Trends in Anaesthesia and Critical Care 3 (2013) 346–350

Contents lists available at ScienceDirect

Trends in Anaesthesia and Critical Care

journal homepage: www.elsevier.com/locate/tacc

REVIEW

The use of the laryngeal mask airway in ENT surgery: Facts and fiction

J. Turnbull, A. Patel*

Royal National Throat, Nose and Ear Hospital, Department of Anaesthesia, 330 Gray's Inn Road, London WC1X 8DA, UK

Keywords:
Laryngeal mask airway
LMA
ENT surgery
Adenotonsillectomy

SUMMARY

The use of the laryngeal mask airway (LMA) for many forms of ENT surgery is well established across Europe and the UK. However, its uptake in America has been much slower and has recently come up for renewed debate. In particular, its safety and reliability for adenotonsillectomy has been questioned. Indeed the endotracheal tube (ETT) remains the preferred airway device for adenotonsillectomy on both sides of the Atlantic. However, there is good evidence, both recent and established, that the LMA is a safe and effective alternative to the ETT in the majority of ENT operations, including adenotonsillectomy. Of crucial importance is experience, both on the part of the anaesthesiologist and surgeon.

1. Introduction

The advent of the laryngeal mask airway (LMA) has revolutionised airway management and modern anaesthesia since it was first described nearly three decades ago. The LMA Classic™ (CLMA, Intavent Limited, Maidenhead, UK) was invented by Dr Archie Brain and first described in his seminal paper 'The laryngeal mask – a new concept in airway management' published in the *British Journal of Anaesthesia* in 1983.[1] Since it was introduced into clinical practice in 1988, its impact has been profound. Over 2500 publications have been written and in excess of 200 million anaesthetics given using some form of LMA device.[2]

2. History of the flexible LMA

The use of the initial CLMA dramatically increased throughout the 1980s. Reports of compression or kinking due to the soft silicone shaft began to emerge, particularly in relation to ENT surgery.[2] This brought about the first modification of the original CLMA and the introduction of the LMA Flexible™ (FLMA, Intavent Limited, UK) or reinforced LMA, also designed by Brain. The new prototypes had identical cuffs but replaced the compressible shaft with a longer and narrower flexometallic silicone shaft (10-mm internal diameter and 19-cm length). The wire-reinforced shaft prevented compression or kinking and the increased shaft length enabled the breathing circuit to be connected further away from the patient's face. In addition, the floppy nature of the shaft meant that any movements were not transmitted to the cuff, resulting in less chance of displacement. The FLMA was released on the market in 1992 and the first publications began to emerge in 1993 describing its use in adenotonsillectomy and dental surgery.[3–6] Since then there have been over 100 publications on the FLMA across a range of specialities.[2]

3. Demographics of flexible LMA use

Despite promising results in the literature, the uptake of the reinforced LMA has been variable. A recent nationwide postal survey in the UK estimated that the endotracheal tube (ETT) is used in 87% of children aged 0–3 years, 79% of children aged 3–16 years, and 73% of adults undergoing tonsillectomy.[7] These findings are in contrast to those from the Royal National Throat, Nose and Ear Hospital in London where it is estimated that over 90% of adenotonsillectomies in children and adults are conducted using a FLMA.[2] In the USA, the uptake has been slower, with <10% of the approximately 530,000 adenotonsillectomies conducted each year employing a FLMA.[2,8] Of the total number of LMA devices sold worldwide, approximately 5% are FLMAs, with 25% of these being sold in the UK.[2]

4. Facts and fiction

Since its introduction, there has been significant scepticism regarding FLMA use for ENT surgery.[10,11] Concerns often refer to suboptimal surgical access, difficulty in FLMA placement, high conversion rate to ETT, frequent occlusion or kinking, and displacement of the cuff with head and neck movement.[2,9] Questions have also been raised regarding the protection conferred by

* Corresponding author.
E-mail addresses: jamesturnbull@nhs.net, drjturnbull@hotmail.com (J. Turnbull), anil.patel@uclh.nhs.uk (A. Patel).

2210-8440/$ – see front matter © 2013 Elsevier Ltd. All rights reserved.
http://dx.doi.org/10.1016/j.tacc.2013.09.001

the LMA against airway soiling, leading to an increased risk of aspiration or laryngospasm.[2] Other reported disadvantages of the LMA include an increased risk of gastric insufflation and aspiration of stomach contents, and unsuitability for prolonged positive pressure ventilation.

Suggested advantages of the LMA which are particularly relevant to ENT surgery include avoidance of laryngoscopy and muscle relaxants, minimising instrumentation of the respiratory tree, less cardiovascular stimulation, lower respiratory morbidity and smoother emergence characteristics. Less established benefits include reduced anaesthetic requirements, lower rates of sore throat and reduced time spent in the operating theatre.[2]

Some of the concerns and benefits have significant merit. However, there is often little scientific evidence to support or dispel such theories and much of current practice is driven by anecdote or personal experience. This review article will aim to determine whether the many reported advantages and disadvantages of LMA use in ENT surgery are either fact or fiction. By doing so we hope to provide the reader with good evidence that in selected patients the FLMA is a safe and effective alternative to endotracheal intubation for many ear, nose and throat procedures.

5. Validity of the flexible LMA

To measure the validity of the FLMA we must look at how it compares against the 'gold standard', endotracheal intubation. Indeed most of the evidence validating the use of the FLMA comes from studies looking at the CLMA. Given that the cuffs are identical on both devices we believe this to be a valid assumption.

5.1. Insertion success and conversion rates

Perhaps the largest analysis of CLMA use comes from Verghese and Brimacombe in Australia who studied 39,824 patients over a 2-year period who underwent general anaesthesia for a variety of surgical procedures.[12] Of these, 11,910 patients (29.9%) were managed with the LMA. Operations were divided into conventional (81.3%), such as ENT and orthopaedics, and nonconventional (18.7%), which included any intra-abdominal procedures. Spontaneous ventilation was used in 6674 patients (56%) and positive pressure ventilation (PPV) in 5236 (44%). Successful placement of the LMA occurred in 99.81% of patients giving a conversion to ETT rate of 0.19%.

Brimacombe published further evidence on insertion success rates with a self-analysis of 1500 CLMA insertions.[13] The first time insertion rate was found to be 95.5% with an overall failure rate of 0.4% after three insertion attempts. This compares favourably with a failure rate for conventional endotracheal intubation of 0.3%.[14] Fibreoptic examination of the LMA found the vocal cords visible in 97.1% of cases and the epiglottis in 64%.

Insertion of the FLMA is more difficult than the CLMA, with first time insertion success rates shown to vary between 80 and 94% depending on experience.[15,16] As we will discuss later, this often comes down to preparation of the LMA cuff and familiarity with the digital insertion technique. Alternative methods of FLMA insertion have also been suggested either using an introducer or laryngoscope to guide placement. A recent study found that laryngoscopic insertion of the FLMA was associated with a 96.3% first time success rate compared with 81.5% with the standard digital insertion technique.[16]

5.2. Respiratory morbidity

A reduction in respiratory complications is often cited as an advantage of LMA use.[2] However, an increased risk of laryngospasm has been linked with LMA use and ENT surgery, particularly in the paediatric population[17] with some studies suggesting an incidence of up to 25% in adenotonsillectomy.[18]

However, most studies appear to show an equivalent incidence of laryngospasm when comparing ETT and LMA insertion. Peng and colleagues found no significant difference in rates of laryngospasm in paediatric adenotonsillectomy when comparing ETT and LMA use.[19] Studies that trend towards a lower incidence with FLMA use often have too small a sample size to draw definitive conclusions,[20,21] although a benefit in nasal surgery appears likely.[22] Similarly the single study which showed an increased incidence of laryngospasm with LMA use had a small sample size and was retrospective in design.[17] In studies of non-ENT populations, LMA use is associated with a significantly lower incidence of laryngospasm (1.7%) when compared to ETT insertion (7.5%).[23]

Certain conditions can adversely affect the incidence of airway or respiratory complications. Upper respiratory tract infections (URTI) are commonplace in the ENT population. Von Ungern-Sternberg et al. showed the presence of an URTI was associated with a two-fold increase in respiratory complications with LMA use.[24] However, this was relatively small compared with the 11-fold increase in complications with ETT use. These findings were mirrored by Tait and colleagues[25] and suggest that in the presence of an undiagnosed URTI the LMA is safer than an ETT.

5.3. Airway protection

There are two primary issues with LMA use and airway protection in ENT surgery. One relates to the risk of aspiration of stomach contents and the other relates to protection against soiling from the surgical site with blood and debris.

Risk of aspiration of gastric contents is a particularly contentious issue with LMA use. Early reports suggested a gastric regurgitation rate of up to 25%, with relaxation of the lower oesophageal sphincter implicated.[26,27] Subsequent studies have showed little or no evidence of reflux using the LMA and PPV.[28] The study by Verghese and Brimacombe had only one clinically important aspiration in a patient who made a full recovery.[12] The study by Brimacombe had no episodes of aspiration with 1500 uses.[13] Furthermore, a systematic review of 29 RCTs comparing LMA and ETT found no clinical evidence of aspiration in the LMA group of any of the studies.[19]

Risk of airway soiling has also been suggested as a reason for avoiding FLMA in ENT surgery. Again this reasoning appears to be misguided. A study of 64 patients undergoing general anaesthesia with a LMA utilised methylene blue dye placed in the pharynx following induction of anaesthesia to check for airway soiling.[29] The investigators then performed a fibreoptic assessment of the LMA and larynx and found no dye in any of the cases. In nasal surgery, Kaplan and colleagues found that airway soiling was significantly reduced with the FLMA compared to ETT use.[30] In adenotonsillectomy, FLMA has been shown to be superior to uncuffed ETTs and equivalent to cuffed ETTs in protecting from aspiration of blood.[8]

Of course, many of these studies rely on the FLMA being inserted and leak tested appropriately. An experimental study on cadavers with FLMAs in situ looked at aspiration of water placed in the pharynx at different cuff pressures.[31] They found that at a leak pressure of 11 cm H_2O, aspiration of water was present in 5% of cadavers. In addition, they found that the neck extension and application of a Boyle-Davis gag, as required for adenotonsillectomy, had no influence on the pharyngeal seal. They suggested that all FLMAs should be leak tested to ensure a leak pressure above 15 cm H_2O to prevent airway soiling, a practice endorsed by the authors of this review.