Ultrasound Measurements of Anterior Soft Tissue Thickness to Predict Difficult Laryngoscopy in Pregnant Patients

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Objective:

Obstetric patient airway management is becoming important, because of anatomical and physiological changes in the airway related to the pregnancy. The aim of our study was to compare the ultrasound (USG) measurements of 5 different levels of anterior neck soft tissue and other clinical screening tests for determination of difficult laryngoscopy in patients who underwent cesarean section operation with general anesthesia.

Materials and Methods:

Prospective, observational study included 140 pregnant women (18-45 years old, ASA I-II). Mallampati test, mouth opening, sternomental and thyromental distance, upper lip bite test, and neck circumference were recorded. The distance from the skin to the anterior aspect of the trachea was measured at 5 different levels: hyoid bone (zone 1), tirohyoidmembrane (zone 2), vocal cords (zone 3), thyroid isthmus (zone 4) and suprasternal notch (zone 5) (Fig I-V). An anaesthesiologist who was blind to the clinical screening variables and USG results performed the laryngoscopy. According to Cormack and Lehane’s scale, patients were divided into two groups: a grade 1 or 2 was accepted easy laryngoscopy, whereas a grade 3 or 4 was considered difficult laryngoscopy.

Fig I-V:Ultrasound Measurements of 5 Different Levels of Anterior Neck Soft Tissue

Fig I: Hyoid Bone (Zone I)

Fig II: Tirohyoidmembrane (Zone II)

Fig III: Vocal Cords (Zone III)

Fig IV: Thyroid Isthmus (Zone IV)

Fig V: Suprasternal Notch (Zone V)

Results:

Twenty of 140 patients were excluded from the study (meeting inclusion criteria (n=5), declined to participate (n=9), other reasons (n=5), and loss of USG recordings(n=3)). 30 patients were classified as having difficult laryngoscopy (25 %). All of the patients were intubated succesfully. Among the other clinical screening tests for difficult laryngoscopy: limited mouth opening (<3cm), high Wilson's Risk Score (> 2), large neck circumference (> 40 cm), unable to bite the upper lip, and high mallampati score (III-IV) were found higher in the difficult laryngoscopy group (p<0.05). Also, BURP maneuver, usage of gum elastic bougie, high intubation difficulty score (IDS ≥5), 3 more intubation attempts, airway difficulty rate were significantly higher in the difficult laryngoscopy group (p<0.05) Uni- and Multivariable Models can be seen on Table I.

Table I: Univariable and Multivariable tests for the ultrasound measurements of 5 different levels of anterior neck soft tissue and other clinical screening tests for determination of difficult laryngoscopy

	Univariable Model			Multivariable Model		
	Odds Ratio	95% Confidence Interval	p	Odds Ratio	95% Confidence Interval	p
Age	1.0	0.92 - 1.09	0.983			
Increased Body Mass Index	1.14	0.94 - 1.39	0.177			
Thyromental Distance	0.86	0.58 - 1.28	0.472			
Sternomental Distance	0.76	0.59 - 0.98	0.034			
Ultrasonography Zone I	37.6	0.01 ->100	0.402			
Ultrasonography Zone II	4.3	0.00 ->100	0.717			
Ultrasonography Zone III	2.9	0.03 ->100	0.650			
Ultrasonography Zone IV	10.9	0.03 ->100	0.419			
Ultrasonography Zone V	15.7	0.04 ->100	0.366			
Mouth Opening	0.35	0.15 -0.86	0.021**			
Modified Mallampati Score	1.70	1.00 -2.90	0.048**			
Wilson Risk Score	1.79	1.18 -2.71	0.006**			
Intubation Difficulty Scale	0.50	0.39 - 0.64	0.000**			
Inability to Bite Upper Lip	2.5	1.25 - 5.0	0.009**			
Neck Circumference	1.23	1.03 -1.48	0.025**			
Airway Difficulty Rate	0.03	0.01 - 0.08	0.000**			
No. of Intubation Attempts	7.06	2.71 - 18.3	0.000**	7.06	2.71-18.3	0.000**
More than Three Attempts	0.03	0.01 - 0.10	0.000**			
*BURP Maneuvre	0.0	0.00 - 0.1	0.000**			
Gum Elastic Bougie	0.0	0.01 - 0.1	0.000**			

*BURP: Backward, Upward, Rightward Pressure **p<0.05

Conclusion(s):

We found that high a mallampati score (III-IV), inability to bite the upper lip, limited mouth opeuseful in preoperative bedside tests to determine difficult laryngoscopyning, large neck circumference and high Wilson's Risk Score were. We believe that the use of BURP maneuver and gum elastic bougie will increase the success rate of endotracheal intubation. In our study, we did not find a statistically significant relationship between difficult laryngoscopy and the distance from the skin to the anterior surface of the trachea when measured with USG. We found that USG measurement of the anterior neck soft tissue has no effective benefit for predicting difficult laryngoscopy in pregnant patients.

Keywords: Airway Management, Laryngoscopy, Ultrasonography, Pregnancy, Neck Circumference.

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