Section: Anaesthesia

Original Research Article

A COMPARISON OF MALLAMPATI CLASSIFICATION, THYROMENTAL DISTANCE AND COMBINATION OF BOTH TO PREDICT DIFFICULT INTUBATION SURGERY UNDER GENERAL ANAESTHESIA

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Received *: 10/09/2025*
Received in revised form *: 04/11/2025*
Accepted *: 21/11/2025*

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DOI: 10.70034/ijmedph.2025.4.411

Source of Support: Nil,
Conflict of Interest: None declared

Int J Med Pub Health
2025; 15 (4); 2282-2287

ABSTRACT

One of the main causes of Anaesthesia-related mortality is unsuccessful intubation. This study sought to ascertain if Mallampati classification (MPC) and Thyromental distance (TMD) alone or in combination of both could predict challenging laryngeal visibility from preoperative testing. The observation study was conducted at the Main operation theatre of Srinivasan medical college and hospital 6 months after an approval from hospitals ethical committee and a written informed consent was obtained. The study comprised 120 patients who met the requirements for a non-emergency elective surgery involving tracheal intubation while under General Anesthesia. We evaluated the two preoperative tests, TMD and MPC, Either alone or combined data were collected after induction, laryngoscope and grading was performed (as per Cormack lehane classification) sensitivity and positive predictive valve (ppv) for each test above and in combination were determine. Difficult laryngoscope Grade 3 or 4 occurred 18 patients. Used Alone TMD and combination of both (TMD and MPC) were associated with poor sensitivity specificity, PPV, NPV compare to Mallampati alone it has high specificity and PPV. Due to its higher specificity and positive predictive value than both Thyromental distance alone and the combination of Thyromental distance and Mallampati classification (MPC), our study demonstrates that Mallampati classification is the better option for evaluating the airway.

Keywords: Difficult laryngoscope; Mallampati classification; Thyromental distance; Incisor anatomy & histology; Intubation; Intratracheal; Laryngoscope methods; upper limb bite; Sternomental distance; airway assessment.

INTRODUCTION

Usually, a Mallampati classification score is used to evaluate pharyngeal airway openness. Enables the professional to assess the degree of airway blockage from the tongue and uvula and to see the oral cavity Test is performed with the patient in the sitting position, head in neutral position the mouth wide open and the tongue protruding maximum. Patient should not be actively encouraged to phonate as can provide false positive result.[1]

The visibility of the pharyngeal structure determines the classification. Originally three grades were proposed roughly corresponds to Mallampati laryngoscope views.[2]

CLASS I - Visualization of Tonsillar pillars, uvula, hard and soft palate.
CLASS II- Visualization of uvula, soft palate and hard palate. CLASS III- Visualization of base of uvula, soft and hard palate. CLASS IV- Only hard palate is seen.

CORMACK LEHANE CLASSIFICATION

The modified Mallampati classification is a straightforward scoring system that estimates the amount of space available for oral intubation using a direct laryngoscope by relating the size of the tongue to the amount of mouth opening.[3] When used correctly it is a straight forward, repeatable and trustworthy pre- anaesthesia airway evaluation technique. Every patient uses this classification as a useful tool for airway assessment. Cormack Lehane Classification
GRADE I: Full exposure of glottis is seen GRADE II: parts of cords are visualized GRADE III: Epiglottis is only seen CORMACK LEHANE GRADE
Modified Mallampati grading (MMT) is widely used pre- operative evalution.Mallampati calssification of an oropharyngeal structure is a simple test indicates the possible limited mouth opening or a limited orophyarngeal space.[3]
High Mallampati score:
An increased rate of airway obstruction due to enlarged tonsils or adenosis, as well as inadequate myofunctional activity, swallowing pattern, and tongue position at rest, is generally indicated by a Mallampati score of 3 or 4.[4]

SAMPSOON – YOUNG'S MODIFICATION:

Added class 4 and correlated between ability to observe intraoral structure band incidence of subsequent difficult intubation.[4]

CLASS ZERO MALLAMPATI:

Visualization of any part of epiglottis during MMP test Associated with easy laryngoscope

2.3 THYROMENTAL DISTANCE

The test to detect Thyromental distance is called a patil's test Thyromental distance is defined as the distance from the mentum to te thyroid notch while the patient's head is fully extended. Thyromental distance measurement helps in determining how readily the laryngeal axis fall in line with the pharyngeal axis when the atlano occipital joint is extended.

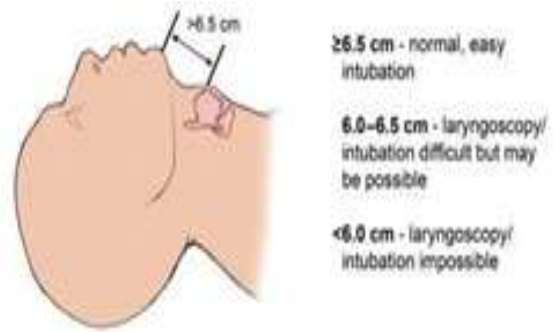

Figure 2.3: Thyromental Distance

Normal – 6.5 or more
Difficult laryoscope -6.0 -6.5cm Laryngoscope may not posssible -< 6.0cm
Some dental patterns such as protruding single or missing maxillary incisior Increase the difficult or direct laryngoscope
The tongue is typically forced into the mandibular space during laryngoscopy. The size of the space and, conse quently, whether the tongue can easily be displaced to facilitate laryngoschopy. In absence of other abnormality if thyromental distance is more than 6.5 cm and the horizontal mandibular length more than 9cm intubation should proceed without difficulty. A Thyromental distance of less than 6cm suggest an increased risk for difficulty.

MATERIALS AND METHODS

This study was approved by the institutional ethical committee after a brief discussion. The informed consent forms used in this study were prepared by the guidance of ethical committee. Every participant was counted-in with the accordance of the guidelines given by the institutional ethics committee.
With the framed selection criteria 120 patients with planned surgery under General Anaesthesia were subjected in this study after obtaining an informed consent. According to the inclusion criteria the sample population was included. Informed and written consent was gained from the patients prior to the study. Demographic data of the subject: Name, Age, Sex, Diagnosis, Type of surgery, Height, Weight, Body Mass Index, Vital signs (Pulse rate, Respiratory rate, Blood pressure, Temperature) airway assessment (Mallampati classification I,II,III,IV) and Thyromental distance (above 6.5cm and below 6.5cmScales for interpretation of Difficult Intubation are Mallampati Classification (MPC)Thyromental Distance (TMD)Combination of both (Mallampati Classification + Thyromental Distance)An observation study of 120 patients who had undergone various surgery under general anaesthesia in Srinivasan Medical College and Hospital Samayapuram, Trichy campus were included in current study the inclusion and exclusion criteria are as follows;
Above 18- 40, Mallampati classification I and II, Thyromental distance above 6.5American society of anaesthesiologist {ASA} I and IIBoth male and female Elective planned surgeries under general anaesthesia Patient giving valid informed consent exclusion -Below 18- 40,Mallampati classification III and IVThyromental distance below 6.5 ,Patient refusal, Patient belonging to ASA classification grade III and IV ,Patient with airway malformation
A count of 120 samples are taken who are undergoing elective surgery under general Anaesthesia During pre anesthesia check up the patient name, age, gen der height weight, ASA Classification, airway assessment. The data collection will be in observation study Involving patients who are both male and

female according to the selection criteria Involving patients who are both male and female according to the selection criteria Pre operative Airwa.y assessment.

Group A – Mallampati Classification Group B – Thyromental Distance

Group C – Combination of both Mallampati classification and Thyromental Distance, Direct visualization of larynx during Endo tracheal intubationTo Assess laryngoscopy grading and detect difficult intubation or not (easy Intubation) data entery

Data Analysis

The statistical software for social science (SPSS Software, version APA) was used to analyze the collected data. For categorical variables such as gender C-L criterion Mallampati grades, false positive (FP) and False negative (FN) the frequency in percentage was calculated. There is a chance for both true positives (TP) and true negatives (TN). For age, the mean, standard deviation, and 95% confidence range were calculated. For MPC, TMD, and both the gold standard for predicting difficult intubation was the C-L score, which was used to compute the sensitivity, specificity, PPVs, NPVs and their combination

RESULTS

120 patients with ASA I and ASA II were admitted and undergone general anesthesia Most of the patients were in the 18–40 age range.

Table 1: Assessment of age of the samples

Age	Score
Mean	30.21
S.D	7.28
Median	31.0
Minimum age	10.0
Maximum age	49.0

The age of the sample is evaluated based on (Table 1) In terms of age, the score's mean was 30.21, its standard deviation was 7.28, its median was 31.0 its minimum was 10.0 and its maximum maximum was 49.0.

Table 2: Evaluation of the samples' sex

Gender	F	%
Female	72	60.0
Male	48	40.0
Total	120	100.0

Analysis of the sample sex revealed that, out of 120 participants, the percentage of females who were assessed as having sex was 72 and 60 .0% while the percentage of males was 48 and 40%.

Percentage distribution of gender of the samples, Displaying a chart that shows the gender distribution of the sample as a percentage, with females accounting for 60.0% of the total and males for 40%.

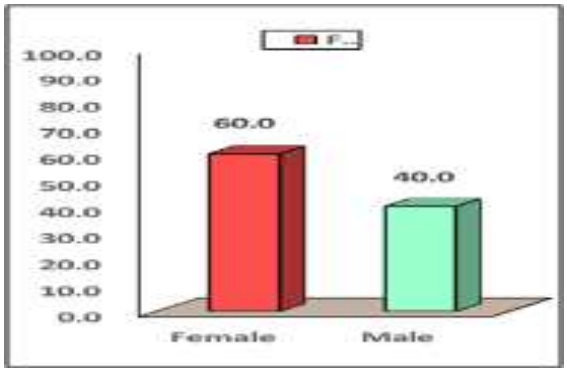

Figure 3

Table 3: Mallampati Score predicting difficult tracheal intubations.

Mallampati Score (MT)	C-L Criteria		Total n(%)
	Difficult	Not Difficult	
MT-III (Difficult)	8(TP)	6 (FP)	14(11.6%)
MT-I & II (Not Difficult)	10 (FN)	96(TN)	106(88.4%)
Total	18	102	120

Sensitivity = 8/18*100 = 44.4%, Specificity = 96/102*100 = 94.12%, PPV = 8/14*100 = 57.1%, NPV = 96/106*100 = 90.6%, TP – True Positive, FP – False Positive, FN – False Negative, TN – True Negative

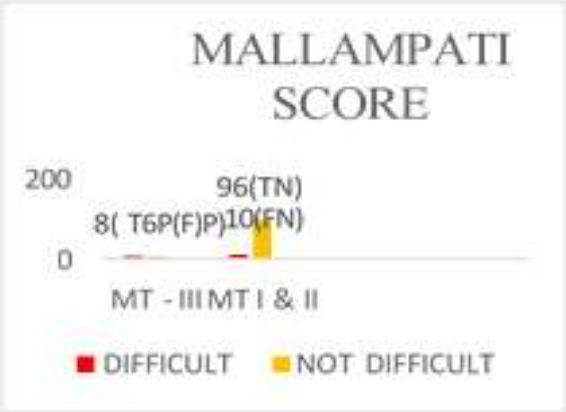

Figure 4

A difficult tracheal intubation is predicted by the Mallampati score. Mallampati grade III was found in 14 (11 .6%) of the cases in Table 3 that had difficult tracheal intubation of these only 8 (TP) had difficult tracheal intubations confirmed and 6 (FP) had easy tracheal intubations confirmed by C-L criteria. Similarly, 106 (88.4%) exhibiting easy tracheal intubation had Mallampati grades I and II of which 96 (TN) were verified to be easy and 10 (FN) to be difficult based on C-L criteria. According to Table 3 the Mallampati grade's sensitivity, specificity, PPV and NPV were 44.4
%, 94.12 %, 57.1 % and90.6% and respectively. Table 4: TMD predicting difficult tracheal intubations.

Table 4

TMD	C-L Criteria		Total n(%)
	Difficult	Not Difficult	
<6.5 cm	6 (TP)	34(FP)	40(33
>6.5 cm (Not Difficult)	12 (FN)	68 (TN)	80(66 .7%)
Total	18	102	120

Sensitivity = 6/18*100 = 33.3%, Specificity = 68/102*100 = 66.7%,PPV = 6/34*100 = 17.6%,NPV = 68/80*100 = 85.0%,TP – True Positive, FP – False Positive, FN – False Negative, TN – True Negative

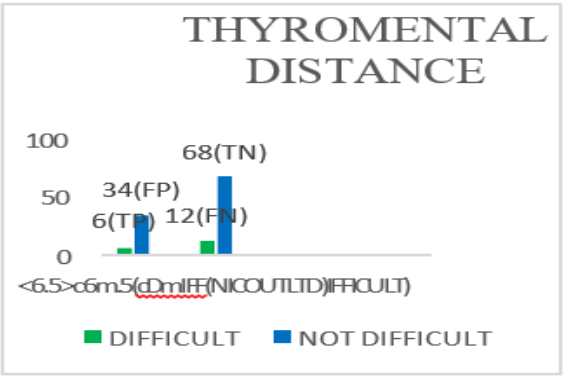

Figure 5

TMD predicts a challenging tracheal intubation. Table 4 shows that TMD was seen in 16 patients 40(33.3%) with difficult tracheal intubation of whom only 6 (TP) had an easy tracheal intubation verified by C-L criteria and 34 (FP) had a difficult tracheal intubation confirmed. Similarly, 80(66.7%) patients who were exhibiting easy tracheal intubation had TMD; of these, 68 (TN) had easy tracheal intubation confirmed and 12(FN) had difficult tracheal intubation by C-L criteria. TMD had the following values: 33.3%, 66.7%, 17.6%, 85.0% for sensitivity, specificity, PPV and NPV, respectively (Table 4).Table 5: Combination of Mallampati and TMD predicting difficult tracheal intubations.

Table 5

Combination of Mallampati and TMD	C-L Criteria		Total n(%)
	Difficult	Not Difficult	
Difficult	4(TP)	14 (FP)	18(15.0%)
Not Difficult	14 (FN)	88 (TN)	102(85.0%)
Total	18	102	120

Sensitivity = 4/18*100 = 22.2% Specificity = 88/102*100 = 86.3%, PPV = 3/14*100 = 21.4%, NPV = 88/102*100=86.2%, TP –True Positive, FP – False Positive, FN – False Negative TN – True Negative

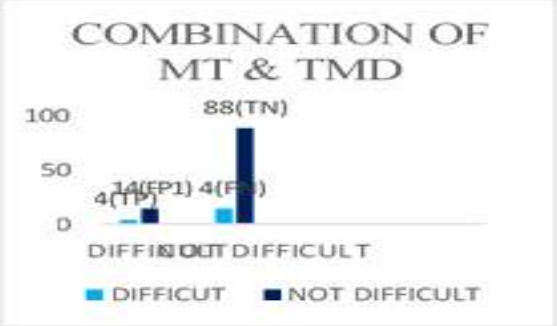

Figure 6

Combined predictability of difficult tracheal intubation of mallampati and TMD is presented in table 5 were observed in 18(15.0%) cases that showed difficult tracheal intubation in which only 4 (TP) were confirmed difficult tracheal intubations and 14 (FP) had easy tracheal intubation validated by C-L criteria, while TP had proven difficult tracheal intubations. Similarly were observed in 102(85.0%) Patients that were showing easy intubation in which 88 (TN) were confirmed easy and 14 (FN) were confirmed difficult tracheal intubation by C- L criteria. The sensitivity, specificity, PPV and NPV of

combined Mallampati and TMD were 22.2%, 86.3%, 21.4% and 86.2% respectively (Table
Mallampati classification alone was associated with higher specificity and positive predictive value than Thyromental distance alone and combination of both (Mallampati and Thyromental distance).

DISCUSSION

Failure to maintain a patent airway even for a short time can be fatal because.[5] it is necessary for proper ventilation and oxygenation. numerous factors including the lack of consistency in characterizing or rating laryngeal values, cricoids pressure, head posture, degree of muscular relaxation and the kind and or size of laryngoscope blades, have been held accountable for the significant variance in the incidence of challenging tracheal intubation.[5]
In order to anticipate problematic airways and make appropriate plans to secure them,[6] pre-operative airway assessment is a routine anaesthetic procedure. Difficult intubation or failed intubation is the main cause of anaesthesia related issue or mortality Expert airway assessment or management is an essential skill for an Anaesthesiologist.[7]
Unanticipated difficult intubation is not only a threat to patient's life but it is great challenge to anaesthesiologist and evaluates the skill of an experienced anaesthesiologist
Sufficient breathing and oxygenation depend on maintaining a patent airway and even a short-term failure to do so can be life threatening.[8]
OUR STUDY DATA REVELAED
Mallampati score (44.4 %, 94.12 %, 57.1 %, and 90.6%) respectively While using it alone it has higher and positive predictive value for difficult intubation based on age and gender specificity, ppv, sensitivity decrease with TMD and combination of both (TMD and MPC).
Bhavdip Patel conducted a prospective study in which they compared MMT grading before surgery to C-L's grading of
+difficulty in intubation age 16y and older.[9] Additionally, they assessed how adding additional metrics such as TMD and SMD, could improve the validity of MMT in predicting a difficult intubation based on the patient's C-L grading.[10] Marked difference in the sensitivity of TMD comparatively in our study is due to difference in sample size in prospective research Nkihu A.Merah and his associates examined 308 patients.23 Predicting challenging laryngeal visualization using pre-operative testing, such as MNT, TMD, SMD, horizontal length of the mandible (HLM) and inter-incisor.[11]
Banjong Krobbuaban et al. evaluated four predictive tests for difficult tracheal intubation. According to them single test most predictable for difficult intubation was RHTMD.16 Their result for MMT was sensitivity 70%, specificity 60%, PPV 20%, NPV 93
and for TMD ≤ 6.5 cm sensitivity 52%, specificity 69%, PPV 21%,[12] NPV 91%. Our result is different from Banjong KrobBuban. Significant differences in mandibular and maxillary morphology and morphometery are confirmed by the dental literature, while,[13] the anthropological literature has well-documented human craniofacial variants.17, 18 and 19 numerous investigations have validated the impact of inter-observer dependability.
This study shows that a Mallampati grade had ads some incremental diagnostic value in comparison to the value of each test alone.[14] It is necessary to explore how these specific xpossibilities contribute to the difference in results in earlier investigations.

1. Difficulty in defining a difficult airway. Most anaesthesiologists use C-L grades III and IV of the direct laryngoscopic view as difficult airway but ASA defined it is clinical situation.[15]
2. Even if a lot of cases may be predicted some are nevertheless missed before intubation, which puts the patient at danger and the anesthesiologist in a difficult situation.[16]
3. Table 4 makes evident the low sensitivity, specificity and PPV of TMD as a single screening test.[17] In the original paper, the TMD sign's sensitivity was 100% and its specificity was 80%. However, further experience revealed that it had fallen short of expectations.[18]
4. It wasn't until anaesthesia was induced that the unexpectedly difficult intubation of a patient with a normal airway upon assessment and specific temporomandibular joint and oropharyngeal diseases became apparent,[19] as muscles lose tone and power.
5. The study's outcome is also impacted by the interobserver variables. For modified MPC interobserver variation is significant.[20]

CONCLUSION

Our study shows that Mallampati classification is better than Thyromental distance and combination of both (MPC and TMD) due to its high specificity and positive predictive value.
This study revealed that one single airway can be used to predict difficult intubation. This study was conducted out in a double clinical setup with targeted population. This study was done only by using three airway predictors (MPC, TMD & Combined MPC and TMD) as variables. The frequency of problematic intubation was not examined by us.
Acknowledgements: Nil
Conflict of Interest: Authors have no conflict of interest.
Source of Support: Nil

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