

ORIGINAL RESEARCH ARTICLE

COMPARISON OF UPPER LIP BITE TEST AND MODIFIED MALLAMPATI TEST FOR PREDICTION OF DIFFICULT INTUBATION

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ABSTRACT

Background: Insertion of endotracheal tube is the basic skill acquired by all anesthesiologists. An unanticipated difficult intubation can be catastrophic and is one of the major causes of morbidity and mortality in anesthetic practice. So, there are multiple screening tests designed to correctly predict difficult intubation but none of them are 100 % accurate. The study aimed to compare the Modified Mallampatti test with Upper Lip Bite test for correct prediction of difficult intubation.

Methods: A cross-sectional study was conducted in the College of Medical Sciences, Bharatpur from 16th June 2020 to December 31st 2020. A total of 610 patients requiring general anesthesia with endotracheal intubation were included in the study. The Modified Mallampatti test and Upper Lip Bite test along with laryngoscopy was performed by an experienced anesthesiologist. Sensitivity, specificity, accuracy and positive and negative predictive values for both tests were calculated and compared.

Results: The incidence of difficult intubation was 17.7% in our study. The upper lip bite test showed better sensitivity (79.63% vs 37.96%), specificity (93.82% vs 69.92%), positive predictive value (73.5% vs 21.35%), negative predictive value (95.53% vs 83.97%) and accuracy (91.31% vs 64.26%) compared to Modified Mallampatti test

Conclusions: Upper lip bite test was a better predictor of difficult intubation compared to MMT with higher accuracy and predictive values

INTRODUCTION

General anesthesia with endotracheal intubation is one of the common techniques used for operative procedures and insertion of a tube through the glottis is a basic skill acquired by all anesthesiologists. The incidence of difficult intubation varies from 1 % to 18 % whereas that of failure to intubate is 0.05-0.35%.¹⁻⁴ It is one of the main reasons for anesthesia-related adverse respiratory events resulting in death or brain damage in 85% of cases.^{5,6} Unanticipated difficult airway is even more of a concern as there is less preparation of resources for the management of the difficult airway. Thus the importance of prediction of difficult airway in patients with seemingly normal external anatomy before the operative procedure is imperative.⁷

Modified Mallampatti test (MMT) is the oldest bedside test that predicts difficult intubation by assessing mouth opening and visibility of pharyngeal structures.^{8,9} but fails to identify it accurately as a stand-alone test.¹⁰ Upper Lip Bite Test (ULBT), a new test, introduced in 2003¹¹ allows assessment of freedom of mandibular movement and the architecture of the teeth to predict difficult intubation.

The aim of our study was to compare the MMT with the ULBT for better prediction of difficult intubation identified through Cormack Lehane grading.

METHODS

This was a cross-sectional study conducted in the Department of Anesthesiology of College of Medical Sciences-Teaching Hospital (COMS-TH), Chitwan, Nepal after obtaining approval from the institutional review committee. Cases undergoing elective surgery under general anesthesia from 16th June 2020 to 31st December 2020, from 18 to 65 years, were taken for study.

Emergency cases requiring rapid sequence intubation, edentulous patients, obstetric patients, and patients with limited mouth opening or with visible external anatomical deformity causing difficult airway were excluded from our study.

In this study 610 patients, were enrolled after taking the informed consent as per the sample size calculated. The prevalence of difficult airway has been reported to range from

0.05-18%. Considering the prevalence as 10% with a margin of error of 2%

$$n = z^2pq / d,$$

Where n: no of cases,

z: 1.96 at 90% confidence interval,

p: prevalence of difficult airway= 0.1,

q: 1-p=0.9,

d: allowable error= 0.02,

The minimum sample size calculated

n= 609. In total enrolled 610 cases by convenient sampling technique.

Preanesthetic checkup and airway evaluation was done by the principal investigator one day prior to surgery. ULBT and MMT were noted as a part of airway evaluation. Classification of the oropharyngeal view was done according to the MMT.⁸

Class 1: soft palate, fauces, uvula, and pillars visualized

Class 2: soft palate, fauces, and uvula visualized

Class 3: soft palate and base of uvula visualized

Class 4: soft palate not visualized

The examination was done with the help of a flashlight with patients in sitting position, tongue fully protruded, and no phonation.

ULBT was performed according to the following criteria:¹²

Class 1: lower incisors can bite the upper lip above the vermilion line

Class 2: lower incisors can bite the upper lip below the vermilion line

Class 3: lower incisors cannot bite the upper lip

All patients were anesthetized using standard anesthesia technique with full muscle relaxation. Laryngoscopy was done in the sniffing position with Macintosh laryngoscope blade size 3 or 4. The laryngoscopic view in the first attempt of intubation was graded and recorded according to Cormack and Lehane classification by anesthesiologists having more than 2 years of experience not involved in the study.¹³

Grade I: full view of glottis;

Grade II: glottis partly exposed (anterior commissure not seen);

Grade III: Only epiglottis is seen, grade IV: epiglottis not seen.

Grade I and II represented easy intubation, while grades III and IV represented difficult intubation. No external laryngeal pressure was applied while reporting the laryngeal view.

The number of attempts of laryngoscopy and intubation, use of external laryngeal manipulation, use of intubation aid

of stylet or bougie, and duration of intubation was noted.

The preoperative airway examination involving the aforementioned tests (Modified Mallampatti Test and Upper Lip Bite Test) and their corresponding intubation findings in CL grading were used to determine the sensitivity, specificity, accuracy, and positive and negative predictive values of each test.

RESULTS

Out of 610 patients enrolled in our study, 296 (48.5%) were male while 314 (51.5%) were female. The age of the patients ranged from 19 years to 65 years with a mean age of 40.01+12.55 years. Figure 1 showing the distribution of age.

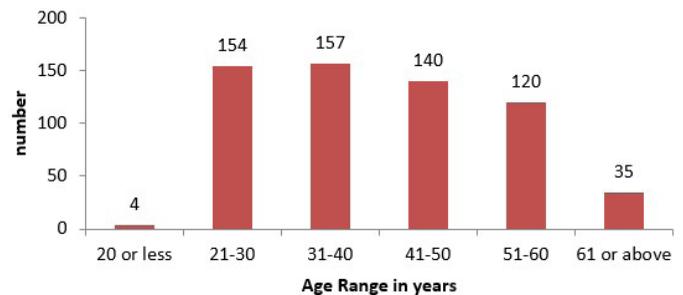


Figure 1: Distribution of patient in age range

About 108 patients were found to have difficult intubation identified at laryngoscopy (CL grading III) with no patients of CL grading IV and no failed intubations. A Modified Mallampatti test of class III or IV (192) and upper lip bite test of class III (117) predicted difficult intubation shown in table 1.

Table 1: Showing the distribution of ULBT and MMT with CL grading

Variables	CL grading		Total	
	I and II	III		
ULBT	1 and 2	471	22	493
	3	31	86	117
MMT	1 and 2	351	67	418
	3 and 4	151	41	192

Sensitivity, specificity, positive predictive value, negative predictive value, and accuracy for MMT and ULBT were calculated. ULBT was found to be more sensitive, specific, and accurate with better predictive value compared to MMT shown in Table 2.

Table 2: Sensitivity, specificity, positive predictive value, negative predictive value, and accuracy

	Sensitivity	Specificity	Positive predictive value	Negative predictive value	Accuracy
ULBT	79.63	93.82	73.5	95.53	91.31
MMT	37.96	69.92	21.35	83.97	64.26

There were no cases of failed intubation. The cases that needed external laryngeal manipulation and bougie or stylet as intubation aid are tabulated in the table 3.

Table 3: Distribution showing use of manipulation and intubation aid

	Yes	No
Use of burp	129	481
Use of bougie	8	602

DISCUSSION

Although the incidence of difficult intubation is quite variable ranging from 1 to 18% and that of impossible intubation is even low 0.05-0.35%, it is the most dreaded event in the field of anesthesia as it can result in death or brain damage in up to 85% of cases.^{1-6,9} It is therefore very much important to anticipate the cases of difficult intubation preoperatively and arrange our resources for its management. There are multiple tests designed for this purpose which include MMT, measurement of sternomental distance, thyromental distance or interincisor gap, ratio of height to thyromental distance, and ULBT.^{10,14}

MMT is the oldest and most frequently used preoperative test to predict difficult intubation. It assesses the size of the patient's tongue and attributes its larger size to the poor exposure of glottic opening resulting in difficult intubation.⁸ But it has been shown in multiple studies that it is not a good predictor of difficult intubation as a single test. It has also been found to have a considerable interobserver variation which could be due to differences in the position of the patient and use of phonation.

ULBT, a comparatively newer test introduced in 2003¹² by Khan et al assesses a combination of jaw subluxation together with the presence of buck teeth which is thought to enhance its accuracy for the prediction of a difficult airway. In his original study, the incidence of the difficult airway was 5.7%. Specificity and accuracy of the ULBT were better than MMT, but the sensitivity, positive predictive value, and negative predictive value of both tests were similar. His test had concluded ULBT could easily predict difficult intubation.

In our study, the comparison of MMT and ULBT showed that the accuracy (91.31%), sensitivity (79.63%), PPV (73.5%), and NPV (95.53%), and specificity (93.82) of upper lip bite test were

all higher than the Mallampati test. These findings were similar to the study done by Khan et al except for PPV which was only 28.9% for ULBT in comparison to 73.5% in our study. It indicates that a larger number of patients with difficult intubation were correctly identified by ULBT in our study.

In our study, the accuracy of MMT and ULBT for the prediction of difficult airway was similar to the results yielded by Eberhart et al in 2005¹⁵ where they compared their findings with the original study done by Khan et al. The sensitivity (79.63%) and PPV (73.5%) for ULBT was higher in our study than study performed by them. In their study they could not reproduce higher predictive values for ULBT. They concluded both tests are poor predictors of difficult intubation.

Another study done by Hester et al in 2007¹⁶ showed that ULBT was superior to MMT in every measure in their study: sensitivity (55% vs 11%), specificity (97% vs 75%), positive predictive value (83% vs 9%), and accuracy (90% vs 64%). The accuracy of MMT (64.26%) and ULBT (91.31%) in our study was similar to their study.

A study done by Karnjanawanichkul et al¹⁷ showed low sensitivity (7.14%) and PPV (44.44%) for ULBT in comparison to our study (79.63% and 73.5%). This may be due to the strikingly low number of patients with ULBT grade 3 in their study (9 versus 117).

In a recent study done by Madhurima et al¹⁸ in 2019 sensitivity (88.46%), specificity (92.74%), Positive predictive value (71.87%), negative predictive value (97.45%) and accuracy (92%) of ULBT were similar to that in our study. For MMT, all the test results showed low values in our study.

The limitation of our study was the non-inclusion of obstetric and pediatric population in whom the correct prediction of difficult intubation is even more important.

CONCLUSION

ULBT has higher accuracy and predictive values when compared to MMT for the prediction of a difficult airway.

CONFLICT OF INTEREST: None

FINANCIAL DISCLOSURE: None

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