

# ASSOCIATION BETWEEN FACTORS PREDICTING AND ASSESSING THE AIRWAY AND USE OF INTUBATING LARYNGEAL MASK AIRWAY

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## Summary

**Background and objective:** The Intubating Laryngeal Mask Airway Fastrach™ (ILMA) has been used with success in difficult intubation cases. The purpose of this study is to evaluate the effect of mouth opening, Mallampati classification, thyromental distance and Cormack-Lehane Grade, on the ease of ILMA use.

**Methods:** Eighty one patients ASA I-II, were assessed preoperatively for mouth opening, Mallampati classification and thyromental distance. After induction with propofol and rocuronium, the first investigator recorded Cormack-Lehane Grade by direct laryngoscopy. Subsequently an appropriate size ILMA was inserted by the second investigator and correct placement was confirmed by adequate ventilation and normal capnogram. A maximum of three ILMA insertion attempts were allowed and the number was recorded. Then blind intubation was attempted and classified as follows, according to Intubation Difficulty Grade (IDG):

IDG-1: intubation succeeded: at first attempt requiring no or minor ILMA manipulations.

IDG-2: intubation succeeded at second attempt requiring major ILMA manipulations or size change.

IDG-3: intubation failed after the second attempt or oesophageal intubation occurred at either attempt. In failure of the technique direct laryngoscopy was the alternative approach.

**Results:** Success rates in insertion of ILMA and in blind intubation were 100% and 92.6% respectively. No difference was found between Cormack-Lehane Grade I-II and II-IV or Mallampati classification and number of ILMA insertion attempts or IDG. There was also no correlation between mouth opening, or thyromental distance and number of ILMA insertion attempts or IDG.

It is concluded that easiness of ILMA use is irrelevant to mouth opening, thyromental distance, Mallampati classification or Cormack-Lehane Grade.

**Key words:** Airway devices; Intubation Laryngeal Mask Airway Fastrach, Airway assessment; Mallampati Classification, mouth opening, thyromental distance, Cormack-Lehane Grade.

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## Introduction

In contradiction to the classic Laryngeal Mask Airway (cLMA), the Intubating Laryngeal Mask Airway Fastrach™ (ILMA), can be used for ventilation, allowing blind or fiberoptic intubation through the device. The specific design characteristics of the ILMA permits its insertion with the patient's head in neutral position, without guidance by the fingers into patient's mouth and with the practitioner not necessarily positioned behind the patient's head. Those features render the ILMA a valuable airway device in the operating room as well as in emergency medical units<sup>1,2</sup>.

Although insertion and placement of the classic LMA has not been associated with prediction or assessment of a difficult airway<sup>3,4</sup>, there is evidence that easiness of ILMA use is inversely related to difficult airway<sup>5</sup>. Indeed intubation with the ILMA has achieved high success rates in patients with difficult intubation<sup>6</sup>, or were traditional techniques to intubate have failed<sup>7</sup>.

Nevertheless no study has evaluated a possible association between airway assessment and easiness of ILMA use in general population. In this study we investigated the possible impact of mouth opening, Mallampati classification, thyromental distance and Cormack-Lehane grade, on ILMA insertion and blind intubation.

## Materials and Methods

Following approval of the Hospital Ethics Committee and obtaining patient's informed consent, 81 adults (13 males, 68 females), ASA I-II, scheduled for surgical procedures under general anesthesia with tracheal intubation were recruited for the study. Exclusion criteria were mouth opening less than 2.5 cm, oropharyngeal pathology and risk of regurgitation.

Preoperatively, an anesthesiologist ignorant of the study to be undertaken, assessed mouth opening, Mallampati classification (Class I-IV) and thyromental distance.

Mallampati classification was assessed, while the patient was sitting with the mouth wide open and the tongue protruding without phonating<sup>8,9</sup>.

Mouth opening was considered as the width of the interincisor gap at midline (expressed as number of anesthesiologist's fingers fitting in the gap)<sup>10</sup>.

Thyromental distance was defined as the distance in cm, measured from the thyroid cartilage to inside of the mentum, while the patient was sitting with the head extended and the mouth closed<sup>11</sup>.

In the operating room, standard monitoring, consisted of ECG, pulse oximetry, non-invasive blood pressure measurement, gas analyser and side spirometry (Datex-Ohmeda S/5™ Anesthesia Monitor, Helsinki, Finland). After inserting an 18G venous catheter, Ringer Lactate infusion was started and ranitidine 50 mg and metoclopramide 10 mg IV were given.

All patients were preoxygenated for 5 minutes with 100% O<sub>2</sub>. Anesthesia was induced with propofol 2.5 mg/kg and fentanyl 2 µg/kg and rocuronium 0.6 mg/kg, provided face mask ventilation was feasible.

Two staff anesthesiologists participated in the study. The first anesthesiologist by direct laryngoscopy using a Macintosh blade 4 without external maneuver<sup>2</sup> evaluated in all patients Cormack-Lehane Grade as:

Grade I (full view of the glottis).

Grade II (glottis partially exposed).

Grade III (only epiglottis seen).

Grade IV (epiglottis not seen).

At completion of laryngoscopy, face mask ventilation was applied again providing 3-5 inflations of 100% oxygen.

Then with the patient's head in neutral position, a second anesthesiologist, having an experience of more 50 successful ILMA uses and standing behind patient's head, attempted to insert in all patients, the appropriate size of ILMA (ILMA™, Laryngeal Mask Airway Company, UK): (size 3 if body weight less than 50 kg, size 4 if body weight between 50 and 70 kg and size 5 if body weight more than 70 kg).

Correct insertion of ILMA, was confirmed by easy bag ventilation without audible leak (at peak airway pressures up to 20 cm H<sub>2</sub>O) and by a normal capnogram. A maximum of 3 ILMA insertion attempts was allowed and the number of attempts was recorded. Manual ventilation by face mask with 100% O<sub>2</sub> and additional boluses of propofol (20-40 mg) were given

to maintain an adequate level of anesthesia between ILMA insertion attempts.

After successful insertion, blind intubation of the trachea was attempted by the same anesthesiologist, with a wire-reinforced, silicone, cuffed tracheal tube specially designed for the ILMA. A 7, 7 or 7.5 and 7.5 or 8 mm ID tube was used for 3, 4 and 5 size ILMA respectively. Attempts for blind intubation were classified by the Intubation Difficultly Grade (IDG) as follows:

IDG-1: successful blind intubation at first attempt without any or after minor manipulation of the ILMA, to optimize the position of the ILMA.

IDG-2: successful blind intubation at second attempt after further manipulation of the ILMA (the ILMA was withdrawn a few cm without deflating the cuff and repositioned: “up-down” manoeuvre) or size change<sup>5</sup> combined with maneuvers to adjust patient’s position for alignment with the glottis (optimizing head-neck position, applying mild laryngeal pressure). ILMA size change and the up-down maneuver according to the depth (measured from the black transverse marker on the tracheal tube) resistance was encountered. If resistance was at less than 1.5 cm or at more than 4 cm a smaller size ILMA used. If resistance was between 2-4 cm a larger size of ILMA was used. If resistance was between 1.5-2 cm an up-down maneuver was performed.

IDG-3: unsuccessful second attempt for blind intubation or esophageal intubation at either attempt. Between intubation attempts patients were ventilated via the ILMA with 100% oxygen and additional boluses of propofol (20-40 mg) were given to ensure adequate anesthetic depth. If blind intubation failed, direct laryngoscopy was the alternative approach.

Complications such as desaturation (SpO<sub>2</sub><90%), regurgitation or aspiration, severe bronchospasm and oropharyngeal or dental trauma, occurring at insertion of the ILMA or at blind intubation, were recorded.

### Statistics

Data were analyzed using the SPSS 15.0 statistical program (SPSS INC., Chicago, IL, USA). According to Kolmogorov-Smirnov test, age, height, BMI and thyromental distance followed normal

distributions, while Mallampati classification, mouth opening, Cormack-Lehane grade, number of insertion attempts and IDG did not follow normality. Chi square test was used for association between Mallampati classification or Cormack-Lehane Grade and insertion attempts and between Mallampati classification or Cormack-Lehane Grade and IDG. To analyze bivariate correlations between BMI, thyromental distance or mouth opening and insertion attempts or IDG, the Spearman non parametric correlation coefficient was used, corrected for the number of possible correlations. Statistical significance was considered when P<0.05 for Chi Square test and when P<0.016 for Spearman correlation coefficient.

### Results

Patient characteristics are shown in Table 1.

*Table 1*  
*Patients characteristics: Age (yrs), Height (cm), BMI (Kg.m<sup>-2</sup>) and Thyromental distance (cm).*  
*Values are mean (SD). Mallampati, mouth opening (number of fingers),*  
*Cormack Lehane Grade, insertion attempts and IDG.*  
*Values are median (min-max).*

Age (yrs)	53(15)
Height (cm)	165(7)
BMI (Kg.m <sup>-2</sup> )	26(4)
Mallampati	2(1-3)
Thyromental distance (cm)	8.5(1)
Mouth opening (number of fingers)	3(2-4.5)
Cormack-Lehane Grade	1(1-3)
Insertion attempts	1(1-2)
IDG	1(1-3)

The overall rate in successful insertion of ILMA was 100%, (91.4% at first attempt and 8.6% at second attempt).

The overall rate in successful blind intubation with the ILMA was 92.6%. Of the successfully intubated patients sixty three (77.8%) had IDG-1, 10 (12.3%) had IDG-2, and eight (9.9%) patients had IDG-3.

Seventy one patients (71/81) had Cormack –Lehane grade I or II, 10 patients (10/81) had a Cormack-Lehane grade III and no patient had grade IV. The rate in successful blind intubation for patients

with Cormack Lehane grade III was 70% (7/10), with a 60% success (6/10) at first attempt.

Eight of the 81 patients (9.9%) were not intubated with the ILMA at either attempt. Seven of them (7/8) had a Cormack-Lehane grade I or II and were easily intubated under direct laryngoscopy. One patient (1/10) had a Cormack-Lehane grade III and could not be intubated under direct laryngoscopy, despite the use of a gum elastic boogie and the McCoy blade and surgery proceeded with an LMA proseal.

There was no difference between Mallampati classification or Cormack-Lehane Grade and insertion attempts or IDG (table 2). No correlation was found between thyromental distance, or mouth opening and insertion attempts or IDG (table 2).

*Table 2*  
*Insertion attempts and IDG in relation to Mallampati score, mouth opening (number of fingers) thyromental distance (cm) and Cormack-Lehane Grade.*

	<b>Insertion attempts</b>	<b>IDG</b>
Mouth opening (number of fingers)	P= 0.480 r = -0.080	P= 0.219 r = -0.138
Mallampati	P= 0.296 X <sup>2</sup> =2.433	P= 0.698 X <sup>2</sup> =2.205
Thyromental distance (cm)	P = 0.150 r = -0.161	P = 0.214 r = -0.139
Cormack-Lehane grade	P = 0.588 X <sup>2</sup> = 1.936	P = 0.75 X <sup>2</sup> = 5.19

\* P<0.05 for Chi Square (level of statistical significance).

\*\* P<0.016 for Spearman coefficient (level of statistical significance)

Complications, such as desaturation (SpO<sub>2</sub><90%), regurgitation or aspiration, severe brochospasm and oropharyngeal or dental trauma, at insertion of the ILMA or at blind intubation, were not recorded.

## Discussion

According to our results successful insertion of ILMA and intubation with the device has been accomplished in 100% and 92.6% of patients respectively. No relationship was found between factors predicting or assessing difficult airway and easiness of the ILMA use.

Brain et al, found that tracheal intubation with the

ILMA required fewer adjusting manoeuvres in patients with a predicted or known difficult airway<sup>5</sup>. The authors suggested that in those cases anterior placement of the larynx favors blind intubation with the ILMA because of its structure. Combes et al, in a recent study showed that airway management with the ILMA was simpler in obese than in lean patients<sup>13</sup>. Although obesity is related to difficult intubation<sup>14,15</sup>, Cormack-Lehane Grade was not assessed in those patients and the authors suggested less rotating movement of the ILMA in obese patients because of less pharyngeal space, a fact not considered in the definition of difficult airway. Similarly Ferson et al, in a retrospective study found that in 111 patients with a Cormack-Lehane Grade IV, intubation with the ILMA was achieved in 92% of patients and in 63.6% intubation was successful at first attempt<sup>6</sup>. Also, Agro et al, in a prospective study recorded correct insertion of ILMA in 95% of the patients studied and intubation at first attempt succeeded in 74% of the patients<sup>16</sup>. In this study only 6 patients had known or predicted difficult airway.

Our results are in accordance with the results of Roblot et al<sup>17</sup>, who did not detect in women any impact of Cormack-Lehane Grade or of a difficult intubation predicting score (Arne's score) on ILMA use.

Although bedside tests are considered poor predictors of difficult intubation, especially if each of them is used alone<sup>18,19</sup>, we preferred to investigate separately the difficult intubation predictive factors, such as thyromental distance, mouth opening and Mallampati classification, because a possible correlation between ILMA use with each factor could not be revealed, if it was summated in a multifactorial risk score. Also since we decided to assess directly the airway by Cormack-Lehane Grade we thought that at the same time predicting difficult airway was unnecessary. We decided to make up to two attempts for blind intubation since according to Difficult Airway Society (DAS) guidelines up to 4 intubation attempts are allowed in cases difficult intubation is encountered after induction<sup>20</sup>. Similarly Frappier et al, studying obese patients (BMI >40) did not find any impact of Cormack-Lehane Grade on the easiness of ILMA use<sup>21</sup>.

We are aware of the difficulty to study prospectively a systematic effect of difficult intubation

predictive factors and Cormack-Lehane Grade on ILMA use in general population. A limitation of our study is a small number of Cormack-Lehane III or IV grade in general population. Since ILMA appears in the revised ASA guidelines<sup>22</sup> and also in DAS guidelines<sup>20</sup> as an alternative approach to difficult airway, it is important that further studies will delineate our hypothesis, if

ILMA is or is not easier to use in a failed intubation scenario.

In conclusion, under the present study design, ILMA use was not associated with mouth opening, Mallampati classification, thyromental distance, or Cormack-Lehane Grade.

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