Pediatric Anesthesia and Critical Care Journal 2020;8(2):129-132
doi:10.14587/paccj.2020.20

PACCJ

Severe multi-organ trauma complicated with SARS-CoV-2 infection in Polish child trauma signs obscuring coronaviral infection

Katarzyna Połatyńska[1], Łukasz Kępczyński[2], Marta Jankowska[1], Magdalena Pokorska[3], Piotr Grzelak[4], Łukasz Przysło[1]

[1]Department of Developmental Neurology and Epileptology, Polish Mothers' Memorial Institute Research Hospital, Łódź, Poland

[2]Department of Genetics, Polish Mothers' Memorial Institute Research Hospital, Łódź, Poland

[3] Pediatric Intensive Care Unit, Polish Mothers' Memorial Institute Research Hospital, Łódź, Poland

[4] Department of Radiology, Polish Mothers' Memorial Institute Research Hospital, Łódź, Poland

Corresponding author: Dr. K. Połatyńska, Departament of Developmental Neurology and Epileptology, Polish Mothers' Memorial Institute Research Hospital, Łódź, Poland. Email: katarzyna.polatynska@iczmp.edu.pl

Keypoints

We claim this case as very important as it is prompting the importance of early testing and not overlooking even subtle signs and symptoms of coronaviral infection obscured by other conditions.

Abstract

This report presents first case of severe multi-organ trauma, complicated with SARS-CoV-2 infection. The child suffered from trauma resulting from falling out of the window. Imaging revealed head trauma, areas of lung contusion and abdominal organ trauma. Co-existence of multi-organ trauma, affecting chest and lungs, obscured the characteristic for COVID-19 pneumonia appe arance.

Keywords

SARS-Co-V-2, COVID-19, Multi-organ trauma, pediatric emergency, head injury, complications

Introduction

New coronavirus species SARS-CoV-2, belonging to β-coronaviruses, first identified in December 2019 in Hubei province in China (1), causes acute, highly lethal pneumonia coronavirus disease termed COVID-19 by WHO on 11 February 2020.

By several months, it has become global health threat. As some of the patients with COVID-19 presented neurological signs, it has been hypothesized, that SARS-CoV-2, like other β-coronaviruses exhibit neuroinvasive potential (2).

Retrospective analyses indicated that SARS-CoV-2 prevalence in pediatric population is relatively low – authors analyzing 366 cases of children, hospitalized due to acute respiratory infections in three adjacent hospitals in China (two in Wuhan and one om Tongji) in January 2020 showed that the prevalence of SARS-CoV-2 was 1.6%, comparing to most common Influenzavirus A 6.3% (3). The course of COVID-19 in 10% children is asymptomatic, mortality is close to 0.0%, whereas in adult population is between 0.9% to 3.0% (4).

This report presents a case of child with severe multi-organ trauma, complicated with SARS-CoV-2 infection. To our best knowledge, this is the first description of multi-organ trauma complicated with novel coronaviral infection.

Case

A 19-month-girl was admitted to the Intensive Care Unit (ICU) after a multi-organ injury, she suffered as a result of falling out of the window. Despite the fall from a

height of 3 residential floors (the standard height of one floor is ca 2.5 m), she was hemodynamically stable, and she has Pediatric Glasgow Coma Scale of 14 (E4 V4 M6). Upon arrival she presented an open fracture of the left upper limb and numerous abrasions and bloody bruising on the scalp. Whole body CT scan revealed: head trauma (diastasis of the metoptic suture, fractures originated at the left side of the metoptic suture, through left parietal bone to squamous and mastoid part of temporal bone with slight bone depression, bilateral presence of fluid in tympanic cavities, fracture of occipital bone reaching to foramen magnum, frontal epidural hematoma 6 mm thick and large subcutaneous hematoma at the vertex region 7 mm thick), areas of left lung contusion with its parenchyma rupture, contusion of liver, both kidneys and spleen with rupture, a multi-fractional supracondylar fracture of the left humerus, with dislocation and interrupting skin continuity (Fig. 1 C,D).

During the day 1 her condition worsen, the respiratory failure developed and she required the endotracheal intubation, mechanical ventilation, and dopamine infusion. Subsequent head CT scan revealed hypodensic lesion in the vermis of cerebellum. At the same time, a detailed epidemiological information emerged – the child's father was presenting moderate respiratory infection signs and he returned from the country of known presence of SARS-CoV-2 at the time. Nasopharyngeal swab specimen was collected following the Institute approved procedure for the SARS-CoV-2 genetic material detection. The patient also required stabilization of humerus fracture and subsequent post-operative red blood concentration administration. At the day 2 the positive result for SARS-CoV-2 genetic material was obtained. The patient required emergency treatment – mechanical ventilation, dopamine infusion, surface head cooling and antibiotics.

At the day 3, the attempt to extubate was failed due to observed decrease in blood oxygen saturation. At the day 12, nasopharyngeal swab specimen and stool specimen was collected following Institute approved procedure for subsequent SARS-CoV-2 genetic material detection. The result from nasopharyngeal swab was negative and the result from stool was still positive. The patient remained ventilated till the day 17. Chest x-ray at the day 15 and 18 revealed bilateral post-inflammatory lesions in the hilum of both lungs. Inflammation markers, initially high, normalized through the stay in ICU (Fig. 1 A).

At the day 20, the patient was discharged from ICU and admitted to Neurology Department. At the admission she was conscious, aphasic but maintained eye contact. Following abnormalities were detected – hyperactive right-side deep tendon reflexes, decreased left muscle tone, and bilateral positive Babiński sign, more prominent on the right side. Nuclear magnetic resonance imaging revealed extensive areas of post-traumatic injury with numerous fluid lesions in the brain stem, genu of corpus callosum, left temporal lobe, subcortical region of the right hemisphere, and area of the precentral and postcentral gyri of the left hemisphere. Electroencephalographic examination at the day 25 and 38 revealed marked slow frequency (4 to 7 Hz) basal activity without focal epileptiform discharges. At the day 43 she was discharged from the Neurology Department to Child Care Facility.

Discussion

In this report we describe a case of severe multi-organ trauma complicated with SARS-CoV-2 infection. Following the initial evaluation, ground glass opacities shown in lung CT scan were attributed to post-traumatic lung contusion (Fig.1 B). Chest CT scan is recently proposed as screen for COVID-19 in patients suspected for stroke or head trauma, and this protocol is proven efficient in elder patients (range 54 – 90 years) in correlation with genetic material of the SARS-CoV-2 detection in COVID-19 endemic regions (5). Nevertheless co-existence of multi-organ trauma, affecting also chest and lungs, obscured the characteristic for COVID-19 pneumonia appearance.

The suspicion of SARS-CoV-2 infection emerged due to epidemiological history, available after the initial

evaluation and after lifesaving procedures required because of the severity of the trauma. SARS-CoV-2 RNA was detected in nasal swab and stool. We were not able to confirm the presence of SARS-CoV-2 in central nervous system, as unsteady post-traumatic neurological status excluded lumbar puncture.

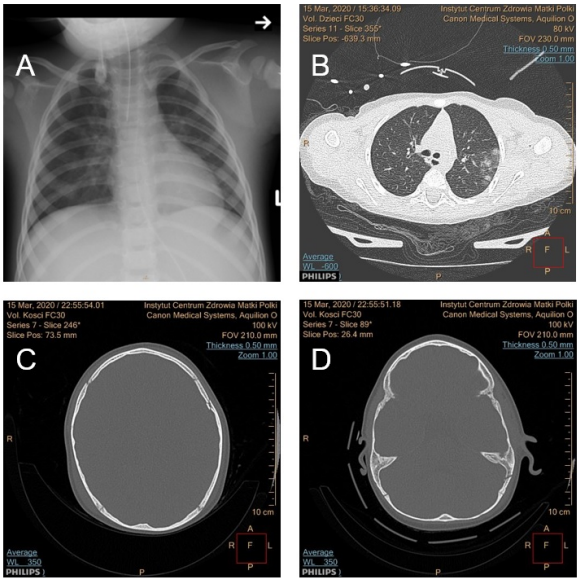

Figure 1. Diagnostic Imaging (day 1): A. Chest x-ray: multilobar ground-glass opacities are seen in left lung, mostly in upper to mid lobes lungs, with a peripheral subpleural distribution. Lack of pleural fluid. B. CT: Multilobar ground-glass opacities are seen in left lung, mostly in upper to mid lobes lungs, with a peripheral subpleural distribution. Lack of pleural fluid. C. CT: The fracture in the left temporal pyramid area. D. CT: The fracture fissure in the left temporal scales

Due to the respiratory failure, our patient required endotracheal intubation and assisted ventilation for 17 days. We are not able to prove, whether coronoviral infection prolonged this time. Data from 172 cases from trauma center in Dallas (6) gave the range of ventilation after severe traumatic brain injuries from 0 to 36 days, which gives the estimation of standard deviation (S.D.), using (max – min)/4 formula, for 9 days and mean + S.D. for 16 days. Unfortunately aforementioned data are skewed and rough S.D. estimation is not considered here as significant.

Human and non-human coronaviruses, are not only responsible for respiratory tract infections, neuroinvasive propensities were described for almost all other β coronaviruses, including highly similar to SARS-CoV-2 species – SARS-CoV, as well as MERS-CoV, human coronavirus OC43, 229E, murine hepatitis virus, and porcine hemagglutinating encephalomyelitis coronavirus (HEV-67N) (7). A case of meningitis/encephalitis associated with SARS-Cov-2 was also described (8). As mentioned earlier, confirmation of SARS-CoV-2 RNA presence in central nervous system and cerebrospinal fluid, was impossible in our patient. Our patient revealed brain lesions attributed to trauma, but we are unable to clearly distinguish inflammatory lesions and those caused by head trauma. Bilateral exudative-like lesions in middle ear, were suggested to be of inflammatory origin, but could be either caused by head trauma, related to neuroinflammation or to the upper tract infection. Our patient did not presented typical presentation of neuroinfection.

Every individual infected by SARS-CoV-2 can be source of horizontal infections. Without taking the detailed epidemiological history, coronavirus infection might have been overlooked, and whole presentation of the clinical course might have been attributed to trauma complications. This might cause both incorrect management for this individual patient as well as threat for other patients and for medical professionals taking care of this patient. We claim this case as very important as it is prompting the importance of early testing and not overlooking even subtle signs and symptoms of coronaviral infection obscured by other conditions.

References

1. Wang D, Hu B, Hu C, Zhu F, Liu X, Zhang J, Wang B, Xiang H, Cheng Z, Xiong Y, Zhao Y, Li Y, Wang X, Peng Z. Clinical Characteristics of 138 Hospitalized Patients With 2019 Novel Coronavirus-Infected Pneumonia in Wuhan, China. JAMA 2020;323(11):1061-1069.
2. Steardo L, Steardo L Jr, Zorec R, Verkhratsky A. Steardo L, Steardo L Jr, Zorec R, Verkhratsky A. Neuroinfection May Contribute to Pathophysiology and Clinical Manifestations of COVID-19. Acta

Physiol (Oxf). 2020;229(3):e13473.

3. Liu W, Zhang Q, Chen J, Xiang R, Song H, Shu S, Chen L, Liang L, Zhou J, You L, Wu P, Zhang B, Lu Y, Xia L, Huang L, Yang Y, Liu F, Semple MG, Cowling BJ, Lan K, Sun Z, Yu H, Liu Y. Detection of Covid-19 in Children in Early January 2020 in Wuhan, China. N Engl J Med. 2020;382(14):1370-1371.
4. Zimmermann P, Curtis N. Coronavirus Infections in Children Including COVID-19: An Overview of the Epidemiology, Clinical Features, Diagnosis, Treatment and Prevention Options in Children. Pediatr Infect Dis J. 2020;39(5):355-368.
5. Kwee RM, Krdzalic J, Fasen BACM, de Jaegere TMH; COVID-19 CT Investigators South-East Netherlands (CISEN) Study Group. CT Scanning in Suspected Stroke or Head Trauma: Is it Worth to go the Extra Mile and Include the Chest to Screen for COVID-19 Infection? AJNR Am J Neuroradiol. 2020. Online ahead of print.
6. Slovis JC, Gupta N, Li NY, Kernie SG, Miles DK. Assessment of Recovery Following Pediatric Traumatic Brain Injury. Pediatr Crit Care Med. 2018;19(4):353-360.
7. Li YC, Bai WZ, Hashikawa T. The neuroinvasive potential of SARS-CoV2 may play a role in the respiratory failure of COVID-19 patients. J Med Virol. 2020;92(6):552-555.
8. Moriguchi T, Harii N, Goto J, Harada D, Sugawara H, Takamino J, Ueno M, Sakata H, Kondo K, Myose N, Nakao A, Takeda M, Haro H, Inoue O, Suzuki-Inoue K, Kubokawa K, Ogihara S, Sasaki T, Kinouchi H, Kojin H, Ito M, Onishi H, Shimizu T, Sasaki Y, Enomoto N, Ishihara H, Furuya S, Yamamoto T, Shimada S. A first case of meningitis/encephalitis associated with SARS-Coronavirus-2. Int J Infect Dis. 2020;94:55-58.