Single lumen tube as endobronchial stent to manage left bronchial compression post total anomalous pulmonary venous connection repair

Sarvesh Pal Singh, Ramesh Menon, Manoj Kumar Sahu, Palleti Rajashekar, Poonam Malhotra Kapoor

Department of Cardio-Thoracic and Vascular Surgery, Cardio-Thoracic Sciences Center, All India Institute of Medical Sciences, New Delhi, India

A 6-month-old female child presented to our emergency department with respiratory distress. On examination, the child was found to have tachycardia, tachypnea, subcostal retractions and peripheral oxygen saturation of 85% on oxygen (5 l/min) with no fever. On transthoracic echocardiography, a diagnosis of obstructed supracardiac total anomalous pulmonary venous connection (TAPVC) with atrial septal defect (ASD) and severe pulmonary artery hypertension was made. The child was managed for congestive heart failure and intubated and mechanically ventilated. On preoperative chest X-ray, a homogenous opacity was seen on the left side [Figure 1]. Therefore, endotracheal (ET) secretions were sent for culture, and empirical antibiotic therapy was started. On 3rd day *Acinetobacter* spp. was reported in the ET secretions and the child was treated with antibiotics for 5 days before being taken for surgery. A TAPVC repair was done by anastomosing the common chamber with the left atrium, ligating the vertical vein and closing the ASD. The child was stable in the immediate postoperative period with stable hemodynamics and arterial blood gases. However, it was difficult to wean off the child from mechanical ventilation and after 2 extubation failures an early tracheostomy was done on postoperative day 7 [Figure 2]. After tracheostomy, the child was weaned off the ventilator but the left lung collapsed [Figure 3] after 2 h and had to be ventilated again with positive pressure ventilation (PPV) [Figure 4]. A bronchoscopy was performed to evaluate the trachea and bronchi. A compression was seen at the origin and in the proximal part of the left bronchus [Figure 5]. A contrast enhanced computed tomography (CT) scan done afterwards revealed left bronchus being compressed between the left atrium and the descending thoracic aorta [Figure 6]. There were complete collapse and consolidation of left lower lobe with patchy collapse of the left upper lobe. In view of repeated collapse of left lung, stenting of the left bronchus was considered.

To fulfill the requirement a single lumen ET tube (ETT) of 3.5 mm ID was used as a stent for left bronchus with a hole punched out at 4 cm from the tip to ventilate the right lung [Figure 7]. The ETT was placed through the tracheostomy stoma just like a double-lumen tube is placed in adults. First an intubation stylet was passed through the tube, and a primary curve was made as is present in all the ETTs [Figure 8]. Then a secondary curve, directed toward left, was made at 2 cm from the tip to ensure placement into the left bronchus [Figure 9]. The tube was placed, initially, with the secondary (distal) curve directed anteriorly and once the ETT was 4 cm at skin of stoma the ETT was turned to the left and inserted up to a depth of 7 cm at skin. The depth was estimated using X-ray of neck AP view and the length of the tracheostomy tube inside the trachea. Once the placement

Access this article online

Website: www.annals.in

DOI: 10.4103/0971-9784.154488

Quick Response Code:

Address for correspondence: Dr. Sarvesh Pal Singh, Department of Cardio-Thoracic and Vascular Surgery, Cardio-Thoracic Sciences Center, All India Institute of Medical Sciences, New Delhi - 110 029, India. E-mail: sarveshpal.singh@gmail.com

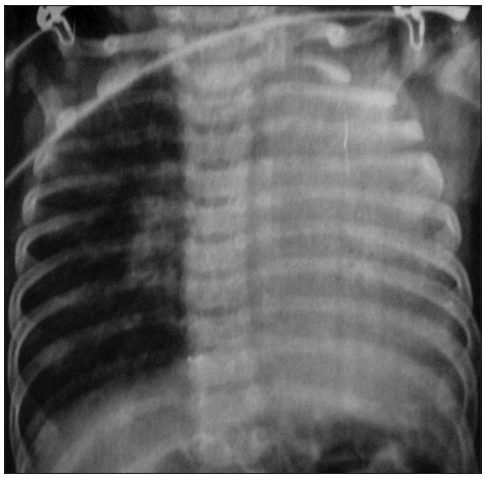

Figure 1: Preoperative chest X-ray PA view showing collapsed left lung

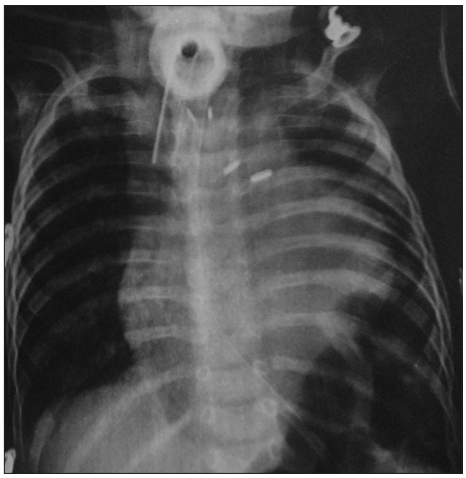

Figure 2: Postoperative chest X-ray AP view, after tracheostomy, on mechanical ventilation showing both lungs being ventilated

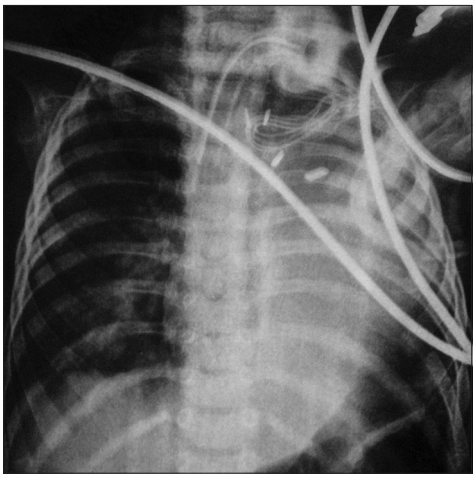

Figure 3: Postoperative chest X-ray AP view, after tracheostomy, on spontaneous breathing showing, left lung collapse

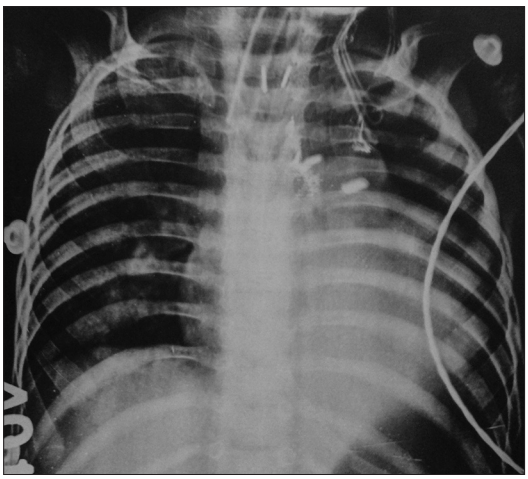

Figure 4: Postoperative chest X-ray AP view on mechanical ventilation showing opened up left lung

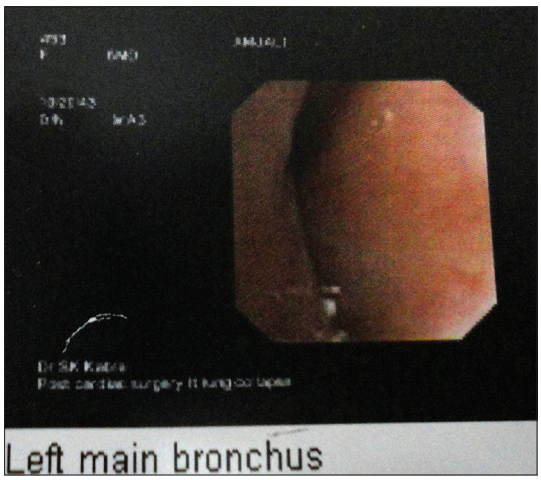

Figure 5: Fiberoptic bronchoscopy showing compression at the origin of left bronchus

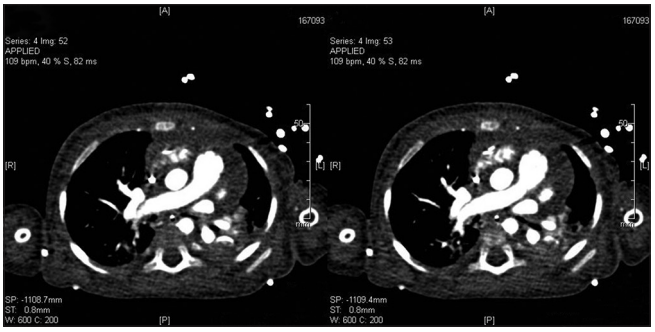

Figure 6: Contrast-enhanced computed tomography image showing compression of left main bronchus at origin and patent distal left bronchus before bifurcation

was done, stylet was taken out, and confirmation was done using auscultation, chest X-ray [Figure 10] and fiber-optic bronchscopy. The ETT was left for 48 h in this position and respiration was supported with positive pressure. Later, the single lumen tube (SLT) was replaced by a tracheostomy tube. The child was allowed to breathe spontaneously on the tracheostomy tube for

72 h and serial chest X-ray was done to ensure adequate ventilation of left lung [Figure 11]. The tracheostomy tube was removed once ventilation of the left lung was maintained [Figure 12]. A repeat CT thorax confirmed normal upper lobe and collapsed lower lobe of left lung. With no possibility of achieving a left lower lobe aeration and absence of clinical symptoms the child was discharged.

The congenital vascular compression of trachea and bronchi have been reported because of aberrant subclavian artery, pulmonary artery sling, aortic arch anomalies, etc.[1] As compared to trachea and right bronchus congenital compression of left bronchus is uncommon and occurs because of compression between the pulmonary artery and anteriorly positioned descending thoracic aorta.[2] In our patient, we cannot be certain that the compression was present since birth because the child presented with pneumonia.

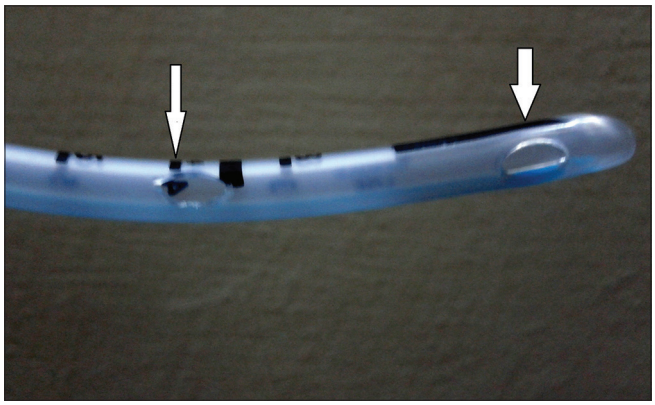

Figure 7: Single lumen endotracheal tube of 3.5 mm (ID) to be used for left bronchial placement. A hole made at the level of 4 cm to ventilate the right bronchus

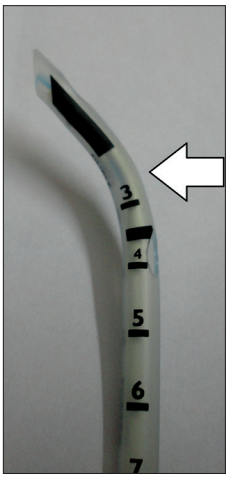

Figure 9: The secondary curve of the endotracheal tube made by bending the tube at 2 cm from the tip at an angle measured on chest X-ray

Since the child was in congestive heart failure and an obvious cause of left lung collapse and consolidation was present no CT scan was done. Moreover, the compression of left main bronchus in our patient was between the left atrium (and not pulmonary artery) and the descending thoracic aorta. In TAPVC, the left atrium is small because the pulmonary venous drainage is directed to the right atrium, so the possibility of a small left atrium compressing the left bronchus is remote. However, during repair the left atrium and common chamber are anastomosed thereby increasing the size of the neo left atrium formed. Furthermore, the compliance of native left atrium is poor and when the neo left atrium is formed the left atrial pressure may rise exponentially leading to the compression of bronchus in at risk anatomy patients. When congenital compression is diagnosed preoperatively, surgical correction can be done.[3] In our patient, the compression was diagnosed postoperatively after repeated weaning failures from mechanical ventilation. We used a single lumen endobronchial tube as a stent to anatomically dilate the left bronchus for 48 h and at the same time ventilated both lungs by precariously positioning the ostium for

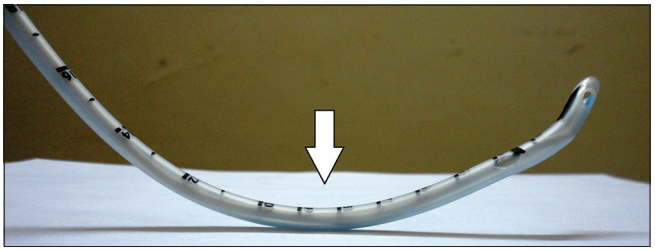

Figure 8: The primary curve of the endotracheal tube

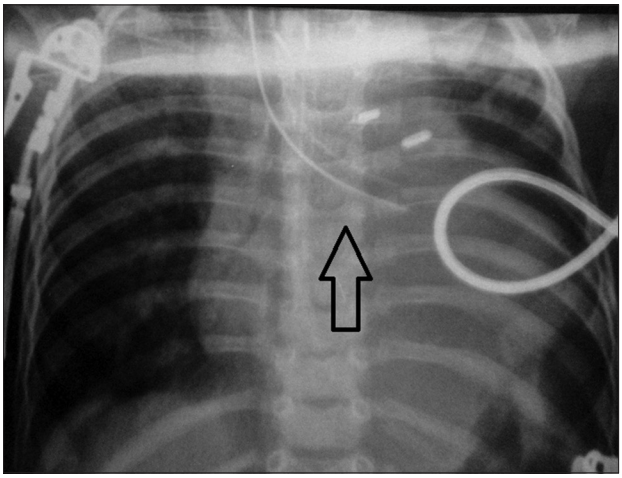

Figure 10: Chest X-ray AP view showing the endobronchial placement of the single lumen tube in the left bronchus. Also seen is the right main bronchus and adequately ventilated right lung

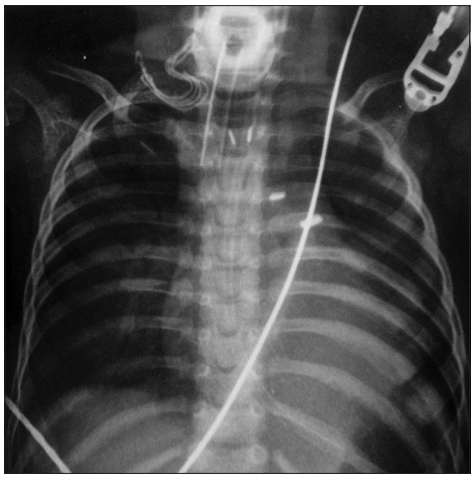

Figure 11: Chest X-ray PA view 72 hours after the removal of the endobronchial tube and placement of tracheal tube

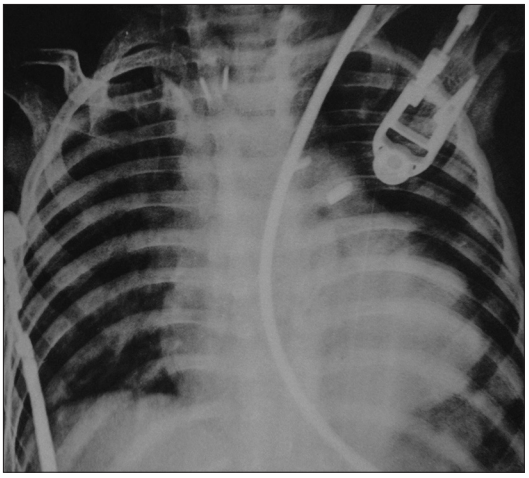

Figure 12: Chest X-ray PA view after removal of tracheostomy tube with child breathing spontaneously

right bronchus just above the carina. The disadvantage of using this method is that routine ET suctioning should be done cautiously by ensuring that the tip of suction catheter remains above the ostium for right bronchus. There should be no manipulation of the endobronchial tube as there is a possibility of kinking of the tube at the site where the hole is punched in for right bronchus because of deficient wall.

In conclusion, left main bronchus may be compressed between the left atrium and descending thoracic aorta. In the postoperative period, a SLT can be used as a stent to dilate the compressed bronchus and at the same time to ventilate both the lungs.

REFERENCES

1. Goldman SA, Rimell FL, Meza MP, Newman B. Diagnosis and management of left main stem bronchus compression. Ann Otol Rhinol Laryngol 1997;106:461-5.
2. Hungate RG, Newman B, Meza MP. Left mainstem bronchial narrowing: A vascular compression syndrome? Evaluation by magnetic resonance imaging. Pediatr Radiol 1998;28:527-32.
3. Talwar S, Sharma P, Choudhary SK, Kothari SS, Gulati GS, Airan B. Le-Compte's maneuver for relief of bronchial compression in atrial septal defect. J Card Surg 2011;26:111-3.

Cite this article as: Singh SP, Menon R, Sahu MK, Rajashekar P, Kapoor PM. Single lumen tube as endobronchial stent to manage left bronchial compression post total anomalous pulmonary venous connection repair. Ann Card Anaesth 2015;18:217-20.

Source of Support: Nil, **Conflict of Interest:** None declared.