Editorial
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Rescue Devices and Difficult Intubation. What next?

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A difficult airway includes difficulty in mask ventilation, difficulty in tracheal intubation or both. The added components to these in the recent years have been the difficulty in the insertion of a supra-glottic airway device or repeated failed attempts after prediction of a normal airway. Practice guidelines by the American Society of Anesthesiologists Task Force advise the assessment of the airway for each of these components and also recommend the composition of a portable storage unit for difficult airway management[1]. Studies related to predicting a difficult airway are usually conducted on normal individuals and involve various scoring systems or grading systems involving various parts of the airway; it may be the tongue in relation to the oral cavity assessment done in the Mallampati scoring or more complex scoring systems such as the Wilson's scoring system etc. Similar scoring systems or guides to difficulty of insertion of supra-glottic airway devices have been utilised to predict difficult insertion. Some of these supra-glottic airway devices such as the iLMA have been proposed as airway rescue devices where-in intubation can be performed through these devices. The position of these devices can be ascertained using fiberoptic devices but sporadic case reports on failure of intubation even with these manoeuvres have been published. Three such cases have been reported by Kim *et al* and they recommend combining the use of a fiberoptic laryngoscope with a iLMA for intubation in cases where either technique fails[2]. The article in this issue deals with problem of predicting difficult tracheal intubation through an iLMA and finds that the only factor which may affect it may be the thyromental distance[3].

The algorithmic approach to a predicted difficult airway allows for selecting devices based on these predictions on history, examination and investigations if required. These approaches concentrate on either direct laryngoscpopy, or supra-glottic airway devices. The All India Difficult Airway Association guidelines algorithm indicates the use of supra-glottic airway devices if conventional laryngoscopy and intubation fail[4]. But, in such emergencies prediction of adequate oxygenation through such devices cannot be done. However, the iLMA has one advantage a failure to intubate does not mean a failure to oxygenate through the LMA. But the difficulties occur if the iLMA cannot be placed properly to achieve adequate ventilation. The common predictors used for difficult airways do not hold good for predicting intubation through iLMA and have not been evaluated extensively. Hence, airway related mishaps still remain the main cause of claims in the United States of America and United Kingdom. All these factors have led researchers to explore better scoring systems and better avenues.

Studies done in Alexandria, Switzerland and the United States of America have tried to incorporate machine learning and facial analysis software in the prediction of a difficult airway. These models are new approaches and with the data available and compared to the abstract definitions of difficult airway have attained sensitivity and specificity values mirroring earlier models based on scoring systems. Connor *et al*[5]. performed a model derivation study including 20 patients with an "easy" airway and "difficult" airway as classified by an anaesthesiologist with 1 year experience. This software used for facial recognition based on 61 points pre identified and assigns a weightage for each variation. Based on the analysis of these variations three factors were identified in addition to the thyro mental distance for accurate prediction of the difficult airway. These parameters were brow nose chin ratio, jaw neck slope and the nose. The validation studies on 2047 facial models comparing the derived model with classical airway assessment techniques were performed. They did show good sensitivity and specificity predicting the difficult airway[5].

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Cuendet *et al*[6]. used the facial analysis software to predict a difficult airway using a fully automatic prediction system. They found good correlation with traditional models obtained by multivariate analysis. This system was evaluated in 900 patients after the validation[6].

Concepts of artificial intelligence and machine learning have been used to predict difficult airway and investigated since 2017. Moustafa *et al*[7]. used the machine learning algorithms to analyse create a predictive software called as the "Alex Difficult Laryngoscopy Software". This software needs the entry of parameters such as body mass index, mandibular length etc in order to predict the Cormack Lehane score as either easy or difficult. The sensitivity and specificity of the prediction was as good as the conventional multi parameter scoring systems[7]. Lower airway disease and obstruction can be mapped and recognised using machine learning. Similarly upper and lower airway obstruction or anomalies can also be assessed using machine learning[8].

Another area of interest for researchers and clinicians is the paediatric airway. Conventional methods of assessment of the airway cannot be used in this subset of patients. Predictive software which is able to predict difficult airway or a higher chance of airway related incidents in these patients would help clinicians stratify the risk would be a welcome addition to the clinician's armamentarium. India may play a pivotal role in such studies as there is availability of technological knowhow related to software and the large number of surgical patients on whom this software can be evaluated. With the increased usage of smart phones in India mobile applications may provide a better platform for assessments.

The further evaluation of software and incorporating predictive models for insertion of supra-glottic airway devices, intubation through these devices may be the way of the future. Data collection in this regard and evaluation may play a pivotal role and may see the role of anaesthesiologists as decision makers taken over by softwares of the future. Until then predicting a difficult airway remains an art to be mastered by all anaesthesiologists and difficult airways which are unanticipated may remain the main cause of adverse events.

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