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COMPARISON BETWEEN ACROMIOAXILLO-SUPRASTERNAL NOTCH INDEX AND THYROMENTAL DISTANCE IN PREDICTING DIFFICULT VISUALIZATION OF LARYNX IN INDIAN POPULATION

Anesthesiology

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ABSTRACT

Background and Aims: Endotracheal intubation is an essential part of general anaesthesia. Many tests are used to predict difficult intubation, but sensitivity and positive predictive value of these tests is low. This study aimed to study the predictive value of acromioaxiollosuprasternal notch index (AASI) for difficult visualization of larynx (DVL).

Methods: After Hospital ethical committee approval, 200 adult patients undergoing General Anaesthesia were enrolled into the study. AASI and thyromental distance were measured preoperatively. Visualisation of larynx was graded by Cormack lehane grading with grade III and IV considered as DVL. Direct laryngoscopy was carried out by experienced anaesthetists blinded to the above mentioned airway predictors.

Results: DVL was observed in 8% patients. We found that sensitivity, specificity and AUC of AASI for difficult intubation to be 62.5(35.4- 85.8), 95.11(90.92-97.74), 0.79(0.72- 0.84) respectively. AUC of AASI was found to be better than Thyromental distance.

Conclusion: AASI > 0.5 is a good predictor of difficult visualisation of larynx at direct laryngoscopy when compared to thyromental distance

KEYWORDS

AASI, Difficult visualization of larynx , Endotracheal intubation, Thyromental distance

INTRODUCTION

Endotracheal intubation is an essential part of general anaesthesia . Airway assessment forms the first part of any airway management strategy, followed by planning of the drugs , equipment and techniques to be used. The difficult airway is defined as "The clinical situation in which a conventionally trained anaesthesiologist experiences difficulty with facemask ventilation of the upper airway , difficulty with tracheal intubation , or both. " a complete definition would include airway instrumentation (eg: with supraglottic airway devices), direct tracheal access and consideration of airway at extubation[1]. The incidence of failed intubation is ~ 1 in 1-2000 in elective setting.[2,3]~ 1 in 300 during rapid sequence induction (RSI) in obstetric setting,[4] and ~1 in 50-100 in emergency department,[5] ICU[6] and prehospital setting[7].

Prediction of difficult endotracheal intubation is still a challenge for anaesthesiologists. Numerous investigators have attempted to predict difficult intubation by using simple bedside physical examination. Many preoperative airway assessment tests such as interincisor gap , Mouth opening , Mallampatti grading , head and neck movement , horizontal length of mandible, sternomental distance, and thyromental distance are used to predict difficult intubations but, sensitivity and positive predictive value of these individual tests are low while false positive results are high.

Difficult visualization of larynx was observed in individuals whose neck was situated deep in the chest i.e with a sloping clavicle ; therefore to consider a bedside test based on surface anatomy is suggested. It was observed that portion of the arm chest junction above the level of suprasternal notch might be used as an indicator to estimate difficult visualization of larynx.

Therefore we designed this prospective observational, blind study of predictive value of AASI as predictor in assessment for difficult laryngoscopy and intubation.

MATERIALS AND METHODS

After ethical committee approval and written informed consent, 200 patients aged 18-60 years with American society of anaesthesiologists' grade I/II, posted for elective surgeries under general anaesthesia through endotracheal intubation were enrolled in this prospective single centre observation study. The study period was from March 2017 to March 2018. Patients with obvious anatomical abnormality, upper airway abnormality (tongue tumour, maxillofacial tumor or fracture, history of recent head and neck surgery, obstretic patient, obese patient and inability to open mouth were excluded from the study.

Each patient underwent physical examination prior to surgery and AASI and Thyromental distance were assessed. The patients were lying in supine position and their upper extremities resting by the sides of the body, AASI calculated based on following measurements: (1) using a ruler, a vertical line was drawn from top of the acromion process to the superior border of the axilla at the pectoralis major muscle (line A). (2) A second line will be drawn perpendicular to line A from suprasternal notch (line B). and (3) the portion of line A that lay above the point at which line B intersects line A will be line C as shown in figure 1. AASI was calculated by dividing the length of line C by that of line A. Thyromental distance was measured from bony point of mentum to thyroid notch while the head is fully extended with mouth closed b.After the patient's arrival in the operating theatre, patients were monitored with electrocardiography, non invasive blood pressure and pulse oximetry. An intravenous line using 18G cannula was secured on non dominant hand and infusion of Ringer lactate was started and non invasive monitoring continued, patients were premedicated with inj. Midazolam 0.05mg/kg , injection glycopyrollate 0.01mg/kg , Injection fentanyl

2 mcg/kg. After preoxygenation for 3 minutes with 100% oxygen, general anaesthesia was induced with injection propofol 2mg/kg slowly. The end point of induction is taken as loss of eyelash reflex. Suxamethonium 2mg/kg IV is used for intubation in all the patients. A skilled anaesthesiologist, who was blinded to the predictors measured carried out laryngoscopy and evaluated the laryngeal view in terms of Cormack lehane grading system; grade I- full view of glottis; grade II- only posterior commissure of laryngeal aperture seen, grade III- only epiglottis seen, grade IV- only soft palate seen.[8] Grade I and II are considered easy visualization of the larynx (EVL) and grade III and IV as difficult visualization of the larynx (DVL).[9]

The sample size was calculated on consultation with the statistician and was based on similar study observations,[10] indicating that approximately 200 patients should be included in each group in order to ensure a power of 80 and 90% confidence interval with 7% absolute precision/error. Data was analysed with statistical package for social science (SPSS) 21.0 software (IBM Carporation, USA). Quantitative variables like age are compared using student t test and chi-square test was used for qualitative variables. Sensitivity, specificity, positive and negative predictive values of thyromental distance and AASI were calculated. Airway under curve (AOC) was computed for both AASI and TMD. A p value of <0.05 was taken as statistically significant.

RESULTS

In this present study, data of reference and index test parameters of 200 patients are presented. The demographic parameters are presented in table 1. Among the patients 85 % were females. There was no statistically difference in DVL and EVL groups in terms of demographic characteristics. Sensitivity, specificity, positive and negative Predictive values are represented in table 2. Sensitivity of AASI is more (62.5%) than TMD (31.5%) as shown in table 3. AASI had high predictive value (52.63%) when compared to TMD (11.63%). Comparison of ROC and AUC of AASI and TMD is presented in figure 2 and 3, the AUC of AASI (0.79) is more when compared to TMD (0.55). A cut off point of >0.5 was taken on the basis of best results between false and true positive cases.[11]

DISCUSSION

It is very crucial for anesthesiologist to identify the probable difficulty for intubation to prevent morbidity and mortality as difficult laryngoscopy and intubation, can have a major consequences in terms of mortality and morbidity[12]. Many studies and meta-analysis have attempted to determine the best single predictor or combination of methods for predicting difficult intubation.[13,14,15,16]AASI is a unique predictor of difficult laryngoscopy as it does not measure any parameter in head and neck region While measuring AASI, the part of the neck which is situated deep into chest is quantified.[11]The size of the trait is predictably associated with the shape,[17] it is postulated that AASI will provide information about sizeband shape of airway even though it does not involve structures in and around airwa .[11] In Kamranmanesh et al study, AASI had the higher predictive value in comparison with MMT with cut off point of less than 0.5. In study conducted by mohammed et al, AASI with cut off point ≤ 0.6 was reliable predictor for prediction of difficult laryngoscopy.

Thyromental distance is considered to be an indicator of mandibular space.[18] This test also reflects whether displacement of the tongue by the laryngoscope blade will be easy or difficult. Shiga et al showed that the positive likelihood ratio improved from 3.4 to 4.1 when cut off criterion of 6.0 cm was considered[19] Our study showed that the incidence of DVL is about 8 % which comparable with previous studies.[20,21,22,23] This difference can be due to differences in anthropometric features, head position, degree of muscle relaxation and cricoids pressure application. In par with the study conducted by mohammed et al, our study showed that the AASI had the highest specificity, positive likelihood ratio, PPV and NPV in comparison TMD. The AASI on its own is not dependent to patient position and it shows the intra-thoracic indexes. Advantages of AASI are the use of an inexpensive and easy applicable instrument for this measurement Limitations of our study are our results are not applicable obstetric patients, infants and morbid obese patients. We have studied only two parameters AASI and TMD for predicting difficult airway. Many more parameters are yet to be compared individually and analysed with AASI for better results.

CONCLUSION

AASI >0.5 is a good predictor of difficult visualisation of larynx at direct laryngoscopy when compared to thyromental distance in Indian population.

Table 1 : Demographic Characteristics Of The Patients

Variable	EVL (n= 184)	DVL (n=16)
Gender (M:F)	107:77	8:8
Age	37.53	37.68
Height	160.83	158.68
Weight	59.37	57.68

Table 2 : Sensitivity, specificity, positive and negative predictive value of airway assessment tools

Airway assessment tools	Sensitivity (95 %CI)	Specificity (95%CI)	Positive predictive value(95% CI)	Negative predictive value (95%CI)	AOC (95%CI)
AASI (>0.5)	62.5(35.4-84.80)	95.11(90.92-97.74)	52.63(95% CI)	0.39(..21-0.74)	0.79(0.72-0.84)
TMD(<6.5 cm)	31.25(11.0-58.6)	71.35(72.77-84.95)	11.63(3.9-25.8)	0.87(0.62-1.22)	0.55(0.48-0.62)

Table 3: Comparison Of Aasi And Tmd With Respect To Laryngoscopic View.

		Laryngoscopic view		
		DVL	EVL	Total
AASI	0.49 or more (DVL)	10	9	19
	<0.49 (EVL)	6	175	181
	Total	16	184	200
TMD	<6cm (DVL)	5	38	43
	6cm or more (EVL)	11	146	157
	Total	16	184	200

Figure 1; The method of measurement of acromio-axillo-suprasternal notch index (AASI). A = The line was drawn from acromion to the upper axillary fold parallel to the longitudinal axis of body; B = The line was drawn perpendicular to the line A as passing from the lower part of suprasternal notch; C = The part of line A which located above the intersection line A with line B. [12]

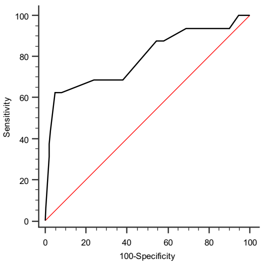
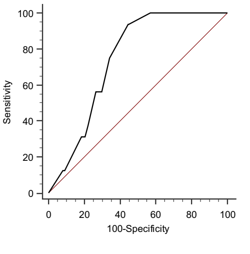


Figure 2: ROC curve of AASI (acromioaxillosuprasternal notch index) index



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