Kartagener's Syndrome: A Rare Case

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ABSTRACT

Kartagener's syndrome, an autosomal recessively inherited disorder, is a subgroup of primary ciliary dyskinesias. This genetic disorder manifests from early life which distinguishes it from acquired mucociliary disorders. Kartagener's syndrome presents as a classical triad of situs inversus, sinusitis and bronchiectasis occurring majorly due to impaired ciliary motility. Here we report a case of a four year old female child who presented to us with repeated episodes of cough and intermittent breathlessness for the past three years. Clinical examination revealed bilateral coarse basal crepitations and apex beat on right fifth intercostal space in the midclavicular line. A thorough investigation revealed situs inversus, chronic sinusitis, and bilateral bronchiectasis. The patient underwent a high-speed video microscopy analysis which was suggestive of primary ciliary dyskinesia. Considering these findings, the patient was diagnosed as a case of Kartagener's syndrome.

Key words: Bronchiectasis; Dynein; Kartagener's syndrome; Primary ciliary dyskinesia; Situs inversus

INTRODUCTION

Kartagener's syndrome (KS) is a subtype of ciliary motility disorders called primary ciliary dyskinesia (PCDs) which is characterised by congenital impairment of mucociliary clearance. The defect lies either in a ciliary structure or function. During the embryonic stage, uniform ciliary beating determines the organ position. As the nodal cilia are also defective, body asymmetry occurs randomly so that the heart along with the other organs fails to move on the left side which results in situs inversus totalis.[1] These patients have repeated episodes of lower respiratory tract infections which can lead to bronchiectasis in later life. Kartagener's syndrome is thus the triad of situs inversus, chronic sinusitis and bronchiectasis. In this article, we report a case of a four year old female child who presented with features suggesting Kartagener's syndrome. This case report sheds light on clinical features, investigational procedures, and management strategy opted in this particular case.

CASE REPORT

A four year old girl, resident of Haryana (India), presented to our institute with complaints of recurrent cough and difficulty in breathing for last three years, with episodes of fever and chronic wheezing requiring multiple prescriptions of antibiotics and steroids. There was no history of contact with tuberculosis. She was born of nonconsanguinity with normal birth history and development. She was immunised as per her age. It was remarkable that the patient's younger brother had a cardiac disease (situs inversus with dextrocardia with large VSD and ASD, AVSD, PS) and the mother had situs inversus.

Clinical examination revealed weight of 14.2 kg (-1 SD), height 106 cm (+1 SD), occipitofrontal circumference 48 cm, and Midarm circumference 15 cm. She was tachypneic, pale, with intercostal retractions and pectus carinatum. There were bilateral rhonchi with crepitations over both infrascapular regions bilaterally. Her apex beat was palpable on the right fifth intercostal space in midclavicular line, otherwise, inspection and percussion findings were normal. The heart sounds were appreciable over the right side of the chest which were normal. Rest of the systemic examinations was unremarkable. Her laboratory investigations showed a haemoglobin of 10 g/dl, total leucocyte count of 33,500/mm^3 with microcytic hypochromic red cells on peripheral smear. Liver and kidney function tests were normal. Blood culture was sterile. The chest x-ray PA view was suggestive of bilateral infiltrates with cardiac shadow and apex on the right side as shown in Figure 1. The ultrasonography of the abdomen revealed complete situs inversus totalis. There were inverted P waves on lead I and AVL of electrocardiograph with sinus rhythm. Echocardiography showed dextrocardia with normal atrioventricular concordance without any structural abnormality.

The patient improved significantly after treatment with injectable antibiotics and inhalational therapy. A high-resolution computerised tomography (HRCT) of thorax revealed bronchiectasis in lingua and situs inversus with bilateral maxillary sinusitis

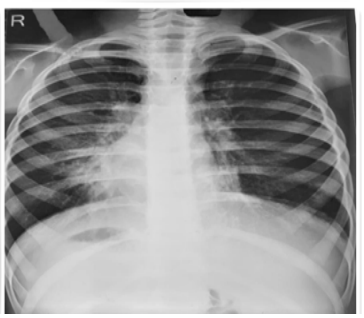

Figure 1. X-Ray suggestive of dextrocardia

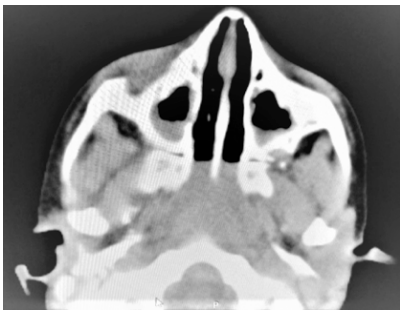

Figure 2. CT scan showing bilateral maxillary sinusitis

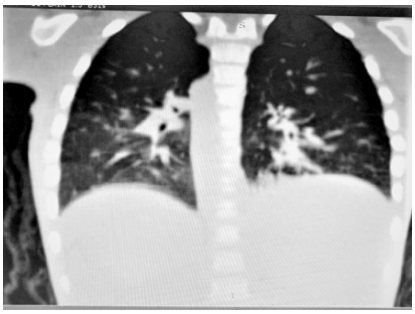

Figure 3. HRCT showing bronchiectasis with dextrocardia

as shown in Figures 2 and 3. High-speed video microscopy (HSVM test) was suggestive of primary ciliary dyskinesia. Hence, with these findings of situs inversus with bronchiectasis and sinusitis, the patient met the criteria for diagnosis of Kartagener's syndrome, a subgroup of primary ciliary dyskinesia. Genetic counselling of both parents was done and the risk of recurrence in future pregnancies was explained.

DISCUSSION

Primary ciliary dyskinesia (PCD) also known as immotile cilia syndrome, is a highly heterogeneous syndrome with a prevalence of one in 26,000 - 40,000 live births.[2] The two important variants of PCD are Kartagener's and Young's syndromes.[3] KS has a prevalence of one in 60,000 and is more common among people with consanguineous marriages.[4] It is inherited in an autosomal recessive pattern with incomplete penetrance.

The cilia are made up of microtubules which are composed of alpha and beta monomers of tubulin and an axonemal structure of inner and outer dynein arms, radial spokes and nexin links. Lack of one or both rows of these dynein arms along with spoke heads or central sheath are commonly seen in KS which are caused by the mutations in the genes encoding the axonemal structure and accessory components of cilia. The common gene mutations in KS are DNAI1 and DNAH5.[5] Due to this ultrastructural defect, the coordinated sliding and bending cannot occur, leading to impaired mucociliary clearance.[6]

Such patients frequently suffer from recurrent cough and cold since childhood leading to chronic sinusitis and recurrent lower respiratory tract infection which leads to bronchiectasis. The other complications associated with KS are otitis media, headache, and infertility in males due to immotile spermatozoa; while women have reduced fertility.[7]

The European Respiratory Society (ERS) Task Force recommends the use of following investigations for the diagnosis of Kartagener's Syndrome: nasal nitric oxide, high-speed video microscopy (HSVM) of ciliary beat frequency and pattern, transmission electron microscopy, genotyping and immunofluorescence staining of ciliary proteins.[8] The nasal nitric oxide and mucociliary clearance method generally requires confirmation with the test of ciliary function and ultrastructure.

HSVM and transmission electron microscopy are the basic methods to examine ciliary movement and ultrastructure. HSVM, having a sensitivity and specificity of 100 and 93 percent respectively, is performed by rapidly transferring the respiratory epithelial cells to isotonic saline solution and measuring the beat frequency to determine whether cilia have normal coordination, beat frequency, and beat pattern. The slowing of ciliary motion may suggest abnormal waveform on cooling the specimen.[9]

The transmission electron microscopy is performed when the diagnosis is uncertain after HSVM. With the increasing availability of external panel tests, the role of genetic testing for the diagnosis of primary ciliary dyskinesia is evolving. Antibiotics, chest physiotherapy and mucolytics are the standard treatment of patients with KS. A low dose prophylactic antibiotic for long term is recommended for patients with frequent exacerbations of bronchiectasis. Influenza and pneumococcal vaccines should be given routinely to such patients. A close clinical follow up is essential for these patients where spirometry is performed on each visit.[10] These patients generally live a normal life with a normal life span. However, repeated infections may influence the ability to work.

CONCLUSIONS

Patients with Kartagener's syndrome are often missed during evaluation of recurrent lower respiratory tract infections. Early diagnosis and appropriate management of complications can significantly improve the morbidity and mortality associated with this disease. Genetic counselling is also an important aspect that needs to be addressed once Kartagener's syndrome is diagnosed.

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