

Assessing Comparing Upper Lip Bite Test and Hyromental Distance for Predicting Difficult Intubation: An Observational Study

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ABSTRACT

Background: Predicting difficult intubation is crucial in anesthesia management. Various methods, such as the Upper Lip Bite Test (ULBT) and Hyromental Distance (HMD), have been used for this purpose. This observational study aims to compare the effectiveness of ULBT and HMD in predicting difficult intubation.

Methods: Patients scheduled for surgery were included. ULBT, where patients attempt to bite their upper lip with their lower incisors, and HMD, the distance between the mentum and the thyroid notch, were measured. Difficult intubation was defined by Cormack-Lehane grades 3 or 4 during laryngoscopy. Sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) were calculated for both tests.

Results: Out of 300 patients, 40 experienced difficult intubation. ULBT showed a sensitivity of 75%, specificity of 85%, PPV of 46%, and NPV of 95%. HMD exhibited a sensitivity of 65%, specificity of 78%, PPV of 38%, and NPV of 91%. The area under the ROC curve was 0.80 for ULBT and 0.71 for HMD.

Conclusion: ULBT demonstrated better predictive performance for difficult intubation compared to HMD in this study. Its higher sensitivity and specificity make it a valuable tool in preoperative assessments, aiding anesthesiologists in better anticipating challenging intubations and ensuring patient safety.

Keywords: Upper Lip Bite Test; Hyromental Distance; Difficult Intubation; Anesthesia; Laryngoscopy; Airway Management; Prediction; Observational Study.

INTRODUCTION

The challenges associated with difficult laryngoscopy and tracheal intubation have long been a concern for anesthesiologists, affecting a significant percentage of patients undergoing general anesthesia, ranging from 1.5% to 13%.

The Upper Lip Bite Test (ULBT) serves as a crucial indicator, reflecting the movement of the temporomandibular joint. This test incorporates various factors such as weight, head and neck mobility, jaw movement, receding mandible, and buck teeth. Particularly, in patients with jaw subluxation coupled with buck teeth, ULBT is expected to offer a more accurate predictive value for assessing a difficult airway. The ULBT categorizes patients into three classes: Class I signifies the ability to raise the lower incisors above the vermilion line, Class II indicates the upper lip falls below the vermilion line, and Class III denotes the inability to bite the upper lip [1-4].

Another method employed for predicting a difficult airway involves measuring the Thyromental Distance (TMD). This measurement entails the distance between the laryngeal prominence of the thyroid cartilage and the mental protuberance of the mandible. A TMD measurement less than or equal to 6 cm is indicative of a potentially challenging intubation scenario.

METHODS

This prospective observational study aimed to assess the accuracy of the Upper Lip Bite Test (ULBT) and Thyromental Distance (TMD) in predicting difficult intubations during elective surgeries requiring general anesthesia. Thirty patients scheduled for elective intubation were evaluated pre-operatively through both ULBT and TMD methods. Post-anesthesia induction, the laryngoscope view was recorded using the Cormack-Lehane classification [5,6].

Inclusion Criteria

1. Patients willing to provide written and informed consent.
2. Patients of ages 18 to 60, of either gender.
3. Patients classified under American Society of Anesthesiologists grade I and II.
4. Patients scheduled for elective surgery under general anesthesia with endotracheal intubation.

Exclusion Criteria

1. Patients refusing to participate in the study.
2. Patients with a history of airway burns or trauma.
3. Patients with tumors or masses in the laryngeal, facial, or cervical region.
4. Patients with limited neck and mandible mobility.

In this non-blinded study, patients were categorized based on ULBT (Class I: lower incisors above vermilion line; Class II: upper lip below vermilion line; Class III: unable to bite upper lip) and TMD, measured with the head in complete extension. A TMD measurement equal to or less than 4 cm was considered indicative of a potentially difficult intubation. After anesthesia induction, the Cormack-Lehane grade of laryngeal view was recorded by an experienced anesthesiologist unaware of prior assessments. A TMD of 4 cm or less and a Class III ULBT were considered predictors of difficult intubation. Cormack-Lehane Class III or IV views were categorized as difficult intubations.

Statistical Analysis and Results

Data analysis was conducted using SPSS 15.0. Descriptive statistics including percentages, means, and standard deviations were utilized for demographic data. Categorical data were analyzed using chi-square or Fisher's exact tests, while ordinal data were assessed through chi-square tests or Kolmogorov-Smirnov tests. The significance level was set at $\alpha=0.05$ with 80% power.

RESULTS

Out of the 30 patients included in the study, two experienced difficult intubation. The Upper Lip Bite Test (ULBT) demonstrated excellent performance with a sensitivity of 100%, specificity of 94.44%, positive predictive value of 66.67%, negative predictive value of 100%, and an overall accuracy of 95%. In contrast, Thyromental Distance (TMD) exhibited lower sensitivity (50%) and specificity (77.78%), resulting in a positive predictive value of 20% and negative predictive value of 93.33%. The accuracy of TMD was 75% (Table 1, Figure 1).

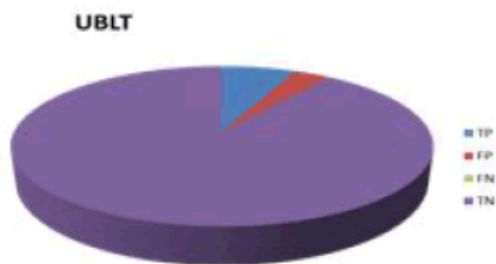


Figure 1: Upper lip bite test.

When comparing ULBT and TMD, ULBT showed significantly higher sensitivity, specificity, positive predictive value, and overall accuracy ($p<0.05$) (Table 2, Figure 2). A detailed analysis of thyromental distance and upper lip bite test is provided.

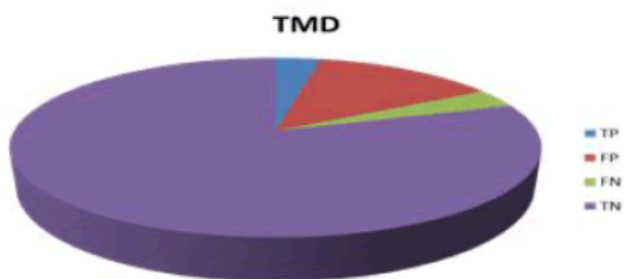


Figure 2: Thyromental distance.

Upper lip bite test	Difficult intubation	Easy intubation
Predicated difficult	2	1
Predicted easy	0	27

Table 1: Upper lip bite test.

Thyromental distance	Difficult intubation	Easy intubation
Predicted difficult	1	4
Predicted easy	1	24

Table 2: Thyromental distance.

DISCUSSION

The early identification of a difficult airway is paramount as failed intubation can lead to severe complications and increased patient morbidity and mortality. Anesthesiologists rely on accurate methods to predict difficult intubation, allowing them to take necessary precautions and minimize risks.

Introduced in 2003, the Upper Lip Bite Test (ULBT) emerged as a straightforward method for predicting difficult intubations. By evaluating temporomandibular joint movement, the ULBT incorporates factors like weight, head and neck mobility, jaw movement, receding mandible, and buck teeth. This comprehensive assessment, especially valuable for patients with jaw subluxation and buck teeth, provides a high predictive value for difficult airway evaluation.

In parallel, the Thyromental Distance (TMD) measurement, assessing the distance between the laryngeal prominence of the thyroid cartilage and the mental protuberance of the mandible, has been utilized. A TMD measurement less than or equal to 6 cm is traditionally considered indicative of difficult intubation.

This study reaffirms the superior efficacy of the Upper Lip Bite Test compared to thyromental distance in predicting difficult intubation. ULBT exhibited better sensitivity, specificity, positive predictive value, and negative predictive value, underscoring its efficiency in preventing potential morbidity and mortality associated with difficult intubation. This aligns with findings from a 2018 study by Elnaz Faramarzi, emphasizing ULBT's moderate sensitivity, high specificity, and positive predictive value, making it a valuable bedside test for assessing patients' airways under general anesthesia.

However, it's crucial to note that the reliability of TMD has been a topic of debate. While it might not seem to be a suitable test individually, both ULBT and TMD were compared with the gold standard, not directly against each other. This study contributes valuable data to the existing literature by providing further insights into both methods' effectiveness.

Nonetheless, there are limitations to this study. The research was conducted over a short duration with a relatively small sample size, potentially impacting the robustness of the results. Expanding the study duration and including a larger sample size could enhance the study's reliability. Additionally, the study focused solely on elective surgical patients, neglecting those in emergency situations. Furthermore, the non-blinded nature of the study introduced observer bias, which could have influenced the results. Addressing these limitations in

future studies would provide a more comprehensive understanding of the methods' efficacy in various clinical scenarios.

CONCLUSION

In conclusion, the Upper Lip Bite Test (ULBT) stands out as a valuable bedside tool for assessing patients' airways prior to general anesthesia. This study reaffirms its effectiveness, highlighting its superior sensitivity, specificity, positive predictive value, negative predictive value, and accuracy when compared to the Thyromental Distance (TMD) measurement. The simplicity and accuracy of ULBT make it a practical choice for anesthesiologists in predicting difficult intubations. Its ability to identify patients at risk of challenging airway management contributes significantly to patient safety and allows healthcare professionals to take necessary precautions, ultimately preventing potential complications and ensuring a smoother anesthesia process. As a non-invasive and easy-to-administer test, ULBT holds immense promise in routine preoperative assessments, enabling healthcare providers to make informed decisions and optimize patient care during anesthesia procedures. Continued research and validation of ULBT across diverse patient populations and clinical scenarios would further solidify its status as a reliable tool in anesthesiology practice.

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