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Research Article

Ultrasonography in prediction of difficult airway intubation in obese patients in emergency operations

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Abstract

Background: Unexpectedly challenging laryngoscopy may still be a significant issue despite the adoption of several clinical index tests for airway evaluation. The aim of the study is to evaluate the efficacy of ultrasonography for predicting difficult intubation in patients who need emergency surgical treatment and are obese.. **Method:** this a prospective single center, double blind Cohort study, included as many eligible patients over period of 6 months whom were obese patients without clear anatomical abnormalities undergoing urgent surgeries and receiving general anesthesia, 349 patients included and divided to Control group (c) who were non obese patients, Obese group (O) with BMI >30 kg/m^2. **Results**: a significant difference recorded between the two groups as regard the weight which was higher in obese patients (92.1±6.2), and consequently the BMI was (34.8±4.9). Also, a significant difference in the clinical assessment between two groups, incidence of difficult laryngoscopy DL (20.3%) of obese patients, **Conclusion:** In obese individuals, ultrasonography might foretell a more challenging laryngoscopy.

Key words: ultrasound, difficult airway, endotracheal intubation, obesity, emergency.

Introduction

Unfavorable airway results were exacerbated by inadequate airway evaluation. In the event of an emergency, a doctor's ability to regulate airways is crucial. Unrecognized airway mishaps, including esophageal intubation, have been reported to occur between 6 percent and 16 percent of the time in emergency rooms[1]. The failure to intubate a patient who has been rendered pharmacologically immobile might have dire consequences. Clinical prediction of patients who may be difficult to intubate is generally possible; nevertheless, this strategy does not give perfect certainty, necessitating the consideration of other measures. [3]

In addition to weight, a high neck circumference has been indicated as a predictor of intubation difficulty in obese individuals. However, the volume of soft tissue in different topographic locations within the neck is not reflected in the neck's circumference. Fat distribution in the neck may be more informative than measuring the whole circumference of the neck. [4]

There are several benefits of using ultrasound (US). It's easy to find, carry about, practise again and over, save money doing it, not feel any discomfort doing it, and is safe. Soft-tissue imaging of the pretracheal tissues and anterior neck was described in the early studies describing US uses in clinical medicine. The use of ultrasound (US) for airway assessment has been validated across a variety of medical settings, including the operating room, the critical care unit, and the emergency room (ER). [5].

Aim of the work:

Through an analysis of correlations between ultrasound measurements of anterior cervical soft in the upper airway and the Cormack-Lehane grade, this study aims to find out if

preoperative ultrasound assessment of the upper airway can predict difficult laryngoscopy in emergency surgical obese patients.
The secondary goal was to evaluate the validity of clinical screening measures as predictors of airway obstruction.

Patients and method:
This prospective Cohort study used double-blind design. The research was carried out from May 2022 to November 2022 in the faculty of medicine's department of anesthesia and critical care at Minya University. Adult patients of both sexes, aged 18 to 60, undergoing urgent surgeries, and receiving general anesthesia were enrolled in the study after receiving approval from the institutional ethical and scientific committee , registration at clinical trials, and informed and written consent from the patients. Patients with severe airway anomalies, those who were clinically unstable, and pregnant women were not included in the research.
Every patient had their airway evaluated and cleared before surgery by two separate anesthesiologists who did not perform the laryngoscopy or intubation.
The ultrasonic technology used was a high-frequency, linear transducer operating between 6 and 13 MHz. After the patient was briefed on what to expect during ultrasonography, they lay supine with their heads in a neutral position. Sagittal imaging was performed with the probe positioned in the submental area of the neck at the midpoint of the transverse axis. Five levels were measured along the median axis: the hyoid bone, the epiglottis, the cricothyroid membrane, the thyroid isthmus, and the suprasternal notch in both a relaxed and extended neck posture. Specific ultrasonographic paremeters were noted in this research.These included the skin to the epiglottis (DSEM), as well as the depth of the Per epiglottic space (PES), as shown in figure 1. (1,2).
Anesthesia was induced intraoperatively after 5 minutes of preoxygenation with fentanyl (1_2 microgram/kg), succinylcholine (1_2mg/kg) and propfo l(1_2mg/kg) patient's head was propped in the sniffing position on a standard operating room pillow elevated to a height of 5 cm, and the anesthesiologist conducted a laryngoscopy with a Macintosh No. 3 or 4 blade, inserting an appropriate endotracheal tube.
The laryngoscope view was classified as grade 1 (a full view of the glottis), grade 2 (a partial view of the glottis with the anterior commissure obscured), grade 3 (observation of just the epiglottis), or grade 4 (no observable glottis) (epiglottis not seen).
After two unsuccessful attempts at intubation, the study was terminated and alternative methods of establishing an airway were tried.

Ethical consideration
The Ethical Committee of the faculty of medicine and the Minia University Hospital administration both gave their assent. Additionally, after describing the data's nature, purpose, and use to each participant, verbal agreement was obtained. We took into account the need to protect the privacy of everyone who took part in the survey.

Statistical analysis
A version of SPSS, 25 was used for all analyses. The initial step was to clean the data in order to find any missing or incorrect variables. The frequency distribution was used to display qualitative data, whilst the mean and standard deviation were used to display quantitative data. The proportions were compared using a chi-square test. Two means were compared using a student t-test. All statistically significant tests were considered to have a probability lower than 0.05.

Results
349 patients enrolled in the study, divided in two group control (non-obese patients) and obese group, The two studied groups were compared as regard demographic data, with no significance but weight and BMI with a significant difference as shown in table (1). A significant difference recorded in airway assessment either clinical (Malmpatie score, neck circumference) as in figure **(3)** or ultrasonographic assessment (per epiglottic space distance, distance from skin to epiglottis midway between the hyoid bone and thyroid cartilage.) in addition to a significant difference in Cormack lahene score between two studied groups as in figure (4),table(2). We found that ultrasonographic evaluation and the Cormack score were positively correlated in individuals who were obese.

Table (1) Demographic data in the studied groups

		Group		P value
		Non-obese	Obese	
		N=157	N=192	
Gender	*Male* *Female*	107(68.2%) 50(31.8%)	116(60.4%) 76(39.6%)	0.134
Weight	*Range* *Mean ± SD*	(60-90) 77.1±6.7	(77-105) 92.1±6.2	<0.001*
Height	*Range* *Mean ± SD*	(1.5-1.8) 1.7±0.1	(1.5-160) 2.5±11.4	0.381
BMI	*Range* *Mean ± SD*	(24.2-29.8) 27.8±1.5	(30-95) 34.8±4.9	<0.001*

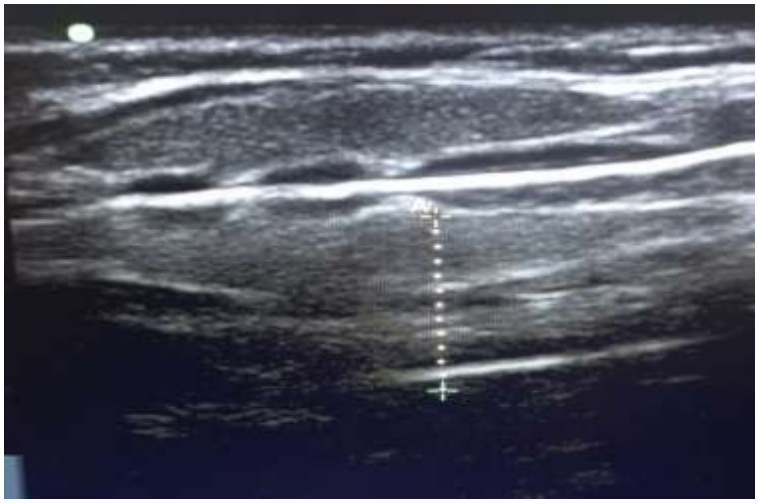

Figure (1): The white line indicates the preepiglottic space in a case in Minia university hospital.

Figure (2): The white line indicates the distance from skin to epiglottis midway (DSEM) between the hyoid bone and thyroid cartilage in a case in Minia university hospital.

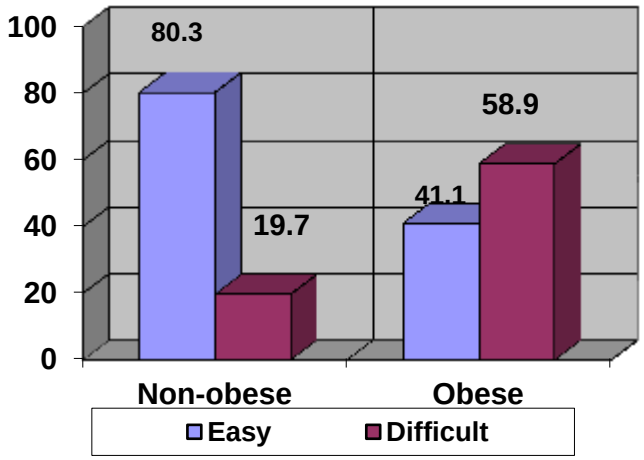

Figure (3): neck circumference with the incidence percentage of easy and difficult intubation in the two studied groups.

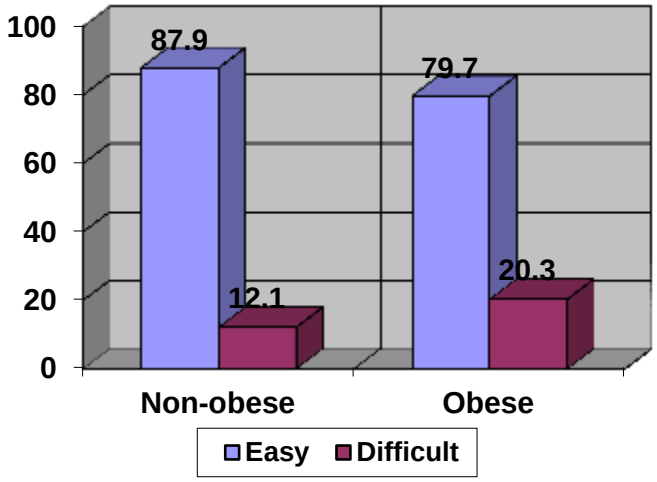

Figure (4) Cormack score with the incidence percentage of easy and difficult intubation in the two studied groups

Table (2) airway assessment in the studied

		Group		P value
		Non-obese	Obese	
		N=157	N=192	
Modified Mallampati score	*Grade 1* *Grade 2* *Grade 3*	40(25.5%) 100(63.7%) 17(10.8%)	19(9.9) 117(60.9%) 56(29.2%)	<0.001*
	Easy *Difficult*	140(89.2%) 17(10.8%)	135(70.3%) 57(29.7%)	<0.001*
Radiological assessment DSEM	*Range* *Mean ± SD*	(1.1-1.9) 1.5±0.2	(1.2-2.2) 1.6±0.2	<0.001*
	Easy *Difficult*	125(79.6%) 32(20.4%)	131(68.2%) 61(31.8%)	0.017*
Radiological assessment pre-epiglottic space	*Range* *Mean ± SD*	(0.9-1.7) 1.2±0.2	(0.5-1.9) 1.3±0.2	<0.001*
	Easy *Difficult*	118(75.2%) 39(24.8%)	118(61.5%) 74(38.5%)	0.007*

*Significant difference among the study groups (p<0.005)

Discussion

A difficult airway remains a major cause of illness and even death in the therapeutic setting. Because of this, a preoperative evaluation of the airway may aid in the provision of correct care. In this case, in addition to obtaining information from the patient's medical history and physical examination, tests such as the Mallampati score, thyromental and sternomental lengths, mouth opening, and neck circumference may be conducted at the bedside. There are limitations to these methods despite their ease of use, and no one test has been shown to be the most reliable predictor of airway obstruction. [6]

Since it is a noninvasive instrument that offers real-time anatomical information regarding the patient's airway, the ultrasound method holds great promise in anaesthetic treatment. Its value as a forerunner of intubation challenges has increased in recent years. [7]

The Mallampati score is a predictor of laryngoscopy difficulty.

Our findings, which showed that 29.7 percent of obese individuals will have intubation difficulties, [8] were subsequently disproven.

We postulated in [9] that a patient's neck circumference is a predictor for a difficult intubation if they are among the 58.9% of obese people. [10] Other research, however, showed no association between neck size, depth of anterior neck soft tissue, or any of these characteristics with the prevalence of laryngoscopy difficulties. For this study, a statistically significant difference between the two groups was found using Cormack-cutaneous Lehane's epiglottis distance [11]. In contrast to the previous studies. [6] in line with what Adhikari et al. found. [12]

Conclusion:

Ultrasonography has a strong correlation with intubation difficulty, which is Safe, portable, non-invasive, easily accessible and painless.

References

1. Mallampati, S., et al., A clinical sign to predict difficult tracheal intubation: a prospective study. 1986. 6(3): p. 257.

2. Brodsky, J.B., et al., Morbid obesity and tracheal intubation. 2002. 94(3): p. 732-736.

3. Bond, A.J.A. and i. care, Obesity and difficult intubation. 1993. 21(6): p. 828-830.

4. Pouraghaei, M., et al., Comparison between the effects of alfentanil, fentanyl and sufentanil on hemodynamic indices during rapid sequence intubation in the emergency department. 2014. 4.(١)

5. Kristensen, M.S., et al., Ultrasonography for clinical decision-making and intervention in airway management: from the mouth to the lungs and pleurae. 2014. 5: p. 253-279.

6. Xue, F.-S., et al., Predicting difficult laryngoscopy using ultrasound technique. 2016 . 34(100): 131-132.

7. Kundra, P., S. Mishra, and A. Ramesh, Ultrasound of the airway. Indian Journal of Anesthesia, 2011. 55(5): p. 456-462.

8. Voyagis, G., et al., Value of oropharyngeal Mallampati classification in predicting difficult laryngoscopy among obese patients. 1998. 15(3): p. 330-334.

9. Dohrn, N., et al., Difficult tracheal intubation in obese gastric bypass patients. 2016. 26: p. 2640-2647.

10. Riad, W., et al., Neck circumference as a predictor of difficult intubation and difficult mask ventilation in morbidly obese patients: A prospective observational study. 2016. 33(4): p. 244-249.

11. Yilmaz, C., et al., An evaluation of ultrasound measurements of anterior neck soft tissue and other predictors of difficult laryngoscopy in morbidly obese patients. 2018. 13(1): p. 18-24.

12.Adhikari, S., et al., Pilot study to determine the utility of point- of- care ultrasound in the assessment of difficult laryngoscopy. 2011. 18(7): p. 754-758.