

# Difficult Placement Of Univent Tube In A Patient With Undiagnosed Tracheal Bronchus Anomaly: A Case Report And Review Of Literature

A Eldawlatly, K Alkattan, W Hajjar, M Mahdy

## Citation

A Eldawlatly, K Alkattan, W Hajjar, M Mahdy. *Difficult Placement Of Univent Tube In A Patient With Undiagnosed Tracheal Bronchus Anomaly: A Case Report And Review Of Literature*. The Internet Journal of Anesthesiology. 2006 Volume 13 Number 1.

## Abstract

The reported incidence of tracheal bronchus is approximately 0.1-3%. The presence of this anomaly poses a significant challenge to anesthesiologists. In this report we describe a case that underwent right thoracotomy with undiagnosed tracheal bronchus presented with difficulty in placement of the Univent tube. A 26-year-old female patient was scheduled to undergo right thoracotomy for evacuation of clotted pleural effusion. Upon tracheal intubation using Univent tube and fiberoptic examination, tracheal bronchus was diagnosed (carinal trifurcation). During surgery right upper lobe was partially ventilated and caused no inconvenience to the surgeon. The tumor resected (teratoma?) was originating from the right lower lobe. At end of surgery and following tracheal extubation patient developed re-expansion pulmonary edema which was treated successfully with continuous positive airway pressure mask, fluid restriction and diuretics. We conclude that Univent tube could be used in similar cases like the present case report. However, as all literatures indicating that left sided double lumen tube could be better choice for proper lung isolation and adequate one lung ventilation for patients with tracheal bronchus undergoing thoracotomy. Regarding re-expansion pulmonary edema, we believe it should be anticipated in any case of long standing lung compression with adequate management which includes positive end expiratory pressure if the trachea is still intubated or continuous positive airway pressure if the trachea was extubated besides fluid restriction and diuretics.

## INTRODUCTION

A tracheal bronchus is an aberrant bronchus that arises most often from the lateral tracheal wall above the carina (<sub>1</sub>). The reported incidence is approximately 0.1-3% (<sub>2,3</sub>). The presence of this anomaly poses a significant challenge to anesthesiologists.

In this report we describe a case that underwent right thoracotomy with undiagnosed tracheal bronchus presented with difficulty in placement of the Univent tube.

## CASE REPORT

A 26-year-old female patient not known to have any previous medical illness was admitted electively after being diagnosed as right sided pleural effusion in another hospital for further management in our hospital. Her main complaint was shortness of breath for more than 2 months with dyspnoea on exertion and orthopnoea. No history of cough, fever, change of appetite but decrease in body weight. Dyspnoea on exertion was progressive in nature and became worse in the last two weeks. Besides she has noticed edema

of both lower limbs for the last two months. She gave past history of complicated pregnancy one and half year ago. During that pregnancy she developed lower limb swelling followed by shortness of breath. During that period she was diagnosed as deep venous thrombosis with possible pulmonary embolism.

She was started on oral warfarin 5mg daily. She was aborted. Chest-x-ray at that hospital revealed right sided pleural effusion which was confirmed with fine needle biopsy and diagnosed as clotted hemothorax. Then she was transferred to our hospital for further management. Laboratory and biochemical analysis were within normal ranges except for prolonged APTT and INR due to warfarin. Thyroid function tests were normal and it was done due to thyroid swelling. Pulmonary function test revealed restrictive pattern with FVC 35% of predicted, FEV1 32% of the predicted and FEV1/FVC ratio 91. Her oxygen saturation on room air was 92%.

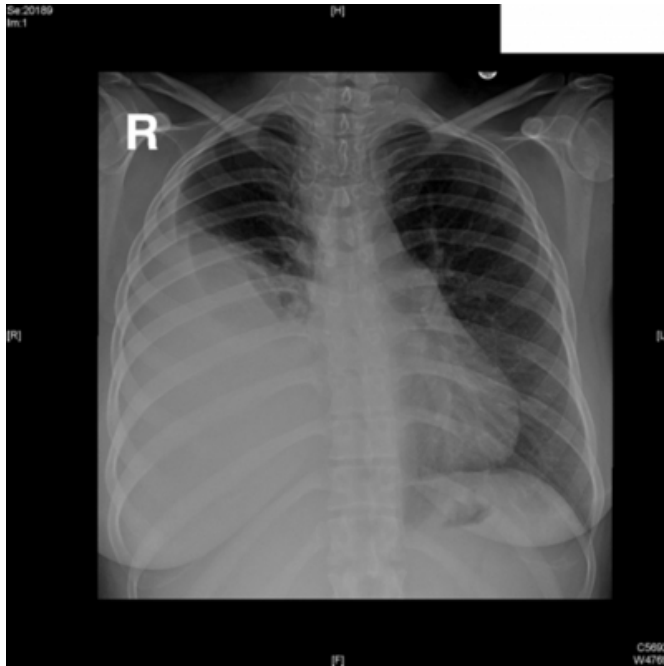
Chest examination revealed decreased air entry in the right

side with dullness on percussion. Cardiovascular system was examined and was negative for any disease.

Vital signs and blood pressure were normal with normal ECG. Chest-x-ray revealed right side radio opaque shadow with the following differential diagnosis: hematoma, clotted hemothorax or pleural effusion (Figure 1).

**Figure 1**

Figure 1: Preoperative chest-x-ray



**Figure 2**

Figure 2: CT scan with right pleural effusion with thickened pleura



CT scan of the lung showed right sided pleural effusion and possible thickening of the pleura. The patient was scheduled for right thoracotomy , evacuation of clotted hemothorax with possible pleural decortication. Warfarin was discontinued and she was on enoxaparin which has been discontinued as well preoperatively.

Premedication consisted of oral diazepam 10mg one hour preoperatively and oxygen through nasal cannula with 3L/min during transportation to the operation theatre. Before induction of anesthesia and after establishing an i.v line, thoracic epidural catheter D5-6 was inserted under complete aseptic technique. Then radial artery was cannulated. Then induction of anesthesia was achieved with i.v sufentanil 0.1mic/kg b.w and propofol 3mg/kg b.w followed by rocuronium 0.6mg/kg b.w to facilitated tracheal intubation using torque control blocker univent (TCBU) size 7 mm. Using fiberoptic bronchoscope (FOB) and upon advancing it we noticed an opening in the right tracheal wall above the carina.

At this stage the diagnosis of tracheal bronchus was made. Then we thought to use left sided double lumen tube (DLT) instead of TCBU. But we decided to proceed with TCBU and advance the blocker into bronchus intermedius to ensure isolation of right middle and lower lobes. Each time we inflate pilot cuff of TCBU with 10 then 7cc air it dislodged

out of the bronchus intermedius. We tried again with 5cc air then the blocker was well placed. Right sided internal jugular vein was cannulated. Anesthesia was maintained with 50% oxygen in air with 1MAC sevoflurane. Bupivacaine 0.25% 7ml was given epidurally and continued on infusion drip at rate of 5ml/hour throughout the procedure. Incremental dosages of rocuronium and sufentanil were given when required. Thoracotomy performed and large swelling originating from right lower lobe was resected, weighing 1.8kg, possibly teratoma (Figure 3).

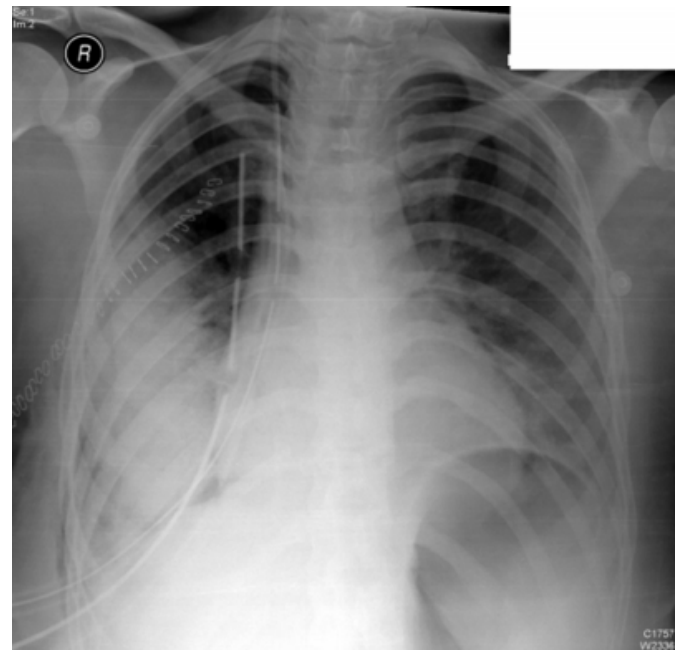
**Figure 3**

Figure 3: Tumor (teratoma?)



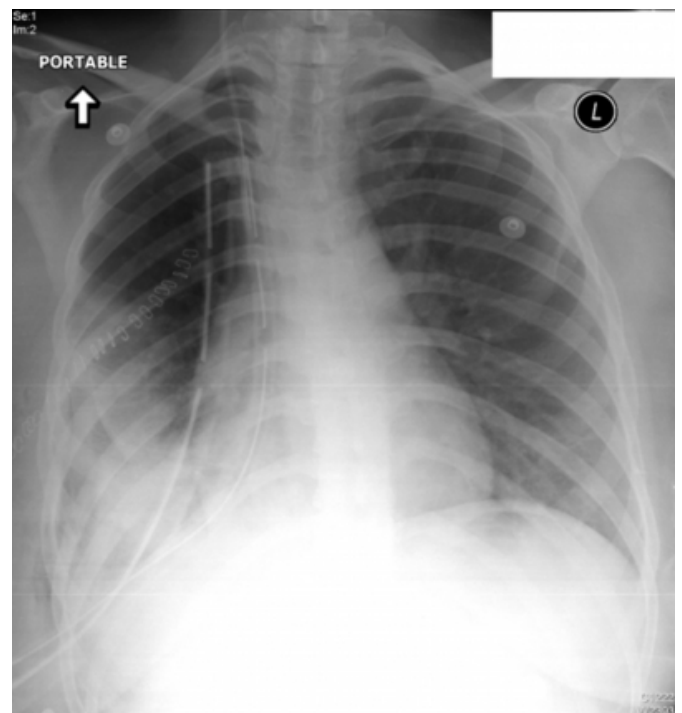
**Figure 4**

Figure 4: Chest-x-ray showing right sided pulmonary edema



**Figure 5**

Figure 5: Resolving right side pulmonary edema



During surgical procedure the right upper lobe was partially ventilated. Initially it was compressed as well with the tumor and hence partially ventilated but later after removal of the tumor and deflating the bronchial blocker pilot cuff, it was fully ventilated. Though it was ventilated intraoperatively

but it didn't disturbed the surgeon while operating since it was far from the lung pathology which was mainly in the right lower lobe. At the end of surgery the blocker pilot cuff was deflated and the right lung was ventilated. During the whole procedure blood gas analyses data were within normal ranges. The duration of surgery was 90 minutes. Blood loss was minimal except of the blood collected in the tumor with it is feeding vessel which was secured. Two units of packed RBCs were given besides 500 cc of lactated ringer solution with 300 cc of urine output. At the end of surgery reversal of muscle relaxants (neostigmine 2.5mg/atropine 1mg) was given and the trachea was extubated.

After tracheal extubation we have noticed that she cough repeatedly with frothy blood stained secretions. The diagnosis of re-expansion pulmonary edema was made.

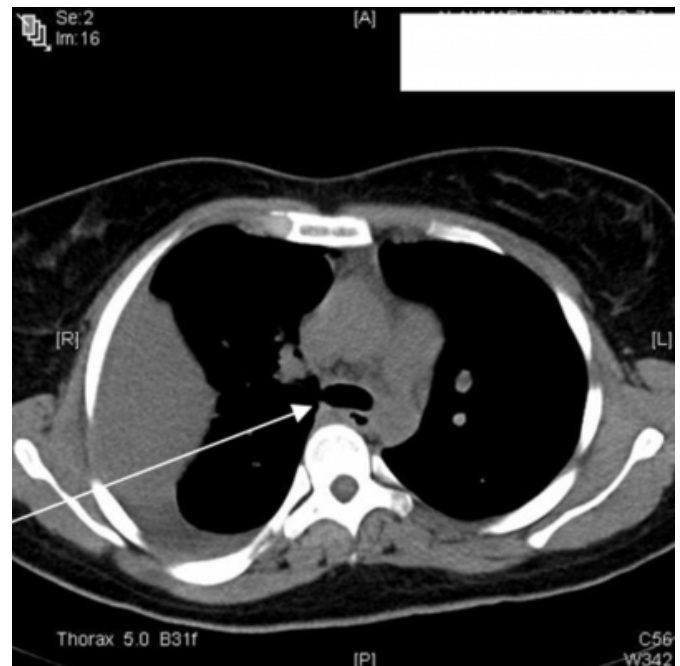
Immediately furosemide (lasix) 40mg i.v was given and fluids restricted and continuous positive airway pressure (CPAP) mask was applied with flow rate of 5L/min and initial pressure of pressure of 10cmH<sub>2</sub>O. Then the patient was transferred to surgical ICU and continued on same management of lasix 20mg i.v once daily, fluid restriction and CPAP mask with pressure reduced to 5cmH<sub>2</sub>O as ABGs improved. Chest-x- ray revealed right sided pulmonary edema (Figure 4). Her ABGs at that time showed CO<sub>2</sub> accumulation 60mmHg. Four hours late she CPAP was replaced with venturi mask with 40%O<sub>2</sub>.

Next day she was breathing room air and made uneventful recovery with better chest-x-ray (Figure 5). Two days later she was transferred to normal surgical floor. An alert card was issued to the patient indicating the tracheal bronchus anomaly and she was advised to show it to the attending anesthesiologist ahead of any surgical procedure in the future in order to avoid any possible complications of tracheal intubation.

Looking into the CT scan of the lung retrospectively with different contrast and view revealed a take off of the right upper lobe bronchus from the lateral wall of the trachea (Figure 6).

**Figure 6**

Figure 6: Take off of the right upper lobe bronchus from the tracheal wall (Arrow)



## DISCUSSION

The patient had an undiagnosed tracheal bronchus which was incidentally found upon examination using FOB. In the majority of cases a tracheal bronchus arises from the lateral wall of the trachea as in our case. In a recent series of 35 tracheal bronchus patients 28 originated from the right wall and 7 from the left (4). The main implications of tracheal bronchus in adults is during endotracheal intubation. An endotracheal tube can occlude the lumen of the tracheal bronchus resulting in atelectasis of the involved lobe. Accidental intubation of the anomalous lobe can cause pneumothorax and inadequate ventilation of the remaining lung (5). In thoracic anesthesia the implications are quite different. The reason why is in thoracic anesthesia lung isolation is required and therefore the possibility of occlusion of the tracheal bronchus orifice which will compromise the right upper lobe and lead to inadequate lung isolation and improper lung ventilation with subsequent postoperative sequelae. Arbitrarily tracheal bronchus can be classified into three types. Type I, in its most severe manifestation, a carina arises at mid-tracheal level. This is commonly present in children. Type II, present in adults where the tracheal bronchus arises from the lower third of the trachea. Type III, mostly in adults where the tracheal bronchus presented as a small but distinct bronchus connected to the lower third of the trachea to a bronchus that

arises from the trachea at the level of carina (carinal trifurcation) and just proximal to the origin of the right main bronchus (6). From that description we consider our patient as type III hence the tracheal bronchus arises at the carinal level as visualized with FOB. Type III anomaly presents particular problems for those using DLT (7,8). Ching et al reported a case of a previously undiagnosed tracheal diverticulum which is a variant of tracheal bronchus which caused difficulty in positioning of a DLT (9). Bronchial blockers also have been used for attempting lung isolation in patients with tracheal bronchus. Kin et al, reported a case of successful lung isolation with one bronchial blocker in a patient with tracheal bronchus and they concluded that although DLT should be used for lung isolation in tracheal bronchus patients, using one bronchial blocker is possible if the distance between the carina and the tracheal bronchus short enough (10). In contrary with that report Peragallo et al, reported a case in which the presence of an undiagnosed tracheal bronchus made isolation of the right lung with bronchial blocker impossible (11). Also Tsuda et al reported unsuccessful use of a bronchial blocker to achieve OLV which has been replaced with DLT with successful outcome (12). However, Lee et al, reported successful OLV in a patient with aberrant tracheal bronchus. The authors have used Univent tube and in addition a Fogarty catheter to block the tracheal bronchus and successfully established isolation of the right lung (13). In the present case report TCBU was used with partially ventilated right upper lobe. There was no need to replace it with left sided DLT to ensure complete right lung isolation. The reason why, is the tumor was so big enough to cause compression although mainly on the right middle and lower lobes but partially compressing the right upper lobe as well.

Moreover, partially ventilated right upper lobe didn't interfere with the surgical procedure since it was distal to the lung pathology which was mainly in the right lower lobe. Following right lung inflation and after tracheal extubation the patient developed re-expansion pulmonary edema (RPE). Otomo et al reported RPE after removal of a giant thoracic tumor associated with long time lung collapse and mediastinal shift (14). Another case of intraoperative RPE was described by Desiderio et al following thoracotomy (15). A case of unilateral RPE was described in the literature after drainage of a large spontaneous pneumothorax with chest tube insertion. The pathogenesis of RPE was also described as controversial due to unknown of the exact mechanism (16). In our case the patient showed no evidence of RPE prior to

tracheal extubation. However, immediately after tracheal extubation she started to cough and expectorate of frothy blood stained sputum. She was successfully managed with CPAP, restriction of fluids and diuretics.

In conclusion, though tracheal bronchus is rare anomaly but it presents difficulty in establishing lung isolation and proper OLV. In our case TCBU was used successfully for OLV with partially ventilated right upper lobe, however, we are aware that for complete lung isolation a left sided DLT will be more appropriate. We do recommend as other reports recommend giving the patient an alert card indicating the diagnosis of tracheal bronchus to be projected to the anesthesiologist in any future anesthesia exposure. Regarding RPE, we believe it should be anticipated in any case of long standing lung compression with adequate management which includes positive end expiratory pressure (PEEP) if the trachea is still intubated or CPAP if the trachea was extubated besides fluid restriction and diuretics.

## References

1. Barat M, Konrad HR. Tracheal bronchus. *Am J Otolaryngol* 1987;8:118-22.
2. McLaughlin FI, Strieder DJ, Harris GBC, et al. Tracheal bronchus: Association with respiratory morbidity in childhood. *J Pediatrics* 1985;106:751-55.
3. Ikeno S, Mitsuhata H, Saito K, et al. Airway management for patient with a tracheal bronchus. *Br J Anaesth* 1996; 76:573-575.
4. Ghaye B, Szapiro D, Fanchamps J-M, et al. Congenital bronchial abnormalities revisited. *Radiographics* 2001; 21:105-109.
5. Aoun NY, Velez E, Kenny LA, et al. Tracheal Bronchus. *Respiratory Care* 2004; 49:1056-1058.
6. Conacher ID. Implications of a tracheal bronchus for adult anaesthetic practice. *Brit J Anaesth* 2000; 85:317-21.
7. Brodsky JB, Mark JBD. Bilateral upper lobe obstruction from a single lumen double-lumen tube. *Anesthesiol* 1991;74:1163-1164.
8. Stene R, Rose M, Weinger MB, et al. Bronchial trifurcation at the carina complicating use of a double-lumen tracheal tube. *Anesthesiol* 1994;89:1162-1164.
9. Ching SLL, Chow MYH, Ng HN. Difficult lung isolation in a patient with an undiagnosed tracheal diverticulum. *J Cardiothorac Vasc Anesth* 2003;17:355-56.
10. Kin N, Tarui K, Hanaoka K. Successful lung isolation with one bronchial blocker in a patient with tracheal bronchus. *Anesth Analg* 2004;98:270.
11. Peragallo R, Swenson JD. Congenital tracheal bronchus: the inability to isolate the right lung with a univent bronchial blocker tube. *Anesth*

Analg 2000;91:300-301.

12. Tsuda K, Kinoshita R, Yamada K, et al. Difficulty in one-lung ventilation reveals tracheobronchial anomaly. Masui 2006;55:100-102.

13. Lee HL, Ho ACY, Cheng RKS. Successful one-lung ventilation in a patient with

aberrant tracheal bronchus. Anesth Analg 2002;95:492-94.

14. Otomo A, Kawatani M, Morikawa T, et al. Reexpansion pulmonary edema after removal of a giant thoracic tumor associated with long time

lung collapse and

mediastinal shift. Masui 2004;53:291-93.

15. Desiderio D, Meister M, Bedford R. Intraoperative re-expansion pulmonary edema. Anesthesiol 1987;67:821-22

16. Volpicelli G, Fogaliati C, Radeschi G, et al. A case of unilateral re-expansion

pulmonary edema successfully treated with non-invasive continuous positive airway pressure. Eur J Emer Med 2004;11:291-94.

**Author Information**

**Abdelazeem Eldawlatly, M.D.**

Associate Professor, Department of Anesthesia, College of Medicine, King Saud University

**Khalid Alkattan, F.R.C.S.**

Professor of thoracic surgery, King Saud University

**Waseem Hajjar, F.R.C.S.**

Assistant Professor, College of Medicine, King Saud University

**Mohamed Mahdy, M.D.**

Senior registrar, Thoracic surgery, King Khalid University Hospital