Thrombocytosis, haemorrhagic pleural effusion and fibro-infiltrative patches with cavitary lung lesions in a child with COVID-19 pneumonia

Ankit Pachauri , Shakal Narayan Singh, Sanjeev Kumar Verma , Shally Awasthi

Pediatrics, King George's Medical University, Lucknow, Uttar Pradesh, India

Correspondence to
Dr Ankit Pachauri;
ankit_pachauri@yahoo.com

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SUMMARY

COVID-19 infection in children is relatively mild and is associated with fewer complications compared with adults. Here we report the case of a previously healthy preteen girl who presented with active COVID-19 and shock. On day 1, ultrasound of the thorax revealed a right-sided pleural effusion with haemorrhagic pus on diagnostic tap, which improved clinically with appropriate hospital treatment. Even at discharge, the chest X-ray barely changed, indicating a fibrotic area and a collapsed lung. The patient had persistent thrombocytosis, her inflammatory markers (C reactive protein, ESR, interleukin 6, serum ferritin, D-dimer and procalcitonin) were elevated, and a high-resolution CT scan of the thorax at discharge revealed fibro-infiltrative patches with cavitary lesions in COVID-19 pneumonia, which are unusual findings. The patient was discharged on clinical improvement and was doing fine on follow-up after 2 weeks.

BACKGROUND

COVID-19 in children accounts for 1%–5% of all cases.[1] Fever and cough are the most common symptoms of COVID-19 infections in children, yet a considerable percentage of infected children appear to be asymptomatic. Supportive therapy, which includes proper nutrition and calorie intake, hydration, electrolyte management, and oxygen supplementation, is the cornerstone of COVID-19 infection care in children. The case we present here exhibited elevated inflammatory markers, prolonged thrombocytosis, haemorrhagic pleural effusion and fibro-infiltrative patches with cavitary lesion in the lungs, unlike most cases.

CASE PRESENTATION

A previously healthy preteen girl reported with a 15-day sickness that included a moderate-grade fever and 5 days of respiratory distress. Respiratory distress began with exertion but progressed to distress at rest and was associated with non-productive cough. The patient was treated at a primary health centre (PHC) for the first 4 days before being referred to our side with severe respiratory distress and shock. A history of placement of an intercostal drain followed by its removal after 3 days at the PHC was documented. She was febrile, in shock (cold peripheries and blood pressure less than the fifth centile, 59/32 mm Hg) and tachypnoeic (respiratory rate of 64 per minute), with moderate chest retractions and nasal flaring, and her oxygen saturation was 85%–88% on room air, which later improved to 92%–94% on non-rebreathing oxygen mask when she was brought to our side. There was mild pallor and bilateral pedal oedema. Chest examination revealed decreased air entry on the right side, as well as bilateral scattered crepitations and tachycardia (heart rate of 148 per minute), with no other abnormal systemic findings apart from mild hepatomegaly of 2 cm. At the time of admission, an arterial blood gas analysis revealed hypoxaemia and metabolic acidosis. There was clinical suspicion for COVID-19 pneumonia with sepsis and pleural effusion.

INVESTIGATIONS

Initial routine testing revealed a high TLC of 33 500 cells/×109/L (N80L16E3M1) and a platelet count of 3.80 lacs/mm^3, which later increased to 7.3 lacs/mm^3. Serum urea was 33 mg/dL and serum creatinine was 0.8 mg/dL, with elevated inflammatory markers: C reactive protein (CRP) 15.3 mg/dL,Erythrocyte sedimentation rate (ESR) 54, serum fibrinogen 243 mg/dL, ferritin 119 mg/dL, D-dimer 2.2 mg/dL, and procalcitonin level 0.42 at first and then 0.05. The patient was also looked into as part of an investigation for multisystem inflammatory syndrome in children (MIS-C). Her troponin T was 0.31 ng/dL, BNP was less than 50 ng/dL and interleukin 6 (IL-6) was 20.32 pg/dL (table 1). Two-dimensional (2D) echo was within acceptable parameters. *Klebsiella pneumoniae* and *Pseudomonas aeruginosa* were found to grow on pleural fluid cultures, indicating they were likely nosocomial. On day 1, X-ray (figure 1) suggested bilateral pleural collection with non-homogeneous, patchy pleural effusion over bilateral lung fields, which gradually deteriorated and showed an ARDS image on consecutive X-rays. Despite the patient's clinical improvement, X-ray image showed no improvement. Prior to discharge, a high-resolution CT (HRCT) was performed and revealed fibro-infiltrative patches with subsegmental atelectasis and cavitary lesions, as well as consolidation and a few mediastinal lymph nodes (figure 2).

TREATMENT

The preteen girl with active COVID-19 presented with decompensated septic shock. Fluid resuscitation, inotropes and oxygen support were given. Empirical antibiotics such ceftriaxone, vancomycin (as we suspected *Staphylococcus aureus* sepsis), ivermectin, azithromycin, steroids and low molecular

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Table 1

	Day 1	Day 3	Day 5	Day 6	Day 8	Day 12
Hb (g/L)	11.9	11.1	–	10.5	9.7	10.6
TLC (cells/×109/L)	33 500	30 900	–	18 900	14 500	11 300
DLC	N80L16E3M1	N80L14E5M1	–	N79L18E2M1	N79L17E2M2	N74L20E5M1
Platelet (lac/mm^3)	3.8	6.8	–	7.3	7.5	5.8
PT (s)	16.8	–	–	–	16.3	–
INR	1.25	–	–	–	1.22	–
Fibrinogen (mg/dL)	243	–	–	–	567	460
D-dimer	2.2	1.28	–	–	1.26	1.36
FDP	Negative	Negative	–	–	Negative	Negative
Ferritin (µg/dL)	–	–	119	–	–	1041.2
CRP (mg/dL)	15.3	–	46.7	–	71	11

Hb-hemoglobin; TLC- total leukocyte count;DLC- differential leukocyte count;PT- prothrombin time;INR- international normalised ratio;FDP- fibrin degradation product.
CRP, C reactive protein.

weight heparin were given according to the state's COVID-19 treatment guidelines at the time. Inotropes were decreased and withdrawn on day 2 when the child responded well. With no evidence of hypercoagulable state and the patient's 2D echo and ECG being normal, injection of enoxaparin was discontinued on day 2. MIS-C was ruled out because the child exhibited active COVID-19, thrombocytosis, no myocardial dysfunction, and no renal and gastrointestinal involvement.[2] A thorax ultrasound revealed bilateral pleural accumulation (right greater than the left side), showing haemorrhagic pus on a diagnostic pleural tap from the right side (figure 3). Routine microscopy and culture sensitivity of the pleural fluid showed mixed growth of *K. pneumoniae* and *P. aeruginosa*, for which antibiotics were upgraded (meropenem and amikacin) accordingly.

OUTCOME AND FOLLOW-UP

During her hospital stay, the patient's condition improved. She was weaned off oxygen as her saturation was maintained on room air, she was haemodynamically stable with no evidence of respiratory distress and she began taking orally. On day 14, the patient's COVID-19 RT-PCR result was negative and she was discharged. At discharge, an HRCT of the thorax revealed moderate right and mild left pleural effusion, as well as subsegmental atelectasis of the underlying lung, fibro-infiltrative patches in the upper and middle lobes of the right lung with cavitary lesions, and surrounding consolidation and infiltrates in the upper lobe of the left lung, and a few subcentimetric mediastinal lymph nodes. The patient had no new complaints on follow-up after 2 weeks. She was planned for HRCT of the thorax on follow-up at 3 months to look for any residual lung changes, for which the attendants were not ready as she had no respiratory complaints.

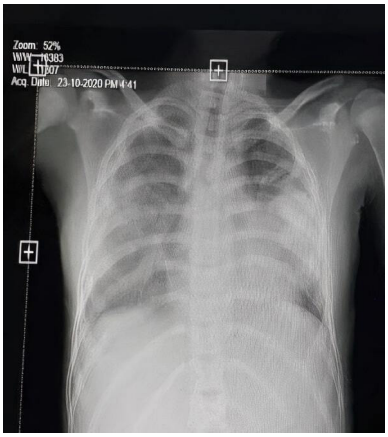

Figure 1 Chest X-ray anteroposterior view (day 1).

DISCUSSION

Children represent only 2% of the COVID-19-positive population in China[3] and 5% in the USA.[4] COVID-19 is less common in children, and atypical presentation in the form of a critically sick state at the time of admission is even rarer. According to Dong *et al*,[5] boys made up 56.6% of the 2143 patients in their study. It is vital to note, however, that children of all ages, including newborn infants and young children, can be infected.[6]

Because majority of children have minor symptoms, initial confirmation with COVID-19 RT-PCR and routine testing with complete blood count, inflammatory markers, coagulation profile and chest X-ray are essential.

The proportion of children with COVID-19 with thrombocytosis has been reportedly low. Feld *et al*[7] reported three infants who presented with fever, feeding difficulty, lymphopaenia and thrombocytosis on laboratory evaluation. Henry *et al*[8] described how a COVID-19-positive sick infant developed high IL-6 levels. It has been seen that patients who presented in shock had a significantly higher incidence of myocarditis, with elevated troponin T, pro-BNP and left ventricular dysfunction, along with significant neutrophilia and lymphopaenia, as compared with those without shock.[9] Here we have reported the case of a preteen girl with active COVID-19 who presented in shock with persistent thrombocytosis and with high CRP, ESR, IL-6,

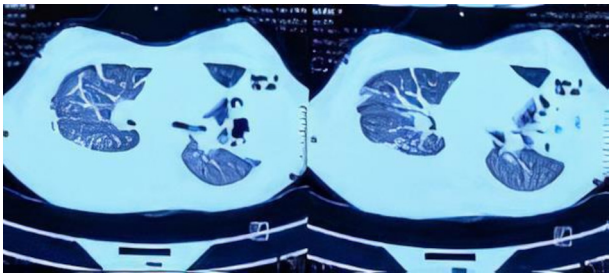

Figure 2 High-resolution CT of the thorax was suggestive of fibro-infiltrative patches in the upper and middle lobes of the right lung with cavitary lesions and with surrounding consolidation and infiltrates in the upper lobe of the left lung.

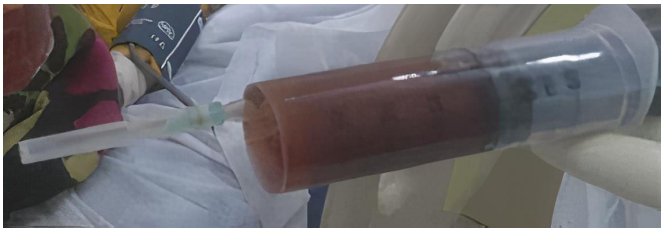

Figure 3 Pleural tap: haemorrhagic pus of 120 mL was tapped.

serum ferritin, D-dimer and procalcitonin, which improved after management.

According to a study done by Chong *et al*,[10] the incidence of pleural effusion was low at 7.3% among 47 observational studies and was common at around day 11 of onset of COVID-19 symptoms. Symptoms of respiratory distress due to pleural effusion began in our patient around day 10, prompting placement of an intercostal drainage tube.

CONCLUSION

There have been very few reports of critically ill children who have developed problems as a result of COVID-19 infections. We discuss the case of a previously healthy preteen girl who presented in shock with persisting thrombocytosis and bilateral pleural collections, which were haemorrhagic pus at presentation, and with elevated inflammatory markers in the absence of MIS-C, which is uncommon. Despite the patient's clinical improvement, X-ray image showed no improvement and HRCT at discharge revealed fibro-infiltrative patches with cavitary lesions and surrounding consolidation and a few mediastinal lymph nodes, which are unusual findings in patients with COVID-19 pneumonia. The patient is doing well and intends to have CT of the thorax done again in 3 months. A thorough work-up in children with COVID-19 may reveal multisystem involvement, necessitating a comprehensive work-up in patients with COVID-19.

Learning points

- COVID-19-positive children may present as critically sick cases.
- COVID-19 pneumonia in children may present with thrombocytosis and pleural effusion.
- Children with COVID-19 may have multisystem involvement, so a thorough work-up is required.
- COVID-19 pneumonia in children may have long-term complications.

Contributors Data were collected by AP and SKV, while SNS and SA contributed to conception, acquisition of data, and analysis and interpretation of data. AP wrote the first draft of the manuscript, which was improved and revised for intellectual content by SKV, SNS and SA until final approval of the version published. All authors agree to be accountable for the article and to ensure that all questions regarding the accuracy or integrity of the article are investigated and resolved.

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Case reports provide a valuable learning resource for the scientific community and can indicate areas of interest for future research. They should not be used in isolation to guide treatment choices or public health policy.

ORCID iDs
Ankit Pachauri http://orcid.org/0000-0002-6022-6509
Sanjeev Kumar Verma http://orcid.org/0000-0001-5309-4336

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