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Isolated right peroneal mononeuropathy after silent SARS-CoV-2 infection in a child: Case report and review of the literature

Maria Terzidou, Athina Sygkouna, Marios Thodis, Dimitrios Cassimos, Elpis Mantadakis

ABSTRACT

Introduction: Peroneal neuropathy is considered as the most common mononeuropathy of the lower extremities, albeit with limited medical documentation. Risk factors include local injuries or recurrent minor trauma, surgery, weight loss, habitual leg crossing, other prolonged postures, or application of inappropriately fitted orthopedic devices that lead to uninterrupted pressure at the fibular head, intoxication, bicycle riding, prolonged anesthesia, lengthy hospitalization, other underlying neuropathies, diabetes mellitus, exposure to cold and irradiation and infection by neurotropic viruses.

Case Report: We present a 4-year-old non-immunocompromised boy with an isolated right foot drop. At presentation, he had a characteristic walking that resulted from the inability to bend his right foot upward at the ankle. The foot drop developed gradually over the last week and was not accompanied by other symptoms. A careful history and appropriate serologic and imaging studies ruled out common causes of peroneal neuropathy except for SARS-CoV-2. Indeed, a high titer of specific IgG antibodies to this new coronavirus was detected, despite no history of prior immunization.

Conclusion: Peroneal neuropathy may represent one of the many neurological sequelae of infection with SARS-CoV-2; physicians should be aware of this.

Keywords: Children, COVID-19, Mononeuropathy, SARS-CoV-2

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Maria Terzidou[1], Athina Sygkouna[1], Marios Thodis[1], Dimitrios Cassimos[1], Elpis Mantadakis[1]

Affiliation: [1]Department of Pediatrics, University General Hospital of Alexandroupolis, Alexandroupolis, Thrace, Greece.

Corresponding Author: Elpis Mantadakis, MD, PhD, Professor of Pediatrics-Pediatric Hematology/Oncology, Democritus University of Thrace Faculty of Medicine, Head, Department of Pediatrics, University General Hospital of Alexandroupolis, 68 100 Alexandroupolis, Thrace, Greece; Email: emantada@med.duth.gr

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INTRODUCTION

Peroneal neuropathy is considered the most common mononeuropathy of the lower extremities, albeit with limited bibliographic data [1, 2]. It is slightly more common in males. Risk factors include local injuries or recurrent minor trauma, surgery, weight loss, habitual leg crossing, other prolonged postures (e.g., squatting) or application of inappropriately fitted orthopedic devices that lead to uninterrupted pressure at the fibular head, intoxication, bicycle riding, prolonged anesthesia, lengthy hospitalization, other underlying neuropathies, and diabetes mellitus [1, 2]. Exposure to cold and irradiation are additional causes [2]. We present a child with isolated and self-limited right peroneal mononeuropathy diagnosed after a “silent” SARS-CoV-2 infection and review the relevant medical literature.

CASE REPORT

A non-immunocompromised 4-year-old boy presented to the emergency department of our hospital with a right foot drop that developed gradually over the last week. There was neither a history of recent or past local injury nor a recent history of a symptomatic viral or other febrile illness. The family history was non-contributory. On initial physical examination, the patient was alert and very cooperative, while he had normal vital signs. The examination of the cranial nerves was unremarkable, while he had normal balance, coordination, and reflexes, an intact sensory system, and full sphincter control. Nevertheless, he was unable to right plantar flexion and had a characteristic walking that resulted from the inability to bend his right foot upward at the ankle (Video 1).

Video 1: A cooperative and healthy 4-year-old boy with isolated right foot drop (see text for details).

Video 1 URL: https://www.idoriums.com/edpanel/preview_article/101379Z01MT2023#video1

Access Video on other devices

The patient was admitted to the Department of Pediatrics for further investigations. Laboratory work-up on admission showed normal full blood count, urinalysis, and serum biochemistries, including electrolytes, liver, and thyroid function tests, C-reactive protein, and vitamin B12. In addition, the serologic workup for human immunodeficiency virus (HIV), Epstein–Barr virus (EBV), and cytomegalovirus (CMV) was negative. A purified protein derivative (PPD) skin test was non-reactive. Nasopharyngeal RT-PCR for SARS-CoV-2 was negative, but the patient had a high titer of IgG antibodies with Abbott's ARCHITECT i2000SR system against SARS-CoV-2, even though he was not immunized against this virus. Since he had no IgM antibodies, the SARS-CoV-2 infection was not likely very recent. A chest radiograph and a magnetic resonance imaging (MRI) scan of the thoracolumbosacral spine were normal.

In view of the isolated clinical finding of impaired right plantar flexion, a neurography test was performed and was suggestive of a peripheral right peroneal nerve injury. More specifically, there was decreased transmission speed in the tibial region of the right peroneal nerve with no findings of block conduction at the level of the fibula head, while the left peroneal and right tibial nerves had both normal transmission speeds.

Our patient was examined by a physiotherapist, who suggested specific passive movements of the right foot for exercise and gave instructions to avoid leg crossing and squatting. The above instructions were followed by the parents at home for the subsequent two months. He eventually recovered with gradual improvement of the right foot drop over six weeks. Currently, he has a normal gait three months after the described events.

DISCUSSION

The IgG results for anti-SARS-CoV-2 antibodies were positive in our patient, revealing a significant past immune response to the new coronavirus that is responsible for COVID-19. Was this reaction responsible for the isolated foot drop in our patient? We consider this a strong possibility after excluding other causes of peroneal neuropathy by history and appropriate serologic and imaging studies.

Regarding infectious etiologies of peroneal neuropathy, varicella-zoster virus, herpes simplex virus, EBV, CMV, leprosy, and HIV can potentially affect the nerve roots directly causing radiculitis or can indirectly affect the peripheral nerves by triggering Guillain–Barre syndrome, 1–3 weeks after the acute infection [3]. All were excluded by physical examination and appropriate serological tests.

Regarding SARS-CoV-2, at the early stages of the pandemic, COVID-19 predominantly affected the lungs, but it is now clear that it is a disease with manifestations and sequelae that involve many body systems and organs. The nervous system is commonly affected, and neurological manifestations can present as late complications of the disease challenging the clinician for the correct diagnosis [3, 4]. In children, COVID-19 has a milder presentation, but with a wide range of symptoms and signs including neurological ones [1]. Patone et al. using data from the English National Immunization (NIMS) Database of COVID-19 vaccination in England

between December 1, 2020, and May 31, 2021, estimated 38 excess cases of Guillain–Barré syndrome per 10 million people receiving the ChAdOx1 nCoV-19 vaccine and 145 excess cases per 10 million people after a positive SARS-CoV-2 test [5]. Hence, the risk of neurological complications is substantially greater following a positive SARS-CoV-2 test and anti-COVID-19 vaccines are likely effective against neurological complications, as it is the case with other complications and against severe COVID-19 disease.

Early in the course of SARS-CoV-2 infection, patients develop headaches, dizziness, anosmia, and ageusia. Neurotropism of SARS-CoV-2 has been explained by the expression of angiotensin-converting enzyme 2 (ACE-2) on endothelial, glial cells, and neurons since ACE-2 has been established as the functional host receptor of SARS-CoV-2. Nevertheless, the underlying mechanisms for the development of peripheral neuropathy after SARS-CoV-2 infection are likely an autoimmune process involving a cytokine storm and molecular mimicry [4]. In favor of this mechanism are the detection of anti-ganglioside antibodies in the serum of affected patients. Unfortunately, this test was unavailable to us. Another possible mechanism for the mononeuritis multiplex of SARS-CoV-2 is through virus-induced thrombosis of large and small blood vessels with subsequent ischemic damage to the vasa nervosum [3]. Finally, the implemented lockdown during the COVID-19 pandemic forced children to remain at home and watch TV and/or monitors for recreational and educational reasons. This resulted in a dramatic increase in screen viewing in the same body position. The mechanical compression of peripheral nerves could be the sole explanation of peripheral neuropathy [1].

Regarding SARS-CoV-2 peroneal mononeuropathy, Brand et al. described an increased incidence of pediatric focal neuropathies in Buenos Ayres, Argentina, in 2020, i.e., the first year of the SARS-CoV-2 pandemic, a year when 7 peroneal and 2 ulnar mononeuropathies were diagnosed in pediatric patients in his center. Most patients were thin and acknowledged prolonged TV viewing, while electrophysiological studies showed demyelinating lesions with favorable prognosis [1]. Cioffi et al. described a 59-year-old man with COVID-19-associated mononeuropathy presenting as acute weakness of the left peroneal muscles, who recovered after administration of intravenous immunoglobulin [6].

Regarding other SARS-CoV-2 triggered mononeuropathies, Law et al. described 19 patients who had an elevated hemidiaphragm that persisted on average seven months post-COVID-19 diagnosis due to phrenic nerve mononeuritis [7]. Carberry et al. described four cases of mononeuropathy multiplex in three men and a single woman aged 55–72 years after critical illness due to SARS-CoV-2 infection manifesting with asymmetric sensorimotor loss in the peripheral nervous system [3]. Critical illness polyneuropathy and myopathy were felt not to be responsible given the asymmetric and variable distribution of sensorimotor impairments that was documented both clinically and by nerve conduction studies. Finally, a study showed that among 69 patients with severe COVID-19 that had been discharged from intensive care units of a single hospital in Cambridge, 11 (16%) had mononeuritis multiplex that was initially unrecognized, as symptoms were incorrectly ascribed to critical illness neuromyopathy. Hence, a detailed neurological assessment of patients with post-COVID-19 asymmetric weakness and focal neurological deficits is warranted [8].

CONCLUSION

In conclusion, we present a child with isolated and self-limited right peroneal neuropathy in the context of a "silent" past infection with SARS-CoV-2. It is important to keep in mind this clinical entity that likely represents one of many neurological sequelae of infection with SARS-CoV-2.

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Author Contributions

Maria Terzidou – Acquisition of data, Analysis of data, Drafting the work, Revising the work critically for important intellectual content, Final approval of the version to be published, Agree to be accountable for all

aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

Athina Sygkouna – Acquisition of data, Analysis of data, Revising the work critically for important intellectual content, Final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

Marios Thodis – Acquisition of data, Analysis of data, Revising the work critically for important intellectual content, Final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

Dimitrios Cassimos – Design of the work, Acquisition of data, Analysis of data, Interpretation of data, Revising the work critically for important intellectual content, Final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

Elpis Mantadakis – Conception of the work, Drafting the work, Revising the work critically for important intellectual content, Final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

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Authors declare no conflict of interest.

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