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ORIGINAL RESEARCH

Assessment of Correlation Between Mentohyoid Distance and Cormack-LehaneGrading in Airway Assessment: A Predictor of Tracheal Intubation

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ABSTRACT

Background: Airway management is the basic responsibility of each and every anaesthesiologist. The present study was undertaken to evaluate the relationship between Mentohyoid distance and Cormac-Lehane Grading in predicting difficult intubation.

Materials and Methods: The present study was carried among 200 patients belonging to ASA I and II physical status undergoing elective surgery in IMS & SUM HOSPITAL. During pre-anaesthetic check-up, patients were examined and mentohyoid distance was measured. On the day of surgery after induction, during laryngoscopy Cormack-lehane grading was observed, time taken for laryngoscopy and intubation was noted. The results were statistically analysed using SPSS version 22 software. "A p-value of p < 0.05 was considered statistically significant and p-value of p<0.001 was considered highly significant".

Results: 12 % of the patients had CL Grade III, 45% had CL Grade I, 43% had Grade II and 11 % had Mentohyoid distance of < 3.0 cm. and 1% had mentohyoid distance of 3 to 4 cm. The incidence of difficult intubation is around 12%. In patients who had decreased mentohyoid distance (mandibular space), we faced difficulty during laryngoscopy with poor CL grading III. Hence making it difficult for intubation and more time taken for laryngoscopy.

Conclusion: Decrease Mentohyoid distance (mandibular space) has significant association with difficult glottis exposure, hence making it difficult for intubation and more time for laryngoscopy. Mentohyoid distance with cormack-lehane grading is a good predictor of tracheal intubation.

Keywords: Laryngoscopy; Mentohyoid; Tracheal intubation.

INTRODUCTION

Airway management is the basic responsibility of each and every anaesthesiologist. Difficult intubation is one of the main reasons of anaesthesia-related morbidity and mortality. Difficult laryngoscopy (described as poor glottic visualization) is synonymous with difficult intubation in most patient.[1] Difficult intubation is described in 1.5-13% of patients.[2] The prevalence of a difficult intubation or a difficult laryngoscopy varies between 0.7% and 31.3%.[3] Intubation difficulties with airway management during emergencies remain among the foremost causes of serious intraoperative problems.[4] It has been assessed that inability to manage effectively very difficult airways is accountable for 30% of deaths totally attributable to anaesthesia.[5,6]

Of the overall claims against anaesthetist in a closed claims study, 17% involved difficult or impossible intubation.[7] Most of the airway catastrophes have occurred when difficulty with the airway was not recognized.[8] Although prediction and forecasting are a tough task, prediction of difficult laryngoscopy and intubation have gained importance because of the serious consequences of failed tracheal intubation.[9] The risk and complications related to difficult intubation can be reduced if difficult airway is anticipated preoperatively. Therefore, airway assessment is an integral part of preanesthetic evaluation, as it helps in recognizing a potentially difficult airway. Most of the predicted cases of difficult intubation are found after clinical examination and application of simple clinical tests. If difficult airway is anticipated preoperatively the risk and complications related to difficult intubation can be reduced. Therefore, assessment of airway is vital part of preanesthetic evaluation, as it helps in recognizing a potentially difficult airway. A range of bedside screening tests are available to predict a difficult airway. These include Modified Mallampati grading, Thyromental distance, Sternomental distance, Upper lip bite test, Cervical mobility, Inter-incisor-gap, Mandibular length, Ratio of height to sternomental distance, Mentohyoid distance, Retrognathia, TMJ movement etc. There are several studies comparing the different preoperative bedside tests in predicting difficult intubation with varying results.[10] However, limited information is available on comparing individual predictor with Cormack Lehane grading for prediction of difficult airway.

We thus undertook this study to find out the relationship between Mentohyoid distance and Cormac-Lehane Grading in predicting difficult intubation.We can determine the Cormack-Lehane grade after putting the intubating blade in the patient's airway and performing direct laryngoscopy. We must be ready for the challenging airway if it progresses to 3/4. As a result, predicting these complications before surgery is a crucial part of the challenging airway evaluation process.

MATERIALS & METHODS

The present prospective observational study was carried among 200 patients undergoing elective surgeries requiring general Anaesthesia in IMS and SUM Hospital after obtaining approval from Institute ethical committee and getting written informed consent from patients over a period of 1 year 6 months.

Based on the clinical observations, we noticed that Mentohyoid distance (MHD) was more or less around 4cm. Keeping four different groups and assumed standard deviation as 2 the sample size was identified as 50 per group more or less where the power of test is 98.6.

Inclusion criteria consisted of patients aged 18 to 60years for both sexes requiring general anaesthesia with endotracheal intubation for elective procedures and those under ASA (American Society of Anaesthesiologists) classification 1 and 2. Exclusion criteria comprised of refusal by patient to participate in study, those classified under ASA (American Society of Anaesthesiologists) 3 and 4, patients with any features of difficult airway such as maxillofacial anomalies, restricted neck movements, obesity as well as limited mouth opening, patients with unstable cervical spine and tumour of the larynx and patients with gross abnormalities of the airway were excluded from the study.

All 200 patients, ASA I & II adult patients, scheduled for various elective procedures under general anaesthesia were assessed pre-operatively on the day before surgery and Mentohyoid distance (distance between body of hyoid bone and tip of chin in the midline, with head fully extended in centimetres) was measured.

In the operating room, IV line was secured, and standard monitors attached. The patient's head was placed in "Sniffing" position (In adults, a head elevation of 8 ~ 10 centimetres, as on a pillow or doughnut achieves appropriate neck flexion. This neck flexion and head extension is called "Optimal Sniffing Position"). The patients were given pre-oxygenation,

pre-medication and IV induction agents. After confirming bag and mask ventilation, muscle relaxant was given. Laryngoscopy was done after 3 minutes of ventilation. Cormack-Lehanegrading, and time taken for Laryngoscopy was noted. Measured Mentohyoid distance was correlated with Cormack-Lehane grading.

Statistical analysis was performed using Statistical Package for Social Sciences (SPSS) version 22. Patient data were presented as mean ± standard deviation or numbers (%), student's t test was used for statistical comparison; 95% confidence interval (CI) was calculated; and a *P* value of 0.05 (two-tailed) was defined as statistically significant.

RESULTS

Table 1 shows 3% respondents were less than equal to 20 years, 34% respondents were within 21 to 30 years, 33% respondents were within 31 to 40 years, 16% respondents were within 41 to 50 years and 14% respondents were more than 50 years. Using one sample t test, the two-tailed P value is 0.0197. By conventional criteria, this difference is considered to be statistically significant.

Time taken for laryngoscopy and intubation in 200 respondents as shown in table 2 is less than 20 second for 88% respondents, 20-39 second for 4% respondents, 40-49 second for 3% respondents and more than 50 second for 5% respondents. Using one sample t test, the two-tailed P value is 0.2592. By conventional criteria, this difference is not statistically significant.

In table 3, we have shown the CL grading with respect to Mentohyoid distance. Here we can see that highest grading in 3.1-4 in Grade II, followed by 4.1-5 in CL grade I.

Table 1: Age distribution

Age	Respondent	Percentage (%)
< 20	6	3
21-30	68	34
31-40	66	33
41-50	32	16
>50	28	14
Total	200	100
Mean ± S.D.	40 ± 23.76552	
p-value	0.0197	

The 95% confidence interval of this difference:From 10.49 to 69.50.

Table 2: Time Taken for Laryngoscopy and Intubation

Time Taken For Laryngoscopy And Intubation (in sec)	Respondent	Percentage (%)
<20	176	88
20-39	8	4
40-49	6	3
>50	10	5
Total	200	100
Mean ± S.D.	40 ± 68.08230	
p-value	0.2592	

The 95% confidence interval: From -44.53 to 124.53

Table 3: Relationship Between Mentohyoid Distance And Cormack Lehane Grading

Mentohyoid Distance (in cm)	CL Grading			
	I	II	III	Total
2.1 - 3	4(2)	1(0.5)	22(11)	27
3.1 - 4	20(10)	54(27)	2(1)	76
4.1 - 5	48(24)	30(15)	0	78
5.1 - 6	9(4.5)	2(1)	0	11
6.1 - 7	4(2)	4(2)	0	8
Total	85(42.5)	91(45.5)	24(12)	200
Chi-square	170.096			
p-value	0.0001			

Figure 1: Relationship Between Mentohyoid Distance and Cormack Lehane Grading

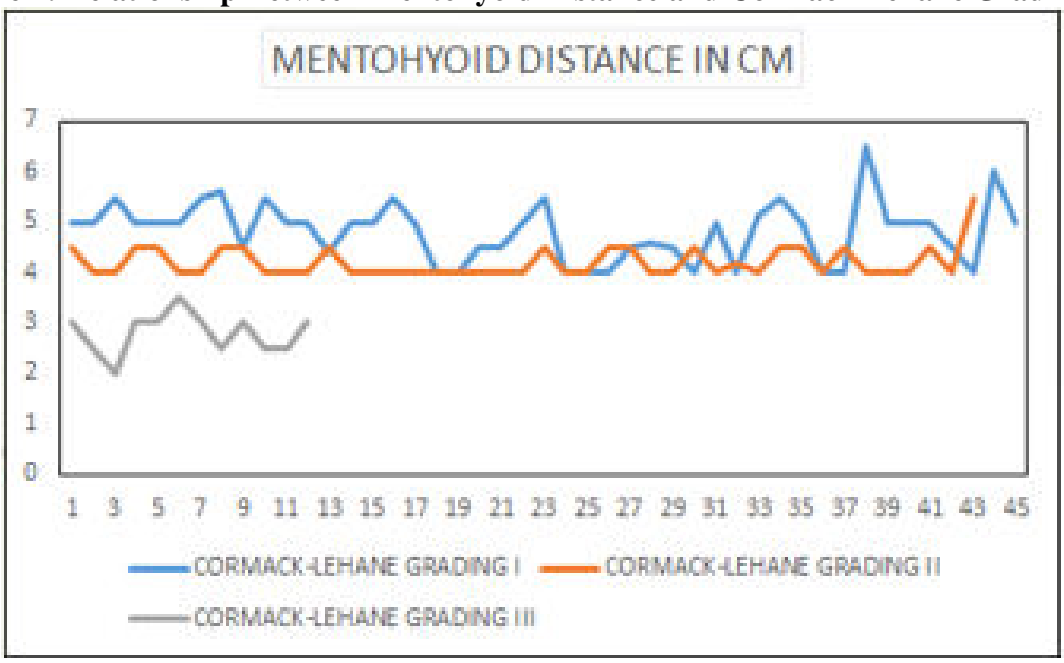

Figure 2: Mentohyoid Distance and Time Taken InCormak-Lehane Grading Groups

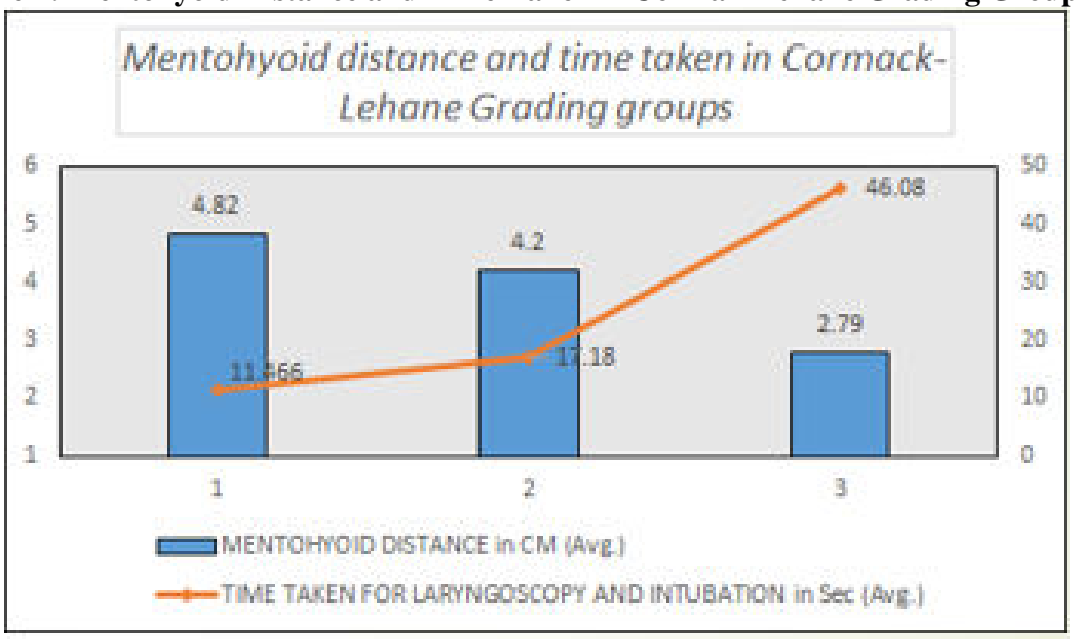

Table 4: Statistical Inference

CL Grade	MHD (cm)	Time Taken for Intubation (Sec)	p Value
CL I Average	**4.82**	11.46	<0.01
CL II Average	**4.2**	17.18	
CL Grade	**MHD (cm)**	**Time Taken for Intubation (Sec)**	**p Value**
CL I Average	**4.82**	11.46	<0.01
CL II Average	**2.79**	46.08	
CL Grade	**MHD (cm)**	**Time Taken for Intubation (Sec)**	**p Value**
CL I Average	**4.2**	17.18	<0.01
CL II Average	**2.79**	46.08	

Null Hypothesis: MHD is same between CL grading.
Alternate Hypothesis: MHD is not same between CL grading.
Based on t-test, inference is drawn. Since $p<0.01$, we do not accept null hypothesis and hence there is significant difference in MHD between CL grades.

DISCUSSION

Airway management remains an important challenge in the contemporary practice of anaesthesia and preoperative airway assessment facilitates appropriate preparation when difficulty with intubation or ventilation is anticipated prior to induction of anaesthesia.
There are several traditional indices of predicting difficult laryngoscopy. Many previous studies have compared several indices for predicting difficult laryngoscopy but none of the study has correlated mentohyoid distance with Cormack-Lehane grading.
The present study was designed to establish a correlation between preoperative clinical parameter mentohyoid distance and the grade of difficulty at direct laryngoscopy.
The incidence of difficult laryngoscopy and intubation reported by numerous studies varies from 1.3% to 13% in patients undergoing general anaesthesia.[11-14]This wide variation in incidence of difficult laryngoscopy and intubation can be attributed to various factors, such as ethnic differences among populations, head position (sniffing position), inclusion of external laryngeal manoeuvre, and the different criteria usedto define difficult laryngoscopy and intubation.[15] In our study, the incidence of difficult laryngoscopy was 12%, which is within the range as reported by previous studies and comparable to results obtained by Prakash S et al.[16]
The present study comprised a total of 200 adult patients who underwent elective surgery under general anaesthesia by endotracheal intubation. As per table 1, Out of 200 respondents, 3% respondents were less than equal to 20 years34% respondents were within 21 to 30 years, 33% respondents were within 31 to 40 years, 16% respondents were within 41 to 50 years and 14% respondents were more than 50 years.The maximum strength was under the age group of 21 to 40 years which is 67% and hence this study is more applicable for the age group of 21 to 40 years which can be compared with Aswini B et al[17] were maximum strength was under 20 to 50 yrs.
As per table 2, Time taken for laryngoscopy and intubation was less than 20 seconds for 88% respondents, 20-39 seconds for 4% respondents, 40-49 seconds for 3% respondents and more than equal to 50 second for 5% respondents. According to Kasinath M Pet al[18] the difficulty of laryngoscopy was found in 13.7% of the 150 patients [43] in which the distance of the mentohyoid was significantly shorter than in easy laryngoscopy patients.Based on table 3, 45% of the patients were Cormack Lehane grade I, Cormack Lehane grade II patients comprised 33% of the whole sample. Approximately 12 percent of the patients were classified as Cormack Lehane grade III.

As per table 3, Mentohyoid Distance in 200 respondents was within 2.1 – 3cm in 11% respondents, within 3.1 - 4cm in 38% respondents, within 4.1 - 5cm in 40% respondents, within 5.1 - 6cm in 10% respondents, and within 6.1 - 7cm in 1% respondent.
As per table 3, we have shown the CL grading with respect to Mentohyoid distance. We found the maximum range of CL grade III falls between 2.1 – 3.0 cm, which were related to Vasudevan et al[19] in their study of 40 individuals, were glottic exposure was shown to be significantly associated with head extension and Mento-hyoid distance of 3 cm.
In our study only mentohyoid distance is considered and correlated with the cormack-lehane grading. Other predictors were not considered. Regarding time taken for laryngoscopy, how many attempts were made and the use of bougie is not included.

CONCLUSION

Decrease Mentohyoid distance (mandibular space) has significant association with difficult glottis exposure, hence making it difficult for intubation and more time for laryngoscopy. Mentohyoid distance with cormack-lehane grading is a good predictor of tracheal intubation.

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