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A Study on "Non - Invasive Airway Assessment Techniques in Predicting Difficult Intubation"

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Abstract: ***Introduction: Airway assessment is the first step in successful airway management. Several anatomical and functional maneuvers can be performed to estimate the difficulty of endotracheal intubation. We aimed to elucidate the role of upper lip bite test (ULBT), Modifies Mallamati Test (MMT), Wilsons risk score (WRS), Thyromental distance (TMD), Sternomental length (SMD) and their correlation in predicting difficulty intubation in relation to laryngoscopic view as per Cormack Lehane (CL) grading. Methods: An observational study has been conducted on 100 subjects aged between 18 to 65 who were posted for elective surgeries requiring general anaesthesia with endotracheal intubation. In the study, we assessed the predictive power of 5 (five) pre - operative tests: Modified Mallampati Test (MMT), Thyromental Distance (TMD), Sternomental Distance (SMD), Upper Lip Bite Test (ULBT) and Wilsons score to detect Difficult Visualization of Larynx (DVL) which in turn can be used for the prediction of difficult intubation. Results: The sensitivity of MMT, ULBT, WRS, TMD, SMD in our study is 92.5%, 100%, 77.5%, 17.5%, 57.5% respectively. The above study states the Negative Predictive Value (NPV) and Positive Predictive Value (PPV) of WRS were found to be 86.6% and 93.9% respectively. Specificities of ULBT, MMT, TMD, SMD and WRS were found to be 1.7%, 53.3%, 73.3%, 100% and 96.7% respectively. Thus when we compared all the five tests, i. e., Modified Mallampati Test (MMT), Upper Lip Bite Test (ULBT), Wilsons risk score (WRS), Thyromental distance (TMD), and Sternomental length (SMD) for the prediction of Difficult Visualization of Larynx (DVL), it was found that Upper Lip Bite Test (ULBT) was the most sensitive (100%). Sternomental distance (SMD) was the most specific (100%). However, it was found that Modified Mallampati Test (MMT), Upper Lip Bite Test (ULBT), Wilsons risk score (WRS), and Sternomental distance (SMD) had a p - value < 0.01, hence significant in the prediction of difficult visualization of the larynx (DVL). Conclusion: Upper Lip Bite Test (ULBT) was the most sensitive (100%), and Sternomental distance was the most specific (100%). Wilsons score had a significant sensitivity, specificity, positive predictive value, and negative predictive value. Wilsons' score, being a multi - parameter scoring system, is the best predictor of the Difficult Visualization of Larynx and thus difficult intubation.***

Keywords: ULBT, MMT, TMD, SMD, WRS, CL Grading, Difficult intubation

1. Introduction

Science and technology have evolved more in the last 30 (thirty) years. There have been overwhelming advances in the field of anesthesia. Even in the wake of these recent advances, anaesthesiologists worldwide still face an ageless problem – "The Difficult Airway." The American Society of Anaesthesiologists (ASA) defined a problematic airway as "the clinical situation in which a conventionally trained anesthesiologist experiences difficulty with mask ventilation, difficulty with tracheal intubation or both" [1, 2, 3]. This difficulty results from the complex interaction between patient factors, the clinical setting, and the skills and preferences of the practitioner [4, 5].

The modern anaesthesiologist has a wide variety of tools in his armamentarium to tackle a case of a difficult airway. But it's the pre - operative detection of a possible difficult airway that is of prime importance [6] Unanticipated difficult tracheal intubation is a significant source of morbidity and mortality in anesthesia practice [7]. Complications range from a sore throat, airway trauma, aspiration to cerebral hypoxia, and even death.

The ASA task force defined difficult endotracheal intubation as occurring when "proper insertion of the tracheal tube with conventional laryngoscopy requires more than three attempts or more than ten minutes. " Thus, Difficult Visualization of Larynx (DVL) can be used as a predictor for difficult tracheal intubation. [8]

The ASA task force defined Difficult Visualization of the Larynx (DVL) or Difficult Laryngoscopy as occurring when "it is not possible to visualize any portion of the vocal cords with conventional laryngoscopy" [11, 35]. The incidence of DVL is observed to be between 1.5% to 8.5%, difficult intubation about 1% to 4% and failed intubation about 0.05% to 0.35% [9, 10].

The need for airway assessment is to diagnose the potential for difficult airway for Optimal patient preparation, Proper selection of equipment, and technique, Participation of experienced personnel in the problematic airway management [2].

Mallampati *et al*. proposed a grading system (Class I to III) to anticipate such a case of DVL, which considers the pre - operative ability to visualize the faucial pillars, soft palate, and base of uvula [11]. Sampsoon and Young later modified this grading. In 2003, Khan *et al.* proposed and studied a new test, the Upper Lip Bite Test, which involves assessing jaw subluxation and the presence of buck tooth [12, 13]. The Thyromental Distance introduced by Patil Aldreti is also widely used for pre - operative prediction of difficult airway [55]. An array of indices has been used to predict a difficult airway to increase such tests' sensitivity. Wilson's Risk Score analyses 5 (five) parameters – weight, head and neck movement, jaw movement, receding mandible, and buck tooth [14].

Other clinical indicators of DVL include atlanto - occipital

joint extension, sternomental distance, hyomental distance, inter - incisor gap, Benumof's 11 parameter analysis, etc [2]. Therefore, a study was conducted to compare the efficiency of 5 (five) tests:

- Modified Mallampati Test
- Thyromental Distance
- Sternomental Distance
- Upper Lip Bite Test
- Wilson's Risk Score in predicting DVL in adult patients undergoing elective surgeries requiring endotracheal intubation.

2. Materials and Methods

A prospective randomized observational study entitled" A study on non - invasive airway assessment techniques in predicting difficult intubation " was undertaken in the Hospital attached to PES Institute of Medical Sciences and Research, a tertiary care postgraduate teaching institute, from 2021 to 2022. Ethical clearance was obtained before the Institutional Ethical review committee. All Adult patients undergoing elective surgery under general anesthesia were selected for the study.

Inclusion Criteria:

- Patients with A. S. A. Class I and II
- Age group 18 - 65 years of either sex.
- Patients undergoing elective surgery under general anesthesia.

Exclusion Criteria:

- Patient refusal for the procedure
- Neurological deficits.
- Patients with a history of Chronic Obstructive Pulmonary Disease (COPD), asthma, cardiac disease, and raised intracranial tension.
- Patients were allergic to any of the drugs used in the study.
- Pregnant patients.
- Patients on any sedatives orantipsychotics.
- Patients of ASA grade III and above.

The patients with satisfying inclusion and exclusion criteria were subjected to pre - anesthetic check - up and routine investigations recommended by the ASA guidelines for the age before surgery. The patient was explained regarding the procedure, and written informed consent was obtained.

A routine examination was conducted in order to assess the general condition of the patient.

- Airway assessment by Modified Mallampati grading, Upper Lip Bite Test, Thyromental Distance, Sternomental Distance, and Wilson's risk score was done. Here, non - invasive techniques for prediction of DVL was used as a surrogate for prediction of difficult intubation.
- Nutritional status, weight, and height of the patient was recorded.
- A detailed examination of the cardiovascular system and the respiratory system were taken. They were evaluated for any systemic diseases.

The study patients were premedicated with tablet Alprazolam 0.5mg and Pantoprazole 40mg orally on the night before the scheduled surgery, and they were kept nil orally 10 pm onwards.

On arrival of patients in the operating room, an18/20gaugeintravenouscannula was secured on the, and an infusion of normal saline was started. The patients were connected to a multichannel monitor which records Heart Rate (HR), non - invasive measurements of systolic blood pressure (SBP), Diastolic Blood Pressure (DBP), Mean Arterial Blood Pressure (MAP), continuous electrocardiogram (ECG), monitoring, capnograph ($ETCO_2$) and oxygen saturation (SPO2). The patient's baseline values of BP and HR rate were recorded.

Types of equipment for intubation:

The anesthesia machine, emergency oxygen source, pipeline oxygen supply, working laryngoscope, appropriate sized endotracheal tubes and connectors, working suction apparatus with the suction catheter, oropharyngeal airways, intravenous fluids, and drugs were kept ready for an emergency like thiopentone sodium, midazolam, succinylcholine, hydrocortisone, atropine, adrenaline, ketamine, mephentermine, calcium gluconate, sodium bicarbonate, and amiodarone.

The patient's head was stabilized in a sniffing position. Preoxygenation with 100% oxygen for 5 (five) minutes using an appropriate size face mask.

Induced with common drugs:

- Inj. Glycopyrolate 0.01 mg/kg IV
- Inj. Fentanyl 2 mcg/kg IV
- Inj. Propofol 2 - 3 mg/kg IV
- Inj. Vecuronium 0.1 mg/kg IV

Appropriate size Macintosh blade used for laryngoscopy and by a well - trained anesthesiologist, the patient was intubated with the proper size cuffed endotracheal tube. Cormack Lehane grading was assessed and thus, the difficulty in intubation was noted. The patient was mechanically ventilated, and surgery was continued as routine.

Monitoring:

During the surgery, tourniquet time, hemodynamic variables like HR, SBP, DBP, MAP, SPO2, ECG were monitored at 0, 5, 10, and 30 minutes and every 30 min. after that intraoperatively and every 60 min. postoperatively. Any hypersensitivity reactionfor the medications, evidence of pneumothorax, and any other adverse events were also monitored.

Statistical analysis:

The data were uploaded into MS excel 2010 version and further analyzed using SPSS version 21. Descriptive statistics were analyzed as follows: The categorical data were analyzed using percentages, and the continuous data were analyzed using the mean and standard deviation. Inferential statistics were analyzed as follows: Chi - square test, 't' test, etc. was used. The probability value of <0.05 was considered as statistically significant.

3. Results

The study was conducted among 100 subjects undergoing elective surgery under general anesthesia were enrolled in the study.

Socio - demographic profile of the subjects:
The socio - demographic details of each study participant, such as Age, Gender, Marital Status, Religion, BMI status, etc. were recorded, and the analyzed data is presented here.

Age study subjects: Among the total of 100 subjects, 45%of residents were in the range of 20 to 40 years, followed by 36% in the range of 41 to 60 years and 19%>61 years age group.

Gender distribution: Among the total of 100 subjects included in the study, 46% were males, and 54% were females.

Marital status distribution: Among the total of 100 subjects, 83% were married and 17% were unmarried.

Religion distribution: Among the total of 100 subjects included in the study, 83% belonged to Hindu Religion, 14% to Muslim Religion, and 3% to Christian Religion.

B. M. I.: Among the total of 100 subjects included in the study, 63% had an average weight, 33% were overweight, and 4% were obese.

Modified Mallampati Test: Among the total of 100 subjects included in the study, 12% of the subjects belonged to Class I of MMT, 53% to Class II, 29% to Class III and balance 6% to Class IV of MMT.

Using the Modified Mallampati Test, 65% of the subjects were predicted to have an `Easy visualization of the larynx', and 35% of them were expected to have a `Difficult visualization of the larynx', which was eventually used to predict difficulty in intubation.

Thyromental Distance:
A Thyromental Distance of less than 6.5 cm is considered a predictor of difficult visualization of the larynx. Using the Thyromental Distance, 23% of the subjects were predicted to have an `Easy visualization of the larynx', and 77% of them were predicted to have a `Difficult visualization of the larynx', which was eventually used to predict difficulty in intubation.

Sternomental Distance:
A sternomental distance of less than 12.5 cm predicts difficult laryngoscopic intubation. Using the Sternomental Distance, 23% of the subjects were predicted to have an `Easy visualization of the larynx', and 77% of them were predicted to have a Difficult visualization of the larynx', which was eventually used to predict difficulty in intubation.

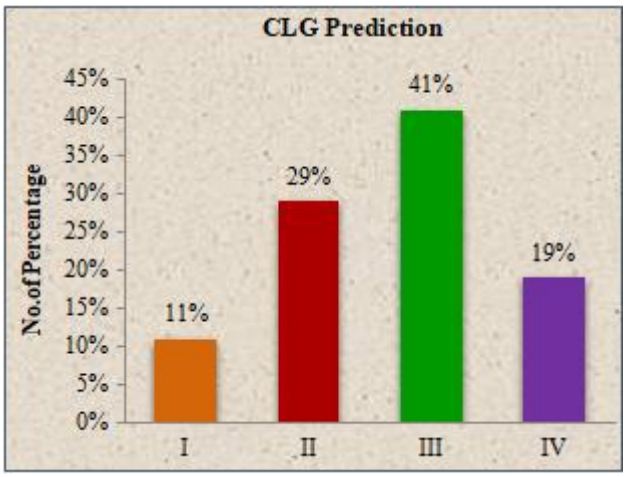
Upper Lip Bite Test
Using the Upper Lip Bite Test, 99% of the subjects were predicted to have an `Easy visualization of the larynx', and 1% of them were predicted to have a `Difficult visualization of the larynx', which was eventually used to predict difficulty in intubation.

Wilson's Risk Scoring System:
Using Wilson's Risk Score System, 33% of the subjects (with a score of 5 or less) were predictehave an Easy visualization of the larynx, 42% (with a score of 6 - 7) were predictedto have a Moderate visualization of the larynx, and 25% of them (with a score of 8 - 10) werepredicted to have a Difficult visualization of the larynx, which was eventually used to predictdifficulty in intubation.

Cormack – Lehane Grading

Table - 1: Distribution of subjects according to CLG Prediction (n=100) – I

C. L. G. Prediction	Percentage (%)
Class - I	11
Class - II	29
Class - III	41
Class - IV	19
Total	100

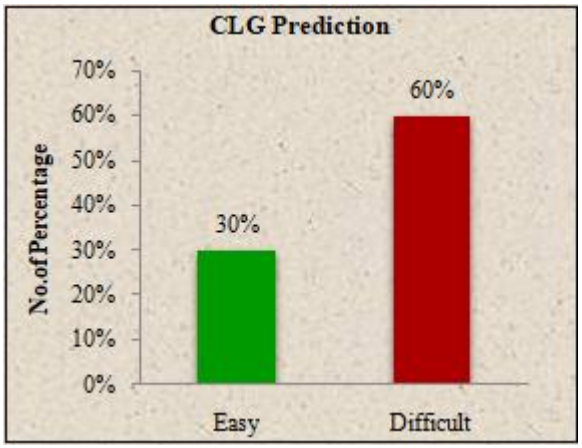


Graph 1: Distribution of study subjects according to CLG Prediction

Table 2: Distribution of study subjects according to CLG Prediction - II

CLG Prediction	Percentage
Easy Visualization	30%
Difficult Visualization	60%
Total	100.0

A Cormack – Lehane grade of I and II was considered an `Easy visualization of the larynx'; III and IV were considered `Difficult visualization of the larynx'. Among the 100 subjects included 60% (41 + 19 = 60) were considered to have `Difficult visualization of larynx' and 40% (11 + 29 = 40) were considered to have `Easy visualization of larynx'.



Graph 2: Distribution of study subjects according to CLG Prediction

Table 3: CLG Prediction and its association with MMT prediction among the subjects

MMT Prediction	C. L. G Prediction		X^2 value	'p' value
	Easy Visualization	Difficult Visualization		
Easy Visualization	37 (92.5)	28 (46.7)	22.1612	<0.0001*
Difficult Visualization	3 (7.5)	32 (53.3)		
Total	40 (100)	60 (100)		

Figures in parentheses are percentage values

A comparison of grading by MMT prediction and CLG prediction showed that there was a significant difference between the two predictors ($p<0.05$). Hence, the MMT grading system alone cannot be used for the prediction of the difficult airway and thus, difficult intubation.

Table 4: CLG Prediction and its association with TMD Prediction among the subjects

TMD Prediction	C. L. G. Prediction		X^2 value	'p'value
	Easy Visualization	Difficult Visualization		
Easy Visualization	7 (17.5)	16 (26.7)	1.1387	0.286
Difficult Visualization	33 (82.5)	44 (73.3)		
Total	40 (100)	60 (100)		

Figures in parentheses are percentage values.

A comparison of grading by TMD prediction and C. L. G. prediction showed no significant difference between the two predictors ($p=0.286$). Hence, TMD grading system alone may be used for the prediction of the difficult airway and thus difficult intubation.

Table 5: CLG Prediction and its association with SMD Prediction among the subjects

SMD Prediction	CLG Prediction		X^2 value	'p' value
	Easy Visualization	Difficult Visualization		
Easy Visualization	23 (57.5)	60 (100)	44.8052	<0.0001*
Difficult Visualization	17 (42.5)	0 (0.0)		
Total	40 (100)	60 (100)		

Figures in parentheses are percentage values.

Comparison of grading by SMD Prediction and CLG prediction showed a significant difference between the two predictors ($p<0.05$). Hence, SMD The grading system alone cannot be used for the prediction of the difficult airway and thus difficult intubation**.**

Table 6: CLG Prediction and its association with ULBT Prediction among the subjects

ULBT Prediction	CLG Prediction		X^2 value	'p' value
	Easy Visualization	Difficult Visualization		
Easy Visualization	40 (100)	59 (98.3)	44.8052	<0.0001*
Difficult Visualization	0 (0)	1 (1.7)		
Total	40 (100)	60 (100)		

Figures in parentheses are percentage values.

A comparison of grading by ULBT prediction and C. L. G. prediction showed a significant difference between the two predictors ($p<0.05$). Hence the ULBT grading system alone cannot be used for the prediction of the difficult airway and thus difficult intubation.

Table 7: C. L. G Prediction and its association with W. R. S. Prediction among the subjects - I

WRS Prediction	CLG Prediction		X^2 value	'p' value
	Easy Visualization	Difficult Visualization		
Easy Visualization	31 (77.5)	2 (3.3)	61.1876	<0.0001*
Moderate Visualization	8 (20.0)	34 (56.7)		
Difficult Visualization	1 (2.5)	24 (40.0)		
Total	40 (100)	60 (100)		

Figures in parentheses are percentage values.

A comparison of grading by WRS prediction and CLG prediction showed a significant difference between the two predictors ($p<0.05$). Hence W. R. S. grading system alone cannot be used for the prediction of the difficult airway and thus difficult intubation.

Figures in parentheses are percentage values.

Table 8: CLG Prediction and its association with WRS Prediction among the subjects - II

WRS Prediction	CLG Prediction		X2 value	'p' value
	Easy Visualization	Difficult Visualization		
Easy Visualization	31 (77.5)	2 (3.3)	59.7090	<0.0001*
Difficult Visualization	9 (22.5)	58 (96.7)		
Total	40 (100)	60 (100)		

For the purpose of statistical analysis and ease of calculation alone, in this study the "Easy" and "Moderate" groups of WRS prediction was clubbed under "Easy" group. A comparison of grading by WRS prediction and CLG prediction showed a significant difference between the two predictors ($p<0.05$). Hence, WRS grading system alone cannot be used for the prediction of the difficult airway and thus difficult intubation.

Diagnostic efficacy:: Efficacy of MMT prediction in comparison with CLG prediction
Sensitivity92.5%, i. e., those with easy intubation indeed identified by MMT prediction
Specificity53.3%, i. e., those with difficult intubation indeed identified by MMT prediction
Positive predictive value 56.9%, i. e., those identified with easy intubation by MMT prediction, is genuinely having an easy intubation.
Negative predictive value91.4%. i. e., those who are identified with difficult intubation by MMT prediction are genuinely having a difficult intubation.

Diagnostic efficacy: Efficacy of TMD prediction in comparison with CLG prediction
Sensitivity17.5%, i. e., those with easyintubation indeed identified by TMD prediction
Specificity 73.3%, i. e., those with difficult intubation indeed identified by TMD prediction
Positive predictive value 30.4%, i. e., those identified with easy intubation by TMD prediction, are genuinely having an easy intubation.
Negative predictive value 57.1%. i. e., those who are identified with difficult intubation by TMD prediction are genuinely having a difficult intubation.
Diagnostic efficacy: Efficacy of SMD Prediction in comparison with CLG prediction
Sensitivity57.5%, i. e., those with easy intubation indeed identified by SMD prediction
Specificity 100%, i. e., those with difficult intubation indeed identified by SMD prediction
Positive predictive value 100%, i. e., those who are identified with easy intubation by SMD prediction truly has an easy intubation.
Negative predictive value 77.9%. i. e., those who are identified with difficult intubation by SMD prediction truly has a difficult intubation.
Diagnostic efficacy:: Efficacy of ULBT prediction in comparison with CLG prediction
Sensitivity100%, i. e., those with easy intubation indeed identified by ULBT prediction
Specificity 1.7%, i. e., those with difficult intubation indeed identified by ULBT prediction
Positive predictive value 40.4%, i. e., those identified with easy intubation by ULBT prediction, are genuinely having an easy intubation.
Negative predictive value of 100%. i. e., those who are identified with difficult intubation by ULBT prediction are genuinely having a difficult intubation.
Diagnostic efficacy: Efficacy of WRS prediction in comparison with CLG prediction
Sensitivity77.5%, i. e., those with easy intubation indeed identified by W. R. S. prediction.
Specificity 96.7%, i. e., those with difficult intubation indeed identified by W. R. S. prediction.
Positive predictive value 93.9%, i. e., those identified with easy intubation by W. R. S. prediction, are genuinely having an easy intubation.
Negative predictive value 86.6%. i. e., those who are identified with difficult intubation by W. R. S. prediction are genuinely having a difficult intubation.

4. Discussions

Difficult endotracheal intubation has been an important cause of anaesthesia related hypoxic brain damage and death, though, there has been overwhelming advances in the field of anaesthesia. As unanticipated difficult tracheal intubation is a significant source of morbidity and mortality in anaesthesia practice, its identification is of prime importance. Several techniques have been employed in the prediction of difficult endotracheal intubation but, the most favorable among them is the technique of Difficult Visualization of Larynx (DVL) used to predict difficult endotracheal intubation especially, in a setting with poor resources in a rural teaching hospital like ours. Thus, Difficult Visualization of Larynx (DVL) has been used as a predictor of difficult intubation [8, 15].

The incidence of difficult visualization of the larynx (DVL.) varies from 1.5% to 8.5% [9, 10]. Since the advent of endotracheal intubation, anaesthesiologists have been in search of an ideal pre - operative bedside test that would successfully predict DVL. A definitive predictive test should have a high sensitivity, specificity, Positive Predictive Value (PPV), negative predictive value, accuracy, should be easy to perform and should have minimum inter - observer variability.

Our study was conducted on 100 patients, out of which, 46% have been `males' and the rest of 54% has been `females'. Thus, we conclude that there has been a fair representation of both the sex groups in the study group.

Cormack – Lehane Grading
The Cormack – Lehane grading was considered as the gold standard for assessing DVL Class III and IV Cormack – Lehane was considered as DVL. . In our present study, the incidence of DVL. Has been 60%. This is much higher than what was obtained in other studies done by Zahid Hussain et al. (5%), Adamus et al. (3.2%), and Nkihu et al. (3.4%). Out of 60 cases of DVL, only 32 were correctly detected by Modified Mallampati Test, one by Upper Lip Bite Test, 58 by Wilsons Risk Score, and 44 by Thyromental distance.

Modified Mallampati Test
Modified Mallampati Test (MMT) has been in anaesthesiology for the last 20 (twenty) years. Some of the significant limitations of MMT are:

- Absence of definite demarcation between Class I – II and III - IV, i. e., inter - observer variability.
- Effect of phonation
- Decreased reliability
- Lack of provision for assessing neck mobility.

The sensitivity of MMT in our study has been 92.5% which is comparable to the research done by Lundstrom et al. (91%) higher than the test by Noorizad and Mahdian (37.9%) and Adamus et al. (64.6%). The specificity of MMT in our study has been 53.3% which is lower than the tests done by Adamus et al. (82.4%), Noorizad and Mahdian (76.9%), and higher than the test by Lundstrom et al. (35%). This wide variation in the reported sensitivity and specificity in various studies may account for inter - observer variability associated with MMT due to its causes.

Upper Lip Bite Test

Upper Lip Bite Test (ULBT) uses a combination of jaw subluxation and buck teeth. It's used as an alternative to the widely used MMT. The ULBT is easy to perform within seconds by demonstrating it to the patient. It doesn't require any specialized equipment. There are clear - cut set endpoints that divide the ULBT into three classes, thereby reducing inter - observer variability. One of the significant limitations of ULBT is that it cannot assess edentulous patients.

The sensitivity of ULBT in our study has been 100% which is more or less comparable to the study conducted by S. K. Mishra et al. (92%) and much higher than a survey done by Zahid Hussain et al. (78.9%). The specificity of ULBT in our study has been 1.7% which is much lower than the studies conducted by Zahid Hussain et al. (91.9%) and S. K. Mishra et al. (86%). The positive predictive value of ULBT in our study has been 40.4% and the negative predictive value has been 100%, respectively.

Wilsons Risk Score

As there was wide variation in single tests' predictive power due to inter - observer variability and other factors, grouped indices with a scoring system have become quite popular. Wilsons risk score is one such test.

The sensitivity of Wilsons' risk score in our study has been 77.5% which is much higher than the tests done by Mohammed et al. (40.2%) and by Domi (7.8%). The specificity of the Wilsons' risk score in our study has been 96.7%, comparable to tests conducted by Mohammed et al. (92.8%) and Domi (78.5%). Our test's positive predictive value and the negative predictive value of Wilsons risk score have been 93.9% and 86.6% respectively.

Thyromental Distance

The sensitivity of thyromental distance in our test has been 17.5% comparable with the sensitivity obtained in other tests done by Nkihu et al. (15.4%) and Noorizad and Mahdian (17.2%). The specificity of thyromental distance in our test has been 73.3% which was lower than other tests done by Nkihu et al. (98.1%) and Noorizad and Mahdian (86.8%). The positive predictive value (PPV) and the negative predictive value (NPV) of thyromental distance have been were 30.4%and 57.1% respectively.

Sternomental Distance

Our test's sensitivity of sternomental distance has been 57.5% which is comparable with the sensitivity obtained in other tests done by Nkihu et al. (65.4%) and Noorizad and Mahdian (53%). Our test's specificity of sternomental distance has been 100% which is comparable to other tests done by Nkihu et al. (98.1%) and Noorizad and Mahdian (86.8%). The positive predictive value (PPV) and negative predictive value (NPV) of sternomental distance have been 100% and 77.9% respectively.

Thus when we compared all the five tests, i. e., Modified Mallampati Test (MMT), Upper Lip Bite Test (ULBT), Wilsons risk score (WRS), Thyromental distance (TMD), and Sternomental length (SMD) for the prediction of Difficult Visualization of Larynx (DVL), it has been found that Upper Lip Bite Test (ULBT) is the most sensitive (100%). StrernomentalDistance (SMD) was the most specific (100%). However, it has been found that Modified Mallampati Test (MMT), Upper Lip Bite Test (ULBT), Wilsons risk score (WRS), and Sternomental distance (SMD) had a p - value < 0.01 hence, significant in the prediction of difficult visualization of the larynx (DVL). It has also beennoted that Wilsons' risk score (WRS) had a high sensitivity, specificity, PPV and NPV, thus, it has been a better predictor of DVL since it is included multiple parameters for the assessment of airway and thus, for the assessment of difficult intubation.

5. Conclusion

An observational study has been conducted on 100 subjects aged between 18 to 65 who were posted for elective surgeries requiring general anesthesia with endotracheal intubation. In the study, we assessed the predictive power of 5 (five) pre - operative tests: Modified Mallampati Test (MMT), Thyromental Distance (TMD), SternomentalDistance (SMD), Upper Lip Bite Test (ULBT) and Wilsons score to detect Difficult Visualization of Larynx (DVL) which in turn can be used for the prediction of difficult intubation.

From our study, it was concluded that:

- The incidence of Difficult Visualization of Larynx has been 60%.
- Among the five pre - operative tests to predict DVL and thus difficult intubation, Upper Lip Bite Test (ULBT) has been the most sensitive (100%), and Sternomental distance has been the most specific (100%).
- Wilsons score had a significant sensitivity, specificity, positive predictive value, and negative predictive value.
- Prediction of Difficult Visualization of Larynx and thus, difficult intubation based on a single parameter has been of low significance.
- Thus, the Wilsons' score, being a multi - parameter scoring system, has been the best predictor of the Difficult Visualization of Larynx and thus, difficult intubation.

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