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# Selected highlights from clinical anesthesia and pain management☆

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ABSTRACT

*Study objective:* To review research highlights of manuscripts published in 2017 that pertain to all aspects of the clinical practice of anesthesiology.
*Design:* Narrative review.
*Setting:* N/A.
*Materials:* The major themes addressed in this review include recent studies examining airway management, obstetrical and gynecological anesthesia, pediatric anesthesia, cardiac anesthesia, regional analgesia and pain management.
*Interventions:* N/A.
*Main results:* N/A.
*Conclusions:* This review will highlight and inform anesthesiologists of the developing trends in clinical anesthesia and will also pose new challenges for further studies.

The management of a difficult airway can be one of the most challenging clinical problems encountered by the anesthesiologist. The presence of a difficult airway is associated with increased morbidity and mortality [1]. Management of intubation difficulty in adult or pediatric patients requires efficient cooperation and effective communication among all clinical providers to ensure effective ventilation and decrease the occurrence of respiratory complications [2,3]. In addition, failed tracheal intubations are reported to be more common among the obstetrical population [4]. Recent studies have examined intubation techniques, neuromuscular blocking agents, airway equipment and improved algorithms for the detection and management of a difficult airway [5]. Our review highlights manuscripts published last year in the *Journal of Clinical Anesthesia* that pertain to all aspects of the clinical practice of anesthesiology.

## 1. Airway management

Delivery of the endotracheal tube into the trachea can be performed with various airway management devices. Flexible bronchoscopy has been established as the gold standard instrument for direct visualization of the airways but requires training. The video laryngoscope offers the advantage of direct visualization and may be more adaptable to use in emergency airway situations. Kurahashi et al. reported a successful tracheal intubation with the McGRATH™ MAC (McGRATH; Aircraft Medical Ltd., U.K.) video laryngoscope during chest compression in a difficult airway patient [6].

An intubating laryngeal mask airway (ILMA) can also be useful securing the airway as it allows unobstructed ventilation and can be used as a conduit to assist the placement of an endotracheal tube. In a randomized prospective clinical trial involving 40 adult patients, Hanna et al. investigated the use of an LMA Fastrach intubating laryngeal mask airway (ILMA) compared to flexible bronchoscopy (FB) for awake intubation in patients with difficult airways [7]. The number of attempts, time to endotracheal tube placement, patient satisfaction and adverse events were recorded. The authors concluded that the first attempt to endotracheal tube placement was significantly less in the ILMA group compared to the FB group (95%, 58%, $P = 0.003$). The success rate within three attempts was the same for both groups (95%). The time it took to place the endotracheal tube was greater in the FB group compared to the ILMA group; 246 s, 92 s; $P \leq 0.001$. Patient satisfaction was not different between groups and no adverse events were reported.

Another type of laryngeal mask airway (LMA), Ambu® AuraGain™ LMA (Ballerup, Denmark) contains a larger port that can be used as a conduit for blind endotracheal intubation. In addition, it also has a

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gastric access port which minimizes the risk of aspiration [8]. Jang et al. reported that the AuraGain™ LMA with esophageal Doppler monitoring enables anesthesiologists to evaluate patients' cardiac output accurately through a convenient probe insertion via a gastric drain port [9].

There are also many types of LMAs that are intended only for ventilation. Recent advances in supraglottic airway devices (SAD) have been shown to be associated with less peri-operative airway complications in children when compared to tracheal intubation [10]. In contrast to the first-generation devices, the 2nd generation devices include a gastric port to reduce the risk of pulmonary aspiration of gastric contents. Liu et al. discussed the importance of the need for formal teaching and training with the use of the second generation LMA-ProSeal. Without proper experience with insertion technique and patient positioning, poor sealing pressure may occur when using the LMA-ProSeal [11].

A newer device, the Laryngeal Mask Airway Protector (Teleflex Medical Japan, Tokyo, Protector), is a single use SAD comprising of a pharyngeal chamber with dual gastric access ports. Moreover, it has an integrated cuff pressure indicator that uses three color bars showing the cuff pressure range (yellow < 40 cm H2O, green 40 to 60 cm H2O, and red > 60 cm H2O), allowing for rapid visual assessment [12,13]. These assessment of changes in airway pressure, for example due to perioperative positioning, which may be challenging for the clinician to detect using standard devices are clinically useful since high cuff pressures are a contributor to tracheal pharyngeal adverse outcomes such as transient sore throat [14,15]. Tan et al. described the placement of the LMA Protector in patients in beach-chair position receiving multimodal anesthesia including an ultrasound-guided interscalene block followed by general anesthesia [16]. All patients were fitted successfully on the first attempt with minimal dislodgement of the LMA Protector in situ during patient repositioning. Although the authors concluded that the placement was relatively smooth with confirmed placement (flexible video bronchoscopy) and positive ventilation, further studies are warranted with respect to advanced uses of the LMA Protector.

In maxillofacial surgeries and patients with a limited mouth opening, airway management is frequently performed with nasotracheal intubation. One of the most common complications following nasotracheal intubation is tissue damage leading to postoperative sore throat with a reported incidence of 40 to 66% [17,18]. Tachibana and colleagues investigated whether nasotracheal intubation using a fiberoptic bronchoscope reduces the occurrence of postoperative sore throat [19]. Using a numerical rating score (0 = none, 10 = severe) to assess sore throat 24 h after surgery, the authors reported that the severity was less in patients who received fiberoptic bronchoscope guided nasotracheal intubation compared to those who received the blindly guided Macintosh laryngoscope technique [IQR 0 (0 to 0), 1 (0 to 3), $P = 0.0007$]. In addition, the median time to completion of intubation was shorter with fiberoptic nasotracheal intubation [IQR 48 (32 to 80) s] than with the Macintosh laryngoscope [88 (56 to 110) s], $P < 0.0001$.

During nasotracheal intubation, the guidance of the tip of the nasotracheal tube into the glottis can be challenging, especially in patients with limited mouth openings. Yang et al. described a novel technique involving a wire attached to the distal tip of a nasotracheal tube allowing for manipulation of the distal curvature of the tube increasing the success rate of nasotracheal intubation [20]. This may be an alternative method in situations where the cuff inflation technique fails [21].

The incidence of difficult intubation has been reported to be as high as 5.8% in the general population and 16.7% in patients with a BMI > 30 kg/m$^2$ [22,23]. In a prospective observational randomized trial, Castillo-Monzon et al. compared the speed and success of tracheal intubation using either the Macintosh or Airtraq laryngoscopes in morbidly obese patients scheduled for surgery [24]. In the Airtraq group, 95.65% of patients presented a glottic view 1 and 2a ($P = 0.006$) and required less additional maneuvers to perform the tracheal intubation ($P = 0.001$) compared to the Macintosh group. In either group, there was no case of failed intubation or difficult intubation or ventilation reported. Similar to other studies, patients allocated to the Macintosh group did experience an increase in heat rate within 5 min after tracheal intubation [25]. The use of the Airtraq created less hemodynamic stimulus irrespective of the induction technique performed. The Airtraq device allows visibility of the glottic opening using less force than traditional laryngoscopy making it useful for assessing vocal cord mobility following thyroid surgery [26]. To improve Macintosh laryngoscopy placement, a lip pulling technique facilitates effective laryngoscopy and limits lip injuries [27].

When encountering a difficult airway, the gold standard of airway management is awake fiberoptic intubation, which requires numbing the upper airway to supress the gag, swallow and cough reflexes [28]. Topical anesthetics, such as lidocaine, are routinely used to anesthetize the airway. Elkoundi et al. reported the use of nebulized administration of ketamine in a patient with documented lidocaine allergy [29]. The topical ketamine effect is thought to attenuate the local inflammatory response in addition to its peripheral analgesic effect. Previous reports have demonstrated that topical ketamine produced analgesia in patients suffering from neuropathic and cancer pain [30] as well as attenuating postoperative sore throat [31]. Nebulized ketamine as a single agent for awake fiberoptic intubation may be a viable option for airway blocks with further studies needed to evaluate its efficacy.

In a randomized clinical trial, Komasawa and colleagues compared the impact of stylet application for tracheal intubation for postoperative pharyngeal pain or hoarseness in patients undergoing elective surgery [32]. The incidence of postoperative pharyngeal pain was significantly higher in the stylet group (10/20 patients) than in the control group (2/20 patients; $P = 0.013$). The incidence of hoarseness did not significantly differ between groups ($P = 0.45$). The authors concluded that the stylet application itself increases the incidence of postoperative pharyngeal pain.

There are many contributing factors that increase the probability of encountering a difficult airway [33–35]. The presence of an anatomical mass in the head neck region can also make securing an airway very challenging and may require imaging as part of the airway management plan [36]. A major contributing factor affecting difficult intubation is the facial angle of the mandible. In a prospective study of 123 patients undergoing maxillofacial surgery under general anesthesia, facial angles were measured with a cephalometry. Difficult intubation was reported in 12% of patients with the facial angle $\leq 82.5^\circ$ demonstrating a high sensitivity of predicting difficult intubation [37]. As an alternative to nasotracheal intubation and when orotracheal intubation is not practical, Altemir's technique of submental intubation [38] may be performed successfully in maxillofacial surgeries and provide transmaxillary access to the cranial base [39,40]. In head and neck surgery, such as thyroid surgery, the use of electromyographic endotracheal tube has become popular to identify and monitor the recurrent laryngeal nerve to avoid injury [41].

Because a highly accurate single airway assessment tool does not exist, multiple assessments of patient and airway characteristics have been used in combination to predict difficulty in airway management [42]. One such assessment is the thyromental height measurement (THM). This assessment is performed by measuring the vertical height form the anterior boarder of the thyroid cartilage to the anterior boarder of the mentum. The optimal sensitivity and specificity cut-off point of the THM measurement has been suggested to be at a cut-off point of 50 mm [43]. In a prospective, blinded study involving 451 subjects undoing general anesthesia, Selvi et al. compared the predictive values of different airway assessment tests including the THM, the modified Mallampati test (MMT), upper lip bite test, and thyromental distance (TMD) measurement for prediction of a difficult laryngoscopy. The optimal cut-off points for THM for predicting difficult