COMPARATIVE STUDY OF AIRWAY ASSESMENT WITH MODIFIED MALLAMPATTI CLASSIFICATION WITH CORMACK & LEHANE GRADING BY VIDEO LARYNGOSCOPY

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Abstract
Background: Difficult laryngoscopic intubation increases the risk of complications such as sore throat, serious airway trauma and aspiration of gastric contents in a patient. This study was undertaken to compare the Modified Mallampatti scores with Cormack & Lehane Scoring by Video laryngoscope and to find the correlation of Modified Mallampatti Scoring with Cormack & Lehane Scoring through Video laryngoscope.
Methodology: This cross-sectional was conducted in the department of Anaesthesiology & CCM, Nehru Hospital, BRD Medical College, Gorakhpur, U.P. India. Patients aged between 18-65 years of either sex belonging to ASA grade I & II, undergoing elective procedure from all surgical specialities requiring endotracheal intubation by Anaesthetics videolaryngoscopy were enrolled.
Results: Out of 100 cases 78 (78%) patients were females and 22 (22%) were males. The cases with ASA grade I & II were in proportion 54% and 46% respectively. According to Mallampati classification the majority of cases were with Class 1 (65%), Class 2 (25%), Class 3 (8%) and Class 4 (2%) respectively. According to Cormack & Lehane grading the majority of cases belonged to grade 1 (60%), grade 2 (24%), grade 3 (12%) and grade 4 (4%) respectively. Out of 100 cases the modified Mallampati and CL grading shows same level correlation in 71 cases while in 29 cases it was different

or non-correlated. Eighty eight cases had time taken less than 15 seconds while 12 cases took more than 15 seconds for Laryngoscopy and intubation.

Conclusion: Modified Mallampati scoring and Cormack & Lehane grading is a good predictor for tracheal intubation. Despite of videolaryngoscopy use the modified Mallampati classification did not correlate grade to grade with Cormack and Lehane grading in all cases. Regular use of videolaryngoscopy may improve the overall ease of intubation.

Keywords: Modified Mallampati classification, Cormack & Lehane grading, Tracheal intubation

INTRODUCTION

The term airway management is the cornerstone of anaesthesia[1]. Direct laryngoscopic intubation is difficult in 1%-4% of patients who have seemingly normal airways[2]. Failure to intubate the trachea is uncommon, being 1:2302 in the non-obstetrics population and 1:300 in obstetric patients.[3, 4] Mallampatti proposed a score to correlate the oropharyngeal space with the predicted ease of direct laryngoscopy and endotracheal intubation. [5] The Modified Mallampati classification is the most commonly used airway assessment test in current anaesthesia practice. [6,7]

Intubation with video laryngoscope is successfully done in shorter time as compared to conventional direct laryngoscopy with Macintosh laryngoscope.[8] The video laryngoscope is provides an enlarged video image of airway structures.[9] Video laryngoscope has been shown to improve glottic visualisation, compared with Direct laryngoscopy, in both routine management and in the predicted difficult airway. Nearly 94% intubation success rate has been reported for video laryngoscopy as a rescue modality after failed direct laryngoscopy.[10, 11] As per the American Society of Anesthesiologist (ASA) difficult airway algorithm, VL is considered for patients with known or predicted difficult airways.[12]

The role of VL in difficult intubation scenarios has recently been recognized in DAS guidelines [13,14] Video Laryngoscopes having different advantages are used in clinical management. [15] When the conventional laryngoscopy results in poor glottis view, due to non-alignment of the Oral, Pharyngeal and Laryngeal axes, C-MAC can be used as a video laryngoscope. [16].

The storz C-MAC has shown higher success rates in glottic visualization and less external laryngeal manipulations compared to macintosh in difficult airways [17]. The technique of awake fiberoptic intubation under local anaesthesia and mild sedation for the management of an anticipated difficult intubation is considered the safest [18,19]. With the above background this study was undertaken to compare the Modified Mallampatti scores with Cormack & Lehane Scoring by Video laryngoscope and to find the correlation of Modified Mallampatti Scoring with Cormack & Lehane Scoring through Video laryngoscope.

MATERIAL AND METHODS

The one year prospective observation study was conducted on adult patients aged between 18-65 years old of either sex belonging to ASA grade I, and II, undergoing elective procedures from all surgical specialties requiring endotracheal intubation at Nehru hospital, BRD medical college, Gorakhpur. The permission of ethical committee was taken. Written informed was taken from all patients. Videolaryngoscope was used using a 4 step technique: Introduce the laryngoscope, obtain the best view, introduce the endotracheal tube and Intubate. Sample size was calculated by the formula P=50% successful predictions by mallampatti scoring system Q=100-P=50, Sample size : N=4pq/LxL, N=4x50x50/10x10, N=100 and L= Allowable error 10%

Inclusion Criteria: Patients with ASA grades I and II were included. Patient aged between 18 to 65 years of either sex were included. Patients undergoing elective procedures from all surgical specialities requiring endotracheal intubation were included.

Exclusion Criteria: Patients who refused **and those undergoing** emergency surgical procedures **were excluded.** Pregnant patients**,** patients with unstable cervical spine**,** tumor of larynx **and** fresh facial injuries were excluded. Patients with apparent restriction of mouth opening due to pain and apparent restriction of neck movement were also excluded. Patient's pre anesthetic checkup and airway assessment was done before surgery. A through preanaesthetic evaluation was conducted in PAC clinic. Airway was assessed using modified Mallampati score with the patients in sitting position the mouth fully open and the tongue protruded.

An appropriate size of video laryngoscope blade was used. The Cormack and Lehane grading was assessed prior to intubation by the trained anaesthesiologist. Correct placement of endotracheal tube was confirmed by the auscultation and end tidal carbon dioxide.

Indirect laryngoscopy was performed whenever the provider visualized the patient's vocal cords by a means other than obtaining a direct line of sight. For intubation, this was facilitated by fiberoptic bronchoscopes, video laryngoscopes, fiberoptic stylets and mirror or prism optically-enhanced laryngoscopes.

In this study videolaryngoscope blades of size 3 and 4 and tracheal tubes (7.0-8.5mm ID) were used by the intubating anaesthesiologist. Further anaesthesia management was continued as per the need of the patients. All information was kept confidential and stored in a data log book.

Statistical Analysis:
The results were analyzed using descriptive statistics. Categorical data were summarized as in proportions and percentages (%) while quantitative (discrete) data were summarized as mean ± SD. The Chi Square Test, The Arithmetic Mean, Unpaired t Test, Paired t test, Spearman Correlation, Sensitivity &Specificity and Kappa Measure of Agreement was applied. Data was collected and analysed through appropriate IBM SSPS version (23). $P<0.05$ was considered as statistically significant.
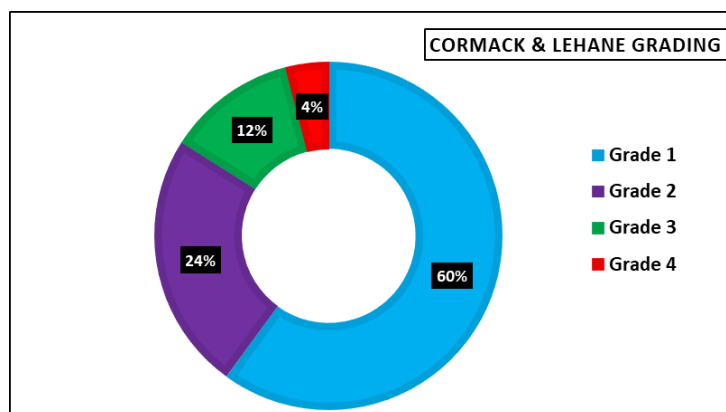
Results
Out of 100 cases, 78 were females while 22 were males. The various diagnosis found were Cholecystitis (59%), Hernia (11%), Appendicitis (4%), Gall bladder stone (3%), Goitre (3%) and renal stone (2%). The cases with ASA grade I and II were in proportion 54% and 46% respectively. The mean age of study cases was 38.28±13.18 years with insignificant difference between correlated and non-correlated cases (p=0.838). Out of 100 patients Cholecystitis patients were (59%), Hernia (11%), Appendicites (4%), Gall Blader Stone (3%), Goitre (3%), Renal Stone (2%) and Others (18%) The cases with ASA grade I and II were in proportion 54% and 46% respectively. According to Modified Mallampati classification, the cases with class 1, class 2, class 3 and class 4 were in proportion 65%, 25%, 8% and 2% respectively.
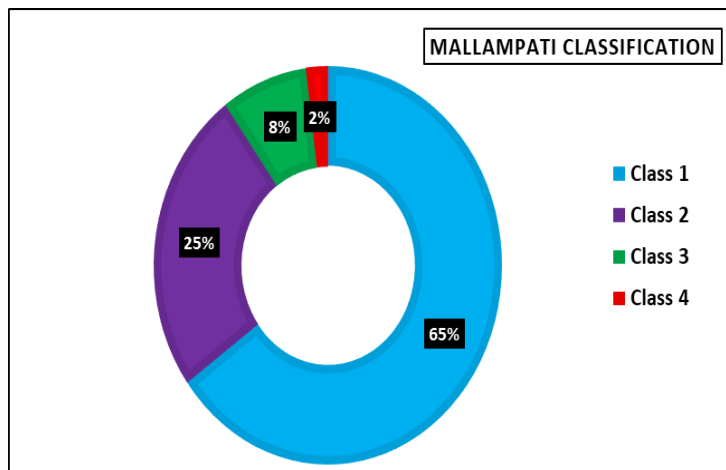
Graph 1: Distribution of Cases according to Modified Mallampati Classification (n=100)

According to Cormack &Lehane grading, the cases with grade 1, grade 2, grade 3 and grade 4 were in proportion 60%, 24%, 12% and 4% respectively.

Graph 2: Distribution of Cases according to Cormack &Lehane Grading (n=100)

The Modified Mallampati score and CL garding showed same level in 71 cases while in 29 cases it was different. This resulted correlations in 71 cases while in 29 cases the levels were uncorrelated. The spearman correlations between the two score was perfect positive (ρ = 1.000, p<0.001) in most of the cases while in non-correlated cases this correlation was 0.144 (p = 0.456, non-significant) Overall Spearman's Correlation between Mallampati and Cormack & Lehane Grading :ρ = 0.680, p<0.001.

Table 1: Distribution of Cases according to Correlation Between Modified Mallampati and Cormack & Lehane Grading (n=100)

between MMP & CL		No.	%	Correlation	p-value	
Correlation	Correlated	71	71.0	1.000	<0.001	Significant
	Non-correlated	29	29.0	0.144	0.456	Non-significant

The Modified Mallampati score and CL garding showed same level in 71 cases while in 29 cases it was different. This resulted correlations in 71 cases while in 29 cases the levels were uncorrelated. The spearman correlations between the two score was perfect positive (ρ = 1.000, p<0.001) in most of the cases while in non-correlated cases this correlation was 0.144 (p = 0.456, non-significant) Overall Spearman's Correlation between Mallampati and Cormack & Lehane Grading :ρ = 0.680, p<0.001.

Table 2: Corellation between Modified Mallampati Classes and Cormack &Lehane Grading

MPS	CL Grading				Total	Kappa	chi sq	p-value
	Grade 1	Grade 2	Grade 3	Grade 4				
Class 1	54	8	3	0	65	0.463	63.16	**<0.001**
Class 2	6	13	5	1	25			
Class 3	0	3	3	2	8			
Class 4	0	0	1	1	2			

Mallampati and CL grading was matched in maximum 54 cases for Grade/Class 1 and minimum 1 case for Grade/Class 4. The measure of agreement between Mallampati and CL grading was 0.463 and found to be highly significant (p<0.001).

Table 3:Grade-wise Distribution of Correlations between Modiied Mallampati and Cormack &Lehane Scorings

MPS with CL	Correlated		Non-correlated		Total
	No.	%	No.	%	
Grade 1	54	90.0	6	10.0	60
Grade 2	13	54.2	11	45.8	24
Grade 3	3	25.0	9	75.0	12
Grade 4	1	25.0	3	75.0	4

The Grade-wise Distribution of Correlations between Mallampati and Cormack &Lehane Scorings showed 90% correlation for grade 1, 54.2% for grade 2, 25% for grade 3 and 25% correlation for grade 4. So the correlation was maximum for grade 1 and minimum for higher grades 3 & 4.

Table 4: Sensitivity and Specificity of Mallampati Classes

Grades	Mallampati				
	Class 1	Class 2	Class 3	Class 4	Average
Cormack &Lehane grades3&4 (sensitivity)	4.6	24.0	62.5	100.0	47.8
Cormack &Lehane grades 1& 2 (specificity)	95.4	76.0	37.5	0.0	52.2

Hence the maximum sensitivity was observed for class 4 and maximum specificity for class 1.
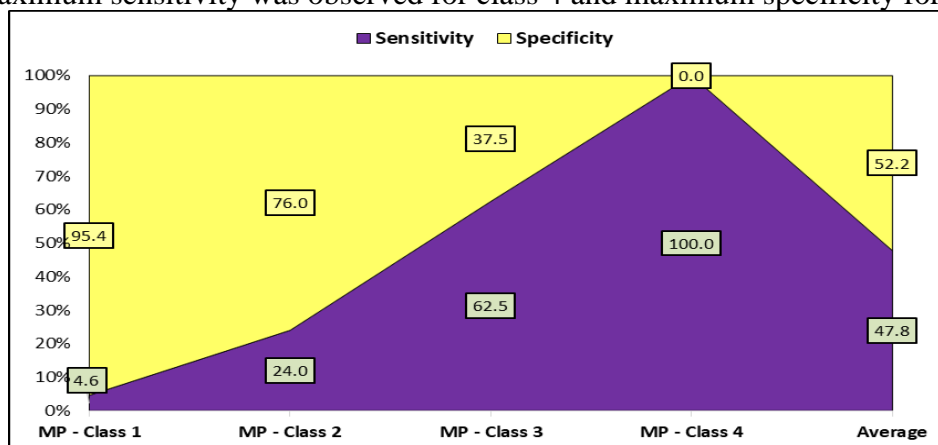

Graph 3: Sensitivity and Specificity of Mallampati Classes

Table 5: No. of Attempts

No. of Attempts	Number of patients (n=100)	Percent (%)
One	88	88.0%
Two	12	12.0%

Only one attempt was required in majority 88 cases while in remaining 12 cases two attempts were needed

The significant difference was found in proportion of one and two attempts between various MPS Classes ($p<0.001$)
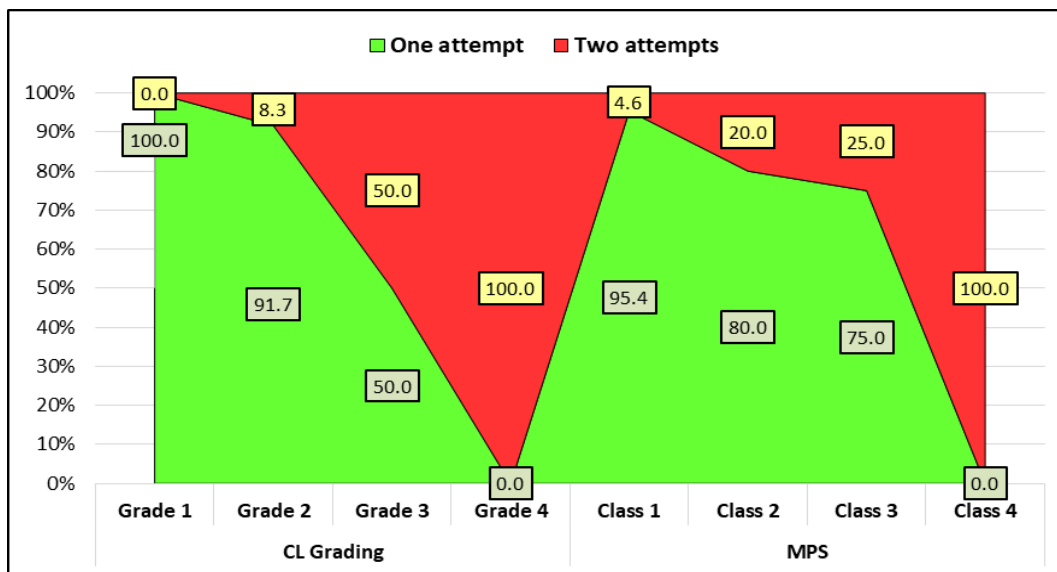
**Graph 4: Comparison of No. of Attempts with Mallampati and Cormack &Lehane Scorings**

Table 6: Difficulty in Intubation with added maneuver: Bougie /BURP/Stylet/Nil

Difficulty in Intubation with added maneuver: BURP/Stylet/Bougie	Number of patients (n=100)	Percent (%)
Bougie	2	2.0%
BURP	7	7.0%
Stylet	8	8.0%
Nil	83	83.0%

Out of 100 cases 83 cases don't required any added maneuver while 8 cases required Stylet, 7 needed BURP and two cases needed Bougie.

Table 7: Distribution of Cases according to Difficulty Determinants

Difficulty		No.	%
Time taken for Laryngoscopy and intubation	<15 Sec	88	88.0
	>15 Sec	12	12.0
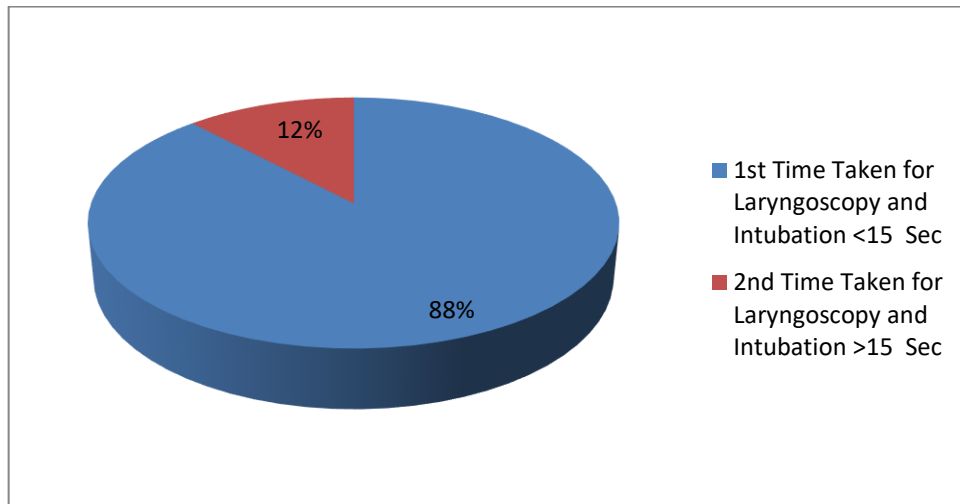
Graph 5: Distribution of Cases according to Difficulty Determinants

Majority 88 cases had time taken less than 15 sec for Laryngoscopy and intubation while 12 cases took more than 15 sec for Laryngoscopy and intubation.

DISCUSSION

Failed intubation is a major cause of morbidity and death. Improvements in visualization of larynx using video laryngoscope may potentially increase success rate with laryngoscopy and intubation. Direct laryngoscopy using Machintosh laryngoscope has been used for laryngoscopy and intubation [22]. The use of video laryngoscope in intubation is well established and has been extensively supported in the literature for managing the difficult airways. A videolaryngoscope provides a better view of the glottis and increases the success rate of tracheal intubation [8, 9, 11, 12].

In a case series of 270 adult patients in whom direct laryngoscopy using a macintosh laryngoscope was difficult and 23 patients with predicted difficult intubation and difficult mask ventilation, tracheal intubation with a videolaryngoscope was successful in 290 of 293 patients.[20] Comparing videolaryngoscope with the macintosh laryngoscope in adult patients unanimously has shown a higher success rate of intubation with the videolaryngosope [21-24]. The videolaryngoscope is less likely to require extension and flexion of the head and neck, pressure on the neck, movement of the cervical spine and distortion of the upper airway. The videolaryngoscope is less traumatic than the classic laryngoscope for a difficult airway among obese patients [25].

In our study the cases with ASA grade 1 and 2 were in proportion 54% and 46% respectively. According to modified mallampati classification the cases with class1(65%), class2(25%), class3(8%), class4(2%) respectively. According to Cormack& Lehane grading the cases of grade1(60%), grade2(24%), grade3(12%) and grade4(4%) respectively.Out of 100 cases the modified mallampati and CL grading shows same level correlation in 71cases while in 29 cases it was different or non-correlated .i.e. 71 cases were matched for their Modified Mallampati class seen during PAC intubating same during videolaryngoscopy, ie.. maximum correlation for grade 1 in 54 cases (90%), for grade 2 in 13 cases(54.2%),and minimum for grade 3& 4 in (25%) cases. In Non-correlated cases out of 29 cases 6 cases(10%) of grade 1, 11 cases(45.8%) cases of grade 2, 9 cases(75%) in grade 3, and 3 cases(75%) in grade 4. The spearman´s correlation between MMP Vs CL grade for correlated cases was perfect positive (p<0.001) while in non-correlated cases this correlation was 0.144(p=0.456) insignificant. Modified mallampati class and CL grading was matched maximum in 54 cases for class/grade1 and minimum 1 case for class/grade 4. The measure of agreements between modified mallampati class and CL grading was 0.463 (Kappa value) and found to be highly siginificant (P<0.001). All cases of Cl grade 1 required only one attempt of intubation while for grade

2, 3 & 4 required one attempt in 91.7%, 50% and 0% cases. 95.4% of the cases of MPS class 1 required only one attempt of intubation while for classes 2, 3, & 4 required one attempt in 80.0%, 75% and 0% cases. Majority 88 cases had time taken less than 15 sec while 12 cases took more than 15 sec for Laryngoscopy and intubation.

Our results are comparable with the study done by Mallampati SR et.al supporting the hypothesis that difficult laryngeal visualization can be predicted in most cases by eliciting the visibility of faucial pillars and uvula.[26]

Cohen et.al [27] compared Mallampati grade with CL grading during laryngoscopy and found that Mallampati class A patient's have easy laryngoscopic visualization and are easy to be intubated as compared to class C patients having poor glottic exposure. The study is in correlation to our study which shows that in most of the cases Modified Mallampatti Classification and Cormack and Lehane grading is a good predictor for tracheal intubation.

Out of 100 cases in our study 84% cases of Mallampati classification classes successfuly predicted Cormack and Lehane grade I and II (i.e ease of Laryngoscopic tracheal intubation). The results of study are similar to **Cohen et.al[27].** In our study, on an average sensitivity was 47.8% and specificity 52.2 %. The average sensitivity was 25.52% while the specificity being 74.48% in the study by **Cohen et.al [27]**. **Kaplan MB et al**, concluded that video-assisted laryngoscopy provides an improve view of the larynx, as compared with the direct visualization. and the technique may be useful for cases in difficult intubation and reintubation as well as for teaching laryngoscopy and intubation [28]. This is in agreement to our study results.

Our study results are also in agreement with **Jungbauer et al** (29). They found that video laryngoscopy (By C-MAC) provided a significantly better view of the cords, a higher success rate, faster intubations and less need for optimizing manoeuvres in difficult intubations.

Our results are also in agreement with the meta-analysis done by **Su YC et al** which concluded that video laryngoscopes are a good alternative to direct laryngoscopy during tracheal intubation [30].

Our results are also comparable with the study by **Cavus E et al** who concluded that combining the benefits of conventional direct laryngoscopy and video laryngoscopy in one device, the C-MAC may serve as a standard intubation device for both routine airway management and educational purposes [31].

Cavus E et al studied the efficacy of C-MAC, a portable videolaryngoscope in 60 patients during routine induction of anaestheisia [31]. Tracheal intubation was successful in all the patients. In 8 patients (13%) a gum elastic bougie was required. The median time taken for tracheal intubation was 16 seconds. In our study out of 100 patients, 88 were intubated in first attempt while 12 were intubated in second attempt while in difficult cases bougie was used in 2 patients. BURP was used in 7 Pt's; Stylet was used in 8 Pt's while in 83 Pt's no added manueuver was used. In our study the time taken for laryngoscopy and intubation was <15 secs in 88 cases & >15 seconds in 12 cases.

Our study results are comparable with the study done by Hodgetts et.al [32]. In their study out of 45 patients intubated by C-MAC Videolaryngoscope, 13 patients (28.8%) needed additional maneuver (Bougie/BURP or both), while in our study out of 100 patients, 17 % patients needed additional maneuver. In their study the median intubation time needed is 29.2±18.6 seconds while in our study 88 % patients need time for laryngoscopy and intubation <15 seconds in 88 % patients while >15 Seconds in 12 % patients. Our study is also comparable to study done by Kiran D S et al [33] in a group of 40 cases intubated by C-MAC videolaryngoscope. BURP was used in 45% of cases, stylet

used in 30% cases, duration of laryngoscopy was 29.5±19.12 while in our study BURP is used in 7% cases, stylet used in 8% cases and bougie used in 2% of cases. Duration of laryngoscopy was <15secs in 88% cases and >15 secs in 12% of cases.

Our study has the following limitations. As the study period was of 1 year duration the total number of patients included was less in number. Therefore the results of this study are not applicable to large scale population group as a longer period of time is required to validate the results of this study. Also the study includes patients coming under ASA class I & II, the results of the study are not applicable for ASA III, IV & V. However evidence from the present study and the other studies comparing modified Mallampati scoring with Cormack and Lehane scoring through videolaryngoscope may improve the overall ease of intubation.

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