International Journal of Research in Medical Sciences
Kumar H et al. Int J Res Med Sci. 2025 Aug;13(8):3486-3488
www.msjonline.org
pISSN 2320-6071 | eISSN 2320-6012
DOI: https://dx.doi.org/10.18203/2320-6012.ijrms20252159

Case Report

Use of a Fogarty embolectomy catheter as a bronchial blocker through a single-lumen endotracheal tube in a patient with tracheal narrowing

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Received: 13 June 2025
Revised: 26 June 2025
Accepted: 30 June 2025

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ABSTRACT

Techniques for single lung ventilation include a double-lumen tube, Univent or a bronchial blocker. However, the larger outer diameter of double-lumen or Univent tubes may pose problem in its passage through an area of subglottic stenosis or tracheal narrowing. Here, we report our experience in a case of tracheal narrowing due to extraluminal compression by mediastinal mass in which a Fogarty embolectomy catheter was used as a bronchial blocker through a single lumen endotracheal tube (ETT). Fogarty embolectomy catheter may be a suitable option for one lung ventilation (OLV) in tracheal narrowing, where there is limitation to use double lumen tube or Univent tube.

Keywords: Bronchial blocker, ETT, Fogarty embolectomy catheter, One lung ventilation, Tracheal narrowing

INTRODUCTION

One lung ventilation (OLV) is a challenging anaesthetic technique used in thoracic surgery, including minimally invasive transthoracic esophagectomy. Single-lumen tubes (SLT) with endobronchial blockers (EB), or double-lumen tubes (DLT), are routinely used for the selective blockage of one lung to facilitate OLV. The first DLT was introduced in 1949, and has for a long time been the most commonly used device for this technique.[1]

Because of the unavailability of appropriate size DLT and bronchial blockers, Fogarty embolectomy catheters are being used to achieve lung isolation.

When OLV is needed in a patient with narrow compressed trachea, the conventional DLT or a Univent tube (Fuji Systems Corporation, Tokyo, Japan) may be too large to pass through the stenotic site. In addition, when a small-sized DLT or a Univent tube is selected, the small lumen may lead to increased airway resistance and to inadequate ventilation in an adult. It also leads to difficulty in suctioning and fiberoptic bronchoscopy of airway. DLT of 35 Fr has got a narrow lumen whose correct and precise placement requires fibreoptic bronchoscope (FOB) of 2.8 mm outer diameter which may not be available in every anaesthesia department. A Fogarty embolectomy catheter can be used as a bronchial blocker for OLV in adult or paediatric patients.[2-4] Single-lumen ETT with bronchial blocker seems to be the best choice for OLV in a patient with tracheal narrowing because of lesser outer diameter (Table 1).[5]

Table 1: Comparison of the outer diameters of single-lumen ETT, Univent tube and DLT, ETT.

Tube type	Inner diameter (mm)	Outer diameter
Single-lumen ETT	ID 6.0 CUFFED	8.2 mm
Univent tube	ID 6.0 CUFFED	11.5 mm
Double-lumen endobronchial tube (Tracheal portion)	ID 28Fr	9.5 mm

CASE REPORT

A 22-year-old female presented with chief complaints of dysphagia, dyspnoea and orthopnoea was scheduled to undergo middle mediastinal mass excision through right thoracotomy incision. Tracheal narrowing proximal to carina was found on CT scan due to extraluminal compression with mass suspected but less likely to invade the wall (Figure 1).

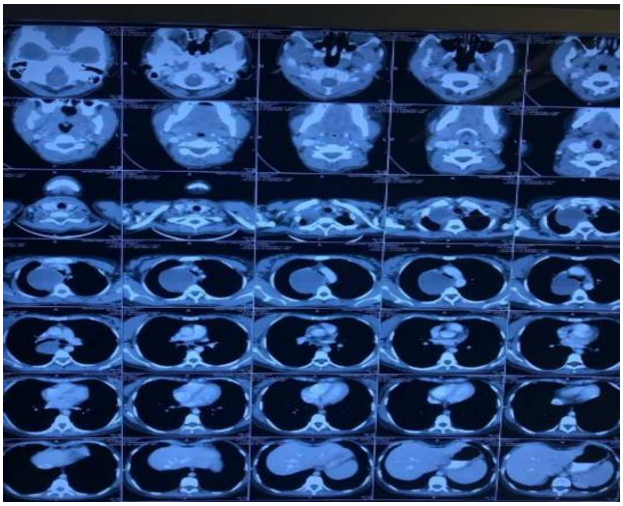

Figure 1: CT scan showing tracheal narrowing just before bifurcation.

CT scan and x-ray were suggestive of difficulty in negotiating a DLT through the narrowed passage with a chance of injury to tracheal wall and in the worst scenario damage to adjacent structures. Anaesthesia was induced using midazolam, fentanyl, propofol and checked for bag mask ventilation then rocuronium was administered. A polyvinyl chloride single-lumen ID 7.5ETT, snuggly fitting the stenotic area was placed in the trachea and was maintained with fentanyl, vecuronium and isoflurane. Fiberoptic bronchial examination was done revealed tracheal stenosis prior to carina, distal to it the structure was normal (Figure 2).

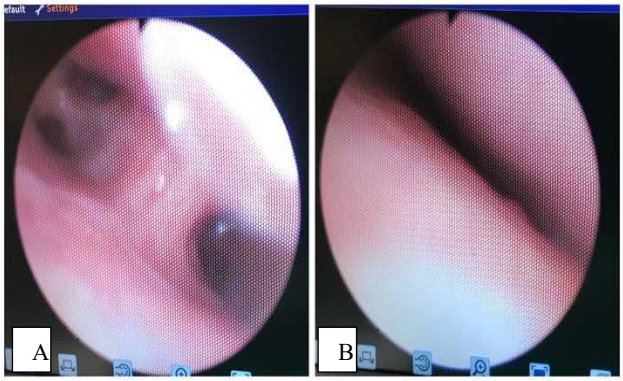

Figure 2 (A and B): Fibreoptic view showing tracheal narrowing due to compression and normal post stenotic area.

Fogarty embolectomy catheter (6 Fr, Baxter Healthcare Corporation, Mississauga, Canada) was then inserted through the ETT and used as a bronchial blocker to isolate the right lung. The tip of Fogarty embolectomy catheter was bent to around 15 degrees for easy placement in the bronchus. A catheter mount was used to stabilise the Fogarty embolectomy catheter shaft. Fogarty catheter was inserted through the aspiration port of catheter mount into the designated mainstem right bronchus. The insertion of a catheter into the right bronchus was performed using fiberoptic bronchoscope guidance (Olympus LF-2, Olympus Optical Co., Tokyo, Japan). The balloon was inflated using 2 ml normal saline under vision. Normal saline was injected through a three way stop cock which was also used to seal the opening of Fogarty catheter and prevent spontaneous deflation of ballon. The position of the Fogarty embolectomy catheter was adjusted until the proximal surface of the balloon was positioned just below the carina. After moving the patient to the left lateral decubitus position, the position of the catheter was re-checked by co-insertion of FOB through the aspiration port of catheter mount (Caution must be exercised to prevent removal of the catheter). After placing the Fogarty embolectomy catheter in situ, it was fixed in its position using adhesive tape (micropore) to prevent displacement from the position and air leakage around the catheter shaft (Figure 3).

Figure 3: Fogarty catheter *in-situ* passed through catheter mount opening and reinforced in position to prevent dislodgement and leakage.

Case was managed successfully with uneventful perioperative course.

DISCUSSION

In order to provide good surgical exposure bronchial blockade is a useful method to achieve lung isolation. Fogarty embolectomy catheter when used as a bronchial blocker, it can be placed either inside the single-lumen

ETT placed in the trachea or alongside the ETT.[6,7] Catheter placed coaxially inside the plain tube, can be easily manipulated under FOB guidance as both can be inserted through the same port. Catheters with an open-tip are preferred over closed-tip catheters because the lumen of the catheter facilitates lung collapse and can be used as a suction port or for oxygen insufflation.[8] Thus, we positioned the Fogarty embolectomy catheter inside the ETT. Bronchial blocker with guide wire inserted through specific designed adapter are considered as an ideal option. Two single-lumen ETTs connected end-to-end, may be considered as another alternative method for achieving OLV in patients with narrow tracheal lumen.[9,10] Endobronchial intubation of single-lumen ETT for isolating the right lung may lead to collapse of right upper lobe. Thus, inadequate ventilation of right lung would cause serious hypoxaemia due to the large transpulmonary shunt. In our patient with tracheal narrowing, a Univent tube of ID 6.0 mm or even a 28 Fr DLT appeared to be too large to pass the tracheal lumen. Owing to small internal diameter of a 28 Fr DLT is 3.5-3.6 mm, FOB for neonatal use which is very thin can only be passed.[5] Small-sized DLT may need overinflation of bronchial cuff to seal the normal-sized mainstem bronchus in adults, and that may lead to tracheobronchial rupture. Univent tubes were introduced for OLV in paediatric patients.[10] However, uninvent tube might increase the airway resistance due to narrow lumen resulting in inadequate ventilation. Repeated attempts to intubate may aggravate airway edema or mucosal injury further complicating the compromised airway. Any attempt of forceful insertion may cause bleeding, or even cutting or shearing of the stenotic tissue. Prior FOB examination is helpful in cases with narrow or stenotic tracheal lumen which will help us and guide in proper selection of airway equipment. Our experience suggests in such patients the use of a bronchial blocker through a single-lumen ETT should be considered as a method to achieve OLV. Fogarty embolectomy catheter is best alternative to use if there is unavailability of bronchial blocker, as this method will provide the larger lumen for positive pressure ventilation, suctioning and bronchoscopic access.

CONCLUSION

In patients with tracheal narrowing, conventional double-lumen or Univent tubes may not be feasible due to their larger external diameters, which risk traumatic insertion and compromise airway safety. This case highlights the successful use of a Fogarty embolectomy catheter as a bronchial blocker through a single-lumen ETT to achieve effective OLV. This technique provides a safe and viable alternative in resource-constrained settings or when conventional bronchial blockers are unavailable. The approach enables better ventilation, bronchoscopic access, and minimal airway trauma, especially in complex airway anatomies. Our experience reinforces the importance of individualized airway strategies and underscores the value of fiberoptic-guided placement in ensuring successful outcomes.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: Not required

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Cite this article as: Kumar H, Ankita. Use of a Fogarty embolectomy catheter as a bronchial blocker through a single-lumen endotracheal tube in a patient with tracheal narrowing. Int J Res Med Sci 2025;13:3486-8.