

Original Article

Correlative value of airway assessment by Mallampati classification and Cormack and Lehane grading

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ABSTRACT

Objective

To evaluate the predictive value of Mallampati classification with Cormack & Lehane grading for tracheal intubation and assess their correlation at direct laryngoscopy.

Methods

This comparative study was carried out in the department of anesthesiology and intensive care unit, Pakistan Institute of Medical Sciences, Islamabad from November 2004 to March 2007. One hundred and twenty two patients belonging to ASA-I, II and III ranging from 18-65 years, undergoing elective procedures from all surgical specialties requiring endotracheal intubation were included in the study. All were assessed pre-operatively one day before surgery and their airway was assessed using Mallampati classification. The conduct of anesthesia was kept uniform in all patients. The Cormack & Lehane grading was assessed prior to intubation. Data were analyzed using SPSS version 10.0.

Results

While comparing Mallampati classification in classes and Cormack & Lehane grades, P-value came to be 0.01. The value of correlation co-efficient (r) was 0.335 (p 0.01).

Conclusion

Mallampati classification and Cormack & Lehane grading is a good predictor for tracheal intubation. Mallampati classification did not correlate grade-to-grade with Cormack & Lehane grading on direct laryngoscopy. (Rawal Med J 2011;36:2-4).

Key words

Larngoscopy, airway, intubation.

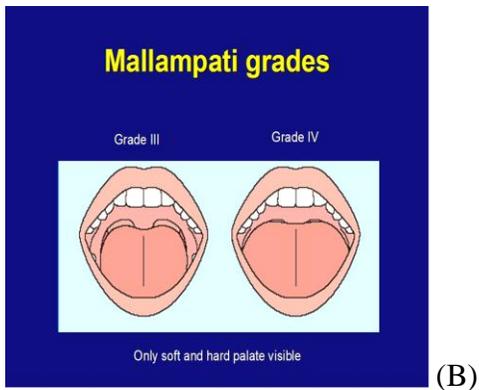
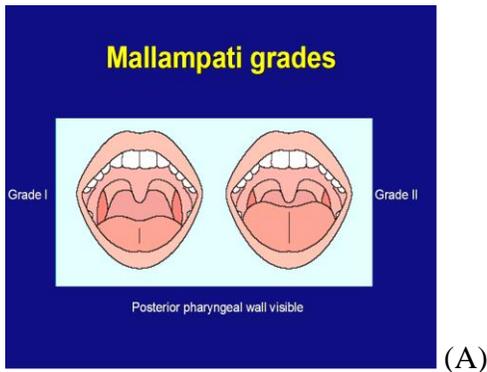
INTRODUCTION

Direct laryngoscopic intubation is difficult in 1%- 4% cases and impossible in 0.05% - 0.35% of patients who have seemingly normal airways.¹ The unanticipated difficult laryngoscopic intubation places the patient at increased risk of complications ranging from sore throat and serious airway trauma to aspiration of gastric contents.^{2,3} Failure to intubate the trachea is even less common, being 1:2302 in the non-obstetrics population⁴ and 1:300 in obstetric patients.⁵ The commonly used

tests for airway evaluation are Mallampati classification, Cormack & Lehane grading, thyromental distance and tests devised by Wilson.

Mallampati et al described clinical signs to predict difficult intubation in 1983.⁶ It is based on the pharyngeal structures and three grades were described,⁶ which were later modified to four grades (Fig 1).⁴ Cormack and Lehane classified the view at laryngoscopy in four grades based on visualization of glottis and epiglottis.⁷ The thyromental distance was devised by Patil et al and they measured the distance from the mental prominence to the thyroid notch with the neck fully extended.⁸

Fig 1. Mallampati grades (Ref 6).



The sensitivity of thyromental distance has been reported to be 62% to 91% and specificity varied from 25% to 82%.⁹ The tests devised by Wilson et al consist of five useful risk factors, measured at three levels of severity that could be used to predict difficulty with intubation.¹⁰ The risk factors identified were weight, head and neck movement, jaw movement, prominent maxillary teeth ("buck teeth") and receding mandible.¹⁰ There is no single test or method of examination that will predict difficult intubation with 100% accuracy. Three mechanisms of injury accounted for three-fourths of the adverse respiratory events and these are inadequate ventilation (38%), esophageal intubation (18%) and difficult tracheal intubation (17%).¹¹ Difficult laryngoscopy was defined by the ASA Task Force as "when it is not possible to visualize any portion of the vocal cords with conventional laryngoscopy". In most instances, this would equate to the Grade III and IV laryngoscopic designation of Cormack & Lehane grades. The objectives of this study were to evaluate the predictive value of Mallampati classification with Cormack & Lehane grading for tracheal intubation and to seek whether pre-operative airway assessment by Mallampati classification correlates with Cormack & Lehane grading at direct laryngoscopy or not.

PATIENTS AND METHODS

This Comparative study was conducted at the Department of Anesthesiology and Intensive Care Unit, Pakistan Institute of Medical Sciences, Islamabad for Thirteen months from November 2004 to March 2007. Adult patients belonging to ASA-I, II and III ranging from 18-65 years of either gender undergoing elective procedures from all surgical specialties requiring endotracheal intubation were included in the study. Emergency surgical procedures, patients with age <18 years, pregnant patients, patients with unstable cervical spine and patients with tumor of the larynx were excluded. One hundred and twenty two patients were selected from the operative schedule by convenient non-probability sampling. The procedure was carried out after routine pre-anesthesia evaluation and obtaining written informed consent.

Patients were assessed pre-operatively one day before surgery and Mallampati classification was assessed. In the operating room, standard monitoring was performed. The patient's head was placed in the "sniffing" position. All patients were given assisted ventilation with 100% oxygen via face mask followed by laryngoscopy after two and half minutes of muscle relaxant. An appropriate sized Macintosh blade was used during laryngoscopy. The Cormack & Lehane grading was assessed prior to intubation. Data was collected and analyzed through SPSS vs10.

RESULTS

Trachea was successfully intubated in first attempt in all the cases. Mean age was 32.80 ± 11.12 years. There were 43 (35%) male and 79 (65%) female patients. Out of one hundred and twenty two cases, the percentage distribution of various Mallampati classes and Cormack & Lehane grades are shown in Tables 1- 2.

Table 1. Mallampati cases and their percentages (n=122).

Mallampati classes	Number	Percentage
Mallampati class-1	79	64.75
Mallampati classs-2	30	24.59
Mallampati class-3	11	9.02
Mallampati class-4	2	1.64
Total	122	100.0

For the purpose of this study, sensitivity was defined as the Cormack & Lehane Grade 3 and 4 prove to be cases of difficult laryngoscopy and specificity was defined as Cormack & Lehane grades 1 and 2 as the proportion of easy laryngoscopy. The break-up of sensitivity and specificity in our study of Mallampati classes are shown in Table 3.

Table 2. Cormack & Lehane grades and their percentages (n=122).

Cormack & Lehane grades	Number of cases	Percentages
Cormack & Lehane-1	73	59.84
Cormack & Lehane -2	29	23.77
Cormack & Lehane -3	17	13.93
Cormack & Lehane -4	3	2.46
Total	122	100.0

The average sensitivity of Mallampati grade 1-4 in our study was 25.52 % while the specificity being 74.48 %. Chi-square test was used to compare Mallampati classification in classes and Cormack & Lehane grades and P-value came to be 0.01(Table 4).

Table 3. Sensitivity and specificity of Mallampati and Cormack & Lehane grades (n=122).

Grades	Mallampati class -1	Mallampati class -2	Mallampati class -3	Mallampati class -4	Average Percentage
Cormack & Lehane grades 3&4 (sensitivity)	13.92	20.0	18.18	50.0	25.52
Cormack & Lehane grades 1&2 (specificity)	86.08	80.0	81.82	50.0	74.48
Total	100.0	100.0	100.0	100.0	100.0

Spearman's Rank correlation was used to check interdependence between the two ungrouped variables i.e. Mallampati classification and Cormack & Lehane grades and value of correlation coefficient (r) was found to be 0.335. The correlation was significant at the 0.01 level (2-tailed).

Table 4. Comparison of Cormack & Lehane Grading & Mallampati Classification (n=122).

		Mallampati classification				Total
		Mallampati class -1	Mallampati class -2	Mallampati class -3	Mallampati class -4	
Cormack & Lehane grading	Cormack & Lehane grade -1	57	14	1	1	73
	Cormack & Lehane grade -2	11	10	8	0	29
	Cormack &	11	5	1	0	17

	Lehane grade – 3					
	Cormack & Lehane grade – 4	0	1	1	1	3
Total		79	30	11	2	122

P-value \leq 0.01

The correlated cases of Mallampati and Cormack & Lehane cases are shown in table 5. The grade to grade non-correlated cases of Mallampati and Cormack & Lehane grades are shown in table 6.

DISCUSSION

Out of the 122 cases, in 83.60% cases Mallampati classification classes successfully predicted Cormack & Lehane grade 1 and 2 (i.e. ease of laryngoscopic tracheal intubation). The results of our study are similar to those of Cohen et al.¹³ In study by Cobley et al, Mallampati classification predicted only about 50% of difficult intubation and had an incidence of false positive results.¹⁴ The average sensitivity of Mallampati grade 1-4 in our study was 25.52 % while specificity of 74.48 %.

Table 5. Grade-to-Grade comparison of Mallampati and Cormack & Lehane classifications (n =122).

Grades	Mallampati	Cormack & Lehane	%
Grade-1	79	57	72.15
Grade-2	30	10	33.33
Grade-3	11	1	9.09
Grade-4	2	1	50.0

Berglar et al found that difficult intubation was significantly more common in patients with Mallampati score \geq 3.¹⁵ However, low sensitivity i.e. 60% and 72% specificity in their study limited the clinical value of this test.¹⁵ Tham et al found that phonation produced a marked improvement of view and a more favorable classification whereas the supine position resulted in a somewhat worse view and a higher-grade assignment.¹⁶ In our study, orotracheal intubation was rated difficult in 20.8% of the patients using Mallampati classification.

Table 6. Grade-to-Grade non-correlated cases of Mallampati classes and Cormack & Lehane grades (n =122).

	Mallampati class	Non- correlated cases of Cormack Lehane	Percentage of Non-correlated Cormack Lehane cases
Class – 1	79	22	27.84
Class – 2	30	20	66.66
Class – 3	11	9	81.81
Class – 4	2	1	50.0

It has been shown that positive predictive value of combination of tests was much higher than the individual tests alone.¹⁷ Encountering a Cormack & Lehane grade 4 laryngoscopy did not necessarily lead to patient morbidity or cancellation of surgery.¹⁸

In a study of 700 patients, orotracheal intubation was rated difficult in 10.4% in Mallampati scale and in 11% of the patients score by the Cormack & Lehane scale.¹⁹ The incidence of difficult intubation was found to be 8%, while sensitivities of the Mallampati test, the Wilson tests and the thyromental distance were 43%, 58% and 35% respectively.²⁰ The linear correlation index in Mallampati classification versus Cormack & Lehane grades in 1956 patients was found to be 0.904,²¹ as compared to 0.335 of our study.

The clinical predictive index had some limitations, as patients with cervical spine pathology, cervical spondylosis, rheumatoid arthritis, tumor of larynx and occipito-atlanto-axial joint pathologies were high-risk group and were not included in our study. At best, there is marked individual variability in measurement of the airway parameters. We all must acknowledge the inevitability of prediction error and be prepared for the worse case scenario, such as being unable to provide adequate ventilation and oxygenation to a patient. We must equip ourselves with a variety of alternative airway techniques and always be ready for the inevitable error.

CONCLUSION

The Mallampati classification with Cormack & Lehane grading is a good predictor for tracheal intubation. Mallampati classification did not correlate grade- to-grade with Cormack & Lehane grading on direct laryngoscopy.

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