Original Article

ASSESSMENT OF TRACHEAL INTUBATION GRADING

Mir Mahmud Hossain[1], Moniul Hossain[2], AKM Akhtaruzzaman[2], Kazi Mesbahuddin Iqbal[3]

SUMMARY

In this prospective study, one hundred adult patients, fifty in each group were assessed before operation, using the modified mallampati test in Group-A and mallampati & measurement of Thyromental Distance (TMD) in Group-B. The groups were matched for age (P=0.539), Sex (P=0.688), weight (P=0.077), and ASA physical status (P=0.436). Total number of patients facing difficulties during intubation are significantly higher in the Group-A (18 in Group-A and 10 in Group-B) (p =0.001). The measured sensitivity and specificity in Group-A are 65% and 25% respectively. On the other hand, the sensitivity, specificity in Group-B are 75% & 60%. So, the combination of Thyromental Distance and Mallampati test may be done as screening test during preoperative visit which may present fatal consequences of difficult and or failed intubation.

INTRODUCTION

Tracheal intubation is an important maneuver in anaesthesia and in many emergency situations. Every year a good number of patients die as a result of failed tracheal intubation. Poor management of difficult and failed intubation is a significant cause of these anaesthetic morbidity and mortality. The reported incidence of difficult intubation is one in every 65 patients. The incidence of failed intubation is approximately 1 in 2000 in general surgical patient but 1 in 300 in obstetric patients[1]. The Confidential Enquiries into Maternal Deaths indicates that on an average, three healthy pregnant women die each year solely as a result of difficult and /or failed intubation. The Confidential Enquiry into Peri-Operative Deaths (CEPOD) published in 1986 revealed that out of 4034 deaths reported, six were related with difficult or failed intubation. Worldwide, up to 600 people are thought to die each year from difficult and / or failed intubation[1]. But, if prediction can be made at preoperative visit, it will allow the

anaesthesiologists to get prepared for this situation which may save many lives. Knowledge of detailed anatomy and development of techniques of intubation are necessary for anticipation of difficult intubation. The best way to predict difficult intubation is direct laryngoscopic examination and grading[2]. But it is not possible to practice in pre-anaesthetic check up room or during bedside examination. The available pre-operative tests which may be used to predict difficult intubation are-Mallampati, Wilson risk score, horizontal length of mandible, mandibulo-hyoid distance, sterno-mental distance[3,4,5]. All are useful to some extent, which have been shown in various studies to have high false-positive value, which detracts from their usefulness. Thyromental Distance (TMD) and other's are useful but the sensitivity, specificity and positive predictive values of these tests are still being studied. Research is still going on to find out bedside simple test to anticipate difficult tracheal intubation. A widely advocated test devised by Mallampati and his colleagues fail to predict all the difficult cases[4,5]. Thyromental Distance, - a method to predict difficult intubation, measures the distance between upper edge of thyroid cartilage to chin with fully extended head. The Thyromental Distance of less than 6.5cm results in less space for the tongue, which is difficult to compressed by the laryngoscope blade for pharyngeal view. Thyromental Distance is relatively unreliable test unless combined with other test[4,5]. So the present study was proposed to assess and compare the specificity and sensitivity of Mallampati test with combined Mallampati test and Thyromental distance to assess the degree of difficulty during tracheal intubation.

PATIENTS & METHODS:

One hundred patients of both sexes requiring assessment for endotracheal intubation before elective surgery of different specialties were

1. Department of Anaesthesia, Analgesia and Intensive Care Medicine, Bangabandhu Sheikh Mujib Medical University
2. Assistant Professor, Department of Analgesia and Intensive Care Medicine, Bangabandhu Sheikh Mujib Medical University, Dhaka
3. Chairman, Department of Anaesthesia, Analgesia and Intensive Care Medicine, Bangabandhu Sheikh Mujib Medical University, Dhaka

included in a double blind, randomized study. The protocol was approved by Protocol Review Board of the Department of Anaesthesia, Analgesia and Intensive Care Medicine of BSMMU, Dhaka. The purpose of the study was clearly explained and written informed consent was taken from each patient. Ages of the patients were between 18 to 30 years. The patients unable to understand normal command were excluded, as were patients with known airway abnormality; pathology in the neck, face, pharynx and larynx; injury to head & neck; cardio-respiratory disorders, pregnancy, collagen diseases and full stomach.

All patients were allocated randomly into two groups. Randomisation was done by card samplings. A total of hundred cards, fifty for each group was prepared by another person. Every patient included in the study was allowed to choose a card. According to card number, the patients were grouped.

In Group-A, the modified Malampati test (modified by Samsoon and Young) was performed in the pre-anaesthetic check up room. The patient seating in a chair or stool with a head in neutral position fully opened his or her mouth and protruded the tongue as far as possible. The observer looked from the patient eye level and inspected the pharyngeal structures by pen torch.

In Group-B, a combination of Malampati test was performed and Thyromental distance was measured in each patient. In the pre-anaesthetic check up room the modified Malampati test was performed as it was done in Group-A. Then Thyromental Distance was measured in the same patients from upper edge of thyroid cartilage to chin with head fully extended by a slide calipers. The mallampati class and Thyromental Distance were recorded in a prescribed data collection sheet.

On the day of operation, the patients were anesthetized with intravenous thiopental sodium 3-5 mg/kg and tracheal intubation was performed using intravenous suxamethonium 1.5 mg/kg body weight. The head of the patient was extended and neck flexed on a head pillow or ring and laryngoscopy was done with proper size Macintosh blade and intubation performed. During intubation, intubation condition was observed :

- No difficulty - Tracheal intubation could be done without any aids.

- Moderate difficulty - Needed some aids like pressure on cricoid cartilage.

- Difficulty - Other than pressure on cricoid cartilage, laryngoscopic blade to be changed or stylet to be used, but intubation are to be done in 1 minute.

- Failed intubation - Not possible to intubate with different maneuver.

All intubation was done by Anaesthetic Consultant in the operation theatre who was blinded about the grouping. In case of failed intubation, the patient was allowed to resume spontaneous ventilation and the alternative airway management protocol were followed.

Data were collected in a specially design 'Data collection sheet'. Data were analysed by Chi-square (c^2) and Z test as appropriate using Sigma Plot 11.1. The evaluation of sensitivity, specificity and positive predictive value (the proportion of predicted intubation actually proved difficult) was done with 95% confidence interval. p< 0.05 was considered statistically significant (Table-I).

RESULTS

The two groups were statistically matched for age (P=0.539), Sex (P=0.688), weight (P=0.077), and ASA physical status (P=0.436).

Table-I
Patient characteristics

Parameters	Group - A	Group - B	p Value
Age in years	24.06±4.03	24.56±4.06	0.539
Weight in kg	51.76±7.57	49.06±7.65	0.077
Sex			
Male	24(48%)	21(42%)	0.688
Female	26 (52%)	29 (58%)	
ASA physical status			
I	43 (86%)	39 (78%)	0.436
II	7(14%)	11(22%)	

Mean ± SD. In parenthesis are the percentages over column total. Group analyses were done by Chi square (χ^2) test. Values are expressed as significant if P<0.05 (CI-95%.)

During intubation, patients were graded according to Cormack & Lehane grading. In Group-A, 22 (44%) in Grade-1, 21(42%) in Grade-2, 4 (8%) in Grade-3 and 3 (6%) Grade-4. In Group-B, 18 (36%) in Grade-1, 16 (32%) in Grade-2, 13 (26%) in Grade-3 and 3 (6%) in Grade- 4 (Table-II).

Table-II

Distribution of of patients during intubation according to cormack & lehane grading

Groups	Grade-1	Grade-2	Grade-3	Grade-4	P value
Group - A	22 (44%)	21(42%)	04 (8%)	03 (6%)	0.120
Group - B	18 (36%)	16(32%)	13(26%)	03 (6%)	

Values expressed as frequency. In parenthesis are percentages over column total. Data were analysed by χ^2 test. Values are regarded as significant, if p value <0.05 (CI-95%).

In Group-A, 18 (36%) patients were difficult to intubate, though during mallampati test, 07 (14%) were suspected to be difficult. The false negative was 11 (22%). The measured sensitivity and specificity in Group-A are 65% and 25% respectively (Table-III).

Table-III

Relation of preoperative anticipation of difficult intubation with the difficulty durign intubation in Group-A

Number of patient	Suspected to be difficult preoperatively	Difficult intubation	False negative
50	7 (14%)	18 (36%)	11 (22%)

Values are expressed in frequency. Within paranthesis of are the percentage over colum total. Analysis between groups were done for sensitivity & specificity using Z test.

In Group-B, 10 (20%) patients were difficult to intubate, though 16 (32%) patient were suspected to be difficult preoperatively using combination of Malampati test and measring of Thyromental Distence. The false positive were 6 (12%). The sensitivity is 75% & specificity is 60% (Table-IV).

Table-IV

Relation of preoperative anticipation of suspected difficult intubation with the difficulty durign intubation in Group-B

Number of patient	Suspected to be difficult preoperatively	Difficult intubation	False positive
50	16 (32%)	10 (20%)	6 (12%)

Values are expressed in frequency. Within paranthesis of are the percentage over colum total. Analysis between groups were done for sensitivity & specificity using Z test.

Numbers of patient facing difficulty in two groups are displayed in Table-V. Eighteen (36%) patients in Gr-A faced difficulties during intubation, which is significantly higher than the Gr-B (p =0.001).

Table-V

Distribution of difficult intubation in two groups

Groups / Variables	Suspected to be difficult intubation	Difficulty in intubation	P value
Group-A	7 (14%)	18 (36%)	0.001
Group-B	16 (32%)	10 (20%)	

Values are expressed in frequency. Within paranthesis of are the percentage over colum total. Analysis between groups were done for sensitivity & specificity using (χ^2) test. Values are expressed as significant if P<0.05 (CI-95%).

DISCUSSION:

Patient who needs to be intubated must be assessed by screening tests to prevent fatal consequences of the unexpected difficult and / or failed intubation. A screening tests for prediction of difficult intubation are to be very easy, rapid and should give reproducible result. No screening test is absolutely sensitive and 100% specific. Therefore process must be develop to minimize sudden unexpected difficulty during intubation.

Oates JDL and his colleagues found 1.8% incidence of difficult intubation using Mallampati test and Wilson risk score in the preoperative check up room[6]. In our study, Mallampati test on one group compared with combination of Mallampati and Thyromental Distance on another group were used

to assess the degree of difficulty during tracheal intubation and compare the specificity and sensitivity of the two groups. The sensitivity in Group-A (Mallampati alone) is 65% and for Group-B is (Mallampati and TMD measurement) 75%. The measured specificity is also higher in Group-B (25% vs 60%).

Mallampati test is a simple and quick based upon the visible pharyngeal structures when the patient's mouth is wide open. Mallampati and his colleagues described first three classes[7], Samson and Young added later on the fourth one[8]. This test predicts only about 50% of difficulties with a high incidence of false negative results. Mallampati test is significantly affected by inadvertent phonation of patient and there is considerable observers variability[9]. It cannot discriminate the patients of difficult laryngoscopy resulting from limited movement of head and neck. Tham and colleagues showed that the grading observed with the patient in the vertical position did not change when the patient was horizontal; thus the test is useful in an emergency with patient supine or who is unable to sit up[10]. One of the greatest criticisms of mallampati test, however, has been the problem of inter-observer variation[9]. If the posterior pharyngeal wall can be seen below the soft palate, patient is in Grade-I or II, should be predicted 'easy' intubation. If pharyngeal wall can not be seen as in Grade-III & IV and if the TMD of these patient is <6.5 the intubation may be difficult.

In Group-A, where the patient were assessed using mallampati test, 11 (22%) of patients exhibited false negative results that means these patients were difficult to intubate but the preoperative assessment failed to predict any difficulty. A simple bedside test of Patil's Thyromental Distance reflects the degree of head extension on neck along with the position of larynx and length and depth of the mandible. By adding TMD with mallampati test, these false negativity of mallampati test was reduced. In addition, both sensitivity and specificity is higher in Group-B than A. So these two simple bedside tests (Mallampati with TMD) can be performed during routine preoperative visit. The patients having grade III or IV view of the pharynx and the Thyromental Distance less than 6.5 cm. can be expected to have difficultly during tracheal intubation. So, it can be concluded that proper preoperative assessment is mandatory to prevent fatal consequences of the unexpected difficult and / or failed intubation.

REFERENCES

1. Frerk CM. Predicting difficult intubation. Anaesthesia 1991; 46: 1005-1008.

2. Cormack RS, Lehane J. Difficult tracheal intubation in obstetrics. Anaesthesia 1984; 39: 1105-1111.

3. Atkinson RS, Rushman GB, Davies NJH. Tracheal intubation. In: Lee's Synopsis of Anaesthesia, 12th ed. End and clays Ltd., Stives plc; ELBS with Butterworth, 1993: 217-222.

4. Ellis H, Feldman S. Anatomy for Anaesthetist 7th ed. & Oxford London, Edinburgh, Boston, Melbourne: Blackwell Scientific Publication, 1995: 27-30.

5. Romanes GJ. Cunningham's Manual of Practical Anatomy, 15th ed. Edinburgh. 1986; 3: 24-26.

6. Oates JDL, Macleod AD, Oates PD, Pearsall FV, Howie JC, Murray GD. Comparison of two methods of predicting difficult intubation. Br J Anaesth. 1991; 66: 305-10.

7. Mallampati SR, Gatt SP, Gugino LD, Desai SP, Waraksa B, Freiberger D. A Clinical Sign to predict Difficult Tracheal Intubation: A Prospective Study. Can Anaesth Soc J. 1985; 32: 429-34.

8. Samson GLT, Young JRB. Difficult tracheal intubation: a retrospective study. Anaesthesia 1987; 42: 487-90.

9. King TA, Adams AP. Failed trachenal intubation. Br J Anaesth 1990; 65: 400-14.

10. Tham EJ, Gildersleve CD, Sanders LD, Mapleson WW, Vaughan RS. Effects of Posture, Phonation and observer on Mallampati classification. Br J Anaesth 1992; 68: 32-38.