

Kartagener Syndrome in a Nigerian African - a case report and literature review.Chuhwak EK *FWACP*

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ABSTRACT:**Background:**

Kartagener syndrome is a type of primary ciliary dyskinesia. It is a rare autosomal recessive disorder with an estimated incidence of about 1 in 32,000 live births. In Nigeria, because of lack of availability of facilities for investigations in order to make a diagnosis, it has hardly been reported.

Aim and objectives:

This report is intended to remind clinicians of the condition of Kartagener syndrome as the patients might be missed in the presentation as our patient's diagnosis was missed and he was diagnosed to have tuberculosis.

Case summary:

This case is that of a 43-year-old male Nigerian African, who has had an on and off productive cough, since he was 33 years of age. Eight months prior to presentation, the cough worsened and was associated with haemolysis that was followed by swelling of the feet. This swelling of the feet started two months before presentation. He had subfertility. He was found to have partial situs inversus viscerum (dextrocardia which is the hallmark of the diagnosis of Kartagener syndrome). He had lung collapse in the right lower zone, also supporting the diagnosis of Kartagener syndrome. This patient had cor pulmonale from repeated chest infection and died after 30 days of admission.

Key words: Kartagener syndrome, partial situs inversus, dextrocardia, cor pulmonale, sub fertility.

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INTRODUCTION.

Kartagener syndrome is also known by several synonyms including the following:

- a) Immotile cilia syndrome - This is rarely applicable now as it has been found that the cilia may not be completely immotile, but may have disordered motility.
- b) Primary ciliary dyskinesia - Kartagener type

- c) Siewert (Zivet) syndrome
- d) Chronic sinobronchial disease and dextrocardia - dextrocardia, bronchiectasis and sinusitis.

Kartagener syndrome was first Siewert,^{2,3} a Ukrainian physician in 1904 to be a combination of situs inversus, chronic sinusitis and bronchiectasis. However, Manes Kartagener, a German paediatrician first recognised this clinical triad and described it in detail as a distinct congenital syndrome in 1933, and it now bears his name. In 1975, Camner⁴ and co-workers first suggested ciliary dyskinesia as the cause of Kartagener syndrome as they observed two patients with the condition who had immotile cilia and immotile spermatozoa, and also had poor mucociliary clearance. Afzelius⁵, in 1976, demonstrated that patients with Kartagener syndrome had a motility defect in the cilia of the respiratory mucosa, in the lungs and sinuses, and that male patients may have a defect in sperm motility resulting in decreased fertility. At times, the syndrome is referred to as Siewert - Kartagener - Afzelius syndrome².

Kartagener syndrome is said to be rare and in the United States, its incidence is estimated to be about 1 in 32,000 live births, while the incidence of primary ciliary dyskinesia (PCD), in which Kartagener is a subtype, is estimated to be 1 in 16,000 live births. Both sexes are affected equally but rarely diagnosed in females because it does not affect fertility much as it does in the males. It affects all races and regions of the world^{6,7}.

Kartagener syndrome is an autosomal recessive disorder with incomplete penetrance, characterised by total or partial dysfunction of the ciliary or flagellated cells. These cells are found in the airways, the paranasal sinuses, the Eustachian tubes, the ventricles of the brain, the oviducts and the vasa deferentia of the testes. Kartagener syndrome consists of a clinical triad of bronchiectasis, sinusitis and situs inversus viscerum. The symptoms of Kartagener syndrome are caused by an ultrastructural defect in the cilia those results in impaired mucociliary clearance. The normal microtubular ultrastructural architecture of mucosal cilia

and sperm tails is disrupted due to the absence of dynein arms resulting in impaired motility of cilia and sperm^{9,10,11}.

Symptoms of Kartagener syndrome start early in childhood, although some may be diagnosed later in life⁷. The symptoms are those of chronic upper and lower respiratory tract diseases from ineffective mucociliary clearance. There may be difficulty in breathing, particularly in the newborn, chronic thick mucoid rhinorrhoea. Nasal polyposis occurs in about 30% of cases. There may be recurrent sinusitis, recurrent otitis media that may lead to hearing impairment and hydrocephalus. In the lower respiratory tract, there may be features of chronic bronchitis, recurrent pneumonia or bronchiectasis which usually occurs in the lower lobes. Bronchial wall thickening is the earliest manifestation of Kartagener syndrome. There may be features of obstructive lung disease. Hyperinflation, telecasts or bronchiectasis is said to be present in about 30% of patients with Kartagener syndrome. PCD is to be distinguished from Kartagener syndrome, although both have similar symptoms. Kartagener syndrome has situs inversus viscerum while in PCD, there may be situs solitus (no situs inversus viscerum) in 50% of cases. In Kartagener syndrome, situs inversus viscerum is the distinguishing feature and may be complete (situs inversus totalis) i.e., occurring in the thorax and abdomen, or partial situs, i.e., occurring only in the thorax. Partial situs inversus viscerum has a higher association with other abnormalities like polysplenia or asplenia³. The cilia could be overly long, overly short, absent or randomly oriented. Males may have secondary infertility from immotile spermatozoa. Females may have decreased fertility. Other features include pyloric stenosis, digital clubbing, oesophageal problems, congenital cardiac abnormalities and olfactory impairment^{2,3,8}.

The clinical criteria for the diagnosis of Kartagener syndrome include situs inversus viscerum particularly dextrocardia, and, bronchiectasis in lower zones, chronic sinusitis, ciliary beat frequency of less than 10Hz/second and a mean cross - section dynein arm of less than 2.^{11,12}

Investigations to be carried out on patients with Kartagener syndrome include sinus radiograph which may show mucosal thickening, opacified sinus capacity, or hypo plastic frontal sinus. Chest X -ray will confirm dextrocardia, and may reveal bronchial wall thickening, hyperinflation, atelectasis or bronchiectasis. Saccharine test, audiologic testing and pulmonary function studies may be done. Pulmonary function studies may show obstructive pattern. Mucosal biopsy will reveal reduced

ciliary beat frequency, co - ordination and amplitude. Nasal endoscopy is done for nasal polyposis in chronic rhinorrhoea¹.

Treatment is directed at alleviating symptoms and preventing bronchiectasis, lung damage and complications. Patients are treated with antibiotics when there is an infection. When pulmonary function studies reveal an obstructive pattern, inhaled bronchodilators are to be given. Mucolytics are used for pulmonary toilet. When all fail, tympanostomy should be done to reduce hearing loss. Sinus surgery may be done but, usually, there is transient improvement after it. There could be lung transplantation in severely damaged lungs^{1,6}.

Problems that arise should be treated promptly. Fertility problems should be discussed with the Obstetrician and Gynaecologist. Patients should be advised to consult an otolaryngologist or geneticist regularly. Recurrent infections to be prevented by vaccinations, particularly childhood infections. Vaccinations should be given against flu and streptococcal pneumonia, more so in asplenic patients.

For the prognosis, it has been observed that Kartagener syndrome becomes less problematic near the end of the patients' second decade of life and many patients have near normal adult lives.

CASE REPORT:

J.A. was a 43 - year - old long distance driver who had had on and off cough that became severe when he was 33 years old. At that time, he used to smoke and he attributed this to the cigarettes he smoked, but the cough did not stop after he stopped smoking, but rather got worse. There was no weight loss. He went to a peripheral hospital where he was given treatment for pulmonary tuberculosis for 24 months. There was some reduction in the cough, but it did not completely subside. He had gone to various places for treatment, both orthodox and unorthodox, but never had complete resolution of the cough.

The episode that brought him to our hospital became worse about eight months prior to presentation. It was associated with swelling of the lower limbs, severe difficulty in breathing with orthopnoea. The cough was productive of mucoid sputum at times haemoptysis. The volume of sputum was not copious and it was not foul - smelling either.

Patient had been married for 26 years. He had his first and only child in the third year of marriage to his wife. The couple did not participate in contraception, but had not had another pregnancy or child again. The child is 23 years old. Patient drank alcohol for several years but no history of other sexual partners and no history of out of wedlock offspring.

Examination revealed a middle aged man, that was in respiratory distress - dyspnoeic and orthopnoeic. He was afebrile, not pale, not cyanosed, but had grade 2 finger clubbing, with marked oedema of both lower limbs up to the lower abdomen and sacral area. There was marked penile and scrotal oedema. Chest examination revealed a respiratory rate of 32 cycles per minute, trachea was deviated to the right side. Chest expansion was reduced on right middle and lower zones. Percussion note was dull on the right middle and zones with hyper - resonance on the left hemi thorax (loss of cardiac dullness). There were widespread crepitations and rhonchi on the left hemi thorax and right upper and middle zones.

On cardiovascular system examination, the pulse was 110/min, regular with full volume, blood pressure was 124/90mmHg supine, jugular venous pressure was not elevated. Apex was not located on left but was felt diffusely on the right close to right sternal edge. Heart sounds heard were first, second and third with a soft pansystolic murmur heard best in the fourth right intercostal space close to right sternal border. Abdominal examination revealed a tender, smooth hepatomegaly of about 8cm below the right costal margin.

A tentative diagnosis of cor pulmonale as a result of repeated chest infections in a case of Kartagener syndrome was made to keep in view pulmonary tuberculosis with background Human Immunodeficiency Virus infection although no evidence was found. The investigations outlined included the following:

- a) Chest X - ray (PA view): This showed tracheal deviation to the right with lung collapse in middle and lower zones. There was hyperinflation on the left hemithorax, and there was dextrocardia. This is shown in Fig. 1.
- b) ECG - showed a tachycardia with sinus rhythm but uniformly small voltages in all the leads.
- c) Echocardiogram showed dilated chambers with dextrocardia. The right ventricular wall was thickened and there was severe tricuspid regurgitation with marked pulmonary systolic dysfunction.
- d) Full blood count done showed a packed cell volume of 50%, which was secondary to the damaged lungs, and no attempt was made at reducing the packed cell volume. The total white cell count was 2,900/mm³ with differential count within the African normal limits, except for leucopenia, otherwise, other parameters were within reference limit.
- e) Other investigations done were: Electrolytes and urea which were within the reference range, serum total protein was also normal but serum albumin was low normal. Sputum culture and sensitivity yielding no growth on culture. Mantoux test was 0mm.
- f) Acid/alcohol fast bacilli were negative in 3 consecutive samples of sputum.
- g) HIV screening was negatively by double ELISA (Enzyme - linked immunosorbent Assay) technique.
- h) An abdominal ultrasound scan revealed a normal placement of intra - abdominal organs. Patient was placed on antibiotics and antiheart failure drugs consisting of diuretic (frusemide), captopril, spironolactone and small doses of digoxin. The oedema did not resolve nor did the breathlessness, but the rhonchi subsided with the administration of a bronchodilator. The condition progressed to death within 30 days of admission.

DISCUSSION:

A report of a case of Kartagener syndrome in a 43 - year - old long distance driver who has had on-and-off ill - health since he was 33 years old is being presented. The diagnosis was not made early enough as the patient had been attending primary health clinics or peripheral hospitals where there are no specialists to make the diagnosis on time. Moreover, it is a rare disorder¹ and clinicians in the peripheral hospital might not readily remember it. Hence, he had cor pulmonale as complication of the original disease - Kartagener syndrome due to failure of recognition.

The diagnosis of Kartagener syndrome was made in this patient based on the symptom of chronic on and off cough. The cough had been treated with various antibiotics including antituberculous therapy, but probably had not been well treated as the patient had some respiratory complications at presentation. Antituberculous drugs are antibiotics but not the right choice. This was a case of misdiagnosis as the patient was placed on antituberculous chemotherapy. He had

cor pulmonale with congestive heart failure that was supported by clinical features of biventricular failure and the echocardiological findings of thickened right ventricular wall. The lower zone of right lung that collapsed in this patient also supports the diagnosis of Kartagener syndrome as lung collapse may be seen. However, no organisms were found on sputum culture, which may be due to possible antibiotic use before presentation in our hospital. The rhonchi he had suggest obstruction to respiratory function and this is known to be associated with Kartagener syndrome.

This patient also had other clinical features suggestive of longstanding pulmonary damage. These features include finger clubbing and hyperinflation of the left lung which suggests compensatory emphysema. These features also support the diagnosis of primary ciliary dyskinesia, but Kartagener type because of the dextrocardia (situs inversus viscerum). The situs inversus viscerum (dextrocardia) was partial situs inversus as only the intrathoracic organs (the heart and great vessels) were involved. The intra - abdominal organs did not change position as the chest x - ray showed the gastric fundus on the left side under the diaphragm. Abdominal ultrasound scan also showed one spleen on the left side of the abdomen, i.e., the spleen was in its right position (situs solitus) The lobes of the liver were also seen to be in normal position by abdominal ultrasonography. All these support our diagnosis of partial situs inversus. Mucosal biopsy to determine ciliary beat frequency was not done as patient was very ill to be moved. Mean cross - sectional

dynein arm count was not determined because we do not have the facilities of electron microscope to do that. These determinations really are to help differentiate other cases of primary ciliary dyskinesia other than Kartagener syndrome as it is the presence of dextrocardia that makes Kartagener syndrome different from others.^{6,8,10}

Partial situs inversus viscerum is associated with other congenital malformations like polysplenia, asplenia and congenital heart disease together with malfunctioning of other organs like those of the heart and spleen.³ He did not have hearing impairment and never had otitis media as these are some of the other areas that could be affected in Kartagener syndrome because of the presence of ciliated epithelium. He had been married for 26 years and had only one pregnancy, with no use of contraceptives, so he suffered from infertility (subfertility) but was consoled because of the one son that he had in the third year of marriage. The patient died before he could become well to complete his investigation of semen analysis even though the conclusion from the above discussion is that he has subfertility.

In conclusion, therefore, this partial situs inversus was not associated with any organ malfunction in this patient, as the cor pulmonale that brought him to hospital was as a result of the complication of repeated chest infection. This case highlights formulation of diagnosis, as this patient was wrongly treated for tuberculosis which never got cured, since the cough kept on recurring.

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