Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Disclosure of interest

The authors declare that they have no competing interest.

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Parvovirus B19-related peripheral nerve necrotizing vasculitis following SARS-CoV-2 infection

A 39-year-old nurse with no past medical history developed ageusia and anosmia during the COVID-19 epidemic. SARS-CoV-2 polymerase chain reaction (PCR) was positive in a nasopharyngeal swab, and symptoms spontaneously resolved in a few days. Six weeks later, she developed bilateral wrist and ankle pain, and a necrotic purpuric rash involving limbs and trunk. One week after, she developed successively over one week numbness and neuropathic pain in the right hand, left hand and feet, followed by right hand and right foot weakness. Physical examination showed severe weakness of intrinsic muscles and abductor pollicis brevis of the right hand and right ankle dorsiflexors. Electrodiagnostic evaluation demonstrated multiple mononeuropathy. Total blood count, CRP, fibrinogen, complement levels and protein electrophoresis were normal. Antinuclear and anti-neutrophil cytoplasmic antibodies, cryoglobulin, hepatitis B and C viruses, HIV, and Lyme disease were not found. SARS-CoV-2 IgG, PVB19 IgG and Epstein-Barr virus IgG antibodies were found in serum, and IgM antibodies were negative for all three viruses. Biopsy of the superficial fibular nerve revealed small-to-medium-sized vessel vasculitis with epineural vessel wall fibrinoid necrosis (Fig. 1A). Skin biopsy showed small-vessel vasculitis with capillary wall fibrinoid necrosis and perivascular C3 deposits (Fig. 1B). The patient was diagnosed with nerve and skin necrotizing vasculitis, and treated with oral corticosteroids 1 mg/kg/day. Neurological status remained unchanged after 4 weeks. Both SARS-CoV-2- and PVB19-related vasculitis were considered, and viral load of both viruses was analyzed in blood, skin and nerve using real-time PCR. PVB19 viral DNA load was estimated at 3650, 21,467, and 1,150,000 copies per one million cells (copies/Mc) in blood, skin and nerve respectively whereas SARS-CoV-2 RNA viral load was undetectable in all 3 tissues (Fig. 1C). As a result, PVB19-related peripheral nerve vasculitis was considered, and the patient was treated with intravenous immunoglobulins (IVIg) at the dose of 2 g/kg, which allowed dramatic clinical improvement with only residual feet paresthesia six months later.

Viruses may provoke peripheral nerve vasculitis, either by a direct cytopathic or an indirect autoimmune response [1]. Skin and nerve vasculitis has been reported in association with acute PVB19 infection, and systemic necrotizing vasculitis has been observed in association with chronic PVB19 infection, with good IVIg-responsiveness [2,3]. Skin vasculitis has been described in association with acute SARS-CoV-2 infection [4]. In our case, vasculitis may have been the result of PVB19 infection, SARS-CoV-2 infection, or both. To untie the knot, we performed viral load analysis in blood, skin and nerve, and observed an absence of SARS-CoV-2 RNA in all

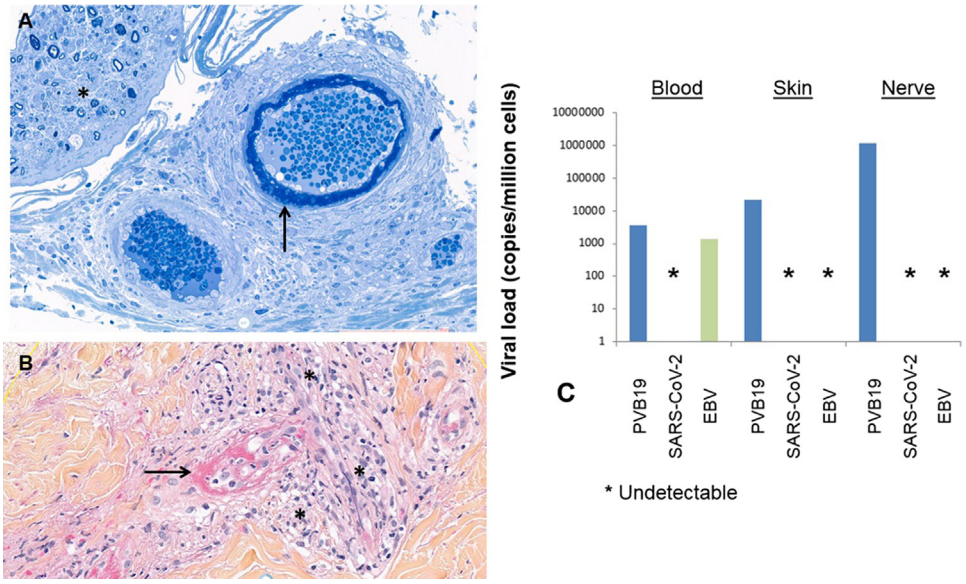

Fig. 1 – A. Superficial fibular nerve biopsy showing small artery wall fibrinoid necrosis (arrow) and axono-myelinic degeneration (asterisk) (Thionin blue staining, magnification × 40). B. Skin biopsy showing small artery wall fibrinoid necrosis (arrow) and massive mononuclear perivascular cells infiltration (asterisk) (hematoxylin eosin saffron staining, magnification x 40). C. Comparison of PVB19 viral load (blue bars), SARS-CoV-2 viral load (*) and EBV viral load (green bar and *) in blood, skin biopsy and nerve biopsy determined by real-time polymerase chain reaction in copies/millions cells. SARS-CoV-2 ARN was not found in blood, skin and nerve. EBV viral load was only found in blood.

samples, and a high PVB19 DNA load in blood, skin and nerve. The much higher PVB19 DNA load in the nerve of our patient in comparison with blood argues against passive blood contamination and suggests that PVB19 is very likely present in peripheral nerve. In addition, although EBV DNA was found in blood, it was not found in skin and nerve (Fig. 1C), supporting the absence of blood contamination in our nerve sample. Interestingly, it has been shown that PVB19 DNA may persist in tissues and induce pro-inflammatory changes, even in a non-proliferative state [5]. In our patient, weak corticosteroids response and dramatic IVIg response were also in favor of PVB19-related vasculitis [2–6]. Interestingly, vasculitis appeared shortly after SARS-CoV-2 infection, suggesting SARS-CoV-2 may have triggered PVB19-related vasculitis. Indeed, it has been demonstrated that infection with viruses such as Adenovirus and Human Herpesvirus-6, can stimulate PVB19 capsid gene expression and lead to PVB19 replication in endothelial cells [6]. To summarize, this case demonstrates that peripheral nerve viral load analysis is a useful tool for the diagnosis of viral-linked vasculitis. In our patient, this technique allowed us to demonstrate the likely causative role of chronic PVB19 infection and ruled out SARS-CoV-2 direct implication.

Disclosure of interest

The authors declare that they have no competing interest.

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Steroid-responsive aseptic meningitis after BNT162b2 SARS-CoV-2 vaccine

Dear editor,

Aseptic meningitis (AM) is an inflammatory disorder of the meninges that can be of iatrogenic origin. Non-steroidal anti-inflammatory drugs (NSAIDs), antibiotics or intravenous immunoglobulin (IVIg) can cause AM [1]. There is also an associated risk with certain attenuated virus vaccines, including polio, measles-mumps-rubella, and yellow fever [2]. New nucleoside-modifier messenger RNA (mRNA) vaccines against SARS-CoV-2 were recently introduced. Their safety profile is not fully understood.

A 62-year-old woman presented to the emergency department with fatigue, difficulties concentrating, dizziness, myalgia, unstable gait, and mild headache, all worsened in orthostatism. She had no fever or systemic complaints. Symptoms started the day after the first SARS-CoV-2 vaccine [BNT162b2-Pfizer®] and progressed for two weeks (she was medicated with paracetamol but not NSAIDs for her symptoms). There was no evidence of prior COVID-19 infection. Her medical history included long-term controlled dyslipidemia and anxiety. She had the vaccination schedule completed without vaccine-related adverse events. Neurological examination was unremarkable, including for higher nervous functions and meningeal irritation. Active standing revealed symptomatic postural tachycardia (supine 59 bpm, 3-minute-standing 93 bpm, 10-minute-standing 88 bpm) without blood pressure changes.

Blood analysis revealed mild lymphopenia, and cerebrospinal fluid (CSF) showed lymphocytic pleocytosis with high protein count and normal glucose (Table 1). Systemic (Sjögren's syndrome, systemic erythematous lupus, Beçhet's disease, sarcoidosis) and neurological inflammatory disorders, antineuronal disease, autoimmune encephalitis, human

Table 1 – Blood (B) and cerebrospinal fluid (CSF) results.

Laboratory tests (reference values)	Results (first LP)	Results (second LP)	Results (third LP)
Lymphocytes (B, 1.10–4.40 G/L)	1.05	0.96	1.02
Leukocytes (< 3/mm^3)	101	301	145
Erythrocytes (< 3 mg/dL)	856	75	24.000
Proteins (15–40 mg/dL)	154	208	128
Glucose (40–70 mg/dL)	54	61	53
Pressure opening	–	8 cm H_2O	–
PCR virus (CSF)	Negative		Negative
CSF immunophenotyping	–	100% lymphocytes with normal phenotype, 73% T-lymphocytes: 52% CD4 (37% activated) and 44% CD8 (39% activated)	–

Lumbar punctures (LPs) were performed 16 days (1st), 25 days (2nd) and 36 days (3rd) after vaccine. 1st and 3rd LP were traumatic. The 3rd LP was performed 10 days after dexamethasone onset. CSF clearance was observed in all samples after centrifugation.