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The airway in day surgery – the laryngeal mask airway and alternatives

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Introduction

The increase in the number of patients selected for ambulatory surgery is associated with an increase in associated pathology and in complexity of the procedures. Many patients require general anesthesia and others can be managed with regional anesthesia. The airway, however, must be evaluated in all patients even if the main technique is a peripheral nerve block, not only because complications can happen, but because blocks are often combined with sedation or general anesthesia.

There has been an increasing interest in the development of extraglottic (or supraglottic) devices (EGD) for the management of the airway, particularly in ambulatory surgery [1].

These devices include the different models of the laryngeal mask airway and their disposable versions, the Cuffed Oropharyngeal Airway (COPA™, Tyco Healthcare Ltd), the Pax oropharyngeal airway (Paxpress™, Vital Signs Ltd), the Cobra Perilaryngeal Airway (COBRA™ PLA, Engineered Medical Systems), and the Airway Management Device (AMD™, Nagor Ltd) [2]. In the last few years a number of studies comparing these extraglottic devices with the laryngeal mask airway have been published. In 2002 Bailey [3] reviewed these and stated: 'The classic LMA still remains the 'king' of the noninvasive airways and is ideally suited to outpatient anaesthesia, and the gold-standard with which newer devices are compared'.

The new extraglottic devices

In Bailey's review the 'new EGDs' are not included. This new generation of EGDs are specifically designed to reduce the risk of aspiration in order to permit basic or advanced use. In a recent study on a cadaver model these new devices seem safer than the classic ones [4]. The devices with oesophageal lumens tested were the Oesophageal Tracheal Combitube™ (OTC, Tyco-Healthcare-Kendall Company), Easytube™ (Rusch), ProSeal™ LMA (PLMA, Intavent Orthofix) and Laryngeal Tube Suction mark II™ (LTS II, VBM Medizintechnik GmbH). All four devices drained fluid adequately and prevented tracheal aspiration. Use of devices with an additional oesophageal drainage tube may be better in patients with an increased risk of aspiration.

Six of the new EGDs have been designed to separate the respiratory and gastro-intestinal tracts: the I-gel™ (Intersurgical), the LTS II and its disposable version (LTS-D™, VBM Medizintechnik GmbH), the Elisha™ Airway Device (Elisha Medical Technologies Ltd), the PLMA and the recently introduced Supreme™ LMA (SLMA, Intavent Orthofix). Another type of new EGD is the Streamlined Liner of the Pharynx Airway™ (SLIPA, SLIPAMED). This is designed to prevent aspiration by acting as a reservoir. For most of these new devices their capability in preventing aspiration has not been proven and is simply assumed. The device with the most evidence of safety is the PLMA [5].

LTS

There seem to be some advantages of the PLMA over the LTS in terms of patient comfort, as reflected by a lower incidence of sore throat and dysphagia. Whereas some authors have indicated that the PLMA and LTS are similar with respect to physiologic and clinical function (insertion success and time, oropharyngeal leak pressure, peak and plateau airway pressures, ability to pass a gastric tube) [1], others have found the LTS to be inferior. In addition, the reshaped proximal cuff of the LTS will probably have little impact on epiglottic downfolding or the potential for mucosal ischaemic injury secondary to the high pressures required to form an effective seal, as seen with the original LT.

ELISHA

This new reusable device combines three functions: ventilation, blind and/or fiberoptic-aided intubation without interruption of ventilation, and gastric tube insertion. In spite of these advantages, it appears that its development has stopped and randomised trials will be necessary to study the device further.

OTC

The OTC (and Easytube), although designed for emergency and routine use, is limited by a high incidence of airway morbidity and possible serious complications.

I-gel

There are studies showing that the I-gel is a reliable, easily inserted device providing an adequate seal [6]. Nevertheless, there are no comparative studies with other devices such as the PLMA, SLMA or LTS. The efficacy of its protection against aspiration through the fine drain tube has not been tested. Further studies are required to determine its safety profile before the I-gel can be recommended for advanced uses.

SLIPA

The SLIPA is a useful alternative to the conventional laryngeal mask airway in patients undergoing minor surgery. However, it is associated with a greater incidence of gastric insufflation which may increase the risk of aspiration. The standard laryngeal mask airway and SLIPA were both equally easy to insert and provided a satisfactory airway in patients receiving controlled ventilation. Both the PLMA airway with an open drainage tube and the SLIPA provided effective protection against 'aspiration' during positive-pressure ventilation using a model [7]. Nevertheless, its use remains very limited.

Supreme LMA

The SLMA combines the double tube (for airway and gastric contents) characteristic of the PLMA and allows intubation similar to the intubating laryngeal mask airway (ILMA) or Fastrach LMA [8]. Similar to other new EGDs, there are only descriptive studies or case series with a small number of cases. It seems that the semi-rigid shape facilitates its insertion, maintaining a high seal pressure. Nevertheless, its adaptation to different anatomies or positions is not as good as that provided by the more flexible PLMA. Further studies will be necessary to define clearly its role with respect to the PLMA and other devices.

How to choose a specific device in an individual case

When considering which airway device should be chosen we must take into account three factors: the skill level of the anaesthetist in charge; the type of airway devices available in the particular medical environment; and, most importantly, the type of device required to meet the patient's need for a secure airway [9].

Current experience

The features that define the basic (conventional) use of the laryngeal mask airway are:

- ASA I-II patients
- Procedures < 1h
- Spontaneous ventilation
- Supine or lithotomy position
- Surgery on extremities or body surface

However, the use of an EGD in day surgery may not always be for conventional indications. The role of EGDs for 'non-conventional' use is now acknowledged by reference texts [10]. In a recent review, Cook and colleagues [11] showed that the PLMA has an important role, particularly for advanced indications (such as obesity, symptomatic gastro-oesophageal reflux (GOR), raised intra-abdominal pressure or controlled ventilation). The difficult airway may also be considered an advanced indication. In these situations not all of the new EGDs have the same capabilities and future research will be necessary to determine which can be recommended in the way that the PLMA has been [12].

The drain tube, probably the most important new feature, should provide protection against regurgitation, facilitate passage of a gastric tube, and allow the use of a guided insertion technique. Guided insertion is more frequently successful than the digital or introducer-tool techniques [12]. Insertion with a bougie is more successful in patients with a simulated difficult laryngoscopy [13].

Availability

Anaesthesiologists must consider carefully the advantages of each device and become proficient in their use before using them for non-conventional indications. Use of the PLMA has become common and clinicians have ample opportunities to become expert with their use. At the present other new EGDs have not enjoyed such wide use.

A suggested strategy

For each patient we must ask: must the airway be 'managed'; how can the medical personnel in charge of the patient's care recognise if the patient has a difficult airway; and what are the management options?

Must the airway be 'managed'?

Does the case require general anaesthesia? Is a regional technique possible? Is it important to avoid neuromuscular block and drugs which might depress respiration, especially obese patients? (Do not be in a hurry to discharge the patient from the PACU).

How do you know if patient has a difficult airway?

There may be an obvious abnormality seen on examination. Alternatively a review of previous anaesthetic charts may reveal a very difficult or impossible intubation, or laryngoscopy or even mask ventilation and previous difficulty with EGD management.

Management options

Is tracheal intubation mandatory? Can you perform awake intubation, if necessary? An additional person should be immediately available for two-person mask ventilation. A Plan B for intubation should be in place including a 'Can't ventilate, can't intubate' option, for example, a laryngeal mask airway, OTC, trans-tracheal jet ventilation, or a surgical airway. If you do not have all of these, do not do the case in day surgery. If you have all these, the need for prolonged surveillance in the PACU must be assessed. If you believe the case can be undertaken with an EGD, consider the procedure, and the surgeon's and anaesthesiologist's experience. Determine if there is a risk of aspiration.

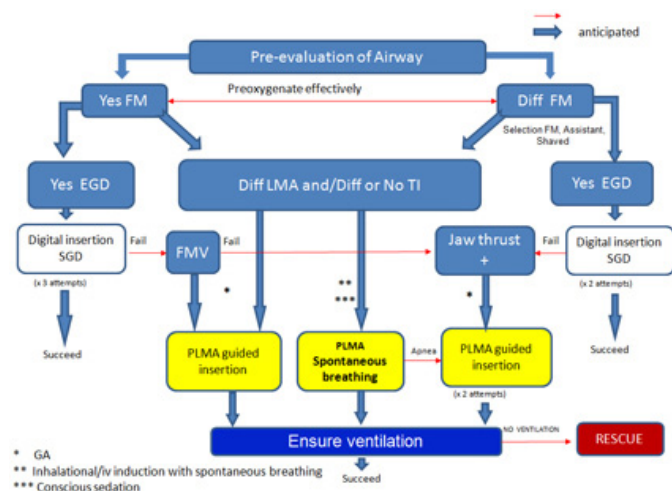
Can a patient with a difficult airway be scheduled for ambulatory surgery?

Although some national societies not recommend the scheduling of patients with a difficult airway for day surgery [14], it is possible to manage these patients with EGD, providing the anaesthesiologist is an experienced user. If we consider the algorithm of the American Society of Anesthesiologists [15], we would plan an awake intubation for an expected difficult airway. The EGD, in particular the laryngeal mask airway, is considered an alternative plan (Plan 'B'). In fact, the algorithm does not contemplate using an EGD in the routine anaesthetic care of patients whose pre-operative evaluation predicts difficulty with direct laryngoscopy. Perhaps the next 'gold standard' to be challenged is whether every patient with a difficult airway requires tracheal intubation. Roseblatt in 2003 [16] developed a pre-operative decision tree to aid the anaesthesiologist in decision making about a rational choice of airway management techniques. Some of the factors considered in this process include the anaesthesiologist's preferences and the risk of aspiration.

Algorithm for managing the difficult airway with an EGD

The Spanish group for the management of the difficult airway in ambulatory patients proposed an algorithm for the use of EGD's (Figure 1) [17]. This is a general plan that includes the pre-operative evaluation of airway. Although the prediction of a difficult intubation has been widely explored, surprisingly the prediction of difficult mask ventilation has attracted little attention[18]. Perhaps we should strive to predict in which patients there will be difficulty with intubation, mask ventilation, and ventilation with an EGD?

Figure 1



Difficult airway algorithm using extraglottic devices TI = tracheal intubation Modified from 'Recomendaciones para el manejo de la VAD en el paciente ambulatorio'. Grupo Español de Estudio de la Vía Aérea Dificil en el Paciente Ambulatorio (GEVADPA) [17].

This Spanish algorithm includes those patients who can be managed with an EGD, whether or not they are known to be difficult to intubate or not. When using the ASA algorithm we should consider facemask ventilation the primary airway and EGD ventilation the secondary airway. We assume that 'difficult' is a gradual concept and can indicate difficult, very difficult or impossible. So, the different scenarios are: facemask – 'yes', EGD – 'difficult'; or facemask – 'difficult', EGD – 'difficult', with difficult tracheal intubation – 'yes' or 'no', and these options may be 'anticipated' or 'unanticipated'.

In those cases in which the EGD use is not anticipated to be difficult, whether or not facemask ventilation is predicted to be difficult, the recommendation is standard insertion of an EGD. This is the plan A of the algorithm. If an EGD doesn't work, then the scenarios are transformed into unexpected situations, and a PLMA guided-insertion-technique is recommended. This is plan B (to ensure the correct insertion of PLMA). The anaesthesiologist must know the correct techniques for guided insertion, using a bougie, Eshmann stylet or suction catheter and the malposition tests (leakage up the drainage tube, passing a gastric tube, protrusion of the bit-block, and the suprasternal tap test).

The main problem for clinicians is the scenario in which the secondary airway is anticipated to be difficult. In this situation, if facemask ventilation is possible, the plan should be use guided insertion of a PLMA under general anaesthesia. In the most difficult situation, facemask ventilation is difficult and EGD insertion is also difficult. Insertion of a PLMA must be attempted, while preserving spontaneous breathing. This is the most important recommendation for this scenario. There are, however, several alternatives. In the most difficult cases, awake insertion of a PLMA with local anaesthesia or insertion of with conscious sedation. For unco-operative patients, insertion with inhaled anaesthesia, maintaining spontaneous breathing, may be a good option.

After guided insertion of a PLMA, from any of the different scenarios described above, we must verify correct ventilation through it. This is plan C. Airway obstruction is possible with a PLMA and management depends on the aetiology [19]. After guided insertion techniques two tests are required to diagnose mechanical obstruction: jaw thrust and cuff deflation [19]. If nothing works, we have plan D or rescue. The first option of plan D is to change the EGD (if there is no immediate risk). Another option is to wake the patient up and to change the strategy (for example, to use fiberoptic intubation, or to cancel or delay surgery). If recovery is not possible, direct laryngoscopy with tracheal intubation, videolaryngoscopy, use of an ILMA or C-Trach (if known difficult intubation) can be used. If the peripheral blood oxygen saturation falls, cricothyrotomy may be required.

According to Miller, EGDs can be classified in three groups [20]. Cuffed perilaryngeal, cuffed peripharyngeal and uncuffed, anatomically preshaped. When changing an EGD because you cannot obtain a satisfactory seal, it does not make sense to use another EGD of the same group. So, if a laryngeal mask airway doesn't work, try a cuffed peripharyngeal (LT, OTC) or uncuffed, anatomically preshaped airway (SLIPA). The I-gel may be an alternative as it is not a cuffed perilaryngeal sealer.

Key Learning Points

- The laryngeal mask airway is the 'gold-standard' of the EGDs, but for basic indications any EGD can be used.
- The new EGDs have important advantages over the classic devices. They are specifically designed to reduce the risk of aspiration. For advanced or non-conventional uses a new EGD should be used.
- A difficult airway in an ambulatory patient should always be specifically considered. At present guided insertion of a PLMA should be the 'plan A' when managing these airways with an EGD.
- The suitability of patients with difficult intubation for ambulatory surgery must be carefully considered if tracheal intubation is mandatory.

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