ORIGINAL RESEARCH PAPER

Anaesthesiology

VALIDITY OF THYROMENTAL HEIGHT AS A SINGLE ANATOMICAL PARAMETER FOR PREDICTION OF DIFFICULT LARYNGOSCOPY IN ADULT PATIENTS POSTED FOR ELECTIVE SURGERIES UNDER GENERAL ANAESTHESIA

KEY WORDS:

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ABSTRACT

Aim: To study preoperative difficult laryngoscopy prediction using thyromental height, as an anatomical parameter in adult patients going for elective surgeries.

Objectives

1.To evaluate the efficacy of thyromental height as a predictor of difficult Laryngoscopy in adult surgical patients

2.Comparison of thyromental height with other anatomical parameters in prediction of difficult laryngoscopy.

Materials And Methods: it is prospective observational study included sample size of 100 patients came for elective surgeries. baseline recordings were taken

1.Mouth opening (inter incisor distance/gap, IIG/IID):

The distance between upper and lower incisors was measured with a tape. Mouth opening <4.5 cm considered as difficult airway.

2.Modified Mallampati test (MMT)

3.Thyromental distance (TMD) :

The patient was seated upright and asked to extend his/her head and neck as far as possible with mouth closed. The straight distance of the exterior surface from the inside of the mentum to thyroid notch is measured. Intubation will be difficult if the distance is less than 6.5 cm.

4.Thyromental height (TMHT):

The new clinical test (TMHT) will be carried out as follows: The distance between the anterior border of the thyroid cartilage (on the inner thyroid notch immediately between the two thyroid laminae) and the anterior border of the mentum (on the mental protuberance of the jaw) while the patient is lying supine with her mouth closed. This height will be measured with depth gauge callipers. As per previous studies, Thyromental height less than 5cm will be considered as difficult intubation. **Results:** There are 100 cases out of which 9 cases has thyromental height less than 5cms and other 91 cases has thyromental distance more than 5cms showing an accuracy of 96%.**Conclusion:** TMHT looks to be a potential single anatomical measure for predicting the probability of difficult laryngoscopy,

INTRODUCTION:

The fundamental responsibility of an anaesthesiologist is to provide an adequate gas exchange for the patient. Failure to maintain oxygenation can result in anoxic injury. It was estimated that 30% of deaths directly related to anaesthesia is because of failure to manage a difficult airway (DA).

There are three methods for maintaining patency of airway and gas exchange. The natural airway from the face to the vocal cords is kept patent without the use of external jaw thrust procedures or upper airway devices while bag and mask ventilation can initially give inspired gas through a mask that is placed on the patient's face. Second, inspired gas can be administered using a supraglottic airway device (SGA), such as a laryngeal mask airway (LMA). Third, tracheal intubation involves passing inspired gases through a tube that passes through the vocal cords, allowing flow from the respiratory circuit to the trachea. DIFFICULT AIRWAY encompasses a wide range of clinical problems, from difficulty or incapacity to perform mask breathing to difficulty or inefficiency in tracheal intubation.

According to Langeron and colleagues, difficult mask ventilation is "The inability of an unaccompained anaesthesiologist to maintain oxygen saturation >92%, as determined by pulse oximetry, or to avoid symptoms of inadequate ventilation during positive-pressure mask ventilation under general anaesthesia. A most challenging task for an anaesthesiologist is managing unanticipated difficult intubation.

MATERIALS AND METHODS:

Study Design:

Prospective observational growth

Study Population :

After receiving informed consent and receiving approval from the hospital ethics committee, 100 patients undergoing various elective procedures under general anaesthesia are enrolled for the study.

Inclusion Criteria:

- Age – 18 to 65 years
- ASA grade I or II
- Elective Surgeries under general anaesthesia

Exclusion Criteria:

- Surgeries under regional anaesthesia
- BMI > 35
- Neurological and musculoskeletal disorders
- Emergency surgeries requiring rapid sequence induction
- Facial, neck and dental abnormalities
- Inability to sit up

After receiving the patient in the pre-anaesthesia room, the patient's weight, height, and BMI are recorded. Patients having BMI >35 are excluded from the study. Baseline readings of pulse rate, blood pressure and oxygen saturation of the patient will be recorded. Patients are explained about the procedure, and informed consent is taken.

After obtaining consent from the patient, the following anatomical markers are measured.

Preoperative data recording:
after ruling out any dental and airway pathologies-

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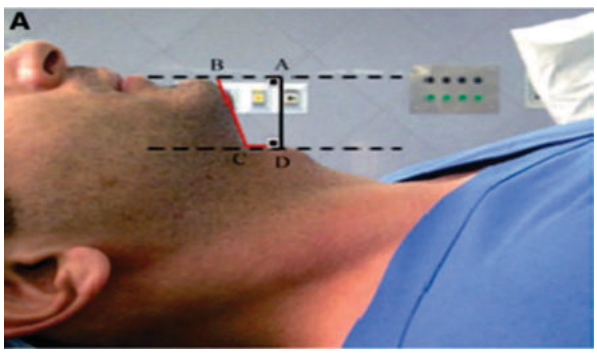

All the above measurements were taken by a single person using a standard calibrated tape and a Depth gauge callipers Inside the operating room (OR) patient was placed in a sniffing position with a standard size pillow below the head and all routine monitoring like ECG, pulse oximeter and non-invasive blood pressure monitoring is attached to the patient. Induction was done with a combination of fentanyl (1 2g/kg), and propofol (1.5-2mg/kg). Paralyzed with vecuronium (0.1 mg/kg) and then mask ventilation for 3mins and before laryngoscopy and complete blockade is assessed with SINGLE TWITCH RESPONSE using nerve stimulator.

The patient's head was placed in a sniffing position, and laryngoscopy is performed using a Macintosh #4 blade or 3 blade. Laryngoscopy was done by an anaesthesiologist who has got at least 3years of experience in intubation. The person doing laryngoscopy is different from person measuring these predictors to avoid observer bias.

Cormack lehane's grading:
The view at laryngoscopy was graded by Cormack Lehane's method in the following manner

Grade I	Complete vocal cords visible;
Grade IIa	Visualizatio of posterior part of vocal cords
Grade IIb	Only arytenoids are seen
Grade III	Only epiglottis visible
Grade IV	None of the fore going visible (not even the epiglottis).

Cormack Lehane grades I, II were defined as Easy Visualization of larynx (EVL) and predict easy intubation. Grade III and IV were defined as difficulty in visualization of Larynx (DVL) and predict difficult intubation.

Statistical Analysis
The sensitivity, specificity, positive predictive value, and negative predictive value in each group were calculated. The data were analysed using the Student t-test for continuous variables and Fisher's exact test or Yates Chi-square test, as appropriate, for non-contiguous variables. The predictive accuracy of the studied parameters was compared by measuring the area under the receiver operating characteristic (ROC) curve (AUROC). The package SPSS 19 was used for statistical analysis and statistical significance was defined as $p < 0.05$.

Each airway predictor's specificity, sensitivity, positive and negative predictive value, positive and negative likelihood ratio, and odds ratio were determined using a standard procedure.

RESULTS

The study group consisted of 100 patients in total.

Thyromental height test (TMHT)
The following are the statistics of thyromental height in difficult laryngoscopy prediction.

Table 11: Accuracy of Thyromental height and CL grading among the study population (n=100):

Thyromental height (cm)	CL grading		Total
	Difficult	Easy	
<5 Difficult	6	1	7
>5cm Easy	3	90	93
Total	9	91	100

Sensitivity	66.67%
Specificity	98.9%
Positive predictive value	85.71%
Negative predictive value	96.77%
Accuracy	96%

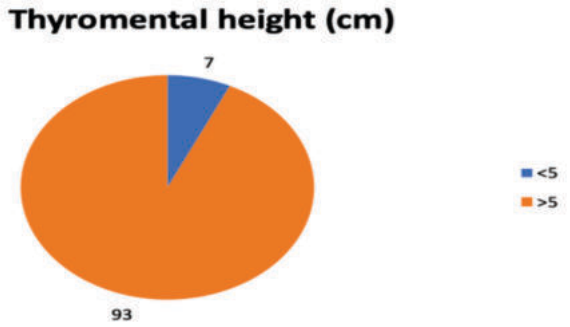

Chart 8 : Pie chart showing distribution of Thyromental height among the study population:

DISCUSSION

All over the world, up to 600 patients are thought to be dead annually as a result of complications occurring during tracheal intubation. Around 30% of the deaths in patients who were experienced difficulties at laryngoscopy or intubation are caused by hypoxic brain damage secondary to inability to maintain a patent airway. In an American Society of Anaesthesiologists that was closed – claims analysis, an increase in the incidence of morbid non-fatal events have also been noted in patients who have undergone difficult tracheal intubation. These events included desaturation, hypertension, oesophageal intubation, pharyngeal trauma, dental injury, cancellation of surgery, increased hospital stay and an increased rate of unexpected intensive care unit admission. Thyromental height (TMHT) a new anatomical parameter was chosen for predicting difficult laryngoscopy because it could be a surrogate for the following frequently

cited anthropometric measures: (1)amount of mandibular protrusion;(2) the submandibular space's size; and (3) the larynx's anterior position.

TMHT was found to have a sensitivity and specificity (66.67% and 98.9% respectively) from our study, and this is comparable with study **Etezadi et al (2013)**[16], which showed a sensitivity and specificity of TMHT around 82.6% and 99.31% respectively. High positive predictive value correctly predicts difficult laryngoscopy. In our study, TMHT has a high positive predictive value (85.71%) means the presence of TMHT <5cm can predict a higher proportion of difficult laryngoscopy. Also the accuracy of the test was 96% which means that the prediction of having difficult laryngoscopy is more possible when thyromental height is <5cm.

The odds ratio for TMHT is very high compared to other tests, and this indicates a significant correlation between TMHT and the chance of difficult laryngoscopy.

The ROC AUC for TMHT is found to be higher than the other individual predictors. AUC around 0.88 indicates a highly reliable test for difficult laryngoscopy prediction

CONCLUSION

We conclude that thyromental height test (TMHT) is the most sensitive test among all the individual predictors of difficult laryngoscopy. Also the sensitivity and specificity of the test is comparable with various multivariate analysis. TMHT looks to be a potential single anatomical measure for predicting the probability of difficult laryngoscopy, but it will need to be validated in a larger patients.

Limitations

1. The values obtained from the test was performed in only in a subset of the population which cannot be generalized to all the population groups. This study was conducted only in patients undergoing elective surgeries mainly laparoscopic and ENT surgeries, which may not completely involve all the population coming for surgeries, mainly obstetric and trauma where the chance of difficult laryngoscopy is high.
2. The study requires an instrument to measure TMHT which is expensive and it is not required for other predictors.
3. There need some experience with the depth gauge callipers before avoiding measuring errors. This learning curve can result in some inter-observer variation.

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