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ASSESMENT OF DIFFICULT AIRWAY BY USING STERNOMENTAL DISTANCE AND NECK AND HEAD MOVEMENT

Anaesthesiology

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KEYWORDS

INTRODUCTION

The main stay of airway management is tracheal intubation which can be usually done uneventfully. however, critical oxygen desaturation may occur occur if intubation is difficult or impossible after anesthesia induction, so unanticipated difficult intubation is more dangerous than a predicted one when already any airway problem or abnormality is detected before giving anesthesia.[1]

Adverse outcomes associated with respiratory events include events due to inadequate ventilation, esophageal intubation and difficult tracheal intubation leading to death or to brain damage. A good understanding of these risks may require investigative protocols.[2]

Failed endotracheal intubation in an anesthetized patient is a principal cause of morbidity and mortality, so there is a need of accurate tests to predict difficult intubation. Unexpected difficult intubation are probably a result of lack of accurate predictive tests for difficult intubation of airway performed preoperatively.[3]

Difficulty in intubation associated with difficulty in exposing glottis involves a series of manoeuvres, including extending head, mouth opening, compressing the tongue into submandibular space and forward lifting of mandible and the ease of performing these manoeuvres can be assessed by one or more parameters. Extension of head can be assessed by looking at movements of head, measuring the sternomental distance or by measuring angle with the help of various devices.[4]

Probability of difficult laryngoscopy using these parameters individually or in combination may help to predict difficulty during intubation.[5]

The present study was carried out on 30 patients posted for surgery under general anaesthesia to evaluate sternomental distance & head & neck movements as prediction of difficult intubation.

AIMS AND OBJECTIVES

The aim and objectives of this study is to predict difficulty in endotracheal intubation by using sternomental distance (SMD) and neck and head movement.

MATERIALS AND METHODLOGY

An observational study was conducted in the Department of anaesthesiology, Maharishi Markandeshwar Institute of Medical Science and Research, Mullana after approval from the ethics committee, on 30 patients of ASA grade I and II, of either sex undergoing elective surgeries under general anaesthesia.

Inclusion Criteria:

- Age group of 18-60 years.
- ASA grade I or II.
- Patient undergoing elective surgeries under general anesthesia.
- Obese patients with BMI>30.

Exclusion Criteria:

- ASA grade III and IV.
- Patient's refusal.
- Patients with upper airways tumours and with abnormality of airway.
- Patients who were scheduled to undergo surgery under general anaesthesia.
- Patients posted for emergency surgeries procedures.
- Edentulous patients.
- Patients who are not able to open the mouth.
- Patients with cervical spine fractures and deformities.
- Patients unable to sit.

Pre anaesthetic evaluation was done prior to the surgery.
A written informed consent was taken from every patient.

Pre Operative Anesthetic Check Up:

- Pre-operative airway assessment was performed.
- Sternomental distance (SMD) was measured with head in full extension & mouth closed. A sternomental distance of <12.5cm predicts difficult laryngoscopic intubation.
- Maximum range of Head and Neck movement-was found out by asking the patient was to extend fully the head and neck while a pencil was placed vertically on the forehead. The orientation of pencil was adjusted in order that it'll be parallel to a foreign framework,
- then while the pencil was held firmly in position, the head and neck was Fully flexed and therefore the pencil was sighted against the horizontal of the framework to gauge if it's moved through 90□.The degree of movement was graded into three levels >100□, near 90□ [90±10□], <80□. (First two angles were taken as easy and third as difficult.)
- Pre-operative examination was done based on surgical procedure, physical status and age of the patients.
- Patients was kept on fasting a minimum of 6 hours prior to surgery
- The patients was administered with alprazolam 0.5mg at night and 0.25mg in the morning of the surgery and ranitidine 150mg orally on the night before the surgery and in the morning on the day of surgery.

Intra Operative

- After arrival in the operation theatre following parameters was monitored:
- Pulse rate.
- Pulse oximetry.
- Non-invasive blood pressure.
- Secure I.V line was started.

Pre Medication:
The patients were pre-medicated with I.V:

- Inj. midazolam 0.03mg/kg.
- Inj. glycopyrolate 0.2mg/kg.
- Inj. nalbuphine 0.1mg/kg.

The patients were undergo similar general anaesthetic procedure. Following preoxygenation for 4 minutes, the standard induction technique were applied to all the patients which include inj. propofol 2mg/kg and Neuro muscular blocker inj. vecuronium 0.1mg/kg. After ventilation with oxygen for 4 minutes, direct laryngoscopy was performed, the vocal card were visualize by placing the head in the

"sniffing the morning air" position by using Macintosh laryngoscope blade to ensure the steadiness of the technique. Glottis visualization during laryngoscopy was assessed using Cormack and Lettane's classification was graded as follows:

Grade I: whole of the vocal cords visible.
Grade II: Only posterior commissure visible.
Grade III: Only epiglottis visible.
Grade IV: None of the above visible.

(Grade I and Grade II was taken as easy intubation and Grade III and Grade IV as difficult intubation).

Based on the parameters, difficulty in intubation was assessed.
After noting the grade of laryngoscopy, tracheal intubationn was performed and assessed during intubation as well as outcome. Anaesthesia was maintained by nitrous oxide: oxygen (2:1) and isoflurane along with vecuronium (0.001mg/kg) as required. At the end of surgical procedure, all patients was reversed with inj. neostigmine 0.05mg/kg and glycopyrolate 0.01mg/kg administered intra venously. All the patients were extubated and were shifted to post-operative care unit.

Statistical Analysis
1) The preoperative airway assessment data and the findings during intubation were used to determine the sensitivity, specificity, positive and negative predictive values for each test.

Measured data were analysed using SPSS software (IBM SPSS Statistics for windows, version 21.0. Armonk, NY: IBM Corp.)

Fisher exact test was used to calculate statistically significant difference in sensitivity and specificity between these tests respectively. Necessary sample size was estimated for a 95% confidence interval (CI) by the use of Epi info statistical package (version 6).

P-value of <0.05 was taken as significant and p-value of >0.05 was taken as not significant.

OBSERVATION AND RESULTS

The present study was undertaken to compare two pre-operative airway assessment tests namely: Sternomental Distance (SMD), and Head and Neck movements (HNM) to predict the difficulty during endotracheal intubation. 30 patients aged between 18-60 yrs. of age. Of both sexes were scheduled for elective surgery were enrolled in the study.

In our study SMD grade II and HNM grade III were considered as predictors of difficult endotracheal intubation. On laryngoscopy, Cormack Lehane view of III and IV were considered as difficult to intubate.

Of the entire 30 patients, a total of 09 patients had difficult intubation, all of whom had Cormack Lehane class III.There were no cases of failed intubation in our Study.

The demographic profile of patients is depicted as follows:
Table 4: Asa Distribution

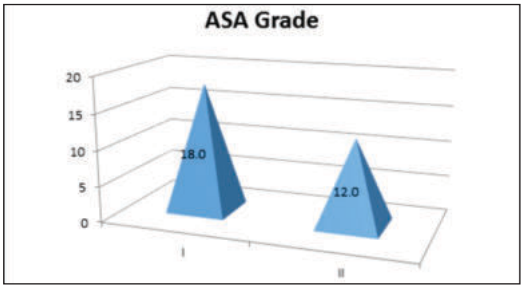
ASA Grade	Number of patients
I	18
II	12
Total	30

In our study out of 30 patients, 18 belongs to ASA I class and 12 patients belonged to ASA II class.

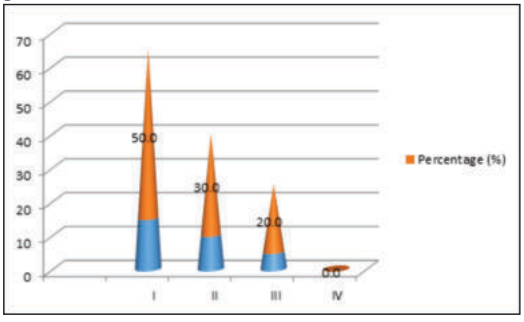
Table 5: Cormack And Lehane Grading Distribution

Grade	No. of patients	Percentage (%)
I	15	50
II	10	30
III	5	20
IV	0	0.0
Total	30	100

In our study 15 patients were of Grade I, 10 patients were of Grade II, 5 patients were of Grade III and there were no patients of Grade IV CL. Classification.



Graph 4: ASA Distribution



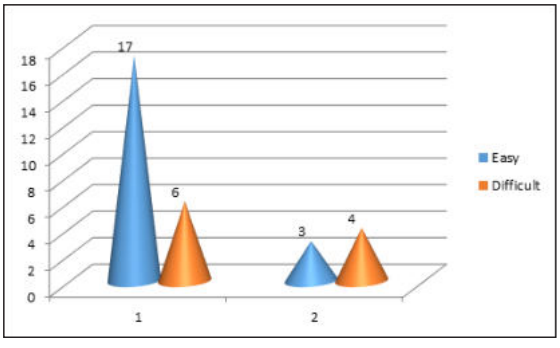
Graph 5: CLG Distribution

Table 6: Sternomental Distance (smd) Overall Prediction

SMD	Assessment during Laryngoscopy		
	Easy	Difficult	Total
Easy	17	3	20
Difficult	6	4	10
Total	23	7	30

In our study 20 patients of grade I (>12.5cm) and 10 patients were of Grade II (<12.5cm) SMD grading, out of which Grade I was taken as easy and Grade II as difficult for intubation.

Total 20 patients were assessed as easy and 10 were assessed as difficult as per SMD Grading. Out of which 23 were assessed as easy and 7 were assessed as difficult intubation after laryngoscopy.



Graph 6: Sternomental Distance Overall Prediction

Table 7: Relation between SMD and Assessment during Laryngoscopy

Parameter		95% CL
True Negative	17	
False Negative	3	
False positive	4	
True positive	6	
Sensitivity	77.3%	54% to 92%
Specificity	87.2%	77.7% to 93.7%
Positive predictive value	63.0%	42.4% to 97.7%
Negative predictive value	93.2%	68.6% to 85.7%
Diagnostic accuracy	85.2%	
p-value	0.000	

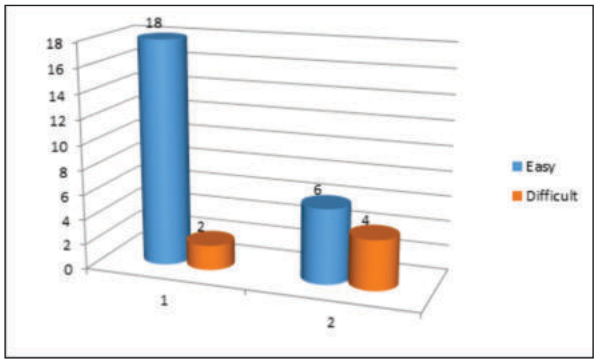
In our study 17 patients were TN, 3 were FN, 6 patients were TP & 4 were FP. The sensitivity, specificity, PPV & NPV were 77.3%, 87.2%,63.0% & 93.2%, respectively.

Table 8: Head And Neck Movement Overall Prediction

NHM	Assessment during Laryngoscopy		
	Easy	Difficult	Total
Easy	18	6	24
Difficult	2	4	6
Total	20	10	30

In our study 17 patients were of Grade I (100^0), 7 patients were of Grade II ($90^0 \pm 10^0$) and 6 patients were of Grade III ($< 80^0$), HNM grading, out of which Grade I and II were taken as easy and Grade III as difficult for intubation.

Total 24 patients were assessed as easy and 6 were assessed as difficult as per HNM grading. Out of which 20 were assessed as easy and 10 were assessed as difficult intubations after laryngoscopy



Graph 7: Head And Neck Movement Overall Prediction

DISCUSSION

A screening test for prediction of difficult intubation must be rapid and provide reliable results. No screening test is 100% sensitivity and 100% specific.

30 patients aged between 18-60 yrs of age, of both sexes of ASA grade I and grade II scheduled for elective surgery were enrolled in the study. In our study incidence of difficult intubation was 14% which was almost comparable to the incidence of 18.2% of difficult intubation in the study of **Allhary E et al. Wilson et al** found an incidence of 13%. The incidence of difficult intubation in **Savva D et al** was 4.9%.

An almost equal no.of male (14) and female (16) participated in the study. The age of the patients ranged from 18-60 years. Mean age was 29.2 ± 6.2. Weight of the patients ranged from 30-75 kg with the mean weight of 56.2 ± 64.6. Demographic data was compared statistically by using the simple formula of calculating the mean, median and standard deviation.

Sternomental distance (SMD) test:

In our study SMD of >12.5 cm (i) was considered as normal and < 12.5 cm (ii) was considered as predictor of difficult intubation. In our study 20 patients were included under grade I and 10 were included under grade II, denoting 20 patients suggestive for easy intubation and 10 patients were predicted for difficult intubation out of 30 and total 7 out of 30 came out to be actually difficult. Total 6 patients were actually difficult and 4 patients were predicted difficult but were actually easy after laryngoscopy.

The sensitivity and specificity of SMD in our study was 77.3% and 87.2% which showed that this test had the best ability to detect true positive patients as this test had the highest sensitivity and PPV. PPV and NPV were 63.0% and 93.2% respectively. The test also had NPV of 93.2% which denotes that this test has ability to detect true negative also.

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Head and Neck Movements (HNM) test :

In our study $\geq 100^0$ (i) and $09^0 \pm 10^0$ (ii) were considered as normal and 80^0 (iii) was considered as predictor of difficult intubation. In our study 17 patients were of grade I, 7 patients were of grade II,denoting total 24 patients suggestive of easy intubations and 6 were of grade III suggesting difficult intubations. Out of these 6 patients 2 were actually difficult and 4 were predicted difficult before but were actually easy after laryngoscopy.

The sensitivity and specificity of HNM in our study was 21.4% and 95.4 %, which showed that this test had moderate ability to detect true positive patients and true negative patients and had PPV and NPV of 88.2 % and 85.0%, respectively.

Atlanto-occipital joint extension is also a tool for assessing the head and neck movements. As per **Gupta S et al** atlanto-occipital joint extension assesses feasibility to make sniffing or magil position for intubation i.e. alignment of oral, pharyngeal and laryngeal axix into an arbitrary straight line.

Combination of sternomental distance and head and neck movement tests increased the sensitivity and negative predictive value to 100% while positive predictive value was also increased to 88.4% but decreased the specificity to 6.7%. SMD resulted best with sensitivity, specificity,PPV and NPV respectively.

SUMMARY AND CONCLUSION

In this study, we have assessed Sternomental distance (SMD) and Head and Neck movements (HNM) for the prediction of difficult endotracheal intubation in Thirty patients aged between 18 to 60 years of either sex,of ASA grade I or II, scheduled to undergo elective surgery under general anaesthesia. Sternomental distance <12,5cm and Head and Neck movement $>80^0$ were considered as predictors of difficult intubation.

The study involved preoperative evaluation of airway by compared Sternomental distance and Head and Neck movements were considered as predictors of difficult endotracheal intubation. On the day of surgery, patients were anaesthetized by using balanced anaesthesia technique i.e., all the patients were premedicated with intravenous inj. Midazolam 0.03 mg/kg, inj. Glycopyrolate 0.2 mg and inj.nalbuphine 0.1mg /kg. After ventilation with oxygen for 4 minutes, direct laryngoscopy was performed, the vocal cords were visualized by placing the head in the "sniffing the morning air" position by using Macintosh laryngoscope to ensure the consistency of the technique. Glottic visualization during laryngoscopy was assessed by using Cormack and Lehane's classification. Patients of Cormack Lehane class III/IV were considered as difficult to intubate.

We found out that the Sternomental distance test has highest sensitivity and positive predictive value of 77.3% and 63.0% respectively resulting as best individual test for predicting difficulty for intubation.

CONCLUSION:

A screening test for prediction of difficult intubation must be rapid and provide reliable results. No screening test is 100% sensitive and 100% specific. The conclusion of study is that when multiple predictors were taken into consideration there was a considerable reduction in the outcome of false positives and false negatives with significant improvement in sensitivity, positive predictive value and negative predictive value. The application of multiple predictors can reduce the frequency of un anticipated difficulty and un necessary interventions related to over-prediction of airway difficulty.

REFERENCES

1. Adamus M, jor O, Vavreckova T, Harabalek L, Zapletalova J. Inter-observer reproductibility of 15 tests used for predicting difficult intubation . J Anesth. 2011; 1559(3):275-282.
2. Caplan RA, Posner KI, Ward RJ, Cheney FW, Adverse respiratory events in anaesthesia: a closed claim analysis. Anaesthesiology. 1990; 81(2):254-25.
3. Tse JC, Rimm EB, Hussain A, Predicting difficult endotracheal intubation in surgical patients scheduled for general anesthesia: A prospective blind study. Anesth Analg. 1995 ;(2):254-258.
4. Gupta AK, Ommid M ,Nengroo S, Naqash I, Mehta A, Predictors of difficult intubation :Study in Kashmiri population.BJMP.2010;3(1):307-309

5. Arne J, Descoins P, Fusciardi J, Ingrand P, Ferrier B, Boudigues. Preoperative assessment for difficult intubation in general and ENT surgery: Apredictive value of a clinical multivariate risk index. Br J Anesth.1998; 80:140-146...
6. Vander linde JC, Roelofse JA, Steenkamp EC. Anatomical factors related to difficult intubations' Afr med. J. 1983 June 18;63 (25):976-7.
7. Malampati SR, Gatt SP, Gugino LD, Desai SP, Waraksa B, Freiberger D, Liv PL. A clinical sign to predicting different tracheal intubation.(hypothesis).Can Anesth. Soc J, 1983, 30:316.31.
8. Cormack RS, Lehane J. Difficult Tracheal intubation in obstetrics, Anesthesia 1984, 39, 1105-1111.
9. Malampati SR, Gatt SP, Gugino LD, Desai SP, Waraksa B, Freiberger D, A clinical sign to predict Difficult tracheal intubation: A prospective study. Can Anesth soc J 1985:332 (4).429-434.
10. Samsoon GL, Young JR. Difficult tracheal intubation: A retrospective study, Anesthesia.1987;42(5):487-490
11. Savva D. Prediction of difficult tracheal intubation. Br J Anesth. 1994; 73:149-153.
12. El-Ganzouri AR, McCarthy RJ, Tuman KJ, Tanck EN, Ivankovich AD. Preoperative airway assessment: Predictive value of a multivariate risk index. Anesth Analg. 1996; 82(6):1197-1204.
13. Chara L, Eleftherios V, Maria M, Anastasia T, Chryssoula S. Anatomic features of neck as predictive markers of difficult direct laryngoscopy in men and women: A prospective study. Indian J Anesth.2014; 58:176-182.
14. Dhanger S, Gupta SL, Vinayagam S, Bidkar PU, Elakkumanan LB, Badhe AS. Diagnostic accuracy of bedside tests for predicting difficult intubation in Indian population: An observational study. Anesth Essays Res 2016; 10:54-58.