EDITORIAL

Difficult Airway: Is this the Time to Focus on Point-of-care Ultrasonography?

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Incidence of difficult intubations varies between 8 and 13% in critical care units, Emergency departments and prehospital settings. Complications during emergency intubations vary between 22 and 54% in critical care and emergency room intubations. Aspiration, hypoxemia, and cardiac arrest risks are reduced by successful first-attempt intubation. Mallampati score III or IV, obstructive Apnea syndrome, Cervical spine mobility restriction, limited mouth opening <3 cm, Coma, Hypoxia, and non-Anesthesiologist intubating (MACOCHA) a combination of anatomical, physiological and operator factor-related scoring system is useful in assessing difficulty during intubation.[1]

INTUBE study which concentrated on intubation practices and peri intubation adverse events among critically ill patients across 29 countries published in 2021, described the indications of tracheal intubation and complications associated with the same in critically ill adults. Technical or physiological difficulties or both could be the reason for difficulties associated with airway management.[2] Hemodynamic instability is seen among one-fourth of patients even following successful intubation. Preintubation point-of-care ultrasound (POCUS), optimization of fluid status and early initiation of vasopressors are gaining popularity to prevent peri and post-intubation complications. Identification of cricothyroid membrane using ultrasound prior to intubation in the case of anticipated difficult airway for front of neck access could be lifesaving. Post-intubation endotracheal tube confirmation using ultrasound is also not uncommon.[3]

Can ultrasound play a vital role in predicting difficult laryngoscopy and difficult intubation in ICU? Is the result comparable to the conventional method of airway assessment?

Ultrasound can assess the subglottic airway with good efficacy. These findings have been validated against computer tomography and magnetic resonance imaging. In obese patients, the distance between the hyoid bone to the mentum of the mandible was measured in neutral as well as hyperextended position of the neck and the ratio between the two called as hyomental distance ratio has shown to be a good predictor of difficult laryngoscopy.[4] Difficult airway and difficult intubation assessment includes clinical examinations like modified Mallampati classification simplified airway risk index (SARI), and modified Cormack Lehane grading. Of late, POCUS has been in focus to predict difficult airways. Distance from the skin to the airway can be used to predict a difficult airway. As anterior neck thickness increases it is likely to result in pharyngeal structure mobility restriction, thereby making direct laryngoscopy more difficult.[5] In a study by Koumatsu et al., the level of vocal cord anterior neck thickness was measured but failed to predict a difficult airway. A meta-analysis by Carsetti et al. measurement of anterior neck thickness at two levels, at the level of the vocal cord and cricothyroid membrane had a poor prediction of the difficult airway. The distance measured from skin to epiglottis and skin to hyoid bone could predict difficult intubation.

Anterior structures like the tongue, epiglottis, mandible, and thickness of the oropharynx and hypopharynx have a direct impact on the performance of direct laryngoscopy.[6] Obstructions are secondary to posterior structures like upper teeth, maxilla, and the head being overcome by the mobility of the upper cervical spine-at the occipital atlantoaxial joint. The hyomental distance ratio is a good indicator of extension at the occipital atlantoaxial joint. Carsetti et al. highlighted that the differentiation of difficult and non-difficult airways was poorly predicted by isolated hyomental distance. But when the hyomental distance ratio was measured by measuring the hyomental distance in neck neutral and neck extended position, it could predict a difficult airway.[7] In a study done by Koundal et al. POCUS was used prior to surgery for airway assessment. Anterior soft tissue thickness at the level of epiglottis (DSEM) and ratio of depth of the pre-epiglottic space (Pre-E) to distance from the epiglottis to the midpoint of the distance between the vocal cords (E-VC)] {Pre-E/E-VC} had strong positive correlation and hyomental distance ratio (HMDR) had moderate negative correlation with difficult laryngoscopy.[8] Similar findings were observed by Pillai et al. among patients getting intubated in the emergency department. Skin to hyoid bone distance and tongue thickness predicted a difficult airway in this study.[9] DARES-protocol for difficult airway evaluation with sonography proposed by Lin et al. considered the following parameters. Distance from the skin to epiglottis (DSE), tongue thickness, hyomental distance, the ratio of hyomental distance measured in the maximal extension of the head to the neutral position of the head, the ratio of hyomental

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distance was also measured in head in ramped position and head in neutral position.[10,11]

A cross-sectional study was performed in a mixed medical-surgical ICU by Kar Supriya et al. to evaluate the role of POCUS in identifying difficult intubation in the intensive care unit.[12] Correlation between airway assessment by clinical examination and ultrasound airway assessment was performed. One hundred and fifty-two patients who were intubated in the ICU were assessed by clinical examination and ultrasound examination prior to intubation. Airway grading was carried out using Cormack Lahane grading. Cormack-Lehane grading III and IV were classified as difficult airways and constituted 17.76% of patients. Hyomental distance ratio (HMD-R) in the neutral and maximum extended position and Thyromental height were measured using a measuring scale. Based on the ROC curve analysis cut-off value of 1.97 cm (95% CI, 0.949–0.996, AUC: 0.972) for anterior soft tissue thickness from the skin to the thyrohyoid membrane distinguished the difficult intubation group from the easy intubation group, with a sensitivity of 96.3% and specificity of 86.4%. For the hyoid bone level, a cut-off value of 0.905 cm (95% CI, 0.706–0.887, AUC: 0.797) had a sensitivity of 74.1% and specificity of 74.4%. Anterior soft tissue thickness from the skin to the thyrohyoid membrane was considered a better predictor of a difficult airway. A good correlation was observed between clinical and ultrasonographic assessment.

All intensive care unit intubations are considered as difficult intubation unless proven otherwise.[13]

Though POCUS can assess the airway within 2–3 minutes, it is operator-dependent. In case of emergency intubations, there may not be enough time to do an ultrasound. In the case of elective/semielective intubations probably to understand the level of difficulty POCUS can give some directions so that the treating team can be prepared to handle the difficult airway. Complex measurements may be still difficult to perform. POCUS seems to overestimate the difficult airway compared to clinical assessment as we observed in the current study. In clinical practice, this false positive result is hardly of any consequence.

Conclusion

We need more studies for further validation to implement POCUS in difficult airway assessment, especially in intensive care units. It is not surprising if POCUS becomes a part of difficult intubation algorithms in the near future.

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