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Mallampati and Thyromental Tests to Predict Difficult Intubation

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Two preoperative tests for prediction of difficult intubation are assessed. In this study a Mallampati test and a measurement of thyromental distance were performed at the preoperative visit of 379 patients whose tracheas were subsequently intubated under general anesthesia. These tests for prediction of difficult intubation had poor sensitivity and positive predictive value, but high specificity and negative predictive value. We concluded that these tests are of little value in predicting difficult intubation in adults, although the likelihood of an easy endotracheal intubation increases when they yield negative results.

Key words: Intubation, Mallampati, thyromental distance

INTRODUCTION

Every practitioner, no matter how skilled, will encounter patients who are unexpectedly difficult to intubate (Miller, 2000). The incidence of a difficult laryngoscopy, or intubation varies from 1.5 to 13% and failed intubation has been identified as one of the anesthesia-related causes of death or permanent brain damage (Randell, 1996). Any test which can predict difficult intubation at the preoperative visit may save lives, as a result of planned use of local or regional techniques, or by allowing time to organize special procedures such as fiberoptic laryngoscopy.

With use of special clinical tests such as mallampati and measurement of thyromental distance we can predict, to some extent, difficult intubation.

In first test pharyngeal structures and in second test, measurement of distance between prominence of thyroid cartilage and tip of mentum are used Frerk (1991). After induction of anesthesia and laryngoscopy the best obtained view is noted according to cormack classification. This classification has four grades that grades III and IV of laryngoscopy constitute blind intubation and is accounted for 50% risk of esophageal intubation (Samsoun and Yong, 1987).

While in various studies, sensitivity and specificity of these two tests differ in various studies and have had high false positive rates and because of the importance of diagnosing the difficult intubation cases before surgery, this study was designed to determine the sensitivity of mallampati and thyromental tests to identify the value of these tests in those patients who are at risk of difficult intubation.

MATERIALS AND METHODS

This study was performed in Matini hospital of Kashan (Islamic Republic of Iran) in 2003. Three hundred and seventy nine adults (179 males, 200 females and aged 18-85 years) who required tracheal intubation as a part of their anesthetic procedure were assessed preoperatively using these two tests. The first test was a mallampati test. The seated patient opened his mouth as wide as he could and protruded the tongue as far as possible, while the observer was looking the patient's eye level and inspecting the pharyngeal structures with a torch. This view was then classified to 4 classes; Class I: soft palate, uvula and pillars are visible, Class II: pillars obscured by base of tongue but posterior pharyngeal wall is still visible below soft palate. Class III: only soft palate could be viewed. Class IV: soft palate could not be seen. The second test performed at the preoperative visit was

the measurement of thyromental distance with head fully extended. The distance is measured between the prominence of the thyroid-cartilage and the boney point of the chin. Patients with Classes III and IV mallampati and/or thyromental distance less than 6 cm were considered at risk of difficult intubation. Patient's age, sex, weight and height were noted. After induction of anesthesia with sodium thiopental (5 mg kg⁻¹) and use of succinylcholine (1.5 mg kg⁻¹) for neuromuscular blockage, laryngoscopy was performed and the best view of glottis was noted according to cormack grading (grade 1, vocal cords are visible, grade 2, only arytenoids or posterior commissure are visible, grade 3, only epiglottis is visible, grade 4, no glottic structures are visible). Patients whom their cormack grade was 3 and 4 were considered to have difficult intubation.

The sensitivity and specificity of these tests were determined by comparing the mallampati class and the thyromental distance related to cormack grading.

RESULTS

Out of the 379 patients, 29 difficult intubation cases were found. Ninety two patients had III and IV mallampati classes and 51 had thyromental distance less than 6 cm. between males there were 22.9% III and IV mallampati classes and 6.14% thyromental distance less than 6cm and 7.8% difficult intubation. Between females there were 25.5% III and IV mallampati classes and for 20.1% thyromental distance was less than 6cm and 7.5% difficult intubation. The sensitivity, specifity, Positive Predictive Value (PPV), Negative Predictive Value (NPV) and accuracy of mallampati and thyromental distance are shown in Table 1.

We also studied the relation of BMI and difficult intubation. Patients were divided in 3 groups (Group 1 with BMI<18.5, Group 2 with BMI between 18.5-25 and Group 3 with BMI>25). The Incidence of mallampati III,

Table 1: The predictive values of Mallampati and Thyromental tests

Test	Sensitivity (%)	Specifity (%)	PPV (%)	NPV (%)	False		Accuracy (%)
					negative (%)	positive (%)	
Mallampati	37.9	76.9	12	93.7	62.1	23.1	73.78
Thyromental	17.2	86.8	9.8	92.7	82.7	13.2	81.48

Table 2: The frequency of patients based on III and IV Mallmpati's class, thyromental distance less than 6 cm, 3 and 4 cormack grading and BMI

BMI Test	BMI<18.5	BMI = 18.5-25	BMI>25	Sum
Mallampati = III, IV	7 (7.6%)	40 (43.5%)	45 (48.9%)	92 (100%)
Thyromental distance<6 cm	3 (6%)	23 (45%)	25 (49%)	51 (100%)
Cormack = 3, 4	2 (6.9%)	10 (34.5%)	17 (58.6%)	29 (100%)

thyromental distance less than 6 cm and difficult intubation in Group 3 (BMI>25) were more than other groups (Table 2).

DISCUSSION

In this study the incidence of difficult intubation was 7.65%, because of low sensitivity and PPV of mallampati test (37.9 and 12%, respectively) and also low sensitivity and PPV of thyromental distance (17.2 and 9.8%, respectively). These tests have limited the reliability of predicting the difficult intubation, but as a result of high specificity and NPV of these tests in some patients who are not at the risk of difficult intubation according to these tests, it could be deduced that the probability of easy intubation is high.

The incidence of difficult laryngoscopy or intubation varies from 1.5 to 13 %. Frerk (1991) has reported that the sensitivity and specificity of mallampati are 81.2 and 81.5%, respectively. He also reported that the sensitivity and specificity of thyromental distance are 90.9 and 81.5%, respectively. According to Frerk (1991) patients who are at the mallampati classes III and IV and / or whose thyromental distance is less than 7 cm, would have difficult intubation obviously.

Egan and Wong (1993) declared that thyromental distance and mallampati tests are probably the most practical and reliable methods for predicting difficult intubation preoperatively.

Butler and Dhara (1992) found that both assessments predicted less than two of three difficult intubation and high false positive rates.

Burgler *et al.* (1997) calculated the sensitivity and specificity of mallampati test 60 and 70%, respectively, that compare to this study this test is more sensitive but less specific.

Tse *et al.* (1995) used mallampati, thyromental distance and full extension of the head for predicting difficult intubation. According to their results these tests had low sensitivity and PPV but high specificity and NPV; they concluded that these three tests are of little value in predicting difficult intubation in adults, but by yielding the negative results the likelihood of an easy endotracheal intubation would be high.

Laplace *et al.* (1995) used mallampati and Wilson scores for predicting difficult intubation and accounted that with these criteria, less than 36% of patients with difficult intubation were detected with a high false positive rate (more than 75%) but a good NPV (more than 90%).

Another point in this research is the relation between BMI and frequency of difficult intubation. According to

this study, either the incidences of mallampati Classes III and IV and the low measured thyromental distance (less than 6 cm) and the frequency of difficult intubation in patients who had BMI>25 were more than other groups. The more BMI increases, the more difficult intubation becomes. Mandibular and cervical mobility can be decreased in the obese patients because of the increased amount of soft tissue. This limitation of motion can cause problems in air way maintenance and intubation of the trachea (Stoelting and Dierdorf, 2002)

CONCLUSIONS

The mallampati and the thyromental tests because of low sensitivity and PPV have low value in prediction of difficult intubations. This study was not concordant with the results of some other studies. However, data from literature show a great variability in the results of different studies. Many factors may affect the results - differences between the samples of patients, evaluation of mallampati test, protocols of induction and intubations or characterization of difficult intubation. However, because of high specificity and NPV of these tests and the capability of being performed at the bedside, we believe that these tests could be used before induction of anesthesia. The chance of an easy endotracheal intubation is high when the patients acquire negative results.

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