



# International Journal of Medical Anesthesiology

E-ISSN: 2664-3774  
P-ISSN: 2664-3766  
[www.anesthesiologypaper.com](http://www.anesthesiologypaper.com)  
IJMA 2020; 3(4): 157-159  
Received: 21-08-2020  
Accepted: 28-09-2020

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## Difficult laryngoscopy and intubation using thyromental distance during: Operative assessment of patients

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DOI: <https://doi.org/10.33545/26643766.2020.v3.i4c.179>

### Abstract

The airway begins functionally at the nares. The septum divides the nasal cavity into two narrow cavities. The nasal cavity extends from the external nares to the posterior choanae, where it becomes continuous with the nasopharynx. Vertically it extends from the palate to the cribriform plate. Each half has a floor, roof, a lateral wall and a medial septum wall. The lateral wall is uneven because of the three bony projection known as conchae. 300 consecutive (apparently normal) American Society of Anaesthesiologist grade 1 & 2 adult patients undergoing elective surgical procedures under general anaesthesia with endotracheal intubation at Medical college and teaching Hospital were the subjects in this study. Thyromental distance < 6cm was considered as predictor of difficult intubation. There were 16 cases out of 300 patients (5.3%) belong to thyromental distance less than 6cms.

**Keywords:** Difficult laryngoscopy, thyromental distance, perative assessment

### Introduction

The term airway refers to extra pulmonary air passage consisting of the nasal and oral cavity, pharynx, larynx, trachea and principle bronchi. The main function of the air way is conduction of air to and from the lung for gaseous exchange.

Airway patency is ensured by bones, cartilage and ligaments and from the surrounding muscle. The nose, mouth, larynx and trachea are equipped with rigid and semi rigid structures. Due to the absence of such rigid elements in the pharynx it is dependent on the tone of the surrounding muscle and ligaments for its patency<sup>[1]</sup>.

The airway begins functionally at the nares. The septum divides the nasal cavity into two narrow cavities. The nasal cavity extends from the external nares to the posterior choanae, where it becomes continuous with the nasopharynx. Vertically it extends from the palate to the cribriform plate. Each half has a floor, roof, a lateral wall and a medial septum wall. The lateral wall is uneven because of the three bony projection known as conchae. The meatus are spaces inferior to the conchae. Adjoining the lateral walls are the air spaces which communicate with the nasal cavity<sup>[2]</sup>.

Mouth opening may be reduced due to disease of the temporomandibular joint or due to soft tissue causes. The reduced mouth opening interferes with the insertion of the laryngoscope blade. This along with the inability to protrude the mandibular teeth anterior to the maxillary teeth interferes with the anterior movement the jaw during laryngoscopy. As good forward subluxation of the mandible provides addition space for forward displacement of the tongue during the laryngoscopy, Block and Brenchmark have suggested that about 30 percent of the mouth opening ability was lost when protrusion of mandible was impaired. If the mouth opening is less than 25mm it is unlikely that any part of larynx will be visualized by direct laryngoscopy. Thus it can lead to impendence of the axis alignment<sup>[3]</sup>. This may be absolute or relative. The mandible provides the skeletal support for the floor the mouth and the tongue. If the mandibular space is smaller than normal or if the tongue is relatively larger, then the tongue cannot be adequately pushed into the sub mandibular space during laryngoscopy to clear the line of vision. Thus the larynx becomes relatively 'anterior' to the base of the tongue. This can be expressed as the thyromental distance or hyomental distance. This decreased measurement can lead to reduction in submandibular space and incase of smaller mandibular space the laryngeal axis will make a more acute angle with the pharyngeal axis, necessitating greater extensibility at the atlanto-occipital joint to bring about alignment<sup>[4]</sup>.

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A short mandibular ramus also reduces the space available for the floor of the oral cavity and pushes the contents towards the base of the skull [18]. Micrognathia which small mandibular body and short ramus manifests clinically as receding jaw, leads to difficult intubation.

Possibility of difficult intubation may be evident from the history and becomes obvious during examination. Any symptoms suggestive of airway pathology, like history of dyspnoea, stridor, hoarseness of voice, sleep apnea, etc may be asked. A document of previous anaesthetic history of difficulty with endotracheal intubation is extremely helpful [5]. Examination of the patient regarding the possible range of neck & jaw movement, patency of the nasal passage, and view of submental and submandibular space will yield information regarding difficulty in intubation.

Features like poor mouth opening, prominent maxilla, narrow palate, oropharyngeal tumours, any contracture or scars, trauma, post-surgical distortion alert immediate attention. Certain important condition like diabetes, rheumatoid arthritis, cervical spine disease, obesity, pregnancy, etc, which are associated with increased difficulty in intubation should be looked for.

Obesity could compromise the airway by means of excessive soft tissue in the paratonsillar and paraglottic areas and thus could lead to difficulty in visibility and accessibility of the glottis during laryngoscopy [6].

**Methodology**

**Source of data**

300 consecutive (apparently normal) American Society of Anaesthesiologist grade 1 &2 adult patients undergoing elective surgical procedures under general anaesthesia with endotracheal intubation at Medical college and teaching Hospital were the subjects in this study.

**Study design:** Prospective clinical study.

**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.

The preanaesthetic evaluation of patient was done in the ward. The consent was taken for surgical procedure, anaesthetic technique and study. Evaluation of the patient was done by history of medical illnesses, surgical procedure, medication, drug allergy and general physical examination. Blood pressure, pulse, hydration were noted, body mass index was calculated, systemic examination was done and American Society of Anesthesiologist (ASA) grading was determined.

**Results**

**Table 1:** Distribution of thyromental distance in the study population

Thyromental distance Predictor	No. of patients	Percent
<6cm	16	5.3
>6cm	284	94.7
Total	300	100.0

Thyromental distance<6cm was considered as predictor of difficult intubation. There were 16 cases out of 300 patients (5.3%) belong to thyromental distance less than 6cms.

**Table 2:** Distribution and correlation of thyromental distance with cormack & lehane grade in prediction of difficult intubation

Cormack and Lehane Grading	Thyromental distance Predictor		Total
	<6 cm	>6 cm	
+ve (grade 3 &4)	12	9	21
	57.1%	42.9%	100.0%
	75.0%	3.2%	7.0%
-ve (grade 1 &2)	4	275	279
	1.4%	98.6%	100.0%
	25.0%	96.8%	93.0%
Total	16	284	300
	5.3%	94.7%	100.0%
	100.0%	100.0%	100.0%

Sensitivity: 75.0% Specificity: 96.8% Positive predictive Value: 57.1% Negative Predictive value: 98.6%

**Table 3:** Distribution of thyromental distance in various age groups

Age	Thyromental distance Predictor		Total
	<6 cm	>6 cm	
21-30 yrs	4	100	104
	3.8%	96.2%	100.0%
31-40 yrs	3	72	75
	4%	96%	100.0%
41-50 yrs	2	54	56
	3.6%	96.4%	100.0%
51-60 yrs	7	58	65
	10.7%	89.3%	100.0%
Total	16	284	300
	100.0%	100.0%	100.0%

**Table 4:** Distribution of thyromental distance in male and female groups

Gender	Thyromental distance Predictor		Total
	<6cm	>6cm	
Male	11	139	150
	7.3%	92.7%	100.0%
	68.8%	48.9%	50.0%
Female	5	145	150
	3.3%	96.7%	100.0%
	31.3%	51.1%	50.0%
Total	16	284	300
	5.3%	94.7%	100.0%
	100.0%	100.0%	100.0%

**Discussion**

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. 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%.

Iohom *et al.* [7] conducted a study in predicting difficult airway by using Mallampatti test, thyromental distance or sternomental distance. They found the sensitivity of Mallampatti test to be 43%, specificity 93%, the results of our study are comparable to the values obtained to this study.

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%.

Frerk *et al.* [8] conducted a study in predicting difficult airway by using Mallampatti test and thyromental distance. The sensitivity of thyromental distance was found to be 88% and specificity 81% which are comparable to this study.

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. Ulrich B *et al.* [9] in 1998 conducted a study on 1993 patients surgical patients showed if during the laryngoscopy, a satisfactory laryngeal view is not obtained, the backward-upward-rightward-pressure (BURP) maneuver may aid in improving the view. The BURP maneuver has shown to improve the laryngeal view, decreasing the difficult intubation in these patients from 4.8% to 1.8%.

Benumof [10] described optimal external laryngeal manipulation by pressing posteriorly and cephalad over the thyroid, cricoid, and hyoid improved the laryngeal view by at least one Cormack & Lehane grade.

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

Thyromental distance of <6cm were considered as predictor of difficult intubation. The Sensitivity was 75%, specificity 96.8%, positive predictive value 57.1%, and negative predictive value 98.6%.

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