

# A Novel Method Of Introducing Double Lumen Tube Over A Bougie In A Difficult Airway: A Case Report

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## Abstract

Isolation of lung with double lumen tube sometimes a challenging task. This is a more challenging target to achieve in a case of difficult airway. We report a case of difficult airway negotiated by a double lumen tube over a gum elastic bougie in a case of TB Spine. The case was posted for anterior spinal fusion through left thoracotomy.

Initially intubation was attempted with a 37Fr left sided double lumen tube and could not succeed. As the laryngoscopic view revealed Cormack lehane grade III, intubation was done with an 8.5mm single lumen tube (SLT) over a bougie.

Single lung ventilation was attempted by introducing the tube into the right main stem bronchus. As the right upper lobe ventilation was compromised; there was requirement for higher FiO<sub>2</sub> to maintain oxygen saturation and airway pressure were rising we decided for double lumen tube intubation over a bougie and selected a right sided DLT for obvious reasons. 3 Ease of introduction of 15Fr disposable portex 70cm long gum elastic bougie with through 37Fr right DLT was checked prior to attempting intubation. Single lumen tube was withdrawn over the bougie and DLT was railroaded into the endo-bronchial position. Isolation of lung was achieved successfully.

It may be possible to introduce a double lumen tube in difficult airway with the aid of latest intubation guides like Airtrac video laryngoscope, Video Macintosh laryngoscope, glide scope, bullard laryngoscope, Wu scope and other video laryngoscopes. As there is dearth of such gadgets in most of the institutes, we adopted this novel method of intubation with DLT over a gum elastic bougie.

## ABBREVIATIONS

DLT: Double Lumen Tube, SLT: Single Lumen Tube, ECG: Electrocardiogram, GEB: Gum Elastic Bougie, ETCO<sub>2</sub>: End Tidal Carbon Dioxide, FOB: Fibre optic Bronchoscope.

## INTRODUCTION

Management of a difficult airway is one of the challenging tasks for anaesthesia care providers. This is all the more difficult with a double lumen tube. There is an increase in demand for selective lung ventilation, even for thoracic spine procedures for better facilitation of surgery and to cut short the duration of procedure.

In a patient with anticipated difficult airway, awake intubation with a fibre optic bronchoscope of appropriate size is the primary choice. With the aid of latest intubation guides like Airtrac video laryngoscope, Video Macintosh laryngoscope, glide scope, bullard laryngoscope, Wu scope and other video laryngoscopes, single lumen tube intubation is done initially. This is followed by introduction of an airway exchange catheter to remove SLT and further railroad a double lumen tube over the airway exchange catheter. [1,

2]

However, placement of double lumen tubes needs skill in the presence of a difficult airway to provide selective lung ventilation. We report a case where, a 37Fr right DLT was successfully placed in an anticipated difficult airway using a gum elastic bougie with atraumatic coude tip as there are no modern gadgets to secure the airway akin to many other institutions

## CASE REPORT

A 38 year old male, weighing 50 Kg, 162 cm tall, a known case of pulmonary Koch's with Potts' spine and paraplegia was posted for anterior spinal fusion.

His hemogram and blood biochemistry were normal; X Ray Chest showed minimal upper lobe infiltrates on either side. ECG was within normal limits. MRI of dorso-lumbar spine showed evidence of destruction of D7, D8 & D9 vertebral bodies with focal kyphotic deformity and compression of spinal cord at D8 & D9 levels.

Systemic examination was unremarkable. His oxygen saturation was 97% on room air. His airway examination

revealed an inadequate mouth opening with attrition and discolouration of dentition, sub-mucosal fibrosis secondary to pawn chewing. The tongue was large, and only the soft palate could be visualized making it a Modified (Samsoon and Young) Mallampatti Grade III view [3,4,5]. Thyromental distance and neck movements were normal. The patient was administered Inj glycopyrrolate 0.2mg IM 30min prior to anesthesia. Inj ondansetron 4mg IV, Inj ranitidine 50mg IV inside the operation theatre; as premedication. He was connected to all non invasive monitors; pulse oximeter, ECG, EtCO<sub>2</sub>, NIBP. A urinary catheter was in-situ as the patient had bladder incontinence. As difficult intubation was anticipated, a low dose fentanyl (50mcg) was administered and later the patient was induced with propofol. Trial ventilation was attempted before giving a muscle relaxant. As trial ventilation was possible with the aid of Guedel's Airway, the patient was mask ventilated with 50% O<sub>2</sub> in N<sub>2</sub>O and 1% sevoflurane for two minutes after administering vecuronium. Further ventilation with 100% oxygen for one minute was accomplished before attempting intubation.

Direct Laryngoscopy revealed only the tip of epiglottis to the view (Cormack and Lehane Grade III)[5]. Intubation was attempted with the 37Fr left DLT, but failed. Later the patient was mask ventilated again with 100% oxygen and successfully intubated with an 8.5 cuffed SLT with the aid of a 15Fr Gum Elastic Bougie which has an atraumatic coude tip that can reduce the potential risk of trauma

In our case, since the surgeon requested for the provision of an adequate surgical field in view of location of the spinal lesion, lung isolation was contemplated. Hence the single lumen tube was pushed into the right bronchus and fixed at 27cms. Lung isolation was achieved with endo bronchial intubation, but the right upper lobe ventilation was compromised to some extent. Oxygen saturation could be maintained at 91-92% with 2% sevoflurane in oxygen (avoiding nitrous oxide). The airway pressure was relatively higher than expected for ventilation with single lumen tube (15-16cm H<sub>2</sub>O) in a paralysed patient.

We did not want to take any risk since there was a possibility of further desaturation during surgical procedure. And in that event, there was no provision for ventilation of both lungs without disturbing the lung isolation; hence we resorted to a trial of bougie guided double lumen intubation.

For this we selected right sided 37Fr DLT as it would be easier to negotiate a right main bronchus which has straighter course and lesser angulation than left one. As the length of 37Fr right sided DLT was 10 -12 cm more than

their single lumen counterparts (30-32cm vs 42-44cm) a prior checking of adequacy of the length of the bougie was done. The ease with which a double lumen tube could be threaded on a 15Fr bougie was also checked prior to intubation.

The gum elastic bougie (70cms) was lubricated well with lignocaine jelly, the stylet from the bronchial lumen of the DLT was removed and the DLT was threaded over the bougie through its bronchial lumen. A lubricated 37Fr right DLT was easily maneuvered into the right bronchus with bougie in situ. The bougie was withdrawn and cuff inflated. The position of the double lumen tube was confirmed clinically by auscultation and also by connecting to EtCO<sub>2</sub>. There was no smaller diameter fibre optic bronchoscope in our institute to confirm isolation of lung. Lung isolation was successfully achieved by clinical assessment. Lung separation during the procedure was found to be excellent with no desaturation. We ensured that the double lumen tube is fixed at the same distance of 27 cm where we could achieve lung isolation with SLT in the initial setting. Oxygen saturation was maintained well between 98-100%, with the use of 50% oxygen in N<sub>2</sub>O and 1% sevoflurane. Mean airway pressures were less than endo bronchial single lumen intubation (10-12cm H<sub>2</sub>O). The advantage of ventilating both lungs remained until there was surgical requirement. Ventilation of both lungs could be further accomplished after the crucial steps of anterior spinal fusion are completed. Oxygen saturation was well maintained throughout the procedure and hemo-dynamics were stable too. Intra-operative period was uneventful as the isolation was found to be excellent.

### **DISCUSSION**

Historically, double lumen intubation was done only for preoperative assessment of pulmonary function in the cases planned for pneumonectomy. Of late the indications for lung isolation have increased enormously. Various isolation techniques were introduced for achieving single lung ventilation[1].

1. Conventional single lumen endo-bronchial tubes
2. Bronchial blockers through SLT or Univent tubes
3. Double lumen tubes (Eric Carlens)

In emergency situations like airway trauma, massive haemoptysis, tension pneumothorax and in some cases of difficult airway, single lumen tubes are used which are deliberately introduced into either of the main bronchus. Endo bronchial single lumen tubes can be still considered a viable option for lung isolation.

Bronchial Blockers are becoming increasingly sophisticated and range from long used Fogarty embolectomy catheter, to the more recently developed wire guided endo-bronchial blocker (Arndt blocker). These devices however lack versatility and spectrum of therapy that can be delivered through a DLT including toilet of the blocked lung and differential ventilation.

Of the various tools available for one lung ventilation, the gold standard is a DLT. Placement of a DLT is more complicated than that of a standard tracheal tube because the DLT is larger in diameter, longer and has a more fixed shape. Moreover, rupture of the proximal endotracheal cuff of the DLT may occur during difficult intubation because the thin walled cuff is located 8-11 cm from the tip of the DLT, where it can easily be torn on maxillary teeth.

Intubation using direct laryngoscopy is usually successful in the majority of the patients, even when a line-of-sight view of the glottis is not possible. Although poor glottic visualization is encountered between 1.5-8.5% of attempts, success can generally be achieved with additional force, external laryngeal manipulation, and the use of airway adjuncts.

Flexible fibreoptic devices are well suited for many settings where a line-of-sight view cannot be achieved. Other aids like the video laryngoscope (Glidescope), fibre-optic laryngoscope (Wuscope) or the rigid fibre-optic laryngoscopes may be used successfully in anticipated difficult airway.

If the patient has a difficult airway, awake intubation with fibreoptic bronchoscope of appropriate size can be attempted with Univent tube, DLT or with SLT under airway anaesthesia. We have rich experience in the technique of awake intubation with double lumen tube for various indications, though the data remained unpublished.

Villalonga et al have reported a case describing the use of 6mm bronchoscope for left endobronchial SLT and then using a Cook Airway Exchanger to guide a No. 39Fr left DLT through the bronchus. [6] Airway exchange catheters are thin long hollow tubes which are depth marked, commercially available in a variety of sizes. They can be adapted for insufflation of O<sub>2</sub> as well as monitoring of ETCO<sub>2</sub>.

Salazar, E et al under airway anaesthesia introduced an eschmann guide through bronchial lumen of double lumen tube and kept ready. Using Airtraq optical laryngoscope, glottic vision is obtained and eschmann guide is passed through the vocal cords. DLT is advanced until bronchial cuff passes through the cords under direct vision. Guide is

withdrawn and correct position of DLT checked with capnography and auscultation. [7] Later fibreoptic bronchoscope is used to check the position of DLT. R. Satya-Krishna and M. Popat initially resorted to nasotracheal intubation achieved under topical airway anaesthesia using a 6.0-mm nasal RAE tube mounted on to an Olympus LF-2 intubation laryngoscope. Anaesthesia was then induced with propofol and vecuronium, and maintained with 66% nitrous oxide and 1% isoflurane in oxygen. A 35-Fr left sided 'Bronchocath' double lumen tube was mounted on to the LF-2 intubation laryngoscope and oral fibreoptic endoscopy was performed. The laryngoscope was then passed alongside the nasal tube into the trachea. When the cuff of the tube was encountered, the cuff was manually deflated and the tip of the laryngoscope was advanced to lie in the left main bronchus. The nasal tube was withdrawn from the trachea and left in the nasopharynx, while the double lumen tube was railroaded into position. The final position of double lumen tube was confirmed by fibreoptic inspection and auscultation. [8]

Arai et al have similarly described intubation with a double lumen tube in patients with difficult airway using endoscope mask, fibreoptic bronchoscope and a tracheal tube guide. [9] Laplace et al have also described lung separation after re intubation with a DLT over an airway exchange catheter in patient with multiple trauma presenting with massive haemoptysis.

R.Sareen et al were successful in placing DLT with the help of an airway exchange catheter in the trachea after which the catheter was removed and the stylet reinserted to guide the bronchial lumen of the DLT in the left bronchus. [10]

It might be argued that reinserting and guiding the DLT with the stylet is traumatic to the tracheobronchial tree. Liberman et al concluded that retaining the stylet for the entire intubation procedure allows for a more rapid and accurate placement of the DLT without increasing the incidence of tracheo bronchial mucosa injury. [11] But the original technique dictates us to remove the stylet after the bronchial cuff crosses vocal cords and enables anaesthesiologist to reach the respective bronchus by turning the tube to 90°. Our technique is slightly modified compared to that of R.Sareen et al. A 15Fr, 75cm long gum elastic bougie was used for the insertion of a 37Fr right double lumen tube in a thoracic spine surgery case for selective lung ventilation.

Airway exchange catheter would have been our choice of 'intubating aid' as there is an advantage of ability to oxygenate the patient throughout the procedure of securing

the airway and also monitoring EtCO<sub>2</sub> if it were available. But the advantage of using a bougie lied in that, it is almost as stiff as the stylet of right sided double lumen tube and rail-roading this bulkier tube was easier and less traumatic than with a stylet. Another crucial decision in achieving successful lung isolation in this case was selection of right sided double lumen tube instead of left DLT. For obvious reasons that, the right main bronchus has straighter course and leaves the carina with less angle, the technique of manoeuvring did not need any expertise and the reason that the lung isolation was already achieved with single lumen tube made our attempts successful.

## **CONCLUSION**

Our experience prompts us to recommend it as an alternative method for DLT placement where direct visual aids and/or bronchial blockers are not available when separation and isolation of lungs is a pre requisite. The non availability of fibre optic devices as well as dearth of training in using them directed us to proceed with this simple technique.

Our technique proves to be cost effective in limited settings where the modern gadgets are not available. However the introduction of DLT over a gum elastic bougie has its own limitations as there may be an error of judgement in positioning the tube in the targeted bronchus. Use of fibre optic bronchoscope is the gold standard of confirming the position of the DLT. Therefore the technique of introducing a DLT over bougie can be considered to be one of the alternatives in a case of difficult airway to achieve lung isolation. It also requires skill and experience in one lung anaesthesia to follow this technique. Despite its own limitations it can be recommended to be followed in limited

settings. However, it cannot replace the time tested methods and may not be an indispensable technique.

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