The Laryngeal Mask Airway (LMA) as an alternative to airway management in mentally retarded patients during dental procedures

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Abstract

Background: *To evaluate the possibility of airway management using a laryngeal mask airway (LMA) during dental procedures on mentally retarded (MR) patients and patients with genetic diseases.* **Design:** *A prospective pilot study.* **Setting:** *University Hospital.* **Methods:** *A pilot study was designed to induce general anaesthesia for dental procedures in 15 mentally retarded patients, with airway management using a laryngeal mask airway (LMA). The parameters assessed during the pilot study included ease of LMA insertion and its seal, inspiratory pressures with controlled ventilation, visibility of the operating field and surgical comfort, recovery from anaesthesia, LMA tolerability and postoperative complications.* **Results:** *LMA insertion was successful in all of the patients, operating field visibility was good in most patients, as was tolerability, and awakening was uneventful. Serious postoperative complicationsæbleeding, prolonged coughing and eating disordersæwere not observed.* **Conclusions:** *In this pilot study, the LMA was a suitable tool for airway management during dental procedures on the mentally retarded and on patients with genetic diseases.*

Key words: *dental care, mentally disabled persons, genetic diseases, laryngeal mask airway*

Outpatient dental care of the severely mentally retarded patient requires the induction of general anaesthesia, mainly because of their complete lack of cooperation. For years, the gold standard for these procedures has been orotracheal or nasotracheal intubation, with general anaesthesia, using controlled or intermittent mandatory ventilation. Use of conscious sedation, a common procedure in adult patients, is almost impossible in the mentally retarded patient because of the lack of cooperation.[1] However, tracheal intubation in these patients is associated with pitfalls. The altered anatomy of the upper airways, associated with some genetic abnormalities (e.g. Down's syndrome and "cri-du-chat'" syndrome) may result in problems with tracheal intubation.[2] Nasotracheal intubation may cause bleeding and contamination of the tube with the nasal cavity content. Post-intubation pain in the throat may lead to anxiety or aggressiveness of the mentally retarded patient, and refusal to take food.3 The aim of the present pilot study was to test laryngeal mask airway management in outpatient dental procedures in the MR patient and in individuals with upper airway abnormalities due to genetically related syndromes.

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Methods

Over a period of 30 months (between 2001 and 2003), a total of 30 mentally retarded patients required dental care under general anaesthesia (out of a total number of 42 registered patients) at the Dental Care Unit for At-Risk Patients of the Prague-based Institute for Clinical and Experimental Medicine. Six patients were managed using spontaneous ventilation without any further airway management, 8 were intubated whilst the LMA was used in 15 (Table I). The diagnoses of patients in the LMA group are summarized in Table 1. The pilot group consisted of 7 women and 8 men, with a mean age of 27 years (range, 15-42 years). This pilot study was approved by the Ethics Committee of the institution.

Table I: The primary diagnoses in the patients undergoing dental procedures with LMA

Diagnosis	*Number of patients*
Down syndrome	5
Posthypoxic encephalopathy	3
Idiopathic mental retardation	6
Cri-du-chat syndrome	1
Total number	*15*

Those indicated for general anaesthesia using the LMA included:
- Patients in whom tracheal intubation is expected to cause problems (previous experience, known or presumed anatomical abnormalities)
- A difficult-to-examine patient scheduled for a procedure of an unspecified type and extent.

All patients were examined preoperatively, and were given oral pretreatment using dehydrobenzoperidole (2 mL) and atropine (0.5 mg). Anaesthesia was induced in ten patients intravenously using propofol, sufentanil and low-dose suxamethonium (0.3 $mg.kg^{-1}$). The LMA was inserted after the induction of general anaesthesia. These patients showed a modicum of cooperation, and allowed us to insert an intravenous cannula. The remaining five patients were given inhaled sevoflurane first, followed by peripheral venous cannulation. An appropriately-sized laryngeal mask airway (sizes 3-5) was inserted, following the administration of suxamethonium at a dose of 0.3 $mg.kg^{-1}$. Anaesthesia was maintained with an O2 and N2O (nitrous oxide) mixture and sevoflurane. Patients were monitored using pulse oximetry, non-invasive blood pressure measurement, and electrocardiogram (ECG). Circuit pressure (inspiratory, expiratory and plateau) levels were also monitored. The LMA was fixed in the corner of the mouth opposite to that used for the surgical procedure. A tamponade (throat pack) was also established in the hypopharynx.

The following parameters were assessed:
- Ease of laryngeal mask insertion (assessed using a four-point scale: 1 = easy insertion at first attempt; 2 = LMA inserted after repeated attempts, no leakage; 3 = LMA inserted after repeated attempts, good seal on spontaneous ventilation, leakage on controlled ventilation; 4 = the mask does not seal after repeated attempts
- Inspiratory pressure on controlled ventilation
- Visibility of the operative field and level of comfort for the surgeon
- Recovery from general anaesthesia, LMA tolerability, airway irritation, coughing, retching
- Postoperative complications: circulatory instability, respiratory depression, neck pain, bleeding, refusal of food intake

Results

The surgical procedure was successfully performed on 15 patients using the LMA. Five patients had multiple tooth extractions, whilst four had conservative treatment of dental caries; six mentally retarded patients underwent more extensive combined procedures.

In most patients LMA insertion was uneventful and successful at the first attempt. Only two patients required repeated LMA insertion and the LMA had to be replaced by another size in one patient. There was no LMA leakage in 14 patients whereas minimal leakage could be heard with one laryngeal mask during controlled ventilation. Inspiratory pressures on controlled ventilation were below 2 kPa (1-1, 8 kPa) in all patients. The laryngeal mask insertion and seal were also uneventful in the 7 patients with altered upper respiratory tract anatomy due to genetically-related diseases with predicted (or previous) difficult intubation. The surgeon rated the operating field visibility as very good in 11 cases, and as somewhat poorer in 4 cases. In no patient was the scheduled surgical procedure reduced because of poor oral cavity visibility. The laryngeal mask was very well tolerated during anaesthesia. Awakening was calm in all patients, there was no aggressiveness, confused motion, coughing and retching. Five patients removed the LMA by themselves after awakening; the other 7 were fully awake and tolerated the presence of the LMA in the hypopharynx. The LMA was removed by the anaesthesiologist.

No patient experienced serious perioperative complications such as circulatory instability, hypoventilation, aspiration or apnea. One patient required short-term (30 minute) supplemental oxygenation via a face mask. In the postoperative course, one patient developed a transient bout of coughing (2 days). Hoarseness, bleeding complications, sore throat, and refusal of food intake were not observed.

Discussion

This pilot study shows a relatively simple and feasible method for airway management of mentally retarded patients and those with genetic diseases undergoing dental procedures.

The LMA is a standard tool for airway management during short- and medium-term procedures.[4] It took a long time before it came into routine use for procedures in the oral cavity, primarily because of the risk of dislodgment and poor visibility of the operating field. In recent years, reports have been published on a series of patients undergoing oral surgery with the help of airway management using the LMA, such as tonsillectomy, mandibular surgery and dental procedures.[5-8] The advantages of the LMA are self-evident: insertion does not require other instruments, manipulation is easy and quick, there is minimal intraoperative laryngoscope-caused damage to dentition, bleeding from nasal cavities and lower airway infection, as well as injury to the vocal cords. In the postoperative

Figure 1: LMA inserted in a patient with Down's syndrome and macroglossia



period the LMA significantly reduced the risk of laryngospasm, laryngeal and tracheal bleeding, coughing, and sore throats. In addition, the LMA can be used in patients expected to cause difficulty during intubation as a result of modified anatomical upper airway circumstances. However, the LMA has several drawbacks when used in oral cavity procedures including rigidity, increased potential for dislodgment compared with the tracheal tube, and reduced oral cavity visibility, compared with nasotracheal intubation. The LMA does not completely rule out the potential risk for aspiration, and its use may be associated with compression of the nerve structures in the oral cavity and hypopharynx.[8-9]

Use of the laryngeal mask in mentally retarded patients and in those with genetic anomalies has not been investigated systemically. There have only been case reports and small series of fewer than 5 patients.[8,10] A mentally retarded patient is seldom able to undergo a procedure with analgosedation or conscious sedation, cooperating with the surgeon. These patients are usually anxious, wary of aliens, oversensitive to painful stimuli and unable to communicate.[1] Often it is not even possible to perform a dental examination prior to the procedure without general anaesthesia. In these patients, general anaesthesia is usually induced using orotracheal intubation. However, it is extremely difficult to perform tracheal intubation in some mentally retarded patients with genetic abnormalities. Down's syndrome patients (chromosome 21 trisomy) often have macroglossia, laryngomalacia, congenital subglottic stenosis and tracheal stenosis.[11] These patients are often diagnosed as having lymphoid hyperplasia; and one of its forms, referred to as lingual tonsillar hypertrophy, may cause life-threatening airway obstruction.[12] Successful airway management in these patients using the LMA has also been reported.[13] LMA insertion has likewise been successful in our Down's syndrome patients. Another genetic syndrome associated with upper airway anomalies is the "cri-du-chat" syndrome (deletion of part of the short arm of chromosome 5). It is characterized by mental retardation, micrognathia, anatomical abnormalities of the larynx, hypotonia, and congenital heart disease.[14] Laryngeal mask insertion in the patient with the "cri-du-chat" syndrome was also successful in our cohort.

Our pilot study shows that anaesthesia with airway management using the LMA is well tolerated by mentally retarded patients; it was also successfully inserted in patients with upper airway pathology. Postoperative complications, including refusal of food intake, which may pose a considerable challenge in patients following tracheal intubation, were minimal in our series.

Conclusion

The laryngeal mask has proved to be an option of choice in airway management in short-term outpatient conservative and dental procedures under general anaesthesia in several mentally retarded patients and in those with genetic syndromes associated with anatomical oral cavity and upper airway abnormalities. The LMA allows for quick and simple airway management, particularly in mentally retarded patients who will not even allow preoperative oral cavity examinations, making the extent of procedure unclear. Procedures to be undertaken in several quadrants and on the MR patient with macroglossia result in poor visibility of the operating field. To improve protection against aspiration, a gauze tamponade in the hypopharyx is advisable. Still, further, larger studies are warranted to define more accurate indications and algorithms for LMA use in the mentally retarded patient in dental care.

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