Original Research Article

Comparison of upper lip bite test with modified Mallampatti classification for predicting difficulty in endotracheal intubation: A prospective study

Shilpa H L[1], V B Gowda[2*], Namratha Ranganath[3]

[1]Assistant Professor, BGS GIMS, Bangalore, Karnataka, INDIA.
[2,3]Professor, Kidwai Memorial Institute of Oncology, Bangalore, Karnataka, INDIA.
Email: shilpahl@yahoo.com

Abstract

Background: Difficult laryngoscopy and intubation causes increased risk of morbidity and mortality. Accurate preoperative assessment tests to predict the difficult intubation is necessary to secure and maintain an intact airway. **Materials and Methods:** The study enrolled160 patients of ASAI-III 16 -60yrs of age scheduled for elective surgical procedures under general anaesthesia. A thorough pre-anaesthetic evaluation was done, preoperatively airway was evaluated using modified mallampattitest (MMT) and upperlip bite test (ULBT). Laryngoscopy was done in sniffing position and glottic views were graded according to the Cormack and Lehane classification. The sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) were calculated for each parameter. **Results:** The mean age of the study subjects was 48.23years, majority of them had MMT I and II, ULBT I and II. MMT had higher sensitivity and specificity than ULBT. **Conclusion:** In the present study we concluded that MMT is a better test at predicting difficult endotracheal intubations when compared to ULBT.
Key Words: Mallampatti classification, endotracheal intubation.

***Address for Correspondence:**
Dr. V B Gowda, Professor, Kidwai Memorial Institute of Oncology, Bangalore, Karnataka, INDIA.
Email: shilpahl@yahoo.com
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INTRODUCTION

Airway management is of prime importance to the Anesthesiologist. For securing airway, tracheal intubation using direct laryngoscopy remains the method of choice in most of the cases. The reported incidence of difficult laryngoscopy and tracheal intubation occurs in 0.5% to 18% of patients in general anesthesia.[1]Difficult laryngoscopy and intubation cause increased risk of complications to the patient ranging from sore throat to airway trauma. In some cases, if anesthesiologist is not able to maintain a patent airway, it may lead to serious complications like hypoxic brain damage or death. About30% to 40% death during anesthesia are attributed to the inability to manage a difficult airway[2,3] Therefore, there's a compelling need for accurate tests to predict difficult intubation, as failure to achieve endotracheal intubation causes morbidity and mortality in anaesthetized patients. There are many tests to predict difficult intubation likeinter-incissor gap (IIG)/mouth opening, Mallampati grading (MPG), head and neck movement (HNM), horizontal length of mandible (HLM), sternomental distance (SMD), and thyromental distance (TMD)[4]. These have been shown to have high false positive rates, which detract their usefulness. However, there are limited studies regarding the usefulness of ULBT. Hence, this present study was conducted to compare ULBT with MMT in predicting difficulty in endotracheal intubation, in patients who are undergoing surgery under general anaesthesia.

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MATERIAL AND METHODS

After obtaining institutional ethical committee clearance the study was conducted at Kidwai Memorial Institute of Oncology, Bangalore. During the study period, 160 patients between 16 -60yrs of age undergoing elective surgical procedures under general anaesthesia 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 after which written informed consent was obtained. Preoperatively airway was evaluated using MMT and ULBT for all the patients. Classification of oropharyngeal view was done according to MMT**,** 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. On the day of surgery IV line was secured in the pre-operative room, once the patient was shifted to the operating theatre, they were monitored with electrocardiogram, non-invasive blood pressure and pulse oximeter. 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 glottis view was graded according to the Cormack and Lehane grading. 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 McNemar's test were used to calculate statistically significant difference in sensitivity and specificity between these tests respectively.

RESULTS

The present study was undertaken - to compare two pre-operative airway- assessment tests to predict the difficulty during endotracheal intubation. One hundred and sixty patients aged between 16 years to 60 years of age, of both sexes scheduled for elective surgery under general anaesthesia were enrolled in the study. 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.

Table 1: Distribution of age of the study subjects

Age in years	Number of patients	Percentage
18-20	4	2.5
21-30	8	5.0
31-40	30	18.8
41-50	42	26.3
51-60	76	47.5
Total	**160**	**100.0**

The mean age of the study subjects was 48.23±11.01 years.

Table 2: Modified Mallampati test (MMT) grading of the study subjects

MMT	Number of patients	Percentage
Class I	65	40.6
Class II	88	55.0
Class III	7	4.4
Class IV	0	0.0
Total	**160**	**100**

In our study, one hundred and fifty three had MMT class I and II and seven patients had class III.

Table 3: Upper lip bite test (ULBT) of patients enrolled

ULBT	Number of patients	Percentage
Class I	71	44.4
Class II	76	47.5
Class III	13	8.1
Total	**160**	**100.0**

Table 4: Relation between Modified Mallampati test and laryngoscopic view

	Cormack-Lehane Grade I and II	Cormack-Lehane Grade III and IV	Tota l
MMT I and II	150	3	153
MMT III and IV	3	4	7

In our study, one hundred and fifty three had MMT class I and II and seven patients had class III. Of these three of the MMT class I and II and four of the MMT class III had Cormack Lehane grade III. None of the patients had MMT class IV.

Table 5: Relation between Upper lip bite test (ULBT) and laryngoscopic view

	Connack- Lehane Grade I and II	Connack- Lehane Grade III and IV	Total
ULBT I and II	141	6	147
ULBT III	12	1	13

Of one hundred and sixty patients, sixty five patients had MMT class I and seventy one patients had ULBT class I, in whom there was each one case of difficult intubation. Four out of the seven cases of MMT class III and one out of thirteen cases in ULBT class III had difficult intubation

Table 6: Correlation of MMT and ULBT in relation to findings of Cormack and Lehane

Statistical terms	MMT	ULBT
True positive	04	01
False positive	03	12
True negative	150	141
False negative	03	06
Sensitivity	57.14%	14.29%
Specificity	98.04%	92.16%
Positive predictive value	57.14 %	7.69%
Negative predictive value	98.04%	95.92%
Accuracy	96.5%	88.75%
P value	<0.001	<0.001

There were one hundred and forty seven patients predicted to be easy for intubation by ULBT (i.e. patients who had ULBT class I and II) out of whom however, we encountered difficult intubation in six patients. One in ULBT class III also had difficult intubation. Of the entire one hundred and sixty patients, a total of seven patients had difficult intubation, all of whom had Cormack Lehaneclasss III on laryngoscopy.

DISCUSSION

Although there are many preoperative tests to predict difficult airway, they are far from being ideal i.e., one which is easy to perform, highly sensitive, highly specific and which possess high positive predictive value with few false positive predictions. Khan and his colleagues' Upper Lip Bite test (ULBT) was such an attempt[5]. They proposed jaw subluxation and buck teeth 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 one hundred and sixty patients of both sexes, aged between 16yrs to 60yrs of age undergoing elective surgery under general anaesthesia. In our study, incidence of difficult intubation was found to be 5% (seven cases of difficult intubation out of one hundred and sixty patients) which is comparable to the results obtained by Frerk and Savva[6,7]. However the reported incidence of difficult laryngoscopy or intubation is 1% to 18 %.[1,8] This wide variation in incidence is, due to the criteria that are used to define the difficult intubation and different anthropometric features among populations. There were no failures to intubate the trachea in any of the patients enrolled in our study. The MMT has been in use for more than two decades and over the years many limitations have been pointed out by various authors. The absence of definite emarcation 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[9,10]. 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 57.14 % which was less compared to the study conducted by Erzi *et al* (76%)[11]. The specificity and PPV of MMT in our study is more than of Khan *et al*(66.8%) and Eberhart *et al* (61%)[5,12]. A higher specificity similar to our study has also been reported by Cattano *et al*[13]. The widevariations in reported specificity and sensitivity in various studies may be because of incorrect evaluation of the test and observer variability seen in MMT as was also found by Eberhart *et al*[12]. The sensitivity of ULBT in our study was 14.29 % which is well below what Khan *et al* had got in their study (76.5%), but it was nearer to the value obtained by Eberhart *et al* (28%)[12]. This means that several patients who present with difficult intubation will not be identified by ULBT (larger number of patients with false negative test). Lower sensitivity of the ULBT can be explained due to low incidence of ULBT class III in our study.The specificity of ULBT in our study was 92.16% well above the original trial by Khan *et al*[5]. This is because of the lesser number of false negative results obtained in our study with ULBT. The PPV of ULBT in our study was 7.69% which was comparable to study done by Eberhart *et al*[12]. The NPV was 95.92 % which is comparable to original study by Khan *et al*. On comparing both the tests, we found that, MMT is more sensitive (57.14%) than ULBT (14.29%). but both tests had high specificity and NPV. Difference in the sensitivity between the two tests was found to be statistically significant.

CONCLUSION

In the present study we concluded that Modified Mallampati Test (MMT) is a better test at predicting difficult endotracheal intubations when compared to Upper lip biting test (ULBT).

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