


Original Research Article

# Correlative study between modified mallampati score with Cormack Lehane and POGO scoring

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## Abstract

**Background:** Assessing the difficulty level of the airway for intubation is extremely important in anaesthetic practice to avoid delays in intubation and resulting adverse consequences. Multiple grading systems are used by anaesthesiologists across the globe to aid in classifying the airways, but the number of studies assessing the level of agreement between various methods is scarce. Hence, the current study was conducted with an objective of assessing the level of agreement of Modified Mallampatti score (MMS) with Cormack –Lehane scoring and POGO Scoring.

**Materials and methods:** The study was a cross sectional study, conducted in the Department of Anesthesiology, Government Mohan Kumaramangalam Medical College and Hospital, Salem, Tamil Nadu on adults aged between 18 to 65 years, belonging to ASA grade 1 and 2, scheduled for elective and emergency surgery under general anaesthesia. Patients with apparent restriction of mouth opening due to pain, with fresh facial injuries and dental abnormalities were excluded from the study. The airway of each subject was assessed by the trained anesthetist, in charge of the procedure. The agreement between the different methods of grading was assessed by kappa Statistic along with its standard error and P value. P value < 0.05 was considered as statistically significant.

**Results:** A total of 236 subjects were included in the study. Among the study population, 74 (31.36%) had mallampatti grade I. The number of mallampatti grade II, III, and IV was 140 (59.32%), 21 (8.90%) and 1 (0.42%) respectively. Among the study population, 143 (60.59%) had Cormack Lehane grade I. The number of Cormack Lehane grade II, and III was 84 (35.59%), and 9 (3.81%) respectively. Among the study population, 170 (72.03%) had POGO grade 1. The number of POGO grade 2, 3 and 4 was 42 (17.80%), 15 (6.36%), and 9 (3.81%) respectively. The measure of agreement was very poor between Mallampatti grading with Cormack Lehane grading. (kappa statistics value -

0.103, P value 0.032). The measure of agreement was also very poor between Mallampatti grading and POGO grade. (kappa statistics value was 0.105, P value 0.004). The measure of agreement was fair between Cormack Lehane grading and Mallampatti grading. (kappa statistics value was 0.327, P value <0.001).

**Conclusions:** When compared to POGO score, Cormack Lehane grading had shown a better level of agreement with Mallampatti grading. But the level of agreement between any of the two methods was too low to rely on them interchangeably in clinical practice.

## Key words

Modified Mallampati scoring, Cormack –Lehane scoring, POGO Scoring, Level of agreement.

## Introduction

Achieving successful intubation and proper management of airway is extremely vital in anaesthetic practice as a failure in doing so can lead to serious adverse consequences including brain death or death. As per some reports, more than half to one-third of cardiac arrests while performing general anaesthesia are attributed to difficult intubation and resulting inadequate oxygenation and/or ventilation [1]. About 1.5 to 13% of the intubations during general anaesthesia are reported to be associated with poor glottis visualization and resulting difficult laryngoscopy and difficult intubation [2]. Hence appropriate airway assessment preoperatively to identify people at risk of difficult intubation is extremely important. Even though there are multiple methods available to assess the airway difficulty level, the search for the ideal and universally acceptable classification system is still ongoing. Because of this anaesthetists across the settings and sometimes in the same setting often use multiple methods.

Recent systematic review by Vannucci A, et al. [3] have highlighted the routine use of various assessment methods in clinical practice across the globe. The most widely used system is the Mallampati Score [4], and its modified version the Modified Mallampatti Score (MMS) [5], which has been one of the most popular methods widely used in anesthetic practice across the globe. There are other anatomical landmarks based grading systems like thyromental distance inter-incisors gap, are also in clinical practice to a different extent. Cormack –Lehane scoring

system [6] and Percentage of Glottis Opening (POGO) [7] Scoring are the other two popular scoring systems.

Many latest reviews have highlighted the fact that these multiple systems are used interchangeably in the practice without an in-depth understanding of the discriminative capacity, sensitivity, and specificity of these tests in predicting difficult airways. There is insufficient evidence on a level agreement between various methods to make strong and evidence based clinical practice recommendations on the choice of the correct set of the method in different scenarios. The scarcity of the studies is even more conspicuous on the Indian population.

## Objectives

- To ascertain whether Modified Mallampati scoring correlates better with Cormack –Lehane or POGO Scoring.

## Materials and methods

The study was a cross sectional study, conducted in the Department of Anesthesiology, Government Mohan Kumaramangalam Medical College and Hospital, Salem, Tamil Nadu.

The study population included selected sample patients, who were scheduled for elective and emergency surgery under general anaesthesia. The data collection for the study was conducted between November 2016 to March 2017

**Inclusion criteria**

- Adults aged between 18 years to 60 years
- Both males and females
- ASA grade I and II

**Exclusion criteria:**

- Patients with apparent restriction of mouth opening due to pain
- With fresh facial injuries
- Dental abnormalities (edentulous patients)
- Poor general condition as in comatose patients
- Patients with apparent restriction of neck movements

A total of 236 subjects were included in the study. All the study subjects were included by convenient sampling till the sample size was reached.

The study was approved by Institutional Human Ethics committee and informed written consent was obtained from all the study participants, after obtaining the risks and benefits involved. The confidentiality of the study participants was maintained throughout the study.

After screening for inclusion and exclusion criteria and obtaining the informed consent, the airway of each subject was assessed by the trained anaesthetist, in charge of the procedure. The airway of each participant was graded by the three grading systems.

- Modified Mallampati Score [5]
- Cormack-Lehane grading [6] and
- POGO scale [7]

Statistical analysis was performed by IBM SPSS statistical software version 23. Descriptive analysis was carried out by frequency and proportion for all categorical variables. No quantitative variables were analyzed. The comparison between the grading of airways by different systems has been assessed by cross tabulation and comparison of proportions.

Wherever feasible chi square test/ Fisher's exact test was performed to test the statistical significance. The agreement between the different methods of grading was assessed by kappa Statistic along with its standard error and P value. P value < 0.05 was considered as statistically significant.

**Results**

A total of 236 subjects were included in the final analysis.

Among the study population, 74 (31.36%) had Mallampatti grade I. The number of Mallampatti grade II, III, and IV was 140 (59.32%), 21 (8.90%) and 1 (0.42%) respectively. Among the study population, 143 (60.59%) had Cormack Lehane grade I. The number of Cormack Lehane grade II, and III was 84 (35.59%), and 9 (3.81%) respectively. Among the study population, 170 (72.03%) had POGO grade 1. The number of POGO grade 2, 3 and 4 was 42 (17.80%), 15 (6.36%), and 9 (3.81%) respectively (**Table - 1**).

**Table - 1:** Descriptive analysis of Mallampatti grading in the study group (N=236).

Mallampatti Grading	Frequency	Percentages
I	74	31.36%
II	140	59.32%
III	21	8.90%
IV	1	0.42%
<b>Cormack Lehane grading</b>		
I	143	60.59%
II	84	35.59%
III	9	3.81%
<b>POGO grade</b>		
1	170	72.03%
2	42	17.80%
3	15	6.36%
4	9	3.81%

Out of 74 people with Mallampatti grade I, 43 (58.10%) had Cormack Lehane grade I, 30 (40.54%) Cormack Lehane grade II and 1 (1.351%) had Cormack Lehane grade III. Out of 140 people with Mallampatti grade II, 98 (70%)

had Cormack Lehane grade I, 36 (25.71%) had Cormack Lehane grade II and 6 (4.285%) had Cormack Lehane grade III. Out of 21 people with mallampatti grade III, 2 (9.52%) had Cormack Lehane grade I, 17 (80.95%) had Cormack Lehane grade II and 2 (9.52%) had Cormack Lehane grade III. Out of 1 people with Mallampatti grade IV, 1 (100%) had Cormack Lehane grade II (**Table – 2**).

Out of 74 people with mallampatti grade I, 61 (82.43%) people had POGO grade 1, 8 (10.81%) people had POGO grade 2, 4 (5.41%) people had POGO grade 3 and 1 (1.35%) people had POGO grade 4. Out of 140 people with mallampatti grade II, 104 (74.28%) people had POGO grade 1, 28 (20%) people had POGO grade 2, 4 (2.86%) people had POGO grade 3 and 4 (2.86%) people had POGO grade 4. Out of 21 people with mallampatti grade III, 5 (23.80%)

people had POGO grade 1, 5 (23.80%) people had POGO grade 2, 7 (33.33%) people had POGO grade 3 and 4 (19.04%) people had POGO grade 4. Out of 1 people with mallampatti grade IV, 1 (100%) people had POGO grade 2. Out of 143 people with Cormack Lehane grade I, 128 (89.51%) people had POGO grade 1, 13 (9.090%) people had POGO grade 2, and 2 (1.398%) people had POGO grade 4. Out of 84 people with Cormack Lehane grade II, 41 (48.80%) people had POGO grade 1, 27 (32.14%) people had POGO grade 2, 13 (15.47%) people had POGO grade 3 and 3 (3.57%) people had POGO grade 4. Out of 9 people with Cormack Lehane grade III, 1 (11.11%) people had POGO grade 12 (22.22%) people had POGO grade 2, 2 (22.22%) people had POGO grade 3 and 4 (44.44%) people had POGO grade 4 (**Table – 3**).

**Table - 2:** Association of Cormack Lehane grading with Mallampatti grading of the study population (N=236).

MALLAMPATTI GRADING	CORMACKLEHANE GRADING		
	I	II	III
I (N=74)	43 (58.10%)	30 (40.54%)	1 (1.351%)
II (N=140)	98 (70%)	36 (25.71%)	6 (4.285%)
III (N=21)	2 (9.52%)	17 (80.95%)	2 (9.52%)
IV (N=1)	0 (0%)	1 (100%)	0 (0%)

\*No statistical test was applied- due to 0 subjects in the cells.

**Table - 3:** Association of POGO grade with mallampatti grading and Cormack Lehane grading of the study population (N=236).

MALLAMPATTI GRADING	POGO grade			
	1	2	3	4
I (N=74)	61 (82.43%)	8 (10.81%)	4 (5.41%)	1 (1.35%)
II (N=140)	104 (74.28%)	28 (20%)	4 (2.86%)	4 (2.86%)
III (N=21)	5 (23.80%)	5 (23.80%)	7 (33.33%)	4 (19.04%)
IV (N=1)	0 (0%)	1 (100%)	0 (0%)	0 (0%)
CORMACKLEHANE GRADING				
I (N=143)	128 (89.51%)	13 (9.09%)	0 (0%)	2 (1.39%)
II (N=84)	41 (48.80%)	27 (32.14%)	13 (15.47%)	3 (3.57%)
III (N=9)	1 (11.11%)	2 (22.22%)	2 (22.22%)	4 (44.44%)

The measures of agreement as assessed by kappa statistics were very poor between mallampatti grading with Cormack Lehane grading. (kappa

statistics value was -0.103, P value 0.032). The measures of agreement as assessed by kappa statistics were none to slight between

mallampatti grading with POGO grade. (kappa statistics value was 0.105, P value 0.004). The measures of agreement as assessed by kappa statistics were fair between Cormack Lehane

grading with mallampatti grading. (kappa statistics value was 0.327, P value <0.001) as per **Table - 4.**

**Table - 4:** Measurement of agreement between various methods of assessment of difficult airway.

Measure of Agreement	Kappa statistics	Std. Error	P value
Mallampatti grading with Cormack lehane grading	-0.103	0.049	0.032
Mallampatti grading with POGO grade	0.105	0.038	0.004
Cormack lehane grading with mallampatti grading	0.327	0.049	<0.001

### Discussion

There are still no standard clinical practice recommendations on the most appropriate method to assess the difficult airway in patients undergoing general anaesthesia. Considering the fact that in every setting, multiple systems are in routine use, understanding the levels of agreement between various methods is vital importance to achieve reliability in clinical decisions. Even though there are many studies, like original study of POGO score by Levitan R. M., et al. [7] and study by Koh L. K., et al. [8] done on Asian population, have proved good interphysician and intraphysician reliability with individual methods, the studies assessing the level of agreement across the methods are limited.

In the current study majority of the study population were classified as either grade I or II by all the evaluation systems and the proportion of subjects with grade III and IV Mallampati grade was 8.90% and 0.42% respectively. About 3.89% were labeled as Cormack Lehane grade III and the proportion of subjects with POGO grade 3 and 4 was 6.36% and 3.81% respectively. The proportion of subjects with possible difficult airway as graded by various systems is comparable with the reported proportion of difficult airway in various previous studies, which is about 1.5 to 13% of the intubations during general anaesthesia [2].

The cross tabulation had shown poor levels of agreement across the methods, as a high proportion of subjects classified as a difficult

airway by one method, were classified as lesser grades of airway difficulty by other methods in the current study. The measures of agreement as assessed by kappa statistics were very poor between Mallampati grading with Cormack Lehane grading. (kappa statistics value was - 0.103, P value 0.032). The measures of agreement as assessed by kappa statistics were none to slight between Mallampati grading with POGO grade. (kappa statistics value was 0.105, P value 0.004). The measures of agreement as assessed by kappa statistics were fair between Cormack Lehane grading with Mallampati grading. (kappa statistics value was 0.327, P value <0.001). So, it can be inferred from the current study, the level agreement between Cormack Lehane grading and Mallampati grading is relatively higher compared to an agreement with POGO score and other two methods. But the overall measure of agreement is very poor across the three systems. Ochroch E. A., et al. [9] who assessed the intra- and inter-rater reliability of Cormack-Lehane grading system and percentage of glottic opening (POGO) scale have reported a high intra-physician and inter physician reliability for the POGO score with a kappa statistic of 0.88 and 0.73 respectively. But the Cormack-Lehane grading system, even though had demonstrated excellent intra-physician agreement with a kappa statistic of 0.83, had poor inter-physician reliability with a kappa statistic of 0.16. But this study did not compare the level agreement between the methods, as in the current study. O'Shea J. K., et al. [10] have also reported similar findings, where C-Lgrading showed



variable interrater reliability (kappa range = 0.37-0.90) and poor inter-rater reliability (Cohen's multirater kappa = 0.22). But the POGO score had good to excellent interrater reliability (one-way random-effects ICC range = 0.57-0.87) and fair to good inter-rater reliability (two-way random-effects ICC = 0.59, 95% Confidence interval: 0.48-0.7)

Not many studies in the literature have compared the level of agreement across the methods as in the present study. But studies by various researchers across the globe, which have compared the level of various other grading methods, have documented a moderate level to poor levels of agreement between various methods [11-13]. Recent systematic review by Vannucci A, et al. [3] of 24 studies on 20,582 patients, have concluded that the "current bedside tests have limited and inconsistent capacity to discriminate between patients with difficult and easy airways. Most studies are characterized by high risk of bias and concerns of applicability. Reliable bedside criteria to predict difficult intubation remain elusive" [3].

## Conclusions

Among the study population, as per Mallampati grade, the majority of the subjects were either grade I (31.36%) or II (59.32%). The proportion of subjects graded as II and IV was 8.90% and 0.42% respectively. The Cormack Lehane grade graded 60.59% of subjects as grade I, 35.59% as grade II and 3.81% as grade III. The proportion of subjects with POGO grade 2, 3 and 4 was 17.80%, 16.36%, and 3.81% respectively. The measure of agreement was very poor between Mallampatti grading with Cormack Lehane grading. (kappa statistics value -0.103, P value 0.032). The measure of agreement was also very poor between Mallampatti grading and POGO grade. (kappa statistics value was 0.105, P value 0.004). The measure of agreement was fair between Cormack Lehane grading and Mallampatti grading. (kappa statistics value was 0.327, P value <0.001).

## Recommendations

There is a strong need for large-scale studies in different settings to document the level of agreement between various methods of airway assessment to enhance the strength of evidence available on the subject.

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