

Title: A child with SARS-CoV2 induced croup

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Dr K Tsoi wrote the first draft of the manuscript and made substantial contributions to the management of the patient and literature review. She drafted and revised the manuscript, and gives approval to the final version to be published. She is accountable for all aspects of the work and ensures that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Dr K Chan made substantial contributions to the conception of the report. In particular she critically revised the manuscript, and gives approval to the final version to be published. She agrees to be accountable for all aspects of the work and ensures that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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Prof S Lam made substantial contributions to the conception of the report and interpretation of the clinical course of the patient. He critically revised the manuscript and gives approval to the final version to be published. He is accountable for all aspects of the work and ensures that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Manuscript

To the Editor,

Children with Coronavirus Disease 2019 (COVID-19), an infection caused by Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) are usually asymptomatic or only mildly symptomatic. The most common symptoms are coryzal in nature including fever and cough¹. Most children are clinically stable¹ and require no medical intervention. However, despite their stable condition, stringent infection control measures are still required.

In this letter, we describe a child infected with SARS-CoV-2 who presented atypically with features compatible with croup. With the current Coronavirus Disease 2019 (COVID-19) pandemic, infection control measures need to be appropriately heightened and early diagnostic sampling for SARS-CoV-2 should be carried out even in symptomatology that is atypical of COVID-19.

A 21-month-old boy was admitted with 1-day history of fever, noisy breathing, mild cough and hoarseness. The cough was not “barking” and there was no drooling, or gastrointestinal or urinary symptoms. On examination, he was febrile at 40.2 degrees Celsius, respiratory rate was 32-36/min and SpO₂ was 94-97% in room air. He had hoarseness and exhibited inspiratory stridor during vigorous cry. Breath sounds were vesicular, air entry bilaterally equal and no other signs were present. The clinical features were compatible with mild croup².

In view of a history of close contact 5 days prior to admission with his maternal grandmother who was confirmed as SARS-CoV-2 positive 3 days ago he was tested for SARS-CoV-2. He tested positive for SARS-CoV-2 by PCR on admission with Ct value of 16.4. Nasopharyngeal swab (NPS) was negative for other respiratory pathogens including adenovirus, human metapneumovirus, human enterovirus/ rhinovirus, influenza A, influenza B, parainfluenza types 1-4, respiratory syncytial virus, *Bordetella pertussis*, *Chlamydia pneumoniae* and *Mycoplasma pneumoniae*. Chest radiograph showed positive steeple sign and no consolidation.

He was treated for croup with one dose of 0.6 mg/kg oral dexamethasone on day 1 of illness. The symptoms improved initially, but deteriorated again 12 hours after the first dose of dexamethasone with worsening of tachypnoea and persistence of stridor with agitation. A second dose of 0.6 mg/kg dexamethasone was given on day 2 of

illness. There was then gradual resolution of the noisy breathing and tachypnoea. His cough and sputum sounds subsided on day 9 but the hoarseness persisted till day 15. NPS SARS-CoV-2 PCR Ct value rose to 31.78 by day 9 and 35 by day 18. Blood for SARS-CoV-2 antibody was positive by day 19. Patient was asymptomatic by that time and was discharged.

Croup is a common viral infection in the paediatric population which is usually associated with parainfluenza, rhinovirus and respiratory syncytial virus infections². Children with croup usually present with a characteristic barking cough, stridor and respiratory distress. Compared with COVID-19, for croup, the presentation and initial management strategies are distinctly different. Treatment including dexamethasone and nebulised adrenaline can be considered. Croup is usually diagnosed by clinical assessment. Healthcare workers deliberately avoid uncomfortable procedures such as blood-taking and nasopharyngeal sampling in these children as agitating the child may worsen any airway obstruction. Croup symptoms usually last for 2-3 days and sometimes up to 1 week².

Our case was an uncommon manifestation of paediatric SARS-CoV-2 infection. Very few cases of SARS-CoV-2 infection presenting with features of croup have been reported in the literature. Pitstick et. al³ reported a SARS-CoV-2 positive case with fever, cough and intermittent stridor, while Venn et. Al³ reported three SARS-CoV-2 positive cases with the first case exhibiting fever, cough and stridor; the second case cough and dyspnoea without fever; and the third child fever, tachypnoea and inspiratory stridor at rest.

Our patient had persistent symptoms lasting 15 days which is much longer than the usual 2-3 days. Such prolonged symptomatology is unusual amongst paediatric COVID-19 cases¹ and also uncommon amongst children with croup. Apart from this, the presentation of the croup caused by SARS-CoV-2 is similar to that of those caused by Parainfluenza type 1. Patients described by Pitstick and Venn also had similar presentations as per usual parainfluenza croup, so whether SARS-CoV-2 can cause longer duration of symptoms for croup remains to be seen.

Nasopharyngeal aspiration (NPA) is an aerosol-generating procedure, that should be carried out in an airborne-infection isolation room (AIIR) by staff protected with adequate personal protective equipment (PPE). In our practice, patients with croup usually are not tested for fear of risk of airway obstruction when agitating the child. As symptoms of croup caused by parainfluenza virus and SARS-CoV-2 are similar, it

would be difficult to differentiate the two by clinical assessment alone. However, the implications regarding aerosol-generating procedures, isolation facilities and treatment may be very different. Hence, under the current pandemic, we would recommend to proceed with early testing in children presenting with clinical features of croup so that appropriate treatment and infection control measures may be instituted. As there is risk of worsening airway obstruction with sampling, expertise and equipment needed for advanced airway support should be available while the patient is undergoing nasopharyngeal sampling. Instead of NPAs, alternative sampling such as throat swabs or nasopharyngeal swabs for SARS-CoV-2 may be considered to minimise aerosol generation as much as possible.

Patients with croup are often treated with oral dexamethasone. For more serious cases, nebulised adrenaline may be considered. Should nebulised adrenaline be indicated, medical staff should wear full PPE and administer nebuliser in AIIR. In case AIIR and adequate PPE are unavailable, there is limited evidence supporting the use of metered-dose inhaler for epinephrine delivery⁵.

Repeated doses of dexamethasone should be considered if appropriate. In case of deterioration, early intubation should be considered by medical personnel equipped with appropriate PPE and nebulised medication can be administered via closed ventilatory circuit.

In conclusion, under the current COVID-19 pandemic, even for children presenting atypically, e.g., croup, after careful consideration of the patient's clinical condition, availability of PPE and AIIR and choice of treatment, early testing for SARS-CoV-2 is still strongly recommended, e.g., shortly after treatment with dexamethasone. Appropriate detection of children with SARS-CoV-2 infection is important to help prevent spread of disease, and patients should also remain housed in an AIIR if possible.

References

1. Hoang, A., Chorath, K., Moreira, A., Evans, M., Burmeister-Morton, F., Burmeister, F., Naqvi, R., Petershack, M. and Moreira, A., 2020. COVID-19 in 7780 pediatric patients: A systematic review. *EClinicalMedicine*, 24, p.100433.
2. Johnson, D., 2014. Croup. *BMJ Clin Evid.*, 09:0321.

3. Pitstick CE, Rodriguez KM, Smith AC, Herman HK, Hays JF, Nash CB. A curious case of croup: laryngotracheitis caused by COVID-19. *Pediatrics*. 2020; doi:10.1542/peds.2020-012179
4. Venn, A., Schmidt, J. and Mullan, P., 2020. A case series of pediatric croup with COVID-19. *The American Journal of Emergency Medicine*
5. Chan, K., Beck, C., Chauvin-Kimoff, L., Gripp, K., Krmpotic, K., Thakore, S. and Trottier, E., 2021. The acute management of paediatric coronavirus disease 2019 (COVID-19) | Canadian Paediatric Society. [online] Cps.ca. Available at: <<https://www.cps.ca/en/documents/position/the-acute-management-of-paediatric-coronavirus-disease-2019covid-19>> [Accessed 15 February 2021].