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A Clinician's Dilemma Could it be Kartagener's?

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Primary ciliary dyskinesia (PCD) is an autosomal recessive disease characterised by abnormal ciliary motion and impaired mucociliary clearance. Ultrastructural and functional defects of the cilia result in a lack of effective ciliary motility. This leads to recurrent or persistent respiratory infections, early-onset COPD, sinusitis, otitis media, and male infertility.

Approximately 50% of patients with PCD will have situs inversus resulting in Kartagener's Syndrome (KS). Siewert first described the combination of situs inversus, chronic sinusitis and bronchiectasis in 1904. Manes Kartagener described this clinical triad as a distinct congenital syndrome in 1933. It bears his name as he described this syndrome in detail.

Diagnosis is often difficult and may not be confirmed for several years after the onset of symptoms and even into adulthood. Diagnostic criteria vary in the US, Europe and Japan.

Pathophysiology

Ciliated epithelium covers most areas of the upper respiratory tract, including nasal mucosa, paranasal sinuses, middle ear, eustachian tube and pharynx. The lower respiratory tract contains ciliated epithelium from the trachea to the respiratory bronchioles. Each ciliated cell gives rise to approximately 200 cilia that vary in length from 5-6 micromm to 1-3micromm.

Etiology- Genetic- Autosomal recessive

Epidemiology

US- Frequency of Kartagener Syndrome is 1 case per 10- 20000 births. PCD is twice the number.

Clinical Presentation

Patients present with chronic upper and lower respiratory infections due to ineffective mucociliary mechanisms. At birth, 80% of newborn babies present with respiratory distress. There will be a history of chronic cough with unexplained respiratory distress in older children. The cough is wet and productive and due to improper drainage of the sinonasal system, this leads to congestion, rhinorrhea, and chronic middle ear effusions with otorrhoea. Some male patients in later life may present with sterility due to immobile spermatozoa. Situs inversus on imaging is specific to KS. Clinical triad of chronic sinusitis, bronchiectasis and situs inversus.

The majority of patients are seen by a physician more than 50 times before a diagnosis is made. Later in life, obstructive lung disease is another component of KS.

Diagnosis

Requires a combination of clinical features and supportive data. The only definitive diagnostic tool is Electron microscopy of a sample of respiratory cilia from a nasal scrape or brush biopsy.

Imaging

Sinus radiographs/ CT Scans- demonstrate mucosal thickening, opacified sinus cavities and hypoplastic frontal and/or sphenoid sinuses.

Chest X-ray- May reveal hyperinflation, atelectasis, bronchiectasis and situs inversus. Bronchiectasis

occurs in the lower lobes in patients of KS (Upper lobes in Cystic Fibrosis).

HRCT Chest is the most sensitive modality.

Medical management

Prevention of dwindling pulmonary function is the primary end goal of treatment.

Antibiotics- To treat upper and lower airway infections.

Children with PCD are good candidates for long-term low-dose preventive antibiotics.

(various options for dosing schedules- Thrice weekly Azithromycin).

Obstructive Lung Disease- Inhaled bronchodilators, mucolytics, pulmonary toilet, pulmonary physiotherapy- and exercise.

The most common infectious organisms affecting children are Haemophilus influenza and Staphylococcus aureus. All patients should have pneumococcal vaccine and yearly flu vaccine in addition to standard childhood immunization.

Also, advise to avoid smoking.

Future treatment in development

Idrevolide, an epithelial sodium channel blocker has been identified as a potential treatment for PCD. Genetic therapies are being studied. Gene editing is being explored.

Surgical Care

Tympanostomy tubes- to reduce hearing loss and recurrent infections.

Refractive sinus disease- sinus surgery endoscopic lobectomy in select cases.

Lung transplantation- no long-term studies.

Case Report

A 59-year-old lady was admitted to Bishop Walsh Memorial Hospital in April 2024 with complaints of productive cough, fever and breathing difficulty for the past 1 week and significant worsening over 1 day. She had been having a productive cough on and off for the past few months -with episodic exacerbations- for which she took local treatment with short-term relief.

The current episode started as a productive cough with yellowish sputum of moderate quantity, non-blood tinged, significant amount in the mornings. Over the past 24 hours, she had become breathless at rest. No orthopnea but worsening cough on lying down.

She has been a known case of Diabetes Mellitus for 10 years not on regular medications or follow-up. She is a known case of Obstructive Airway Disease on a Foracort inhaler.

She gave a history of Pulmonary Tuberculosis 20 years back and was treated fully. She also gives a history of Endoscopic sinus surgery 10 years back.

Obstetric History- Postmenopausal.

On Examination

Average built, Febrile, PR- 140bpm, BP- 120/60mm Hg, SpO2- 93% on Room Air, temperature- 104 F. No flaps

RS- Left-sided inframammary, axillary and infrascapular areas crepitations with scattered wheeze present.

CVS- Heart sounds over the right side of the chest. Normal

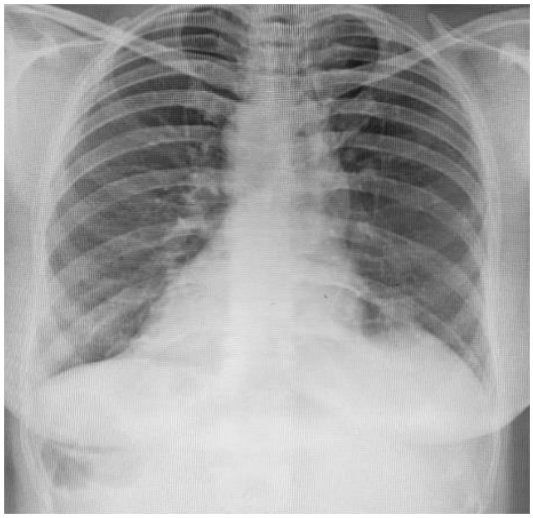
Other systemic examination NAD.

Investigations

CBC- Hb: 9 g%, WBC: 20,100/cu.mm, N80 L14 E5 M1, Platelets: 23.5 lakh, RBS- 341.6 mg/dl, Urea 42.7 mg/dl, S. Creatinine 0.7mg/dl, Urine routine- Alb- trace, Sugar 3+, Ketones+. PC- 6-8/HPF, EC- 2-4/HPF

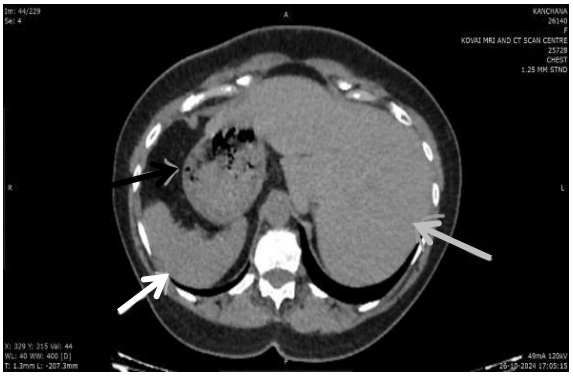
ECG: Features suggestive of dextrocardia.

Chest X-ray: Dextrocardia. Stomach bubble on the right side. Non-homogenous opacification in bilateral lower zones.



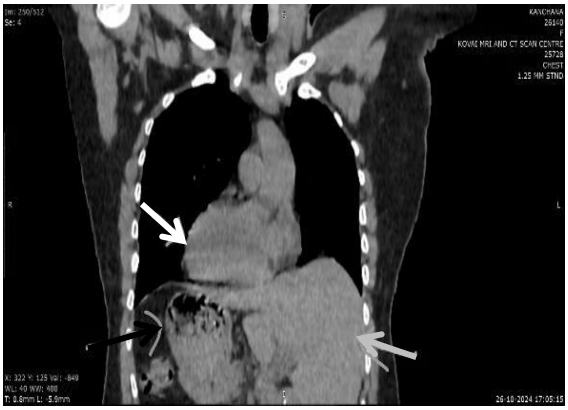
A probable diagnosis of Kartageners syndrome was kept in view of history, clinical examination and chest X-ray.

She was treated with I.V. and oral Antibiotics, Oral Hypoglycemic agents, nebulisations, antipyretics and vitamins. She progressively improved and needed an extended course of antibiotics- Follow-up chest X-ray- good clearing.

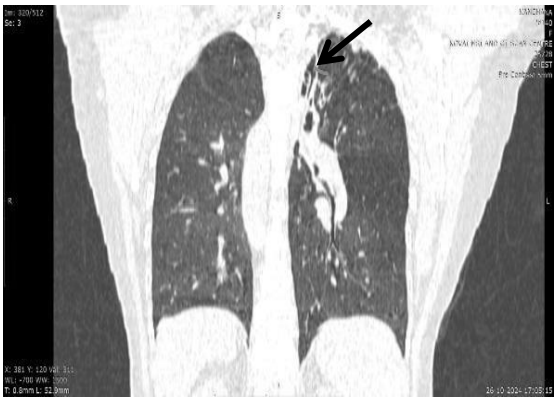


HRCT Chest 26/10/2024- 1. Situs inversus in chest and abdomen. 2. Marked volume loss with bronchiectasis in the upper lobe of the left lung. Minimal bronchiectasis in the superior segment of the lower lobe of the left lung. Fibrotic strands in the upper lobe, and lower lobe of left lung with adjacent tiny nodules. Emphysematous rest of left lung. Likely Old Tuberculosis sequelae. Kartageners syndrome is unlikely. 3. Faint nodules in the middle lobe of the left lung, anterior aspect of the lower lobe of the left lung- could be mild active nonspecific viral/ bacterial pneumonia.

The spleen (white arrow) and stomach (black arrow) are located on the right side of the abdomen. The liver (gray arrow) is located on the left side of the abdomen.



Dextrocardia (white arrow), Stomach (black arrow) on the right side. The liver (gray arrow) on the left side- Represents situs inversus.



Left Lung upper lobe bronchiectasis (black arrow)

The case presented in view of its presentation, findings of situs inversus, with past h/o recurrent lower respiratory tract infection, and history of sinus surgery- making us consider a possibility of Kartagener's syndrome. There were

no features of recurrent chronic sinusitis or otorrhoea.

HRCT features of bronchiectasis in left lung upper lobe, features of emphysematous changes- lower lobe likely old pulmonary tuberculosis sequelae. Kartagener's syndrome is seen with bronchiectic changes in bilateral lower lobes.

This case was not a case of Kartagener's syndrome- but is being presented for clinicians, to be aware of such an entity, as early diagnosis helps in preventing progressive pulmonary damage.

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