# Bevel Position and Its Effect on Success of Intubation Through Intubating Laryngeal Mask Airway

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**Background**: The bevel position of tracheal tube (TT) affects the success rate while using intubating laryngeal mask airway (ILMA). The present study compared the success of intubation on the basis of anterior and posterior position of the bevel of conventional polyvinylchloride (PVC) tracheal tube through an ILMA. **Methods**: Two hundred adult ASA I or II patients, having Mallampati class 1 or 2 airway, and undergoing elective surgery under general anesthesia were included in the study. Patients were randomized in two groups based on anterior or posterior bevel position while intubating. If proper tracheal position was established within 3 insertion attempts tracheal intubation was considered successful. **Results**: Successful tracheal intubation was achieved in 191/200 patients (95.5%). There was higher first attempt success rate in bevel anterior group (88.6% vs 65.5%, relative risk ratio 1.418, 95% C.I. 1.18-16.8; p= 0.00006). There was similar overall success rate between the bevel anterior and posterior groups (97.0% vs 94.0%, relative risk ratio 1.03, 95% C.I. 0.97-1.10; p=0.5). **Conclusion**: Tracheal intubation was successful in 95.5% of patients through an ILMA using PVC tracheal tube. Success rate of intubation was similar in both the groups. Bevel anterior group had higher success on first attempt intubation.

**Keywords**: Intubation, laryngeal mask, tracheal tube, Bevel Position-tracheal tube, bevel position

## Introduction

The "intubating laryngeal mask airway (ILMA)" is designed for guiding tracheal intubations.[1] Reusable Fastrach silicon wire-reinforced tube was designed for tracheal intubation through an ILMA but it is relatively expensive whereas the disposable conventional polyvinyl chloride (PVC) tracheal tubes (TT) are cheaper, and readily available. The conventional TT can be used for intubation through the ILMA as shown in many studies.[2,3,4] With fiber optic intubation it was noticed, while railroading the vocal cords or arytenoids sometimes catches on the TT tip. To overcome it pulling back the TT and rotating it 90° counterclockwise or clockwise helps the process.[5] Therefore it is hypothesized that keeping the bevel anterior or posterior while intubating through an ILMA might improve the first attempt success rate. The present study aims to compare the effect of the bevel position (bevel anterior and bevel posterior) of the conventional PVC tracheal tube while intubating the trachea through an ILMA.

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## Methods

After approval from the institution ethical committee, 200 patients in ASA (American Society of Anesthesiologist) I and II category who were scheduled for elective surgery under general anesthesia (GA) were included in the study. Written and informed consent was obtained from all patients. Following patients were excluded 1) BMI

> 35 kg/$m^2$ 2) respiratory tract pathology 3) limited mouth opening (incisor gap < 2cm), 4) high risk of aspiration and 5) anticipated difficult airway. The patients were randomized into two equal sized groups (n=100 each) using Sequentially numbered, opaque, sealed envelope (SNOSE) method into group A (bevel anterior) or group P (bevel posterior) depending on the intended position of bevel of TT at the level of epiglottic elevating bar. Before ILMA placement, the TT was passed through it and the tube was marked at the point where its tip just lifted the epiglottic elevating bar. Patients were pre-medicated at night before surgery with oral diazepam 5 mg and ranitidine 150 mg, a repeat dose of premedication was given in the morning of surgery and 8 hour fasting was advised. In the operation theater routine monitors were attached, patients were pre-oxygenated with 100% oxygen. Anesthesia was induced using 2 µg/kg fentanyl, 5 mg/kg thiopental and 0.1 mg/kg vecuronium was used for muscle relaxation. The ILMA was inserted after 4 minutes of bag and mask ventilation. For patients weighing <50 kg, a 7.0 mm ID PVC endotracheal tube via a size 3 ILMA was used. For patients weighing >50 kg, a 7.5 mm ID PVC endotracheal tube via a size 4 ILMA was used. The ILMA was inserted by the first author (MM), and the cuff was inflated with air (approximately 20 ml in size 3 & 30 ml in size 4). Optimal ILMA position was confirmed by chest wall movement and normal capnogram trace during gentle manual ventilation. ILMA was removed and re-inserted if ventilation was not satisfactory. Conventional PVC TT (Portex) was inserted after lubrication with water soluble jelly with the normal curvature till the mark. The tube was then rotated 90° clockwise or anticlockwise to make the bevel orientation anterior (group A) or posterior (group P) respectively and then gently advanced into the trachea. Successful endotracheal intubation was confirmed by a normal capnogram. The ILMA was removed after successful intubation leaving the tracheal tube in situ. Total intubation attempts were limited to three per patient. In the first attempt no maneuver other than rotation was performed. During the second and third attempts Chandy's[6] and UpDown[1] maneuver were performed respectively. Failed attempt at intubation was considered if any of the following is present:

1) The tracheal tube could not be advanced more than 3cm,
2) The tracheal tube was advanced more than 3cm but there was no capnograph trace
3) Oxygen saturation was <90%.

The trachea was intubated by conventional direct laryngoscopy after 3 failed attempts.

The following parameters were noted: total number of attempts taken to achieve successful intubation in anterior and posterior bevel position, the time needed to intubate the trachea (time from disconnection of breathing circuit of the ILMA to confirmation of TT placement by capnography), the total intubation time (from the start of ILMA insertion to the confirmation of TT placement by capnography), number of times TT slipped into esophagus and the number of maneuvers performed. In addition, the number of failed intubations was also noted. Heart rate, blood pressure, oxygen saturation ($SpO_2$) and end tidal carbon dioxide ($EtCO_2$) were recorded. (Baseline and then every minute till 10 minutes). The presence of blood on the TT was also noted. Sore throat was documented at 2 hours and 24 hours after surgery using an unmarked visual analogue scale of 100 mm (VAS).

Student's unpaired t-test was used for continuous variables. Chi-square analysis was used for comparing nominal data. $P < 0.05$ was considered statistically significant. The SPSS Version 17.0 was used to analyze the data.

**Results**

The demographic characteristics of the patients were similar between the two groups. The ILMA was placed successfully in all patients. Clinical data

studied in two groups are presented in Table 1. Trachea was successfully intubated in 191 (95.5%) of 200 patients. In 9 (4.5%) patients 3 attempts of intubation through ILMA failed and these were

***Table 1:*** *Clinical Data Studied in two groups*
*ILMA = Intubating laryngeal mask airway; VAS = Visual analog scale; *p<0.05*

| Variable | Group A(n=100) | Group P(n=100) |
|---|---|---|
| Attempts at ILMA placement (mean±SD) | 1 ± 0.2 | 1.1 ± 0.3 |
| Attempts at intubation [n (%)] | | |
| One | 86 (86) | 61 (61)* |
| Two | 6 (6) | 18 (18) |
| Three | 5 (5) | 15 (15) |
| Total | 97 (97) | 94 (94) |
| Time needed to intubate the trachea (mean±SD) | | |
| Tracheal tube insertion time | 9.0 ± 13.9 (n=97) | 17.1 ± 21.4 (n=94)* |
| Total intubation time | 25 ± 17.2 (n=97) | 35.5 ± 24.3 (n=94)* |
| Maneuver performed during attempts | | |
| Total (n) | 16 | 40 |
| Mean ± SD | 0.3 ± 0.8 | 0.8 ± 1.1* |
| Failed intubation [n (%)] | 3 (3) | 6 (6) |
| Esophageal intubation [n (%)] | 5 (5) | 5 (5) |
| Blood on tracheal tube [n (%] | 5 (5) | 3 (3) |
| Sore throat (VAS > 3) [n (%)] | | |
| 2 hours | 7(7) | 16 (16) |
| 24 hours | 1 (1) | 7 (7)* |

intubated using conventional direct laryngoscopy. Ninety-Seven patients (97%) in group A and 94 patients (94%) in group P were successfully intubated after three attempts (Relative risk ratio 1.03, 95% C.I 0.97-1.03; p=0.5). Group A had higher success rate of first attempt intubation than in group P (Relative risk ratio 1.418, 95% C.I. 1.18-16.8; p=0.00006). The mean intubation attempts were 1.1±0.5 in group A and 1.4±0.8 in group P. (Student's t test; p = 0.003; mean difference -0.29 and 95% CI -0.4 to -0.09). Significantly a greater number of maneuvers were performed to achieve successful tracheal intubation through ILMA in group P (Student's t test; p = 0.001; mean difference -0.50 and 95% CI -0.78 to -0.21). Significantly more time was needed for intubation in group A as compared to group P (Student's t test; p = 0.001, mean difference -9.93 and 95% CI from -15.82 to -4.03).

There were 10 esophageal intubations during the 255 attempts of tracheal intubation using ILMA.

Incidence of trauma was 4.0% and was comparable between the two groups (p=0.470). The incidence of sore throat at 2 hours and 24 hours after surgery was 11.5% and 4.0% respectively. Sore throat was more frequent in group A than in group P (p=0.046 at 2 hours, and p=0.030 at 24 hours). Hemodynamic variables, mean increase in $EtCO_2$ and the lowest recorded $SpO_2$ were comparable between the two groups.

**Discussion**

This study reaffirms the previous studies and shows that tracheal intubation using easily available, less expensive, conventional PVC tracheal tubes via an

ILMA is safe and feasible. There was no difference in overall success rate of anterior and posterior bevel position but in bevel anterior group the success rate for intubation at first attempt was higher as compared to the bevel posterior group.

We used PVC tracheal tube because they are readily available, less expensive and disposable as compared to "Fastrach" silicone wire reinforced tube which is expensive and therefore not cost effective. Previous studies found 99% and 95% success rate of intubation respectively using ILMA.[2,7]This is similar to the study conducted by Kanazi et al[8] and the present study.

Kundra and colleagues in their study compared "Fastrach silicone wire reinforced tube", Rush PVC tube, and Rush latex armored tube. All tubes were used in normal orientation. The reported success rate was 96% within two attempts with all the tubes.[3]There was 96.7% success rate of intubation in another study conducted by Joo and Rose with reverse orientation using conventional PVC tracheal tubes.[9]

Lu et al in their study compared normal and reverse position of conventional tracheal tube while intubating through ILMA. They found a similar overall success rate with both positions (96.7% and 94.2% respectively) but reverse group had a higher first attempt success rate as compared to the normal orientation group (86.7% vs 75.0% respectively).[4]

In the present study, along with the overall intubation success rate (97% vs 94%), bevel anterior group has higher first attempt success rate as compared to bevel posterior group (86% vs 61%).

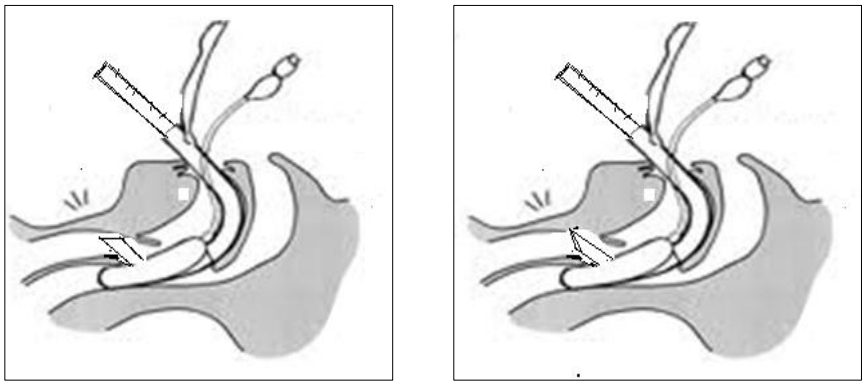
The sore throat incidence for the use of LMA-Classic has been reported as 0-70%.[10] in the present study, sore throat incidence at 2 and 24 hours post-surgery as measured by VAS was found to be 11.5% and 4.0% respectively. In a study conducted by Lu and colleagues[4] incidence of sore throat at 2 and 24 hours after surgery was 17% and 14.2% respectively which is higher than the present study. The increased incidence of sore throat was due to increased number of intubation attempts, failed intubation with ILMA and with traumatic intubation. In the present study, sore throat was found to be more in bevel posterior group and it is also associated with time taken to intubate the trachea.

There was more difficulty in passing the TT through ILMA when its bevel faced posterior. Possible explanation for this difference between two groups may be, when the PVC TT with its bevel facing posterior emerges from the ILMA there is a chance that the tip of the bevel may impinge on the epiglottis, anterior part of larynx, cricothyroid membrane, or trachea thus making the passage of TT into the trachea difficult, whereas when the bevel of TT faces anterior, the tip remains downward and hence there is less chance of impinging (Figure 1).

There are several limitations of this study. This study was conducted in MMP I and II patients, so current findings may not be generalized in all patients. We confirmed the position of ILMA only clinically and didn't perform fiber-optic bronchoscopy so the ILMA position could not be documented

In conclusion, we recommend the use of less expensive, disposable, and readily available conventional PVC tracheal tubes for intubation via ILMA. To achieve a higher success at intubation in first attempt, we recommend that the bevel of TT to be placed anterior while inserting the tracheal tube through an ILMA.

***Figure 1****. Endotracheal tube inserted through intubating laryngeal mask airway and rotated clockwise (left) to make the bevel anterior or anticlockwise (right) to make the bevel posterior*



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