

Comparative Study of Upper Lip Bite Test and Modified Mallampatti Classification in Predicting Difficult Endotracheal Intubation

Ajanth S¹, Vinayak Sirsat², S Chauhan³, Deepak M Kokane⁴

Author's Affiliation: ¹Junior Resident, ^{2,4}Associate Professor, ³Professor and HOD, Department of Anesthesiology, Government Medical College, Latur, Maharashtra 413512, India.

Abstract

Objective: To compare sensitivity, specificity, positive and negative predictive values of upper lip bite test and modified mallampatti test to predict difficulty in endotracheal intubation in patients between 16 to 55 years of age.

Methods: One hundred ASA1/2 patients admitted for elective surgical procedure requiring endotracheal intubation were prospectively studied to predict difficult intubation in age group 16-55 years of age after obtaining an informed consent. Preoperative Airway assessment was done with modified mallampatti test and upper lip bite test.

Results: In our study, eighty four had Upper lip bite test (ULBT) class I and II and sixteen patients had class III. Of these two of the ULBT class I and II and five of the ULBT class III had Cormack Lehane grade III. There were one hundred patients predicted to be easy for intubation by MMT (i.e. patients who had ULBT class I and II) out of whom however, we encountered difficult intubation in 6 patients. One in MMT class III also had difficult intubation. None of the patients had class IV MMT. Of the entire one hundred patients, a total of seven patients had difficult intubation, all of whom had Cormack Lehane class III on laryngoscopy.

Conclusion: Upper Lip Bite Test (ULBT) is a better test at predicting difficult endotracheal intubation when compared to Modified Mallampati Test (MMT). Upper lip bite test and modified mallampatti classification are good predictors of easy intubation rather than difficult intubation. Upper lip bite test should be used in combination with other airway assessment methods viz. Thyromental distance, hyomental distance, inter incisor distance to predict difficult intubation.

Keywords: Upper lip bite test; Modified mallampatti classification; Difficult endotracheal intubation.

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Corresponding Author: Deepak M Kokane, Associate Professor, Department of Anesthesiology, Government Medical College, Latur, Maharashtra 413512, India.

E-mail: kdrdeepak@gmail.com

Introduction

Airway management is of prime importance to the Anaesthesiologist. For securing airway, tracheal intubation using direct laryngoscopy remains the method of choice in most of the cases. No anesthetic technique is safe unless diligent efforts are made to secure and maintain an intact airway.

The reported incidence of difficult laryngoscopy and tracheal intubation occurs in 1.5% to 8% of patients in general anaesthesia.¹ In some cases, if Anaesthesiologist is not able to maintain a patent airway, it may lead to serious complications like hypoxic brain damage or death. Of all the anaesthetic deaths 30% to 40% are attributed to the inability to manage a difficult airway.² Amount the overall claims against anesthetist in closed claims project, 17% involved difficult or impossible intubation.³

There are many tests to predict difficult intubation that is Patil's measurement of Thyromental distance, the Modified Mallampati test and the Wilson scoring system. A new, simple bed side test is Upper lip bite test (ULBT).^{4,5} In day to day practice, we use MMT to predict the difficult endotracheal intubation, whereas ULBT is not as popular as that. So ULBT needs to be evaluated as a useful test to predict difficult intubation in day to day cases. Hence, we proposed this study to compare ULBT with MMT in predicting difficulty in endotracheal intubation, in patients who are undergoing surgery under general anaesthesia.^{6,9,11,14}

Materials and Methodology

After obtaining institutional ethical committee clearance and written informed consent, the study was conducted in 100 male/female patients aged between 16 to 55 yrs of age Patients undergoing elective surgical procedures under general anaesthesia in surgery, ent, orthopaedics, obgy were enrolled in the study. A thorough pre anaesthetic evaluation was carried out in all the patients and the procedure was explained in detail to the patients.

Exclusion Criteria includes Edentulous patients, Patients unable to open the mouth, Patients with cervical spine fractures and deformities, Patients with upper airway tumors, Patients with altered consciousness, confusion.

Preoperatively, two anaesthesiologists not involved in intubating the airway evaluated using Modified mallampatti test and Upper lip bite test. Classification of oropharyngeal view was done according to Modified mallampatti test, wherein the patients were made to be in sitting position with mouth fully open and tongue maximally protruded, and patients were asked not to phonate.^{8,12,13}

Modified Mallampatti Classification

Class I	Soft palate, fauces, uvula, and pillars are seen
Class II	Soft palate, fauces, and uvula are seen
Class III	Soft palate and base of uvula
Class IV	Hard palate is visible

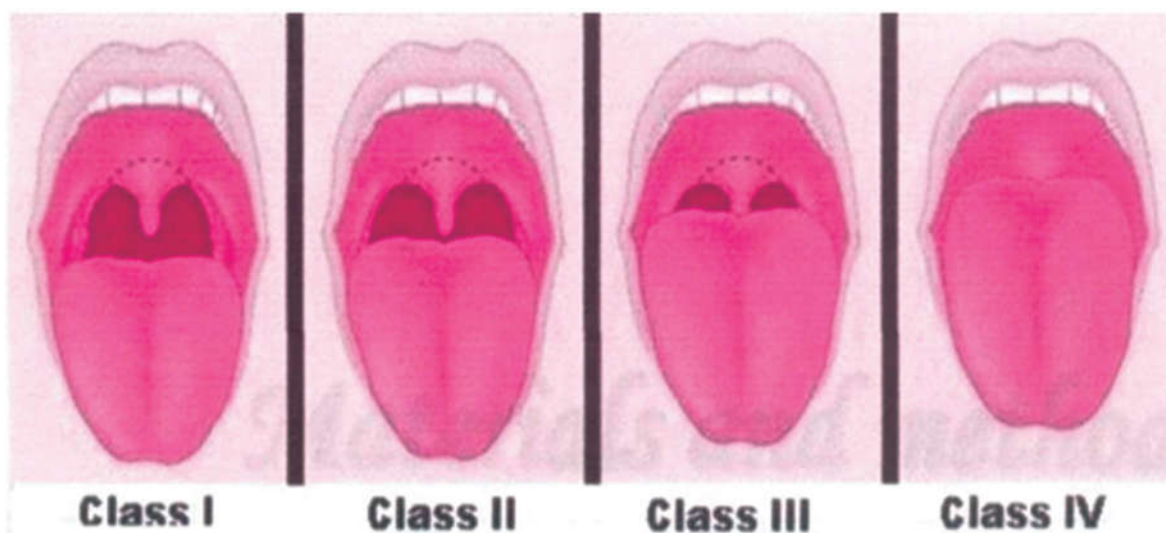
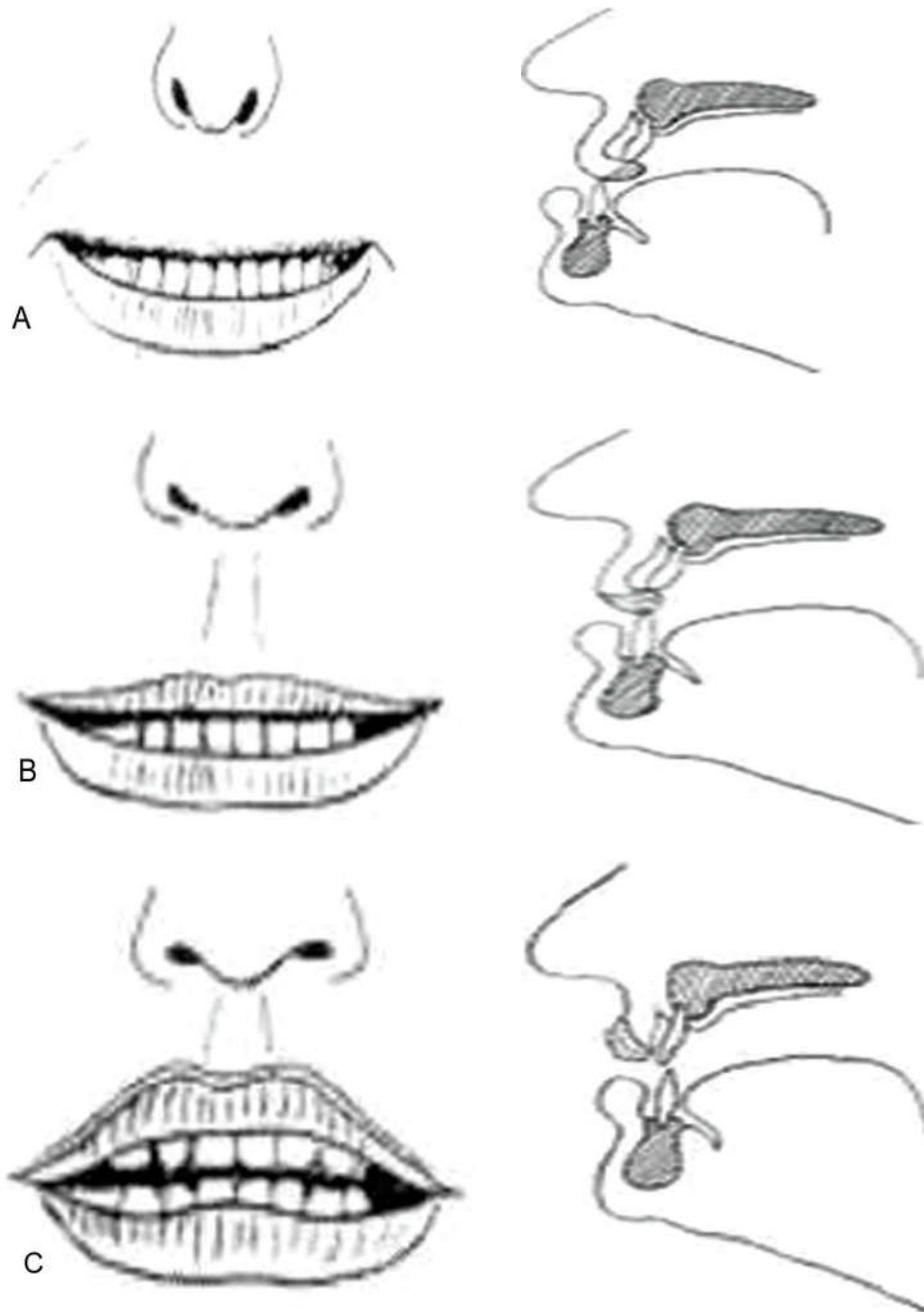


Fig. The Upper lip bite test was performed according to the following criteria.



UPPER LIP BITE TEST

Class 1 - Lower incisors can bite upper lip above the vermilion line

Class II - Lower incisors can bite upper lip below the vermilion line

Class III - Lower incisors cannot bite the upper lip

Procedure

On the day of surgery IV line was secured prior to surgery in the pre operative room, once the patient

was shifted to the operating theatre, patients were monitored with electrocardiogram, non-invasive blood pressure and pulse oximeter. Adequate preoxygenation is given for 3 minutes with 100% oxygen. Patients were anaesthetized using balanced anaesthesia technique i.e., premedicated with IV glycopyrrolate 0.004 mg/Kg⁻¹, IV midazolam 0.03 mg kg and Iv ondansetron 0.08mg/kg. patients were induced with IV propofol 2mg/Kg⁻¹ and the endotracheal intubation was accomplished with suxamethonium 1.5 to 2 mg/Kg⁻¹ by Anaes-

thesiologists who were not informed of the preoperative modified mallampatti classification and upper lip bite test.

The patients' head and neck were kept in optimal intubating position with a pillow under the occiput during intubation (sniffing position), laryngoscopy was done using appropriate sized Macintosh blade and glottic view was graded according to the Cormack and Lehane grading.⁷

Cormack Lehane Grading of Glottis

Grade I	Full view of the glottis
Grade II a	partial view of glottis
Grade II b	Only posterior commissure visible or arytenoids.
Grade III	Only tip of epiglottis visible
Grade IV	No glottic structure visible

Patients were intubated with appropriate sized endotracheal tube. Patients vital signs were monitored throughout the procedure. At the end of surgery patients were adequately reversed with inj. glycopyrrolate 0.01 mg/kg and inj. neostigmine 0.05 mg/kg. Patients were extubated after thorough oral suctioning. After stabilization, patients were shifted to post operative recovery room. The pre operative airway assessment data and the findings during intubation were used to determine the sensitivity, specificity, positive and negative predictive values for each test.

Statistical Analysis

The pre operative airway assessment data and the findings during intubation were used to determine the sensitivity, specificity, positive and negative predictive values for each test. Fisher exact test and

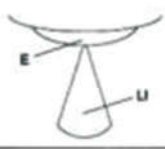




Original Cormack and Lehane system	1 Full view of the glottis	2 Partial view of the glottis or arytenoids		3 Only epiglottis visible	4 Neither glottis nor epiglottis visible
View at laryngoscopy					
Modified system	1 As for original Cormack and Lehane above	2a Partial view of the glottis	2b Arytenoids or posterior part of the vocal cords only just visible	3 As for original Cormack and Lehane above	4 As for original Cormack and Lehane above

Fig. 1: Description of the two scoring system used, E = epiglottis, LI = laryngeal inlet.

McNemar's test was used to calculate statistically significant difference in sensitivity and specificity between these tests respectively.

Results

In our study MMT class III and IV along with ULBT class III were considered as predictors of difficult endotracheal intubation. On laryngoscopy Cormack Lehane view of III and IV were considered as difficult to intubate. In our study, eighty four had ULBT class I and II and sixteen patients had class III. Of these two of the ULBT class I and II and five of the ULBT class III had Cormack Lehane grade III as shown in the table 4 & graph 4. As shown in table 3, there were one hundred patients predicted to be easy for intubation by MMT (i.e. patients who had ULBT class I and II) out of whom

however, we encountered difficult intubation in 6 patients. One in MMT class III also had difficult intubation. None of the patients had class IV MMT. Of the entire one hundred patients, a total of seven patients had difficult intubation, all of whom had Cormack Lehane class III on laryngoscopy. There were no cases of failed intubation in our study.

Table 1: Age Distribution.

Age (Years)	No. of Cases
16-25	30
26-35	36
36-45	23
46-55	11
Total	100
Mean	32.35
SD	9.94

Table 2: Gender Distribution.

	No. of Cases
Male	53
Female	47

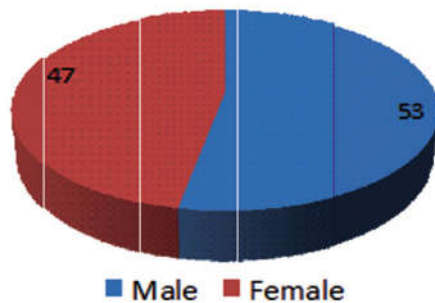


Fig. Gender Distribution.

Table 3: Body Mass Index

Body Mass Index	No. of Cases
16-19.99	16
20-24.99	67
25-29.99	13
30-34.99	4

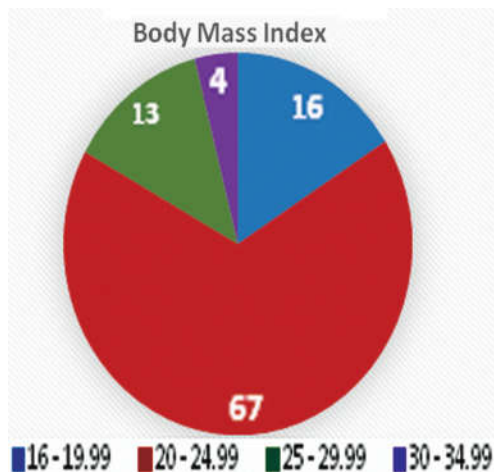


Fig. Body Mass Index.

Table 4: Cormack Lehane Grading.

ULBT	Difficult	Easy	Total
Difficult	6	10	16
Easy	1	83	84
Total	7	93	100

Difficult: Grade III & IV, Easy: Grade I & II.

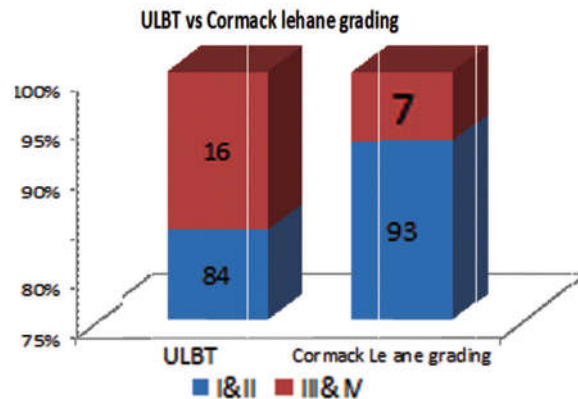


Fig. Relation between various classes of Upper lip bite test (ULBT) and Cormack Lehane gradings.

Out of 100 patients 84 had ULBT easy intubation and 16 patients had difficult intubation.

Table 5: Ulbt Vs Cormack Lehane Grading.

Parameter	95% C I	
True Positives	6	
False Positives	10	
False Negatives	1	
True Negatives	83	
Sensitivity	85.71%	(48.69, 97.43)
Specificity	89.25%	(81.33, 94.05)
Positive Predictive Value	37.50%	(18.48, 61.36)
Negative Predictive Value	98.81%	(93.56, 99.79)
Diagnostic Accuracy	89%	(81.37, 93.75)

Table 6: Cormack Lehane Grading.

MMT	Difficult	Easy	Total
Difficult	1	3	4
Easy	6	90	96
Total	7	93	100

Difficult: Grade III, Easy: Grade I & II.

Relation between various classes of Modified Mallampatti test (MMT) and Cormack Lehane gradings.

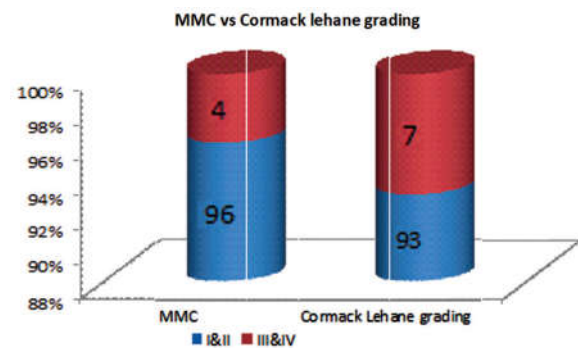


Fig. Out of 100 patients 96 had easy intubation and 4 had difficult intubation.

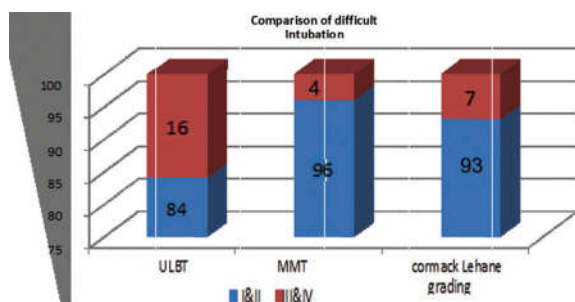
Table 7: Mmt Class Vs Cormack Lehane Grading.

Parameter	95% C I	
True Positives	1	
False Positives	3	
False Negatives	6	
True Negatives	90	
Sensitivity	14.29%	(2.568, 51.31)
Specificity	89.25%	(81.33, 94.05)
Positive Predictive Value	9.09%	(1.623, 37.74)
Negative Predictive Value	93.26%	(86.06, 96.87)
Diagnostic Accuracy	84%	(75.58, 89.9)

Table 8: Comparison of Difficult Intubation.

Grades	ULBT	MMT	Cormack Lehane grading
I&II	84	96	93
III&IV	16	4	7

Of one hundred patients, 84 patients had ULBT class I and 96 patients had MMT class I, in whom there were no cases of difficult intubation. Five out of the sixteen cases of ULBT class III and one out of two cases in MMT class III had difficult intubation. In our study there were no cases of MMT class IV.

**Fig.** Comparison of difficult intubation.

Discussion

The incidence of unanticipated difficult intubation varies between 1.3% to 13% in various studies and the search for predictive tests that has ease of applicability, reliability and accuracy continues.

Khan et al's Upper Lip Bite Test was such an attempt. They proposed this test a combination of jaw subluxation and buck teeth as an alternative to the widely used test the Modified Mallampati Test .For Upper lip bite test the sensitivity was 85.7%,specificity was 89.25%,positive predictive value was 37.5%,The negative predictive value was 98.4%.For Modified mallampatti classification ,the sensitivity of MMT in our study was 14.29%the

specificity was 89.25% Positive predictive value was 9.09%. The Negative predictive value was 93.26%.

On comparing both the tests, we found that, ULBT is more sensitive (85.71%) than MMT (14.29%), but both tests had high specificity and NPV. Difference in the sensitivity between the two tests was found to be statistically significant.

Although MMT had higher specificity, which is statistically significant ($p < 0.05$), it has a very poor sensitivity, making it an unreliable test to screen the patients for difficult intubations.

Both the tests have a negative predictive value more than 90%, thus stressing the fact that all these tests can be good predictors of easy intubation, rather as positive predictors of difficult intubation. ULBT has diagnostic accuracy of 87%.The accuracy that testifies lower false positives and negatives values in predicting difficult intubation was observed to be highest in UPPER LIP BITE TEST. Test with high accuracy is an optimal test for prediction of difficult intubation.Limitations of upper lip bite test are its is not appropriate for edentulous patients since its consideration of buck teeth.Due to ethnic variations in craniofacial configuration of population and racial variations in morphology and morphometry of human mandible and maxillary bones.So upper lip bite test may not applicable for some populations

Conclusion

Upper Lip Bite Test (ULBT) is a better test at predicting difficult endotracheal intubation when compared to Modified Mallampati Test (MMT).

Upper lip bite test and modified mallampatti classification are good predictors of easy intubation rather than difficult intubation. Upper lip bite test should be used in combination with other airway assessment methods viz. Thyromental distance, hyomental distance, inter incisor distance to predict difficult intubation.

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