

Tracheal Intubation Awake or Under Anesthesia for Potential Difficult Airway: Look Before You Leap

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Securing a patent airway remains a pivotal point in clinical anesthesia, while failure to establish airway in anesthetized patients can cause severe outcomes in a few minutes.^[1] According to the closed claims analysis conducted by the American Society of Anesthesiologists, a leading cause of anesthesia-related patient injury is the inability to intubate the trachea and secure the airway. As consequences, 85% of those are either death or brain damage.^[2] In a review of litigation related to anesthesia in the National Health Service hospitals in the UK from 1995 to 2007, airway- and respiratory-related events account for 12% of all anesthesia claims, 53% of deaths, and 27% of reparation, and are involved in ten out of the fifty most expensive claims.^[3] In addition, about half of the incidents reported to the fourth National Audit Project of the Royal College of Anaesthetists and the Difficult Airway Society describe that airway complications are related to primary problems with tracheal intubation, including failed intubation, delayed intubation, and “cannot intubate cannot oxygenate” situation.^[4] These facts have greatly facilitated the progress of clinical airway management and resulted in the development of new related strategies and techniques.^[5] Furthermore, in numerous nations, practice guidelines have been developed to assist anesthesiologists for safe airway management in perioperative period.^[6-12] Due to those tremendous efforts, the incidence of serious complications related to airway management has been significantly decreased.^[1]

As airway management specialists in a hospital, anesthesiologists successfully manage airway relying on a wide range of knowledge, including the ability to predict difficult airway, to formulate plans for airway management, and to possess the skills for using all kinds of airway devices.^[13] The expert panel that reviewed 184 cases of major airway complications in the Fourth National Audit Project of the Royal College of Anaesthetists and the Difficult Airway Society concludes that poor judgment (59%) and education/training (49%) are the second

and third most frequent causal and contributory factors (next to patient factors; 77%), respectively. Furthermore, deficiencies in airway assessment, underutilization of awake tracheal intubation, inappropriate use of supraglottic airway devices, and evidence of poor airway management planning were also noted.^[4] These findings indicate that current strategies for airway management are not ideal and further improvements are required.

Awake tracheal intubation is often considered as one of the safest performers for patients with known or predicted difficult airways,^[14] but the technique itself is a tremendous stimulating and uncomfortable procedure. Some patients even refuse awake tracheal intubation and thereafter abandon surgical treatment because of anxiety and trepidation, especially for those who had this experience in the past. In addition, awake tracheal intubation is impossible to be carried out successfully in some cases, such as younger children and psychopathic patients with difficult airways due to their lack of cooperation.^[15] For these cases, tracheal intubation under general anesthesia becomes necessary. When the tracheal intubation is performed under general anesthesia in patients with known or predicted difficult airways, the next thing that the anesthesiologists eager to know is whether or not the facemask ventilation is difficult. If facemask ventilation is not difficult, the airway is manageable by using the facemask ventilation even if the larynx proves difficult to be visualized or tracheal intubation is a failure.^[16] When the tracheal intubation under general anesthesia is planned

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on patients with known or predicted difficult airways, it is imperative to know whether adequate facemask ventilation can be obtained after anesthetic induction.

As far, many preoperative approaches and tests in predicting difficult facemask ventilation after anesthetic induction have been proposed.^[17] Ideally, a screening test for difficult facemask ventilation should allow diagnosis of all problem cases (sensitivity = 100%), without false positives in patients who are easy to ventilate (specificity = 100%). As difficult facemask ventilation is a low incidence and high-risk event by many reasons, such a guaranteed test does not exist, and it seems unlikely that one will be developed in the future. The currently available evidence indicates that most of the preoperative airway assessment tests only have a low predictive performance for difficult facemask ventilation after anesthetic induction.^[1] Thus, the new tests and evidences for prediction of difficult facemask ventilation are still needed.

In this issue of CMJ, Wang *et al.*^[18] reported their findings from a multicentric prospective randomized study which had tested a new approach, fast difficult airway evaluation (FDAE), for difficult facemask ventilation after anesthetic induction. The authors randomly assigned 302 patients with potential difficult facemask ventilation and difficult intubation undergoing elective surgeries into the FDAE and control groups. In the FDAE group, patients were gradually induced with sevoflurane, and adequacy of facemask ventilation during spontaneous breathing was assessed at various anesthetic levels. If facemask ventilation was adequate, tracheal intubation was performed using direct or videolaryngoscopy under anesthesia. Otherwise, sevoflurane anesthesia will be stopped and awake tracheal intubation would be performed as the standard care. In the control group, difficulty in tracheal intubation was evaluated under local anesthesia. Their results showed that the FDAE significantly reduced the need for awake tracheal intubation and improved the efficiency of tracheal intubation and satisfaction levels of patients without comprising patient safety. The study by Wang *et al.*^[18] has demonstrated the growing wealth of information regarding the applicability of airway management under general anesthesia in patients with known or predicted difficult airways.

Many things were well done in this study. Especially, a prospective, randomized, controlled design was applied and a large sample of patients with potential difficult airways was included. Furthermore, airway obstruction, a mostly important concern by anesthesiologists when managing difficult airways under general anesthesia, was used as the primary goal of airway assessment.^[1] In addition, the FDAE approach designed by Wang *et al.*^[18] has some logical features. First, during the FDAE process, anesthetic depth is gradually increased with sevoflurane inhalation while maintaining spontaneous breathing. Sevoflurane concentration is kept at 3% until loss of consciousness. Second, the first decision-marking point of the FDAE approach depends on whether or not facemask ventilation is adequate. If severe airway obstruction occurs during

sevoflurane inhalation and cannot be relieved by routine airway maneuvers, sevoflurane is turned off and the patient is woken up for awake tracheal intubation. Third, for patients with adequate facemask ventilation under sevoflurane anesthesia, direct laryngoscopy attempt is allowed and then second decision-marking point of the FDAE approach depends on whether or not laryngoscopic view is adequate. If the laryngoscopic view is good, and the chances of achieving successful tracheal intubation are high, intravenous muscle relaxants are allowed before tracheal intubation. If the laryngoscopic view is bad, video-assisted intubation is performed. These features of the FDAE approach provide the high yield of securing the airway.

It must be emphasized that the final goal of airway management is oxygenation, rather than successful tracheal intubation. Failure of tracheal intubation does not directly lead to adverse outcomes, such as death or brain injury as a result of oxygenation failure, if facemask ventilation is adequate.^[19] Importantly to point out that nearly one-third of difficult facemask ventilation is actually accompanied by difficult or impossible tracheal intubation. Difficult facemask ventilation is, therefore, a more critical situation to be avoided and resolved in anesthetized patients than tracheal intubation failure.^[20] Most of the current guidelines for difficult airway management during anesthetic induction begin with unsuccessful intubation attempts.^[7-10] These guidelines aim to solve the intubation problems and to prevent adverse outcomes. This FDAE approach significantly differs from those of practice guidelines. The investigators mainly focus on the assessment of difficult facemask ventilation after anesthetic induction and immediately use the real-time assessment results to make decision for subsequent airway management. Although usefulness of the FDAE approach was validated by successful intubation in most anesthetized patients (94.2%, 149/155) without adverse outcomes, they were unable to completely prevent the development of hypoxemia throughout airway management. In this study, one patient developed laryngospasm during the FDAE process and his SpO₂ briefly dropped to 50%. That is, as we mentioned above, the development of an airway strategy for always maintaining oxygenation throughout each step of airway security in all anesthetized patients has not yet been succeeded. Furthermore, more large-sample clinical studies are needed to validate clinical safety of the FDAE approach before adoption into routine practice.

In our view, there are several issues in their study design and findings that deserve attention. Since the main aim of designing the FDAE approach was to assess the ability to obtain adequate facemask ventilation after anesthetic induction in patients with potential difficult airways, supraglottic airway devices were not used as the tools to manage difficult facemask ventilation. In fact, the supraglottic airway devices play an important role in the management of patients with difficult airways, as the devices enable ventilation in patients with difficult facemask ventilation and simultaneous use as a conduit for tracheal intubation.^[21,22]

Moreover, use of supraglottic airway devices during difficult airway management has been widely recommended in many practice guidelines.^[6-12] In addition, this study showed that the FDAE approach significantly decreased the need for awake tracheal intubation in patients with predicted difficult airways. We would like to remind the readers that this result does not mean that awake tracheal intubation is no longer a necessary technique for difficult airway management. In fact, this study has excluded the patients who truly require awake tracheal intubation for airway management, such as patients with severe airway obstruction, severe respiratory diseases, and a high risk of aspiration. Despite these exclusion criteria, 5.8% of patients (9/155) in the FDAE group still developed obvious airway obstruction after anesthetic induction and received awake tracheal intubation. As the safest option for managing difficult airways, we believe that awake tracheal intubation will still be needed in patients with uniquely altered anatomy.^[23] Especially, awake fiberoptic tracheal intubation, a “gold standard” technique in managing difficult airways, can be performed with a high degree of success and a very low complication rate in very large number of patients over a long period of time.^[24] We would also like to mention that other techniques, though they might not be used often but could be life saving, should be taken into consideration for a comprehensive airway management strategy. Those include surgical airway^[8,9] and, for rare cases, extracorporeal membrane oxygenation implantation.^[25]

In conclusion, the factors for continuous improvement in anesthesiologists’ successfully managing difficult airway situations are manifold, including comprehension of the problems; use of assessment tests with good predictive ability; evolution of universally applicable management strategies and acquisition of practical skills; and development of new airway devices with better performance characteristics.^[1,26] Patient safety during airway management should not rely on a single specific technique/strategy. Anesthesiologists should be encouraged to explore techniques or methods for safe management of difficult airway. To our knowledge, this study is the first randomized controlled trial evaluating performance of a predesigned approach for decision-marking of subsequent airway management strategies based on the development of difficult facemask ventilation after anesthetic induction. The findings of this study challenge the classic recommendation that patients with difficult airways must be managed by an awake tracheal intubation technique. Due to a decreased use of awake intubation, this approach might at least be very valuable for the management of potential difficult airways while balances patients’ comfortableness and anesthesiologists’ efficiency. This has important significance to improve the quality of clinical anesthesia and satisfy patients’ needs and expectations.

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There are no conflicts of interest.

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