

RESEARCH ARTICLE

ACROMIO-AXILLO-SUPRASTERNAL NOTCH INDEX [AASI] : A SCREENING METHOD TO PREDICT DIFFICULT LARYNGOSCOPY IN PATIENT UNDERGOING GENERAL ANAESTHESIA AND REQUIRING ENDOTRACHEAL INTUBATION

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Manuscript Info	Abstract
<i>Manuscript History</i> Received: 28 August 2021 Final Accepted: 30 September 2021 Published: October 2021	Introduction and Aims: Difficult laryngoscopy [poor visualisation of larynx] is a surrogate indicator of difficult intubation and inability to manage difficult visualisation of larynx (DVL) can be life threatening. This study is performed to assess the ability of new index –Acromio - Axillo-Suprasternal Notch Index to predict difficult laryngoscopy in
<i>Key words:-</i> AASI, Difficult Visualisation of Larynx	patient undergoing general anaesthesia in addition to other common
	 Material and Methods: 100 patients with ASA class I and II candidate for general anaesthesia with endotracheal intubation were enrolled to this study. The four usual tests Modified MallampatiTest[MMT], Ratio Of Height to Thyromental Distance[RHTMD], Neck Circumference/Thyromental distance, Sternomental distance difference were assessed before induction of anaesthesia. The new test AASI is calculated as follow: 1) Using a ruler a line is drawn vertically from the top of the acromion process to the superior border of the axilla at the pectoralismajor muscle named as line A. 2) A second line is drawn perpendicular to line A from the suprasternal notch (line B); and 3)That portion of line A that lies above where line B bisects line A is line C. AASI is calculated from the length of line C divided by line A[AASI = C/A]. By a skilled anaesthesiologist with more than 5 years of experience & who was unaware of the study, A laryngoscopy was done and based on Cormack-Lehane classification, grading of laryngoscopy was recorded. Sensitivity, specificity, positive predictive value and negative predictive value with 95% Confidence Interval for each airway predictor in isolation was studied. Results: DVL observed in 12% patients. We observed that sensitivity,specificity,PPV,NPV,AUC of Roc[95% confidence interval] of AASI was 80%[44.4-97.5%], 95.56%[89-98.8%],66.67%[42.22-84.6%],97.7%[92.6-99.33%],0.985[0.898-0.988]respectively & these results are better than other conventional methods of difficult airway predictors. Conclusion: AASI more than or equal to 0.5 is a good predictor of difficult visualisation of laryng (DVL) at direct laryngoscopy.
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Introduction:-

Difficult laryngoscopy was defined by ASA Task force as occurring when " It is not possible to visualize any portion of the vocal cord with conventional laryngoscopy."¹ Incidence of difficult tracheal intubation is about 1.5-20%. The risk of hemodynamic complications was directly related to number of laryngoscopic attempts.² There are different clinical predictors of difficult airway have been proposedbut none reach the sensitivity and specificity that practicing anaesthesiologist desires. Difficult visualization of larynx (DVL) was observed in individuals whose neck was situated deep in the chest (i.e. with a sloping clavicle)^{3,4}. The portion of the arm-chest junction above the level of suprasternal notch might be used as an indicator to estimate DVL. This study was aimed to evaluate the predictive value of a new index (AASI) and compare it with a conventional predictor of airway assessment. The hypothesis for this study was that AASI more than or equal to 0.5 will predict DVL.

Methodology:-

After taking written informed consent, 100 patient scheduled to undergo elective surgery and requiring endotracheal intubation were enrolled in this study. Study Design - It is a prospective, observational, single centre study. Study period - March 2019 to August 2019. Inclusion Criteria- Patient aged 18-65 years, ASA Grade I & II, Patient undergoing elective surgery. Exclusion Criteria- Anatomical abnormality of head, neck & thorax, Cervical spine abnormality, Obese patient (BMI > 30 kg/m2), Obstetric patient, Restricted mouth opening/ inability to open mouth, Patient with oral pathology(mass/ tumour), ASA III and IV Patients.

Each patient underwent physical examination before surgery & airway assessment tests –Acromio-axillosuprasternal notch index (AASI),ModifiedMallampatiTest (MMT), Ratio Of Height to Thyromental Distance (RHTMD),Neck Circumference to Thyromental distance ratio (NCTMD),Sternomental distance difference (SMDD) and were assessed by the independent researcher who was not involved in subsequent study.

AASI was measured with the patients lying in supine position and their upper limbs resting by the sides of the body. Using a ruler, a vertical line was drawn from the top of the acromion process to the superior border of the axilla. Then a second line was drawn perpendicular to line A from the suprasternal notch. The portion of line A that lie above the point at which line B intersected line A was termed as line C.AASI was calculated by dividing the length of line C by that of line A (AASI = C/A).

AIRWAY TESTS	CUT OFF VALUE FOR DVL
MMT	class III & IV
RHTMD	ratio more than 23.5
NCTMD	ratio more than 5.0
Sternomental distance (SMD) difference	Difference less than 5 cm
AASI	more than or equal to 0.5

 Table 1:- Cut off value of assessed test.

All patient received premedication Inj. Glycopyrrolate 4mcg/kg, Inj. Ondensetron 0.08mg/kg, Inj.Midazolam 0.02mg/kg and analgesic Inj. Fentanyl 2mcg/kg.Induction done with Inj. Propofol 2 mg/kg as starting dose and then subsequently titrated to loss of eye lash reflex.Direct laryngoscopy and tracheal intubation were facilitated with Inj. Succinylcholine 2mg/kg.

With the head in the sniffing position, direct laryngoscopy was performed with Macintosh laryngoscope blade 3 by an anaesthesiologist with more than 5 years of experience and was masked to the airway parameters measured. The laryngeal view was graded according to the Cormack and Lehane grading system .⁵Sensitivity, specificity, positive and negative predictive values were calculated for MMT, AASI, RHTMD,NCTMD,SMDD with 95% confidence interval (CI) using laryngoscopic view as gold standard. Receiver operating characteristics (ROC) curves with calculation of area under the curve (AUC) were also computed for the airway predictors.

Observations:-

In this present study, data of 100 patients are presented. There was no statistically significant difference among the difficult and easy visualisation of larynx groups in terms of demographic parameters. 12% patient had difficulty in visualisation of larynx(DVL).

Variables	EVL(n=88)	DVL(n=12)	P value
Gender	M=40 F=48	M=6 F=6	
Age	35.61+/-12.66	42.04+/-13.06	0.534
BMI	20.20+/-1.56	22.32+/-1.04	0.628

Table2:- Demographic character.

Result:-

Airway assessment	Sensitivity	Specificity (95%CI)	PPV (95%CI)	NPV (95%CI)
tests	(95%CI)			
	80(44.4-97.5)	95.56(89-98.8)	66.7(42.2-84.6)	97.7(92.6-99.3)
AASI				
	66.67(34.9-90.1)	88.51(79.9-94.3)	44.4(28.3-61.9)	95.1(89.6-97.7)
NC/TMD				
	58.33(27.7-84.8)	91.95(84.1-96.7)	50(29.8-70.2)	94.1(89.1-96.9)
RHTMD				
	66.7(34.9-90.1)	90.91(82.9-96.0)	50(31.6-68.7)	95.2(90.0-97.8)
MMT				
SMD DIFFRENCE	75(42.8-94.5)	87.50(78.7-93.6)	45(30.1-60.9)	96.2(90.6-98.6)

Table 3:- predictive value of airway assessment tests.



 Table 4:- ROC Curves of Airway Predictors.

AIRWAY PREDICTORS	AUC(95%CI)
AASI	0.958(0.898-0.988)

NC/TMD	0.874(0.792-0.932)
RHTMD	0.812(0.721-0.884)
MMT	0.784(0.691-0.860)
SMD DIFFRENCE	0.897(0.820-0.949)

 Table 5:- AUC Values of airway predictors.

Discussion:-

In our study, AASI has best for prediction of DVL among MMT, SMDD, RHTMD and NCTMD. Our finding coincide with the previous research findings on AASI. Sensitivity and specificity of AASI vary across different studies. Kamranmanesh et al.⁴ compared the AASI with MMT.AASI (<4.9) sensitivity & specificity of AASI 78.9(62.2-89.9) & 89.4(86.5-91.7) respectively & which is higher in comparison with MMT. Rajkhowa et al. ⁵ compared AASI with MMT, SMD, TMD and IID. Sensitivity & specificity of AASI (cut off ≥ 0.5) 81.25 (53.69-95.03), 96.7 (94.39-98.11) respectively & found to better than other studied parameter. Although not detailed by Kamranmanesh et al., Rajkhowa et al. present the probable anatomical basis of this index.Jitendra Singh Shekhawat et al⁷ compared AASI with MMT and AASI was 92% sensitive and 97.71% specific in predicting difficult intubation and Area Under Curve (AUC) of AASI was 0.97 with cut-off value >0.49 as a predictor of difficult intubation.

Acromion process is at the lateral most end of the clavicle. The line joining acromion process and superior border of axilla (Line A) represents the 'arm chest junction'. The Line A can be regarded as a representative measurement of the portion of the 'chest' that continues as the arm. On the ventral side, the 'neck' extends caudally to the clavicles and suprasternal notch. Suprasternal notch lies cauded to acromion. Thus, the length from 'acromion process to suprasternal notch' may represent the 'part of neck' that lies 'deep in the chest'. To quantify the degree by which the 'neck is situated deep into chest', it is necessary to obtain the ratio C/A. Thus, the higher the C/A, the deeper the neck is situated into the chest.None of the previous studies has compared AASI with these parameters. Further studies are needed to understand the differences in prediction of difficult laryngoscopy of these parameters.

Our study has some limitations-The grading of laryngeal view was performed by different anaesthesiologists, Laryngeal view is influenced by many factors, namely, technique, posture while performing and height of operating table, inter-observer bias.

If the cut off value of AASI in our study is >0.48 then sensitivity and specificity would be 90 % and 86.67% respectively and if it is >0.52 then sensitivity and specificity would be 50% and 97.78% respectively.

We did not evaluate combination of different airway predictors. The aim of our study was to evaluate the sensitivity and specificity of a new screening index.

Conclusion:-

AASI (≥ 0.5) is a good to predict the difficult visualisation of the larynx at direct laryngoscopy than other predictors used in this study.e. MMT, RHTMD, NCTMD & SMDD.

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