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CASE REPORT



Coronavirus HKU 1 infection with bronchiolitis, pericardial effusion and acute respiratory failure in obese adult female

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ABSTRACT

Seven species of coronavirus cause acute respiratory illness in humans. Coronavirus HKU 1 (CoV HKU 1) was first described in 2005 in an adult patient with pneumonia in Hong Kong. Although it is a well-known respiratory tract pathogen, there is not much information about its role in hospitalized adults, especially in southern Europe. Here, we describe a case of radiologically demonstrated CoV HKU 1-related bronchiolitis with acute respiratory failure in an adult female without significant comorbidities except obesity.

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Coronavirus; virus infection; bronchiolitis; acute respiratory failure

Introduction

Coronaviruses (CoV) are enveloped single-strand RNA viruses. At least seven species of the family cause acute respiratory illness in humans (1). Two genera, alphacoronavirus and betacoronavirus, have been identified. Severe acute respiratory syndrome (SARS) CoV (betacoronavirus lineage B) caused an outbreak in November 2002 that originated in southern China, with a mortality rate of about 9% (2). Middle East respiratory syndrome (MERS) CoV (betacoronavirus lineage C) has a significant mortality rate and was first described in Saudi Arabia (2). A new coronavirus, related to SARS CoV, is involved in a serious outbreak in Wuhan province (1,3) and has been named “severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)” by the International Committee on Taxonomy of Viruses (ICTV).

Coronavirus HKU 1 was first described by Woo et al. (4) in a 71-year-old Chinese male pneumonia patient in Hong Kong. The patient was an ex-smoker with a history of tuberculosis and chronic colonization by *Pseudomonas aeruginosa* (4). Sloots et al. (5) later found that CoV HKU 1 was significantly present

among Australian children and can be divided into two genetic lineages.

Coronavirus HKU 1 has been demonstrated in Europe and is especially associated with upper respiratory tract infections in children, together with the other non-severe acute respiratory syndrome (non-SARS) coronaviruses (6–8). The clinical features specific to HKU 1 infection are not well known, and its role in lower respiratory tract infections is controversial (6,9). Israeli authors reported a significant presence of CoV HKU 1 in the hospitalized population, especially in the spring–summer period, compared to the other non-SARS coronaviruses (10). Bronchiolitis has been reported as a possible consequence of CoV HKU 1 infection, especially in infants (11). The role of the virus in respiratory syndromes in adults is unclear.

Case report

A 61-year-old woman was admitted to the Emergency Department of Siena University Hospital in January 2020 with a 3-week history of increasing dyspnea and dry cough. The patient was Italian and had not

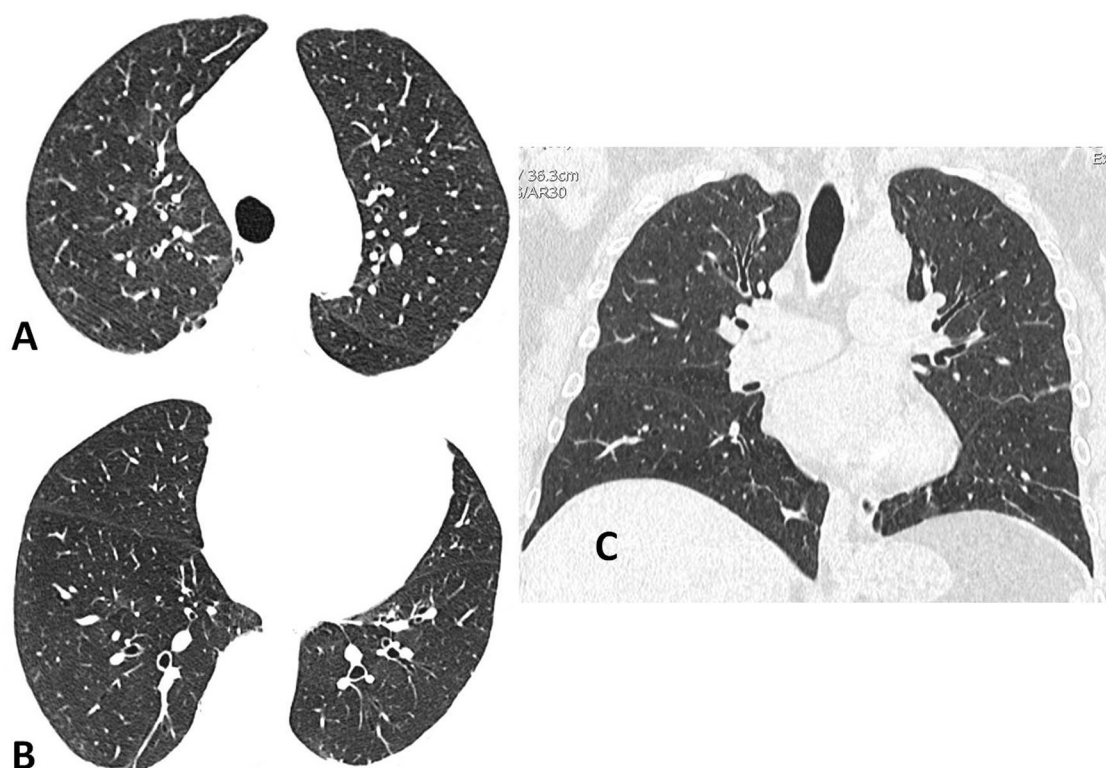


Figure 1. High resolution CT scan examination shows ground-glass opacity in the upper (A) and in the inferior right lobe (B) and multiple atelectasis in both lungs (coronal image C), suggesting an infectious bronchiolitis.

traveled abroad in the past six months. The same was true of her relatives. Smoking history and no occupational exposure was reported.

On admission, chest auscultation revealed moderate expiratory wheezing, while blood gas analysis showed hypoxemia and hypocapnia (pO_2 56.2 mmHg; pCO_2 34.3 mmHg; sO_2 89.7%) with balanced pH (7.439; HCO_3^- 22.7 mmol/l). No comorbidities except uncomplicated arterial hypertension (treated with lisinopril and hydrochlorothiazide) were reported. The patient had severe/morbid obesity (BMI 41.66 kg/m²). Chest X-ray was negative for pleuro-parenchymal and heart alterations, so a high resolution CT scan was performed, which was negative for thromboembolism, but showed ground-glass opacity in the upper and lower right lobe and multiple atelectasis in both lungs suggestive of bronchiolitis; slight pericardial effusion was also present (Figure 1). The echocardiogram was negative. Oxygen supplementation, steroid therapy and inhaled bronchodilators were started; antibiotic cover with ceftriaxone was also introduced.

Serology including IgM and IgG for *Mycoplasma pneumoniae* and *Chlamydia pneumoniae* and IgA for flu (influenza A and influenza B) was negative; no urinary antigens of *Streptococcus pneumoniae* or *Legionella pneumophila* were detected. A pharyngeal swab for respiratory pathogens was performed. Real-

time polymerase chain reaction (PCR) for influenza virus (A and B), syncytial respiratory virus (RSV), parainfluenza virus, metapneumovirus, adenovirus, *Mycoplasma pn.* and *Chlamydia pn.* was negative. PCR for coronavirus was positive and subsequent typing identified the HKU 1 genotype.

Antibiotic cover was suspended, whereas systemic steroid therapy with methylprednisolone 20 mg/day was continued. Respiratory and subjective conditions improved day by day. After two days of spontaneous breathing of room air and nine days since hospital admission, the patient was discharged in good respiratory condition with normal lung sounds.

Discussion

Coronavirus HKU 1 was first described in an adult with pneumonia in Hong Kong (4). Most studies of the virus concern children. Many studies have described its role in acute respiratory infections in children, although it seems to be an infrequent factor of disease compared to other coronaviruses (12,13), possibly partly because immunization against other coronaviruses of the same group (betacoronavirus) could protect against infection by CoV HKU 1 (14). Previous analysis of respiratory specimens from children in our area with acute respiratory tract infections shows that

coronaviruses accounted for less than 2% of the causative pathogens and the HKU 1 strain was never identified (7); similar results were obtained in other parts of Italy (8,15). However, all these studies were done more than 10 years ago. Two longitudinal studies conducted in Yamagata prefecture in Japan demonstrated a higher presence of coronaviruses (up to 9.7% of the strains isolated, with wide year-to-year variability) in the Japanese pediatric population with respiratory symptoms. In Japan, CoV HKU 1 was also found especially to affect young children (13,16). A specific study on the role of respiratory viruses in children with lower respiratory tract infections in Latvia failed to detect HKU 1 in any of the samples studied (17).

The spread of respiratory infection due to CoV HKU 1 among the adult population, and its clinical characteristics, is less known. A recent retrospective analysis of coronavirus detections in respiratory samples across the USA in a three-year period showed that HKU 1 is less common than other coronavirus species; more than 45% of the patients were under 18 years of age; no correlation between different coronavirus species and clinical features was reported (18). An Iranian study among adult patients hospitalized for acute respiratory infection did not find positivity for any of the coronaviruses investigated (HKU 1 included) (19). A Chinese study specifically conducted in Beijing over a period of 4 years on adult (over 14 years) outpatients with respiratory symptoms and normal chest X-rays showed that only 1% had a coronavirus infection (87/8396) and only 14 patients (0.2%) were positive for HKU 1. Interestingly, CoV HKU 1 showed a higher correlation with lower tract respiratory infections than the other types (OC 43, NL 63 and 229E), but the difference was not statistically significant (9). Lau et al. (20) also detected CoV HKU 1 in adult patients from Hong Kong, although over one year of monitoring, only two of the 13 patients with HKU 1 infection were adults. They were very old (84 and 87 years) with multiple comorbidities and only one had lower respiratory tract involvement (pneumonia). In Hong Kong, Woo et al. (21) found CoV HKU 1 in nasopharyngeal samples of 2.4% of patients hospitalized for community-acquired pneumonia, but most were elderly and had major underlying diseases. The authors did not specify what other possible etiological agents were investigated. A prospective hospital-based Swiss study confirmed the presence of the four non-SARS coronaviruses in bronchoalveolar lavage of a small proportion of patients who underwent bronchoscopy for various reasons. Most of the patients screened were on immunosuppressants and the authors did not specify the immunological

status or clinical features of those with CoV HKU 1 (22). In Italy, CoV HKU 1 has been reported in hospitalized adults, but all of them were immunocompromised and lower respiratory tract involvement was rare (only two cases out of the five identified) (23).

In conclusion, the present case of severe coronavirus HKU 1-related bronchiolitis, determining acute respiratory failure and requiring hospitalization, concerned an adult patient without severe comorbidities except obesity. Viral bronchiolitis is mainly a common cause of lower respiratory tract infection in infants, but it can also have a significant role in adults. Bronchiole structure can be the target of different pathological processes and CT scan is crucial for correct diagnosis of bronchial and parenchymal alterations (24,25).

CoV HKU 1 may be a causative agent of respiratory failure in adults without significant comorbidities. A pharyngeal swab for respiratory pathogens should be part of routine microbiological assessment for better clinical and therapeutic management of patients presenting with symptoms of acute respiratory tract infection, as demonstrated in this case.

Declaration of interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of this article.

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