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Original Research Article

Pre-Operative Airway Assessment in Patients Undergoing General Anaesthesia and Management of Difficult Intubation: A Randomised Nonblind Population Based Study

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Conflict of interest: Nil

Abstract:

Background: One of the most important causes of anaesthesia mortality and morbidity is the difficult airway. A screening test for prediction of difficult intubation must be rapid, easy to perform at the bedside and provide reliable result. The main goal of the study was to determine which airway assessment test and/or combination of tests was best at predicting difficult intubations.

Aims and Objectives: To assess the airway pre-operatively in patients undergoing general anaesthesia.

Methods: This observational, prospective study was performed on 80 consecutive adult patients with American Society of Anaesthesia (ASA) class I and II, of both sexes who required endotracheal intubation for elective surgeries under general anaesthesia. Informed written consent was obtained from all the patients. The following test were performed in all the patients during pre-anaesthetic checkup Mouth opening / Inter Incisor Gap, Neck Length, Neck circumferences, Mentohyoid distance, thyromental distance (TMD), sternomental distance (SMD), Modified Mallampati grading and Wilson's scoring system.

Result: Vertical neck length, Interincisor gao <5cm, sternomental distance <12.5cm were significant criteria for predicting difficult intubation. For modified Mallampati grading, the test was 80% sensitive and 84% specific. The false positive rate was 16% and positive predictive value was 25%. For Wilson risk score, the sensitivity was 100% and specificity was 86.6% while false positive rate was 13.3% and positive predictive value was 33.3%.

Conclusion: Our study concluded that the Wilson risk score is the most preferable for assessment of the airway and predicting difficult intubation.

Keywords: Airway Assessment, Modified Mallampati Grading, Wilson Scoring System, Positive Predictive Value, False Positive Rate.

Introduction

The major responsibility of the anaesthesiologist is to provide adequate ventilation for the patient by allowing an unobstructed flow of oxygen and gases to the alveoli. One of the most important causes of anaesthesia mortality and morbidity is the difficult airway. Unanticipated difficult intubations remain a major concern for anesthesiologists due to the potentially serious

consequences of failed endotracheal intubations [1]. Failure to maintain a patent airway for more than a few minutes' results in brain damage or death.[2] The prevalence of difficult laryngoscopic intubations is reported to range from 1.5 to 20% [3-5]. The identification of patients with difficult airways is crucial during preoperative evaluations [6]. A variety of tests are used to evaluate for a potentially difficult intubation in advance of the procedure [7,8]. Proper assessment leads to correct anticipation which helps one in planning ahead. A screening test for prediction of difficult intubation must be rapid, easy to perform at the bedside and provide reliable result. It is not clear; however, which test has the best predictive ability. Therefore, this prospective study was conducted to evaluate the accuracies of the Mouth opening / Inter Incisor

Gap, Neck Length, Neck circumferences, Mentohyoid distance, thyromental distance (TMD), sternomental distance (SMD), Young's modification of Mallampati grading and Wilson's scoring system. The main goal of the study was to determine which airway assessment test and/or combination of tests was best at predicting difficult intubations.

Aims and Objectives

To assess the airway pre-operatively in patients undergoing general anaesthesia

Materials and Methods

After approval from the institutional research Ethics Committee, this observational, prospective study was performed on 80 consecutive adult patients with American Society of Anaesthesia (ASA) class I and II, of both sexes who required endotracheal intubation for elective surgeries under general anaesthesia. Informed written consent was obtained from all the patients.

The following test were performed in all the patients during pre-anaesthetic checkup :

A) Anatomical Distances: Patient was asked to sit upright, with head in neutral position, following were measured in centimetre using a stiff measuring tape

1) Mouth opening / Interincisor gap: distance between upper and lower incisor teeth

2) Neck length: distance from thyroid prominence to sternal notch and from mastoid process to sternal notch

3) Neck circumference: at the level of cricoid cartilage

4) Mentohyoid distance: distance from mental prominence to hyoid bone with neck fully extended, divided into 3 grades
Grade I > 6 cm
Grade II 4-6 cm
Grade III <4 cm

5) Thyromental distance / Patils test: distance from thyroid notch to mental prominence with neck fully extended, patients were divided into 3 grades

Grade I > 6.5 cm
Grade II 6-6.5 cm
Grade III < 6 cm

6) Sternomental distance: distance from sternal notch to mental prominence with neck fully extended, difficult intubation < 12.5 cm.

B) Young's Modification of Mallampati Grading: Patient sitting upright, head in neutral position, asked to open mouth as widely as possible with tongue protruded. The Structures were noted by sitting in front of the patient with eye at the level of patient mouth. Patients were divided into 4 classes

Class I – Soft palate, posterior pharyngeal wall, uvula, faucial pillars visible
Class II – Soft palate, posterior pharyngeal wall, faucial pillars visible, uvula not visualized
Class III – Only soft palate visualized
Class IV – Only hard palate visualized

C) Wilson's Scoring System:

	Score
1 Weight	
< 90 kg	0
90 – 110	1
>110	2
2 Head and neck movement	
>90	0
90	1
<90	2
3 Jaw movement (interincisor gap)	
>5 cm	0
5 cm	1
<5 cm	2
4 Receding Mandible	
Normal	0
Mild	1
Severe	2
5 Buck Teeth	
Normal	0
Mild	1
Severe	2
Total	10

For anaesthesia, the same induction and intubation protocol was used for all patients. Routine monitoring of continuous electrocardiogram, blood pressure and pulse oximetry was done. All patients were induced with propofol in a dose of 2-3 mg/kg body weight. This was followed by muscle relaxant succinyl choline in a dose of 1.5 – 2 mg/kg body weight. After achieving adequate relaxation, the patient head was kept in the classic "Sniff position" to align the oral, pharyngeal and laryngeal axes. The head is raised using a head support, flexed at the lower cervical spine and extended at the atlanto-occipital joint. The anaesthetist eyes was kept at the oropharyngeal plane of the patient. The anaesthetist performing the laryngoscopy had an experience of two years and the study cases were done under the guidance of a senior anaesthetist.

Laryngoscopy was done with an adult Macintosh laryngoscopy with curved blade. The distal end of the curved blade is advanced into vallecula and forward and upward force is exerted along the axis of the laryngoscope blade. This serves to elevate the epiglottis and expose the glottic opening. Visualisation obtained by laryngoscopy was recorded according to Cormack and Lehane grading-

Grade I – Full view of glottis

Grade II – Visualisation of posterior portion of glottis

Grade III – Visualisation of epiglottis only

Grade IV – Visualization of soft palate only

Result

A total of 80 patients with age group of 16-65 years of either sex belonging to ASA grade I & II who were scheduled for elective surgical procedures requiring general anaesthesia with endotracheal intubation were enrolled in this study. Statistical analysis showed no significant correlation with difficult laryngoscopy with respect to age, sex and weight of the patients. Oblique neck length, neck circumferences, Mentohyoid distance <4cm and thyromental distance <6.5 cm were not significant criteria for predicting difficult intubation (table 1). Vertical neck length, Interincisor gao <5cm, sternomental distance <12.5cm were significant criteria for predicting difficult intubation (table 1& 2). For modified Mallampati grading, the test was 80% sensitive and 84% specific. The false positive rate was 16% and positive predictive value was 25%. For Wilson risk score, the sensitivity was 100% and specificity was 86.6% while false positive rate was 13.3% and positive predictive value was 33.3%. (table 3)

Table 1: Showing the mean and standard deviation (SD) in patient characteristics for easy and difficult laryngoscopy

Variable	Easy (n=75)		Difficult (n=5)		Test of significance (p<0.05)
	Mean	SD	Mean	SD	
Age (yrs)	39.6	13.55	44.4	5.85	1.57
Weight (kg)	50.98	10.87	53.6	22.07	0.26
Vertical Neck length	**10.5**	**2.04**	**7.2**	**1.95**	**2.77 (.0007)**
Oblique neck length	16.42	1.75	16.8	2.41	0.27
Neck circumferences	33.94	3.3009	34.8	2.41	0.75
Mouth opening	**5.08**	**0.8791**	**2.9**	**1.14**	**4.364 (.000)**
Mentohyoid distance	7.038	1.249	7.00	1.1726	0.22
Thyromental distance	10.59	1.67	10.4	1.635	0.136
Sternomental distance	**16.95**	**2.21**	**14.3**	**2.01**	**4.561 (.010)**

Table 2: Showing the distribution of easy and difficult laryngoscopy with interincisor gap above and below 5 cm

Intubation	Interincisor gap		
	<5cm	**>5cm**	**Total**
Difficult	5	0	5
Easy	39	36	75
Total	44	36	80

Table 3: Showing the distribution of Modified Mallampati grading, Wilson risk score and laryngoscopic view

	Mallampati grade			Wilson risk score intubation		
	Difficult	Easy	**Total**	Difficult	Easy	**Total**
Difficult (III & IV)	4	2	**16**	5	10	**15**
Easy (I &II)	1	63	**64**	0	65	**65**
TOTAL	5	75	**80**	5	75	**80**

Discussion

The significance of difficult or failed tracheal intubation following laryngoscopy is well recognised as a cause of morbidity and mortality in anaesthetic practice. [9] If a screening test for difficult intubation is to be useful it must be performed on all patients who might need intubation, it must therefore be able to perform and also give reliable results. Many anatomic characteristics have been suggested as useful in assessing anticipated difficult tracheal intubation. Mallampati et all [10] showed in his study that if all 3 pharyngeal structures (fauces, uvula and soft palate) are visible, one can expect adequate exposure of larynx by direct laryngoscopy. But if faucial pillars and uvula are masked by base of tongue and only soft palate is visible, one should anticipated difficult intubation. Samson and young[11] found that their classification could be used to screen patients for difficult intubation. They considered those with class III & IV to be at risk whereas Class I & II should not pose any serious problems.

Management of difficult tracheal intubation in adults

The algorithm follows a step wise approach in the management of unanticipated difficult airway in adults (figure 1).

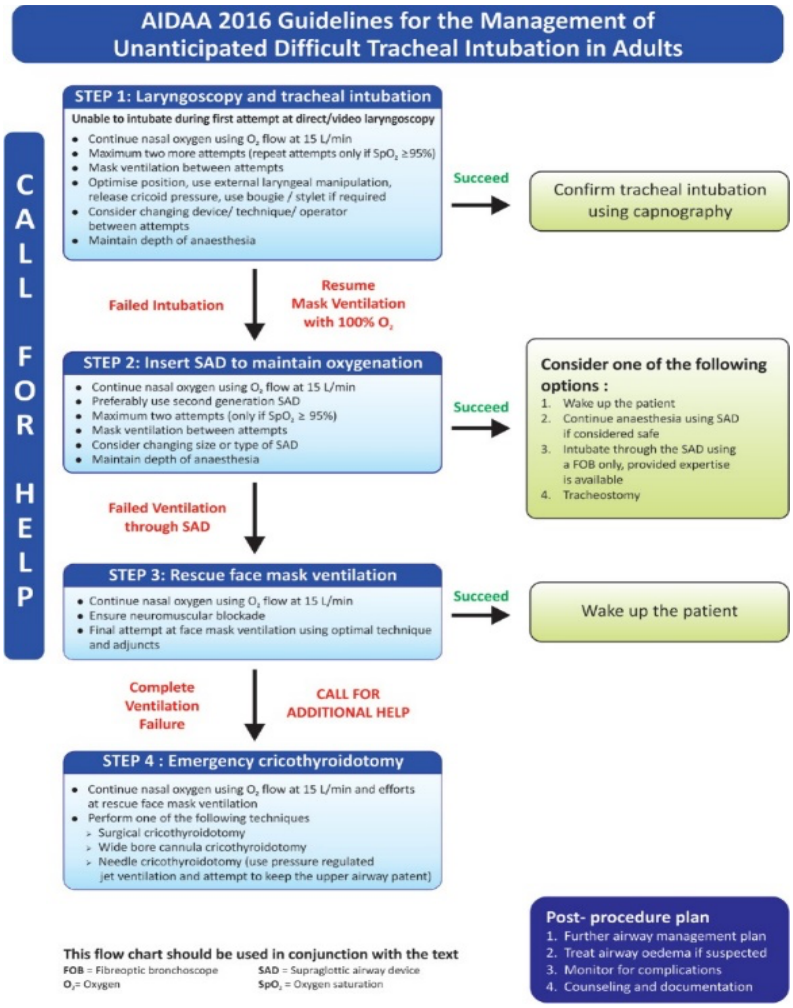

Figure 1

It is important to remember that while following any step in the algorithm, if the oxygen saturation is not maintained or starts rapidly falling one can bypass any step and even straightaway proceeding to emergency cricothrotomy [11,12].

Conclusion

Our study concluded that the Wilson risk score is the most preferable for assessment of the airway and predicting difficult intubation. However, some of the findings in this study were not always in accordance with the studies conducted earlier.

Limitation

The limitation of our study might include a small patient group size as compared to the original studies.

Declaration: None

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