



## USEFULNESS OF UPPER LIP BITE TEST IN PREDICTING DIFFICULT LARYNGOSCOPIC INTUBATION

### Anaesthesiology

**Dr.Rajesh.S.R**

Postgraduate, Department of Anaesthesia, Yenepoya Medical College

**Dr.Shruti T Bhandari\***

Assistant Professor, Department of Anaesthesia, Yenepoya Medical\*Corresponding Author

**Dr.Shabnam Ara**

Assistant Professor, Department of Anaesthesia, Yenepoya Medical College

### ABSTRACT

**Background:** Unanticipated difficult laryngoscopy and tracheal intubation always remain a primary concern for an anaesthesiologist. The upper lip bite test (ULBT) is a simple, single, bedside test that can be used preoperatively for evaluation of difficult airway. In this study, we plan to determine the sensitivity and specificity of the Upper Lip Bite Test in predicting difficult laryngoscopic intubation. **Methodology:** A prospective, observational study was conducted in 21 patients posted for surgery under general anaesthesia from January 2020 to February 2020 in our Institution. Preoperatively, airways of the patients were evaluated using ULBT. Difficulty of laryngoscopy at intubation was graded according to the method described by Cormack and Lehane. The preoperative assessment data and the intubation findings were used to determine the accuracy, Sensitivity, specificity, positive and negative predictive values for ULBT. **Results:** The mean age of the patients was  $33.14 \pm 13.21$  years. 10 (47.6%) were males and 11 (52.4%) were females. Two (9.5%) patients were found at laryngoscopy to have difficult intubation. The calculated accuracy, sensitivity, specificity, positive predictive value and negative predictive value of ULBT were 95.2%, 100%, 94.74%, 66.6% and 100% respectively. **Conclusion:** Upper lip bite test (ULBT) is a quick, simple bedside test that is highly accurate, sensitive and specific for predicting difficult intubation.

### KEYWORDS

Difficult intubation, upper lip bite test, predictive tests.

### INTRODUCTION

Unanticipated difficult laryngoscopy and tracheal intubation always remain a primary concern for an anaesthesiologist. Failed tracheal intubation has been identified as one of the most important causes of death or permanent brain damage during anaesthesia. So, expertise in airway management is an important skill and a life line for the anaesthesiologist. The reported incidence of difficult laryngoscopy or endotracheal intubation varies from 1.5% to 13% in patients undergoing surgery.<sup>2,3</sup> The ability to predict a difficult laryngoscopy and intubation during the pre-anaesthetic visit alerts the anaesthesiologist to take precautions and to use an alternative approach to the airway from the very beginning of anaesthesia to decrease the risk and complications of failed tracheal intubation.

Several clinical tests have been proposed for preoperatively identifying patients who may have difficult laryngoscopy and intubation but unfortunately at present, there is still no single test or group of tests that can accurately predict difficulty in laryngoscopy. In clinical settings, the assessment should be simple and convenient to the clinician and thus, the search for a predictive test with ease of applicability, reliability and accuracy of prediction continues.

A new but not much used technique to evaluate for difficult airway and intubation is Upper lip bite test (ULBT).<sup>1</sup> It is a simple, single test that could be used preoperatively to evaluate for difficult airway.

We designed a prospective, observational study to determine the sensitivity and specificity of the Upper Lip Bite Test in predicting difficult laryngoscopic intubation. We hypothesized that the upper lip bite test will predict the difficult laryngoscopic intubation graded by the laryngeal view obtained during direct laryngoscopy according to Cormack and Lehane's classification.

### MATERIAL AND METHODS

This study was conducted in the Department of Anaesthesiology at YENEPOYA MEDICAL COLLEGE HOSPITAL, Mangalore from January 2020 to February 2020. After approval from the Institutional Ethical Committee, a prospective observational study was conducted in 21 patients undergoing elective surgical procedures under general anaesthesia, during January 2020 to February 2020. At 5% level of significance and 5.7 anticipated proportion with 10% of precision the total sample size is <sup>21</sup>.

Patients of either sex in age group of 18-60 years, of American Society of Anaesthesiologists (ASA) physical status 1, 2 and 3, were

included in this study after obtaining written informed consent for including them in this study. ASA Physical status 4 and 5, Patients posted for emergency surgeries, Obese patients with BMI >30 kg/m<sup>2</sup>, Patients with anomalies of face and neck, Pregnant patients and any patients with history of previous difficult intubation were excluded from this study.

On the previous day of surgery, preanaesthetic evaluation was done and Airway assessment was done using Upper Lip Bite Test and documented. Upper lip bite test was assessed with patient sitting, head in neutral position. After a proper demonstration of the test to the patient, ability of the patient to bite his / her upper lip was assessed and graded by the investigator according to the following criteria-

**Table 1: Upper lip bite test classification**

| Upper lip bite test (ULBT) |                                                                 |
|----------------------------|-----------------------------------------------------------------|
| Class-I                    | Lower incisors can bite the upper lip above the vermillion line |
| Class-II                   | Lower incisors can bite the upper lip below the vermillion line |
| Class-III                  | Lower incisors cannot bite the upper lip                        |

Class-III predicts difficult intubation.

All patients were pre-medicated with Tab. Pantoprazole 40 mg and Tab Lorazepam 1 mg at 10pm a day prior to the day of surgery.

On the day of surgery, Patient were shifted to operating room and positioned in sniffing position using silicone gel head ring. Standard pre-induction ASA monitors [Electrocardiography (ECG), Non Invasive Blood Pressure (NIBP), Pulse Oximetry (SpO<sub>2</sub>)] were connected. After recording baseline readings, an intravenous access with 18G cannula and Ringer's Lactate infusion was started.

Patients were pre oxygenated with 100% oxygen for 3 min and induced with Intravenous Fentanyl 2 µg/kg, Propofol 2 mg/kg. After checking for mask ventilation, injection Atracurium 0.5 mg/kg was given intravenously. Patients were then manually ventilated for 3 min using Bain's circuit, with 50% N<sub>2</sub>O in O<sub>2</sub> and isoflurane (0-1%).

An anaesthetist with an experience of more than 2 years, blinded to the result of ULBT, did direct laryngoscopy with MacIntosh size 4 blade. Visualisation of glottis was graded according to Cormack and Lehane's criteria and documented.<sup>4</sup>

**Table 2: Cormack – Lehane (CL) Grading**

| Cormack – Lehane (CL) Grading |                                                                  |
|-------------------------------|------------------------------------------------------------------|
| Grade I                       | Visualization of entire laryngeal aperture                       |
| Grade II                      | Visualization of only posterior commissure of laryngeal aperture |
| Grade III                     | Visualization of only epiglottis                                 |
| Grade V                       | Visualization of just the soft palate                            |

Grade I & II are considered Easy Laryngoscopy, whereas Grade III & IV are considered Difficult Laryngoscopy.

If there is a difficulty in intubation following manoeuvres were attempted:

- Application of external laryngeal pressure
- Extra attempts
- Any alternate techniques or
- Laryngoscopy by an additional anaesthesiologist

Failure to intubate a patient after two attempts was managed according to ASA Difficult Airway Algorithm.

Statistical analysis of data was done using IBM-SPSS version 21.0. The preoperative assessment data and the intubation findings were used to determine the accuracy of the ULBT in predicting difficult intubation. Accuracy, Sensitivity, specificity, accuracy, and positive and negative predictive values were calculated for ULBT.

## RESULTS

**Table 3: DEMOGRAPHIC PROFILE**

| Variable                       | Total (21)   | Easy intubation (Cormack & Lehan - I & II)(19) | Difficult intubation (Cormack & Lehan - III & IV )(2) | P value |
|--------------------------------|--------------|------------------------------------------------|-------------------------------------------------------|---------|
| Age in years                   | 33.14±13.21  | 34.05±13.58                                    | 24.5±2.12                                             | 0.34366 |
| Gender proportion (% of males) | 10/21(47.6%) | 9/19(47.36%)                                   | 1/2 (50%)                                             | 0.94    |
| BMI                            | 24.39±1.93   | 24.35±2.04                                     | 24.73±0.22                                            | 0.79    |

The study included 21 patients. The age of the patients ranged from 16-60 years. The mean age of the patients was 33.14±13.21 years. 10 (47.6%) were males and 11 (52.4%) were females. The mean BMI was 24.39±1.93. (Table 1)

Two (9.5%) of them were found at laryngoscopy to have difficult intubation, exhibiting laryngoscopy grade III or IV. There were no failed intubations. The mean age, gender and BMI were not significantly different between easy and difficult intubations ( $p>0.05$ , Table 1).

Among the 2 patients with difficult intubation both had been predicted as difficult on ULBT (true positives=2) and none were predicted as easy on ULBT (False negative=0). Among the 19 patients with easy intubation, 1 was predicted as difficult on ULBT (False positive=1) and 18 were predicted as easy on ULBT (True negative=18). The calculated accuracy, sensitivity, specificity, positive predictive value and negative predictive value of ULBT were 95.2%, 100%, 94.74%, 66.61% and 100% respectively.

## DISCUSSION

Difficult or failed intubation is a major cause of anesthesia related mortality. Therefore, airway management is a considerable challenge in anaesthesia and preoperative airway assessment facilitates has a very important role in prediction of difficult laryngoscopy. There are many preoperative tests for prediction of difficult intubation, but none of them being ideal compared to direct laryngoscopic view.<sup>3,4</sup>

ULBT is a simple bedside test developed by Khan et al<sup>1</sup> that involves the assessment of jaw subluxation and presence of buck teeth. The three classes ULBT are clearly demarcated and delineated; making inter observer variations highly unlikely and its practical interpretations for predicting a difficult airway can be quickly

understood.<sup>1</sup>

We used the Cormack- Lehan system for grading the laryngeal view during endotracheal intubation. It was graded according to the method described by Cormack and Lehan as grade I, II, III grade IV (table);no external laryngeal pressure was applied while reporting the laryngeal view. A grade of I or II was considered to represent easy intubation and a grade of III or IV to represent difficult intubation.<sup>4</sup>

The incidence of unanticipated difficult intubation varies from 1.3% to 14.5% in various studies depending on the criteria used to define it. The incidence of difficult intubations in our study was 9.5% which is similar to the data in recent studies.

**Table 4: COMPARISON OF ACCURACY, SENSITIVITY, SPECIFICITY, POSITIVE AND NEGATIVE PREDICTIVE VALUES AMONG VARIOUS STUDIES**

| STUDY                             | Incidence of unanticipated difficult intubation(%) | Accuracy (%) | Sensitivity (%) | Specificity (%) | Positive predictive value (%) | Negative predictive value (%) |
|-----------------------------------|----------------------------------------------------|--------------|-----------------|-----------------|-------------------------------|-------------------------------|
| Sangeeta et al <sup>6</sup>       | 8.57                                               | 94.85        | 80              | 96.25           | 66.66                         | 98.08                         |
| Varghese et al <sup>7</sup>       | 8                                                  | 92           | 18.8            | 98.9            | 60                            | 93.2                          |
| Aswar et al <sup>8</sup>          | 8                                                  | 89.5         | 25              | 95.11           | 60                            | 93.58                         |
| Min et al <sup>9</sup>            | 14.4                                               | 84.77        | 22.9            | 95.2            | 44.4                          | 88                            |
| Sharma et al <sup>10</sup>        | 5.33                                               | 94.66        | 25              | 98.6            | 50                            | 95.9                          |
| Honarmand et al <sup>11</sup>     | 14.5                                               | 92           | 48.86           | 99.41           | 93.5                          | 91.9                          |
| Kolarkar et al <sup>12</sup>      | 13.33                                              | 92.67        | 100             | 45              | 92.2                          | 100                           |
| Shah et al <sup>13</sup>          | 10.4                                               | 95.5         | 91.5            | 96              | 72.8                          | 98.9                          |
| Mehta et al <sup>14</sup>         | 7                                                  | 95           | 50              | 98.56           | 72.77                         | 92.26                         |
| Javaherforosh et al <sup>15</sup> | 8.4                                                | 89.95        | 28.9            | 95.6            | 37.9                          | 93.5                          |
| Our study                         | 9.5                                                | 95.2         | 100             | 94.74           | 66.6                          | 100                           |

In our study the specificity was 94.74% and negative predictive value was 100%, which was similar to the data in studies by Sangeeta et al,<sup>6</sup> Sharma et al,<sup>10</sup> Kolarkar et al<sup>12</sup> and Shah et al.<sup>13</sup> The high specificity and negative predictive value of ULBT makes it useful in identifying easy tracheal intubation.

The sensitivity of ULBT was found to be 100% in the study by Kolarkar et al<sup>12</sup> and 91.5% by Shah et al.<sup>13</sup> In our study the sensitivity was found to be 100% and hence the highly sensitive ULBT is also helpful in identifying most patients in whom intubation will be difficult.

The positive predictive value in our study was 66.6%. In most studies the positive predictive value ranged from 37.4% to 93.5%.<sup>6-15</sup> Hence it is possible that good proportion of patients with airways actually easy to intubate will be subjected to difficult airway protocol.

The accuracy of ULBT was found to be 95.2% in our study which is similar to the data in most trials.<sup>6-15</sup> Hence this test is an optimal test for prediction of difficult intubation.

## CONCLUSION

We conclude from our study that upper lip bite test (ULBT) is a quick, simple bedside test which is highly accurate, sensitive and specific for predicting difficult intubation and could be a good rationale for including it in routine airway assessment during preanaesthetic evaluation.

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