MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE
SUMY STATE UNIVERSITY
ACADEMIC AND RESEARCH MEDICAL INSTITUTE

Eastern Ukrainian Medical Journal

116, Kharkivska st., Sumy 40007, Ukraine eumj.med.sumdu.edu.ua
e-mail: eumj@med.sumdu.edu.ua ISSN: 2663-5909 (print)/2664-4231 (online)

How to cite / Як цитувати статтю: Smiyan O, Horbas V, Shevchenko N, Buhaienko V, Lendych Yu, Marchenko O, Vasilyeva O, Reznychenko Yu, Vysotsky I. Myelopathy in a child after SARS-COV-2 infection: a case report from Sumy, Ukraine. *East Ukr Med J*. 2024;12(3):730-735

DOI: https://doi.org/10.21272/eumj.2024;12(3):730-735

ABSTRACT

Oleksandr Smiyan [1]
https://orcid.org/0000-0001-8225-0975

Viktoriia Horbas [1]
https://orcid.org/0000-0002-7455-6875

Natalia Shevchenko [2]
https://orcid.org/0000-0003-4407-6050

Viktoriia Buhaienko [3]

Yuliya Lendych [1]
https://orcid.org/0009-0003-5815-6577

Oleksandr Marchenko [3]

Olena Vasilyeva [1]
https://orcid.org/0000-0003-4470-8740

Yurii Reznychenko [4]
https://orcid.org/0000-0003-1534-0326

Ihor Vysotsky [5]
https://orcid.org/0000-0002-6357-3362

[1] Educational and Research Medical Institute of Sumy State University, Sumy, Ukraine

[2] V. N.Karazin Kharkiv National University, Kharkiv, Ukraine

[3] Children's Clinical Hospital of St. Zinaida, Sumy City Council, Sumy, Ukraine

MYELOPATHY IN A CHILD AFTER SARS-COV-2 INFECTION: A CASE REPORT FROM SUMY, UKRAINE

Introduction. The post-acute course in children in 22% of cases may have signs of nervous system damage. Common symptoms are headache, cognitive problems, anosmia, seizures, Guillain-Barré syndrome, demyelinating syndrome and autoimmune encephalitis, acute disseminated encephalomyelitis, posterior reversible encephalopathy syndrome, viral encephalitis, and gait difficulties.

The study aims to describe a rare clinical case of post-COVID syndrome in children with nervous system lesions.

Materials and methods. A 9-year-old girl with myelopathy, lower spastic paraparesis, post-COVID syndrome, who was treated in the neurological department of the St. Zinaida Children's Clinical Hospital of the City of Sumy, was studied. The following research methods were carried out for differential diagnosis and confirmation of the disease: clinical blood and urine tests, cerebrospinal fluid analysis, virological examinations (adenovirus, enterovirus, cytomegalovirus, herpes simplex virus types 1, 2, SARS-CoV-2), magnetic resonance imaging of the brain and spine, electroneuromyography.

Results. At the time of hospitalization, a 9-year-old child complained of pain and weakness in the lower extremities, impaired coordination of movements, and sometimes cramps in the leg muscles. An objective examination revealed the patient's general condition of moderate severity, clear consciousness, and emotional lability. The following disorders were noted on the part of the nervous system: set-up horizontal nystagmus, more to the left, nasolabial fold was slightly smoothed to the left, mild tongue deviation to the right, tendon and periosteal reflexes D=S, vigorous in the upper extremities, reduced in the lower ones. Pathological foot extensor reflexes were detected on both sides. Muscle strength in the lower extremities is 3.5 points on both sides. Hypertension of the muscles of the lower extremities. Clinical

[4] Department of Hospital Pediatrics, Zaporizhzhia State Medical University, Zaporizhzhia, Ukraine

[5] Department of Biophysics, Biochemistry, Pharmacology and Biomolecular Engineering, Educational and Research Medical Institute, Sumy State University, Sumy, Ukraine

analysis of blood, urine and cerebrospinal fluid results according to the age norm, virological examination: SARS-CoV-2, IgG - positive. MRI - disc protrusion at C4-C5, L2-3, L3-4, L4-5, L5-S1. Electroneuromyography (ENMG): signs of decreased supra-segmental conductor-type effects (by the weakening of the gamma-motoneuron control system). Signs of demyelinating focal lesions of the peroneal nerve on the right at the level of the intercalated line and the peroneal nerve on the left at the level of the popliteal fossa. The diagnosis was made: post-covid syndrome, lower spastic paraparesis, myelopathy.

Conclusions. Coronavirus infection can lead to serious neurological complications such as myelopathy, even if the initial course of the disease is mild. It emphasizes the importance of careful monitoring of children by physicians after coronavirus infection.

Keywords: clinical case, children, post-covid syndrome, nervous system, lower spastic paraparesis, myelopathy.

Corresponding author: *Viktoriia Horbas, Educational and Research Medical Institute of Sumy State University, Sumy, Ukraine*
e-mail: v.gorbays@med.sumdu.edu.ua

ABSTRACT

Олександр Сміян [1]
https://orcid.org/0000-0001-8225-0975

Вікторія Горбась [1]
https://orcid.org/0000-0002-7455-6875

Наталія Шевченко [2]
https://orcid.org/0000-0003-4407-6050

Вікторія Бугаєнко [3]

Юлія Лендич [1]
https://orcid.org/0009-0003-5815-6577

Олександр Марченко [3]

Олена Васильєва [1]
https://orcid.org/0000-0003-4470-8740

Юрій Резніченко [4]
https://orcid.org/0000-0003-1534-0326

Ігор Висоцький [5]
https://orcid.org/0000-0002-6357-3362

[1] Кафедра педіатрії Навчально-наукового медичного інституту Сумського державного університету, м. Суми, Україна

[2] Харківськоий національний університет імені В. Н. Каразіна, м. Харків, Україна

[3] Комунальне некомерційне підприємство «Дитяча клінічна лікарня Святої Зінаїди» Сумської міської ради, м. Суми, Україна

МІЄЛОПАТІЯ У ДИТИНИ ПІСЛЯ ІНФЕКЦІЇ SARS-COV-2: КЛІНІЧНИЙ ВИПАДОК, М. СУМИ, УКРАЇНА

Вступ. Постковідний перебіг у дітей в 22% випадків може мати ознаки ураження нервової системи. Поширеними симптомами частіше можуть бути такі, як головний біль, когнітивні проблеми, аносмія, судоми, синдром Гійєна-Барре, демієлінізаційний синдром і аутоімунний енцефаліт, гострий дисемінований енцефаломієліт, синдром задньої оборотної енцефалопатії, вірусний енцефаліт і труднощі з ходою, такі як м'язова слабкість та атрофія м'язів.

Мета роботи. описати рідкісний клінічний випадок ускладнення коронавірусної інфекції у дитини з ураженням нервової системи.

Матеріали та методи. Під спостереженням дівчинка 9 років з постковідним синдромом, нижнім спастичним парапарезом мієлопатією, що знаходилась на лікуванні у неврологічному відділенні «Дитяча клінічна лікарня Святої Зінаїди» Сумської міської ради. Для диференційної діагностики та підтвердження захворювання були проведені наступні методи дослідження: клінічний аналіз крові та сечі, аналіз спинномозкової рідини, вірусологічні обстеження (аденовірус, ентеровірус, цитомегаловірус, вірус простого герпесу 1, 2 типів, вірус Епштейна-Барра, SARS-CoV-2), МРТ головного мозку та хребтового стовпа, електронейроміографія.

Результати. Дитина 9 років на момент госпіталізації скаржилася на біль та слабкість в нижніх кінцівках, порушення координації рухів, іноді судоми в м'язах ніг. При об'єктивному огляді виявлено загальний стан хворої середньої тяжкості, ясну свідомість, емоційну лабільність. З боку нервової системи відмічались такі порушення, як: установчий горизонтальний ністагм, більш ліворуч, носо-губна складка була злегка згладжена ліворуч, легка девіація язика праворуч, сухожилкові та періостальні рефлекси D=S, жваві у верхніх кінцівках, у нижніх –

[4] Кафедра госпітальної педіатрії, Запорізький державний медичний університет, м. Запоріжжя, Україна

[5] Кафедра біофізики, біохімії, фармакології та біомолекулярної інженерії, Навчально-науковий медичний інститут, Сумський державний університет, м. Суми, Україна

знижені. Виявлені патологічні рефлекси розгиначів стоп з обох боків. М'язова сила у нижніх кінцівках 3,5 бали з обох боків. Гіпертонус м'язів нижніх кінцівок. Результати клінічного аналізу крові, сечі та ліквору згідно вікової норми, вірусологічне дослідження: SARS-CoV-2, IgG – позитивні. МРТ – протрузія дисків на рівні С4-С5, L2-3, L3-4, L4-5, L5-S1. електронейроміографія (ЕНМГ): ознаки зниження супрасегментарних впливів провідникового типу (за типом ослаблення гамма-мотонейронної системи контролю). Ознаки демієлінізуючого вогнищевого ураження малогомілкового нерву праворуч на рівні міжчовникової лінії та малогомілкового нерву ліворуч на рівні підколінної ямки.

Висновки. Коронавірусна інфекція може призвести до серйозних неврологічних ускладнень, як мієлопатія, навіть якщо ініціальний перебіг захворювання був легким. Це підкреслює важливість ретельного моніторингу стану дітей після перенесеної короновірусної інфекції лікарями.

Ключові слова: клінічний випадок, діти, постковідний синдром, нервова система, нижній спастичний парапарез, мієлопатія.

Автор, відповідальний за листування: Вікторія Горбась, кафедра педіатрії Навчально-наукового медичного інституту Сумського державного університету, м. Суми, Україна
e-mail: v.gorbays@med.sumdu.edu.ua

INTRODUCTION / ВСТУП

Coronavirus disease (COVID-19) caused by Severe Acute Respiratory Syndrome CoronaVirus-2 (SARS-CoV-2) is an acute viral disease with predominantly respiratory tract involvement that causes a pandemic and is long-lasting, with a mortality rate of 5.42 million cases [1].

Children with COVID-19 usually have a mild or asymptomatic clinical picture. These patients are characterized by typical disease manifestations, such as fever, weakness, dry cough, other respiratory symptoms, and gastrointestinal tract lesions [2].

In the case of SARS-CoV-2 infection, there are two ways of damaging the nervous system, namely, direct and indirect. The direct one, in turn, can be neurogenic and hematogenic. The neurogenic pathway is caused by the virus penetrating the central nervous system (CNS) through the peripheral nerves (olfactory, facial, lingual-pharyngeal, vagus). Hematogenously, the virus enters the brain through the damaged blood-brain barrier. As a result, peripheral and central neurons are hypersensitized, resulting from SARS-CoV-2-induced neuroinflammation. Once the virus reaches the central nervous system, it causes acute illnesses that persist in the cells of the nervous system and participates in the formation of delayed neurological consequences. Such mechanisms characterize the indirect pathway as generalized thrombotic damage and damage resulting from hypoxia and homeostasis disorders. Generally, indirect damage is characterized by the fact that patients with coronavirus disease may have a cytokine storm syndrome. In acute necrotizing myelopathy, encephalopathy, encephalitis, and acute disseminated encephalomyelitis with an adverse polymerase chain reaction in the cerebrospinal fluid, a cytokine storm is the most likely mechanism of CNS damage. As a result of hypoxia and homeostasis disturbance, diffuse alveolar and interstitial inflammatory edema are characterized by impaired alveolar gas exchange and CNS hypoxia. In the case of thrombotic damage in patients with COVID-19, there is an increase in the level of circulating prothrombotic factors, which reflects the state of hypercoagulation. Circulating free thrombin activates platelets, leading to varying severity and localization thrombosis, including ischemic strokes [3, 4].

Today, the consequences of COVID-19 are increasingly manifested in children in the form of post-COVID syndrome, which can have a diverse clinical picture and can lead to a deterioration in quality of life. Children are characterized by risk factors such as obesity, anxiety, female gender, older age (> 6 years), and allergic reactions [5].

Post-COVID syndrome can be manifested by the persistence of acute symptoms or the development of new symptoms after four weeks of SARS-CoV-2 infection. The following symptoms of COVID-19 are defined: acute (≤ 2 weeks), subacute (2-12 weeks), chronic (> 12 weeks) [6, 7, 8].

The prevalence of chronic neurologic symptoms is 1.8–51 %, occurring in children after acute symptomatic SARS-CoV-2 infection. At the same time, the long-term consequences of COVID-19 in pediatric patients remain poorly understood. According to some authors (Patel PB and Selvakumar J), acute neurological symptoms occur in approximately 30% to 40% of adult patients and 22% of children with SARS-CoV-2 infection. The clinical manifestations of neurological consequences in post-COVID syndrome are headache (35%), cognitive problems (26%) and anosmia (18%) in children. Other reported manifestations are seizures, Guillain-Barré syndrome (GBS), demyelinating syndrome and autoimmune encephalitis, acute disseminated encephalomyelitis, posterior reversible encephalopathy syndrome, viral encephalitis, and gait difficulties [8, 9].

In addition, patients with COVID-19 may have spinal cord damage (myelopathy). Postinfectious myelopathy occurs due to a disruption of the adaptive immune response to self-antigens after a previous infection. Signs of this disease in children appear from 0 to 24 days after the onset of COVID-19 symptoms (on average, 8-10 days). In some cases, neurologic manifestations occurred after the disappearance of COVID-19 symptoms. Most patients had the following symptoms: motor (acute flaccid paralysis), sensory, intestinal, or bladder changes. Some patients also had acute motor axonal neuropathy [10].

Most children usually have a mild course until marked or complete neurological improvement, at least within a few days or weeks of follow-up, and sometimes up to 2 months [9, 10].

Aim: To deepen knowledge of possible complications of SARS-CoV-2 on the example of a rare clinical case of post-covid syndrome in children with damage to the nervous system.

Materials and Methods: A 9-year-old patient with myelopathy, lower spastic paraparesis, and post-COVID syndrome, who was treated in the neurological department of the St. Zinaida Children's Clinical Hospital of the City of Sumy, was observed. The following examination methods were performed: clinical blood and urine tests, cerebrospinal fluid analysis, virological examinations (adenovirus, enterovirus, cytomegalovirus, herpes simplex virus types 1, 2, SARS-CoV-2), MRI of the brain and spinal column, electroneuromyography.

CLINICAL CASE

Patient C., girl , nine years old, was hospitalized on 04.20.2023 in the Department of Neurology of the Children's Clinical Hospital of St. Zinaida, Sumy City Council, due to complaints of pain, weakness and impaired coordination of movements in the legs, recurrent cramps in the muscles of the lower extremities.

From the medical history, it is known that the disease began 1.5 weeks before hospitalization with the onset of pain in the lower legs. Six days before inpatient treatment, the child's parents noticed the spread of pain in the upper thighs and the appearance of weakness in the lower extremities. The child was treated at home independently: a combined local anesthetic and a non-steroidal anti-inflammatory drug internally.

After that, they went to an orthopedist who prescribed an ultrasound of the hip joints. The examination result: No pathological changes were detected. The parents attributed these complaints to an acute respiratory viral infection suffered a month ago. It was also noted that the family had similar symptoms but did not seek medical care or undergo diagnostic tests.

The child's general condition did not improve on an outpatient basis, and the family doctor referred the child to the neurological department of the St. Zinaida Children's Clinical Hospital of the City of Sumy with a diagnosis of polyneuropathy, unspecified.

The medical history shows that the child is from the first pregnancy and urgent delivery. She was born full-term at 38 weeks of gestation. She was put to the breast on the first day and was naturally breastfed until eight months. Physical and psychomotor development corresponded to age. Hereditary diseases were not noted. During her life, the child suffered from ARVI 2-4 times a year. Preventive vaccinations were carried out by the child's age and vaccination schedule. The family's social and living conditions and moral and psychological state are favourable.

At the time of the examination, the child's condition was moderately severe, with clear consciousness. The patient was asthenic and emotionally labile. The body structure was normosthenic. The skin and visible mucous membranes were pale pink. A clear lung sound and vesicular breathing were heard over the lungs. Respiratory rate was 22/min., oxygen saturation - 98%, body temperature -36.6°C. The heart limits corresponded to the age-related norm. Heart activity is rhythmic; tones are preserved. BP is 100/60 mmHg, and heart rate is 98/min. The abdomen is soft and painless to palpation. The liver is not enlarged. Urination is painless; the urine is light straw-coloured. Pasternacki's symptom is negative on both sides. On the part of the nervous system, the following was noted: establishing horizontal nystagmus, more on the left, nasolabial fold slightly smoothed on the left, no sensory disorders, mild deviation of the tongue on the right, tendon and periosteal reflexes D=S, lively in the upper extremities, reduced in the lower ones. Pathological foot extensor reflexes were observed on both sides. Muscle strength

in the lower extremities was 3.5 points on both sides. There was hypertonicity of the muscles of the lower extremities. There were no meningeal symptoms. The following results were obtained during laboratory tests: complete blood count - haemoglobin 148 g/l, erythrocytes - 4.5 x 1012/l, leukocytes - 4.3 x 10^9/l, ESR - 3 mm/h, rods - 2%, segmented neutrophils - 41%, eosinophils - 2%, lymphocytes - 51%, monocytes - 4%. Clinical urine analysis: amount - 50 ml, colour - yellow, transparent, reaction - acidic, specific gravity - 1015, protein - 0, epithelium 1-3 in the field of view, leukocytes 2-3 in the field of view. Cerebrospinal fluid analysis - colourless, transparent, protein - 0.15 g/l, chlorides - 118 mmol/l, glucose - 3.5 mmol/l, cytosis 3 in 1 μ/l, lymphocytes - 100%. During the virological examination, a negative result was obtained for the following viruses: adenovirus, enterovirus, cytomegalovirus, herpes simplex virus types 1, 2, and Epstein-Barr virus. In addition, the child was tested for SARS-CoV-2, and the results of the enzyme-linked immunosorbent assay were negative (IgM - 0.222 units) and positive (IgG - 2.904 units), which may indicate a history of coronavirus infection.

Among the instrumental methods, the following were performed: MRI of the brain and spinal column and electroneuromyography (ENMG). According to the MRI, the patient had a diffuse dorsal disc protrusion at C4-C5 and disc protrusion of L2-3, L3-4, L4-5, and L5-S1 against the background of dysplastic osteochondrosis of the lumbar spine. No changes were found in the brain and thoracic spine. Electroneuromyography (ENMG): signs of decreased supra-segmental conductor-type effects (by weakening the gamma-motoneuron control system). Signs of demyelinating focal lesions of the peroneal nerve on the right at the level of the intercalated line and the peroneal nerve on the left at the level of the popliteal fossa.

Thus, based on the conducted studies, the diagnosis was made: post-COVID syndrome, myelopathy, lower spastic paraparesis.

The patient received treatment in a hospital: bed rest, IPIDACRINUM 20 mg tablets. Three times a day, vitamin B complex: thiamine (B1), pyridoxine (B6), and cyanocobalamin (B12) 1 tablet. Three times a day, prednisolone 2.5 mg once a day, ASPARAGINAT K-Mg 1 tablet two times a day, ACIDUM THIOCTICUM 300 mg once a day, NEUROPEPTIDES 2.0, Pentoxifyllinum 1000 ml IV drip, Human normal immunoglobulin for intravenous administration 5% - 300 ml, exercise therapy. After the complex treatment, the patient's condition improved, and she was discharged home with recommendations for rehabilitation.

CONCLUSIONS / ВИСНОВКИ

The presented clinical case demonstrates a rare course of post-COVID syndrome in a child with nervous system damage. Patient C. had the following main clinical manifestations of the disease: pain, weakness, impaired coordination of movements in the lower extremities, recurrent muscle cramps, institutional horizontal nystagmus, smoothed nasolabial fold, mild tongue deviation, decreased tendon and periosteal reflexes in the lower extremities, abnormal foot extensor reflexes on both sides and hypertension of the lower extremity muscles. This clinical case demonstrates the development of a complication of COVID-19 in children, namely myelopathy, which indicates the importance of careful monitoring of their condition.

Thus, coronavirus infection can lead to serious neurological complications such as myelopathy, even if the initial course of the disease is mild or asymptomatic. It emphasizes the importance of closely monitoring children after coronavirus infection. Delayed detection and treatment of neurological complications can lead to severe consequences, including disability. Much attention in medical research and practice has recently been paid to complications related to the cardiovascular system and hemostasis in patients with SARS-CoV2. However, the neurological consequences of this infection remain insufficiently characterized, requiring more attention from physicians and timely planning of preventive measures and rehabilitation [11].

AUTHOR CONTRIBUTIONS / ВКЛАД АВТОРІВ

All authors substantively contributed to the drafting of the initial and revised versions of this paper. They take full responsibility for the integrity of all aspects of the work.

FUNDING / ДЖЕРЕЛА ФІНАНСУВАННЯ

None.

CONFLICT OF INTEREST / КОНФЛІКТ ІНТЕРЕСІВ

The authors declare no conflict of interest.

REFERENCES/СПИСОК ЛІТЕРАТУРИ

1. Laaribya, S., Alaoui, A., & Azmi, R. (2022). Contribution to the identification of medicinal plants used against COVID-19 in North-West Morocco. Regulatory Mechanisms in Biosystems, 13(4), 339–345. https://doi.org/10.15421/022244.
2. Shen KL, Yang YH. (2020). Diagnosis and treatment of 2019 novel coronavirus infection in children: a pressing issue. World J Pediatr. 16(3):219–221. https://doi.org/10.1007/s12519-020-00344-6.
3. Bodro M., Compta Y., Sánchez-Valle R. (2020). Presentations and mechanisms of CNS disorders related to COVID-19. Neurol Neuroimmunol Neuroinflamm. 8(1):e923. https://doi.org/10.1212/NXI.0000000000000923.
4. Song WJ, Hui CK, Hull JH, et al. (2021). Confronting COVID-19-associated cough and the post-COVID syndrome: role of viral neurotropism, neuroinflammation, and neuroimmune responses. Lancet Respir Med. 9(5):533-544. https://doi.org/10.1016/s2213-2600(21)00125-9.
5. Kumar P, Jat KR (2023). Post-COVID-19 sequelae in children. Indian J Pediatr. 90(6):605-611. https://doi.org/10.1007/s12098-023-04473-4.
6. Garazzino S, Denina M, Pruccoli G, et al. (2023). Long COVID-19/post-COVID condition in children: Do we all speak the same language? Ital J Pediatr. 49(1):12. https://doi.org/10.1186/s13052-023-01417-8.
7. Hirt J, Janiaud P, Gloy VL, et al. (2023). Robustness of reported post-acute health outcomes in children with SARS-CoV-2 infection: a systematic review. Arch Dis Child. 108(6):498-505. https://doi.org/10.1136/archdischild-2022-324455.
8. Selvakumar J, Havdal LB, Drevvatne M, et al. (2023). Prevalence and characteristics associated with post-COVID-19 condition among nonhospitalized adolescents and young adults. JAMA Netw Open. 6(3):e235763. https://doi.org/10.1001/jamanetworkopen.2023.5763.
9. Patel PB, Patrick KE, Benedetti GM, et al. (2023). A multidisciplinary pediatric neurology clinic for systematic follow-up of children with neurologic sequelae of COVID-19. J Child Neurol. 38(3-4):121-129. https://doi.org/10.1177/08830738231156950.
10. Artemiadis A, Liampas A, Hadjigeorgiou L, Zis P. (2021). Myelopathy associated with SARS-COV-2 infection. A systematic review. Neurol Res. 43(8):633-641. https://doi.org/10.1080/01616412.2021.1915078.
11. Ahn B, Yun KW (2023). Non-neuropsychiatric long COVID symptoms in children visiting a pediatric infectious disease clinic after an omicron surge. Pediatr Infect Dis J. 42(5):e143-e145. https://doi.org/10.1097/inf.0000000000003862.

Received 23.01.2024
Accepted 23.04.2024

Одержано 23.01.2024
Затверджено до друку 23.04.2024