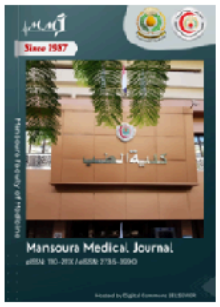
MANSOURA MEDICAL JOURNAL

ISSN - Print: 1110-211X - Online: 2735-3990

journal homepage: mmj.mans.edu.eg



Volume 52 | Issue 2 Article 9

Unusual Late Presentation of Kartagener Syndrome: A Case Report

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CASE REPORT

Unusual Late Presentation of Kartagener Syndrome: A Case Report

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Abstract

Kartagener's syndrome (KS) is a rare inherited autosomal recessive condition. It comprises the triad chronic sinusitis, bronchiectasis, and situs inversus. The symptoms are more prevalent in children in the early years of life. We describe a case of a 15-year-old child showing severe respiratory distress with a history of intermittent wet cough and rhinitis for the past 6 months. The patient was diagnosed with dextrocardia at birth and had no significant medical history since then. Based on his clinical presentation and imaging findings, he was diagnosed with KS which was confirmed by whole-exome sequencing. The patient was managed with conventional medical therapy and noninvasive ventilation. He was discharged on a long-term intermittent prophylactic antibiotic regimen. KS should be suspected in any child with dextrocardia who has recurrent respiratory tract infections. Early detection of KS is critical for avoiding complications and improving patients' quality of life.

Keywords: Bronchiectasis, Chronic sinusitis, Kartagener syndrome, Situs inversus

1. Introduction

Kartagener syndrome (KS) is an uncommon genetic disease with autosomal recessive inheritance (Uludag Yanaral et al., 2021). It is one of the several ciliary motility abnormalities known as primary ciliary dyskinesias (PCDs), which classically include the triad of bronchiectasis, chronic sinusitis, and situs inversus. The presence of this clinical triad is now considered the gold standard for diagnosing KS (Wang et al., 2021). Furthermore, because of recent breakthroughs, genetic testing has been more widespread in the diagnosis of KS (Pereira et al., 2019). One in every 30,000 live babies is predicted to have KS. Males and females are equally affected (Sahu et al., 2022). It is crucial to identify these children early and manage chronic lung infections to improve their quality of life and survival (Taušan et al., 2016).

2. Case report

A 15-year-old male patient was brought to the emergency department (ED) of our tertiary-care hospital after being diagnosed with pneumonia with wet cough for 3 weeks in a nearby local hospital. He has a 6-month medical history of intermittent wet cough episodes and runny nose. Following a cold or flu, the cough frequently got worse, along with yellow phlegm and was only partially treated by symptomatic treatment.

His mother denied ever experiencing hemoptysis or chills. There were no prior allergies or weight loss. The mother stated that the pediatrician had mentioned the patient's dextrocardia at the time of birth.

The system review was unremarkable. There was no family history of asthma or atopy. His parents were in good health, and the marriage was not consanguineous.

On physical examination, the patient appeared acutely ill. He was showing signs of severe respiratory distress. His temperature was 38.5 °C, the oxygen saturation was 82% on room air, and the respiratory rate was 55 breaths/minute. There was tenderness in the sinus area as well as pharyngeal congestion. The results of the otoscopy examination showed no signs of otitis media with effusion. A

Received 14 May 2023; revised 4 June 2023; accepted 11 June 2023.
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https://doi.org/10.58775/2735-3990.1389

chest auscultation revealed coarse crackles and bilateral wheezing at the bases of both lungs. During the cardiac examination, the apex beat was felt in the right fifth intercostal area at the midclavicular line. Heart sounds were best heard on the right side of the chest, with a short systolic murmur at the right parasternal area. The results of other physical examinations were unremarkable, showing normal growth and development (weight and height on 50th centiles for age). The patient was admitted with an unresolved pneumonia diagnosis.

A facial mask was applied to the patient, 10 L/min of oxygen was supplied, and his oxygen saturation improved to 93%. Initial arterial blood gas (ABG) measurement revealed partially corrected respiratory acidosis (PH = 7.26, PaCO2 = 82 mmHg, HCO3 = 36 mEq/L). The results of complete blood counts, renal and liver function tests, and serum electrolytes were all normal. He was managed with a combination of antibiotics (Ceftriaxone, 100 mg/kg/day, and Ampicillin clavulanic acid, 100 mg/kg/day) through intravenous injection for a week. In addition, mucolytics, bronchodilator medications, and chest physiotherapy were regularly conducted to clear mucus from the lungs.

2.1. Imaging tests

Radiograph of the chest revealed a right-sided cardiac apex and aortic arch, indicating dextrocardia, and right-sided stomach air, indicating situs inversus, as well as coarsened broncho-vascular markings with tram-tracking consistent with bronchiectasis in the lower and middle lung areas (Fig. 1). A chest and abdomen computed tomography (CT) scan revealed dextrocardia as well as radiographic indications of bronchiectasis in the lower lung lobes, as well as a left-sided liver and right-sided spleen, confirming situs inversus (Figs. 2 and 3). CT scan of the paranasal es showed thickening of the mucosa in the ethmoid and maxillary sinuses. Two-dimensional echocardiography revealed dextrocardia, a tiny muscular ventricular septal defect, and average chamber sizes in all four cardiac chambers.

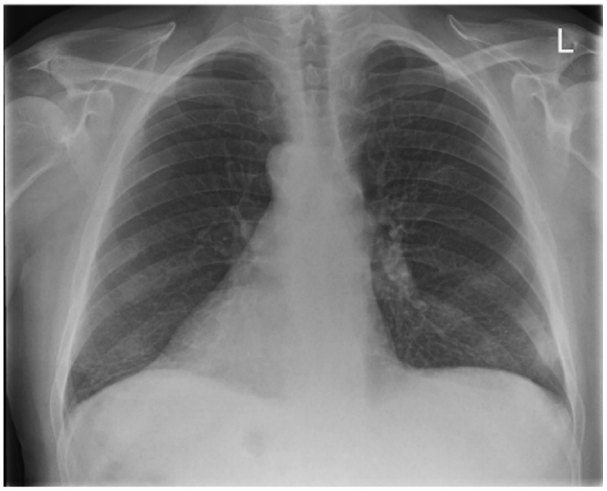

Fig. 1. Chest radiograph showing dextrocardia and bronchial inflammation.

2.2. Laboratory tests

Sweat chloride test, tuberculin skin test, and immunoglobulins assay were carried out; the findings were negative.

2.3. Genetic tests

The patient's whole-exome sequencing revealed a missense mutation in the DNAH5 gene (Fig. 4).

Considering the clinical presentation, imaging findings and genetic tests, a final diagnosis of KS was made. Despite the persistent wet cough, the patient was clinically improved after starting the antibiotics. Serial ABG was improved (PH = 7.34, $PaCO_2$ = 48 mmHg, HCO3 = 28mEq/L). Weaning from O_2 administration was done gradually until it was completed on the seventh day of admission.

At the time of discharge, he was put on a long-term intermittent prophylactic antibiotic regimen (Azithromycin 10 mg/kg/day orally, given in 14-day on and 14-day off cycles for 6 months before being reevaluated). He was advised to get vaccines for pneumococcus and influenza. He was subsequently advised to visit cardiology, pulmonology, and otolaryngology clinics regularly for follow-up.

3. Discussion

Throughout development, normal ciliary activity is necessary for host defense in the respiratory system, sperm motility, and appropriate visceral orientation. A subtype of PCD known as KS is characterized by aberrant cilia structure and function, increasing the likelihood of recurrent sinopulmonary infections, infertility, and left-right body alignment issues (Wang et al., 2021; Sahu et al., 2022).

Because of their recurrent lung infections, KS and PCD cases are typically discovered in newborns or early years of childhood (Sahu et al., 2022). In our situation, the patient had been symptom-free for about 15 years. In prior research of 1009 PCD patients from 26 European nations, the median age of diagnosis was 5.3 years, lower in children with situs inversus compared with those without (Bush et al.,

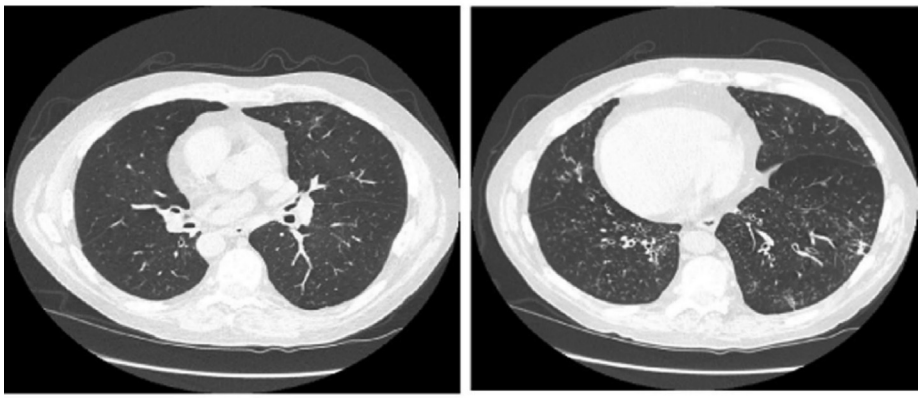

Fig. 2. Chest CT showing dextrocardia, with radiographic evidence of bronchiectasis and mucus plugs in the middle and lower lobes.

2007). Chinese children with KS were diagnosed, on average, at age 6.52 years old (Wang et al., 2021; Jin et al., 2015).

In contrast to our situation, 73% of pediatric PCD patients and 47.6% of pediatric KS patients often experience recurrent respiratory symptoms during the neonatal period (Wang et al., 2021; Noone et al., 2004). Consequently, this presupposes that PCD and KS are not fatal diseases and that children with KS can maintain a good quality of life and have a normal lifespan.

The clinical symptoms of KS, including bronchiectasis, sinusitis, and situs inversus, were present in our patient. In the diagnosis of the disease, a direct study of ciliary motility was not accessible. However, the genetic tests that revealed a missense mutation in the DNAH5 gene and the existence of the clinical triad of KS supported the diagnosis. Patients with PCD or KS frequently have DNAH5 mutations. As homozygous or compound heterozygous DNAH5 mutations cause outer dynein arm abnormalities and aberrant cilia motility during fetal development, patients with DNAH5 mutations may have situs inversus (Nöthe-Menchen et al., 2019). In addition, more than 40 related genes that cause KS have been discovered thus far, the most prevalent of which are DNAI1, DNAI2, DNAH11, ARMC4, and TXNDC3 (Boaretto et al., 2016). In contrast to the findings in cystic fibrosis (CF), where the pulmonary disease primarily affects the upper lobes, the chest CT scan performed revealed evidence of bronchiectasis in the lower lung

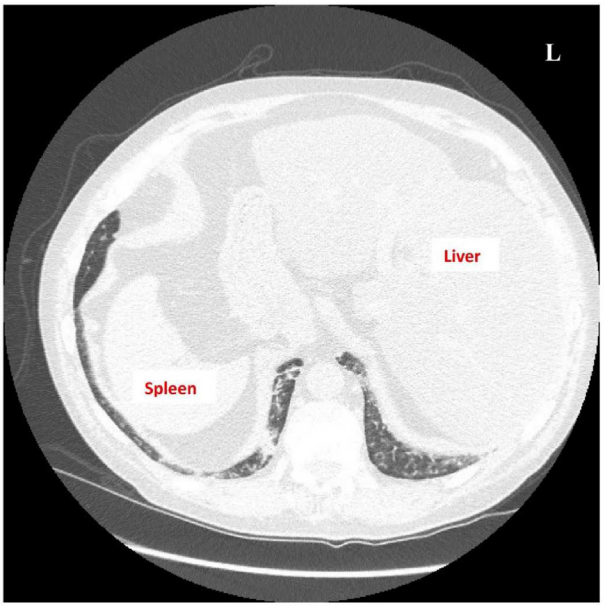

Fig. 3. Abdomen CT shows situs inversus (liver on the left side and spleen on the right side).

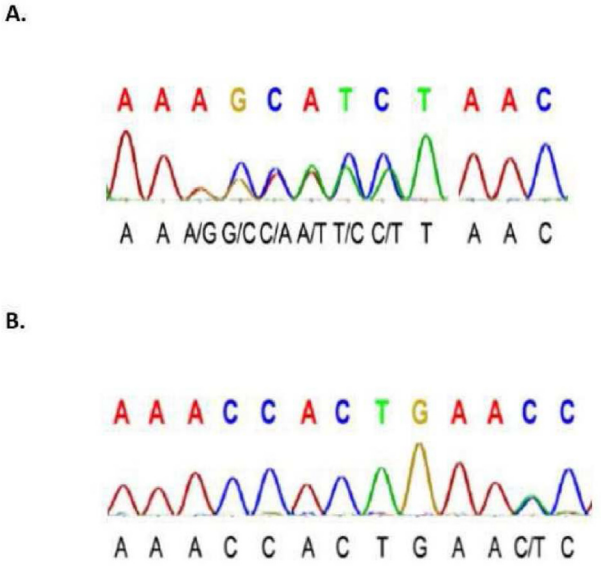

Fig. 4. Identified missense mutation in the DNAH5 gene in the child and his parents: (A) Sequencing of DNAH5 reveals a heterozygous deletion of T mutation in the child and his father. (B) Sequencing of DNAH5 reveals a heterozygous C > T mutation in the child and his mother.

lobes. Both KS and CF have a high prevalence of sinus disease; however, CF is more likely to have nasal polyps than KS (Sahu et al., 2022).

Because there is no cure for KS, early detection and regular follow-ups are essential for these patients to avoid complications (Wang et al., 2021). The cornerstone of treating bronchiectasis patients with prophylactic antibiotic therapy is to break the cycle of recurrent infections and exacerbations by suppressing bacterial infection. This reduces bacterial load, inflammation, and subsequent tissue damage to the airways (Spencer et al., 2022).

In conclusion, the early identification of KS, especially in children with situs inversus, has significant clinical implications as some KS patients can survive years without showing any symptoms. The patient's quality of life could be worsened by a delayed diagnosis, and symptomatic care could be more difficult than anticipated.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Ethical approval

All procedures performed in studies including human participants were as per the ethical standards of the institutional and national research committee.

Informed consent

Informed consent was taken from the participant's parents for publication of this de-identified case report.

Conflicts of interest

The author declares that there is no conflict of interest.

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