Difficult airway Assessment: Comparison of Upper Lip Bite Test (ULBT) and Modified Mallampati Test (MMT)

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Abstract

Airway management is most important job of anaesthesiologists. Difficult airway is assessed mainly comparing different parameters of airway assessment. In this study we mainly compare Upper Lip Bite test (ULBT) and Modified Mallampati Test (MMT) for prediction of difficult intubation. We have taken 100 patients' database from RIMS Ranchi hospital, study have been done in all patients undergoing general anaesthesia. After database is designed, data are processed through SPSS and Excel software analysis. In this case we have gone through 100 patients and subsequently after grading ULBT and MMT, taking Cormack Lehane Grading as standard one. Comparison done on the basis of sensitivity, specificity, positive predictive value, negative predictive value, accuracy. It was observed from the study that MMT is better predictor of difficult intubation than ULBT. Both are predictors of good predictors of easy intubation rather than difficult intubation.

Keywords: Upper Lip Bite test (ULBT); Modified Mallampati Test (MMT).

Introduction

Proper airway management is the most important responsibility of anesthesiologists. Incidence of difficult airway is 1.5%-8% [1]. Poor airway management has been recognized as a serious problem for almost three decades highlighting the need for careful airway assessment because an unanticipated difficult airway are potentially catastrophic [2]. Three main causes of airway related problems are

- Inadequate ventilation.

- Difficult laryngoscopy.

- Difficult endotracheal intubation.

Although prediction is very difficult, in light of the complications, considerable attention has been given to predict difficult intubation in patients.

There are many tests to predict difficult intubation which have been shown to have own merits and demerits. So prediction of difficult intubation is done by applying various airway assessment methods.

Mallampati SR et al (1985) [3] suggested Mallampati Test to predict difficult intubation. Mallampati test mainly estimates proportionality of tongue size to oral cavity which indirectly estimates visibility of glottis. Samsoon GLT and Young JRB(1987) [4] reviewed a series of obstetrical and general surgical patients who were known difficult intubations and assigned Mallampati classifications. They !added a further class (class IV = no pharyngeal structures visualized) to the Mallampati grading. Samsoon observed that among patients in whom laryngoscopy was known to be difficult, class III and class IV assignments predominated. The Mallampati classification system was further evaluated by them who studied the effects of posture, phonation and

observer on Mallampati classification. Phonation produced a marked improvement of view and a more favorable classification whereas the supine position resulted in a somewhat worse view and a higher grade. In day to day practice, we use Modified Mallampati Test (MMT) to predict the difficult endotracheal intubation. In direct laryngoscopy. MMT are classified into four classes

Class I: Soft palate, fauces, uvula and tonsillar pillar.

Class II: Soft palate, fauces, uvula seen.

Class III: Soft palate and base of the uvula seen.

Class IV: Only hard palate is visible, no soft palate is visible.

Oropharyngeal examination during Mallampati classification should be done with adequate flashlight. The patients will be in sitting position, tongue will be fully protrude out and not asked to say 'ah'. In some cases due to unexpected anatomical disproportionality it becomes difficult to estimate by MMT.

Khan ZH et al(2003) [5] suggested Upper Lip Bite Test(ULBT), a simple new bedside test for predicting difficulty in endotracheal intubation. In upper lip bite test the range of motion of temporomandibular joint is tested.

Upper lip bite test is classified as

ClassI: Lower incisor can bite upper lip above the vermilion line.

ClassII: Lower incisor can bite upper lip below the vermilion line.

ClassIII: Lower incisor cannot bite the upper lip.

In this study we compare ULBT and MMT for prediction of difficult intubation, which ultimately compared with Cormack Lehane gradings.

Aims and Objectives

1. Evaluation of a simple new bedside test for airway assessment
2. To evaluate and compare sensitivity, specificity, positive predictive value and negative predictive

value of upper lip bite test and modified mallampati classification in predicting difficult intubation in patients undergoing general anaesthesia.

Materials and Methods

The present study was performed in operation theatres of RIMS, Ranchi on 100 (one hundred) patients undergoing general anaesthesia with institutional ethical clearance.

Inclusion Criteria: Patient's consent.

ASA Grade I and II.

Age groupe16-80 yrs.

Exclusion Criteria: Patient's refusal.

ASA Grade III and IV.

Edentulous patients.

Tumour and growth in the mouth and oral cavity. Burn contracture around the mouth and oral cavity.

Cervical spine injury.

Pharygolaryngeal pathology .

Patients selected after pre-anaesthetic check –ups. Evening before the operation day patients were again examined and informed and written consent were taken. Airway evaluation done for MMT gradings and ULBT gradings and pro-forma was filled up. In the operation theatre smooth induction and direct laryngoscopy done in ideal position, Cormack Lehane grading were noted and intubation done. Then intraoperative parameters were monitored throughout the procedure and extubation done and patients were shifted in post operative recovery room.

Observations and Results

Statistical significance of variation weight, height, Body mass index (BMI).

Table 1: Statistical significance of variation weight, height, Body mass index (BMI) (By Chi Square Method)

Parmeters	Mean	SD	P value	Significance
Weight	54.18	9.74	0.05	Significant
Height	164.92	10.44	0.009	Significant
BMI	19.84	2.50	0.001	Significant

Table 2: Comparison between Modified Mallampati Test and Cormack Lehane gradings

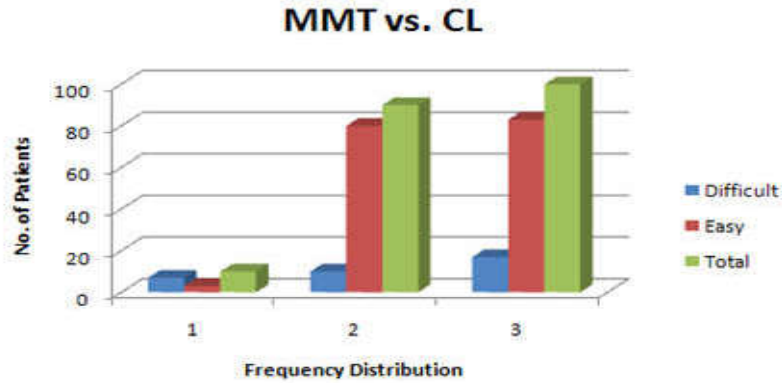|	Cormack Lehane Grading		
MMT	Difficult	Easy	Total
Difficult	4	13	17
Easy	3	80	83
Total	7	93	100

Fig. 1: Comparison of Modified Mallampati Test with Cormack   Lehane Grading.
Significance: The Chi -square statistic is 8.5962.The p-value is 0.003.The result is significant

Table 3: Comparison between Upper Lip Bite Test(ULBT) and Cormack Lehane Gradings

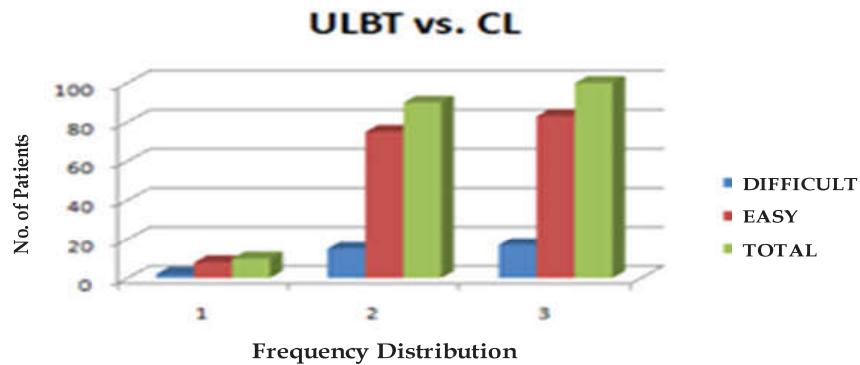| ULBT	Cormack Lehane		Total
	Difficult	Easy	
Difficult	2	15	17
Easy	5	78	83
Total	7	93	100

Fig. 2: Comparison of Upper Lip Bite Test with Cormack Lehan Grading.
Significance: The Chi-square statistic is 0.5593.p value is 0.3.The result is   not significant.

Table 4: Comparison between MMT and ULBT

Parameters	MMT	ULBT
True positive	4	2
False positive	13	15
True negative	80	78
False negative	3	5
Sensitivity	57.14%	28%
Specificity	87%	83%
Positive predictive value	24%	11.76%
Negative predictive value	96.38%	93%
Accuracy	84%	80%

Disscussion

Airway management remains an important challenge in the practice of anaesthesia and preoperative airway assessment facilitates appropriate preparation when difficulty with intubation or ventilation is anticipated prior to induction of anaesthesia. The preoperative tests considered as ideal, one which is easy to perform, highly sensitive, highly specific and which 'posses high positive predictive value with few false positive predictions.

Khan ZH et al(2003) [5] Upper Lip Bite test (ULBT) was such an attempt. They propsed jaw sublaxation as alternative to the most widely used Modified Mallampati Test. They found out that ULBT was easy to perform within seconds of demonstrating it to the patients and very convenient to perform as a bedside test. The classes are clearly demarcated and delineated making inter observer variability highly unlikely while using this test.The current study therefore, was undertaken to compare Upper Lip Bite Test (ULBT) with Modified Mallampati Test(MMT) for predicting difficulty during endotracheal intubation in 100 patients of both sexes , aged between 16 yrs to 80 yrs of age undergoing elective surgery under general anaesthesia .

In our study, incidence of difficult intubation was found to be 7% (seven cases of difficult intubation out of one hundred patients) which is comparable to the results obtained by Savva D et al (1994) [6]. However the reported incidence of difficult laryngoscopy or intubation is 1.5% to 8%. The incidence of difficult intubation in Khan Z. H et al (2003) [5] trial was 5.7% where as in Leopold H. J et al (2005) [7] trial it was 12%. This wide variation in incidence is due to the criteria that are used to define the difficult intubation and different anthropometric features among populations. The findings of this study is in corroboration with the above studies.

There were no failed intubation in our study. Modified Mallampati Test (MMT) has been in use for more than two decades. The absence of definite demarcation between the class II, class III and IV groups and the effect of phonation on the oropharyngeal classification leads to higher inter observer variability and decreased reliability .

Another limitation of MMT includes, the fact that the test does not assess neck mobility which is an important factor in predicting difficult intubation. This is true for ULBT also .

In our study we found the sensitivity of MMT to be 57% which was slightly lower than the study conducted by Khan Z.H et al(2003) [5] which was 93% and Erzi T et al (2003) [8] was 76%. But this was comparable with the study of Savva D et al (1994) [6] where it was 64%.

The specificity of MMT in our study is 87 % which is more than of Khan Z.H et al (2003) [5] which was 66.8%, Eberhart L.H.J et al(2005) [9] at 61% and Leopold H.J et al (2005) [7] at 61%.

Higher specificity similar to our study been reported by Oates J.D.L et al (1991) [10] of 81% and Freck C.M et al(1991) [11] at 84%.

The wide variations in reported specificity and sensitivity in various studies may be because of incorrect evaluation of the test and inter observer variability seen in MMT as was also found by Eberhart L.H.J et al(2005) [9].

The positive predictive value of MMT in our study was 24 % which is similar to that of Leopold H.J et al (2005) [7] and much higher than that found by Khan Z.H et al(2003) [5].The experience of the Anaesthesiologist performing the intubation also might have caused variation in results.

The sensitivity of ULBT in our study was 28% which is well below what Khan Z.H et al(2003) [5] had got in their study (76.5%), but it was nearer to the value obtained by Eberhart et al (2005) [9], at 27% and to that of Leopold H.J et al trial(2005) [7], of 28.5%.This means that several patients who present with difficult intubation will not be identified by ULBT (larger number of patients with false negative test) .

The specificity of ULBT in our study was 83% comparable to Leopold H.J et al (2005) [7](92.5%) and Khan Z.H et al (2003) [5] (88.7%) trials.

The PPV of ULBT in our study was 11.76% which was less as compared to Leopold H.J et al (2005) [7] trial (33.6%) and Khan Z.H et al (2003) trial (28.9%.).

The negative predictive value of MMT is 96.38% and ULBT is 93% in the present study is comparable to those of Khan Z. Het al (2003) [5] (92%) and Eberthert L.H. J et al(2005) [9] (90%). Both tests have high negative predictive values, so they can be predictors of easy intubation rather than positive predictors of difficult intubation which has very low incidence. This same conclusions was made by Leopold H.J et al(2005) [7].

The accuracy of prediction was frequent in the original study describing the ULBT by Khan et al(2003). The accuracy of ULBT was (84%) compared

to MMT (80%)this was almost replicated in the trial by Leopold H.J et al (2005) [5] (84.9%)for ULBT and (62.1%)for MMT.

On comparing both the tests, we found that, MMT is more sensitive (57.00%) than ULBT (28.00%), but both tests had high specificity and negative predictive value.

Difference in the sensitivity between the two tests was found to be statistically significant (0.001). Although ULBT has higher specificity but 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 which has a very low incidence.

Incidentally, during the study, we found that repeated demonstrations were required for patients to perform ULBT and a few cases are failed to understand the procedure despite of our efforts. We went on to exclude these patients from our study which are three in number. Another interesting observation was the reflex movement of the upper lip in the reverse direction over the upper teeth. This movement may alter the point of meeting of vermilion line with the lower incisors. It might be different in different age groups and also in males and females. In the same individual, this may also vary according to the effort applied.

However the distinct advantage of ULBT that less or no chance for inter observer variability because of clear demarcation of the different classes and the appreciation of buck teeth during assessment which is one of the important factor predicting difficult intubation.

Regarding MMT it can be said that more chances of inter observer variability because of difference in anthropometric features, less clear demarcation between the grading. Phonation and posture of patients also make difference.

Conclusions

From our study we conclude that:

1. MMT is a better test at predicting difficult endo-tracheal intubations when compared to ULBT.

2. Both the tests are better predictors of easy intubations rather than difficult intubations (high negative predictive value).

Acknowledgement

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