



“A COMPARATIVE STUDY OF MODIFIED MALLAMPATTI TEST IN SITTING AND SUPINE POSITION FOR PREDICTION OF DIFFICULT INTUBATION IN ADULTS”

Dr. Lokesh Wasnik	Senior Resident, Dept. of Anesthesia, Chhindwara Institute of Medical Sciences Chhindwara MP.
Dr. Ashwini Patel	Assistant Prof, Dept. of Anesthesia, Chhindwara Institute of Medical Sciences Chhindwara MP.
Dr. Rajkumar Ahirwal	Associate Prof, Dept. of Anesthesia, Gandhi Medical College Bhopal MP.
Dr. Shikha Mehrotra	Prof and Head, Dept. of Anesthesia Gandhi Medical College Bhopal MP.
Dr. Ninjab Rao Evane*	Ex Senior Resident, Dept. of Anesthesia Gandhi Medical College Bhopal MP. *Corresponding Author

ABSTRACT

Background: The Mallampati classification (MLPT) is normally evaluated in the sitting position. However, many patients cannot be evaluated in the sitting position for medical reasons. The Modified Mallampati grading (MMPG) in the sitting position is a common test performed preoperatively to predict difficult intubation. It has been suggested that supine MMPG is possibly a better predictor of difficult tracheal intubation (DTI) rather than the sitting MMPG in normal individuals.

Objectives: 1) To compare airway assessment in sitting and supine positions with MMT and their correlation to Cormack and Lehane laryngoscopy grade (CL grade). 2) The applicability of MMT in supine position for prediction of difficult airway.

Material & Methods: This study was conducted in 200 patients age 18-65 years undergoing for surgery were examined in both supine and upright position for assessment of Modified Mallampati class. The airway class was assessed according to Samson and Young modification of Mallampati's classification in 2 different positions, with the patient's head in neutral, mouth fully open, tongue maximally protruded, and without phonation. First the observation was made in sitting position and the examiner eye to eye contact with the patient. The airway assessment was again repeated after laying the patient supine and the examiner looking vertically downward. The CL grade was also calculated and its ability to predict DTI was tested.

Results: In our study we had taken the sample size of 200 patients. Majority of our patients were male 116 (58%), and 84 (42%) were female. 18 (9%) out of a total of 200 patients had difficult tracheal intubation. MMT assessed in both sitting and supine positions almost equally predicts difficult intubation which is statistically insignificant ($p > 0.05$).

Conclusion: MMT in supine position and grade I & II, 12 patients had difficult intubation (CL grade III & IV) and out of them 2 patients required more than one attempt for intubation. For MMT in supine position with grade III & IV, 6 patients had difficult intubation (CL grade III & IV) and out of them 3 patient, required more than one attempt for intubation.

KEYWORDS : Mallampatti grading, Cormack and Lehane laryngoscopy grade, MMT, DTI

INTRODUCTION:

Anaesthesia is a unique speciality. The importance of the airway is emphasized and every anaesthesiologist has felt the cold panic when he or she first realizes that usual anatomic structures cannot be visualized. In such situations a more scientific approach to airway evaluation and management becomes necessary^[1]. Modified Mallampati test in sitting position is most commonly used and is a standard method of assessing the airway and for predicting potentially difficult intubation. Although applicable to the majority of patients, airway evaluation in sitting position may not be always advisable or convenient. Elderly patients or very sick patients or patients with fracture spine and cervical spine injury and prolapsed disc patients may not be able to sit up for any assessment^[2]. The feasibility of Mallampati assessment in sitting position in patients requiring emergency endotracheal intubation has also been questioned due to difficulty in getting patients cooperation and their critical illness^[3]. A modification of the Mallampati test, to allow it to be done in supine position, has been suggested as an alternative approach. Not only for the patient, airway evaluation in supine position on the operating table, it will be more convenient even for the examiner also^[2]. Literature on assessment of airway in supine position is limited and has not shown consistent results regarding Mallampati score in sitting and supine positions. The difficulties in endotracheal intubation can be significant factor in morbidity and mortality in clinical practice.^[2] Therefore this study was designed and conducted to compare airway assessment with MMT in sitting and supine positions and their correlation to Cormack and Lehane grade and also studied the applicability of MMT in supine position for prediction of difficult airway.

MATERIAL AND METHODS:

The study was conducted in department of Anesthesiology GMC

Bhopal and associated Hospitals after ethics committee approval. Total 200 patients, aged 18-65 years undergoing general anesthesia for surgery were examined in both supine and upright position for assessment of Modified Mallampati class. Patients with upper airway pathology that could alter the Mallampati class, cervical spine fracture, prolapsed disc, diabetes or pregnancy were excluded. Classification of oropharyngeal view was done according to MMT, Where in the patients were made to be in sitting position and then supine position with mouth fully opened and tongue maximally protruded, and patients were asked not to phonate.

Class 0: The ability to visualize any part of the epiglottis on mouth opening.

Class I - Soft palate, fauces, uvula, and pillars are seen

Class II - Soft palate, fauces, and uvula are seen

Class III - Soft palate and base of uvula

Class IV - Soft palate not visible

The airway class was assessed according to Samson and Young modification of Mallampati classification in 2 different positions, with the patient's head in neutral, mouth fully open, tongue maximally protruded, and without phonation. First the observation was made in sitting position and the examiner eye to eye contact with the patient. The airway assessment was again repeated after laying the patient supine and the examiner looking vertically downward. After induction of general anaesthesia and administration of muscle relaxant, laryngoscopy was done using Macintosh blade-3. Laryngoscopy grade was assessed by the C-L grading scale. The pre operative airway assessment data and the findings during intubation were used to determine the sensitivity, specificity, positive and negative predictive values for each test. Data were entered in Microsoft excel sheet 2007

and analyzed by using a software SPSS version 17. The difference in proportion was analyzed by using chi square test.

OBSERVATION AND RESULTS:

In our study we had taken the sample size of 200 patients. Majority of our patients were male 116(58%), and rest were female 84(42%). The mean age of our patients was 40 ± 5.48 years, mean height was 162.78 ± 6.020 centimeter (Males: 164.59 ± 5.75 cm, Females: 162.63 ± 6.39 cm), Mean Weight 61.31 ± 8.84 kg (Males: 63.27 ± 8.74 kg, Females: 57.24 ± 8.29 kg), Mean BMI 23.20 ± 3.36 kgm^{-2} . Mean Neck Circumference 34.06 ± 3.96 cm (Male 37.99 ± 2.25 and female 30.06 ± 2.10 cm). Mallampati grade III and IV were observed in 68(34%) patients in sitting position and in 89(44.5%) patients in supine positions. Sensitivity for MMT sitting position was 77.7% and for MMT supine position was 77.7%. Specificity for MMT sitting position was 69.78% and for MMT supine position was 58.79%. PPV for MMT sitting position was 20.58% and for MMT supine position was 15.73%. NPV for MMT sitting position was 96.94% and for MMT supine position was 96.39%. Difficult intubation was observed in 18 patients in out of total 200 patients. In 18 patients, with MMT of I & II in sitting position, 14 patients had difficult intubation (Cormack Lehane grade III & IV) and out of them 1 patient required more than one attempt for intubation. For MMT grade III & IV in sitting position, 4 patients had difficult intubation (Cormack Lehane grade III & IV) and out of them 2 patients required more than one attempt for intubation. MMT in supine position and grade I & II, 12 patients had difficult intubation (Cormack Lehane grade III & IV) and out of them 2 patients required more than one attempt for intubation. For MMT in supine position with grade III & IV, 6 patients had difficult intubation (Cormack Lehane grade III & IV) and out of them 3 patient, required more than one attempt for intubation.

Table 1: Modified Mallampati Test view

	MMT CLASS	No. of Cases	Percentage
MMT (Sitting)	I, II	132	66%
	III, IV	68	34%
MMT (Supine)	I, II	111	55.5%
	III, IV	89	44.5%

Table 2: Cormack Lehane (CL) grade of laryngoscopy view

	MMT Class	No. of Cases	CL grade (I, II)	CL Grade (III, IV)	p-value
MMT (Sitting)	I, II	132	118	14	0.54
	III, IV	68	64	4	
MMT(Supine)	I, II	111	99	12	0.60
	III, IV	89	83	6	

Table 3: Comparison of MMT between sitting and supine positions

Parameter Value	MMT (sitting)	MMT (supine)
True positive (TP)	14	14
False positive (FP)	55	75
True negative (TN)	127	107
False negative (FN)	4	4
Sensitivity	77.7%	77.7%
Specificity	69.78%	58.79%
Positive predictive value (PPV)	20.58%	15.73%
Negative predictive value (NPV)	96.94%	96.39%
Accuracy	70.5%	60.5%

Table 4: Difficult intubation verses attempts taken for intubation

MMT	MMT Class	No. of Cases	CL Grade (III, IV)	Pt's required >1 attempts
MMT (Sitting)	I, II	132	14	1
	III, IV	68	4	2
MMT (Supine)	I, II	111	12	2
	III, IV	89	6	3

DISCUSSION:

Airway management remains one of the most important responsibilities of an anaesthesiologist. An anaesthesiologist has to maintain a patient's airway patency in an emergency situation and as well as in elective surgical situation. A patent airway means maintaining the ability of the patient's lungs to provide oxygen to the tissues thereby preventing hypoxia and hypoxia related undesirable effects. Failure to maintain a patent airway has been recognized as a

very serious patient safety concern. Direct laryngoscopy is the gold standard for tracheal intubation. There is no single definition of difficult intubation. The difficult glottic view during direct laryngoscopy is the most common cause of difficult intubation. Difficult intubation can be estimated in terms of Cormack Lehane (CL) grade or percentage of glottic opening (POGO) or intubation difficulty scoring (IDS). According to Cook et al^[4], the incidence of difficult intubation is 75% in difficult laryngoscopy and 3% in easy laryngoscopy.

We conducted this study to compare modified Mallampati test in sitting and supine positions for prediction of difficult intubation in patients undergoing surgery requiring general anaesthesia and endotracheal intubation. We performed airway assessment using MMT in sitting and supine position and compared with C-L laryngoscopy grade during laryngoscopy. We found that the change in posture from sitting to supine position significantly worsened the Mallampati grade in 42(21%) patients, Zahid Hussain Khan et. al^[5] also found that Mallampati class was high in the supine position. There were no failed intubations in our study. No patients with difficult mask ventilation were reported during our study. In our study we observed a statistical significance in patients having easy intubation /laryngoscopy compared with patients having difficult intubation/ laryngoscopy with respect to clinical parameters. This is in concurrence with the study conducted by Moon H Y et. al^[6], Rose & Cohen et. al^[7], and Ezri et. al^[8] who reported that the difficult laryngoscopy and intubation increases with age due to bone and joint changes and due to poor dental condition. We did not find statistical significance between male and female gender vs difficult intubation in our study. Of the 18 patients with difficult intubation, 16 patients were intubated in the first laryngoscopic attempt. These 16 patients were successfully intubated with an optimal external laryngeal manipulation^[9], which improved the view of glottis. The remaining of two patients required one or two laryngoscopic attempts respectively, where in there was no improvement of glottic view on optimal external laryngeal manipulation^[9]. Gum elastic bougie used for facilitating intubation in Cormack Lehane grade III and IV and were subsequently intubated without any significant events or difficulty. No significant airway trauma and episodes of desaturation were noted during study. None of the patient had difficulty with bag and mask ventilation. Our finding is consistent with many other studies. Amadasun et. al^[10] reported improved Mallampati score on assumption of the supine position from sitting. Despite positional variation in Mallampati grade, we also found that the airway assessment using MMT in supine position almost equally predicted difficult intubation when compared to sitting position. The significant correlation of modified Mallampati class in supine position with laryngoscopy grade Cormack and lehane was also found by Kim et al^[11]. They suggested that assessment of Mallampati classification in supine position can be used as the predicting factors for difficult intubation. The incidence of 'Difficult visualization of Larynx' (CL grades 3 and 4) in this study is 9% (18 cases out of 200 cases) which is comparable to the results obtained by Frerk^[12] and Savva^[13]. The incidence of 'Difficult laryngoscopy' or 'Difficult intubation' ranges from 1.5% to 13% in various studies^[14,15,16]. The reasons for the variable incidence of 'Difficult laryngoscopy' are differences in anthropometry among populations, differences in anesthesia protocols, differences in choice of muscle relaxants for intubation, variability in use of ELM (external laryngeal pressure), and choice of laryngoscope blade^[15,16]. In our study we found that the accuracy of MMT was more in sitting than in supine position (62% vs. 60.5%). Mallampati test is known to have poor to good accuracy for predicting difficult airway by Lee et al^[17]. In our study the sensitivity, specificity, positive predictive value and negative predictive value of MMT grade were found to be 77.7%, 70.32%, 20.58% and 96.96% respectively in sitting position where in supine position these were 77.7%, 58.79%, 15.75% and 96.39% respectively. These were comparable and showed better prediction than to El - Ganzouri et. al^[18], Oates et al^[19], and Shiga et. al^[20] studies.

Preoperative airway evaluation primarily aims at detecting as many patients with difficult airways as possible. This is necessary for minimizing the risk of unanticipated difficult or failed intubations. Difficult intubation can be better predicted by the sensitivity of a test. Our study showed similar sensitivity in both the sitting and supine position with MMT. Further, the predictive values for difficult intubation in both the positions were comparable. These findings show that the evaluation of an airway in supine position with MMT is an

equally good alternative to MMT in sitting position for predicting difficult airway^[2].

CONCLUSION:

We found that the accuracy of Modified Mallampati grade was more in sitting (62%) than in supine position (60.5%). However, airway evaluation in both the positions almost equally predicts for difficult intubation. Airway assessment using MMT in supine position can be routinely applied in bedridden patients and in patients requiring emergency intubation.

REFERENCES:

- 1) Srinivasa S*, Vrinda Oza, Vasantha Kumar, Vandana Parmar and V.A. Chhaya. Assessment of difficult airway predictors for predicting difficult laryngoscopy and intubation Journal DOI:10.7439/ijbar:2014
- 2) Khatiwada, Sindhu & Bhattarai, Balkrishna & Pokharel, Krishna & Acharya, R & Ghimire, Ashish & Baral, Dharanidhar. (2012). Comparison of Modified Mallampati test between sitting and supine positions for prediction of difficult intubation. Health Renaissance, January-April 2012; Vol 10 (No. 1);12-15. 10. 10.3126/hren.v10i1.6000.
- 3) Bair AE, Caravelli R, Tyler K, Laurin EG. Feasibility of the Preoperative Mallampati Airway Assessment in Emergency Department patients. J Emerg Med. 2010; 38: 677-80.
- 4) Cook TM. A new practical classification of laryngeal view. Anaesthesia. 2000 Mar;55(3):274-9.
- 5) Zahid Hussain Khan, Shahram Eskandari, Mir Saeed Yekaninejad J Anaesthesiol Clin Pharmacol. 2015 Apr-Jun; 31(2): 207-211. doi: 10.4103/0970-9185.155150
- 6) Moon H.Y, Baek C.W, Kim J.S, Koo J.H, Kim j.Y, Woo Y.C, Jung Y.H, Kang H, Shin H.Y, and Yang S.Y. The causes of difficult tracheal intubation and preoperative assessments in different age groups; Korean J Anesthesiol 2013 - April 164 (4): 308-314.
- 7) Rose DK, Cohen MM. The airway: Problems and predictions in 18,500 pat ients. Canadian Journal of Anaesthesia 1994;41: 372-383.
- 8) Ezri T, MD, Warters R. D, MD, Szmuk P, MD, Saad-Eddin H, MD, Geva D, MD, Katz J, MD, and Hagberg C, MD. The incidence of class "Zero" Airway and Impact of Mallampati score, Age, Sex and Body Mass Index on Predict ion of laryngoscopy Grade. Anesth Analg 2001; 93: 1073 -1075.
- 9) Benumof J.L., M.D, Cooper S. D, M.D. Quantitative improvement in laryngoscopic view by optimal external laryngeal manipulation. Journal of Clinical Anaesthesia 1996; Volume 8, Issue 2, Pages 136-140.
- 10) Amadasun FE, Adudu OP, Sadiq A. Effects of position and phonation on oropharyngeal view and correlation with laryngoscopy view. Niger J Clin Pract. 2010; 13(4): 417-20.
- 11) Kim DS, Kim KH. Assessment of the Modified Mallampati Classification on Supine Position. Korean J Anesthesiol 2000; 38(5): 789-94
- 12) H J Eberhart, Leopold & Arndt, Christian & Cierpka, Thomas & Schwaneckamp, Judith & Wulf, Hinnerk & Putzke, Caroline. (2005). The Reliability and Validity of the Upper Lip Bite Test Compared with the Mallampati Classification to Predict Difficult Laryngoscopy: An External Prospective Evaluation. Anesthesia and analgesia. 101. 284-9, table of contents. 10.11213/01.ANE.0000154535.33429.36.
- 13) Chareter P, Perera S, Horton WA. Visibility of pharyngeal structures as a predictor of difficult intubation. Anaesthesia 1987;42:1115.
- 14) S G, S P, Sc D. Comparison of two methods for predicting difficult intubation in obstetric patients. Middle East J Anaesthesiol. 2003 Jun;17(2):275-85.
- 15) Bilgin H, Ozyurt O. Screening tests for predicting difficult intubation. A clinical assessment in Turkish patients. Anaesth Intensive Care. 1998;26(4):382.
- 16) Yildiz TS, Korkmaz F, Solak M, Toker K, Erciyes N, Bayrak F, et al. Prediction of difficult tracheal intubation in Turkish patients: a multi-center methodological study. Eur J Anaesthesiol. 2007;24(12):1034-40.
- 17) Lee A, Fan LT, Gin T, Karmakar MK, Ngan kee WE. A systematic review (meta-analysis) of the accuracy of the Mallampati tests to predict the difficult airway. Anesth Analg 2006; 102: 1867-78
- 18) El-Ganzouri AR, MD, McCarthy R.J, Phar.D., Tuman K.J, MD, Tanck E.N, MD, Ivankovich A.D, MD. Preoperative Airway Assessment: Predictive Value of a Multivariate Risk Index Anesth Analg 1996; 82: 1197-204.
- 19) Oates JDL, McLeod AD, Oates PD. Comparison of Two Methods for Predicting Difficult Intubation. Br J Anaesth 1990; 65:400-14.
- 20) Shiga T, M.D., Ph.D., Wajima Z, M.D., Ph.D., Inoue T, M.D., Ph.D., Sakamoto A, M.D., Ph.D. Predicting Difficult Intubation in Apparently Normal Patients: A Meta-analysis of Bedside Screening Test Performance Anesthesiology 2005;103:429-37.