INTEROBSERVER VARIABILITY FOR NON-INVASIVE PREDICTION OF DIFFICULT INTUBATION IN DIFFERENT YEARS OF ANESTHESIOLOGY RESIDENCY*

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Abstract

Background. The incidence of a difficult laryngoscopy/intubation, which could lead to failed intubation is in the range of 1.5%-13%. Failed intubation may lead to hypoxia, brain damage or death. Preoperative evaluation of the airway can be accomplished by non-invasive bedside clinical tests during physical examination. We studied interobserver variability for non-invasive prediction of difficult intubation in different anesthesiology residency years.

Methods. Three hundred eighty four adult patients undergoing elective surgery with general anesthesia and endotracheal intubation were enrolled this study. The investigators were divided in to two groups: three of them were in 4th (Group 1) and the other three were in 1st (Group 2) year of their anesthesiology residency. The variables evaluated were age, weight, height, submental-cervical angle, measurements of mandibular space, deviation of trachea, jaw-hyomental distance, swelling or scar tissue at neck, limited mouth opening, small mouth cavity, macroglossia, cleft lip-palate, long teeth and modified Mallampati score.

Results. The incidence of difficult intubation is %4.9. Group 1 is more successful than Group 2 in predicting difficult intubation.

Conclusions. Regarding Mallampati score, measurements of mandibular space, jaw-hyomental distance, mouth opening and mouth cavity; interobserver variability is detected in predicting difficult intubation among different years of anesthesiology residency. In means of submental-cervical angle, tracheal deviation, swelling or scar tissue at neck and macroglossia, similar results which are statistically significant, are obtained.

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Introduction

Predicting difficult airway is one of the most important responsibilities of an anesthesiologist and the incidence of a difficult laryngoscopy/intubation, which could lead to failed intubation range between 1.5% to 13%[1-5]. Failed intubation can cause hypoxia, brain damage or death[6]. Problems in the airway management can be predicted based on previous anesthesia records, the medical history of the patient and a physical examination[1]. Difficult mask ventilation can be a sign of difficult intubation[7].

American Society of Anesthesiology Closed Claims study provided that large percentage of claims is about respiratory adverse events. Difficult intubation is one of the most common reasons leading to injury[8]. Death or brain damage occurred in 85% of cases[6-9]. This respiratory adverse events ratio decreased in 19931999- (%35) compared with 19851992[10]-. Some preoperative test and examination methods are expected to predict difficult intubation with high sensitivity-specificity and positive predictive value. But there are some disadvantages like inter-observer difference and deficiency of common consensus[11].

Preoperative evaluation of the airway can be accomplished by some measurements of the non-invasive bedside clinical test during physical examination. The aim of this study is to investigate whether an interobserver variability exists in different years of anesthesiology residency concerning certain measurements of non-invasive prediction of difficult intubation.

Methods

A written informed consent was received from 384 adult patients (i.e. older than 18 years old) who will undergo elective surgery with general anesthesia and endotracheal intubation between 2-6 November 2010. The patients have no airway pathology. The study protocol was approved by Ethics Committee of Hacettepe University on 23 July 2010 (Protocol number: HEK 10/47 642) (Chairperson of the ethics committee: Prof.Dr.Rustu Onur).

Preoperative evaluation of the patients was performed by investigators using a standard sheet. The variables evaluated were age, height, weight, and measurements of submental-cervical angle, mandibular space, jaw-hyomental distance, mouth opening and cavity. In addition existence of deviation of trachea, swelling or scar tissue at neck, macroglossia, cleft lip-palate and long teeth were recorded. Modified Mallampati score were obtained from each patient; and class III and IV were predicted as candidates for difficult intubation.

Measurement of mandibular space is the straight distance from the angle of mandibula to the symphysis-menti[12]. Reference point hyomental distance is body of the hyoid bone and symphysis of mandibula[13]. Interincisor gap is measured between the maxillary and mandibular incisors in the midline with the mouth fully opened and with the head neutral position[3,5,14]. Interincisor gap is graded by distance measured: grade1 = <3.5 cm, grade2 = 3.5-5 cm, grade3 = >5 cm.

Although the prognostic value is poor, Mallampati score is one of most commonly used bedside tests for predicting difficult intubation. It is determined by inspecting the oral cavity of the patient. Recommended test way is the patient in sitting position, the head in extension position, the tongue protruded outside the mouth without phonation, with maximal mouth opening[15]. Score evaluate the visibility of the base of uvula, faucial pillars (the arches anterior and posterior to the tonsils). Also head and neck mobility is important for the score but not included[2]. In 1985 Mallampati et.al reported three class score based on oropharyngeal anatomical structure[16]. Then in 1987 Samsoon ve Young reported Modified Mallampati score[17]. The modified Mallampati test was better at predicting tracheal intubation than original[1,5,16,18]. Sensitivity was 0.55 and the overall specificity was 0.84[18]. Class III and IV Mallampati have a high positive predictive accuracy for identifying difficult intubation[18].

Modified Mallampati classification (is based on visibility of oropharyngeal anatomical structure)[17]:

Class I: Soft palate, fauces, uvula, pillars;

Class II: soft palate, fauces, portion of uvula;

Class III: soft palate, base of uvula;

Class IV: hard palate only.

The investigators participated in this study were divided in to two groups: three of them were in 4th (Group 1); the other three were in 1st (Group 2) year of their anesthesiology residency. Preoperative visit of each patient was performed both physicians from each group, at different time points.

The patients did not receive any premedication. Anesthesia was induced by combination of propofol, fentanyl and rocuronium. Then orotracheal intubation was performed by the same anesthesiologist who was at the 4th year of their residency. Endotracheal tube size, necessity of guide usage during intubation, difficulty in mask ventilation-intubation was evaluated by using standardized anesthesia sheets prospectively. Intubation in more than three attempts or total duration of 10 min was defined as difficult intubation[19].

Before the study we made a pretest for 20 patients to calculate kappa and power. Then by using PASS 2008 program we provided minimum 250 sample size was enough for the study. The statistical analysis was performed by using SPSS 18.0. Mallampati scores of patients attributed by Group 1 and Group2 were compered by using weighted kappa. Due to different prevalence, other test results were compared with PABAK kappa (prevalence-adjusted, bias-adjusted κ)[20]. Predicting difficult intubation is compared by using ROC curvey.

Results

Three hundred eighty four patients (n = 384) were included in the study. Demographic data of the patients is shown in table 1.

Table 1

Demogrphic data of the Patients. Data are given as mean ±

Variable	
Age (year)	51.12 ± 15.96
Weight (kg)	73.67 ± 15.33
Height (m)	1.64 ± 0.085
Body Mass index (kg/m^2)	27.47 ± 5.84

Weighted kappa was 0.942 (p: 0.00) for Group 1, which indicates a very good agreement among the residents in Group 1. Weighted kappa was 0.922 (p: 0.00) for Group 2, which also indicates a very good agreement among the residents in Groups 2.

Mallampati scores of patients evaluated by Group 1 (4th year residents) and Group 2 (1st year residents) are compared at the table 2. Weighted kappa between two groups is 0.2328 which points out low correlation between the groups. Standard error is 0.0397 and p <0.001.

Table 2

Comparison of Mallampati scores according to groups

		Group 1 Mallampati score				Total
		1	2	3	4	
Group 2 Mallampati score	1	278	14	8	1	301
	2	43	11	5	2	61
	3	9	5	0	2	16
	4	3	2	1	0	6
Total		333	32	14	5	384

Intubation was difficult in 19 patients (4.9% of all patients) and 10 of who were obese. Prevalence of difficult intubation in obese patients is 9.5%. Guide usage was necessary in 21 patients and 12 of them is difficult intubation.

ROC curve was used to compare determination of difficult intubation. Area under the Group 1's ROC curve was 0.806 (± 0.066) and the Group 2 curve was 0.758 ± (0.065). Although Group 1 is more successful than Group 2 both groups can be considered successful in predicting difficult intubation, as long as both groups predicted 13 of 19 difficult intubation patients.

Statistically significant similar results were obtained in both groups in means of determining submental-cervical angle, tracheal deviation, swelling or scar tissue at neck and macroglossia (p <0.05). Results of measurements mandibular space, jaw-hyomental distance, mouth opening, mouth cavity size were also similar in both groups statistically not significant (p >0.05). Agreement on existence cleft lip-palate and long teeth were 100%.

Discussion

Predicting difficult airway is one of the most important priorities of an anesthesiologist. Curtain non-invasive bedsides tests are used in order to predict difficult intubation. Interobserver difference is one of disadvantages of these tests. In this study, it is detected that results of Mallampati score has low correlation between two different groups of residents. There is interobserver variability due to different anesthesiology residency years in Mallampati score and similarly in predicting difficult intubation. In spite of this, similar results were obtained in both groups in means of determining submental-cervical angle, tracheal deviation, swelling or scar tissue at neck and macroglossia.

There are various studies in large populations using different bed-side predictive tests for difficult intubation[2,4,21]. Interobserver Mallampati score variability was similar to previous demonstrated between two anesthetist[11,22] and between nurse and anesthetist[14]. Karkouti et al. studied interobserver reliability of ten tests for predicting difficult tracheal intubation with one rater for each group. Similarly Hilditch et.all studied interobserver reliability with one rater for each group.

Interobserver variability depends on factors like poor communication between anesthesiologist and patient, poor instruction and unknown technique. Already Mallampati test has complicated and modified maneuvers. Already in our study interobserver Mallampati score variability was obtained like in other studies. Unlike previous studies, interobserver agreement between was very good in both groups. But despite of having same education program at the beginning of anesthesiology residency, agreement between two groups was fair. This might be related to the different level of experiences of the groups. The other studies do not mention about the rater's experience. On the other hand both groups predicted difficult airway successfully. This may suggest that, factors other than Mallampati score, also influences the decision of the raters on predicting difficult intubation. Another interesting point in our study is that, the total number of patients with scores of Mallampati III and IV (indicating difficult intubation) was similar between two groups (19 to 22).

In our study the incidence of difficult intubation was 4.9 %, which was comparable to the literature. However Bilgin et. al found 8% incidence of difficult intubation in their study with Turkish population[5].

All anesthetists studied lessons about predicting difficult intubation and non-invasive bedside tests at the beginning of their residency. However in our study, we showed that experience of anesthetist effects tests results.

The study of Karkouti et. al suggested more than two raters for excluding variability due to rater factors[11]. Because of this, in our study we accepted three anesthetists for each group. At the same time larger sample size was compared to previous studies investigating interobserver variability for prediction of difficult intubation.

One negative aspect of our study was the lack of laryngeal view grade of laryngoscopy.

In our study, unlike previous studies, we accepted more than one rater for each group and our study revealed very good agreement among raters of the same group, although the agreement between groups with different experience groups was fair. Despite that, both groups predicted difficult intubation successfully. This indicates that other factors than Mallampati score, also play an important role when assessing and predicting difficult airway.

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