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Difficulties in Placement of DLT in Kartageners Syndrome- Causes and solutions

KEYWORDS: Kartageners Syndrome(KGS), Double Lumen Tubes (DLT), thoracotomy

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ABSTRACT *Kartageners syndrome (KGS) is a subgroup of immotile cilia syndrome, found in 1:50000 births. Cardinal features of this syndrome are bronchiectasis, situs inversus totalis and sinusitis.[1] We report a case with bronchiectatic changes in a 18 year old girl operated for Rt. lower lobectomy under general anesthesia. Even though anatomy is reversed, just selecting right sided Double Lumen Tube (DLT), does not nessesorily solve the problem of lung isolation. We here discuss the anaesthetic management and possible causes of difficulties faced in isolation of lung with the Double Lumen Tubes (DLT), along with solutions.*

Key Messages:
Kartageners syndrome has a reversed anatomy. In this situation, Right Sided DLT is an appropriate choice. Even then the three dimensional structure of the tracheo-bronchial image from spiral CT scan is variable in choosing the appropriate size of DLT. So correct placement of DLT in reversed anatomy has higher chances of failure and remains as a challenge to anesthesiologists.

Introduction:
Kartageners syndrome is a autosomal recessive disorder characterized by abnormal ciliary motility, dextrocardia, bronchiectasis .[1] This syndrome amounts to one tenth cases of bronchiectasis, and about one sixth cases of situs inversus. These patients have variable age of onset and severity of chronic respiratory tract infections.[2]

Case History:
Eighteen year old girl presented with chronic repeated chest infections with productive cough since childhood and was treated by a local doctor. Since last 2 years frequency and severity of symptoms was increased. Six months back Chest radiograph was done which showed Dextrocardia with right middle and lower lobe consolidation. Air bubble of stomach was seen on right side. Anatomical right lung in the left hemithorax; as evidenced by the large size of the lung on left side and nearly straight line between the trachea and right sided main bronchus versus acute angle on the left side. **(Figure1 here)** She was then referred to our institute for further management.

On examination, she was small built with height 148cm, and weight 40kgs. General physical examination and airway assessment revealed no abnormality. Her RR was 22/min. and SPO2 99% on room air; with no clubbing. Apex beat was on the right side. On auscultation, heart sounds were normal with basal crepitations on the right lung field. Her blood investigations were within normal limits except raised total leucocyte count of 15800cm3. ECG showed sinus rhythm with non significant T wave inversion in lead II. Computed Tomography (CT) scan showed situs inversus totalis picture with stomach on the right side and liver on left side. CT scan of chest revealed presence of anatomical right lung in the left hemithorax with significant bronchiectasis on right lower lobe and linguala, with moderate bronchiectasis in left middle lobe. Air and fluid bronchogram seen in the collapsed right lower lobe suggested stagnation of the mucus. There was mild atelectasis seen in the right middle lobe. Also, there was associated bronchial wall thickening suggestive of chronic bronchial inflammation. Pulmonary Function Test (PFT) was showing mild obstructive with restrictive disease. Sputum culture and sensitivity was done and appropriate antibiotics started. The patient was scheduled to undergo thoracotomy with right lower lobectomy under general anesthesia.

Preoperative preparation included antibiotics, incentive spirometry and postural drainage along with steam and asthaline nebulization. Premedication was achieved with oral lorazepam two hours preoperatively. Asthline- saline nebulization was given just before shifting to OR. In the operation theatre, 18 G intravenous canulla threaded in forearm. Pre induction monitors like pulse oximeter, ECG and non-invasive blood pressure were attached. Inj. Midazolam1mg, Inj. Glycopyrrolate 0.2mg, Inj. Ondencetron 8 mg and Inj. Fentanyl 100µ administered intravenously. Thoracic epidural was placed in T 7-8space. Right Internal Jugular Vein was accessed and right Radial artery catheterized. Induction of anesthesia was achieved with Inj. Propofol 3mg/kg endotracheal intubation was facilitated by Inj. Vecuronium 1.2mg/kg intravenously. Inj. Midazolam1mg, Inj. Glycopyrrolate 0.2mg, Inj. Ondencetron 8 mg and Inj. Fentanyl 100µ administered intravenously. Thoracic epidural was placed in T 7-8space. Right Internal Jugular Vein was accessed and right Radial artery catheterized. Induction of anesthesia was achieved with Inj. Propofol 3mg/kg endotracheal intubation was facilitated by Inj. Vecuronium 1.2mg/kg intravenously.

For isolation of lungs we chose 35 F Mallinckrodt right sided DLT (Bronchocath), via direct laryngoscopy. On auscultation DLT failed to isolate the lungs. Withdrawal and further advancement of tube also failed to collapse the lung. Different volumes of bronchial cuff inflation (from 0-3 ml) and head rotation maneuver also tried. Fibreoptic Bronchoscopy did not reveal any obvious endo-bronchial abnormality; still isolation of lungs was not possible. Later Left Sided 35F DLT was also tried which also failed to isolate the lung. To avoid airway trauma, DLT was replaced by 7.0 size cuffed ETT, and ETCO2 attached. Patient was placed in Lt.lateral position. ETT was then advanced to Right side during surgery. Anaesthesia was maintained with O2: N2O and Sevoflurane mixture. For isolation of lungs we chose 35 F Mallinckrodt right sided DLT (Bronchocath), and was placed via direct laryngoscopy. On auscultation DLT failed to isolate the lungs. Withdrawal and further advancement of tube also failed to collapse the lung. Different volumes of bronchial cuff inflation (from 0-3 ml) and head rotation maneuver also tried. Fibreoptic Bronchoscopy did not reveal any obvious endo-bronchial abnormality; still isolation of lungs was not possible. Later Left Sided 35F DLT was also tried which also failed to isolate the lung. To avoid airway trauma, DLT was replaced by 7.0 size cuffed ETT, and ETCO2 attached. Patient was placed in Left lateral position. ETT was then advanced to Right side during surgery. Anaes-

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Intra operative analgesia was provided with Inj. Bupivacaine 0.25% through epidural catheter. Intraoperatively Urine output and ABG were measured. Intermittent ETT suctioning was done. The surgeon confirmed the anatomical left lung in the right hemithorax and found adhesions between Rt. Lower lobe and diaphragm and also between chest wall and lingualla. At the end of surgery, neuromuscular blockade was antagonized and trachea extubated. Patient was shifted to high dependency unit with O2 mask and monitored. Post operative period was uneventful.

Discussion:

Kartageners Syndrome is an autosomal recessive disorder of microtubules of ciliated cells. This is also called as Primary Cilliary Dyskinesia (PCD).KGS was first described in 1933, characterized by sinusitis, bronchiectasis and situs inversus. [1] Clinical manifestations of chronic sinusitis, bronchitis, and bronchiectasis are more severe during the first decade of life but remit somewhat by the end of adolescence. [2] Proper lung isolation is important in KGS patient undergoing lobectomy surgery because it protects the other lung from being spoiled by the suppurative secretions of the diseased lung. [2]

Anaesthetic considerations are 1) Isolation of lungs, 2) Choice of DLT.

In our patient reversed anatomy made us choose Right sided DLT [3] of size 35F keeping in mind the height and size of the patient. [4]

Probable reasons for failure of proper placement of DLT in our case are:

1) Due to reversed anatomy of the trachea bronchial tree and high take off of the left upper lung lobe in KGS, proper placement of DLT presents real difficulty.
2) Since our patient was smaller size, it is likely that even before inflating the cuff the bronchial segment of 35F DLT might stretch the bronchus**.** In such cases if we inflate the cuff, it may cause deviation of cuff, even in correctly placed tube leading to difficulty in isolation. This emphasizes the importance of auscultation for bronchial seal before and during inflation of bronchial cuff. [4]
3) Even adhesions of lung parenchyma with diaphragm and chest wall would have altered the tracheo- bronchial angle significantly leading to inability to isolate the lungs.
4) Again there is an increased risk for DLT related complications even in normal women because of their smaller size and unique bronchial anatomical differences. [4]
5) Also trans bronchial angle of DLT of different manufacturers are varied. [5]
6) Even the bronchial segment diameter and size of bronchial cuff segment of DLT of same manufacturers of same bronchial size are different. [5]
7) Even though the trachea and main bronchus are so closely related in terms of their cross sectional areas, no preoperative variable like gender, height and size of Left main stem bronchus by CXR or CT scan have proven to be reliable guide to proper DLT size solution. [6-7]

Solutons :

1) P. slinger has mentioned that CT should be used routinely to select the proper DLT size. But proper exposure of film and expert radiological assistance are mandatory. [7-8]
2) Placement of DLT should be always confirmed by Fibreoptic bronchoscope for successful lung isolation. [9]
3) Wide range of alternative ways of isolation of lung can help. [10] A successful usage of Univent tube with bronchial blocker has been reported by A. Eldawlatly, K. Alkattan in KGS. [11]
4) Sahajananda et al. reported a successful general anesthesia for lobectomy in a eight year-old child with KGS. The authors used modified single lumen tube advanced into the left bronchus to achieve lung isolation. [12]

To conclude, in Kartageners syndrome with reversed anatomy, Right sided DLT is an appropriate choice. Mirror image of the lung anatomy need not successfully accept reversed sided i.e. right sided Double Lumen Tube, to solve the problem of lung isolation, as it is not a mirror image of left DLT. Also, the three dimensional structure of the tracheo-bronchial image from spiral CT scan is variable, for choosing the appropriate size of DLT. Though fibroptic bronchoscopy confirms the correct position of DLT, auscultation plays a vital role in detecting correct placement at initial stages and also gross misplacements of DLT. This shows that correct placement of DLT in reversed anatomy has a higher chances of failure and remains as a challenge to anesthesiologists.

Figure No. 1, CXR- PA view

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