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COMPARISION OF THYROMENTAL HEIGHT TEST (TMHT), MODIFIED MALLAMPATI SCORE (MMD) AND THYROMENTAL DISTANCE (TMD) IN PREDICTING DIFFICULT LARYNGOSCOPY.

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ABSTRACT

Introduction: Handling and management of the airway is the cornerstone of anaesthesia. Anaesthetizing a patient is only possible and safe once the airway is protected. In scenarios of difficult airway, identification and proper planning of conducting anaesthesia starts right from the pre-anaesthetic assessment. The incidence of difficult tracheal intubation following induction of general anaesthesia has been estimated at 3-18%. **Materials and methods:** A prospective observational study was conducted on 80 patients undergoing routine surgeries under general anaesthesia. After obtaining written informed consent and ethical clearance, 3 indices, the thyromental height test, modified mallampati test and thyromental distance were assessed along with routine pre-anaesthetic evaluation. We compared the sensitivity, specificity, PPV, negative predictive value (NPV), and diagnostic accuracy of TMHT with other bedside tests such as the modified Mallampati score and TMD in predicting difficult laryngoscopy. Any Cormack and Lehane's intubation grade II b and above was considered to be difficult laryngoscopy. **Results:** TMHT had the highest sensitivity (84.62%) and specificity (98.97%), and had the most PPV (88%) and NPV (98.63%) when compared with the modified Mallampati score and TMD. **Conclusion:** TMHT appears promising as a single anatomical measure to predict the risk of difficult laryngoscopy but it still requires further validations.

INTRODUCTION:

Handling and management of the airway is the cornerstone of anaesthesia. Anaesthetizing a patient is only possible and safe once the airway is protected. In scenarios of difficult airway, identification and proper planning of conducting anaesthesia starts right from the pre-anaesthetic assessment. The incidence of difficult tracheal intubation following induction of general anaesthesia has been estimated at 3-18%. It is the most critical emergency that an anaesthetist can be faced with and may lead to hypoxaemic anaesthetic death, brain damage or serious soft tissue damage. An important aspect of airway management is assessment of the patient's airway to predict the likelihood of ease or difficulty with bag mask ventilation or with laryngoscopy and intubation, enabling the anaesthesiologist to prepare for this challenging clinical scenario[1]

Several bedside physical airway assessment tests are available but have a high inter-observer variability2 and moderate to fair sensitivity and specificity3.There are many anatomical parameters for evaluating the feasibility of tracheal intubation, one that can reliably predict a difficult intubation is the Cormack-Lehane classification obtained during direct laryngoscopy4. But assessing the CL grading is an invasive procedure and cannot be performed on an awake and conscious patient or in patients who haven't underwent general anaesthesia. Coming to the available pre-anaesthetic indices available in practice i.e. Modified Mallampati Grading, Thyromental distance, Sternomental distance, upper lip bite test, chin protrusion test, etc., it is difficult to assess which indices are the best for the prediction of difficult airway. So, in practice a combination of the above indices is used. Recently a new assessment was brought about by Etzadi et al – Thyromental Height test (TMHT) which in their terms has a high accuracy (98%) and sensitivity (90.4%)5. This study was undertaken to compare Thyromental Height test against the routinely used Modified Mallampati grading and Thyromental Distance. Hypothesis: Thyromental Height test is more accurate than Modified Mallamptai grading and Thyromental height.

OBJECTIVES

a) To find out the incidence of difficult laryngoscopy.
b) To compare the 3 indices of difficult airway, thyromental height test (TMHT), modified mallampati score (MMT) and thyromental distance (TD) in predicting difficult intubations.

METHODOLOGY

After obtaining ethical approval, 80 patients with ASA physical status I/II were selected who underwent Elective surgeries under general anaesthesia between November 2018 and December 2018 in Yenepoya Medical College Hospital.

During obligate pre-anaesthetic visit before the day of surgery, demographics and physical assessment were performed by an experienced anaesthesiologist. Bedside indicators of difficult airway were assessed:

1. Modified Mallampati test (MMT): oropharyngeal view was assessed using the modified Mallampati classification. Patients were in sitting position with mouth maximally opened, tongue protruded and without phonation. MMT scores of 3 and 4 were considered as predictors of difficult laryngoscopy.

2. Thyromental distance (TMD): measured between the thyroid prominence and the most anterior part of the mental prominence of the mandible with a tape measure (Standard) as a distance in centimetres, with the patient in supine position, head fully extended, mouth closed. A TMD of <6.5cms was considered as a predictor of difficult laryngoscopy.

3. Thyromental height test (TMHT): measured as a height between the anterior border of the thyroid cartilage (on the thyroid notch just between the 2 thyroid laminae) and the anterior border of the mentum (on the mental protuberance of the mandible) with a depth gauge (Insize 1240-1501 Vernier Depth Gauge, 0.05 mm Graduation) in millimetres, with the patient in supine position, head in neutral position and closed mouth. Cut off value of 5cm for TMH was taken from Ethizad et. al.5 TMH < 5 cm is considered as predictor of difficult laryngoscopy and > 5 cm considered as predictor of easy laryngoscopy.

All patients underwent induction of General Anaesthesia using standard protocol.

Pre-medication: All patients received Tablet RANATIDINE 150mg and Tablet ALPRAZOLAM 0.25mg the night before surgery.

On the day of surgery, a wide bore cannula was secured in all patients. Monitors such as pulse-oximeter, electrocardiography and manual non-invasive blood pressure monitor was connected. Induction was done with Inj. Fentanyl 2 mcg/kg IV, Inj. Propofol 2mg/kg IV and Inj. Vecuronium 0.1 mg/kg IV. Patients head were placed in optimal sniffing position. All intubation procedures were performed using a Macintosh blade of appropriate size, usually

size 3 or 4. Best visualisation of the airway was rated according to Cormac and Lehane classification. Correct tube position will be confirmed by capnography and by auscultation. Once intubation procedure is completed, general anaesthesia will be maintained using regular protocol i.e., Isoflurane, nitrous oxide and oxygen with Inj. Vecuronium 1mg IV SOS. All intubations were performed by an experienced anaesthesiologist having >6 years' experience who was unaware of the preanaesthetic airway assessment. Wherever a difficult airway was expected, difficult airway cart was kept ready.

STATISTICAL ANALYSIS:

The sample size of 80 was calculated after assessing results from previous studies, taking MMT as gold standard for airway assessment, assuming power of the study to be 80%, 95% confidence level and 5% alpha error. Sensitivity, specificity, negative predictive value, positive predictive value and accuracy of all the tests were calculated. Student's t-test, Fisher's exact test, and Yates Chi-square tests as appropriate were used. Statistical significance was defined as $P < 0.05$.

RESULTS:

A total of 80 patients were included. The demographic profile is depicted in Tables 1.

The incidence of difficult laryngoscopy was 7.5% (7/80), of which 5 had CL grade IIb and 2 had CL grade III. None of our patients had a grade IV view, and there were no failed intubations. A bougie/stylet was used to facilitate intubation in these difficult laryngoscopies.

Among all the tests, TMHT had the highest sensitivity (84.62%), specificity (98.97%), and had the most PPV (88%) and NPV (98.63%). This was followed by modified Mallampati classification. TMD had the least sensitivity and PPV [Table 2].

Table 1: Demographic data of the study.

Patient characteristics	Value (mean + std.deviation)
Male : Female ratio	37:43
Age (years)	43.4±13.3
Height (cm)	162.6±5.9
Weight (kg)	62.0±7.3
BMI (kg/m2)	23.4 (2.0)

Table 2: Airway parameters and statistical results.

Airway tool	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)	Accuracy (%)
TMHT	84.62	98.97	88	98.63	97.7
MMT	73.08	81.03	25.68	97.10	80.3
TMD	11.54	83.45	5.88	91.32	77.5

DISCUSSION

Our results suggest that TMHT at a 50 mm cutoff had the highest sensitivity, specificity, PPV, NPV, and was the most accurate when compared with modified Mallampati score and Thyromental distance. TMHT may have the best ability to predict difficult laryngoscopy as it had the highest PPV (88%). Modified Mallampati score was close to TMHT in terms of sensitivity and specificity.

The TMHT observations from our study are comparable to the original data from an Iranian population (314 patients), and subsequent data from an Indian population (345 patients) utilising simlar cutoffs at 50 mm.5,6 The sensitivity (84.6%), specificity (98.9%), PPV (88%), and NPV (98.6%) of TMHT from our study is comparable to the original Iranian study that produced the coresponding values as 82.6%, 99.35, 90.45, and 98.6% respectively.5 The high PPV (88%) along with an accuracy close to 100% (98.63%) from our data might indicate that a high proportion of difficult laryngoscopy could be predicted when the TMH is below 50 mm.

Though the sensitivity and specificity of modified Mallampati score in our study (73% and 81%) are comparable with that of an earlier metaanalysis by Shiga et al.3 (49% and 86%, respectively). Mallampati assessment is susceptible for incorrect evaluation and gross interobserver variability.7 The classification is prone to error with phonation which usually occurs involuntarily resulting in poor differentiation between various grades.[8]

TMD (6.5 cm) had the least sensitivity and PPV, implying that this predictor cannot be used individually for predicting difficult laryngoscopy. Although cervical spine movements greater than 90 degrees has been contemplated warranting easy intubation9, gross inter-observer variability10 and access to goniometer limit its clinical utility.

We believe TMHT may have a role in physically and mentally disabled patients, as well as in those who cannot cooperate for other tests such as the modified Mallampati score and upper lip bite test. Our study had few limitations. Small sample size and we haven't included any other ethnicities with different morphological features. Airway assessment tools were assessed as single tests. Nonetheless, a recent systematic review highlighted that combination of tests has limited value.11 The limitations of TMHT are also worth mentioning. The requirements of calipers and tapes to conduct the test is a constraint.

It is worth reiterating that clinicians should move away from the notion of focusing on a single airway assessment tool in predicting difficult intubation. As echoed in the All India Difficult Airway Association guidelines,12 safer management of patients including recognising those at risk should be a priority rather than relying on a single bedside airway assessment parameter.

CONCLUSION

TMHT was the most sensitive and accurate test in predicting difficult laryngoscopy when compared against modified Mallampati score and TMD.

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