www.jmscr.igmpublication.org
Impact Factor 5.84
Index Copernicus Value: 83.27
ISSN (e)-2347-176x ISSN (p) 2455-0450
crossref DOI: https://dx.doi.org/10.18535/jmscr/v5i6.198

IGM Publication
Journal Of Medical Science And Clinical Research
An Official Publication Of IGM Publication

Original Article

Proportion of Poor Visualisation of Glottis Documented Using Cormack-Lehane Grading During Anaesthesia

Authors
V R Bindhumol[1], Rehana B*[2], Linette. J. Morris[3]
[1]Post Graduate Resident, Department of Anaesthesia, Government Medical College, Thiruvananthapuram, Kerala, India
[2]Assistant Professor, Department of Anaesthesia, Government Medical College, Thiruvananthapuram, Kerala, India
[3]Professor, Department of Anaesthesia, Government Medical College, Thiruvananthapuram, Kerala, India
*[2]Corresponding Author
Rehana B
Assistant Professor, Department of Anaesthesia, Government Medical College, Thiruvananthapuram, Kerala, India
Email: *rehana_babu@hotmail.com*

ABSTRACT
Despite detailed clinical evaluation of the airway, unanticipated intubation difficulty is encountered in a small subset of patient population. An attempt is made to study the proportion of people in our setting who have Cormack-Lehane Grade 3 & 4 who were previously assessed to have normal airway by classical methods; and also the intubation difficulties which were encountered during anaesthesia. 213 patients who had consented and were assessed to have normal airway were anaesthetised for elective surgery and during laryngoscopy, the Cormack-Lehane Grade and the ease of intubation according to intubation difficulty scale were noted. In this study involving 213 patients, 18 patients were having Cormack-Lehane Grade3 view (8.5%). Of the total 18 patients, 17 patients met with intubation difficulty with a score of more than 5 (8%).It was found that Cormack-Lehane grading is a significant predictor of difficult intubation. It was also found that the sensitivity of Modified Mallampati Classification (MMC) in predicting Grade 3 Cormack-Lehane was 61.1and the specificity was 45.6. It is less reliable as a single predictor of difficult intubation. Likewise the Wilson Risk Sum Score is very sensitive in predicting difficult laryngoscopy, but it is less specific. It was also found that there is a strong association between Cormack-Lehane Grading and intubation difficulty.
Keywords: *Mallampati Classification, Wilsons` Risk Sum Score, Cormack-Lehane Grading, Intubation Difficulty Scale.*

INTRODUCTION

Management of airway is the primary responsibility of the Anaesthesiologist; to secure, protect and maintain the airway during intubation, maintenance, and recovery from anaesthesia. Difficult intubation under general anaesthesia can cause intubation delay or failure which can lead to grievous consequences. The principal adverse outcomes associated with difficult airway include but not limited to death, brain injury, cardiopulmonary arrest, surgical airway, airway trauma and damage to the teeth.

Glottic view during laryngoscopy is graded using the Cormack-Lehane grading[1]. Manipulations of the glottis externally [BURP] or bimanual laryngoscopy can improve glottis view. A 2% or lower incidence of Cormack-Lehane Grade 3and 4 are recorded. In large prospective studies excluding patients with obvious or anticipated, airway difficulty, the incidence of Cormack-Lehane Grade 3or4 were6.1%-10.1%[2]. Even patients assessed to have normal airway by classical methods can have higher Cormack-Lehane grading and difficult intubation.

The difficult intubation is very subjective and it is very difficult to measure the degree of difficulty. An intubation difficulty scale was developed by Adnet et al[3]that has an objective numerical scoring system which serve as reproducible quantitative means of assessing difficulty of an endotracheal intubation after it was performed. It is a function of 7 parameters –number of attempts, number of operators, number of alternative techniques, laryngeal view, lifting force applied, application of laryngeal pressure, and vocal cord mobility. The patients were grouped into 3 categories after intubation: easy endotracheal intubation, slightly difficult endotracheal intubation and very difficult endotracheal intubation.

In most cases, the incidence of unanticipated difficult airway is low. A multivariate airway assessment programme is more predictive of difficult airway than a single factor. Devices such as the laryngeal mask, lighted style and rigid fibreoptic laryngoscopes are effective in establishing a patent airway, especially the laryngeal mask and Combitube are lifesaving in "cannot ventilate"situations[4]. An attempt was made to find out the proportion of poor visualisation of glottis documented using Cormack-Lehane grading during anaesthesia. The ease of intubation with Macintosh laryngoscope blade was also studied and a scoring according to intubation difficulty scale was done.

There are a number of studies which evaluated the usefulness of Mallampatigrading[5] in assessing difficult intubation. A few studies have correlated Mallampati grading and Cormack–Lehane grading following laryngoscopy. The present study was aimed to find an association between Mallampati grading and other airway assessment indices with Cormack-Lehane grading and their predictive power on intubation difficulty scoring in our tertiary care hospital.

MATERIALS & METHODS

The study proposed to identify the proportion of patients with normal airways (as assessed bythe standard airway assessment methods); who have difficult visualisation on laryngoscopy and to find out the percentage of these people who have difficulty with intubation.

Male and female patients of ASA I & II in the age group between 17and 70 years undergoing elective surgical procedures under general anaesthesia were included for the study after obtaining written informed consent and approval from institutional ethics committee. Patients with difficult mask ventilation, those with anticipated difficult intubation, patients with pathology of face, head &neck, pregnant women and patients who have not consented were excluded from the study. Study variables of age, weight, ASA PS, Sex, Mallampati Class, Wilson`s Risk Sum Score[6] and Cormack-Lehane score were noted. Intubation difficulty scale were also studied. A score of 0 indicate easy intubation, score1 to <= 5 indicate slight difficulty, and more than 5 score indicate difficult intubation.

Table 1: Wilson`s Risk Sum Score

Risk Factors	Score Points
Weight	<90 Kg=0 90-110 Kg=1 >110 Kg=2
Head & neck movement	>90°=0 About 90°=1 <90°=2
Jaw movement	IO>5 cm or slux>0 IO<5 cm or slux=0 IO<5 cm or slux<0
Receding mandible	Nil =0 Moderate=1 Severe=2
Buck teeth	Nil =0 Moderate=1 Severe=2

IO = Maximum Interincisal Opening
slux= Jaw Subluxation and maximum forward protrusion of lower incisors beyond upper incisors

Patients were advised nil per oral from 10:00PM on the previous day of surgery. Anxiolytic drugs were prescribed on the evening day before surgery and on the morning of surgery.

After preparation of the OT for GA, the patients were brought to the theatre and monitored with Electrocardiogram (ECG), pulse oximetry (spo2) and Non-Invasive Blood Measure Monitoring (NIBP) and intravenous access was obtained. The patient was placed in classical sniffing position for intubation. In this position cervical spine belowC5 is relatively straight, and there is increasing flexion from C4 to C2 and this is achieved with a pillow under the occiput thus elevating the head and head is extended at atlanto-occipital joint. These manoeuvres will align the oralpharyngeal & laryngeal axis to ease intubation.

The patients were pre medicated with inj. Midazolam 0.02mg/kg, inj. Glycopyrrolate 0.004mg/kg, inj.Ondansetron 100µgm/kg and inj. Morphine 0.15mg/kg. Patients were pre oxygenated for 3 minutes with 100% 0xygen. Anaesthesia was induced with inj.Propofol 1-2.5mg/kg in divided doses checking the blood pressure in between.

The adequacy of mask ventilation was checked and inj.Vecuronium 0.1mg/kg was given. Patient was then ventilated with $O_2$and N_2O + Isoflurane0.5-1% for 3 minutes followed by ventilation with O_2 for one minute. Then laryngoscopy was done with Macintosh laryngoscope blade with the patient in sniffing position. Full mouth opening facilitate the insertion of the laryngoscope blade. It is inserted from right side of the tongue while taking care not to trap the lips between the blade and tooth. The laryngoscope was advanced and simultaneously moved in to midline to displace the tongue to the left. The epiglottis is the first key anatomic land mark. The tip of laryngoscope is advanced into vallecula, and epiglottis is elevated indirectly by applying a force that tenses the hyoepiglottic ligament. The epiglottis is elevated and a further lifting force was applied to the laryngoscope to get the best view of larynx. Levering on them axillary teeth was avoided as this may cause dental damage. When a good view of larynx was achieved, the vocal cord, aryepiglottic folds, posterior cartilage, inter arytenoid notch can be identified. The glottic opening was assessed and Graded according to Cormack-Lehane grading; Grade 1, where complete glottis is visible, Grade 2 where only posterior part of glottis is visible,Grade3, where no part of glottis ,but only epiglottis is visible and Grade4, where not even epiglottis is visible.

If the view of the larynx is poor, check that basic technique has been performed optimally and if needed other manoeuvres are used. External laryngeal manipulation described as bimanual laryngoscopy which includes internal manipulation of laryngoscope with external laryngeal pressure often improves the view. The manoeuvres used to optimise laryngoscopic view included maximum head extension, moving the tongue entirely to left of laryngoscope, optimal depth of insertion of laryngoscope, strong lifting force applied in correct direction to laryngoscope and external laryngeal manipulation. The intubation difficulty score (IDS) is also assessed.

The evaluation method of IDS is as follows;

N1: Number of additional intubation attempts

N2: Number of additional operators. Number of persons directly attempting and not assisting intubation.

N3: Number of alternate intubation techniques

N4: Laryngoscopic view as Graded by Cormack-Lehane

N5: Lifting force applied during laryngoscopy. When abnormal amount of force wasused compared with routine practice

N5-0-Inconsiderable

N5-1-Considerable

N6: The need to apply external laryngeal pressure for optimal glottis exposure. Application of Sellick`s Manoeuvre is intended to inhibit gastric aspiration & do notalter the score

N6-0-Inconsiderable

N6-1-Considerable

N7: Position of vocal cords at intubation

N7-0-Vocal cords are abducted

N7-1-Vocal cords adducted or not visible

For N1, if intubation was successful on the first time 0 point was given and 1 point was added for each additional intubation attempts. For N2, one point was added for increase in number of operators. For N3, 1 point was added with the repositioning ofthe patients or with a change in intubation technique, such as blade or tube change. For N4, Grade 1 in Cormack-Lehane classification was given 0point, Grade 2 is given 1 point, Grade 3 is given 2 points and Grade 4 is given 3 points. For N5, if the lifting force was normal with the use of laryngoscopy, 0 point was given. If a lot of force was needed, 1 point was added. For N6 if external laryngeal pressure is needed to see the glottis better, 1 point is added. For N7, if the vocal cord under laryngoscopic view is abducted 0 point is given and if the cords are adducted 1point is given. The values of the individual components may be documented to find the details of the difficulties encountered and a composite score is summed to provide an overall assessment of difficulty.

The data were analysed using computer software statistical package for social sciences (SPSS) version 10. The quantitative data were analysed for mean and standard deviation. To elucidate the association between different parameters, Mann-Whitney U test and Kruskal Walli`s test were used. For all statistical evaluation the probability of value $p<0.01$ was considered significant.

OBSERVATION & ANALYSIS

The number of patients in the Mallampati class I was 96 in number (45.1%) and class II117 (54.9%). Only patients in the Mallampati Class I&II were studied. Patients with obvious or anticipated difficulty were avoided. Cormack-Lehane grade I view during laryngoscopy using Macintosh laryngoscope were seen in 114 patients (53.5%). Grade II laryngeal view during laryngoscopy were seen with 81 patients (38%) and Grade III view with 18(8.5%). No grade IV view occurred in the study. The number of patients with Wilson Risk Sum Score 0 were 167 in number (78.4%) and those with Score 1 were 36(16.9%). The Wilson Risk Sum score 2 had 10 patients (4.7%). Patients with anticipated difficulties were excluded from the study. Wilsons Risk Sum score>2 is associated with possible difficulty in intubation. It was possible to intubate 192 patient in first attempt (90.1%). About 16 patients (7.5%) needed one additional intubation attempt and 5 patients (2.3%) required 2 additionalattempts.193 patients (90.6%) were intubated without the help of any additional intubation gadgets. 20 patients (9.4%) required additional intubation technique like change of blade, using stylet, bougie or repositioning the head.

Table 2: Percentage distribution of sample according to intubation difficulty scale

Intubation Difficulty Scale	Count	Percent
Easy	107	50.2
Slight difficulty	89	41.8
Moderate major difficulty	17	8.0

Table 3: Association of Mallampati class and Cormack-Lehane grading

Cormack-Lehane Grading	Class I		Class II		Z#	P
	Count	Percent	Count	Percent		
Grade I	68	59.6	46	40.4	4.21**	0.000
Grade II	21	25.9	60	74.1		
Grade III	7	38.9	11	61.1		

Mann-Whitney U Test **Significant at 0.01 level

The association was tested with Mann Whitney U test and was found to be significant with p=0.00.

Table 4: Association of Mallampati class and no.of additional intubation attempts

No.of additional intubation attempts	Class I		Class II		Z#	P
	Count	Percent	Count	Percent		
0	90	46.9	102	53.1	1.57	0.117
1	4	25.0	12	75.0		
2	2	40.0	3	60.0		

The association of Mallampati class and no. of additional intubation attempts was not significant.

Table 5: Association of Wilson`s Risk Sum Score and Cormack-Lehane grading

Wilson`s Risk Sum Score	Cormack-Lehane grading						χ^2#	P
	Grade I		Grade II		Grade III			
	Count	Percent	Count	Percent	Count	Percent		
0	98	58.7	56	33.5	13	7.8	3.01**	0.003
1	15	41.7	17	47.2	4	11.1		
2	1	10.0	8	80.0	1	10.0		

Kruskal Wallis Test

The association was significant with a p value of 0.003

Table 6: Association of Wilson`s Risk Sum Score and no. of additional intubation attempts

No.of additional intubation attempts	Wilson`s Risk Sum Score						χ^2#	P
	0		1		2			
	Count	Percent	Count	Percent	Count	Percent		
0	154	80.2	29	15.1	9	4.7	4.32	0.115
1	9	56.3	6	37.5	1	6.3		
2	4	80.0	1	20.0	0	0.0		

Table 7: Association of Cormack-Lehane grading and no. of additional intubation attempts

No.of additiona lintubation Attempts	Cormack-Lehane grading						χ^2#	P
	Grade I		Grade II		Grade III			
	Count	Percent	Count	Percent	Count	Percent		
0	114	59.4	76	39.6	2	1.0	141.46 **	0
1	0	0.0	5	31.3	11	68.8		
2	0	0.0	0	0.0	5	100.0		

#Kruskal Wallis Test **Significant at 0.01 level

The association was significant with p value 0.000.

Table 8: Predictive power of Mallampatti class on Grade III of Cormack-Lehane grading

Mallampatti Class	Cormack-Lehane grading		
	Grade III	Grade I & II	Total
Class II	11	106	117
Class I	7	89	96
Total	18	195	213

According to this study there is slight predictive power for Mallampati for Cormack–Lehane Grading.

Table 9: Association of Cormack-Lehane grading with intubation difficulty scale

Cormack-Lehane Grading	Easy		Difficult		χ^2	P
	Count	Percent	Count	Percent		
Grade I	114	100.0	0	0.0	371.04**	0.000
Grade II	81	100.0	0	0.0		
Grade III	1	5.6	17	94.4		

**Significant at 0.01 level

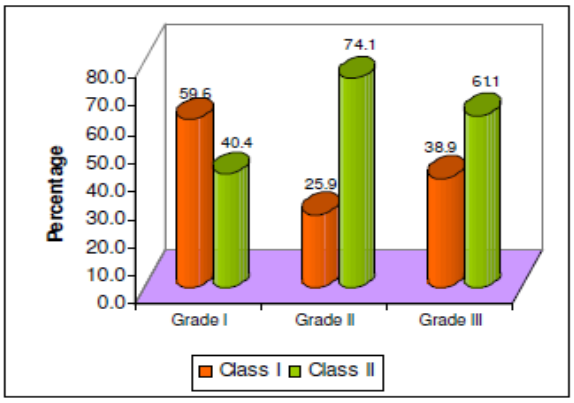
The association was significant with p value of 0.000.

Table 10: Predictive power of Cormack-Lehane grading on Intubation difficulty

Cormack-Lehane Grading	Intubation difficulty scale		
	Difficulty	Easy	Total
Grade III	17	1	18
Grade I & II	0	195	195
Total	17	196	213

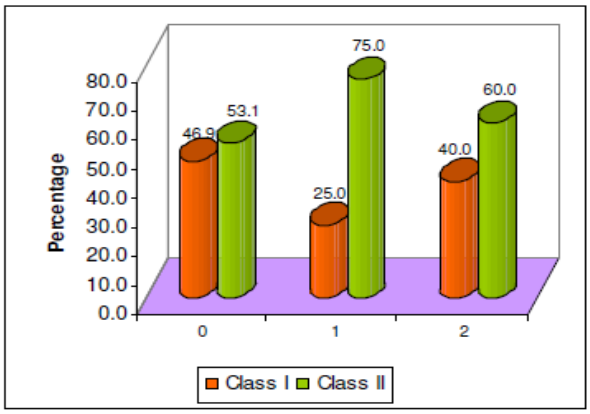
Cormack-Lehane Grade 3 was present for 18 patients .Of these 18 , 17 patients had intubation difficulty scale score more than 5.The predictive power of Cormack-Lehane grading on intubation difficulty was assessed with Kappa and an almost perfect agreement was found. Only 1 patient in the Cormack –Lehane Grade 3 was intubated easily. The Cormack-Lehane grading is a good predictor of difficulty intubation with a sensitivity of 100% and specificity of 99.5 %.

Figure 1-Association of Mallampati class and Cormack-Lehane grading



The association was tested with Mann Whitney U test and was found to be significant with p=0.00.

Figure 2 -Association of Mallampati class and number of additional intubation attempts



Ninety patients in MPC I(46.9%) and 102(53.1%) patients in MPC I1 were intubated in the 1st attempt. Four patients (25%) in MPC I% and 12(75%) in MPC II were intubated in 2nd attempt. Two patients (40%) in MPC I and 3 in MPC II(60%) were intubated in 3rd attempt. The association was not significant.

DISCUSSION

Airway assessment by pre-anaesthetic evaluation is extremely important in anaesthesiology and investigators in this field are constantly searching for better predictors of difficult airway. The most commonly used tests for predicting difficult intubation include Mallampati score, modified by Samson and Young[7], measurement of sternomental and thyromental distances, the inter incisor distance, and the mobility of the neck and prognanthic ability of the jaw. In addition to standardizing the patient's position (sniffing position), itwas also important to standardize neuromuscular blocking drug thus guaranteeing optimal conditions for endotracheal intubation in all patients. 213 surgical patients were studied who had no anticipated or obvious difficulty in intubation.

Of the 213 patients, 96 patients were in Mallampati class I (45.1%) and 117 patients (54.9%) were in Mallampati class II.In the present study population, 114 patients had grade 1 Cormack-Lehane view(53.5%), 81 patients had grade 2 view (38%) and 18 patients had Grade 3 Cormack-Lehane view(8.5%). In a study by Athul Kulkarni and Amar S Thirmanwar excluding patients with anticipated difficult intubation the percentage of CL Grade 3was 4%with Macintosh laryngoscopic blade[8]. In another study by Rose et al, the poor view ie Grade 3-4 was 10.1%.[9] They

have conducted the study after excluding all the patients with anticipated difficult intubation in whom an alternative method of intubation was chosen. This value is very close to the present study. Koh LK et al had studied 605 patients requiring tracheal intubation during generalanaesthesia.[10] The optimal view during laryngoscopy were scored using 5 grade Modified Cormack-Lehane System. The distribution of the scores were 73.9% Grade 1 (full view of vocal cords), 21.0% Grade 2A(partial view of vocal cords), 3.3% Grade 2B(only arytenoids and epiglottis seen), 1.6% Grade 3(only epiglottis visible) and 0.2% Grade 4 view. External laryngeal pressure was required in 45.3% of cases to optimise glottis view. The rate of difficult laryngoscopy was 5.1%which is somewhat close to the present study and difficult intubation was 6.9%. The Mallampati classification and thyromental distance were associated with low predictive value for difficult laryngoscopy. They found that the modified Cormack-Lehane Grading system is a better indicator of difficult laryngo-scopy thanoriginal Cormack-Lehane system.

Mallampati class I had 90 patients and Mallampati class II had 102 patients who were intubated in the first attempt. MPC 1 had 4 patients and MPC II had 12 patients who were intubated in the 2nd attempt and 2 patients in class I and 3 patients in class II were intubated in the 3rd attempt. The association was tested with Mann Whitey U test and the association was not statistically significant (p=0.117). The association was similar to the study by Henrique et al[11], where they have correlated the modified Mallampati classification with the number of attempts at intubation, in their study, 96.2% of patients classified as MPC I or II were intubated at the first or second attempt, when1.9% required more than two attempts, and in another case 1.9%intubation proved impossible using the conventional laryngoscope. All 29 patients classified as Mallampati III or IV were successfully intubated at the first or second attempt; with no statistically significant correlations being established (p=0.56).

In the original study by S.Rao. Mallampati et al, the sensitivity of the Mallampatic lassification was very high. Lundstrom et al.[12] has published a meta-analysis in 2011involving 177,088 patients in which only 35% of patients had difficult intubation who belonged to MPC111/1V.

In a study conducted by Seo et al and others, Mallampati cannot stand as a single predictor of difficult endotracheal intubation[13]. In the study conducted by Henrique et al[11], and associates, 50% of patients in whom laryngoscopy was predicted to be difficult (Cormack-Lehane III/IV) were classified as Mallampati III/IV, whereas those in whom intubation indeed proved difficult or impossible had been classified as Mallampati I/II and these results were not statistically significant. Factors like positioning of patient during examination, patient's ability to understand, presence or absence of phonation, and pregnancy may alter the patient's Mallampati class, which may explain the different incidence of Mallampati classes in different studies. el-Ganzouri AR et al.[14] studied 10,507 consecutive patients after assessing prior togeneral anaesthesia with respect to mouth opening, thyromental distance, oropharyngeal (Mallampati) classification, neck movement, ability to prognath, bodyweight, and history of difficult tracheal intubation. Laryngoscopy Grade IV was found in 107(1%) patients and difficult mask ventilation identified in 8(0.07%). They identified all seven criteria as independent predictors of difficulty with laryngoscopic view. They concluded that prediction of difficult rigid laryngoscopy (Grade IV) will be more accurate with the use of a multivariate risk index compared to oropharyngeal (Mallampati) classification at both low and high risk levels.

The association between Wilson`s risk sum score and Cormack-Lehane grading was found to be significant with a p value of 0.003. In a study conducted by Henrique et al., and others[86] who studied 81 patients on correlation with laryngoscopy and endotracheal intubation conditions, found that 51(100%) patients with Wilsons score 0 or 1 had Cormack-Lehane 1or

2.24(85.7%) 0f 28 patients with Wilsons score 2/3 had Cormack-Lehane1/2 and 4 patients had grade 3 view3. In this study, the Wilson score successfully predicted 100% of the patients in whom laryngoscopy proved difficult (Wilson 2/3) (p=0.01). This reflects the good sensitivity of this test. Specificity, however, was poor. In the present study Wilson`s score 0and1 together the Cormack-Lehane grade was 75.5%.This study shows that Wilsons score is highly predictive of difficult intubation. It is highly sensitive but specificity is low. All the patients in present study group were below90 kilograms in weight.

Shiga et al.[15]in 2005 published a meta-analysis showing that specificity and sensitivity of tests used alone are very poor in predicting difficult airway where they may result in poor positive and negative predictive values. In their study the overall incidence of difficult intubation was 5.8%(95% confidence interval,4.5–7.5%). Screening tests included the Mallampati oropharyngeal classification, thyromental distance, sternomental distance, mouth opening, and Wilson risk score. Each test=sensitivity of 20–62% and specificity 82-97%.

The most useful bedside test for prediction was found to be a combination of Mallampati classification and thyromental distance (positive likelihood ratio, 9.9; 95% confidence interval,3.1–31.9). Currently available screening tests for difficult intubation have only poor to moderate discriminative power when used alone. Combining these tests leads to slightly better indexes.

Predictive power of Cormack-Lehane Grade on intubation difficulty was also studied. Of the total 18 patients with Cormack-Lehane Grade 3, seventeen patients were found with difficult intubation. Rest 196 patients, 107 easy and 89 had slight difficult intubation. The predictive power of Cormack-Lehane grade on intubation difficulty was tested with Kappa with p=0 a perfect agreement was detected. According to the present study Cormack-lehane Grading has 100% sensitivity and 99.5% specificity in predicting difficult intubation .False positive was 0.0 and false negative is 0.5Predictive value of the positive test is 94.4and predictive value of negative test is 100.The accuracy is 99.5.In the original study by Adnet et al, poor visualisation was not always associated with difficult intubation. They have intubated 61.7% of patients with Cormack-Lehanegrade_3 in the first attempt with IDS score 2-5.indicating slight difficulty. They also found that Cormack-Lehane 1 is not synonymous with easy intubation. But as ageneral rule poor visualisation is a determining factor for difficult intubation.

CONCLUSION

213 patients posted for surgery under general anaesthesia were assessed with Mallampati classification and Wilson`s risk sum score prospectively and those who were assessed to have normal airway were included in the study. It was observed that there is a significant association between Mallampati class and Cormack-Lehane grading as in previously reported studies. However there was no association between Mallampati classification and number of intubation attempts. The study also showed that Wilson`s risk sum score is a sensitive predictor of difficult airway as it includes multiple parameters and anatomical characteristics for assessing the airway, but the specificity is low. However the study has some limitations as only patients in the ASA physical status I and II were included and the study was conducted on patients with no obvious or anticipated difficulty in intubation. So the results cannot be extrapolated to the general population. It is concluded that using many airway assessment factors to predict difficult airway is better than using a single factor for the same. The study has found a significant association between Cormack-Lehane grading and intubation attempt. It was also found that Mallampati classification has some predictive power for Cormack-Lehane grading.

REFERENCES

1. Cormack, R.S.; Lehane, J(1984). "Difficult tracheal intubation in obstetrics". Anaesthesia 39(11):1105–11
2. Rose D K ,Cohen M M.The Airway:Problems and predictions in 18500 patients :Can J Anaesth 41:372-383,99
3. Adnet F, Racine SX, Borron SW,et al. A survey of tracheal intubation difficulty in the operating room: a prospective observational study. Acta Anaesthesiol Scand 2001;45:327-32.
4. Crosby E T,Cooper RM, Douglas MJ, Doyle DJ,Hung OR,Labrecque P,MuirH, Murphy MF,Preston RP,Rose d K,Roy L: The unanticipated difficult airway with recommendations for management. Can J Anaesth. 1998 Aug;45(8):757-76.
5. Mallampati SR. Clinical sign to predict difficult tracheal intubation(hypothesis). Can Anaesth Soc J 1983;30: 316-7
6. Wilson M E,Spiegelhalter D,Robertson J A et al.,Predicting difficult intubatin: BJA 61:211.1988
7. Difficult tracheal intubation:a retrospective study.Samson and Young:Anaesthesia 1987 May(5),487-90
8. Kulkarni A P, Tirmanwar AS.Comparison of glottis visualisation and ease ofintubation with different laryngoscope blades .IJA 2013;57;170-4
9. The incidence of airway problems depends on the definition used: D. KeithRose MD FRCPC,* Marsha M. Cohen MD: Can J Anaesth,1996 /43:1/Pp30-4
10. Koh LK, Kong CE, Ip-Yam PC:The modified Cormack–Lehane score for thegrading of direct laryngoscopy: evaluation in the Asian population. Anaesth Intensive Care 2002;30:48-51
11. Gustavo Henrique S. Wanderley1, Luciana Cavalcanti Lima2,3,4, Tânia Cursino de Menezes Couceiro2,5,6, Waston Vieira Silva2,: Clinical Criteria for Airway Assessment: Correlations with Laryngoscopy and Endotracheal Intubation Conditions Open Journal of Anesthesiology, 2013,3,320-325
12. L. H. Lundstrom, A.M. Moller, C. Rosenstock, G. Astrup, MR. Gätke, J Wetterslev: documented previous difficult tracheal intubation as a prognostic test for a subsequent difficult tracheal intubation in adults Anaesthesia.Volume 64,Issue 10, pages 1081–1088,October 2009
13. Suk-Hawan Seo,Jeong-Gil Lee,Soo-Bong Yu,Doo-Sik Kim,Sie Jeong Ryu,andKyung-Han Kim: : Predictors of difficult intubation defined by the intubationdifficulty scale (IDS): predictive value of 7 airway assessment factors KoreanJ Anesthesiol. Dec 2012;63(6): 491–497.
14. El –Ganzouri AR,McCarthy RJ,Tuman KJ ,Tanck E N,Ivankivich AD:Preoperative airway assessment: predictive value of a multivariate risk index.Anaesth Anag 1996 Jun;82(6):1197-204
15. Shiga T, Wajima Z,Inoue T, Sakamoto A: Predicting difficult intubation inapparently normal patients: A meta-analysis of bedside screening test performance. Anaesthesiology 2005;103:423-37