Evaluation of Mallampati Score in Comparison with Cormack and Lehane Score for Tracheal Intubation

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ABSTRACT

Background: Mallampati classification is a standard bedside evaluation used to identify patients who may require multiple intubation attempts to minimize anesthesia-related morbidity and mortality, such as sore throats and substantial airway injuries, as well as aspiration of stomach contents.

Objectives: To compare the predictive usefulness of Mallampati classification to Cormack and Lehane grading for tracheal intubation and to see how well they correlated during direct laryngoscopy.

Methods: A comparative, cross-sectional study was conducted from the first of January to the 30th of June 2021 in general surgery operating theater of Baghdad teaching hospital. The study included 72 adult patients aged between 25-70 years old (81.9% female and 18.1% male). Thyroid surgery was included in about 43.1% of total number of patients.

Results: Mallampati score had a sensitivity of 40%, a specificity of 100%, and an accuracy of 91.7%. Mallampati score was also successful in predicting 84% of cases of grade 1, 46.2% of cases of grade 2, 28% of cases of grade 3 and 66.7% of cases of grade 4 of intubation difficulty. Cormack-Lehane scale detected 50 case with grade 1 of difficult intubation, 33 of them were confirmed by Mallampati score.

Conclusion: There was a fair agreement between Mallampati and Cormack-Lehane scales, and this agreement was statistically significant, that is why preoperative assessment is valuable in decreasing the risk of difficult intubation with preferable airway management.

Keywords: Challenging intubation, Mallampati score, Evaluation of airway, Cormack-Lehane.

Anesthesiologists bear the primary duty for airway management, which is a key technique[1]. The failure to maintain a patient's airway is a leading cause of anesthesia-related morbidity and mortality[2]. The patient is at risk of consequences ranging from sore throat and significant airway trauma to aspiration of stomach contents due to the unanticipated difficult intubation[3].

Effective airway strategies depend on preoperative preparation and anticipation: human factors, skills, situational awareness, communication and teamwork, all play a role in successful and safe airway management[4].

One of the most critical tasks of the anesthesiologist is to secure the airway. The Mallampati classification is a typical bedside exam that anesthesiologists utilize frequently to identify the patients who suspect difficult intubation. The classes of Mallampati score are: Class 1: Soft palate, fauces, uvula, pillars evident, Class 2: Soft palate with visible fauces and uvula, Class 3: Soft palate with visible base of uvula, and Class 4: Soft palate with no visible uvula. Easy intubation is classified as classes 1 and 2, while difficult intubation is classified as classes 3 and 4. Accepted definitions of difficult intubation where intubation requires multiple attempts or additional equipment[5].

Difficult laryngoscopy is defined as the inability to visualize the glottis opening with a typical curve blade laryngoscope, which corresponds to a Cormack and Lehane III or IV grade view, in which only the epiglottis

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or just the pharynx and tongue can be seen, respectively[6].

Definition of a difficult airway is when trained anesthesiologist experiences difficulty with face mask ventilation of the upper airway, difficulty with tracheal intubation, or both.[7] Airway management, including the capacity to intubate, is a basic skill that every doctor should have, especially in a primary care setting in a remote place [8]. Securing the airway is one of the most important jobs of the anesthesiologist. An airway pre-assessment is the first step in planning for a problematic airway. There are a number of bedside tests for airway assessment, one of the most commonly used bedside tests is the modified Mallampati classification, which was developed by Mallampati. Research refers that this system may help in the prediction and assessment of difficult airways, it is much more effective when used in combination with other tests. Furthermore, this test alone is not sufficient to predict difficult airways[9]. At laryngoscopy, the Cormack-Lehane grading is a significant predictor of difficult intubation. It serves as the gold standard by which all other bedside tests are measured[10].

The aim of this study is to compare the predictive usefulness of Mallampati classification to Cormack and Lehane grading for tracheal intubation and to see how well they correlated during direct laryngoscopy.

——————————————Methods

In the general surgery operating theatre of Baghdad teaching hospital a comparative, cross-sectional study was conducted. The study included 72 adult patients aged 25 to 70 years old.

The study was done from the 1st of January to the 30th of June 2021. Exclusion criteria: Pregnant women, patients with congenital defects, cognitive impairment, patients with any disease that alters architecture of face or neck, patients aged ≤ 25 and ≥ 70 years old and emergency cases.

All patients were asked about their surgical or medical histories, including chronic conditions and previous difficult intubation attempts. Before surgery, the patient's airway was evaluated, including Mallampati measures, which taken in a sitting position with a neutral head position and the tongue maximally protruded from the mouth. Body weight, length, dentation, and the presence or absence of a long beard or mustache are all factors to consider. After that, all of the patients were divided into groups based on their age, gender and operation types. An intravenous cannula was done and full monitoring, including electrocardiography (ECG), pulse oximetry, capnography, noninvasive blood pressure, and end-expiratory inhalational analysis. All equipment were available in the theater which including laryngoscope, C-mack video laryngoscope, fibro optic laryngoscope, gum elastic boogie, stellate, various sizes of endotracheal tubes, suction catheter, Ambu bag, i-gel[4,5] and emergency medications. All procedures done under general anesthesia including ketamine, propofol, esmerone muscle relaxant and inhaled anesthetic (sevofluran, isoflurain) with variable doses according to the patients weight and duration of operation. After that the patient's airway difficulty was classified using Mallampati classification in conjunction with Cormack and Lehane laryngoscopic grading at direct laryngoscopy. All patients recovered well and discharged to the recovery unit.

——————————————Results

In this study, mean age of study patients was 40.7 ± 13.9 years; 81.9% were females; 56.9% were obese; 8.3% had history of difficult intubation; 12.5% had chronic medical diseases; 15.3% had abnormal state of dentation; and beard and mustache were present in 9.7% of them. We noticed that 43.1% of patients underwent thyroid surgery, (Table 1).

Mallampati score succeeded in prediction of 84% of cases of grade 1, 46.2% of cases of grade 2, 28.6% of cases of grade 3, and 66.7% of cases of grade 4 of intubation difficulty, (Table 2).

Cormack-Lehane scale detected 50 case with grade 1 of intubation difficulty; 33 of them were confirmed by Mallampati score. In conclusion, there was a fair agreement between Mallampati and Cormack-Lehane scales, and this agreement was statistically significant (kappa= 0.241, P=0.004), (Table 3).

Table 4 shows the sensitivity, specificity, and accuracy of Mallampati score in prediction of difficult intubation. The sensitivity of Mallampati score was 40%, while the specificity was 100%. Accuracy of Mallampati score was 91.7%.

Table 1: Distribution of study patients by certain characteristics.

Variable	No. (n= 72)	Percentage
Age (Year)		
25 – 30	24	33.3
31 – 49	28	38.9
50 – 70	20	27.8
Gender		
Male	13	18.1
Female	59	81.9
BMI level		
Normal (18.5-24.9)	16	22.2
Overweight (25-29.9)	15	20.8
Obese (30-39.9)	41	56.9
Type of surgery		
Thyroid	31	43.1
Others	41	56.9
History of difficult intubation		
Yes	6	8.3
No	66	91.7
Past Medical history		
Yes	9	12.5
No	63	87.5
State of dentation		
Normal	61	84.7
Abnormal	11	15.3
Beard and mustache		
Present	7	9.7
Not present	65	90.3
Number of intubation attempts		
1	61	84.7
2	5	6.9
3	3	4.2
4	3	4.2

Table 2: Comparison between grades of Mallampati and grades of Cormack-Lehane scale.

Grade	Mallampati Score No. (n= 72)	Cormack-Lehane scale No. (n= 72)	Percentage of successful prediction
1	42	50	84.0
2	26	12	46.2
3	2	7	28.6
4	2	3	66.7

Table 3: Agreement between Mallampati and Cormack-Lehane scales.

Mallampati Score grades	Cormack-Lehane scale grades				Total	Kappa value	P- value
	1	**2**	**3**	**4**			
1	33	6	2	1	42		
2	17	6	3	0	26		
3	0	0	2	0	2	**0.241**	**0.004**
4	0	0	0	2	2		
Total	50	12	7	3	72		

Table 4: Sensitivity, specificity, and accuracy of Mallampati score in predicting intubation difficulty.

Mallampati Score grades	Cormack-Lehane scale grades		Total
	Difficult	Easy	
Difficult	4	0	4
Easy	6	62	68
Total	10	62	72

—————————————**Discussion**

In the current study, the 72 patients who were enrolled, they were all elective surgeries. The parameters used were: Mean age of study patients was 40.7 ± 13.9 years (aged between 25-70 years); 81.9% were females; 56.9% were obese; 8.3% had history of difficult intubation; 12.5% had chronic medical diseases; 15.3% had abnormal state of dentation; and beard and mustache were present in 9.7% of them. Thyroid surgery was performed on 43.1% of the patients. The explanation for the high rate of thyroid surgery in our study is because thyroid surgery was on the top list of majority of the patients admitted to the theater of Baghdad teaching hospital and one of the most common cause of increased morbidity and mortality due to airways. The incidence of difficult intubation was 13.9%. There was a fair agreement between Mallampati and Cormack-Lehane scales, and this agreement was statistically significant (kappa= 0.241, P=0.004) ,{ Cohen's kappa coefficient is a statistic for assessing inter-rater (and intra-rater) reliability for qualitative (categorical) items}, the sensitivity of Mallampati score was 40%, while the specificity was 100% and accuracy of Mallampati score was 91.7%. Mallampati score succeeded in prediction of 84% of cases of grade 1, 46.2% of cases of grade 2, 28.6% of cases of grade 3, and 66.7% of cases of grade 4 of intubation difficulty.

In a study performed in India by Ramapati Sanyal et al[11], which comprised a total of 100 patients, the incidence of difficult intubation was 14%, and in our study was 13.9%. The association between Mallampati classification and Cormack Lehane grade was significant as shown by Chi square test (p<0>) while in our study shown by kappa value 0.241(P value was 0.004) which is significant. The sensitivity was 42.86%, the specificity was 82.56%, the accuracy of the test was 77% in their study while in our study the sensitivity was 40%, specificity was 100% and the accuracy of the test was 91.7%. We are relatively agreed with this study but the difference may be related to the test value and the sample number. That difference could be due to the fact that there are no age extremes among the patients in their study, obesity is satisfactorily ruled out, the majority of surgical cases in their study were laparoscopic cholecystectomy, and they exclude all patients with neck anomalies, denture loss, and a history of problematic intubation.

In comparison with the study of K Murugesan et al[12], a total of 236 participants were included in the final analysis of their study. Adults aged 18 to 65

years old, ASA grades 1 and 2, both male and female, were included in the study. They were all scheduled for elective and emergency surgery under general anesthesia. The study eliminated patients with a visible restriction of mouth opening due to pain, as well as those with recent facial injuries and dental anomalies. The degree of agreement between Mallampatti and Cormack Lehane grading was quite low (P value 0.032, kappa statistics value -0.103), while in our study the agreement between Mallampati and Cormack Lehane was statistically significant (kappa 0.241 and p value 0.004). Our study did not match the result of this study which may be due to we deal with elective well prepared patients, with or without history of chronic medical illness with smaller sample size and abnormal dentition 15.3 % of patients in comparison with this study.

In another study of Hemali Doshi et al[13], a total of 100 patients were enrolled in the study, most of them were females 91 and only 9 were males. All the patients were between 18-85 years of age, with mean age of 39 years. Of the total 100 patients, 43 were classified as Mallampati class I, 50 were class II, and 7 were class III while none was classified as class IV. Of the total population under study 37 patients were classified as having Cormack Lehane grade I, 42 were grade II, 21 as grade III while none was grade IV. The study showed that Mallampati classification is of limited value when used alone and cannot be relied on. Mallampati classification does not correlate grade to grade with Cormack Lehane grading or with attempt of endotracheal intubation. Cormack Lehane classification does correlate with number of attempts of intubation.

Total patients in the current study were 72, 81.9% female, 18.1% male aged between 25-70 years old, with mean age of study patients was 40.7± 13.9 years. In our study Mallampati score succeeded in prediction of 84% of cases of grade 1, 46.2% of cases of grade 2, 28.6% of cases of grade 3 and 66.7% of cases of grade 4 of intubation. Coremack-Lehane scale

detected 50 cases with grade 1 of intubation difficulty, 33 of them confirmed by Mallampati score. It's possible that the discrepancy between the two trials is attributable to the type of surgery used.

In conclusion, there was a fair agreement between Mallampati and Cormack-Lehane scales, and this agreement was statistically significant (kappa= 0.241, P=0.004). The sensitivity of Mallampati score was 40%, while the specificity was 100%. Accuracy of Mallampati score was 91.7%. That is why preoperative assessment is valuable in decreasing the risk of difficult intubation with preferable airway management.

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