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Original Article

Anaesthesia Section

Ultrasound-based Quantification of Anterior Neck Soft-tissue Thickness for Early Prediction of Difficult Laryngoscopy in Obese Individuals: A Cross-sectional Study

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ABSTRACT

Introduction: Ultrasound has emerged as a simple, portable, non invasive, and reliable tool for airway assessment. It is safe, readily available, repeatable, and provides real-time dynamic images, making it particularly useful when combined with airway procedures.

Aim: To evaluate the role of bedside airway ultrasonography in identifying predictors of difficult laryngoscopy in patients with Body Mass Index (BMI) between 30 and 34.9 kg/m².

Materials and Methods: This cross-sectional study was conducted at Lisie Hospital, Ernakulam, Kerala, India, over six months (July-December 2015). A total of 50 obese patients (BMI 30-34.9 kg/m²) were included. Clinical predictors such as Neck Circumference (NC) at the level of the thyroid cartilage were assessed, along with ultrasound-guided measurements of anterior neck soft-tissue thickness at the thyrohyoid membrane, hyoid bone, and vocal cords. Laryngoscopic view was graded using the Cormack-Lehane classification and categorised as easy or difficult. Statistical analysis was performed using Statistical Package for the Social Sciences (SPSS) version 22.0. Continuous variables were expressed as mean±standard deviation. Appropriate statistical tests were applied, and a p-value <0.05 was considered significant.

Results: The study population included 22 males (44%) and 28 females (56%), with a mean age of 42.92±7.63 years and mean BMI of 31.70±1.13 kg/m². Easy laryngoscopy was observed in 35 patients (70%), while 15 patients (30%) had difficult laryngoscopy. Age, gender, and BMI showed no significant association with laryngoscopy difficulty (p-value >0.05). Thyromental Distance (TMD) and Inter-Incisor Gap (IIG) were comparable between groups. NC was significantly greater in the difficult laryngoscopy group (46.60±2.90 cm) compared to the easy group (39.97±2.08 cm) (p-value <0.001). Ultrasound measurements revealed significantly increased anterior neck soft-tissue thickness at all three levels in patients with difficult laryngoscopy (p-value <0.001).

Conclusion: Difficult airway remains a major contributor to anaesthesia-related morbidity and mortality. Incorporating ultrasonography into preoperative airway assessment provides a reliable, inexpensive, and real-time method for predicting difficult laryngoscopy, enabling better airway planning.

Keywords: Difficult airway, Neck circumference, Ultrasonography

INTRODUCTION

Securing a patent airway is a fundamental responsibility of anaesthesiologists and intensivists in the operating theatre, intensive care unit, and emergency settings. Failure to anticipate or manage a difficult airway can result in serious complications, including hypoxia, aspiration, airway trauma, cardiac arrest, and even death. It has been estimated that nearly one-third of anaesthesia-related complications are attributable to difficulties in airway management, particularly during laryngoscopy and tracheal intubation [1]. Therefore, accurate preoperative assessment and early prediction of difficult laryngoscopy remain critical components of safe anaesthetic practice.

Difficult laryngoscopy is influenced by a complex interaction of patient-related anatomical factors, pathological conditions, and operator experience. Obesity is a well-recognised risk factor for airway difficulty due to increased fat deposition in the upper airway structures, reduced pharyngeal space, limited neck mobility, and decreased pulmonary reserve. Obese individuals are particularly vulnerable to rapid oxygen desaturation during airway manipulation, making early identification of a potentially difficult airway especially important in this population [2].

Traditional bedside airway assessment tools commonly used in preoperative evaluation include Modified Mallampati Score (MMS), Inter-incisor Gap (IIG), Thyromental Distance (TMD), neck mobility, and NC. These parameters are simple, quick, and cost-effective; however, when used individually, they have limited sensitivity and specificity for predicting difficult laryngoscopy [3]. Among these, NC has gained attention as a potential surrogate marker for fat distribution in the neck, particularly in obese individuals. However, NC alone does not provide information regarding the depth or precise anatomical location of soft-tissue that may interfere with glottic visualisation during laryngoscopy [4].

Ultrasonography has emerged as a promising adjunct in airway assessment due to its non invasive nature, portability, lack of radiation exposure, and ability to provide real-time dynamic imaging of airway structures. Point-Of-Care Ultrasound (POCUS) allows direct visualisation of the oral cavity, pharynx, larynx, and trachea, enabling assessment of airway anatomy that cannot be reliably evaluated by surface-based clinical examination alone [5]. Over the past decade, airway ultrasonography has been increasingly utilised for a variety of applications, including confirmation of endotracheal tube placement [6,7], identification of the cricothyroid membrane for emergency airway access [8], guidance for percutaneous tracheostomy [9,10], detection of subglottic stenosis, and prediction of appropriate endotracheal tube size in both paediatric and adult populations [11,12].

Several studies have demonstrated that ultrasound-guided measurement of anterior neck soft-tissue thickness correlates with the difficulty of laryngoscopy. Increased pretracheal soft-tissue

thickness at specific anatomical levels such as the hyoid bone, thyrohyoid membrane, and vocal cords-has been shown to impede alignment of the oral, pharyngeal, and laryngeal axes, thereby worsening the laryngoscopic view [4,13-16]. These ultrasound-derived measurements provide objective quantification of soft-tissue distribution, offering a potential advantage over conventional clinical predictors.

Despite growing evidence supporting the utility of airway ultrasonography, there remain important gaps in the existing literature. Most studies have focused either on morbidly obese patients (BMI ≥35 kg/m²) or on heterogeneous populations with wide BMI ranges [17-23]. To the best of our knowledge, there aren't many studies specifically evaluating obese individuals with a BMI between 30 and 34.9 kg/m², a group that constitutes a substantial proportion of the surgical population and may not always be clinically suspected to have a difficult airway.

The present study was therefore designed to address this research gap by evaluating the role of ultrasound-guided quantification of anterior neck soft-tissue thickness in predicting difficult laryngoscopy in obese patients with a BMI of 30-34.9 kg/m². The aim of this study was to evaluate the role of bedside airway ultrasonography in identifying predictors of difficult laryngoscopy in patients with BMI between 30 and 34.9 kg/m².

MATERIALS AND METHODS

This cross-sectional study was conducted at Lisie Hospital, Ernakulam, Kerala, India, over a six-month period from July 2015 to December 2015. Institutional Ethics Committee (IEC) approval was obtained prior to initiation of the study (IEC No.:2013/52), and written informed consent was obtained from all participants.

Inclusion criteria: Patients aged 18-60 years with BMI between 30 and 34.9 kg/m², classified as American Society of Anaesthesiologists (ASA) physical status I or II, and scheduled to undergo major elective elective surgical procedures under general anaesthesia were included in the study.

Exclusion criteria: Patients with difficult airway, existing upper airway pathology, cervical spine fracture or instability, requirement for head and neck surgery, full stomach, pregnancy, or significant gastro-oesophageal reflux disease were excluded from the study.

A total of 50 patients fulfilled the inclusion criteria, and no eligible patients were excluded during the recruitment period.

Sample size: The sample size was calculated based on a paired-sample comparison of mean anterior neck soft-tissue thickness between easy and difficult laryngoscopy groups, using ultrasound-guided measurements, as described in a study by Ezri T et al., [4].

The formula used for calculating the sample size for comparison of paired means is:

$n=2((Z\alpha/2+Z\beta)\times\sigma/d)^2$

Where:

n = required sample size

$Z\alpha/2$ = standard normal deviate for two-tailed alpha error ($\alpha = 0.05 \rightarrow 1.96$)

$Z\beta$ = standard normal deviate for power (80% power $\rightarrow 0.84$)

σ = pooled standard deviation of the paired differences

d= expected mean difference between paired measurements

$n = 2\{((Z\alpha/2 + Z\beta) \times \sigma) /d\}^2$

$n = 2\{((1.96 + 0.84) \times 6) /6\}^2$

$n = 2\{(2.80 \times 6) /6\}^2$

$n = 2 (2.80)^2$

$n = 15.16$

From the study by Ezri T et al., [4]: Mean difference (d) in skin-to-epiglottis distance between easy and difficult laryngoscopy ≈ 6 mm

Standard deviation (σ) ≈ 6 mm

Considering variability across measurement levels (hyoid, thyrohyoid membrane, vocal cords), multiple predictors, and to maintain adequate power for subgroup analysis, G*Power software (version 3.1.5) was used with the following inputs:

Test: Independent samples t-test

Effect size (Cohen's d): 0.8 (large effect size, as reported in prior ultrasound airway studies)

α error probability: 0.05

Power (1 - β): 0.80

This yielded a minimum required sample size of 26 patients. To enhance statistical power, improve data robustness, and account for potential dropouts or measurement variability, the final sample size was increased to 50 patients.

Study Procedure

All patients underwent a detailed preoperative assessment on the day prior to surgery. Airway evaluation included measurement of IIG, TMD, and NC, along with assessment of the MMS. All patients were kept nil per oral for eight hours for solids and two hours for clear fluids. As part of routine premedication, ranitidine 150 mg and metoclopramide 10 mg were administered orally on the night before surgery and again on the morning of surgery.

Ultrasound-guided measurement of anterior neck soft-tissue was performed in the preanaesthesia room by a single trained investigator who had completed a 2-week structured training program in the radiology department. A Sonosite® ultrasound machine was used with high-frequency linear transducer (5.0 MHz) and low-frequency curvilinear transducer. Chlorhexidine solution was used for transducer disinfection. Patients were positioned supine with a pillow under the occiput to maintain neck flexion and head extension.

Scanning Technique

The transducer was oriented in sagittal, parasagittal, and transverse planes.

At the hyoid level: The linear probe was placed transversely. The hyoid bone appeared as a superficial, inverted U-shaped hyperechoic structure with posterior shadowing. The distance from skin to the hyoid bone was measured.

At the thyrohyoid membrane: The epiglottis was visualised through the sonographic window and appeared as a hypoechoic curvilinear structure, bordered anteriorly by the hyperechoic periepiglottic space and posteriorly by the air-mucosa interface. The distance from skin to the epiglottis was recorded.

At the Anterior Commissure (AC): Using the window through the thyroid cartilage, the glottic aperture appeared as a triangular echogenic structure with a central air-mucosal interface. The distance from skin to the AC was measured.

Intraoperative Procedure

After completing ultrasound measurements, patients were transferred to the operating theatre. Standard monitors were applied (ECG, pulse oximetry, non invasive blood pressure, and capnography). Preoxygenation was performed for three minutes with Continuous Positive Airway Pressure (CPAP) of 10 cmH_2O. Anaesthesia was induced with fentanyl 2 µg/kg and propofol 2 mg/kg. After confirming adequate mask ventilation, succinylcholine 1.5 mg/kg was administered. Laryngoscopy was performed by an anaesthesiologist with at least two years of experience, blinded to the ultrasound findings, using a Macintosh blade (size 3 or 4). The laryngeal view was graded according to the Cormack-Lehane classification:

Grade I-II: Easy laryngoscopy

Grade III-IV: Difficult laryngoscopy

Endotracheal intubation was performed, and bilateral air entry confirmed. Anaesthesia was maintained as per institutional protocol, and patients were extubated at the end of surgery and shifted to recovery.

STATISTICAL ANALYSIS

Data analysis was performed using SPSS version 22.0. Continuous variables were expressed as mean±standard deviation. The independent t-test was used to compare ultrasound-derived measurements with clinical predictors. The significance level was set at p-value <0.05.

RESULTS

The study comprised 44% males and 56% females as shown in [Table/Fig-1]. Laryngoscopy was easier in the female subjects than the male counterparts as shown in [Table/Fig-2].

Gender		n (%)
Male		22 (44)
Female		28 (56)
Age (years)	18-35	28 (56)
	36-45	18 (36)
	46-60	4 (8)
ASA PS	I	32 (64)
	II	18 (36)

[Table/Fig-1]: Gender distribution of study subjects.
No statistically significant association was found between gender and the ease of laryngoscopy.

Gender	Laryngoscopy		p-value
	Easy n (%)	Difficult n (%)	
Female	19 (67.9)	9 (32.1)	0.95
Male	16 (72.7)	6 (27.3)	

[Table/Fig-2]: Association of gender and the ease of laryngoscopy.
Chi-square test

The mean age of easy vs difficult laryngoscopy group was identified with a p-value of 0.52. There was no statistically significant association between age and the ease of laryngoscopy. Similarly, mean BMI of easy vs difficult laryngoscopy group was identified. There was no statistically significant association between BMI and the ease of laryngoscopy as showed in [Table/Fig-3].

Variables	Total Mean±SD	Laryngoscopy		p-value
		Easy (n=35) Mean±SD	Difficult (n=15) Mean±SD	
Age (years)	42.92±7.63	43.37±7.20	41.87±8.73	0.52
BMI (Kg/m^2)	31.70±1.13	31.71±1.15	31.67±1.11	0.89

[Table/Fig-3]: Association of age and BMI with ease of laryngoscopy.
Unpaired student t-test

The ease of laryngoscopy was classified as easy and difficult according to Cormack-Lehane grading. Chi-square test of association was used to test the null hypothesis. It was found that there was no statistically significant association between the Mallampati grading and the ease of laryngoscopy (χ^2=2.17, p-value=0.54) as shown in [Table/Fig-4].

Mallampati grade	Laryngoscopy	
	Easy n (%)	Difficult n (%)
I	6 (66.7)	3 (33.3)
II	20 (76.9)	6 (23.1)
III	8 (57.1)	6 (42.9)
IV	1 (100.0)	--

[Table/Fig-4]: Mallampati grading and the ease of laryngoscopy.

[Table/Fig-5] shows the association between TMD and the ease of laryngoscopy which was not found to be statistically significant. It was found that there was no statistically significant association between the IIG and the ease of laryngoscopy. The p-value was found to be 0.91 and there was a statistically significant association between the NC and the ease of laryngoscopy (p-value <0.001).

Variables	Laryngoscopy		p-value
	Easy (n=35) Median	Difficult (n=15) Median	
TMD (cm)	6.2	6.3	0.33
IIG (cm)	4.2	4.1	0.91
Neck Circumference (NC) (cm)	39.97±2.08	46.60±2.90	<0.001

[Table/Fig-5]: Association of Thyromental Distance (TMD), Interincisor Gap (IIG) and Neck Circumference (NC) with ease of laryngoscopy.
Mann-Whitney U test

The association between the thickness of anterior pretracheal soft-tissue of the neck and the ease of laryngoscopy was analysed. The frequency of distribution charts for the USG guided measurements for the easy and difficult groups are given below in [Table/Fig-6]. USG guided quantification of anterior soft-tissue neck thickness has a statistically significant association with the ease of laryngoscopy (p-value <0.001).

Variables	Laryngoscopy		p-value
	Easy (n=35) Mean±SD	Difficult (n=15) Mean±SD	
Distance from skin to AC (mm)	11.06±1.57	17.20±1.27	<0.001
Distance from skin to hyoid bone (mm)	10.51±1.87	16.07±2.09	<0.001
Distance from skin to epiglottis (mm)	16.80±2.55	25.60±2.97	<0.001

[Table/Fig-6]: USG guided measurements for the easy and difficult groups.
Unpaired student t-test

Identifying the Correlation among the Predictors

Spearman's correlation analysis showed no statistically significant correlation between NC or ultrasound-derived anterior neck soft-tissue thickness at the levels of the vocal cords, hyoid bone, and thyrohyoid membrane with conventional airway predictors, including TMD, IIG, and MMS (p-value >0.05 for all) as shown in [Table/Fig-7]. The absence of significant correlation between ultrasonographic measurements and conventional airway predictors indicates that ultrasound assesses a distinct anatomical dimension of the airway, which explains its high diagnostic accuracy in predicting difficult laryngoscopy despite weak inter-parameter correlations.

Correlations					
Variables			TMD	IIG	Modified Mallampati Grading
Spearman's rho	Neck Circumference (NC) (cm)	Correlation Coefficient	0.06	0.15	0.04
		Sig. (2-tailed)	0.66	0.29	0.75
	Distance from skin to AC (mm)	Correlation Coefficient	-0.1	0.001	0.071
		Sig. (2-tailed)	0.45	0.97	0.622
	Distance from skin to hyoid bone (mm)	Correlation Coefficient	-0.05	-0.005	0.089
		Sig. (2-tailed)	0.70	0.97	0.539
	Distance from skin to epiglottis (mm)	Correlation Coefficient	0.03	0.08	0.05
		Sig. (2-tailed)	0.81	0.57	0.69

[Table/Fig-7]: Spearman's rho correlation analysis of clinical and ultrasonographic airway predictors.

NC >43 cm demonstrated high predictive value for difficult laryngoscopy, with a sensitivity of 86.7%, specificity of 94.3%, and

overall diagnostic accuracy of 92%, indicating it is a reliable parameter for identifying patients at risk of difficult airway [Table/Fig-8].

Crosstab				
Neck Circumference (NC) (cm)		re_cormack		Total
		Easy	Difficult	
≤43	Count % within Neck Circumference (NC) (cm)	33 (94.3%)	2 (5.7%)	35 (100.0%)
>43	Count % within Neck Circumference (NC) (cm)	2 (13.3%)	13 (86.7%)	15 (100.0%)
Total	Count % within Neck Circumference (NC) (cm)	35 (70.0%)	15 (30.0%)	50 (100.0%)

[Table/Fig-8]: Calculation of specificity, sensitivity, positive predictive value and negative predictive value for Neck Circumference (NC).
Sensitivity: 86.7%; Specificity: 94.3%; PPV: Positive predictive value 86.7%; NPV: Negative predictive value 94.3%; Diagnostic accuracy: 92.0%; Chi-square = 32.76; p<0.0001

The distance from skin to the AC was strongly associated with the ease of laryngoscopy. Among patients with distance ≤15.5 mm, 94.4% had easy laryngoscopy, whereas 92.9% of patients with distance >15.5 mm experienced difficult laryngoscopy. The sensitivity, specificity, positive predictive value, negative predictive value, and diagnostic accuracy of distance >15.5 mm for predicting difficult laryngoscopy were 86.7%, 97.1%, 92.9%, 94.4%, and 93.3%, respectively. This association was statistically significant (Chi-square=38.91, p-value <0.0001) [Table/Fig-9].

Crosstab				
Distance from skin to AC (mm)		re_cormack		Total
		Easy	Difficult	
≤15.5	Count % within distance from skin to AC (mm)	34 (94.4%)	2 (5.6%)	36 (100%)
>15.5	Count % within distance from skin to AC (mm)	1 (7.1%)	13 (92.9%)	14 (100%)
Total	Count % within distance from skin to AC (mm)	35 (70%)	15 (30%)	50 (100%)

[Table/Fig-9]: Calculation of specificity, sensitivity, positive predictive value and negative predictive value for the distance from skin to AC.
Chi-square=38.91, p<0.0001

Similarly, for the distance from skin to the hyoid bone >12.5 mm, the sensitivity, specificity, PPV, NPV, and accuracy were 82.4%, 97.0%, 82.4%, 97.0%, and 92.0%, respectively. An 82.4% of the individuals with the distance from skin to hyoid bone >12.5 mm belong to difficult laryngoscopy group. 97% of the individuals with the distance ≤12.5 mm belong to easy laryngoscopy group. This association was statistically significant (Chi-square = 33.87, p-value <0.0001) [Table/Fig-10].

Crosstab				
Distance from skin to hyoid bone (mm)		re_cormack		Total
		Easy	Difficult	
≤12.5	Count % within distance from skin to hyoid bone (mm)	32 (97%)	1 (3%)	33 (100%)
>12.5	Count % within distance from skin to hyoid bone (mm)	3 (17.6%)	14 (82.4%)	17 (100%)
Total	Count % within distance from skin to hyoid bone (mm)	35 (70%)	15 (30%)	50 (100%)

[Table/Fig-10]: Calculation of specificity, sensitivity, positive predictive value, negative predictive value, accuracy for the distance from skin to hyoid bone.

For the distance from skin to the epiglottis >21.5 mm, these values were even higher, with a sensitivity of 93.3%, specificity of 97.1%, PPV of 93.3%, NPV of 97.1%, and overall diagnostic accuracy of 96.6%. There was a strong association between the distance from skin to epiglottis and ease of laryngoscopy. Most patients with distance ≤21.5 mm had easy laryngoscopy (97.1%), while those with distance >21.5 mm mostly had difficult laryngoscopy (93.3%). This association is statistically significant (Chi-square=40.51, p-value <0.0001), with excellent diagnostic performance (sensitivity, specificity, PPV, NPV, and overall accuracy of 96.6%) [Table/Fig-11].

Crosstab				
Distance from skin to epiglottis (mm)		re_cormack		Total
		Easy	Difficult	
≤21.5	Count % within distance from skin to epiglottis (mm)	34 (97.1%)	1 (2.9%)	35 (100%)
>21.5	Count % within distance from skin to epiglottis (mm)	1 (6.7%)	14 (93.3%)	15 (100%)
Total	Count % within distance from skin to epiglottis (mm)	35 (70%)	15 (30%)	50 (100%)

[Table/Fig-11]: Calculation of specificity, sensitivity, positive predictive value, negative predictive value, accuracy for the distance from skin to epiglottis.

DISCUSSION

The present study demonstrated that commonly used bedside airway predictors such as the MMS, IIG, and TMD did not show a statistically significant association with difficult laryngoscopy in obese patients with a BMI between 30 and 34.9 kg/m². In present study cohort, MMS grades I-II and III-IV showed comparable proportions of easy and difficult laryngoscopy, indicating limited predictive utility of MMS when used alone. These findings suggest that conventional surface-based airway assessments may be inadequate in obese individuals, where deeper soft-tissue distribution plays a more decisive role in determining laryngoscopic view [13].

The present study findings regarding MMS are in agreement with the meta-analysis by Lundström LH et al., which demonstrated poor prognostic value of the MMS when used as a standalone predictor [13]. Ezri T et al., also reported no significant association between Mallampati grade and difficult laryngoscopy in obese patients, reinforcing the limited role of oropharyngeal visualisation in this population [4]. In contrast, Wu J et al., identified MMS as an independent predictor; however, their study population included predominantly non obese individuals and differed in anatomical characteristics and sample size, which may explain the observed discrepancy [14]. Similarly, studies involving patients with much higher BMI, such as that by Brodsky JB et al., found MMS to be predictive, highlighting the influence of body habitus and degree of obesity on the performance of this test [15].

In the present study, IIG and TMD also failed to demonstrate significant differences between easy and difficult laryngoscopy groups. This observation was consistent with the findings of Ezri T et al., and Wu J et al., who reported that neither mouth opening nor TMD independently predicted difficult laryngoscopy in obese patients [4,14]. The lack of association may be attributed to the inability of these static external measurements to reflect increased pretracheal and paraglottic soft-tissue thickness, which contributes substantially to airway difficulty in obesity [2,3].

A key finding of this study was the strong and statistically significant association between increased NC and difficult laryngoscopy, with a cut-off value of greater than 43 cm showing excellent sensitivity, specificity, and diagnostic accuracy. This finding corroborates the work of Brodsky JB et al., who identified NC as an independent predictor of difficult intubation in morbidly obese patients [15]. Riad W et al., similarly demonstrated that increasing NC was associated with both difficult mask ventilation and difficult intubation, underscoring its clinical relevance as a simple and reliable bedside predictor [16]. The consistency of these observations across different studies supports the inclusion of NC in routine preoperative airway assessment.

Furthermore, ultrasound-guided measurements of anterior neck soft-tissue thickness at the levels of the hyoid bone, thyrohyoid membrane, and vocal cords showed a highly significant association with difficult laryngoscopy in the present study. These ultrasound parameters demonstrated excellent discriminatory

ability, outperforming traditional clinical predictors. Similar findings have been reported by Wu J et al., Adhikari S et al., and multiple subsequent studies, all of which highlighted the superior accuracy of ultrasound-based airway assessment in predicting difficult laryngoscopy [14,17,18,21]. Recent systematic reviews and meta-analyses have further validated the role of ultrasound as a reliable and objective modality for airway evaluation [19].

Binary logistic regression analysis in the current study revealed no significant association between conventional bedside predictors and ultrasound-measured anterior neck soft-tissue thickness, indicating that ultrasonography assesses anatomical dimensions not captured by surface examination. This observation aligns with previous studies demonstrating that ultrasound provides additional and independent predictive information beyond traditional airway assessment tools [17,22]. Taken together, these findings reinforce the role of airway ultrasonography as a valuable adjunct in preoperative airway evaluation, particularly in obese patients where conventional predictors may be unreliable.

Limitation(s)

The difficulty of laryngoscopy can be affected by factors such as the anaesthesiologist's experience, airway secretions, and variations in anatomy. This study only looked at the Cormack-Lehane grade and did not consider other factors like the number of attempts or different laryngoscopy techniques. These factors may limit how widely the results can be applied.

CONCLUSION(S)

The study demonstrates that ultrasound-guided measurement of anterior neck soft-tissue is highly effective in predicting difficult laryngoscopy in obese patients with a BMI of 30-34.9 kg/m². Measurements at the hyoid bone, thyrohyoid membrane, and vocal cords were found to be independent and reliable predictors. Traditional clinical predictors such as modified Mallampati score, TMD, and IIG showed limited utility in this population. NC also showed a strong correlation with difficult laryngoscopy, supporting its use as a simple clinical indicator. Ultrasound provides a non invasive, rapid, and accurate method for preoperative airway assessment. Incorporating ultrasound into routine preoperative evaluation can help anaesthesiologists anticipate and prepare for potential airway challenges in obese individuals.

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