EFFECTIVENESS OF ULTRASONOGRAPHY IN THE EVALUATION OF DIFFICULT AIRWAY IN OBESE PATIENTS

INTRODUCTION

Obesity has become an increasing public health problem worldwide. Obesity- related changes in pulmonary mechanics and metabolic, cardiovascular and respiratory physiology increases the risk of mortality and morbidity in the perioperative period.

Obesity is a proinflammatory multisystemic disease defined as hypertrophy and/or hyperplasia of adipose tissue. Genetic characteristics, endocrine disorders, neurological, psychological and environmental factors are effective in the development of obesity. Obesity is classified according to body mass index.[1] Body Mass Index (BMI) is defined as the ratio of body weight in kilograms (kg) to the square of height in meters (m). According to the World Health Organization (WHO), obesity is a global epidemiological epidemic and there are 1.5 billion obese patients worldwide[2].

Obesity is a main factor causing difficulties in airway management. Difficult airway is characterized by difficult mask ventilation and difficult intubation. It is more frequent in obese patients, because the neck is short and thick, and the larynx is displaced anteriorly and upwards. The amount of pharyngeal and palatal soft tissue is increased and the tongue is enlarged. Difficulty should be expected in providing airway management such as mask ventilation, direct laryngoscopy and tracheostomy, as a result of the enlargement of the face, neck, chest and abdomen circumferences with a high Mallampati score. The incidence of difficult intubation in patients with BMI>35 kg/m^2 has been reported as 15.5%[3]. But the literature also states that difficulty in intubation is not related to BMI but due to large neck diameter and mallampati score III-IV[4]. The probability of difficult intubation was 5% in those with a neck circumference of 40 cm and 35% in those with a neck circumference of 60 cm[5]. Indicators of difficult intubation in the pre-operative assessment are small oral cavity, short neck, limited head and neck movements due to increased fat tissue, mallampati score 3 or higher, sternomental distance of 12.5 cm or thyromental distance of less than 6 cm[6].

Ultrasonography is a low-cost, safe and rapid evaluation method. Some studies show that the measurement of soft tissue thickness in the anterior neck at the level of the vocal cords plays an important role in predicting difficult laryngoscopy in obese patients[7]. Airway evaluation with ultrasonography can be performed in emergency departments, intensive care units and operating rooms. In addition to the upper airway evaluation, the lower airway, lungs and pleura can also be evaluated. Again, difficult intubation is envisaged in patients with pretracheal soft tissue thickness of 28 mm and neck circumference of more than 50 cm at the level of the vocal cord[8].

In this study, it is aimed to determine the correlation between ultrasonographic measurements (anterior cervical soft tissue thickness at the level of the skin-anterior vocal cord junction, the distances between skin-hyoid bone, skin-thyrohyoid membrane, skin-midpoint of

the epiglottis) and difficult mask ventilation (Han Scale) and difficult laryngoscopy (Cormack-Lehane Classification) in obese patients (BMI≥30 kg/m^2).

METHODS AND MATERIALS

A total of 150 patients ages between 18-80 years, BMI ≥ 30 kg/m^2, ASA I-III who will undergo elective surgery under general anesthesia will be included in the study. Patients with facial and cervical trauma or cancer surgery, tracheostomy or thyroid surgery, non-cooperative patients and pregnant women will be excluded.

During the pre-operative evaluation gender, age, height, weight, type of surgery, BMI, neck circumference and extension, thyromental distance, sternomental distance, hyomental distance, mouth opening and distance between incisors will be measured to evaluate the dentition. ASA physical status will be recorded. OSAS will be evaluated based on Apnea-Hypopnea Index (AHI) (AHI<5 simple snoring, 5≥AHI<15 Mild OSAS, 15≥AHI<30 Moderate OSAS, AHI≥30 Severe OSAS). Modified Mallampati Score will be recorded. During this test, the pharyngeal structures will be evaluated by having the patient open his/her mouth as much as possible and protrude his/her tongue forward as much as possible in the neutral position without making a sound. (Class I: uvula, soft palate, tonsil bed, anterior and posterior plicae can be easily seen. Class II: uvula and soft palate can be seen. Class III: soft palate and base of the uvula are visible. Class IV: the uvula is completely covered by the tongue root and the pharyngeal wall cannot be seen). Patients will have an upper lip bite test. In order to perform the upper lip bite test, the patients will be asked to bite their upper lip with their lower incisors. According to this test; if the patient can bite the upper lip above the vermillion with the lower incisors, he/she will be evaluated as class 1; if the patient can bite the upper lip below the vermillion with the lower incisors, he/she will be evaluated as class 2; if the patient cannot bite the upper lip with the lower incisors, he/she will be evaluated as class 3. In accordance with the original study, class 1 and 2 will be considered as easy and class 3 as difficult intubation criteria.[9]

Ultrasonographic measurements will be performed by the main researcher anesthesiologist with the patient in supine position with head and neck placed neutrally. Anterior cervical soft tissue measurement will be performed in the transverse plane with a 13-6 MHz linear USG probe (Sonosite M-Turbo), including the hyoid bone, thyrohyoid membrane and anterior vocal cord junction. At the level of the hyoid bone, the minimum distance between the hyoid bone and skin (HCM) will be measured and recorded; at the level of the thyrohyoid membrane, the distance between the epiglottis midpoint and skin (ECM) between the hyoid bone and thyroid cartilage; and at the level of the vocal cord, the distance between the vocal cord anterior junction and skin (VCM) will be measured and recorded.

Train of four (TOF) monitoring will be applied to all patients along with standard anesthesia monitoring. Standart induction of anesthesia, 2 mg/kg propofol , 2 mcg /kg fentanyl, 0.6 mg/kg rocuronium as standard to be done intravenously. Mask ventilation will be done with a disposable plastic mask. The Han Scale will be used to assess difficult mask ventilation. (Class 1- Easy mask ventilation , Class 2- Oral airway / adjuvant requirement with/without NMBA ,

Class 3- Inadequate, difficult and unstable two practitioners with/without NMBA, Class 4- Impossible with/without NMBA ventilation) The laryngoscopy procedure will be performed by an anesthesiologist who has a minimum of 2 years of anesthesia experience and does not know about USG measurements, with an appropriate size Macintosh blade, after adequate muscle relaxation. The laryngoscopy image will be evaluated with the Cormack-Lehane classification. (Class 1- Glottis fully visible, Class 2- a. Glottis partially visible b. Only arytenoid cartilages visible, Class 3- Only epiglottis visible, Class 4- Epiglottis or glottis not visible) Han Scale 3-4 difficult mask ventilation, Cormack-Lehane 2b-4 will be considered difficult laryngoscopy.
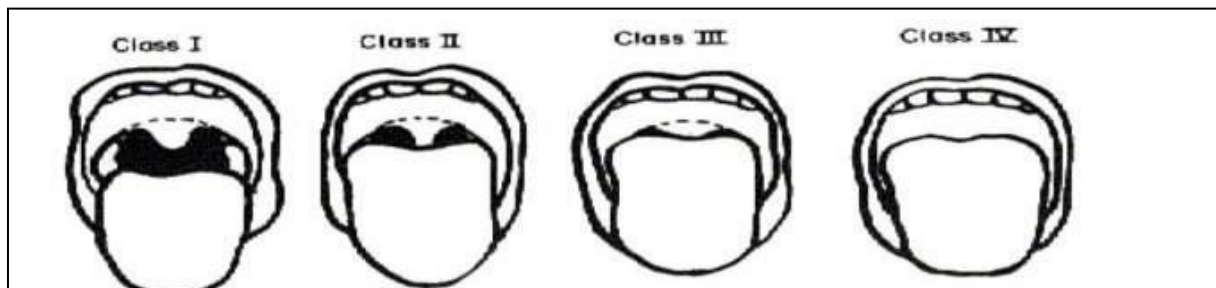
MALLAMPATI CLASSIFICATION

Class I: Anterior and posterior pleats, soft palate, tonsil bed and uvula are seen as comfortable,

Class II: Uvula and soft palate are visible,

Class III: The soft palate and base of the uvula are visible,

Class IV: Uvula is completely covered by the tongue root, the pharyngeal wall is not visible.
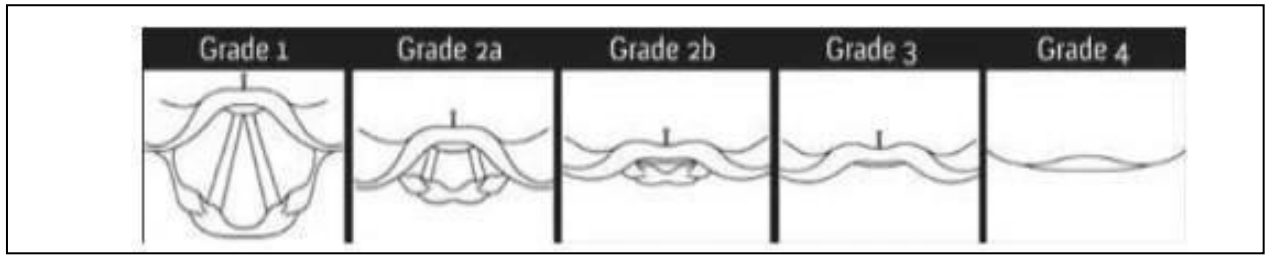

CORMACK-LEHANE CLASSIFICATION

1- Glottis fully visible

2 a. Glottis appear partially

   b. Only arytenoid cartilages are visible

3- Only the epiglottis is visible
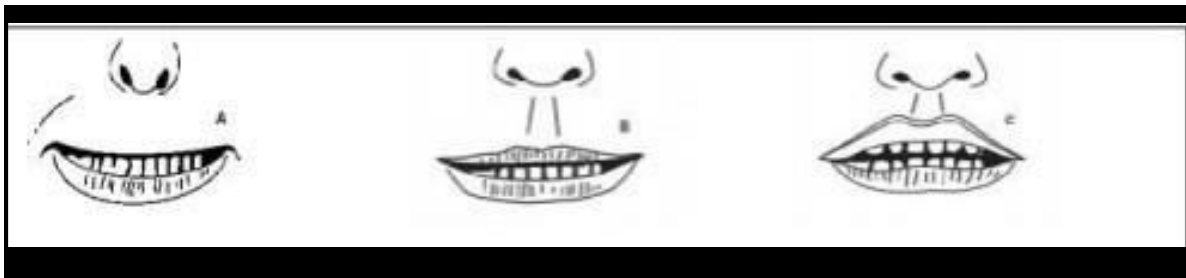
4- Epiglottis or glottis not visible

| Grade 1 | Grade 2a | Grade 2b | Grade 3 | Grade 4 |

UPPER LIP BITING TEST

If he can bite his upper lip above the vermillion with his lower incisors

If he can bite his upper lip under the vermillion with his lower incisors

Class 3- If he cannot bite his upper lip with his lower incisors

APNE-HYPOPNEA INDEX

- AHI<5 simple snoring,
- 5≥AHI<15 Mild OSAS,
- 15≥AHI<30 Moderate OSAS,
- AHI≥30 Severe OSAS

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