

# A prospective study for prediction of difficult intubation in apparently normal patients by combining modified mallampatti test and thyromental distance

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### Abstract

**Introduction:** Intubation and maintenance of the patient's airway is one of the most important steps in anaesthesia practice and a fundamental responsibility of the anaesthesiologist. Difficult intubation has been associated with serious complications particularly when failed intubation results.

**Materials and Methods:** This study will be conducted in Department of Anaesthesiology at Tertiary Hospital, Bangalore. It is multispecialty hospital having all specialties with very good number of case load. Hospital have highly equipped Anaesthesiology department. The study will include 300 Adult patients posted for elective surgical procedures under General Anaesthesia.

**Results:** Three hundred apparently normal ASA grade 1&2 adult patients in the age group 18 - 60yrs of either sex posted for elective surgical procedures were prospectively studied.

**DISCUSSION:** In earlier days anaesthesia was induced by anaesthetic vapours given through face mask. Due to inability to maintain a patent airway, adequate depth of anaesthesia for surgical procedures and its complication leading to morbidity and mortality led to development of safer anaesthetic practice by maintaining anaesthesia through endotracheal insufflation.

**Conclusion:** The present study has shown that the combination of modified Mallampatti test and thyromental distance is better than when used alone in predicting difficult intubation

**Keywords:** Intubation, thyromental distance, vecuronium, mallampatti grade.

### Introduction

Intubation and maintenance of the patient's airway is one of the most important steps in anaesthesia practice and a fundamental responsibility of the anaesthesiologist. Difficult intubation has been associated with serious complications particularly when failed intubation results. There is no universally accepted definition of difficult intubation. The American Society of Anesthesiologists (ASA) has defined difficult endotracheal intubation, as when proper placement of endotracheal tube with conventional laryngoscopy requires more than 3 attempts or more than 10mins. Similarly difficult airway is defined as a clinical situation in which a conventionally trained anesthesiologist experiences difficulty with mask ventilation or difficulty tracheal intubation or both. The ASA (American society of anaesthesiologists) closed claims database analysis of adverse respiratory events has found that vast majority of 85% airway related events involves brain damage or death, and as many as 1/3<sup>rd</sup> of deaths is attributed solely to anaesthesia due to inability to maintain patent airway. Difficult intubation is second most frequent proclaimed damaging event leading to anaesthesia malpractice claims. Most catastrophes have occurred when possible difficult airway was not

recognized. Occasionally with a patient who has difficult airway, the anaesthesiologist is faced with a situation where mask ventilation is proved difficult or impossible. This is the most critical emergency that might be faced in the practice of anaesthesia.

When subtle anatomical abnormalities are hidden against the normal air passage then identification is likely to be missed. In such patients prediction of difficult intubation may be helpful. If the cases of difficult airway could be predicted confidently in the pre operative period, the anaesthesiologist can plan the safest and most effective way of managing tracheal intubation by organizing special procedures like fibre optic intubation, etc. During routine anaesthesia, the incidence of difficult intubation has been estimated in a recent study as 5.8%

## **Aims and Objectives**

### **Primary Objective**

To compare sensitivity, specificity and predictive value of Modified Mallampati test, thyromental distance and their combination as methods of airway assessments for prediction of difficult intubation by comparing with Cormack and Lehane grade on direct laryngoscopy.

### **Secondary Objective**

To document alternate manoeuvres used during difficult intubation to secure airway such as application of external pressure over larynx, use of extra large blade of laryngoscope, stylet or bougie.

## **Materials and Methods**

### **Study Area**

This study will be conducted in Department of Anaesthesiology at a tertiary Hospital, Bangalore. It is multispecialty hospital having all specialties with very good number of case load. Hospital have highly equipped Anaesthesiology department.

### **Study Population**

The study will include 300 Adult patients posted for elective surgical procedures under General Anaesthesia.

### **Inclusion Criteria**

- All patients aged between 18 to 60 yrs of either sex.
- Patients belonging to ASA (American Society of Anaesthesiologist) Grade 1 and 2 Physical status.
- Patients undergoing elective surgery under general anaesthesia with endotracheal intubation.

### **Exclusion Criteria**

- Pregnant patients
- Patients with body mass index more than 30
- Mouth opening less than 3 cms
- Midline neck swellings.
- Difficult neck movements
- ASA (American Society of Anaesthesiologist) 3 and 4 patients.

**Study design:** Prospective Study.

**Study Duration:** Between June 2018 to May 2019

### Sample Size

For 95% confidence intervals and 10% precision with clustering effect of 1.5 due to different operation theatres, we plan to include 300 patients in this validity study.

### Results

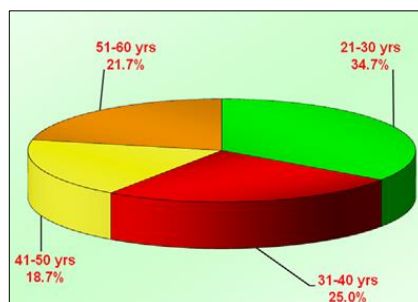
Three hundred apparently normal ASA grade 1&2 adult patients in the age group 18 - 60yrs of either sex posted for elective surgical procedures were prospectively studied.

### Demographic data

**Table 1:** Age distribution

Age	No. of patients	Percent
21-30 yrs	104	34.64
31-40 yrs	75	25.0
41-50 yrs	56	18.7
51-60 yrs	65	21.66
<b>Total</b>	<b>300</b>	<b>100.0</b>

The study population belong to the age group of 20yrs to 60yrs



**Fig 1:** Age distribution of the study population

**Table 2:** Average age and bmi of the study population

	Age	BMI
N	300	300
Mean	37.14	24.05
Median	36.00	24.00
Mode	18(a)	24
Std. Deviation	14.14	1.68
Minimum	18	21
Maximum	60	29

### Discussion

In earlier days anaesthesia was induced by anaesthetic vapors given through face mask. Due to inability to maintain a patent airway, adequate depth of anaesthesia for surgical procedures and its complication leading to morbidity and mortality led to development of safer anaesthetic practice by maintaining anaesthesia through endotracheal insufflation. The endotracheal tube is one of the airway devices which can be introduced into the trachea either orally or nasally, to maintain a patent airway in both unconscious and anaesthetized patients. The significance of difficult or failed tracheal intubation following induction is a well

recognized cause of morbidity and mortality in anaesthetic practice. Moreover the need to predict potentially difficult tracheal intubation has received wide attention but with meager success. Many anatomical characteristics and pathological conditions (like Pierre Robin syndrome, Ludwig's angina) have been suggested to be useful in assessing anticipated difficult intubation by altering or distorting the regional anatomy of the airway. Unheralded difficult intubation is a risk to the patient's life and a challenge to the skill of the anaesthesiologist. In the absence of pathological conditions, radiographic methods are time consuming and cannot be used routinely for prediction of the difficult intubation. But these factors have limitations because of observer variability, inadequate statistical power and difference in incidence of difficult intubation. Based on these observations and studies, our study was conducted to overcome a few of these limitations and hence we have used two simple bedside airway assessment tests i.e., Mallampatti test and measurement of thyromental distance to predict the incidence of difficult intubation. The study population consisted of 300 ASA grade 1 & 2 patients with apparently normal airway who underwent surgical procedures under general anesthesia. In our study the prediction of difficult intubation was done by combining Mallampatti test grade 3&4 and thyromental distance <6cm during the preoperative airway assessment and correlating it with the Cormack & Lehane laryngoscopic grading at intubation. Grade 3&4 of Cormack & Lehane was considered difficult intubation. Butler. P.J *et al* conducted on 250 patients, who did the preoperative airway assessment by Mallampatti test and thyromental distance. The incidence of difficult laryngoscopy in their study was 8.2. Incidence of difficult intubation -

### Comparison between male and female groups

In our study, 300 patients were studied out of which 150 patients were female and 150 patients were male. When Mallampatti test, and thyromental distance were used alone or in combination to assess the difficult airway, the 'p' values obtained were 0.558, 0.123, and 0.828 respectively, which shows no significant variation in incidence of difficult intubation in either sex. Variation in incidence of difficult intubation - comparison between different age groups. In our study the result obtained based on various age groups, shows that when Mallampatti test, and thyromental distance were used alone, and in combination, the 'p' value obtained were 0.053, 0.310, and 0.072 respectively, which shows no significant variation in incidence of difficult intubation in various age groups. The results obtained in our study in predicting difficult airway using Mallampatti test alone was found to be having a sensitivity of 68.90% and specificity of 99.6%, the positive predictive value was 95.30%, and a negative predictive value was 96.8%. In our study when thyromental distance was used alone in assessing the difficult airway, the sensitivity was 75%, specificity was 96.8%, positive predictive value was 57.1% and the negative predictive value was 98.6%. When the combination of Mallampatti test and thyromental distance was used to assess difficult airway and it was used to correlate it with Cormack and Lehane laryngoscopic grading, the sensitivity was 78.7%, specificity 98.9%, positive predictive value 85.9% and negative predictive value 98.2% was obtained.

The above result obtained show that, the discriminative power is greater when used in combination rather than alone. In our study the patients with difficult airway determined by Cormack and Lehane grade 3&4 were intubated either by "BURP" maneuver or bougie. There were 21 patients belonging to Cormack & Lehane grade 3 and 4 out of which 17 patients were intubated with BURP maneuver and 4 patients were intubated with bougie. The airway management was not associated with any patient morbidity or mortality. Further, surgery was never cancelled or postponed secondary to difficulties with airway management.

### Conclusion

In our study the incidence of difficult intubation was found to be 7%. No single anatomical factors can be used as a sole predictor of difficult intubation, with few exceptions. Patients

with obvious pathological and anatomical deformity of airway have difficult intubations. The present study has shown that the combination of modified Mallampatti test and thyromental distance is better than when used alone in predicting difficult intubation.

### Summary

Our study is a hospital based prospective study entitled “ prediction of difficult intubation in apparently normal patients by modified Mallampatti test and thyromental distance” done on 300 patients in the department of Anaesthesiology, a tertiary hospital, Bangalore. The preoperative airway assessment of Mallampatti grading & thyromental distance was done on 300 ASA grade 1&2 patients, aged between 18-60yrs presenting for surgeries under general anaesthesia. Patients were brought to the operation theatre, connected to all monitors, then they received Inj. Fentanyl 2 µ g/kg and inj. Midazolam 25 µ g/kg IV. Patients were preoxygenated for 3mins, induced with inj.propofol 2mg/kg IV and relaxed with inj vecuronium 0.1 mg/kg IV. After 3mins direct laryngoscopy was performed using Macintosh laryngoscope - blade 3, and Cormack & Lehane laryngoscopic grading was determined. The preoperative Mallampatti test grading and the thyromental distance was compared with Cormack & Lehane laryngoscopic grade. The Mallampatti grade 3&4 were considered as predictors of difficult intubation and 29 cases out of 300 patients (9.7%) of the study population belong to this group.

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