



# Tracheobronchomegaly causing endotracheal tube cuff leak

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## ABSTRACT

We describe a 75 year old gentleman, admitted to intensive care unit, who develops a significant endotracheal cuff leak. After ruling out cuff puncture we discover the patient has tracheobronchomegaly on a CT thorax. The leak is highly positional but was managed successfully with careful ETT manoeuvring. We discuss the causes of ETT cuff leak and then explain the underlying mechanisms of tracheobronchomegaly.

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## 1. Case

A 75 year old gentleman presented to our district general hospital with a general decline over the course of a couple of weeks. Over the recent few days he had become significantly dyspnoeic, associated with a non-productive cough.

He was a significant tobacco ex-smoker and had had a hospital admission two years earlier with a lower respiratory chest infection. A chest X-Ray on this previous admission demonstrated marked bilateral lung fibrosis.

Having been treated for community acquired pneumonia on a medical ward he deteriorated with hypercapnic respiratory failure. He was intubated and ventilated on our intensive care unit having failed a short trail of non-invasive ventilation. Intubation, with a size 8 mm endotracheal tube (ETT), was straightforward (laryngoscopy grade 1) but a significant cuff leak immediately developed after inflation of the pilot cuff. He was re-intubated with a new larger tube (9 mm), due to concern of a potential ETT cuff puncture. On inspection after removal, no leak was evident in the first ETT cuff. The leak continued intermittently and appeared positional. When no leak was present, adequate ventilatory volumes (480 ml) were achieved with normal inflation pressures (peak pressure <22cmH<sub>2</sub>O), but in certain positions, the leak caused an audible peritubal bubbling noise and insufficient tidal volumes were achieved.

Subsequent CT thorax demonstrated tracheobronchomegaly (Figs. 1–3). The largest transverse airway diameter was 42 mm, just sub-glottic.

Adequate ventilation was achieved by careful positioning of the

ETT. One week after admission, a tracheostomy was percutaneously inserted to aid weaning – size 9 mm. Sufficient ventilation was achieved with intermittent peritubal leak in certain positions. Unfortunately, the patient died due to respiratory failure two weeks after admission to intensive care.

## 2. Discussion

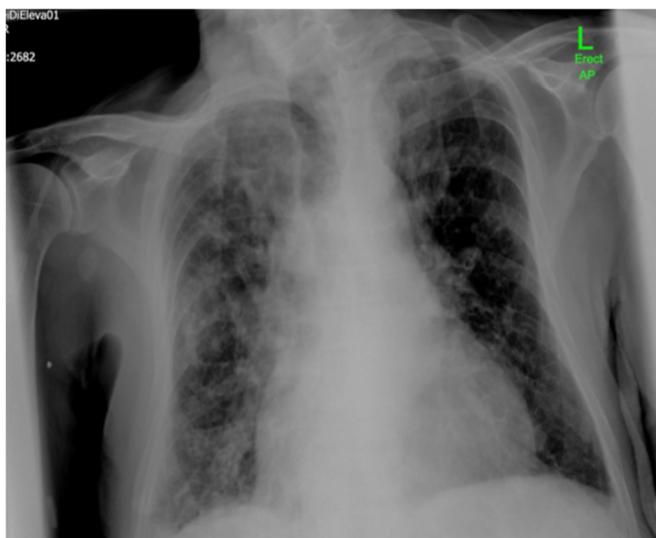
Cuff leaks can occur due to a number of reasons as listed below [1,2]:

- Cuff under inflation
- Partial tracheal extubation
- Misplaced oro- or nasogastric tubes
- Discrepancy between ETT and tracheal diameters
- Raised airway pressures
- Damage to ETT cuff/pilot balloon.

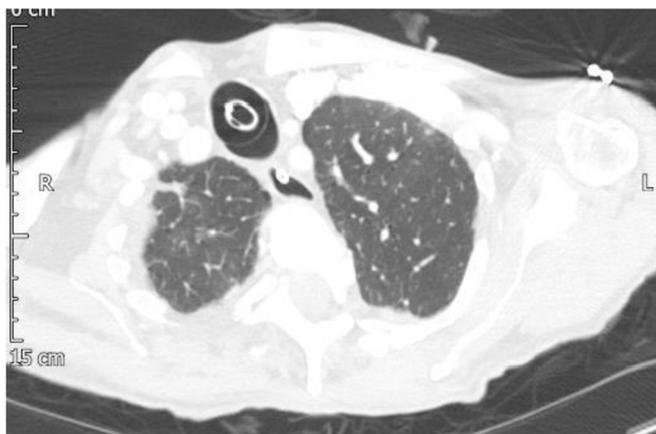
Our patient exemplifies a significant discrepancy between ETT and tracheal diameters. Problems encountered because of ETT cuff leak can be due to insufficient ventilation. Also, there is risk of pulmonary aspiration as the gastrointestinal tract is not isolated from the tracheobronchial tree.

Tracheobronchomegaly is a rare condition consisting of marked dilation of the trachea and major bronchi. Mounier-Kuhn, in 1932, first described the radiological and endoscopic appearances, for which it gets its name Mounier-Kuhn Syndrome (MKS) [3]. Tracheomegaly is described as a transverse diameter of the trachea, at the level of the aorta, exceeding 25 mm in men and 21 mm in women [4,5]. This can be congenital, associated with connective tissue defects, for example, Ehlers-Danlos syndrome. More commonly, tracheobronchomegaly is secondary to other causes,

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**Fig. 1.** Predominant right lower and middle zone opacification on a background of chronic lung disease. Tracheomegaly is noted.



**Fig. 2.** Thoracic computer tomography slice demonstrating an endotracheal tube with cuff inflated. Tracheomegaly is evident with the ETT cuff inadequately occluding the airway. Incidentally, lung parenchyma has some chronic lung changes as well as 'tree in bud' pattern with shadowing and consolidation.

often associated with chronic respiratory infections (for example, chronic bronchitis or pulmonary emphysema) or smoking. Case reports also describe radiotherapy and prolonged mechanical ventilation as causes [6].

The enlarged airways and chronic cough impede mucociliary clearance and can lead to mucus retention with subsequent recurrent chest infections, emphysema, bronchiectasis and pulmonary fibrosis [6,7]. Tracheobronchial collapse has been noted on coughing or forced expiration due to markedly increased airway compliance. Pulmonary function tests in patients with tracheobronchomegaly usually show an enlarged dead space [8].

Diagnosis can be using Chest X-ray, CT thorax or bronchoscopy. Treatment is predominantly antibiotics for chest infections and postural drainage for mucous clearance. There is some evidence non-invasive ventilation may improve ventilatory dynamics [9]. Greater intra-cuff pressures were required to maintain an effective seal in our patient, with intermittent positional leaks occurring. Increasing ETT size to the largest appropriate may be a solution to



**Fig. 3.** Thoracic computer tomography slice demonstrating tracheobronchomegaly.

preventing peri-cuff leak, however this can be potentially hazardous in ITU patients. Authors have described using an uncuffed ETT and packing the laryngopharynx with gauze to prevent leak [10]. This technique may surface in the operating theatre for short periods of ventilation but is unlikely to work in the ITU. There are case reports of longer tracheostomy tubes being required due to the greater airway diameter and associated trachomalacia [11].

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