov-19 (Oxford-AstraZeneca COVID-19 Vaccine). This phenomenon was termed vaccine-induced immune thrombotic thrombocytopenia (VIITT) [1]. Although not as commonly published, there are reports of covid vaccine related arterial thromboses [2], and a suggestion that these events may be more frequent than venous thrombosis [3]. We describe a case of acute arterial lower limb ischemia following vaccination with ChAdOx1 nCov-19.

A 49-year-old male, previously fit and well, presented with a 4-day history of cramping left leg pain with progressive pallor and paraesthesia. He denied smoking, alcohol, recreational drug use and had no significant family history. Notably, the patient had received his first dose of the ChAdOx1 nCov-19 vaccination 14 days prior. Examination confirmed left lower acute limb ischemia (Rutherford Class IIa) [4]. Blood laboratory findings demonstrated mild thrombocytopenia (platelet count 135 $\times$ 10^9/L) with elevated D-dimer at 950 ng/mL. CT lower limb angiogram (Fig. 1) demonstrated focal acute thrombus just above the left iliac bifurcation and an acute occlusion of the mid-popliteal artery extending into the proximal segments of the crural arteries.

Following multidisciplinary meeting discussion, it was decided to proceed with urgent pharmaco-mechanical thrombectomy. Fluoroscopic angiogram confirmed occlusion of the popliteal artery with no distal run-off (Fig. 2). The absence of filling defects in the iliac arteries on angiogram was deemed likely secondary to distal clot embolisation. Treatment was performed using the Angio-Jet™ Thrombectomy System and thrombolysis with alteplase. Initial therapy restored in line flow to the ankle with residual filling defects in the infra-popliteal arteries. A multi-sidehole infusion catheter was placed up to the anterior tibial artery (ATA) for overnight thrombolysis with alteplase at 0.5 mg/h, and heparin (250 U/h) was infused via the sheath.

Patient remained on thrombolysis for a total of 24 h with two subsequent check angiograms during this time. Further thrombectomy was performed during the first check angiogram in the ATA to reduce the clot burden; however this failed to restore flow. Due to initial concerns from haematology of heparin as a potential cause of further clot formation, it was substituted with 0.9% saline to maintain access sheath patency and thrombolysis with alteplase continued. Final angiogram showed resolution of the popliteal and tibial thrombus with only a short segment residual filling defect in the common plantar artery (Fig. 3).

Intravenous Argatroban was commenced as the choice of anticoagulation based on national haematological guidelines to treat suspected VIITT [5] with a target activated partial thromboplastin time (APTT) range of 1.5–3.0 of normal control. Following clinical and symptomatic

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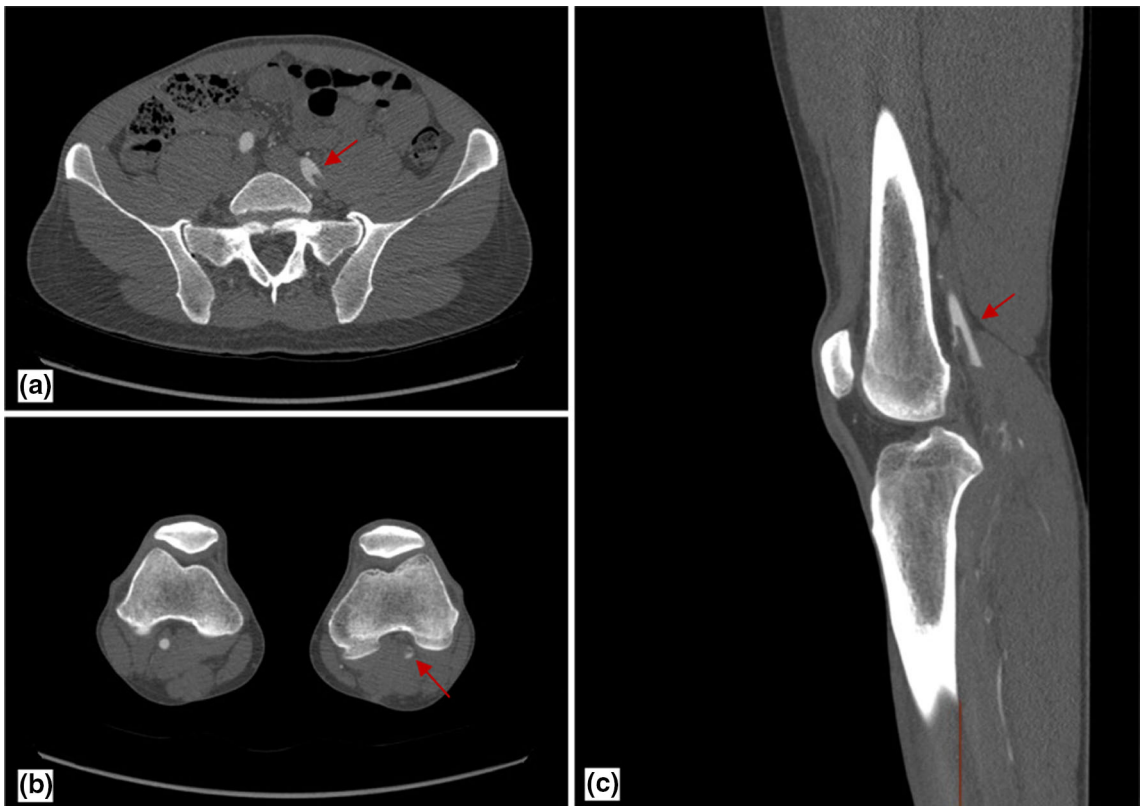

Fig. 1 CT Angiogram acquired using 64-Slice Siemens CT scanner **a** axial view showing a filling defect in the left common iliac artery, **b** filling defect in the left popliteal artery and **c** sagittal view showing complete occlusion of the mid-popliteal artery (P2 segment)

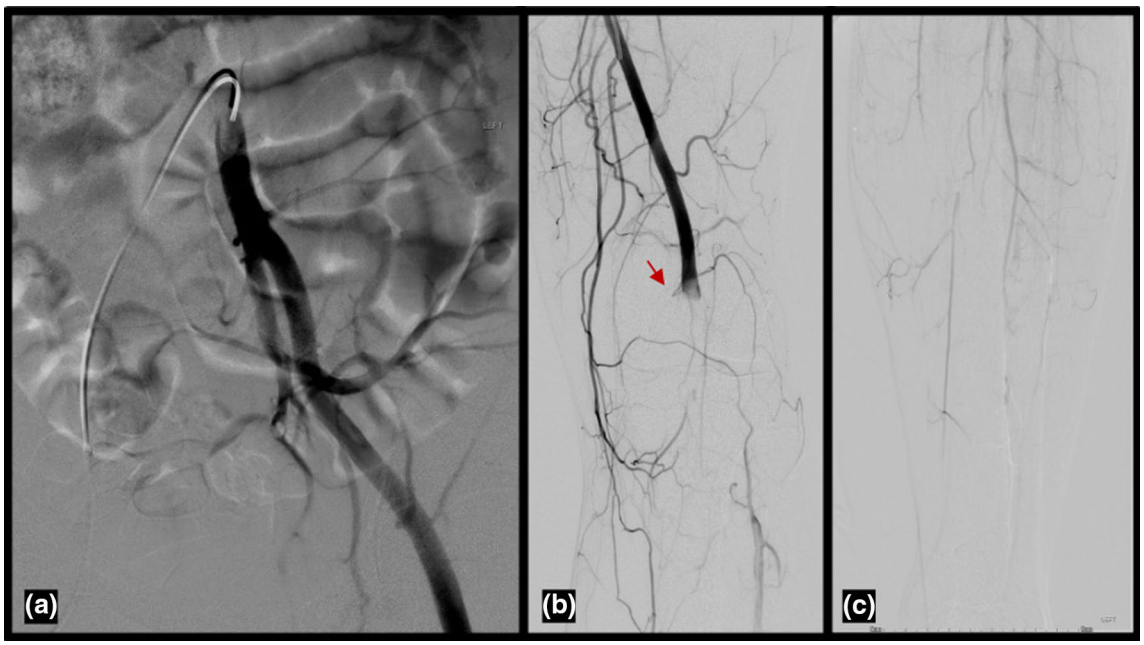

Fig. 2 Initial Digital Subtraction Angiogram (DSA) performed using ARTIS Pheno angiography system (Siemens). Retrograde Right common femoral access under local anaesthesia and placement of a 7-French Flexor Balkan sheath (Cook Medical). The sheath tip was positioned in the proximal left common iliac artery for DSA runs. **a** No filling defects in the left common, internal and external iliac arteries, **b** abrupt occlusion of the left popliteal artery in the P2 segment with no opacification of the proximal infrapopliteal arteries, **c** clot burden extending into the tibial arteries with incomplete filling and no runoff below the ankle

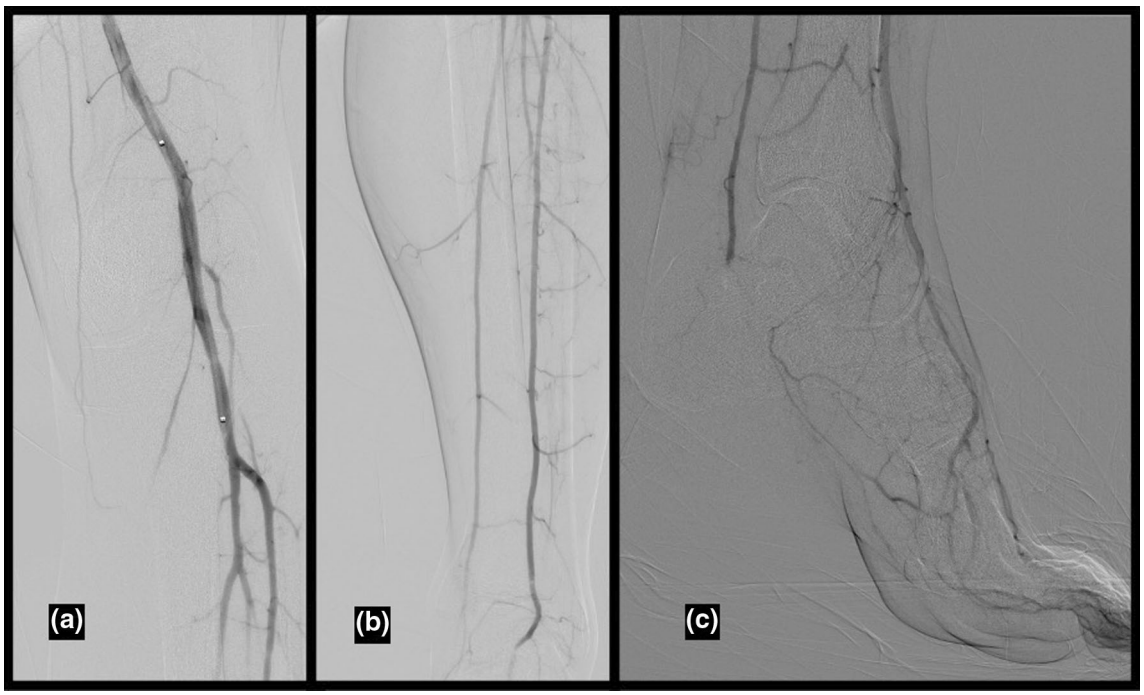

Fig. 3 Final Check Angiogram **a** restoration of flow in the popliteal artery and proximal infrapopliteal arteries with no residual filling defects, **b** contrast flow into the anterior tibial and posterior tibial arteries, **c** contrast flow into the dorsalis pedis and plantar arch. Short segment residual filling defect in the common plantar artery with retrograde filling of the lateral plantar artery

improvement, Argatroban was switched to warfarin on discharge and continued for a period of 6 months.

Thrombophilia screen revealed normal protein C and S activity and negative assays for prothrombin and factor V Leiden mutation. Lupus anticoagulant was detected on admission (level 1.26), however this was negative at 6 months follow up, excluding it as a cause for the thrombosis. Rapid HIT screen test with "*Biorad Diamed ID-PaGIA Heparin/PF4 antibody test"* was negative. Conversely, testing with "*Stago-Asserachrom HPIA ELISA"* was positive for anti-PF4 antibodies, thereby confirming the diagnosis of VIITT.

Contrary to classic heparin induced thrombocytopenia (HIT), VIITT is seen without exposure to heparin. Rapid HIT testing detects polyanion complexes formed between heparin and anti-PF4 antibodies [6]. In contrast, ELISA testing detects the PF4 IgG antibodies, hence repeat testing using this method that was undertaken [1]. The absence of significant thrombocytopenia, which was being seen in patients with venous thrombosis at the time, coupled with the first negative HIT screen was the reason that VIITT was not considered as an initial diagnosis and patient commenced on heparin. However, in the absence of any identifiable cause of arterial clot formation and timing of the presentation following vaccination, our clinical and diagnostic suspicion for a vaccine related phenomenon increased and subsequently confirmed following positive ELISA PF4 antibodies.

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Declarations

Conflict of interest The authors declare that they have no conflict of interest.

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Informed Consent Informed consent was obtained from all individual participants included in the study.

Consent for Publication Consent for publication was obtained for every individual person's data included in the study.

References

1. Scully M, Singh D, Lown R, Poles A, Solomon T, Levi M, et al. Pathologic antibodies to platelet factor 4 after ChAdOx1 nCoV-19 vaccination. N Engl J Med. 2021. https://doi.org/10.1056/NEJMoa2105385.
2. Jones M, Boisvert A, Landry J, Petrasek P. Limb ischemia and pulmonary artery thrombosis after the ChAdOx1 nCoV-19

(Oxford–AstraZeneca) vaccine: a case of vaccine-induced immune thrombotic thrombocytopenia. Can Med Assoc J. 2021;193(24):E906–10. https://doi.org/10.1503/cmaj.210795.
3. Smadja D, Yue Q, Chocron R, Sanchez O, Lillo-Le LA. Vaccination against COVID-19: insight from arterial and venous thrombosis occurrence using data from VigiBase. Eur Respir J. 2021;58(1):2100956. https://doi.org/10.1183/13993003.00956-2021.
4. Rutherford R. Clinical staging of acute limb ischemia as the basis for choice of revascularization method: when and how to intervene. Semin Vasc Surg. 2009;22(1):5–9. https://doi.org/10.1053/j.semvascsurg.2008.12.003.
5. Pavord S, Lester W, Makris M, Scully M, Hunt B. Guidance produced from the expert haematology panel (EHP) focussed on syndrome of thrombosis and thrombocytopenia occurring after coronavirus vaccination [Internet]. B-s-h.org.uk. 2021 [cited 1 May 2021]. Available from: https://b-s-h.org.uk/about-us/news/guidance-produced-by-the-expert-haematology-panel-ehp-focussed-on-vaccine-induced-thrombosis-and-thrombocytopenia-vitt/
6. Galea V, Khaterchi A, Robert F, Gerotziafas G, Hatmi M, Elalamy I. Heparin-induced multiple electrode aggregometry is a promising and useful functional tool for heparin-induced thrombocytopenia diagnosis: confirmation in a prospective study. Platelets. 2012;24(6):441–7. https://doi.org/10.3109/09537104.2012.724736.