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Clinical Airway Assessment Tests In Obese Patients And Their Corelation With Lehane Cormack Grading.

Dharmaraja[1], K Koel Mitra[2], Subramanian VV[1], Debabrata Sarbapalli[3], and Parthasarathy S[4]*.

[1]Assistant Professor, Department of anaesthesiology, Mahatma Gandhi Medical College and Research Institute, Sri Balaji Vidyapeeth, Puducherry, India.
[2]Associate Professor, Department of anaesthesiology, Medical College, Kolkata, West Bengal, India.
[3]Professor, Department of anaesthesiology, Medical College, Kolkata, West Bengal, India
[4]Professor, Department of anaesthesiology, Mahatma Gandhi Medical College and Research Institute, Sri Balaji Vidyapeeth, Puducherry, India.

ABSTRACT

Securing a definitive airway is indeed a critical aspect of anesthesia, especially in obese patients, where airway management can be challenging. This study aimed to assess various airway evaluation tests and their correlation with established laryngoscopic views in obese patients. The results indicate that while all the tests showed significant correlations with difficult airways, some were more closely related than others. The Modified Mallampatti Test (MMT), Upper Lip Bite Test, Thyromental Distance, Neck Circumference, and Head Extension were assessed in 60 obese patients. After administering general anesthesia, the Lehane Cormack grading was used to evaluate laryngoscopic views. The statistical analysis, including the chi-square test and correlation analysis, was performed as needed. The findings revealed that mandibular distance had the strongest correlation with difficult airways. This implies that assessing mandibular distance should be considered a key component when evaluating the airway in obese patients. However, it's important to note that other factors, such as neck circumference and thyromental distance, also showed significant correlations, emphasizing the multifactorial nature of airway management challenges in obese individuals ($p < 0.05$). The study's conclusion suggests that relying on a single predictive test may not be sufficient. Instead, it is advisable to combine multiple airway examination tests to enhance the accuracy of predicting difficult airways in obese patients. This is a valuable recommendation because various anatomical and physiological factors contribute to airway difficulties, and a comprehensive assessment can help anesthesiologists better prepare for and manage such cases. In summary, this study underscores the importance of thorough airway evaluation in obese patients and highlights the need for a multifaceted approach that considers multiple variables to predict and manage difficult airways effectively during anesthesia procedures.

Keywords: anaesthesia, airway, assessment, difficulty, predictor, tests.

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Corresponding author

INTRODUCTION

Airway management is crucial in all areas of medicine, as maintaining a patent airway is essential for adequate oxygenation and ventilation. Failure to do so, even for a brief period, can be life-threatening. Respiratory events are the most common anaesthesia-related injuries, following dental damage [1]. The three main causes of respiratory-related injuries are inadequate ventilation, oesophageal intubation, and difficult tracheal intubation. Difficult tracheal intubation accounts for 17% of respiratory-related injuries and results in significant morbidity and mortality [2].

Assessment of the airway and anticipation of the "difficult airway" are fundamental skills for an anaesthesiologist. The airways of obese patients present additional challenges, such as redundant neck soft tissue, impaired neck mobility, and large chest and breasts. The prevalence of obesity is increasing worldwide, and the incidence of difficult intubation in the obese population (BMI > 30) has been reported in a large meta-analysis to be 15.8% compared to 5.8% in the general population [3].

Preoperative assessment for recognition of a difficult airway in advance is the best method of avoiding any disaster caused by the inability to maintain the airway. Various anatomical measurements and non-invasive clinical tests, singly or in various combinations, are done for the same [4]. However, the inability to predict difficult airways is probably due to high inter-observer variability and low predictability of commonly used airway assessment screening tests [5-8].

Since there is less data regarding the predictability of these tests in obese patients, this study was conducted to compare the predictive value of some common clinical airway assessment tests for predicting difficult laryngoscopy in obese patients.

METHODOLOGY

After obtaining an Institutional Ethical Committee clearance, a prospective observational Study is conducted for the period of 14 months in 60 consecutive obese patients with BMI ≥30kg/m2 who required general anaesthesia for different types of surgeries. Consenting patients of either sex, age between 18 and 60 years, ASA physical status II and III were included in the study. Patients who are pregnant or having Upper Airway pathologies (maxillo-facial fractures, tumours, etc), Cervical spine fractures, burn contractures of face and neck, Full stomach, Hiatus hernia, Gastro-oesophageal reflux disease, or a history of difficult laryngoscopy or intubation are excluded from the study. Assessment of 1: Modified Mallampatti Test, 2: Thyromental distance, 3: Upper Lip Bite Test, 4: Neck circumference, 5: Head extension, 6: Cormack Lehane grading of larynx were done.

The Mallampati score was assessed to screen the structure of the oropharynx, including the base of the tongue. This was measured while the patient was sitting down and protruding the tongue to the maximum extent. Classification was assigned into four classes [1]. Class I: Soft palate, fauces, entire uvula, anterior and posterior tonsillar pillars visible, Class II: Soft palate, fauces, uvula visible. Class III: Soft palate and base of uvula visible. Class IV: Only hard palate visible. Classes I and II were considered predictive of easy intubation whereas classes III and IV were considered predictive of difficult intubations.

The Thyromental distance (TMD) was measured from the thyroid notch to the anterior border of the mandibular mentum while the patient sat down with a closed mouth and extended his or her head to the maximum extent. It was measured with a ruler in the upright sitting position. A TMD less than 6 cm was predictive of difficult intubation.

ULBT tests the range of mandibular movement and dental morphology. Patients were asked to bite their upper lip with lower incisors as high as they could, in sitting position with head in neutral position. The anaesthetist also demonstrated the test to the patient, thereby enabling patient compliance as instructed by the original authors9. ULBT was assessed-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. Classes I and II were predictive of easy intubation and class III of difficult intubation [9].

Range of head extension< or > 80° as described by Wilson et al [10].

Neck circumference was measured in the upright and seated position at the level of the thyroid cartilage using a standard tape measure. Neck circumference of 43 cm or greater was classified as predicting a difficult.

On the day of surgery, after confirming the nil per oral status, monitors were attached (electrocardiogram, automated blood pressure, pulse oximetry, end tidal carbon dioxide). Lactated ringer was started at 2 ml/kg/hr through a 20G intravenous cannula. Patients were sedated 5 minutes prior to induction with midazolam (0.05 mg/kg) and fentanyl (2 mcg/kg) and pre-oxygenation for 3–4 minutes with 100% oxygen.

General anesthesia was induced with propofol (1.5-2mg/kg) and succinylcholine(1.5mg/kg) and the patient was ventilated with oxygen, nitrous oxide (50%), for 3 minutes. Then the patient was positioned with TABLE RAMP method. As in obese patients, the 25-degree back-up or head-elevated laryngoscopic position, which is better than the supine position for tracheal intubation, which is usually achieved by placing blankets or other devices under the patient's head and shoulders. This position can also be achieved in electronic tables by flexing the table at the trunk-thigh hinge and raising the back (trunk) portion of the table. After fully opening the mouth, laryngoscopy was done with Macintosh blade of appropriate size by an anaesthesiologist with minimum one year experience. Laryngoscopic view was graded without the use of external laryngeal manoeuvre. Cormack-Lehane (CL) grading system was used to determine the glottis view14.Grade 1: Most of the glottis visible. Grade 2: Only the posterior part of glottis and epiglottis visible. Grade 3: Only epiglottis visible. Grade 4: Not even epiglottis seen. CL grade 1 and 2 were considered easy laryngoscopy, whereas CL grade 3 and 4 difficult laryngoscopy. The patients were intubated with sizes 6.5, 7, 7.5 cuffed endotracheal tubes for females and sizes 8, 8.5, tubes for males. In the event of CL grade 3 or 4, intubation with external laryngeal manoeuvre was tried. In the event of an unsuccessful attempt, intubation was taken over by the senior most anaesthetist in the operation theatre (OT).

Statistics

For statistical analysis data were entered into a Microsoft excel spreadsheet and then analyzed by SPSS 24.0. and Graph Pad Prism version 5. Data had been summarized as mean and standard deviation for numerical variables and count and percentages for categorical variables. Two-sample t-tests for a difference in mean involved independent samples or unpaired samples. Paired t-tests were a form of blocking and had greater power than unpaired tests. One-way analysis of variance (one-way ANOVA) was a technique used to compare means of three or more samples for numerical data (using the F distribution). A chi-squared test (χ^2 test) was any statistical hypothesis test wherein the sampling distribution of the test statistic is a chi-squared distribution when the null hypothesis is true. Without other qualification, 'chi-squared test' often is used as short for Pearson's chi-squared test. Unpaired proportions were compared by Chi-square test or Fischer's exact test, as appropriate.

Explicit expressions that can be used to carry out various t-tests are given below. In each case, the formula for a test statistic that either exactly follows or closely approximates a t-distribution under the null hypothesis is given. Also, the appropriate degrees of freedom are given in each case. Each of these statistics can be used to carry out either a one-tailed test or a two-tailed test.

Once a t value is determined, a p-value can be found using a table of values from Student's t-distribution. If the calculated p-value is below the threshold chosen for statistical significance (usually the 0.10, the 0.05, or 0.01 level), then the null hypothesis is rejected in favour of the alternative hypothesis. p-value ≤ 0.05 was considered for statistically significant.

RESULTS AND ANALYSIS

All the sixty patients completed the study. There were no significant events or drop outs.

The association between MMT and CL grading was significant.

Chi-square value: 28.0360; p-value:0.0009

In GR-I, 7(50.0%) patients had MMT I and 7(50.0%) patients had MMT II.In GR-II, 4(11.8%) patients had MMT I, 13(38.2%) patients had MMT II, 16(47.1%) patients had MMT III and 1(2.9%) patient had MMT IV. In GR-III, 1(11.1%) patient had MMT I, 6(66.7%) patients had MMT III and 2(22.2%) patients had MMT IV. In GR-IV, 1(33.3%) patient had MMT I and 2(66.7%) patients had MMT II.Association of MMT vs. CL grading was statistically significant (p<0.0009).(tables 1 – 12).

Table 1: MMT and CL GRADING - corelation

MMT	GR-I	GR-II	GR-III	GR-IV	TOTAL
I Row % Col %	7 53.8 50.0	4 30.8 11.8	1 7.7 11.1	1 7.7 33.3	13 100.0 21.7
II Row % Col %	7 31.8 50.0	13 59.1 38.2	0 0.0 0.0	2 9.1 66.7	22 100.0 36.7
III Row % Col %	0 0.0 0.0	16 72.7 47.1	6 27.3 66.7	0 0.0 0.0	22 100.0 36.7
IV Row % Col %	0 0.0 0.0	1 33.3 2.9	2 66.7 22.2	0 0.0 0.0	3 100.0 5.0
TOTAL Row % Col %	14 23.3 100.0	34 56.7 100.0	9 15.0 100.0	3 5.0 100.0	60 100.0 100.0

Table 2: Association between ULBT: CL Grading

CL GRADING					
ULBT	GR-I	GR-II	GR-III	GR-IV	TOTAL
I Row % Col %	6 27.3 42.9	13 59.1 38.2	3 13.6 33.3	0 0.0 0.0	22 100.0 36.7
II Row % Col %	8 23.5 57.1	21 61.8 61.8	5 14.7 55.6	0 0.0 0.0	34 100.0 56.7
III Row % Col %	0 0.0 0.0	0 0.0 0.0	1 25.0 11.1	3 75.0 100.0	4 100.0 6.7
TOTAL Row % Col %	14 23.3 100.0	34 56.7 100.0	9 15.0 100.0	3 5.0 100.0	60 100.0 100.0

In GR-I, 6(42.9%) patients had ULBT I and8(57.1%) patients had ULBT II. In GR-II, 13(38.2%) patients had ULBT I and21(61.8%) patients had ULBT II. In GR-III, 3(33.3%) patients had ULBT I, 5(55.6%) patients had ULBT III. In GR-IV, 3(100.0%) patients had ULBT III. Association of ULBT vs. CL grading was statistically significant (p<0.0001).

Table 3: Association between HEAD EXTENSION and CL Grading

CL GRADING					
HEAD EXTN	GR-I	GR-II	GR-III	GR-IV	TOTAL
≤80 Row % Col %	0 0.0 0.0	3 50.0 8.8	0 0.0 0.0	3 50.0 100.0	6 100.0 10.0
>80 Row % Col %	14 25.9 100.0	31 57.4 91.2	9 16.7 100.0	0 0.0 0.0	54 100.0 90.0
TOTAL Row % Col %	14 23.3 100.0	34 56.7 100.0	9 15.0 100.0	3 5.0 100.0	60 100.0 100.0

Chi-square value: 29.6078, ; p-value:<0.0001

In GR-I, 14(100.0%) patients had head EXTN <80. In GR-II, 3(8.8%) patients had head EXTN >80 and 31(91.2%) patients had head EXTN >0. In GR-III, 9(100.0%) patients had head EXTN <80. In GR-IV, 3(100.0%) patients had head EXTN <80. Association of head EXTN vs. CL grading was statistically significant (p<0.0001).

Table 4: Distribution of mean age (yrs) vs. CL Grading

	CL Grading	Number	Mean	SD	Minimum	Maximum	Median	p-value
Age (yrs)	GR-I	14	32.5000	12.8288	19.0000	58.0000	28.5000	0.6793
	GR-II	34	29.5294	9.2907	18.0000	50.0000	27.5000	
	GR-III	9	33.5556	10.5843	22.0000	52.0000	35.0000	
	GR-IV	3	30.6667	8.1445	25.0000	40.0000	27.0000	

GR-I, the mean age(mean± s.d.) of patients was 32.5000 ± 12.8288 years.In GR-II, the mean age(mean± s.d.) of patients was 29.5294 ± 9.2907 years.In GR-III, the mean age(mean± s.d.) of patients was 33.5556 ± 10.5843 years.In GR-IV, the mean age(mean± s.d.) of patients was 30.6667 ± 8.1445 years.Difference of mean age vs. CL grading was not statistically significant (p=0.6793).

Table 5: Distribution of mean BMI vs CL Grading

	CL Grading	Number	Mean	SD	Minimum	Maximum	Median	p-value
BMI	GR-I	14	31.9786	1.2411	30.2000	34.2000	31.9500	0.3563
	GR-II	34	31.8353	1.2490	30.2000	34.2000	31.3500	
	GR-III	9	31.7667	1.0259	30.2000	33.2000	31.6000	
	GR-IV	3	30.6000	.2000	30.4000	30.8000	30.6000	

In GR-I, the mean BMI(mean± s.d.) of patients was 31.9786 ± 1.2411 kg/m2.In GR-II, the mean BMI(mean± s.d.) of patients was 31.8353 ± 1.2490 kg/m2.In GR-III, the mean BMI(mean± s.d.) of patients was 31.7667 ± 1.0259 kg/m2.In GR-IV, the mean BMI(mean± s.d.) of patients was 30.6000 ± .2000 kg/m2.Difference of mean BMI vs. CL grading was not statistically significant (p=0.3563).

Table 6: Distribution of mean TMD vs CL Grading

	CL Grading	Number	Mean	SD	Minimum	Maximum	Median	p-value
TMD	GR-I	14	6.3857	.5172	5.5000	7.0000	6.5000	<0.0001
	GR-II	34	6.6500	.2643	6.2000	7.4000	6.6000	
	GR-III	9	5.4222	.4265	4.8000	6.2000	5.5000	
	GR-IV	3	6.2333	.3786	5.8000	6.5000	6.4000	

In GR-I, the mean TMD(mean± s.d.) of patients was 6.3857 ± .5172.In GR-II, the mean TMD (mean± s.d.) of patients was 6.6500 ± .2643.In GR-III, the mean TMD(mean± s.d.) of patients was 5.4222 ± .4265.In GR-IV, the mean TMD(mean± s.d.) of patients was 6.2333 ± .3786.Difference of mean TMD vs. CL grading was statistically significant (p<0.0001).

Table 7: Distribution of mean NECK CIRCUM vs. CL Grading

	CL Grading	Number	Mean	SD	Minimum	Maximum	Median	p-value
NECK CIRCUM	GR-I	14	44.8571	1.2315	43.0000	48.0000	45.0000	<0.0001
	GR-II	34	40.9412	2.5099	36.0000	46.0000	41.0000	
	GR-III	9	46.3333	1.5811	44.0000	49.0000	46.0000	
	GR-IV	3	40.6667	3.0551	38.0000	44.0000	40.0000	

In GR-I, the mean neck circum(mean± s.d.) of patients was 44.8571 ± 1.2315.In GR-II, the mean neck circum (mean± s.d.) of patients was 40.9412 ± 2.5099.In GR-III, the mean neck circum(mean± s.d.) of patients was 46.3333 ± 1.5811.In GR-IV, the mean neck circum(mean± s.d.) of patients was 40.6667 ± 3.0551.Difference of mean neck circum vs. CL grading was statistically significant (p<0.0001).

Table 8: Association between MMT vs CL Grading

	CL GRADING		
MMT	Difficult (GR-III and IV)	Easy (GR-I and GR-II)	TOTAL
GR III and IV Row % Col %	8 32.0 66.7	17 68.0 35.4	25 100.0 41.7
GR I and II Row % Col %	4 11.4 33.3	31 88.6 64.6	35 100.0 58.3
TOTAL Row % Col %	12 20.0 100.0	48 80.0 100.0	60 100.0 100.0

Chi-square value: 3.8571; p-value: 0.0495, Sensitivity: 66.7,Specificity: 64.6,Positive Predictive Value: 32.0, Negative Predictive Value: 88.6

In CL grading Difficult (GR-III and IV), 8(66.7%) patients had <80 MMT GR III and IV and 4(33.3%) patients had MMT GR I and II. In CL grading Easy (GR-I and GR-II), 17(35.4%) patients had MMT GR III and IV and 31(64.6%) patients had MMT GR I and II. Association of MMT vs. CL grading was statistically significant (p=0.0495).

Table 9: Association between TMD vs CL Grading

	CL GRADING		
TMD in Cm	Difficult (GR-III and IV)	Easy (GR-I and GR-II)	TOTAL
≤6 Row % Col %	9 69.2 75.0	4 30.8 8.3	13 100.0 21.7
>6 Row % Col %	3 6.4 25.0	44 93.6 91.7	47 100.0 78.3
TOTAL Row % Col %	12 20.0 100.0	48 80.0 100.0	60 100.0 100.0

Sensitivity: 75.0, Specificity: 91.7, Positive Predictive Value: 69.2, Negative Predictive Value: 93.6, Chi-square value: 25.1391; p-value :<0.0001.

In CL grading Difficult (GR-III and IV), 9(75.0%) patients had TMD ≤6cm and 3(25.0%) patients had TMD >6cm In CL grading Easy (GR-I and GR-II), 4(8.3%) patients had TMD ≤6cm and 44(91.7%) patients had TMD >6cm. Association of TMD vs. CL grading was statistically significant (p<0.0001).

Table 10: Association between ULBT vs CL Grading

	CL GRADING		
ULBT	Difficult (GR-III and IV)	Easy (GR-I and GR-II)	TOTAL
Class III Row % Col %	4 100.0 33.3	0 0.0 0.0	4 100.0 6.7
Class I and II Row % Col %	8 14.3 66.7	48 85.7 100.0	56 100.0 93.3
TOTAL Row % Col %	12 20.0 100.0	48 80.0 100.0	60 100.0 100.0

Chi-square value: 17.1429; p-value:<0.0001, Positive Predictive Value: 100.0, Negative Predictive Value: 85.7

In CL grading Difficult (GR-III and IV), 4(33.3%) patients had ULBT Class III and 8(66.7%) patients had ULBT Class I and II. In CL grading Easy (GR-I and GR-II), 47(100.0%) patients had ULBT Class I and II. Association of ULBT vs. CL grading was statistically significant (p<0.0001).

Chi-square value: 6.6667; p-value: 0.0098, Sensitivity: 83.3, Specificity: 58.3. Positive Predictive Value: 33.3, Negative Predictive Value: 93.3

Table 11: Association between NECK CIRCUMFERENCE vs CL Grading

	CL GRADING		
NECK CIRCUM	Difficult (GR-III and IV)	Easy (GR-I and GR-II)	TOTAL
>43 Row % Col %	10 33.3 83.3	20 66.7 41.7	30 100.0 50.0
≤43 Row % Col %	2 6.7 16.7	28 93.3 58.3	30 100.0 50.0
TOTAL Row % Col %	12 20.0 100.0	48 80.0 100.0	60 100.0 100.0

In CL grading Difficult (GR-III and IV), 10(83.3%) patients had neck circumference >43 and 2(16.7%) patients had neck circumference ≤43. In CL grading Easy (GR-I and GR-II), 20(41.7%) patients had neck circum>43 and 28(58.3%) patients had neck circumference ≤43. Association of neck circum vs. CL grading was statistically significant (p=0.0098).

Table 12: Association between HEAD EXTN vs CL Grading

	CL GRADING SN		
HEAD EXTN	Difficult (GR-III and IV)	Easy (GR-I and GR-II)	TOTAL
≤80 Row % Col %	3 50.0 25.0	3 50.0 6.3	6 100.0 10.0
>80 Row % Col %	9 16.7 75.0	45 83.3 93.8	54 100.0 90.0
TOTAL Row % Col %	12 20.0 100.0	48 80.0 100.0	60 100.0 100.0

Sensitivity: 25.0, Specificity: 93.8, Positive Predictive Value: 50.0,Negative Predictive Value: 83.3.Chi-square value: 3.7500; p-value:0.0528

In CL grading Difficult (GR-III and IV), 3(25.0%) patients had <80 head EXTN and 9(25.0%) patients had >80 head EXTN. In CL grading Easy (GR-I and GR-II), 3(6.3%) patients had <80 head EXTN and 45(93.8%) patients had >80 head EXTN. Association of head EXTN vs. CL grading was statistically significant (p=0.0528).

DISCUSSION

Identification of risk factors for difficult intubation is important to distinguish between anticipated and unanticipated difficult airway and take precautions. Although recent advances in supraglottic airway devices, intubating stylettes, fiberoptic bronchoscopes and video-laryngoscopes have been included in difficult airway situations, they will not replace the traditional conventional laryngoscopy. Obese patients were slightly more difficult to intubate compared to lean patients based on IDS. In our study the incidence of difficult laryngoscopy is 20%. This is concurrent with studies by Juvin, et al., Kim, et al., and Seo et al. who observed 15%, 13.8% and 11.8% incidence of difficult intubation in obese, respectively [8, 11, 12].

We found that in CL grading Difficult (GR-III and IV), 8(66.7%) patients had MMT GR III and IV and 4(33.3%) patients had MMT GR I and II. In CL grading Easy (GR-I and GR-II), 17(35.4%) patients had MMT

GR III and IV and 31(64.6%) patients had MMT GR I and II. Association of MMT vs. CL grading was statistically significant (p=0.0495). It was found that Sensitivity: 66.7; Specificity: 64.6; Positive Predictive Value: 32.0; Negative Predictive Value: 88.6. Sharma S et al found in their study that MMT had sensitivity of 100% and a specificity of 80%, but the sensitivity dropped to 40-50% in subsequent prospective studies.

The most important factor which has an influence on MMT is the inter observer variability. Physical factors like phonation, pregnancy and labour do alter this airway assessment. We in our study tried to eliminate all these factors as much as possible. Despite all this we obtained a sensitivity of 66.7%. MMT has a high false positive rate i.e. low predictive value, which makes the anaesthesiologist overcautious in most of the patients who do not have a difficult intubation. But at the same time because of its low false negative rate i.e. a very high negative predictive value it rules out chances of unanticipated difficult intubation [13].

TMD reflects the ease of displacement of the tongue by the laryngoscope blade by giving an estimate of mandibular space In CL grading Difficult (GR-III and IV), 9(75.0%) patients had TMD ≤6cm and 3(25.0%) patients had TMD >6 In CL grading Easy (GR-I and GR-II), 4(8.3%) patients had >80 TMD ≤6 and 44(91.7%) patients had TMD >6. Association of TMD vs. CL grading was statistically significant (p<0.0001). It was found that Sensitivity: 75.0; Specificity: 91.7; Positive Predictive Value: 69.2; Negative Predictive Value: 93.6 which is comparable with the Sharma S et al [14] found in their study that TMD of≤6.5cm was considered to predict a difficult laryngoscopy and obtained a sensitivity of 50% and specificity of 95.7%. A positive predictive value of 100% was obtained when a TMD less than 6 cm was used. The subsequent studies defined TMD of <7 cm to predict difficult intubation. Despite the higher values these studies increased neither the sensitivity nor the specificity of this test high enough to justify the employment of the TMD as the only predictor of a difficult laryngoscopy.

A simple new technique, Upper lip bite test (ULBT) was described by Khan et al which can assess a combination of jaw subluxation and the presence of buck teeth simultaneously. They conducted many studies subsequently in various set of patients with different conditions and comparing with other tests and found that the inclusion of these factors increased the accuracy and specificity of ULBT as compared to MMT. 74, 75. In our study CL grading Difficult (GR-III and IV), 4(33.3%) patients had ULBT Class III and 8(66.7%) patients had ULBT Class I and II. In CL grading Easy (GR-I and GR-II), 47(100.0%) patients had ULBT Class I and II. Association of ULBT vs. CL grading was statistically significant (p<0.0001). We found that Sensitivity: 33.3; Specificity: 100.0; Positive Predictive Value: 100.0; Negative Predictive Value: 85.7 which comparable with the Khan et al [15] study except for a poor sensitivity.

Neck circumference is an increasingly common predictive measure for difficult airway management. Brodsky et al [16] previously identified neck circumference as an independent predictor of difficult intubation, with the risk of difficult intubation increasing seven-fold as neck circumference increased from 40 to 60 cm. In that study, however, a patient was defined as difficult to intubate if the product of laryngoscopic view and number of intubation attempts was greater than a predetermined value. This definition of difficult intubation is not commonly used and may affect the ability to generalise or to compare results among studies. Gonzalez et al. studied difficult intubation (defined as an IDS score of more than 5) prospectively, in 131 lean and obese patients. Neck circumference greater than 43 cm was an independent predictor of difficult intubation and increased the risk of difficult intubation by 37%. In our study, It was found that neck circumference for prediction of difficult laryngoscopy had Sensitivity: 83.3; Specificity: 58.3; Positive Predictive Value: 33.3; Negative Predictive Value: 93.3, which is correlating with high sensitivity of the test.

The head and neck movement is measured as described by Wilson et al [10] by asking the patient to fully extend the head and neck. Tse et al [17] found that a head extension angle ≤ 80 to predict DI had a Sensitivity of 8 % and a PPV of 21 %. Thus it cannot be used as a reliable test in the prediction of DI. However, if there is no limitation in head extension, there would be no intubation difficulty meaning that the test has high Specificity and NPV thus providing reassurance that negative results indicate truly easy endotracheal intubation. This is in relation with our study that In CL grading Difficult (GR-III and IV), 3(25.0%) patients had <80 head EXTN and 9(25.0%) patients had >80 head EXTN. In CL grading Easy (GR-I and GR-II), 3(6.3%) patients had <80 head EXTN and 45(93.8%) patients had >80 head EXTN. Association of head EXTN vs. CL grading was statistically significant (p=0.0528) with Specificity: 93.8; Positive Predictive Value: 50.0; Negative Predictive Value: 83.3 [18].

CONCLUSION

The multifactorial nature of airway management challenges in obese patients is evident, with neck circumference, Modified Mallampatti Test (MMT), and head circumference all showing significant correlations. Notably, mandibular distance exhibited the strongest correlation with difficult airways. Given the limitations of individual predictive tests, it is advisable to combine these airway examination methods to predict the likelihood of difficult airway occurrences more accurately in obese patients. This approach acknowledges the diverse factors influencing airway management difficulty.

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