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CASE REPORT

Kartagener Syndrome with Pulmonary Tuberculosis in a Fertile Male: A Rare Co-existence

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Kartagener syndrome (KS), a subset of primary ciliary dyskinesia, is an autosomal recessive disorder with variable phenotypic expressions. Males with this syndrome are usually infertile. Its association with pulmonary tuberculosis (PTB) is exceedingly rare. We report this case in view of the simultaneous coexistence of KS with male fertility and PTB.

Key words: Kartagener syndrome, primary ciliary dyskinesia, fertile male, pulmonary tuberculosis

INTRODUCTION

Primary ciliary dyskinesia (PCD) is a rare genetic disorder involving number of human organs like upper and lower respiratory tract, spermatozoa in male and fallopian tube in females. Kartagener syndrome (KS), a subset of PCD, is characterized by the clinical triad of bronchiectasis, chronic sinusitis, and situs inversus.[1,2] Male patients with this syndrome are almost invariably infertile because of immotile spermatozoa. The immotility is due to a variety of ultrastructural defects in respiratory cilia and sperm tail.[3,4] Though, there is a high degree of concordance between abnormality of cilia and spermatozoa but the occasional discordance may occur due to variable phenotypic expressions. There have been few case reports of classic KS and abnormal ciliary ultrastructure, but normal spermatozoa.[3,5-7] Very few cases of concurrent KS and pulmonary tuberculosis (PTB) have been described in the English literature.[8,9] We report a case of KS with PTB in a fertile male.

CASE REPORT

A 42-year-old man presented with symptoms of chronic productive cough, gradually progressive dyspnea, left sided chest pain and low-grade fever for about 1 year. The sputum was mucoid but viscid, moderate in amount with aggravation in left lateral position. He had lost 7 kg weight since the onset of the illness. He had no history of night sweat, headache, hemoptysis or any ear, nose and throat symptoms. There was no history of contact with a person known to have tuberculosis. He was married and had four apparently healthy daughters. He was a farmer and life-time nonsmoker.

Physical examination showed a thin built man with no pallor, clubbing, cyanosis, pedal edema or peripheral lymphadenopathy. His vitals were as follows: Pulse rate = 100/min, respiratory rate = 30/min, blood pressure = 100/74 mmHg, SpO_2 95% in room air. He was dyspneic with use of accessory muscles. Bilateral maxillary sinuses were tender. On chest palpation apex, beat was felt on the right side. Chest percussion revealed liver dullness on the left side and tympanitic note on right subcostal area. Auscultation revealed bilateral diffuse coarse inspiratory crackles and wheezes. Pleural rub was audible on left infrascapular area suggesting pleurisy.

Initial hemogram showed the neutrophilic leukocytosis (white cell count 12700/cmm, 90% neutrophil). Blood metabolic panel was normal. Sputum for acid-fast bacilli (AFB) was negative. Chest radiograph showed dextrocardia and bilateral diffuse nodular fluffy opacities [Figure 1]. Paranasal sinuses X-ray showed haziness of both maxillary sinuses [Figure 2]. Electrocardiograph was consistent with true dextrocadia. Echocardiogram was essentially normal. Saccharine test was prolonged (55 min) (usually <30 min is normal) indicating impaired mucociliary clearance. His sperm count was normal with 70% motility. Sputum culture grew *Pseudomonas aeruginosa* sensitive to ciprofloxacin. High resolution computed tomography scan of the chest confirmed the bronchiectasis with situs inversus totalis [Figures 3 and 4]. He improved with antibiotic,

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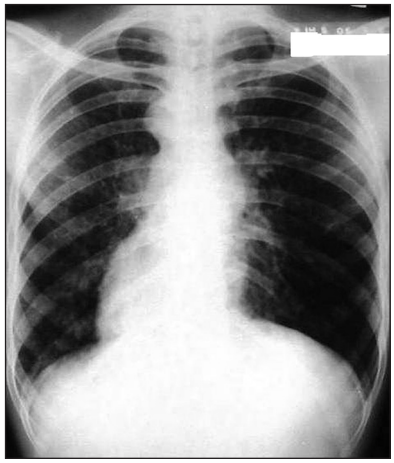

Figure 1. Chest X-ray showing dextrocardia and right paracardiac patchy opacities

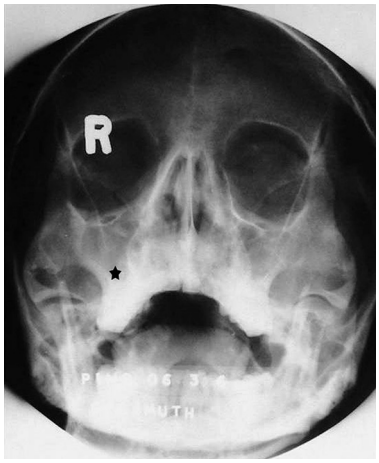

Figure 2. X-ray paranasal sinuses showing bilateral maxillary sinus haziness and hypoplastic frontal sinuses

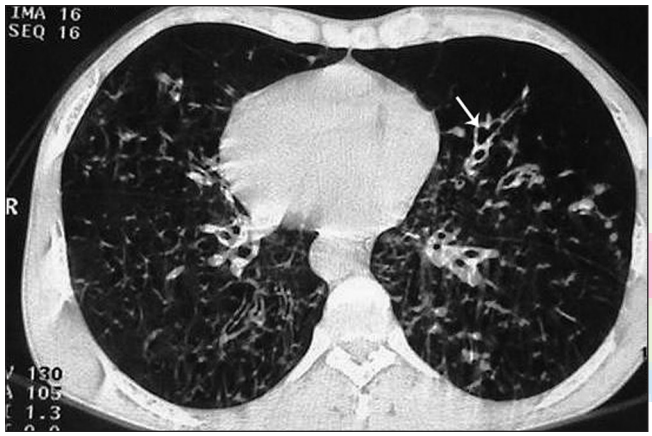

Figure 3. High resolution computed tomography chest showing bilateral early bronchiectasis in lower lobes, middle lobe and lingual with thickened bronchial wall (arrow)

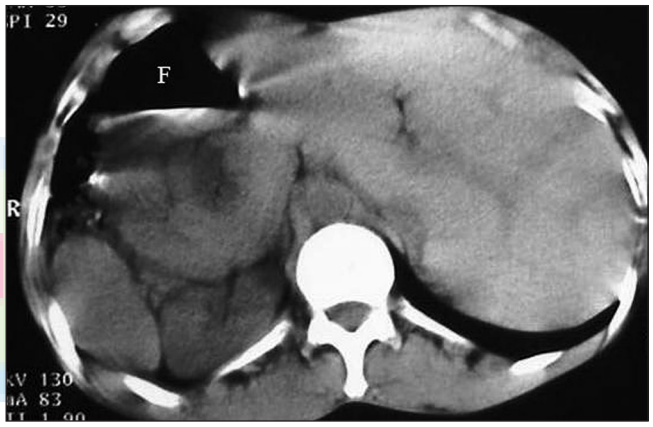

Figure 4. Computed tomography scan showing situs inversus (F denotes fundus)

bronchodilator and supportive care. Two weeks later in follow-up, spirometry showed severe obstruction with poor reversibility (postbronchodilator forced expiratory volume 1 s [FEV1] - 1.03 L [42%], forced vital capacity [FVC]-2.04 [70%], FEV1/FVC - 50 [63%)]). He was advised inhaled corticosteroid plus long acting beta-agonist. After 40 days of initial presentation he visited third time for increased cough and sputum. He was tachypneic, hemodynamically stable and had early digital clubbing. Repeat sputum examination for AFB was positive (2+) in all three samples. Sputum culture in Lowenstein–Jenson medium later confirmed the presence of *Mycobacterium tuberculosis*. Final diagnosis of KS with PTB was made based on the clinical triad of bronchiectasis, chronic sinusitis and situs inversus and sputum microbiology. He was advised antitubercular therapy under directly observed treatment short course and to get his daughters screened for similar disorder.

DISCUSSION

Primary ciliary dyskinesia is usually an autosomal recessive disorder with variable phenotypic expressions. The estimated prevalence of PCD is 1:15-30,000 live births and situs inversus occurs randomly in half the patients.[2] Siewert first described the combination of situs inversus, chronic sinusitis, and bronchiectasis in 1904. However, Manes Kartagener first recognized this clinical triad as a distinct congenital syndrome in 1933 and thereafter it bears his name.[10] Afzelius was first to recognize that the relationship of Kartagener triad with male infertility was due to immotility in both spermatozoa and respiratory cilia.[4] Pedersen and Mygind suggested that this immotility was caused by an abnormal structure of the axonema, consisting of the absence of dynein arms.[10] Most cases of PCD are due to a lack of outer dynein arms or a combined lack of both inner and outer dynein arms. Other ultrastructural defects those lead to ineffective ciliary motility

include isolated absence of inner dynein arms or radial spokes, transposition of microtubules to the center of axoneme, missing nexin links etc.,[2] The clinical diagnosis of PCD is established in:

a. Cases with complete KS,
b. Men without situs inversus, but recurrent sinobronchial infections since early childhood and with living, but immotile spermatozoa,
c. Women or children without situs inversus, but having typical clinical signs and having a sibling with KS, and
d. Individuals without situs inversus, but with typical clinical features and characteristic ultrastructural defects in cilia.[1] Our case satisfies these criteria except that he was fertile with normal sperm counts and motility.

Male infertility in KS is usual but not universal.[3,5-7,11,12] There are cases described with the ciliary abnormality but normal spermatozoa. Munro *et al*. reported in a series of 12 patients with PCD, six had dextrocardia with recurrent upper and lower respiratory tract infections, four of them had normal spermatozoa.[7] Escudier *et al*. described a 28-year-old man with KS and normal cilia and sperm tails, but unexplained infertility. A possible mechanism for this paradox could be a genetically mediated heterogeneity influencing the phenotypic presentations.[13] Even, the absence of dynein arm may not necessarily be associated with ciliary immotility, and the presence of ciliary immotility might have prognostic significance as these patients appear to have more active bronchiectasis.[14] Also, few cases of KS have been reported with ultrastructurally and functionally normal both respiratory cilia and spermatozoa infertile males.[11,12] Conraads *et al*. suggested that an abnormal, uncoordinated motility pattern of the ultrastructurally normal respiratory cilia results in improper mucociliary clearance but this coordination is not needed in swimming spermatozoa, which could explain the apparent paradox between bronchopulmonary symptoms and normal fertility,[12] which may be true in our case though ultrastructural study was not done due to lack of such facility. We assume our case to be fertile as he had normal sperm counts and motility and had fathered four children.

The association of KS and PTB is rarely described. Kartagener in 1933 observed few tubercles in the lungs of his fourth case of this syndrome during the postmortem study.[8] Afzelius in their original series of 14 patients with immotile cilia syndrome had three patients treated for previous tuberculosis.[1] To the best of our knowledge, K C Mathur first reported a case of KS with sputum positive PTB from India. The brother of that patient also had PTB with situs inversus.[8] Earlier reported cases show association of PTB with situs inversus[15] and KS with aspergilloma.[9] Chronic bacterial colonization and recurrent pulmonary infections especially with *P. aeruginosa* are frequently seen in adult patients with bronchiectasis. Similarly, infections with *M. tuberculosis* and nontuberculous mycobacteria are common in bronchiectasis. Therefore, patients with KS may be predisposed to develop PTB due to associated bronchiectasis.[2] We feel, the initial smear negativity in our patient could be due to dilution of sputum by secondary bacterial infection or the initial bacillary concentration was below the detectable limit for smear microscopy. This reemphasizes the need for repeat sputum examination in the diagnosis of PTB.

CONCLUSION

Infertility in men with KS is not a universal phenomenon. PTB with secondary bacterial infection can be the presenting manifestation in them rendering initial sputum smear examination negative. Repeat sputum examination following control of secondary infection may be rewarding in diagnosis of PTB in such patients.

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