An Extremely Rare Presentation Of Central Arterial Stiffness With Kartagener Syndrome In A Young Female: An Unseen Comorbidity

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Abstract: Primary Ciliary Dyskinesia (PCD) is an autosomal recessive hereditary disorder having wide range of genetical and phenotypical expression. The triad of situs inversus, chronic sinusitis and bronchiectasis is known as Kartagener syndrome (KS). We report the case of 22 year old unmarried female presented with the typical triad diagnosed as Kartagener syndrome with positive saccharine test associated with extremely rare presentation of moderate to high central arterial stiffness, recognised as previously unreported fatal co morbidity in a young age. Treatment of bronchiectasis, sinusitis as well as hypo- Vitaminosis D has been commenced with promising response in follow up. [Rana R Natl J Integr Res Med, 2019; 10(6):72-74]

Key Words: Bronchiectasis, central artery stiffness, Kartagener's syndrome, sinusitis, situs inversus.

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Introduction: Primary Ciliary Dyskinesia (PCD) is an autosomal recessive hereditary disorder having varied form of genetical and phenotypical expression. The disorder varies from patient to patient in the severity and incidence even it may vary among siblings. Congenital defects in the ciliary motility leading to impaired mucociliary clearance are the main cause of the occurrence of the disease. The prevalence of PCD is about 1 in 16,000, though the prevalence may be higher as number of cases went undiagnosed due to gap in knowledge. Almost 50% of the patients with PCD have situs inversus[1].

The triad of situs inversus, sinusitis and bronchiectasis is known as Kartagener syndrome (KS)[2]. Few recent studies have found that patients with chronic respiratory disorders have increased risk of arterial stiffness[3] and also cardiac risk are higher in patients with bronchiectasis[4]. However, its association in patients with Kartagener syndrome not reported hitherto.

Case Report: A 22-year-old unmarried non smoker female presented to the Respiratory Medicine department of BPS GMC Khanpur Sonepat, Haryana, India in the year 2019 with the complaints of abdominal pain, diarrhea with the history of recurrent episodes of shortness of breath, productive cough since childhood. She also had frequent episodes of cold, rhinorrhea, nasal blockade, facial pain and frontal headache since childhood. There was no family history of asthma or atopy. On general physical examination, the vitals were within normal limits, grade 1 clubbing was present and apex beat was palpable in 5th intercostal space on the right side of the chest. On auscultation, diffuse ronchi were present all over the chest and basal crepitation was heard over the left hemithorax. Cardiac sounds were more audible over the right hemithorax. The upper border of liver dullness was in left 6th intercostal space and tympanic note of fundal gas was in right 7th intercostal space. Electrocardiogram showed evidence of dextrocardia. Skiagram of chest in PA view revealed dextrocardia [Figure 1]. Skiagram of paranasal sinuses revealed mucosal thickening of maxillary sinuses [Figure 2].

Figure1: Skiagram Of Chest (PA View) Showing Cardiac Apex And Aortic Arch On The Right Side.

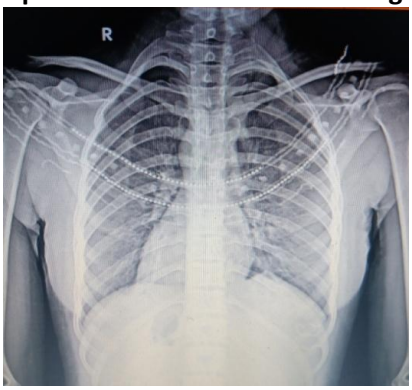
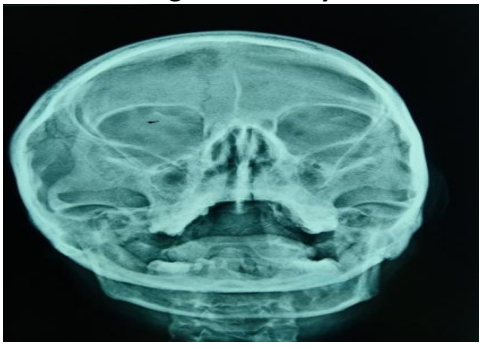


Figure 2: Skiagrm Of Paranasal Sinuses Showing Mucosal Thickening In Maxillary Sinuses.



Post bronchodilator FEV_1 and FVC was 1.23 (51.46% predicted) and 1.58 litres (57.66%

predicted) respectively with FEV_1/ FVC of 77.88. Contrast-enhanced computed tomography (CECT) of Thorax revealed left middle lobe bronchiectasis with dextrocardia and right sided aortic arch [Figure 3]. CECT abdomen revealed transposition of abdominal viscera [Figure 4].

Figure3a and 3b: Contrast-Enhanced Computed Tomography Of Thorax (CECT) Showing Left Middle Lobe Bronchiectasis And Right Sided Aortic Arch.

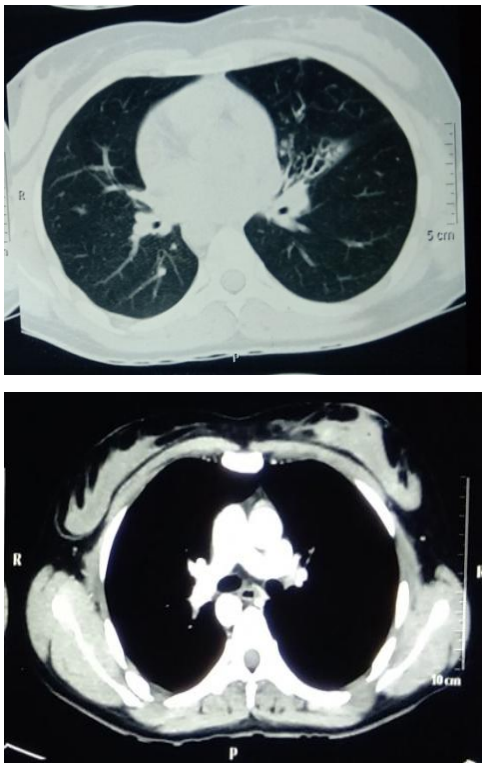
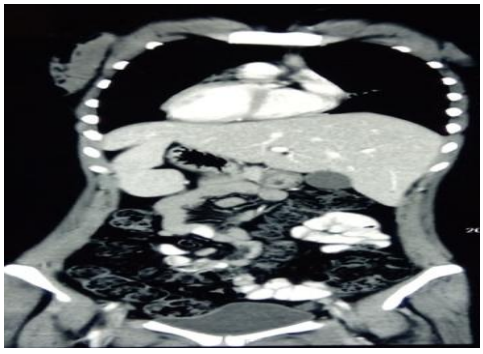


Figure 4: CECT abdomen showing transposition of abdominal viscera. Bronchoscopic evaluation shows transposition of airways with right main bronchus dividing only into right upper and right lower lobe segmental bronchi while left main bronchus divided into left upper lobe bronchus and bronchus intermedius which further divided into left middle lobe and left lower lobe segmental bronchi.



To confirm the diagnosis of ciliary dyskinesia, Saccharine test was done. A single saccharine pellet was dropped below the right inferior turbinate. Patient was asked to indicate the taste of sweetness in her throat as soon as she perceives it. Our patient reported the sweetness after 52 minutes which is significantly high of normal range (20-30 minutes). Vitamin D_3 level was found to be 21.80 nmol/l though bone mineral density shows normal T score. (T score = -0.5).

Brachio ankle and carotid femoral pulse wave velocity (consider as surrogate indices for cardiovascular diseases), was measured using a volume plethysmographic apparatus (Periscope (Recorders & Medicare System Pvt Ltd, Chandigarh). Transit time of the pulse wave between two pulse points was measured for the estimation of Brachio-ankle (ba) and carotid femoral pulse wave velocity (cfPWV)[5].

Moderate central arterial stiffness (observed value- 1453.3, normal value- < 1058.16) was observed in baPVW as well as borderline high aortic stiffness (observed value- 827.1, normal value- < 706.92) in cfPWV was found, suggestive of cardiovascular risk in young age, though her lipid profile, fasting blood sugar and HbA_1c was within normal limits.

Discussion: The syndrome of situs inversus, sinusitis and bronchiectasis was first described by Siwert in the year 1904 which was later described in detail by Kartagener. However the association between Kartagener syndrome and male infertility was studied by Afzelius when he observed defect in dynein arms of the sperm and cilia of four individuals, three of them was having Kartagener syndrome and fourth one was the brother of the one of the Kartagener patient.[6]

DNAI1 and DNAH5 genes mutation associated with changes in ultrastructure may lead to ciliary motility dysfunction causing infertility due to sperm dysmotility. According to the literature, anomaly in the ciliary motility during embryogenesis may lead to either transpositions of thoracic and abdominal organs (situs inversus totalis) or dextrocardia only (situs solitus). In addition to this, ciliary motility dysfunction during embryogenesis leads to frequent respiratory tract infection (upper as well as lower) due to defect in respiratory tract host defences.The diagnostic criteria for the diagnosis of Kartagener syndrome includes the history of frequent respiratory tract infection (upper as well as lower) since early

childhood and one or more of following trait-impaired or absent tracheobronchial clearance, situs inversus or situs solitus in a subject with immotile or alive spermatozoa, attributed to ultrastructural ciliary defect on electron microscope. These patients may also have increased saccharine clearance time, low exhaled nasal nitric oxide level (approximately 10% of normal) [7].

Fertitility in the female patients with Kartagener syndrome varies from normal to ectopic pregnancies or infertility, due to dysfunctional ciliary motility in the ovarian ducts.[8] It is also believed that these patients have somewhat higher incidence of ectopic pregnancy due to abnormal ciliary function in the fallopian tubes compared with the normal population.[9]

Although, the micronutrients and vitamins have an essential impact against respiratory infections, there is insufficient evidence endorsing their role in PCD-associated airway infections. However, few recent researchers revealed that patients with stable PCD have significantly lower level of vitamin D which is true in the present case also.[10] According to eminent research baPVW as well as cfPVW consider as significant non invasive parameter to predict cardiovascular risk.[5] Which is significantly high in present case though pathological changes in cardiovascular system have no evident explanation, however it is proposed that systemic inflammation due to chronic inflammation of airway as well as sinus, initiate remodelling process in extracellular matrix of vessels with the deposition of elastin and collagen fibres, leading to increased arterial stiffness[3].

Although the evidence for the association of low-grade systemic inflammation with incidence of cardiovascular disease in Kartagener syndrome in authentic literature is missing. Hence, further research is essential to link it with Kartagener syndrome so that early diagnosis could be established to reduce the possibility of fatal co morbidity.

Conclusion: Central arterial stiffness is a rare co morbidity reported with Kartagener syndrome which have fatal consequences if undiagnosed in young age due to lack of knowledge , hence it is essential to rule out possible pathological cardiovascular changes in patients with Kartagener syndrome irrespective of their age.

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