deficiency (MPHD) but without hypogonadism than in those with both MPHD and hypogonadism.[4] This indicates that elevated gonadotropin levels may accelerate growth.

Preterm infants generally exhibit EUGR. Prolonged or extreme mini-puberty in preterm infants may be an adaptive strategy to prevent EUGR and promote linear growth. In our case, no linear growth was observed between 2 months and 5 months CA, although estrogen levels were the highest during this period. This was probably a consequence of CLD. However, when the period of extreme mini-puberty was assessed, we confirmed an average increase in linear growth rate; thus, extreme mini-puberty may have positively affected the linear growth of the infant. Therefore, non-intervention may be a suitable approach. Clinically, extreme mini-puberty should be differentiated from central precocious puberty; hence, regular follow-up is required. This knowledge can help neonatologists understand this condition better and make appropriate diagnoses. More evidence may guide the development of relevant treatment policies and clinical management guidelines.

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Disclosure

The authors declare no conflict of interest.

Author contributions

A.K. and Y.N. drafted the manuscript. H.K. and Y.U. provided conceptual advice. All authors read and approved the final manuscript.

Informed consent

Written informed consent to publish this case report was obtained from the infant's parents. The institutional ethics board waived the need for ethical approval because this was a non-interventional study.

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COVID-19 pneumonia in a child with Sotos syndrome

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Key words child, ciclesonide, COVID-19, inhalation, Sotos syndrome.

Coronavirus disease 2019 (COVID-19) originated in Wuhan, China, and it spread throughout the world very quickly. Previous reports focusing on COVID-19 pneumonia suggested that although pediatric patients seldom have severe outcomes, the infection might be more severe among young children.[1] There is little information about COVID-19 children with underlying diseases including chromosomal or genetic abnormality.

Inhaled ciclesonide, one of the candidate medications for COVID-19 pneumonia because of its inhibitory effect for SARS-COV-2 replication,[2,3] has not yet been widely used for pediatric COVID-19. This is a first report on a moderate COVID-19 child with Sotos syndrome, who was treated with ciclesonide inhalation.

Our patient was a 20-month-old Japanese boy. He was born at 34 weeks of gestation and diagnosed with Sotos syndrome due to *NSD-1* gene microdeletion. He had deafness, hypothyroidism and vesicoureteral reflux, but no congenital heart disease. He showed severe developmental delay; being unable to hold up his head or speak at all. Although he often coughed while drinking water, he had no history of asthma or pneumonia. He was admitted to another hospital on day 3 of cough. The contact people, including his family, medical doctors, nurses and therapists, did not have any suspicious symptoms of COVID-19. His temperature was 37.6 °C and percutaneous oxygen saturation (SpO_2) was 94% in ambient

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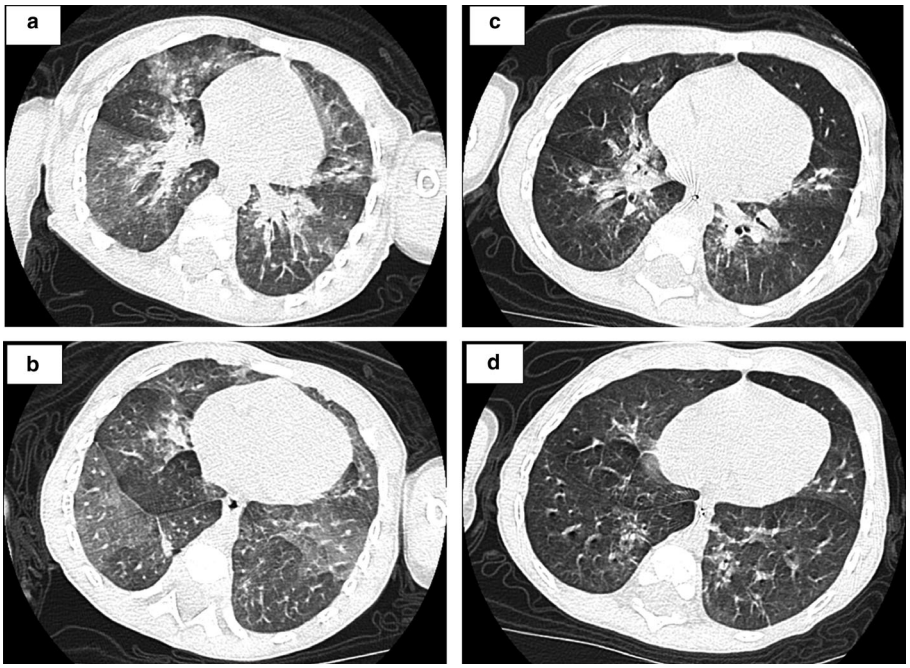

Fig. 1 Chest computed tomography (CT) shows peribronchial consolidation and ground-glass opacities (GGO) in bilateral lungs on day 5 of illness, before ciclesonide therapy (a, b). After ciclesonide therapy, GGO decreased on day 11 of illness (c, d).

air. A chest radiograph showed bilateral bronchopneumonia. Laboratory testing showed slightly elevated C-reactive protein (0.54 mg/dL). He received intravenous methylprednisolone once, antibiotics, pranlukast and oxygen therapy. A nasopharyngeal SARS-CoV-2 PCR test, performed upon admission, turned out to be positive on day 4 of illness. None of his relatives had tested positive for the PCR survey. On day 5 of illness, he was transferred to our hospital for further management. He had an occasional cough but no fever. There was no retractive breathing and no definitive abnormal pulmonary sound, although SpO_2 decreased to 90% on room air during sleep.

Laboratory test results showed white blood cell counts; 6,100/μL (lymphocytes 40%), C-reactive protein; 0.11 mg/dL, LDH; 319 U/L, ferritin; 68 ng/mL and d-dimer; <0.5 μg/mL.

A chest computed tomography (CT) scan revealed peribronchial consolidation and ground-glass opacities (GGO) in bilateral lungs (Fig. 1a,b). Considering its ability to inhibit viral replication *in vivo,*[2] we introduced ciclesonide inhalation (100 μg/dose, once a day) by using a spacer with a mask, after informed consent for its off-label use for COVID-19 infection was obtained from his family. We continued oxygen supply (nasal O_2 2 L/min) and intravenous fluid replacement therapy followed by nasal tube feeding. The oxygenation improved in a few days and he could sleep without oxygen on day 9 of illness. Chest CT scan, evaluated on day 11 of illness, showed significant improvement of the shadows, especially GGO (Fig. 1c,d).

We evaluated chest CT scans of the COVID-19 child with Sotos syndrome and found peribronchial consolidation and GGO in bilateral lungs. Previous study reported that the typical chest CT findings of COVID-19 pneumonia were peripheral and bilateral GGO with or without consolidation on visible intralobular lines.[4] Our patient's CT findings resembled bronchopneumonia, which might be caused not only by coronavirus but also micro-aspiration due to his poor swallowing function.

Ciclesonide, inhaled corticosteroid, is one of the alternative therapeutic candidates for COVID-19, because of its relatively high viral suppression effect against SARS-CoV-2.[2] A previous report demonstrated the efficacy of ciclesonide inhalation for three adult patients with mild to mid-stage COVID-19 pneumonia.[3] Improvement of hypoxia and GGO in CT imaging was observed consistently in the present case. However, we are unable to determine the effect of ciclesonide therapy, as children with COVID-19 tend to show relatively better outcomes. There is a risk of respiratory tract infection by using inhaled corticosteroids in asthma and chronic obstructive pulmonary disease.[5] However, our case did not have any complications.

In conclusion, we tried to use inhaled ciclesonide for a moderately hypoxic COVID-19 child with Sotos syndrome. The patient recovered promptly with no side effects. Further evaluations are necessary to elucidate the advantage for ciclesonide therapy to pediatric COVID-19 infection.

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Disclosure

The authors declare no conflict of interest.

Author contributions

T.I. and H.S. designed the therapeutic strategy, and treated the patient. E.K. collected clinical information. T.I., E.K, T.Y, K.H., and H.S. evaluated CT scans. T.I and H.S. wrote the manuscript. All authors read and approved the final manuscript.

Informed consent

Informed consent was obtained from the patient's family for the publication of this manuscript.

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Retropharyngeal emphysema in a newborn with inspiratory stridor

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Key words airway obstruction, emphysema, infant, pneumothorax, stridor.

Retropharyngeal emphysema is caused by an air leak into the retropharyngeal space and can lead to upper airway obstruction and inspiratory stridor.[1] Neonatal retropharyngeal emphysema is rare; however, this disease is important, as it is associated with events that are commonly performed at the time of delivery, such as oropharyngeal suctioning or insertion of a feeding tube.

A female infant was born vaginally with 39 weeks and 2 days of gestation with a birth weight of 4,478 g, from a 35-year-old gravida 1, para 0 mother. The infant presented with shoulder dystocia and had Apgar scores of 1, 3, and 5 at 1, 5, and 10 min, respectively. The amniotic fluid was contaminated with meconium. The previous physicians administered oxygen, positive pressure ventilation, and oropharyngeal suctioning for resuscitation. Tracheal intubation was not performed because her breathing condition improved during preparation. Due to birth asphyxia and dyspnea, the infant was transferred to our neonatal intensive care unit 2 h after birth.

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On admission, a chest radiography revealed right pneumothorax. A low dose of oxygen delivery through a mask was therefore initiated and a nasogastric tube was smoothly inserted. An absence of congenital heart disease and intracranial hemorrhage was revealed by ultrasonography. At 2 days of age, an inspiratory stridor developed, while neck swelling with a cutaneous snow-grasping sensation appeared (Fig. 1a, arrows). Her vital signs were body temperature of 37.1 °C, heart rate of 150 bpm, blood pressure of 62/45 mmHg, respiratory rate of 48 per minute, and transcutaneous blood oxygen saturation of 95%, which temporarily decreased to 74%. Physical examination revealed inspiratory stridor and agonal gasping, diminished bilateral breath sounds, and no hoarseness. Blood tests showed mildly elevated C-reactive protein levels but imaging findings were not suggestive of a respiratory tract infection; we therefore considered meconium aspiration as the cause of elevated C-reactive protein levels. A chest computed tomography scan indicated air leakage into a bilateral thoracic cavity (Fig. 1(b), arrows) as well as the mediastinum, subcutaneous, and retropharyngeal space (Fig. 1(c), arrowheads). Given her inspiratory disorder, the patient was intubated and her respiratory distress disappeared. A laryngoscopy excluded both pharyngeal trauma and either laryngeal or upper tracheal anomalies. Artificial ventilation at minimal pressure was used to prevent the exacerbation of the air leaks.