# LEFT DOUBLE LUMEN ENDOTRACHEAL TUBE: BRONCHOSCOPIC FINDING AFTER CONFIRMATION OF CORRECT POSITION OF TUBE WITH AUSCULTATION

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## ABSTRACT

***Objective:*** To determine the frequency of malposition of left sided double lumen endotracheal tube with fiber-optic bronchoscope after its correct positioning by auscultation.

***Study Design:*** Prospective observational study.

***Place and Duration of Study:*** Main operation theater, Combined Military Hospital, Rawalpindi, from Jul 2015 to Dec 2016.

***Methodology:*** After approval from ethical review committee and consent, 90 patients with American Standards Association (ASA) II and III status were included in study by consecutive sampling. Proper monitoring attached and patients were premedicated. After induction of general anesthesia left sided double lumen tube was inserted by direct laryngoscopy. After inflation of cuffs, auscultation was done to determine correct position of tube. Then position of tube was confirmed by fiber optic bronchoscope.

***Results:*** The mean age was 38.13 ± 15.43 years and 66 (73.3%) males. In all the patients, auscultation showed that the left sided double lumentube were in the correct position with adequate ventilation of left upper and lower lobes. However, flexible bronchoscopy showed that double lumentubes had been placed correctly in only 54 (60%) cases, while 36 (40%) cases had partially misplaced double lumentubes. Out of these 36 cases, 26 (72.2%) had distally malpositioned double lumentube and 10 (27.8%) patients had proximally displaced double lumentube.

***Conclusion:*** Auscultation was found an unreliable method for confirmation of correct position of double lumentube and fibreoptic bronchoscope should be used for the confirmation of correct position of double lumentube for better anesthetic management in one lung ventilation.

**Keywords:** Auscultation, Accurate position, Bronchoscopic findings, Double lumen endotracheal tube.



## INTRODUCTION

One lung ventilation (OLV) or the intentional collapse of the lung on the operative side is necessary to allow for proper visualization of operative field for video assisted thoracoscopic surgeries and a wide variety of thoracic procedures[1]. Double lumentube (DLT), most common method of lung separation and OLV, is a type of endotracheal tube which is made of two coaxial tubes with separate channels and two separate opening[2]. There are anatomical differences between right and left bronchus. The right main bronchus is at more acute angle and is 1-2cm longer. The left main bronchus is approximately 5cm long where it bifurcates into left upper and lower lobe bronchi. This anatomical difference has resulted in use of different tubes for left and right sided one lung ventilation. Due to the considerable variation in the right bronchus anatomy, the use of right sided tube may introduce considerable risk of inadequate right upper lobe ventilation. Therefore, routine use of right sided tube is not recommended in thoracic surgery requiring one lung ventilation, except in left pneumonectomy, left lobectomy, descending thoracic aortic aneurysm, external or intraluminal tumor resection and left lung transplantation[2]. Left sided double lumen endotracheal tube is used for right sided lobectomies; right and left decortication; right pneumonectomy and thoracoscopic mediastinal surgeries.

Proper placement of DLTs requires considerable clinical experience and various

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techniques for their insertion having been developed[3]. There is no fail safe method for placement of DLT, the choice between conventional Macintosh versus bronchoscope or video-assisted laryngoscope depends upon the operator experience and expertise[4,5]. Until recent years, confirmation of double lumen endotracheal tube position was limited to clinical assessment by inspection and auscultation. Fiberoptic bronchoscope can be used for placement and later confirmation of correct position of double lumen endotracheal tube[6]. The aim of this study was to determine the fiberoptic bronchoscopic findings in left sided double lumen endotracheal tube after its correct positioning by auscultation.

## METHODOLOGY

This prospective observational study was conducted at the main operation theater, Combined Military Hospital, Rawalpindi. Approval from hospital ethical committee was obtained. Sample size was calculated with WHO calculator by keeping the confidence level 95%, absolute precision of 11% and anticipated population proportion 54%[7]. Sample size obtained was 79 but we included 90 patients in our study. After taking written informed consent, patients of both genders, between the age of 18 to 70 years and ASA physical status II-III, undergoing elective thoracic surgery were included in our study by consecutive sampling. Patient with anticipated abnormal airway anatomy, with severe cardiac or respiratory compromise were excluded from study. These patients required one lung ventilation for thoracic surgery with one lung collapse for facilitation of surgery. Monitoring with heart rate, non-invasive blood pressure, end tidal carbondioxide, oxygen saturation, temperature, invasive blood pressure and central venous pressure was done[8]. Premedication was done with IV dexamethasone 0.1mg/kg, metoclopramide 0.15 mg/kg and nalbuphine 0.1mg/kg. Inductinon and muscle relaxation was done with propofol 1.5 mg/kg and IV atracurium 0.5mg/kg respectively. Then patients were intubated bylaryngoscopy with DLT, according to the size and gender of the patient (32, 35 or 37 Fr). Once the tube was in place the bronchial and tracheal cuffs were inflated and tube fixed. The position was initially confirmed by auscultation. Then a 2mm fiberoptic bronchoscope was inserted first through the tracheal lumen to visualize the right main bronchus and the endobronchial cuffin the left bronchus; and then through the bronchial lumen to visualize the left upper and lower lobe bronchi. Both the auscultation and bronchoscopy was done in supine position. The incidence of malposition as well as the position of the endobronchial cuff and the adjustment that was done were recorded. Collected data was analyzed by SPSS 16. Qualitative values like gender, size of tube, surgery performed and frequency of malposition were represented as frequency and percentage. For qualitative values like age mean ± standard deviation were calculated.

A left sided DLT position was considered optimal when bronchial cuff was immediately below carina and there was clear visualization of left subcarina with unobstructed upper and lower bronchi. DLT was considered partially malplaced if it required to be moved more than 0.5cm to correct its position[9]. The distance of the malposition was taken as the length the double lumen endotracheal tube had to be moved (either distally or proximally) to bring it to the optimal position, using fiberoptic bronchoscope. Data was analysis using SPSS-20.

## RESULTS

Total patients included in study were 90. The mean age amongst the subjects was 38.13 ± 15.43 years. 66 (73.3%) were males. The demographic distribution of the patient population is tabulated as table-I.

In all the patients, auscultation showed that the left sided DLT were in the correct position with adequate and equal ventilation of left upper and lower lobes. However, flexible bronchoscopy showed that DLTs had been placed correctly in only 54 cases (60%), while 36 cases (40%) had partially misplaced DLTs. Out of these 36 cases, 26 (72.2%) patients had distally malpositioned DLT (cuff visible approximately 1.5 ± 0.5 cm

inside left main bronchus) and 10 (27.8%%) patients had proximally displaced DLT (endobronchial cuff partially visualized at the carina and partially obstructing it). The position of the tube was adjusted accordingly under bronchoscopic vision. None of the patients had any complication of malpositioned DLT. The results have been shown as fig-1.

**Table: The demographic distribution of the patient population.**

| Variable | Values | |
|---|---|---|
| Age | Mean ± SD | 39.08 ± 15.57 |
| Gender | Male | 66 (73.3%) |
| | Females | 24 (26.7%) |
| DLT size | 32 Fr | 5 (5.6%) |
| | 35 Fr | 28 (31.1%) |
| | 37 Fr | 57 (63.3%) |
| Type of surgery | Right pneumonectomy | 5 (5.6%) |
| | Thoracoscopic surgery | 34 (37.8%) |
| | Thoracotomy | 51 (56.7%) |

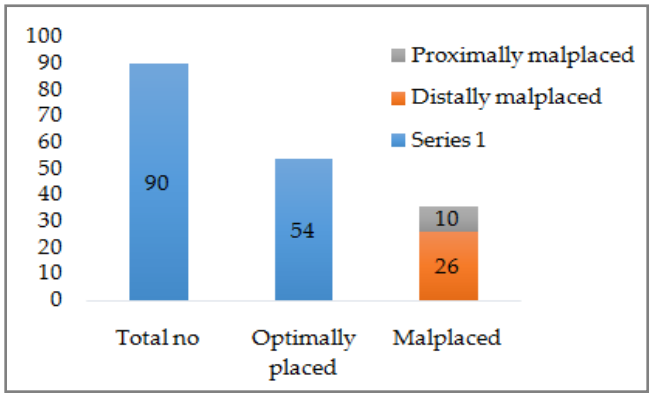


**Figure-1: Placement of Double Lumentube.**

## DISCUSSION

We studied the bronchoscopic findings in left double lumen endotracheal tube which had correct position of tube confirmed by auscultation. With the advancement in technology, video assisted thoracoscopic surgeries are becoming more and more common with improved patient outcomes due to enhanced peri-operative anesthesia care. This is directly related to optimal one lung ventilation. Three methods are more usually used for this purpose: endotracheal tube with bronchial blocker, double lumen endotracheal tube (DLT) and single lumen endobronchial tubes[10]. Currently, DLT is more commonly used for OLV in major thoracic surgical centers. Amongst the DLTs used, the Carlens and the Robertshaw tubes are most commonly used[2]. In OLV, it is crucial to confirm the correct position of DLT both immediately after intubation and after any change in position of the patient. Malposition can result in complications. Complications include hypoxia, airway pressures greater than 40mmHg, air trapping, poor lung isolation and airway trauma[11,12]. The margin of safety is small when positioning left sided DLT (16-19 mm) and it is even smaller when positioning right DLT (1-4mm)[13]. Length of right main stem bronchus is shorter and take off of right upper lobe bronchus is at 1.5 to 2cms while left main bronchus is approximately 5cm long where it bifurcates into left upper and lower lobe bronchi. A gross malposition of DLT is usually detected by the anesthetist without the need of bronchoscope. However, despite the positive confirmation of correct position of DLT by auscultation, partial but clinically significant malposition

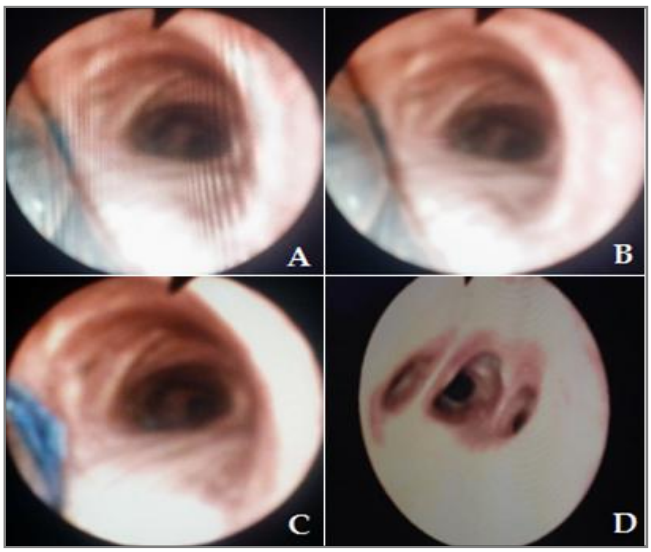


**Figure-2: View through tracheal lumen with "A" shows an ideal position of Left sided DLT, "B" shows distally malplaced DLT, "C" shows a proximally malplaced left sided DLT, "D" shows the fiberoptic view through the right main bronchus showing the opening of right anterior, posterior and apical bronchus.**

maybe present. To confirm correct position of left DLT fibreoptic bronchoscopy is first performed through tracheal lumen. The visualization of the right bronchus with its three opening (apical, middle and lower lobe bronchi) confirms that the tracheal lumen lies within the main bronchus and not left bronchus; as shown in figure number 2d. The radiopaque marker of endobronchial tube should be visible just above carina[14]. The blue endobronchial cuff should be visible 5mm below tracheal carina in left bronchus. Then fibreoptic bronchoscopy is performed through endobronchial lumen to identify patent orifices of both upper and lower lobe. A flexible fiberoptic bronchoscopy examination can be used before, during placement, and at the conclusion of the use of DLTs[15].

According to our study amongst the 90 patients who had correct left sided DLT position according to auscultation; 36 were found to have partially malpositioned DLT on bronchoscopy. Of these distal malposition was more common than proximal displacement. None of our patients experienced any complication due to inadequate ventilation after repositioning of DLT with fibreoptic bronchoscope. The bronchoscopic confirmation of position of left sided DLT has become routine in our institute; both after intubation and after any change of position of the patient. The ideal, distal and proximal malplacement was shown in fig-2.

A study done by Brodsky showed that when left sided DLT was used for OLV, 49% had malposition of DLT after patient positioning and 32% had malpositioned DLT during OLV[16]. In study done on two hundred patients having thoracic surgery requiring DLT (either left or right) showed that 79 patients (39.5%) had malpositioned DLT as judged by bronchoscopy despite adequate ventilation on auscultation[17]. Similar results were found by de Belles *et al*. who studied 144 patient over a period of nine months. They found that 33% of double lumen tubes required repositioning by means of flexible bronchoscopy, despite positive evaluation made by auscultation[18].

## CONCLUSION

Optimal one lung ventilation depends upon optimal positioning of the tube and auscultation was an unreliable method for confirmation of DLT position. In our study more than one third of patients had incorrectly placed double lumen tube. Fibreoptic bronchoscope should be used for the confirmation of correct position of DLT for better anesthetic management in thoracic surgeries requiring one lung ventilation.

## CONFLICT OF INTEREST

This study has no conflict of interest to be declared by any author.

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