Comparison of upper lip bite test with modified mallampati classification for prediction of difficult obstetric intubation

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Citation

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Abstract

Failed obstetric intubation is a major contributory factor in anaesthesia related morbidity and mortality. Upper lip bite test (ULBT) is a relatively new test for prediction of difficult intubation, introduced in the year 2003. Here we have compared ULBT with Modified Mallampati classification (MMC) for prediction of difficult intubation in obstetric patients scheduled for caesarean section. Preoperative airway assessment for prediction of difficult laryngoscopy and intubation was done using the MMC and ULBT in hundred consecutive parturients undergoing elective as well as emergency Cesarean section under general anesthesia. Class III ULBT and a MMC of III or IV were considered to be predictive of difficult intubation (Cormack & Lehane class III or IV). Fourteen patients in the study had difficult intubation (14%). The sensitivity (92 Vs 85.7%), specificity (86 Vs 69.7%), positive predictive value (52.3 Vs 31.5%), negative predictive value (98.6 Vs 96.7%), and accuracy (87 Vs 72%) were as observed for ULBT and MMC respectively. Thus ULBT was found to be superior in every aspect studied.

INTRODUCTION

Despite its limitations in predicting difficult intubation, MMC [1,2,3] is one of the most commonly used predictor in general as well as obstetric population. Physiological changes associated with pregnancy further add on to these limitations resulting in an increase in the incidence of unanticipated difficult intubation in obstetrics population [4,5] which remains a primary concern for the obstetric anesthesiologists. ULBT [6] a simple test proposed as an alternative predictor of difficult intubation has not been studied in obstetric patients. Hence this study was designed to evaluate the ability of ULBT to predict the incidence of difficult intubation as compared to the existing standard i.e. MMC in this high risk population subset.

METHODS

One hundred pregnant patients posted for caesarean section under general anesthesia (both emergency and elective) were enrolled to this prospective, observational, single-blind study after obtaining an informed written consent. The institutional committee had cleared the study. Preoperative Airway assessment was done with MMC and ULBT.

MODIFIED MALLAMPATI CLASSIFICATION (MMC)

- Class I - soft palate, fauces, uvula, and pillars visible
- Class II - soft palate, fauces, and uvula visible,
- Class III -soft palate and base of uvula visible and
- Class IV - only hard palate is visible.

Upper-Lip-Bite test (ULBT):-Patients were asked to bite their upper lip with the lower incisors as high as they could.

- Class I-Lower incisors can bite the upper lip above the vermilion line
- Class II-Lower incisors can bite the upper lip below the vermilion line
- Class III-Lower incisors cannot bite the upper lip.

The laryngeal view obtained with single handed cricoid pressure without any additional external laryngeal maneuver was reported according to the Cormack and Lehane grading.

- Grade I or II - Easy intubation
- Grade III or IV - Difficult intubation

The anesthesiologists who documented the laryngeal view by the Cormack-Lehane classification were blinded to pre

operative airway assessment to minimize observer bias. All the patients were induced with Injection Thiopentone sodium IV 5mg/kg and suxamethonium chloride 1.5mg/kg IV. Rapid sequence induction with single-handed cricoid pressure was applied [7]. The head was placed in the sniffing position, and initial laryngoscopy was performed with a Macintosh No.3 blade and grade of glottic view according to Cormack Lehane classification [1,8] was noted. However, if difficulty was encountered and the first attempt failed to provide an optimal glottic view, additional measures as demanded by the situation, such as external laryngeal pressure (BURP-maneuver [9] and adjustment of head position were instituted. Patients with a history of burns, trauma, tumors or a mass and previous surgery involving the craniofaciocervical region or the airway, patients with restricted mobility of the neck and mandible (e.g., rheumatoid arthritis or cervical disk disorders), and severe PIH were excluded from the study.

STATISTICAL TESTS

True positive, False positive, True negative, False negative, Sensitivity, Specificity, Positive predictive value, Negative predictive value, and Accuracy for MMC and ULBT were calculated (Table 1). The completed data sheets were analyzed by SPSS version 13 software (SPSS Inc., Chicago, IL, USA). McNemar test for nonparametric variables was used for between-group comparison for significant differences.

Figure 1

Table 1

- **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 positives + false negatives)
- **Specificity**:- The percentage of correctly predicted easy intubations as a proportion of all intubations that were truly easy, i.e., True negatives/(True positives + false negatives)
- **Positive predictive value**:- The percentage of correctly predicted difficult intubations as a proportion of all predicted difficult intubations, i.e. True positives/(True positives + 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)
- **Accuracy**:-The percentage of correctly predicted easy or difficult intubations as a proportion of all intubations, i.e., (True positives +True negatives)/ (True positives + True negatives +false positives+ false negatives).

RESULTS

One hundred obstetric patients posted for caesarean section under general anesthesia were included in the study. The mean age of the patient was 25 years (25 ±4.2); mean weight 57±8.36kg, mean height 156± 6.24cm and BMI was 23.21± 6.12.

The MMC predicted difficult intubation in 38 patients (38%) as compared to 14 patients (14%) by ULBT (Table 2). Fourteen patients (14%) had a laryngeal view of grade III or IV by the Cormack-Lehane classification and were considered to have difficult intubation, warranting application of External laryngeal maneuver (ELM), thereby decreasing the grade of laryngeal view i.e. making it easy intubation. True positive, false positive, true negative, and false negative results together with sensitivity, specificity, positive predictive value, negative predictive value, and accuracy for MMC and ULBT are as shown in Table 3. None of the patients in the study had failed endotracheal intubation.

Figure 2

Table 2: Relationship between the Results of Two Predicting Tests and Laryngoscopy Grades in 100 Patients

	Laryngoscopic view	
Predicting test	**I and II**	**III and IV**
Modified Mallampati		
Classes I and II	60	2
Classes III and IV	26	12
Upper lip bite		
Classes I and II	74	1
Class III	12	13

Figure 3

Table

Test	TP	FP	TN	FN	Acc %	Se %	Sp %	PPV %	NPV %
MMT	12	26	60	2	72	85.7	69.7	31.5	96.7
ULBT	13	12	74	1	87	92	86	52.3	98.6
P	-	-	-	-	< 0.05	< 0.05	< 0.05	< 0.05	NS

Statistical Terms Used for MMT and ULBT as Predicting Tests- **TP** true positive; **FP** false positive; **TN** true negative; **FN** false negative, **Acc** accuracy or total correct prediction; **Se** sensitivity; **Sp** specificity; **PPV** positive predictive value; **NPV** negative predictive value; **NS** = not significant

Using the McNemar test, statistically significant differences were observed in the sensitivity, specificity, positive predictive value and accuracy between the two tests (P< 0.001).

DISCUSSION

Khan et al (2003) [6] had introduced a simple method for

predicting difficult intubation called as the upper lip bite test (ULBT), and compared it with the Modified Mallampati classification (MMC). They had advocated that ULBT was a more accurate and simple method than the MMC for prediction of difficult airway. ULBT assessed a combination of jaw subluxation and the presence of buck teeth simultaneously, enhancing its predictive value and reliability. Previous studies done by various authors' are mostly in non obstetric cases. [6,10,11,12]

MMC has been in use for more than 2 decades and over the years many of its limitations have been pointed out by various trials [13,14,15] . The main limitation is absence of a definite demarcation between class2 & class 3 as well as between class3 & class 4 groups and effect of phonation [14,16] on the oropharyngeal classification, thereby leading to high inter observer variability and decreased reliability [16,17] . In contrast the three classes for the new test (ULBT) are clearly demarcated and delineated, thereby making inter-observer variations highly unlikely when using this test. ULBT shares a common limitation with MMC in not assessing neck mobility, which is an independent predictor of difficult intubation.

The sensitivity (92 Vs 85.7%), specificity (86 Vs 69.7%), PPV (52.3 Vs 31.5%), NPV (98.6 Vs 96.7%), and accuracy (87 Vs 72%) were as mentioned for ULBT and MMC respectively in our study. Hester et al [10] compared the ULBT with the MMC and reported sensitivity (55% vs. 11%), specificity (97% vs.75%), PPV (83% vs. 9%), and accuracy (90% vs. 64%) for ULBT and MMC respectively. Their conclusion that, ULBT was superior to the modified Mallampati in almost every aspect for difficult airway prediction studied concurs with the findings of our study. Khan et al (2003) [6] in their original study comparing ULBT and MMC had observed sensitivity (76.5 Vs 82.4%), specificity (88.7 Vs 66.8%), PPV (28.9 Vs 13%), NPV (98.4 Vs 98.4%) and accuracy (88 Vs 66.7%) for the two tests respectively. They had concluded that ULBT showed significantly higher specificity and accuracy than the MMC ($P < 0.001$), while comparisons of sensitivity, positive and negative predictive values, between the two tests, were similar ($P > 0.05$).

We found, in our study that the specificity for the MMC was 69.7%. Savva e.t.al [18] had reported a similar specificity for MMC, although larger percentages (82%, 84%) have been reported in few studies. [17,19]. This difference between the reported specificity in various studies might be because of involuntary phonation by patients during the test significantly altering the MMC.

The sensitivity of MMC in our study was 85.7%, accompanied by large false positive values (26%), resulting in extra time being devoted to prepare for overcoming anticipated difficult intubation by provision of alternative measures such as fiberoptic laryngoscope etc. This observation concurs with the Khan et al study.

The limitations of our study are,

(1) As regional anesthesia is safer in pregnancy, the number of caesarean sections conducted under general anesthesia in our institute is significantly less, hence there is a need for further studies to be undertaken among a larger population, to more thoroughly define the efficacy of ULBT as a clinical predictive test.

(2) Cricoid pressure is mandatory for all caesarean section under general anesthesia, to minimize the risk of aspiration. Alteration of the glottic view caused by application of cricoid pressure might have been a confounding factor in the outcome of our study. Jabalameli e.t.al [11] had found that single handed cricoid pressure provided the best view at laryngoscopy with minimal distortion. In an attempt to minimize its effect on the outcome, single handed cricoid pressure was applied by anesthesiologists who had more than three year experience.

(3) As with any clinical or bedside test, the ability of patients to comprehend the instructions and comply with the same might have confounded the observations and hence the out come of our study.

CONCLUSION

ULBT has higher level of sensitivity, specificity, accuracy and positive predictive value compared with the MMC. As a relatively new test, ULBT requires further evaluation and comparison with other screening tests like Sternomental, Thyromental distance and MMC to accurately determine its definitive role in prediction of difficult obstetric intubation.

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