

Case report

4-month-old boy coinfecting with COVID-19 and adenovirus

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SUMMARY

A 4-month-old boy with a history of muscular ventricular septal defect and atopic dermatitis presented with decreased oral intake, loose stools, stuffy nose, mild cough and diaphoresis. The patient had an in-home exposure to COVID-19. The initial respiratory pathogen panel was positive for adenovirus, consistent with his symptoms. The following day, the COVID-19 PCR was also positive. The patient was treated with supportive care, isolation precautions were implemented and the patient was discharged on day 4. This case demonstrates the importance of testing for COVID-19 even if a patient tests positive for another virus due to the possibility of coinfection, especially in children, in order to limit spread of COVID-19 to others.

BACKGROUND

On 11 March 2020, the WHO declared COVID-19 a pandemic.¹ A virus that first appeared in December 2019 in Wuhan, China, has as of 13 June 2020 affected almost every country, with over 7.6 million cases, 427 000 deaths and 4 million recovered.^{1,2} The data are limited on the number of children infected. According to the Centers for Disease Control and Prevention, out of 1 748 851 cases of COVID-19, 80 818 (4.62%) were 0–17 years of age.³ Common symptoms of COVID-19 include fever, fatigue and dry cough but can also include shortness of breath, muscle pain, diarrhoea, sore throat and respiratory failure.¹ A retrospective study on the cases of COVID-19 in children in China demonstrated that adults (18.5%) are more likely to have severe and critical cases when compared with children (5.9%).⁴ When looking at the age groups of the paediatric patients, the most at-risk group were children <1 year with 10.6% having severe and critical cases.⁴ There are rare reports of children developing multisystem inflammatory syndrome related to COVID-19 with symptoms similar to Kawasaki disease and toxic shock syndrome.⁵ However, a study by Qiu *et al* showed almost half the children were asymptomatic and did not have findings of infection on imaging.⁶

A study by Kim *et al*, evaluating the coinfection rate for COVID-19 patients (1–100 years of age) from 3 March 2020 to 25 March 2020, in northern California, showed that 116/1217 patients tested positive for COVID-19 infection.⁷ Of these patients, 24/116 had coinfections with another pathogen, including rhinovirus/

enterovirus, respiratory syncytial virus (RSV), non-severe acute respiratory syndrome coronavirus 2 (non-SARS-CoV-2) coronavirusidae, metapneumovirus and parainfluenza.⁷ Other pathogens such as *Mycoplasma*, influenza and cytomegalovirus have been reported as coinfections with COVID-19 in the adult population.^{8,9} There have been reports of adult patients where testing positive for a routine viral pathogen dismissed them from initially being tested for COVID-19.¹⁰ In the paediatric population, coinfection with COVID-19 is thought to be more common compared with adults.¹¹ In the literature, there are reports of paediatric patients with COVID-19 and coinfection with a second pathogen, including influenza A, influenza B, cytomegalovirus, RSV, mycoplasma, human orthopneumovirus, human metapneumovirus, rhinovirus and Epstein-Barr virus.^{11–15} We present a case of a 4-month-old boy who tested positive for both COVID-19 and adenovirus.

CASE PRESENTATION

On 26 March 2020, a 4-month-old boy with a history of muscular ventricular septal defect and atopic dermatitis, presented via telemedicine, with decreased oral intake, loose stools, stuffy nose, mild cough and diaphoresis, but no fever. The patient was full-term, spontaneous vaginal delivery. The patient has no known allergies, no recent travel history and is up to date on all childhood vaccinations. Parents were advised to follow-up in acute care clinic the following day where the child was swabbed for COVID-19 and his mother advised to self-quarantine. To note, mother and maternal grandmother, who live with infant, both tested positive for COVID-19 on 26 March, after presenting with cough, and loss of taste and smell, but no fever. Mother states her symptoms started on 15 March. On 31 March, patient arrived at ED due to no improvement in symptoms. In the emergency department, patient was in acute distress with respiratory distress, nasal flaring and retractions. The patient was congested, had clear rhinorrhea and dry mucous membranes. He was afebrile, but tachycardic, tachypneic and saturating at 91% on room air. The patient was placed on 14 L of high flow nasal cannula at 30% FiO₂ to achieve >98% oxygen saturation. There was marked improvement in his work of breathing.



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INVESTIGATIONS

Complete blood counts and baseline comprehensive metabolic panel were normal as were the inflammatory markers: C-reactive protein (<5 mg/dL), procalcitonin (<10 ng/mL) and erythrocyte sedimentation rate (9 mm/hour). Lactate dehydrogenase was mildly elevated at 387 U/L (110–240 U/L). Chest X-ray showed no evidence of pneumonia, with only mild bronchiolitis described. A respiratory pathogen panel (RPP) was performed. The RPP detects for influenza A and B, RSV A and B, parainfluenza 1–4, adenovirus, human metapneumovirus, rhinovirus/enterovirus, coronavirus, *Chlamydia pneumoniae* and *Mycoplasma pneumoniae*. The pre-admission COVID-19 test was still pending after 4 days. The patient was given a 20 cc/kg 0.9 normal saline intravenous fluid bolus and transferred to the paediatric intensive care unit. The results of the patient's RPP reported within 2 hours and was positive for adenovirus. The next day, 5 days after collection, the COVID-19 test was positive, and, given the newly available rapid, in-house PCR test, a second COVID-19 test reported positive within 3 hours of testing.

TREATMENT

The patient was treated with supportive care, intravenous fluids and oxygen. He was weaned off supplemental oxygen over the next 3 days, and discharged home on day 4. Given the relatively moderate course consistent with adenovirus bronchiolitis, only supportive care was given and no specific COVID-19 therapy was initiated. Blood cultures were negative and there was no indication of secondary bacterial infection.

OUTCOME AND FOLLOW-UP

Three days after discharge, a virtual visit was performed from the child's home. The child was feeding well, producing normal number of wet diapers, having normal daily bowel movements and improvement in cough. On examination, patient had mild subcostal retractions improving since discharge. There were no additional concerns. To note, within a week of the child's discharge, his aunt and father tested positive for COVID-19.

DISCUSSION

To the best of our knowledge, this is the first case presented of an infant coinfecting with COVID-19 and adenovirus. A study by Zhu *et al*, reports 10 out of 257 patients testing positive for coinfection with COVID-19 and adenovirus; however, the majority of these patients were 15–65 years of age.¹⁶ While there are a small number of adult cases reported,^{16–18} most of the literature describes coinfections with other pathogens, and no patients with adenovirus coinfections.^{19–21} Additionally, there are no reports of infants coinfecting with COVID-19 and adenovirus. This 4-month-old child had symptoms consistent with adenovirus infection, but the child's home exposure prompted the team to test for COVID-19. If this child did not have in-home exposures, the child may not have undergone COVID-19 testing because of the positive adenovirus infection. The high prevalence of COVID-19 coinfection in paediatric population along with this case report demonstrates the importance of testing for COVID-19 even if the common respiratory panel is positive for another pathogen. It is unknown whether the symptoms this patient presented with were due to adenovirus, COVID-19 or a combination of both. The patient may have been a carrier of COVID-19, while being symptomatic from adenovirus. Regardless, if COVID-19 was not tested for, it is possible that the patient may have exposed others.

Asymptomatic children may transmit the virus to others in the community, worsening the global pandemic.^{6,22}

Additionally, in a study by Xia *et al*, not only were patients found to have coinfections with common respiratory viruses, but also an elevated procalcitonin level was common among the paediatric patients infected with COVID-19.¹¹ It is unknown whether the elevated procalcitonin level is due to an inflammatory response or a coinfection with a bacterial pathogen. However, this study suggest the possibility of COVID-19 coinfections with bacterial pathogens.¹¹ Thus, implementing routine antibacterial treatment should also be a consideration.¹¹

We suggest that COVID-19 should be routinely tested alongside the RPP even if a child tests positive for another virus. Failure to do so may result in an undiagnosed case with secondary environmental spread. While there are currently no evidence-based treatments for COVID-19, failure to diagnosis underlying COVID-19 may result in incomplete patient care, notably where targeted therapies such as remdesivir may be considered.

Learning points

- ▶ COVID-19 and adenovirus can appear as coinfection in infants.
- ▶ Identifying this coinfection is important for reducing transmission of COVID-19 in the community.
- ▶ During this pandemic, consideration should be given to testing for COVID-19 in children even if the respiratory pathogen panel is positive for another virus.

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