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Comparison of Hyomental Distance Ratio with the modified Mallampati test for accurately predicting difficult visualization of the larynx

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Abstract:

Background: This study has been done to compare Hyomental Distance Ratio (HMDR) with the modified Mallampati test (MMD) for accurately predicting difficult visualization of the larynx (DVL) in apparently normal patients. Methods: 198 apparently normal patients of more than 18 years of age, with ASA I and II, undergoing general anesthesia with tracheal intubation were evaluated. A hard-plastic b ond ruler is used to measure the distance from the tip to the anterior-most part of the mentum was measured and defined as the Hyomental distance. After induction using thiopentone and paralysis using suxamethonium, glottic visualisation was assessed by using modified Cormach and Lehane classification without external laryngeal manipulation. Results: The sensitivity of HMDR for predicting Difficult Laryngoscopy was 27.78% and specificity was 98.89%. The test has a positive predictive value of 71.43%, Negative predictive value of 93.19%. Conclusion: Due to very low sensitivity and positive predictive value of HMDR, we recommend MMT test should be used because of its greater diagnostic accuracy along with HMDR to pedicting the DVL

Key words: Behavior, diabetes mellitus, informants, ethnology

Introduction:

Poor glottic visualization is synonymous with difficult intubation during surgery in most patients [1]. It is a difficult question of determining which patient will present an increased difficulty for intubation during procedure.

Visualization of the larynx is usually described using the Cormack and Lehane grades. The incidence of DVL is higher in patients undergoing cervical spine surgery (20%) [2] or laryngeal surgery (30%) [3].

This study has been undertaken with a purpose to evaluate the usefulness of the Hyomentaldistance ratio (HMDR) for accurately predicting DVL in apparently normal patients. The preoperative airway predictors, in combination; the modified Mallampati test (MMD) and HMDR were examined.

Materials and Methods

Ethics Committee approval was taken before starting the study. Written informed consent was taken from the patients involved in the study.

Patient selection: 198 apparently normal patients of more than 18 years of age, with ASA I and II, undergoing general anesthesia with tracheal intubation were evaluated. Exclusion criteria were: pregnant patients, mouth opening <3cm, midline neck swellings, gross anatomical abnormality, recent surgery of the head and neck, upper airway disease (e.g. maxillofacial fracture or tumors), loose teeth, those requiring a rapid sequence or awake intubation. Each patient underwent a preoperative assessment. Intraoperatively, the patients were positioned supine, with the head firm on the table. They were instructed to look straight ahead, keep the head in the neural position, close the mouth and not swallow.

A hard-plastic bond ruler was pressed on the skin surface just above the hyoid bone, and the distance from the tip to the anterior most part of the mentum was measured and defined as the Hyomental distance (HMD) in the neutral position.

The patients were then instructed to extend the head maximally, taking care that the shoulders were not lifted while extending the head. The HMD was measured again in this position, and this variable was defined as the HMD at the extreme of head extension.

The Hyomental distance ratio (HMDR) was calculated as the ratio of HMD at the extreme of head extension to that in the neutral position. MMD was measured in sitting position.

After preoxygenation, all patients were induced using thiopentone and paralysed using suxamethonium as per patients weight to facilitate good orotracheal intubating condition. Laryngoscopy was performed after full relaxation. The head was placed in sniffing position on a head ring or pillow and an appropriate Macintosh blade was used by a consultant anaesthesiologist.

Glottic visualisation was assessed by using modified Cormach and Lehane classification without external laryngeal manipulation.

External laryngeal pressure was permitted after evaluation for insertion of endotracheal tube. Cormack and Lehane grades 3 and 4 was defined as Difficult visualization of the larynx (DVL) in this study. The sensitivity, specificity and positive and negative predictive values of each tests was calculated according to standard formula.

Statistical analysis was done using students‘t’ test and chi- square test.

Results:

The Chi-square test was used for statistical analysis of variables. The study done on 198 patients included 102 male (51.51%) and 96 female (48.48%) patients. We observe that there is slight male preponderance in the study (Table-1).

Table 1: Demographic Parameter

Demographic parameter	
Age (mean ±SD)	41.8±13.49
Sex n (%)	
Male	102 (51.51%)
Female	96 (48.48%)
Total	198

The sensitivity of modified Mallampati test for predicting Difficult Laryngoscopy (DL) was 44.44% and specificity was 99.44%. The test has a positive predictive value (PPV) of 88.89% and negative predictive value (NPV) of 94.71% (Table 2).

Table 2: Statistics of modified Mallampati test for predicting Difficult Laryngoscopy

Modified Mallampati		Difficult visualization of the larynx		Total
		Yes	No	
Modified Mallampati Class ≥ 3	Yes	8	1	9
	No	10	179	189
Grand Total		18	180	198

TP (n)	TN (n)	FP (n)	FN (n)	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)
8	179	1	10	44.44	99.44	88.89	94.71

The sensitivity of HMD at the extreme of head extension for predicting DL was 11.11% and specificity was 95.56%. The test has a positive predictive value of 20% and negative predictive value of 91.49%.

The sensitivity of HMD in the neutral position for predicting DL was 0% and specificity was 98.89%. The test has a positive predictive value of 0% and negative predictive value of 90.82%.

The sensitivity of HMDR for predicting DL was 27.78% and specificity was 98.89%. The test has a positive predictive value of 71.43%, and negative predictive value of 93.19%. (Table 3).

Table 3: Statistics of HMDR for predicting Difficult Laryngoscopy

HMDR		Difficult visualization of the larynx		Total
		Yes	No	
HMDR ≤ 1.2	Yes	5	2	7
	No	13	178	191
Grand Total		18	180	198

TP (n)	TN (n)	FP (n)	FN (n)	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)
5	178	2	13	27.78	98.89	71.43	93.19

In our study, overall sensitivity of the diagnostic predictors was relatively less. The highest sensitivity of 44.44% (8/18) was observed in predicting DVL with modified Mallampati followed by HMDR 27.78 % (5/18). In contrast, the specificity in our study was relatively high. The highest specificity of 99.44 % (179/180) was observed in predicting DVL with modified Mallampati followed by HMDR 98.89 % (178/180).

Discussion:

Preoperative identification of those patients at risk for difficult laryngoscopy is important in adopting safer alternative strategies for intubation.

This study has been undertaken with a purpose to evaluate the usefulness of the HMDR for accurately predicting DVL in apparently normal patients. The preoperative airway predictors; the modified Mallampati test and HMDR were examined.

Incidence: In our study, the larynx was difficult to visualize (Cormack and Lehane grades III and IV) in 18 / 198 (9.09 %) patients. No failed tracheal intubations occurred. The incidence of 9.09% is consistent with the incidence reported in literature.

In a meta-analysis 14,438 patients, a DVL incidence of 6% -27% was seen [4]. Huh et al reported 12.2% incidence of DVL in 213 apparently normal patients undergoing general anesthesia with tracheal intubation. The wide variations in the incidence of DVL may be related to factors such as age and ethnic differences among patients [5,6] or types of laryngoscope blade used [7].

Sensitivity and specificity of HMDR: Test for DVL prediction should have 100% sensititity and 100% specificity idealy; however, sensitivity and specificity are inversely proportional to each other. Optimal cutoffs used in our study to calculate the sensitivity and specificity in our study were HMD at the extreme of head extension ≤5.3 cm; HMD in the neutral position > 5.5 cm; HMDR ≤1.2; Modified Mallampati Class ≥3.

In our study, overall sensitivity of diagnostic predictors was relatively less. The highest sensitivity of 44.44 % (8/18) was observed in predicting DVL with modified Mallampati followed by HMDR 27.78 % (5/18) and TMD (11.11 % (2/18) and HMD at the extreme of Head (11.11 % (2/18). In contrast, the specificity in our study was relatively high. The highest specificity of 99.44 % (179/180) was observed in predicting DVL with modified Mallampati followed by HMDR 98.89 % (178/180), HMD at the neutral position 98.89 % (178/180), TMD 96.67 % (174/180) and HMD at the extreme at head 95.56 % (172/180).

These findings are in contrast to the observations by Huh who reported that the HMDR with the optimal cutoff point of 1.2 had greater diagnostic accuracy (area under the curve of 0.782), than other single predictors ($P < 0.05$), and it alone showed a greater diagnostic validity profile (sensitivity, 88%; specificity, 60%) than any test combinations. Sensitivity and specificity of other diagnostic predictor were HMD at the extreme of head extension ≤5.3 cm (46% & 81 %); HMD in the neutral position >5.5 cm (23% 95%); Modified Mallampati Class ≥3 (12% & 94%).

Due to the different diagnostic criteria adopted by the investigators various studies that assessed the sensitivity, specificity and predictive values of different diagnostic predictors have come across variable findings. Mathew et al demonstrated that patients with TMD of <6cm and horizontal length of mandible <9cm showed good correlation with MMT grade III and IV and had a higher probability of difficult intubation [8].

There are some potential limitations to our study design. First, intersubject variability was possible because the end point for extending the head maximally depended on the voluntary participation of each patient. We tried to clearly explain each maneuver to the patients and demonstrated it when necessary; thus, we believe that intersubject variability was of minor importance. Second, intrarater variability was possible, because a single investigator performed all of the measurements at once in each test. In this study, we defined the modified C-L Grade 3 or 4 as an indicator of DVL.

In many clinical situations, however, the application of external laryngeal pressure facilitates a laryngoscopic view and intubation can be performed without difficulty in these patients. In addition, direct laryngoscopy is the most common means of facilitating intubationbut it not the only way to secure and maintain an airway.

Conclusion:

We demonstrated in our study that HMDR is a clinically reliable predictor of DVL to certain extent because of its high specificity and negative predictive value. Due to very low sensitivity and positive predictive value of HMDR, we recommend MMT test should be used because of its greater diagnostic accuracy along with HMDR to pedicting the DVL. We also recommend seeking an optimal combination of these two tests and other predictors and performing the tests in combination, rather than using HMDR alone.

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References:

1. Benumof JL. Difficult laryngoscopy: obtaining the best view.Can J Anaesth 1994;41:361-5
2. Calder I, Calder J, Crockard HA: Difficult direct laryngoscopy in patients with cervical spine disease. Anaesthesia 1995; 50:756-763
3. Ayuso MA, Sala X, Luis M, et al: Predicting difficult orotracheal intubation in pharyngo-laryngeal disease: Preliminary results of a composite index. Can J Anaesth 2003; 50:81-85
4. Lee A, Fan LT, Gin T, Karmakar MK, Ngan Kee WD. A systemic review (meta-analysis) of the accuracy of the Mallampati tests to predict the difficult airway. Anesth Analg 2006;102:1867-78.
5. Wong SH, Hung CT. Prevalence and prediction of difficult intubation in Chinese women. Anaesth Intensive Care 1999;27:49-52.
6. Cooke MS, Wei SH. A comparative study of southern Chinese and British Caucasian cephalometric standards. Angle Orthod 1989;59:131-8.
7. Asai T, Matsumoto S, Fujise K, Johmura S, Shingu K. Comparison of two Macintosh laryngoscope blades in 300 patients. Br J Anaesth 2003;90:457-60.
8. Huh J, Shin HY, Kim SH, Yoon TK, Kim DK. Diagnostic predictor of difficult laryngoscopy: the hyomental distance ratio. Anesth Analg 2009 Feb;108(2):544-8.