A 17-Year-Old Girl with a Recent History of Marijuana Use Presented with Pneumomediastinum and Pneumopericardium and Tested Positive for SARS-CoV-2 Infection on Hospital Admission

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Patient: Female, 17-year-old
Final Diagnosis: Pneumomediastinum • pneumopericardium
Symptoms: Abdominal pain • diarrhea • nausea • vomiting
Medication: —
Clinical Procedure: Recovered • symptomatic and supportive care
Specialty: Pediatrics and Neonatology

Objective: Unusual clinical course
Background: Pneumomediastinum and pneumopericardium have been reported to occur in people who regularly smoke marijuana and have also been reported in patients with COVID-19 pneumonia due to infection with SARS-CoV-2. This report is of a 17-year-old girl with a history of marijuana use who presented with pneumomediastinum and pneumopericardium and was found to be positive for SARS-CoV-2 infection on hospital admission by Abbott ID NOW testing.

Case Report: A 17-year-old girl presented to the emergency room with a 3-day history of abdominal pain, nausea, and vomiting and a 1-day history of diarrhea. She had a history of daily marijuana use and lived with her grandmother who was presumed to be positive for COVID-19, based on symptoms. Her admission laboratory results were unremarkable except for pyuria, which was suspicious for urinary tract infection. The patient’s nasopharyngeal swab was positive for SARS-CoV-2 infection. Owing to abdominal pain, a computed tomography (CT) scan of the abdomen and pelvis was obtained, which was concerning for pneumomediastinum and pneumopericardium. A CT scan of the thorax confirmed the findings. A contrast-enhanced barium esophagogram was performed and was unremarkable. The patient was admitted to the pediatric intensive care unit for observation and supportive care.

Conclusions: This report shows the importance of current testing for SARS-CoV-2 infection in patients of all ages who present acutely to the hospital. It also highlights the importance of obtaining a full social and medical history so that symptoms and signs from causes other than SARS-CoV-2 infection are not missed.

Keywords: COVID-19 • Intensive Care Units, Pediatric • Pediatrics • Pneumomediastinum, Diagnostic • Pneumopericardium • Severe Acute Respiratory Syndrome Coronavirus 2 • Marijuana Use • Case Reports

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Background

The COVID-19 outbreak started in Wuhan, Hubei province of China, in December of 2019 [1]. COVID-19 disease is caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) [1]. Owing to the rapid spread of COVID-19 globally, on January 30, 2020, the World Health Organization (WHO) declared COVID-19 a public health emergency of international concern, and on March 11, 2020, COVID-19 was declared a pandemic [2-4].

Although the virus is known to infect patients of all ages, the published literature supports the observation that infections have been generally less severe in the pediatric population than in the adult population [2]. The clinical manifestations of COVID-19 disease range from patients having mild symptoms to being critically ill [2]. Cough and fever are the most common symptoms in adults [5,6]. Pneumomediastinum and pneumopericardium have been reported in the literature to be associated with COVID-19 [7]. Li et al reported the case of a 68-year-old man who was found to have pneumomediastinum and pneumopericardium after being on mechanical ventilation for 2 weeks [7]. Similarly, Juarz-Llocilla et al reported 12 adult patients with spontaneous pneumopericardium and pneumomediastinum, many of whom developed the complication after being started on noninvasive or invasive ventilation [8]. Spontaneous pneumomediastinum has also been associated with the use of inhaled marijuana. Weiss et al reported 14 cases of spontaneous pneumomediastinum associated with marijuana use [9]. At this time, the literature is lacking pediatric population data.

As the world continues to be affected by the COVID-19 pandemic, the knowledge regarding diagnostic testing for SARS-CoV-2 continues to evolve [10]. The tests can be divided into diagnostic tests and antibody tests [11]. The diagnostic tests include antigen and molecular tests, which can detect active infection [11]. The antibody test detects immune response to SARS-CoV-2 and is not an alternative for diagnosing an active SARS-CoV-2 infection [11]. To take necessary precautions to prevent the spread of infection during the hospital stay, it is important to test patients of all ages who present acutely to the hospital.

We report the case of a 17-year-old girl with a history of smoking marijuana who presented with pneumomediastinum and pneumopericardium and was found to be positive for SARS-CoV-2 infection by Abbott ID NOW testing on hospital admission.

Case Report

A 17-year-old girl with a history of drug abuse (daily marijuana use, one-quarter pack of cigarettes per day, and recreational vaping of nicotine) presented to the emergency department (ED) with progressively worsening abdominal pain, nausea, and vomiting for 3 days. The abdominal pain was periumbilical in location and radiated toward her epigastrium. The pain was constant, sharp in character, 10/10 in intensity, and there were no aggravating or relieving factors. The pain was associated with a 3-day history of nausea and vomiting and 3 episodes of non-bloody, watery diarrhea, which started on the day of the patient’s presentation to the ED. The emesis were non-bloody, non-bilious, with 5 to 6 episodes per day, and did not respond to ondansetron taken at home. The patient denied having fever, chills, cough, shortness of breath, chest pain, and any other respiratory, gastrointestinal, or genitourinary symptoms. There was a positive sick contact at home, her grandmother, who was the patient’s legal guardian. The grandmother was having respiratory symptoms and was presumed to be positive for SARS-CoV-2 infection by her primary care physician, and was instructed to keep herself in isolation. The patient denied taking any precautions with her sick grandmother at home.

The patient was vitally stable, including oxygen saturation, and the physical examination was significant for generalized abdominal tenderness to palpation without any guarding, rebound tenderness, or appendiceal signs. The patient was given a bolus of normal saline intravenously and 1 dose of ketorolac, famotidine, and ondansetron. The baseline laboratory examination results revealed a complete blood count within the reference range, no leukocytosis, and normal hemoglobin and platelet counts. The complete metabolic panel was significant for a potassium level of 3.4 mmol/L and chloride of 96 mmol/L; glucose, electrolytes, and liver function tests were within the reference range. Cardiac markers, C-reactive protein, and lipase levels were within the reference range. A nasopharyngeal swab was obtained to test for SARS-CoV-2 viral ribonucleic acid (RNA) using the Abbott ID NOW molecular testing kit, and the results were positive. A pregnancy test was negative, and urinalysis results were significant for 21-50/HPF WBC, positive nitrates, many HPF bacteria, and >150 g/dL of ketones. The patient was given 1g of ceftriaxone. The urine culture was positive for Escherichia coli >100 000 colonies per mL, which were pansensitive.

A computed tomography (CT) scan of the abdomen and pelvis without contrast was obtained and was concerning for pneumomediastinum and pneumopericardium. Hence, a CT scan of the thorax without contrast was obtained, revealing extensive subcutaneous emphysema in the soft tissues of the neck, extending into the supraclavicular regions and left axillary
region, and extending along the left scapula anteriorly, medially, and posteriorly. There was extensive pneumomediastinum with gas along the great vessels, aorta, trachea, and esophagus (Figure 1A, 1B). There was also pneumopericardium. No pneumothorax, pleural effusion, or airspace consolidates were demonstrated, and the central airways were patent. A contrast-enhanced barium esophagogram was performed and was unremarkable, without any extraluminal leak of the contrast. A thoracic surgeon was consulted and recommended admitting the patient for observation, without any surgical intervention.

In the pediatric intensive care unit, the patient was started on maintenance intravenous fluid, and her pain was treated as needed with doses of acetaminophen and morphine. Ceftriaxone was continued for her urinary tract infection. Per protocol, she was started on heparin for deep vein thrombosis prophylaxis, and the baseline D-dimer level obtained on admission day 3 was 630 ng fibrinogen-equivalent units/mL. The pediatric infectious disease and pulmonology teams were consulted; both agreed with the current supportive treatment and recommended doing an electrocardiogram, which was obtained and was normal. Over the next few days, the patient’s symptoms improved, and a follow-up chest X-ray was obtained on admission day 4, revealing reduction in the size of the pneumomediastinum, without any associated pneumothorax (Figure 2). The patient was discharged home on admission day 7 in stable condition. During the hospital stay, the patient did not require any respiratory support.

Discussion

It has been more than 1 year since the SARS-CoV-2 infection was declared a global pandemic by the WHO [2-4]. With the limited data we have at present, it is important for clinicians to be up-to-date on the latest literature including the natural history of the COVID-19 disease and its clinical course. Our case highlights the importance of testing for SARS-CoV-2 in patients of all ages who are hospitalized with acute symptoms and of obtaining a thorough medical and social history.
so that signs and symptoms of causes other than SARS-CoV-2 are not missed.

SARS-CoV-2 is an enveloped, single-stranded RNA virus which mostly originates in bats [12]. The virus is transmitted mainly via respiratory droplets to people in close proximity to an infectious person or by touching contaminated objects. Other potential routes of transmission, including the fecal-oral route, are under investigation [13,14]. The incubation period of the virus ranges from 1 to 14 days with a mean of 5 days. It is estimated that 95% of patients develop symptoms up to 12.5 days after exposure, which explains the current practice of a 14-day quarantine period after exposure [15,16].

Few cases of COVID-19 and low mortality have been reported in the pediatric population [2]. Diagnosing COVID-19 in the pediatric population is challenging. Children with a positive contact, familial clustering, recent travel, or who are living in an area with a high transmission rate are at risk for contracting COVID-19 [2]. Our patient’s grandmother was presumed to be positive for COVID-19, and the close proximity of the patient to the grandmother without any precautions likely led to the transmission to our patient. Our patient presented at the start of the pandemic when testing options were limited, and she tested positive using Abbott ID NOW molecular testing, which was granted emergency use authorization by the FDA in March 2020 [17]. The specific strain of SARS-CoV-2 was not identified in our case.

The clinical manifestations of COVID-19 range from mild to severe [2]. In their meta-analysis, Chang et al reported fever and cough, resembling common viral illness, as the most common presentation in the pediatric population [2]. Children are less likely to develop severe symptoms but are believed to be an important source of transmission even when they are asymptomatic or have mild symptoms [16,18,19]. Although the literature is deficient regarding severe presentation in the pediatric population, Chen et al reported the first case of a critically ill pediatric patient in China [2,16]. The 1-year-old boy presented with diarrhea and vomiting for 6 days without any respiratory tract symptoms and quickly deteriorated after admission, developed shock, progressed to acute respiratory distress syndrome, required mechanical ventilation, and developed acute renal failure, for which he required hemodialysis [2,16]. Our patient presented with gastrointestinal symptoms without any fever or respiratory symptoms.

There are many case reports and case series published in the literature regarding pneumomediastinum in the adult population, with rare reports of its association with pneumopericardium. Many adult patients developed pneumomediastinum after starting noninvasive or invasive ventilation. Juarez-Lloclla et al reported on 12 adult COVID-19 patients with spontaneous pneumomediastinum and pneumopericardium [8]. Pulmonary findings of consolidation, crazy paving, and ground-glass opacities were observed in 50%, 75%, and 100% of their patients, respectively [8]. The cytokine storm in patients with COVID-19 affects the alveolar markings, making them more liable to rupture, and the use of noninvasive and invasive ventilation can precipitate pneumomediastinum. Associated myocarditis can also precipitate pneumopericardium [7]. Our patient did not have the characteristic ground-glass pattern of the lungs or pneumonia on imaging studies, which is observed in the majority of the patients with COVID-19. The findings of pneumomediastinum and pneumopericardium in the absence of pulmonary findings were unique in our patient, and to the best of our knowledge, no case has been reported in the literature with such findings in the pediatric population.

Marijuana use has been reported to be associated with spontaneous pneumomediastinum. Weiss et al reported 14 cases in their study that were associated with marijuana use [9]. Another explanation for the findings in our patient, in addition to COVID-19, can be that our patient’s vomiting might have been secondary to marijuana withdrawal, which might have contributed to the development of the pneumomediastinum, and the positive SARS-CoV-2 was found incidentally. But this interpretation does not explain the associated pneumopericardium.

The general treatment strategy for COVID-19 includes supportive treatment, bed rest, and adequate hydration and calorie intake [16]. At present, there are many evolving treatments for the management of COVID-19, but there is no definitive treatment.

Conclusions

This report has shown the importance of current testing for SARS-CoV-2 infection in patients of all ages who present acutely to the hospital and of obtaining a full social and medical history, so that symptoms and signs from causes other than SARS-CoV-2 infection are not missed.
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