



Original Research Paper

Comparative Study of Upper Lip Bite Test & Modified Mallampati Score in Predicting Difficult Intubation

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Abstract

Background: Good airway management defines an anesthesiologist. Link between unanticipated difficulty during endotracheal intubation with anaesthetic morbidity and mortality has been proved. Therefore it becomes necessary to predict difficult intubation as accurately as possible. Upper lip bite test is one proposed tests to predict difficult intubation.

Objectives: To compare sensitivity, specificity, positive predictive value and negative predictive value of ULBT and MMT to predict difficulty in endotracheal intubation.

Methods: A prospective study was carried on 124 patients, both sexes aged between 18 yrs to 60 yrs scheduled for elective surgeries under general anaesthesia fulfilling inclusion and exclusion criteria.

Patient airway was evaluated by MMT and ULBT preoperatively. Predictors of difficult endotracheal intubation were assigned to MMT class III and IV, ULBT class III. After premedication and induction laryngoscopy was performed in sniffing position. The glottic view was graded according to the Cormack and Lehane classification. Difficult intubation was assigned to Patients of Cormack Lehane class III / IV.

Results: Incidence of difficult intubation in our study was found to be 17.7% i.e. 22 out of 124). ULBT was found to be more sensitive and had higher positive predictive value. But, specificity and negative predictive value of both the tests were comparable.

Conclusions: ULBT is a better predictor of difficult endotracheal intubation when compared to MMT and both the tests are better predictors of easy intubations than of difficult intubation.

Keywords: Difficult intubation, Modified Mallampati Test, Upper Lip Bite Test, Cormack Lehan.

Introduction

Securing safe airway is of paramount importance in anaesthesia and key to skilled anesthesiologists. Unanticipated difficult airways and failed intubation are unpleasant encounters which can

cause serious complications like cerebral hypoxia, brain damage and death ¹. The reported incidence of difficult laryngoscopy and tracheal intubation is 1.5% to 8%². Of all the anaesthetic deaths 30% to 40%³ are attributed to the inability to manage a

difficult airway. Of all the overall claims against anesthetists in closed claims project, 17%⁴ involved difficult or impossible intubation. This has led to designing simple and reliable tests to predict difficult intubation⁵.

Modified Mallampati Test is used as the standard oropharyngeal assessment to determine difficult intubation. However its reliability has been questioned after some meta-analysis reports⁶. Presently, the commonly used tests for airway evaluation are Mallampati classification, Cormack & Lehane grading, thyromental distance, prediction scores devised by Wilson⁷, Sternomental distance, Inter incisor distance, Lower jaw length. Several authors have done combinations of several tests and yet, they remained wary of false positive results value.

So far, there is no test or method that will predict difficult intubation with 100% accuracy. It is inadvisable and unpleasant to expose patient to invasive methods preoperatively. It has to be emphasized that bed side test should be quick and reliable.

In 2003, Khan et al⁸ proposed and studied a simple noninvasive bed-side test called the Upper Lip Bite Test (ULBT) and hypothesized that it can be an alternative to Modified Mallampati Test (MMT). He obtained encouraging results with higher scores than MMT. Many other authors studied ULBT alone as well as in combination with other tests. These studies had variable results. While many agree to use MMT preoperatively, it is a non sensitive test in predicting difficult intubation and others have questioned the role of non-airway factors e.g. history of obstructive sleep apnea and obesity, ahead of accepting a single test as definitive predictor of difficult intubation⁹.

ULBT is not popular due to lack of familiarity and definite recommendation for its usage. Taking into consideration the variability of opinion regarding ULBT, we proposed to study the Upper Lip Bite Test compared to Modified Mallampati Test and ultimately to Cormack Lehane (CL) at time of intubation, to predict difficult laryngoscopy for patients under general anesthesia.

Aim of the study

- To decide whether Upper Lip Bite Test can predict difficult intubation.
- To compare modified Mallampati score and Upper Lip Bite Test to predict difficult intubation.

Objectives of the study

- To determine the sensitivity of the Upper Lip Bite Test in predicting difficult intubation.
- To compare if modified Mallampati score is more sensitive to predict difficult intubation.

Definition of Outcome Terms

Sensitivity - percentage of correctly predicted difficult intubations as a proportion of all intubations that were difficult. {Sen = true positive/true positive + false negative}

Specificity - percentage of correctly predicted easy intubations as a proportion of all intubations that were easy. {Spec = true neg/true neg + false positive}

Positive predictive value - percentage of correctly predicted difficult intubation as a proportion of all predicted difficult intubations. {PPV = true pos / true pos + false pos.}

Negative predictive value - percentage of correctly predicted easy intubations as a proportion of all predicted easy intubations. {NPV = true neg / true neg + false neg}

Accuracy - percentage of correctly predicted easy or difficult intubations as a proportion of all intubations.

Materials and Methods

This randomized prospective study was conducted at the Jawaharlal Nehru Hospital, Mauritius during the period between January 2014 and January 2015. As per the Slovin's formula a sample size of 124 Patients were chosen. The study was approved by the institution's research and ethics committee. After obtaining informed consent, 124 patients aged between 18-60yrs were

recruited, according to the inclusion and exclusion criteria.

Inclusion criteria: Patient 18 – 60 yrs, both genders, Elective surgeries requiring intubation, ASA physical status I & II.

Exclusion Criteria: Patients with-Edentulous, Neck contracture, cervical spine pathology, Emergency cases, Pregnancy and pregnant patients, malformed or deformed airways like Marfan and Pierre-Robin Syndromes, Mentally incapacitate patients.

The parameters to be studied were the MMT, ULBT preoperatively and CL after Laryngoscopy. The parameters considered to affect intubation were weight (kg), height (cms), calculated BMI (kg/m²). ULBT 3, Mallampati III & IV. Cormack Lehane III & IV were used to define difficult intubation.

All patients were thoroughly evaluated preoperatively of all the systems and particularly to the airways. The assessment methods were explained in detail to the patients. The demographic details (age, sex, ethnicity, weight, height, BMI) and airway pathology or active infection, dentition status as well as snoring were recorded.

The patients were then asked to perform the Upper Lip Bite Test. It was assessed by the extent how much the lower incisors could go over the vermilion line of the upper lip.

It was graded as

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 - the lower incisors cannot bite the upper lip

Class III was assumed to predict difficult intubation.

Preoperative NBM protocol was followed. IV access was secured. Standard anesthesia monitoring done throughout surgery. Head ring of 10 cm height was used to achieve proper sniff position. Patients were premedicated with glycopyrrolate 0.2 mcg/kg & fentanyl 1.5 mcg/kg.

Pre-oxygenation was carried out for 3 minutes and induced with propofol 2 mg/kg. Depending on ease of ventilation, suxamethonium 1-2 mg/kg or atracurium 0.5mg/kg were given. The patients were manually ventilated for 3 min.

Laryngoscopy was carried out, by an anaesthesiologist having minimum 3 yrs experience, with an appropriate size Macintosh laryngoscope and endotracheal intubation carried out using orotracheal tube 8-mm ID and 7-mm ID for males and female respectively. Use of intubation aids were documented i.e. use of bougie, stylet, longer blade, ELM maneuver, McCoy laryngoscope, LMA as well as seeking assistance at intubation.

The laryngoscopic view was graded according to the Cormack Lehane grade. Grade 3 and 4 was assigned to difficult intubation.

At the end of surgery, patients were reversed with I.V glycopyrrolate 0.01 mg / kg and neostigmine 0.05 mg / kg. After regain of reflexes and thorough suction, patients were extubated.

Recorded data was analysed in SPSS Software version 15.0. Descriptive statistics have been carried out for almost all variables. For some variables the p-value has been calculated and it is considered to be statistically significant for p< 0.05.

Observations and Results

Majority of the patients were 41-50 years old (74% Females and 26% males). 50.8% of the patients belong to the weight group of < 70 kg but > 50 kg. However, only 0.8% belongs to < 120 kg but > 110 kg. 39.5% of the population in the study is within the group 25-30 kg/m² whereas 16.1% > 30 kg/m². Asian origin (A) being the majority (n=91) represented 73.4% and African origin (AF) (n=33) represented 26.6% of the sample respectively. 76.4% Asian and 23.6% Africans are of normal BMI and 73.6% Asian and 26.5% African are overweight: 65.0% Asian and 35.0% Africans had Obesity Grade I.

Patients with Mallampati score 1 and 2 (70+50 = 120) predicted easy intubation (96.8%) whereas

Mallampati score III (4) predicted difficult intubation (3.2%). [Table 1]

Table 1. Mallampati Score Distribution

Class	Frequency	Percent
I	70	56.5
II	50	40.3
III	4	3.2
Total	124	100.0

Table 2 53 patients (42.7%) had ULBT Class 1 and 65 patients had ULBT Class 2 (52.4%), were considered as easy intubation. 6 patients had ULBT Class 3 (4.8% case), were considered as difficult intubation cases.

Table 2 Upper Lip bite test distribution

Class	Frequency	Percent
1	53	42.7
2	65	52.4
3	6	4.8
Total	124	100.0

Table 3 87 patients (70.2%) had CL grade I, 25 patients (20.2%) had a CL grade II and 12 patients (9.6%) had CL grade III. There were no patients in the Cormack Lehane grade IV group.

Table 3. Cormack Lehane Distribution

Cormack Lehane Grade	Frequency	Percent
I	87	70.2
II	25	20.2
III	12	9.6
Total	124	100.0

According to Table 4, it is depicted that 0 patient (with ULBT grade 3) out of 70 with MMT class I, 4 patients (with ULBT grade 3) out of 50 with MMT class II and 2 patients (with ULBT grade 3) out of 4 with MMT class III had difficult intubations.

Table 4. Mallampati Score v/s ULBT Grade (no. of pts in ULBT 3 who had difficult intubation)

	ULBT 1	ULBT 2	ULBT 3	Total
MMT I	51	19	0	70
MMT II	2	44	4	50
MMT III	0	2	2	4
Total	53	65	6	124

According to Table 5, it is depicted that 1 / 70 patient with MMT I, 9 / 50 patients with MMT II and 2 / 4 patients with MMT III had difficult intubations (CL III).

Table 5 Mallampati Score v/s Cormack Lehane Grade

	CL I	CL II	CL III	Total
MMT I	62	7	1	70
MMT II	25	16	9	50
MMT III	0	2	2	4
Total	87	25	12	124

Table 6. Based on the above investigation, it can be inferred that 1 / 53 class 1 ULBT patients had Cormack Lehane grade III, 6 / 65 patients with ULBT class 2 had Cormack Lehane grade III and 5/6 patients with ULBT class 3 had Cormack Lehane grade III.

Table 6. Upper Lip Bite Test v/s. Cormack Lehane Grad.

	CL I	CL II	CL III	Total
ULBT 1	52	0	1	53
ULBT 2	35	24	6	65
ULBT 3	0	1	5	6
Total	87	25	12	124

Table 7 Relationship between the results of the 3 predicting tests and Cormack Lehane grades in 124 patients

Table 7: Relationship between the 3 predicting tests

	Cormack Lehane	
	I & II	III&IV
	ULBT	
Classes I & II	111	7
Classes III	1	5
	MMT	
Classes I & II	110	10
Classes III	2	2

Table 8.1 Mallampati Score vs. Cormack Lehane grade

True Positive = 02	SEN=16.67%
True Negative= 110	SPE= 98.2%
False Positive= 02	PPV= 50%
False Negative= 10	NPV=91.67%

Table 8.2 Upper Lip Bite Test vs. Cormack Lehane grade

True Positive = 05	SEN=41.67%
True Negative= 111	SPE= 99.11%
False Positive= 01	PPV= 83.33%
False Negative= 07	NPV=94.07%

Sensitivity for Mallampati and ULBT were 16.67% and 41.67% respectively whereas specificity is almost similar 98.2% and 99.11%.

Positive Predictive Value for Mallampati Test was 50% and ULBT was 83.33%, Negative predictive

value was 91.67% and 94.07% respectively. [Table 9]

Table 9. Comparison of sensitivity and specificity of ULBT and Mallampati Score

	SENSITIVITY	SPECIFICITY	PPV	NPV
ULBT	41.67%	99.11%	83.33%	94.07%
MMT	16.67%	98.2%	50%	91.67%

Aid required for different Mallampati score

According to the TABLE 10.1., 62/85, 23/85 and 0/ 85 patients in MMT class I, II and III respectively did not require any aid.

6/ 28 patients in MMT class 1, 20/ 28 patients in MMT class II and 2/ 28 patients in MMT class III require ELM.

4/ 4 patients in class II required LB. 1/1 patient in MMT class I required ELM + 2 head rings. 1 patient each in MMT class II and MMT class III required ELM + Mc coy and 1 patient in MMT III required ELM+ Bougie. Thus in all 27/50 patients in MMT class II and 4/4 patients in MMT class III had difficult intubations.

Table 10.1. Relationship between Aid Required & Mallampati Score (Cross- tabulation)

Aid required	MMT I	MMT II	MMT III	Total
Nil	62 (72.94%)	23 (27.06%)	0	85
ELM	6 (21.43%)	20 (71.43%)	2 (7.14%)	28
LB	0	4 (100%)	0	4
LB + ELM	0	2 (100%)	0	2
ELM + 2 Head rings	1 (100%)	0	0	1
MC COY + ELM	0	1 (50%)	1 (50%)	2
ELM + BOUGIE	0	0	1 (100%)	1
Total	70	50	4	124

According to the Table 10.2., 53/85, 32/85 and 0/ 85 patients in ULBT class 1, 2 and 3 respectively did not require any aid.

0/ 28 patients in ULBT class 1, 25/ 28 patients in ULBT class 2 and 3/ 28 patients in ULBT class 3 require ELM.

3/ 4 patients in class 2 and 1/4 in class 3 required LB. 2/2 pts in ULBT 2 required LB + ELM. 1/1

in ULBT class 2 required ELM + 2 head rings. 1 pt. each in ULBT class 2 and ULBT class 3 required ELM + Mc coy and 1 pt in ULBT 3 required ELM+ Bougie. Thus in all 32/65 pts in ULBT class 2 and 6/6 pts in ULBT class 3 had difficult intubations. Out of 53 patients in ULBT class 1, no patient required any aid.

Table 10.2: Relationship between Aid required and ULBT

Aid required	ULBT 1	ULBT 2	ULBT 3	Total
Nil	53 (62.34%)	32 (37.65%)	0 (0%)	85
ELM	0 (0%)	25 (89.29%)	3 (10.71%)	28
LB	0 (0%)	3 (75%)	1 (25%)	4
LB + ELM	0 (0%)	2 (100%)	0 (0%)	2
ELM + 2 Head rings	0 (0%)	1 (100%)	0 (0%)	1
MC COY + ELM	0 (0%)	1 (50%)	1 (50%)	2
ELM + BOUGIE	0 (0%)	0 (0%)	1 (100%)	1
Total	53	65	6	124

Discussion

Anesthesiologist's main objective is safe anaesthesia. Based on the different studies, the incidence of unanticipated difficult intubation varies between 1.3% to 13%⁷. Burkle et al²⁰ in a sample of 37,482 patients, quotes the percentage of unanticipated difficult intubation as 1.5%-8.5% which was attributed to varying anthropology, wrong positioning of patient and or use of wrong blade²¹.

Available methods have been evaluated many times to find the ideal predictive test for unanticipated difficult laryngoscopy before proceeding for general anaesthesia. Several tests like Mallampati test and Modified Mallampati test, sternomental distance, thyromental distance, ratio of one test to the other for example the ratio of height to mandibular distance - all of them have been tested again and again alone or in combination without none being totally reliable^{13,32}.

Khan et al⁸ introduced Upper Lip Bite test as a substitute to the widely used modified Mallampati test. It assesses how much the lower teeth can bite the upper lip, with the vermilion line as the set point. It is a simple and easy test performed within a few seconds and doesn't require any equipment. The 3 classes of ULBT are clearly demarcated and delineated showing inter observer variability highly unlikely when using this test¹¹.

Modified Mallampati classification⁶ has been used for more than 2 decades and over the years, its limitations have been pointed out widely by several studies²² when used as a single test²³. Absence of a proper demarcation between class I & Class II and between Class III & IV and the effect of phonation on the oropharyngeal classification have led to high inter observer variability and decreased reliability. Each of the predictors had their own limitation and none can be 100% sensitive and specific²⁴. Cormack and Lehane grade 3 and 4 are associated with difficult intubation and requiring aids like bougie, higher grade of laryngoscope blades, laryngeal manipulation and bougie etc.

A Couple of meta-analyses have refused to acknowledge their accuracy²⁵ when the comparison is based on the Cormack and Lehane score as outcome measure. Studies by Horton et al²⁶ and Oates et al²⁷ have attributed this lack of accuracy due to inter-observer variability and the effect of phonation which decreases the reliability of Modified Mallampati Test. Oates et al had a preference for Wilson risk score (study in 675 patients). A larger meta-analysis involving 55 studies and 177 088 patients was carried out by Lundstrom et al²³ concluded that Modified Mallampati Score was inadequate as a stand-alone test to predict difficult intubation but it still has a role if combined with other test. Another meta-analysis by Lee et al³³ involving 40 studies and 34,513 patients concluded that Mallampati tests were poor at identifying difficult mask ventilation and when used alone, it had limited accuracy for predicting difficult airway and thus are not useful screening tests.

The objective of our study was to compare the sensitivity and specificity of Upper Lip Bite Test with Modified Mallampati Test in order to predict difficult laryngoscopy and intubation using Cormack and Lehane grade of difficulty as gold standard.

We examined airway of 124 patients requiring general anaesthesia on elective basis (belonged to ASA I and II only and both sexes).

In our study, the majority of patients belonged to MMT score 1 (56.5%), Cormack Lehane score 1 (87%) and ULBT class 1 (52%). The incidence of difficult intubation was 17.7% i.e. 22 out of 124 patients assessed. Percentage of correctly predicted as difficult intubation (CL-3) by modified Mallampati test were 4 patients and 6 patients belonged to (difficult) ULBT. This is comparable with study done by Asghar et al¹¹ (17.3%) and close to Eberhart et al¹³ which had an incidence of 12%. Incidence of difficult intubation in Khan et al¹⁰ trial was 5.7% .We took note that in our study there was no failed intubation nor did any patient sustain physical injury while intubation.

Sensitivity of modified Mallampati

In our study, sensitivity of modified Mallampati class was 16.67% which was less than the study carried by Khan et al (i.e. 82.4%). Our result was comparable with studies done by Ashgar et al¹¹ (19.6%). Large meta-analysis by Lundstrom et al²³ had sensitivity value of 22% and Hester et al¹⁸ reported 11%. Discrepancies in evaluation and interpretation have been suggested by Oates²⁷ et al and Karkouti et al²⁸ who concluded that Mallampati had poor reliability (K= 0. 31). Some patients did require several repositioning in order to perform MMT well, though some patients were hesitant to protrude the tongue maximally.

Nevertheless current results correlate well with wide inter-observer variability which was reported by Eberhart et al¹³ and Karkouti et al²⁸. But higher sensitivities are reported by Khan et al (82%), Eberhart et al (70 %), Chohedri et al (94%). This confirms the wide inter-observer variability test done by Hilditch et al³¹, which was attributed to inaccurate classification, inconsistent technique and patient factors such as inability to perform what was asked despite demonstration.

Specificity of Modified Mallampati

Specificity of Modified Mallampati class in this study is 98.2% which is closely related to studies conducted by Chohedri et al²⁹ (96%) and Lundstrom et al²³ (93%). But study done by Khan et al⁸ reported specificity of Modified Mallampati Test as 66.8%; Eberhart et al¹³ also reports a lower percentage of Modified Mallampati (61%). According to study by Oates et al²⁷ and Frerk et al³⁰, the specificity has been reported as 82% and 84% respectively, which is similar to this study. Frerk et al concluded that MMT is a sensitive test but not very specific due to high number of false positive results and therefore not recommending it as a sole predictor of difficult intubation.

Sensitivity of ULBT

In our study, sensitivity of ULBT was 41.67% which was comparable to Mohan et al¹⁵ (40%) whereas Khan et al⁸ reported a sensitivity of 76.5%. This means that several patients presenting with difficult intubation would not be identified

by ULBT. Therefore it makes it an unreliable test to filter difficult intubation scenarios. This was in sharp contrast to study by Naithani et al¹⁴ who reported a very high sensitivity score of 92.8% and Ashgar Ali et al¹¹ (87.5%). Shah et al¹⁰ also reported higher values (74.6%). This shows that final specificity score has a tendency to vary. However, low sensitivity values were obtained by Eberhardt et al¹³ (28.2%), Karci et al¹⁷ (13%). They concluded that due to its inferior sensitivity value, ULBT is not reliable to predict difficult intubation. Lower sensitivity value in our study could possibly be explained due to a smaller sample as well as very low incidence of ULBT class 3.

Specificity of ULBT

Study by Karci et al¹⁷ in 2011 concluded that ULBT had higher specificity (97.6%) than modified Mallampati and recommended further studies on this subject. Almost all authors reported high specificity value (>85%) except Safavi et al¹⁶ (73%). In our study, specificity of ULBT was 99.11% and is similar to that obtained by Chohedri et al²⁹ (98.3%), Badhe et al¹⁹ (99.1%) and Honarmand et al³⁴ (99.4%). Karci et al¹⁷ noted that ULBT has higher specificity (97.6% vs. 94% for MMT) but very low sensitivity for both test (13% vs. 26.6% respectively). He concluded they are poor predictors and advocated further studies on this subject. Specificity of ULBT in our study was higher than that of Eberhardt et al¹³ and Khan et al⁸ (92.5% and 88.7% respectively). Balasubramanyam et al¹² also reported high specificity for ULBT in his study (97.9%).

Positive predictive value of MMT

In our study, the PPV of Modified Mallampati Test was 50%. It was comparable to study done by Srinivasa et al³⁵ (PPV 48%) and Naithani et al¹⁴ (PPV 42.8%). Although relatively low value, it was still higher than the PPV noted by Khan et al⁸ (13%) and Honarmand et al³⁴ (18.3 %) and Eberhardt et al¹³ (PPV 19.5%). This can be explained by the fact that the airway was evaluated by a single resident whereas in the other studies, it was conducted by two or more

anesthesiologists which may have contributed to higher inter-observer variability leading to higher values of false positivity.

Positive predictive value of ULBT

Positive predictive value of ULBT in this study (83.33%) is similar to that conducted by Hester et al¹⁸ (83%) although less than Honarmand et al³⁴ (93%). It was higher than the study of Eberhart et al¹³ (33.6%) and Khan et al trial⁸ (28.9%). This could be because of a low number of ULBT class 3 and smaller sample size hence decreasing the potential incidence of difficult cases in this study. But although ULBT had high PPV, it still had lower sensitivity value (41.7%) compared with Khan et al⁸ (76.5%) but correlated with Eberhart et al¹³ (28.2%) and Honarmand et al³⁴ findings (48.9%).

Negative predictive value

High negative predictive value identifies correctly predicted easy intubation. In our study, the negative predicted value for Mallampati Test was 91.67% and ULBT was 94.07%. Therefore it can be assumed that both ULBT and MMT can be considered as good predictors of easy intubation rather than being positive predictors of difficult intubation which had a very low incidence in this study. Similar results were obtained by Badhe et al¹⁹ (96% and 94% respectively), Khan et al⁸ (98% and 98%) but less by Hester et al¹⁸ (79% for MMT and 90% for ULBT).

Accuracy value

In our study, the ULBT had an accuracy value of 90 % and Mallampati 90% also which is high for both of the tests. It correlated well with the findings of Chohedri et al²⁹ (94% for MMT and 96% for ULBT). Various authors had accuracy around 90% for ULBT (Khan et al 88%, Badhe et al 93%, Hester et al 90%, Honarmand et al 92%)³⁴ but similar results cannot be reproduced for all authors for MMT which had a rather wide range of accuracy (Khan et al 68%, Hester et al 64%, Eberhart et al 62%) possibly reflecting the wide inter-observer variability.

In the study by Khan et al⁸, accuracy was 88% compared to modified Mallampati Test 67.7%. This was comparable to Eberhart et al¹³ (84.9%) for ULBT and 62.1% for modified Mallampati class.

Thus in this study, we found that the sensitivity of ULBT 41.67% was much higher compared to modified Mallampati test 16.67%. ULBT had a higher specificity of 99.11% and positive predictive value 83.3% compared to modified Mallampati test 50%. The negative predictive value for both tests was more than 90% proving that these tests are better used for their prediction of easy intubation. It could be explained by the low incidence of difficult intubation in the current study.

ULBT and Mallampati are simple and easy to perform bed side tests and have good predictive value and should be used on a routine basis during the pre-anesthetic visits for the screening of difficult intubation. The large meta-analysis by Lundstrom however stated the fact that Mallampati test is best used as part of a multivariate assessment method. The presence of ULBT III is considered as the best predictor of difficult intubation and the absence of Mallampati class IV is the best single test to rule out the difficult intubation. Hence, the identification of potential difficult intubation in pre-anaesthetic visit is highly recommended so that an alternative method can be planned in advance from the starting up of anaesthesia in order to avoid potential serious outcome for both the physician and patient.

Limitation & Bias of the Study

This study had a few limitations.

- The sample used possibly was too small and it involved mostly patients of Asian descent which might not be representative of the general population, making analysis restricted.
- Some patients were unable to elicit/understand the test in spite of

repeated demonstrations. This group was not limited to any specific age group.

- It was noted that some patients had the ability of moving involuntarily / reflexly the upper lip downward and at the same time biting over it with the lower teeth, hence overestimate the real Upper Lip Bite Test class.
- The likelihood of difficult intubation in the obese group was not really appreciated as higher BMI values were not available for this sample size.
- The subdivision of Cormack Lehane grade II (a & b) was not taken into consideration. Its involvement possibly could have converted a Cormack Lehane grading of III into II, hence decreasing reported incidence of difficult intubation.

Conclusion

On the basis of the current study, we can conclude:

- Upper Lip Bite Test in this sample predicted more accurately difficult intubation than Modified Mallampati Test.
- Upper Lip Bite Test is as useful as the Mallampati Test to predict easy laryngoscopy.
- Upper Lip Bite Test cannot be used as sole predictor of difficult intubation.
- Upper Lip Bite Test being simple and non-invasive can be used in combination with Modified Mallampati test.
- Upper Lip Bite Test had good accuracy value as MMT in this study.
- Upper Lip Bite Test should not be forced upon patients after 3 attempts.
- A larger sample is needed for further evaluation.

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