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COMPARISON OF UPPER LIP BITE TEST AND MODIFIED MALLAMPATI CLASSIFICATION IN PREDICTING DIFFICULT INTUBATION

Anaesthesiology

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ABSTRACT

Introduction : Airway management is of prime importance to the Anaesthesiologist for securing the airway, tracheal intubation using direct laryngoscopy remains the method of choice in many cases. Difficult laryngoscopic endotracheal intubation still remains an important concern of anaesthesiologists. The incidence of difficult endotracheal intubation were reported to be between 1.5% to 13% among patients undergoing surgery. The present study was conducted with the primary aim to evaluate sensitivity, specificity, accuracy, negative predictive value and positive predictive value of Upper Lip Bite Test and Modified Mallampati Classification to predict difficult intubation in patients undergoing any elective surgery under general anesthesia.

Material & Methods : A single-blind, Prospective Observational (Analytical) study was conducted in Krishna Institute of Medical Sciences, Hospital and Research Centre, Karad, Maharashtra after the approval from the institutional ethical committee. A sample size of 181 patients of both gender, between 20 and 50 years of age, belonging to ASA physical Status I-II scheduled to undergo elective surgery under general anaesthesia with endotracheal intubation were evaluated for both test before surgery after fulfilling the inclusion criteria. A senior Anaesthesiologists having minimum five years of experience in clinical anaesthesia who unaware of preoperative airway assessment, performed laryngoscopy and grading as per Cormack and Lehane's classification. Senstivity, specificity,accuracy, positive and negative predictive values of Upper lip bite test and Modified Mallampati Classification were calculated.

Results: We compared various accuracy parameters of both the methods (MMT and ULBT), we observed that MMT (88.23% Vs. 76.47%) has got higher sensitivity, higher specificity of (89.02% Vs. 87.19%), higher positive predictive value (45.45% Vs. 38.23%) and higher negative predictive value (98.64% Vs. 97.27%) as compared to ULBT.

Conclusion : In comparison with ULBT, MMT has got better predictive ability for difficult endotracheal intubation. MMT and ULBT appear to be better predictors for easy intubations rather than difficult intubations (high negative predictive value). Combination of MMT and ULBT has got better diagnostic accuracy as compared to MMT or ULBT alone.

KEYWORDS

UPPER LIP BITE TEST, MODIFIED MALLAMPATI CLASSIFICATION, DIFFICULT INTUBATION.

INTRODUCTION

Airway management is of prime importance to the Anaesthesiologist for securing the airway, tracheal intubation using direct laryngoscopy remains the method of choice in many cases. No anaesthetic is safe unless diligent efforts are made to secure and maintain an intact airway. Endotracheal intubation remains the gold standard for emergency airway management. Airway management is a core skill in emergency medicine, anesthesiology, and critical care. Ensuring an unobstructed airway and adequate oxygenation are first priorities in the resuscitation of the patient. Unlike the elective surgical patient, the trauma and critically ill patients present with many challenges[1].

Difficult laryngoscopic endotracheal intubation still remains an important concern of anaesthesiologists. The incidence of difficult endotracheal intubation were reported to be between 1.5% to 13% among patients undergoing surgery [2], American Society of Anaesthesiologists (ASA) task force defines the difficult airway as, "the clinical situation in which conventionally trained anesthesiologist experiences difficulty with face mask ventilation of upper airway. Failure in managing the airway is the most important reason of death in patients undergoing general anaesthesia. About 50-75% of cardiac arrests during general anaesthesia are due to difficult intubation that causes inadequate oxygenation and/or ventilation, which about 55-93% of them cause death or brain dead[3][1]. Attention has been given on predicting difficult intubation or poor glottis visualization, to avoid serious consequences during the surgery[1], Difficult intubation was observed common among cases of anatomical malformations such as the limited temporo-mandibular joint movement, chin protrusion, lower jaw anomalies and excessive maxillary length.

To achieve a proper alignment of the axis of the mouth, pharynx and larynx, Banister and Macbeth[4]in their research stated the importance of the position of the neck & head during direct laryngoscopy, they suggested many tests (Mallampati test, subluxation of the mandible, thyro-mental distance (TMD), length of mandibular rami, chin protrusion, atlanto-occipital extension to predict an unanticipated difficult airway, but the reliability of above tests remains questionable. However, in combination, these tests prove their role in many conditions. Various researched had been done to evaluate their diagnostic accuracy (sensitivity, specificity, Positive predictive value, negative predictive value, likelihood ratio (LR) with minimal FP, and false negative values). However, there are very few studies comparing upper lip bite test (ULBT) and MMT[5][6].

Though many advances have been made and many time-tested methods have been used to overcome the conundrum of unanticipated difficult laryngoscopic tracheal intubation, available tests, such as the Mallampati technique, inter incisor gap, subluxation of the mandible, thyromental distance, length of mandibular rami, chin protrusion, and atlanto-occipital extension are not totally reliable. Because the range and freedom of mandibular movement and the architecture of the teeth have pivotal roles in facilitating laryngoscopic intubation, we hypothesized that the upper lip bite test (ULBT) could serve as a good predictor for difficult laryngoscopic intubation[7].

The present dissertation was conducted with the primary aim to evaluate sensitivity, specificity, accuracy, negative predictive value and positive predictive value of Upper Lip Bite Test and Modified Mallampati Classification to predict difficult intubation in patients undergoing any elective surgery under general anesthesia.

MATERIALS AND METHODS

Study design: It was a single-blind, Prospective Observational (Analytical) study

Study duration: this study was carried out over a period of 18 months (December 2016 to July 2018).

Sampling technique: Universal sampling

Sample size: The statistical power analysis as per formula n = $4pq/L^2$(p= population proportion of positive character or present

prevalence, q= 100-p, L= allowable error which we taken as 5%) suggested that a sample size of 181 patients of both gender, between 20 and 50 years of age, belonging to ASA physical Status I-II, scheduled to undergo elective surgery under general anaesthesia with endotracheal intubation were recruited for this single-blind, prospective, observational (analytical) study.

Source of Data:
This study was conducted in **Krishna Institute of Medical Sciences, Hospital and Research Centre, Karad**, **Maharashtra** after the approval from the institutional ethical committee. A sample size of 181 patients of both gender, between 20 and 50 years of age, belonging to ASA physical Status I-II scheduled to undergo elective surgery under general anaesthesia with endotracheal intubation were recruited in this present study.

Inclusion criteria:
1. Patients of both gender between 20 and 50 years of age.
2. Patients belonging to the American Society of Anaesthesiologists (ASA) physical status I and II.

Exclusion criteria:
1. Facial trauma
2. Edentulous patient
3. Burns patients with neck contracture
4. Intraoral pathology /infections
5. Rheumatoid disease
6. Degenerative spinal disease
7. Inability to open mouth

Methods
181 cases fulfilling the inclusion criteria were enrolled in the present study, after the approval of the institutional ethical committee. A detailed history (demographic information, clinical history, past medical history), complete physical and general examination and necessary investigations were done for all patients after the prior informed written consent from, the study subjects. Where in the patients were asked to be in sitting position with fully open mouth and tongue maximally protruded, and patients were asked not to phonate for mallampatti score.

Classification of **MMT** was done according to oro-pharyngeal view:[8]
- 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 - Soft palate not visible

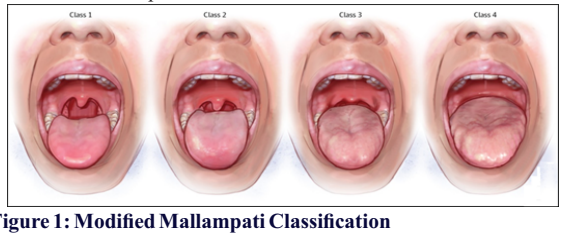


Figure 1: Modified Mallampati Classification

Patient was examined in sitting position. Patient was asked to bite his/her upper lip by lower incisors with head in neutral position.

The ULBT was performed according to the following criteria[9]
- Class 1 - Lower incisors can bite upper lip above the vermillion line
- Class II - Lower incisors can bite upper lip below the vermillion line
- Class III - Lower incisors cannot bite the upper lip

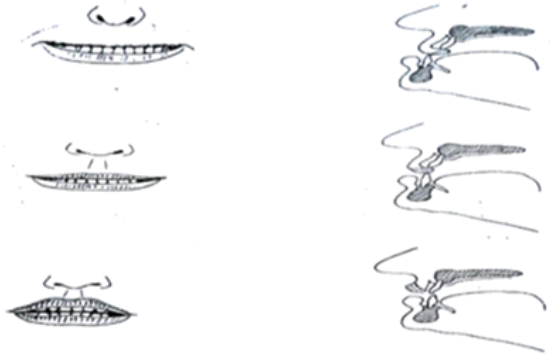


Figure 2: Upper Lip Bite Test

On the day of surgery large bore IV line was secured prior to surgery in the preoperative room, once the patient was shifted to the operation theatre, patients were monitored with non-invasive blood pressure, electrocardiogram and pulseoximeter.
- Patients were anaesthetized using balanced anaesthesia technique i.e., premedicated with IV glycopyrolate 0.005 mg/Kg, IV midazolam 0.05 mg/kg and IV fentanyl 1.5 µgm/kg. After pre-oxygenation with 100% oxygen for 3 minutes, patients were induced with IV thiopentone 3-5 mg/Kg in titrated doses and endotracheal intubation was accomplished with suxamethonium 1.5 - 2 mg/kg by senior Anaesthesiologists having minimum five years of experience in clinical anaesthesia.

The patient's 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 glottis view was graded according to **Cormack and Lehane grading**:[2]
- **Grade I:** Full view of the glottis
- **Grade II:** Only posterior commissure visible
- **Grade III:** the Only tip of epiglottis visible
- **Grade IV:** No glottic structure visible

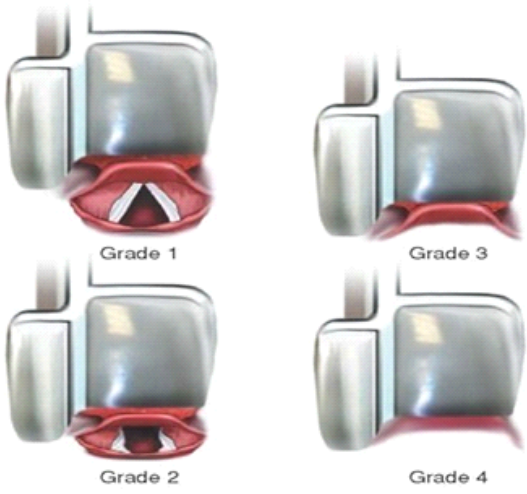


Figure 3: Cormack and Lehane grading

Patients were intubated with an appropriate sized endotracheal tube. All difficult intubations were done with the help of bougie and BURP maneuver given by the assistant.

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 through oral suctioning. After stabilization, patients were shifted to the postoperative recovery room.

Data analysis
The collected data was coded and entered with the help of Microsoft Excel software. The data was analysed with the help of **statistical package for the social sciences** (SPSS) Version 22 statistical package. Descriptive statistics were derived in the form of tables and charts for frequency analysis.

Statistical Definitions:
- **True positive**: A difficult intubation that had been predicted to be difficult
- **False positive**: An easy intubation that had been predicted to be difficult.
- **True negative**: An easy intubation that had been predicted to be easy.
- **False negative**: A difficult intubation that had been predicted to be easy.
- **Sensitivity**: The percentage of correctly predicted difficult intubations as a proportion of all intubations that were truly difficult, i.e., true positives / (true positive + false negatives).
- **Specificity:** The percentage of correctly predicted easy intubations as a proportion of all predicted difficult intubations, i.e., true negative / (true negative + false positives).

- **Positive predictive value:** The percentage of correctly predicted difficult intubations as a proportion of all predicted difficult intubations, i.e., true positive / (true positive + false positives).
- **Negative predictive value**: The percentage of correctly predicted easy intubations as a proportion of all predicted easy intubations, i.e., true negatives/(true negatives + false negatives).

$\text{Sensitivity} = \frac{True\ positive}{True\ positive+False\ negative} \times 100$	$\text{PPV} = \frac{True\ positive}{True\ positive+False\ positive} \times 100$
$\text{Specificity} = \frac{True\ negative}{True\ negative+False\ positive} \times 100$	$\text{NPV} = \frac{True\ negative}{True\ negative+False\ negative} \times 100$

RESULTS

This study was done to evaluate the ability of Upper Lip Bite Test (ULBT) and Modified Mallampati test to predict difficult intubation in patients undergoing any elective surgery under general anaesthesia. 181 cases fulfilling the inclusion criteria were enrolled in the present study, after the approval of the institutional ethical committee. A detailed history (demographic information, clinical history, past medical history), complete physical and general examination and necessary investigations were done for all patients after the prior informed written consent from the study subjects.

DEMOGRAPHIC FEATURE

In the present study, the demographic features were analysed of the study population. The age distribution, gender-wise distribution, body mass index were compared.

Gender-wise distribution

Table 1: Distribution of study population according to their gender

Gender	Number	Percentage
Male	55	30.38%
Female	126	69.61%
Total	181	100%

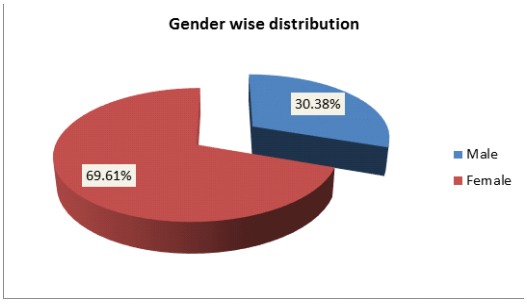


Figure 4: Distribution of study population according to their gender

In the present study, majority of the subjects were females (n=126, 69.61%), followed by males (n=55, 30.38%)

Age wise distribution

Table 2: Distribution of study population according to their age

Age distribution	Number	Percentage
20-30	43	23.75%
31-40	97	53.59%
41-50	41	22.65%
Total	181	100%

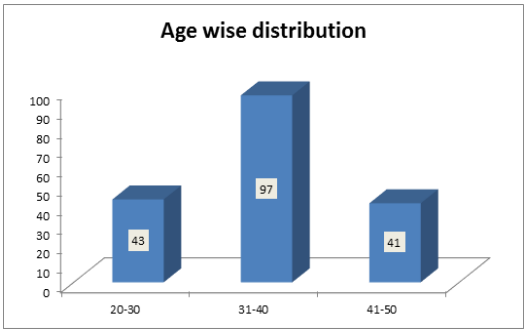


Figure 5: Distribution of study population according to their age

In this study, we reported the study population according to their age distribution. We reported that the study population belonged to age 20-30 years (n=43, 23.75%), 31-40 years (n=97, 53.59%), followed by and 41-50 years (n=41, 22.65%).

BODY MASS INDEX

Table 3: Distribution of study population according to their body mass index

BMI	Number	Percentage
<17.5	20	11.04 %
17.5-25	97	53.59 %
25-30	42	23.20 %
30-40	17	9.39 %
>40	5	2.76 %
Total	181	100%

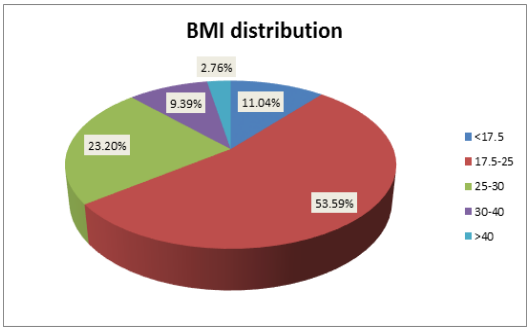


Figure 6: Distribution of study population according to their body mass index

In this study, we compared the body mass index among study subjects. We observed that the study cases belonged to BMI of the underweight cases (n=20, 11.04%), normal range (n=97, 53.59%), followed by overweight individuals (n=42, 23.20%), obese cases (n=17, 9.39%), and morbid obese cases (n=5, 2.76%).

DIFFICULT INTUBATION

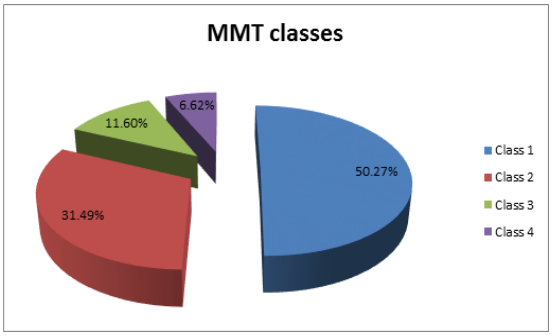
GRADING OF DIFFICULT INTUBATION

In this study, we assessed the difficult intubation with the help of various grading systems, such as Modified Mallampati Score, Upper lip bite tests and CLG method.

MODIFIED MALLAMPATI SCORE

Table 4: Distribution according to Modified Mallampati Score

MMT class distribution	Number of cases	Percentage
Class 1	91	50.27%
Class 2	57	31.49%
Class 3	21	11.60%
Class 4	12	6.62%
Total	181	100 %

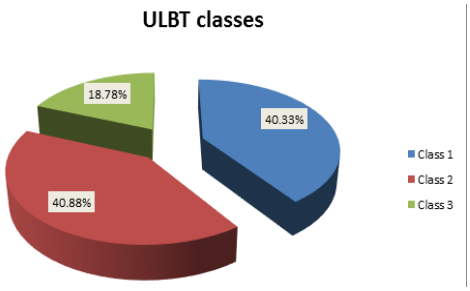


In this study, we classified the study population according to difficulty in intubation into 4 classes: Class 1 to 4. We reported that majority of the study cases (n=91, 50.27%) belonged to class 1, followed by class 2 (n=57, 31.49%), class 3 (n=21, 11.60%) and class 4 (n=12, 6.69%) out of which class 1 and 2 are considered as the parameters of easy intubation and class 3 and 4 are considered as parameters of difficult intubation (Table 4). Hence the percentage of difficult intubation based on MMT was observed to be 18.23%.

UPPER LIP BITE TEST

Table 5: Distribution according to Upper Lip Bite Test

ULBT class distribution	Number of cases	Percentage
Class 1	73	40.33%
Class 2	74	40.88%
Class 3	34	18.78%
Total	181	100 %



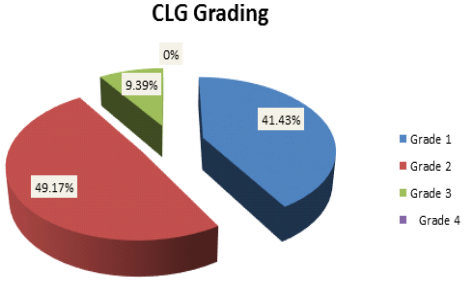
In this study, we classified the study population according to difficulty in intubation into 3 classes: Class 1 to 3. . We analysed that the study cases (n=73, 40.33%) in class 1, followed by (n=74, 40.88%) in class 2, and class 3 (n=34, 18.78%).

Out of which class 1 and 2 are considered as the parameters of easy intubation and class 3 is considered as parameters of difficult intubation (Table 5). Hence the percentage of difficult intubation based on ULBT was observed to be 18.78%.

CORMACK LEHANE GRADING

Table 6: Distribution according to CLG grading

CLG class distribution	Number of cases	Percentage
Grade 1	75	41.43%
Grade 2	89	49.17%
Grade 3	17	9.39%
Grade 4	0	0%
Total	181	100 %



In this study, we classified the study population according to difficulty in intubation into 4 grades: Grade 1 to 4. We analysed that the study cases Grade 1 (n=75, 41.43%), Grade 2 (n=97, 49.17%), followed by grade 3 (n=17, 9.39%) and grade 4(n=0, 0%). Out of which grade 1 and 2 are considered as the parameters of easy intubation whereas grade 3 and grade 4 is considered as the parameters of difficult intubation (Table 6). Hence the percentage of difficult intubation based on CLG was observed to be 9.39%

COMPARISON BETWEEN DIFFERENT GRADING SYSTEMS

In the present study, we classified the degree of difficulty of intubation in various surgeries into various classes, by using various grading systems. We compared the different grading systems, to find out their accuracy, sensitivity and specificity.

$$\text{Sensitivity} = \frac{\textit{True positive}}{\textit{True positive+False negative}} \times 100 \qquad \text{PPV} = \frac{\textit{True positive}}{\textit{True positive+False positive}} \times 100$$

$$\text{Specificity} = \frac{\textit{True negative}}{\textit{True negative+False positive}} \times 100 \qquad \text{NPV} = \frac{\textit{True negative}}{\textit{True negative+False negative}} \times 100$$

MMT Vs CLG

We compared MMT with CLG, in order to find out its accuracy.

Table 7: MMT Vs CLG

MMT		Total	Cormack Lehane Grading	
			Difficult	Easy
MMT	Difficult	33	15	18
	Easy	148	2	146
Total		181 (100%)	17 (9.39%)	164 (90.60%)

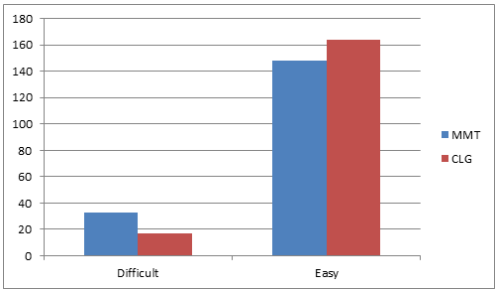


Figure 10: MMT Vs CLG

Table 8: Sensitivity, Specificity of MMT (with respect to CLG)

MMT Vs CLG	Values with reference to CLG systems
Sensitivity	88.23%
Specificity	89.02%
Positive predictive value	45.45%
Negative predictive value	98.64%

According to MMT, 33 cases had difficult intubation as compared to CLG in which 17 cases had difficult intubation. We analysed that MMT had a sensitivity of 88.23%, Specificity of 89.02%, the Positive predictive value of 45.45% and Negative predictive value of 98.64%.

ULBT Vs CLG

Table 9: ULBT Vs CLG

ULBT		Total	CORMACK LEHANE GRADING	
			Difficult	Easy
ULBT	Difficult	34	13	21
	Easy	147	4	143
Total		181 (100%)	17 (9.39%)	164 (90.60%)

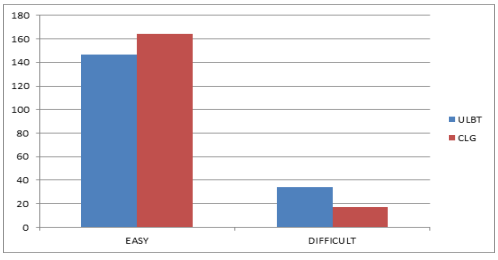


Figure 11: ULBT Vs CLG

Table 10: Sensitivity, Specificity of ULBT (with respect to CLG)

ULBT Vs CLG	Values with reference to CLG systems
Sensitivity	76.47%
Specificity	87.19%
Positive predictive value	38.23%
Negative predictive value	97.27%

We compared ULBT with CLG, in order to find out its accuracy. We reported that 34 cases (18.78%) cases had difficult intubation. We analysed that ULBT had a sensitivity of 76.47%, Specificity of 87.19%, the Positive predictive value of 38.23% and Negative predictive value of 97.27%.

COMPARISON BETWEEN ALL THE 3 GRADING SYSTEMS

The following table and figures showing the comparison between MMT, CLG and ULBT findings.

Table 11: Comparison between MMT, CLG and ULBT

	MMT	ULBT	CLG
EASY	148	147	164
DIFFICULT	33	34	17

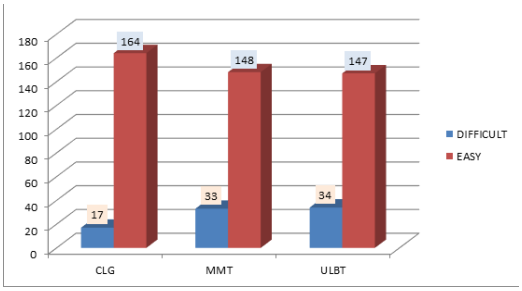


Figure 12: Comparison between MMT, CLG and ULBT

COMBINED ACCURACY OF MMT AND ULBT

Table 12: Comparison of Combined MMT+ULBT with CLG

ULBT+MMT		Total	Cormack Lehane Grading	
			Difficult	Easy
ULBT+ MMT	Difficult	24	15	9
	Easy	157	2	155
Total		181 (100%)	17 (9.39%)	164 (90.60%)

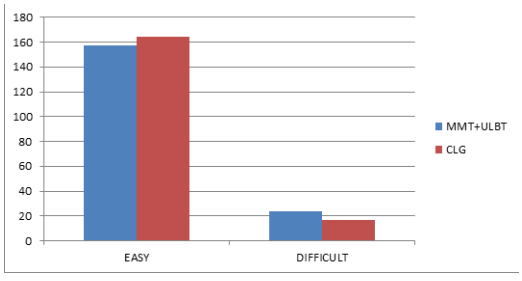


Figure 13: Comparison of Combined MMT+ULBT with CLG

Table 13: Sensitivity, specificity of combined (MMT+ULBT) (with respect to CLG)

MMT+ULBT Vs CLG	Values with reference to CLG systems
Sensitivity	88.23%
Specificity	94.51%
Positive predictive value	62.5%
Negative predictive value	98.72%
Diagnostic accuracy	93.92%

In this study, we evaluated the combined accuracy of ULBT and MMT as compared to CLG grading of difficult intubation. We analysed that 24 (13.25%) cases had difficult intubation using combined ULBT and MMT classification systems.

When we analysed diagnostic accuracy of combined MMT and ULBT were 93.92%, we observed Sensitivity of 88.23%, Specificity of 94.51%, Positive predictive value of 62.5% and Negative predictive value of 98.72%.

DIAGNOSTIC ACCURACY PARAMETER OF MMT, ULBT AND COMBINED MMT+ULBT COMPARED

When we compared the diagnostic accuracy of all the tests to predict difficult intubation. We analysed that combined MMT and ULBT has got better diagnostic accuracy as compared to MMT or ULBT alone.

Table 14: Diagnostic accuracy parameter of MMT, ULBT and combined MMT+ULBT compared

Diagnostic accuracy parameters	ULBT	MMT	Combined
Sensitivity	76.47%	88.23%	88.23%
Specificity	87.19%	89.02%	94.51%
Positive predictive value	38.23%	45.45%	62.5%
Negative predictive value	97.27%	98.64%	98.72%
Diagnostic accuracy	84.53%	88.95%	93.92%

DISCUSSION

It is the challenge to assess and manage the airway in the general practice of anaesthesia when difficulty with intubation or difficult intubation is anticipated prior to induction of anaesthesia.

Although in literature, there are many preoperative tests to predict difficult airway, still there are many challenges while labelling any of them as ideal. Some are easy to perform, highly sensitive, highly specific and which high positive predictive value with few false positive predictions.

This study was done to assess sensitivity and positive predictive value of Upper Lip Bite Test (ULBT), Modified Mallampatti classification (MMT) alone and with combination of both to predict difficult intubation in patients undergoing any elective surgery under general anaesthesia.

DEMOGRAPHIC FEATURES

In this study, we reported the demographic features of the study population. The age distribution, gender-wise distribution, body mass index etc are compared. In this study, the maximum subjects were females (n=126, 69.61%), followed by males (n=55, 30.38%). We evaluated the study population according to their age distribution. We observed that maximum study population belonged to age group of 31-40 years (n=97, 53.59%), followed by 20-30 years (n=43, 23.75%) and 41-50 years (n=41, 22.65%).

Bhat et al[10], conducted a study among 500 cases subjected to elective surgeries. They analysed that the age group of patients in the study was 16 to 67. Females comprised 286(57.2%) of the study population whereas 214(42.8%) were males. Most of the females were in the age between 28-48 years and males in the age between 26 -55.

BODY MASS INDEX

In this study, we compared the body mass index among study subjects. We observed that greater number of cases belonged to BMI of the normal range (n=97, 53.59%), followed by overweight individuals (n=42, 23.20%), and underweight cases (n=20, 11.04%).

Bhat et al [10],observed that the BMI ranged from 13 to 42kg/m^2. Most of the females had BMI ranging from18-24kg/m^2, whereas males had a range of 16 to 22kg/m^2.

PREVALENCE OF DIFFICULT INTUBATION

In this study, we evaluated the difficult intubation with the help of various grading systems, such as Modified Mallampati Score, Upper lip bite tests and CLG method. Using various methods, we observed the rate of difficult intubation was observed to be 9.39 %(17 out of 181 patients).

Bhat et al[10] incidence was 7.8% (39 out of 500 patients).

Modified Mallampati Score (MMT) has been in use since many years, though it has many limitations in it, such as absence of definite demarcation between the class II, class III and IV groups and the leads to higher interobserver variability due to effect of phonation and decreased reliability, and does not evaluate neck mobility which is an important factor in predicting difficult intubation. According to MMT, we analyzed that most of the study cases (n=91, 50.27%) belonged to class 1, followed by class 2 (n=57, 31.49%), class 3 (n=21, 11.60%) and class 4 (n=12, 6.6%) out of which class 1 and 2 are considered as the parameters of easy intubation and class 3 and 4 are considered as parameters of difficult intubation.

R Bhat et al[10], in their study, found that, in MMT, the number of patients in class 1&2 (164+238) predicted easy intubation is 402 (80.4%) whereas class 3&4(83+15) predicted difficult intubation was 98(19.6%).

CORMACK LEHANE GRADING

In this study, we classified the study population according to difficulty in intubation into 4 grades: Grade 1 to 4. We analysed that majority of the study cases (n=89, 49.17%) were belonged to in grade 2, followed by grade 1 (n=75, 41.43%), grade 3 (n=17, 9.39%) and grade 4(n=0, 0%). Out of which grade 1 and 2 are considered as the parameters of easy intubation and grade 3 and grade 4 is considered as parameters of difficult intubation.

MODIFIED MALLAMPATI SCORE

We compared MMT with CLG, in order to find out its accuracy. We observed that MMT has a sensitivity of 88.23%, Specificity of 89.02%, the Positive predictive value of 45.45% and Negative predictive value of 98.64%.

Sensitivity obtained in our study (88.23%) was greater to the study conducted by **Ezri et al**[11] (76%). We reported greater specificity

(89.02) as compared to **Khan et al**[12] (66.8%) and **Eberhart et al**[13] (61%), However, **Eberhart et al**[13] obtained 98.4% as a negative predictive value of MMT, which is comparable to our study (98.64%) .

UPPER LIP BITE TEST

In this study, we classified the study population according to difficulty in intubation into 3 classes: Class 1 to 3. We reported that most of the cases (n=74, 40.88%) belonged to class 2, followed by class 1 (n=73, 40.33%), class 3 (18.78%). Out of which class 1 and 2 are considered as the parameters of easy intubation and class 3 is considered as parameters of difficult intubation.

We compared the observations from ULBT with CLG, in order to find out its accuracy. We observed that ULBT has a sensitivity of 76.47%, Specificity of 87.19%, the Positive predictive value of 38.23% and Negative predictive value of 97.27%.

Khan et al[12] analysed a sensitivity of 76.5% in their study, in our study; we got a sensitivity of 76.47%.**Bhat et al**[10] in their study observed that in ULBT, the observations according to the classes of difficult intubation were 76%, 21%, 3%.

In the present study, we compared various accuracy parameters of both the methods (MMT and ULBT), we observed that MMT (88.23% Vs. 76.47%) has got higher sensitivity, higher specificity of (89.02% Vs. 87.19%), higher positive predictive value (45.45% Vs. 38.23%) and higher negative predictive value (98.64% Vs. 97.27%) as compared to ULBT.

Both the tests (MMT and ULBT) have a high negative predictive value more than 95%, which shows that these tests can be good predictors of easy intubation, rather as positive predictors of difficult intubation which has a very low incidence.

Khan et al[12]**,** in their similar type of study, where they evaluated the sensitivity of MMT and ULBT (55% vs. 11%), specificity (97% vs. 75%), positive predictive value (83% vs. 69%), and accuracy (90% vs. 64%).

However, the distinct advantage of ULBT as we found out included less or no chance for interobserver variability because of clear demarcation of the different classes and the appreciation of buck teeth during assessment which is one of the significant causative factor of predicting difficult intubation.

Hence, the results of this study, we proved that the accuracy of MMT test is greater as compared to ULBT.

Combination of MMT and ULBT has got better diagnostic accuracy as compared to MMT or ULBT alone.

CONCLUSION

1. In comparison with ULBT, MMT has got better predictive ability for difficult endotracheal intubation.
2. MMT and ULBT appear to be better predictors for easy intubations rather than difficult intubations (high negative predictive value).
3. Combination of MMT and ULBT has got better diagnostic accuracy as compared to MMT or ULBT alone.

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