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Research Article

Laryngeal Mask Airway (LMA) in Lacrimal Duct Surgery in Children is Safe?

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ABSTRACT

In very young children General Anesthesia (GA) with Endotracheal Intubation (EI) is highly recommended even for short-term procedures including syringing and probing for congenital obstruction of the lacrimal duct. It is a simple and short term intervention but it is necessary to properly overcome some clinical problems occurring in clinical practice, due to GA with EI, such as risk of mucosal trauma, need of muscle relaxants, adverse effects post extubation and so on. In these last years, the Laryngeal Mask Airway (LMA) has proven to be one of the most useful and appropriate devices for safe airway control during short term procedures even in children. It allows a precise and effective management of anesthesia without using muscle relaxant drugs and EI, due to the following benefits: lack of airway mechanical stimulation; chance to get a flexible anesthetic inhalatory plan; airways protection from external agents. The incidence of peri and postoperative respiratory adverse events is very low . We present our experience

INTRODUCTION

This topic is relevant to pediatric anesthetists and ophtalmologists. Congenital obstruction of the lacrimal drainage system is present in 6-8% of newborns. Bilateral congenital obstruction of lacrimal system is present in 25% of cases. The etiopathogenesys may be referred to several factors. “Syringing and probing” is one of the simplest and most common interventions [1-11] but it is important to underline that in the great majority of cases (90%), the obstruction undergoes spontaneous healing in the first year of life. Current literature indicates that GA with EI is the best way to perform syringing and probing in children (ASA grade1-2) ranging 11-18 months y.o. [12,13]. The aim is to achieve a perfect airway management and to allow maneuvers on lacrimal duct in a patient without muscle movements by a sure, simple and short term procedure [14,15].

In this field the anaesthetist must be competent to deal with any critical situation that may arise, in order to reduce risks and duration of the procedure. At the induction phase he has to cope with children agitation or un cooperation, the resulting need of

sedative hypnotics, a frequent stormy inhalation induction by mask and difficulties in venous access. In children these events occur routinely regardless of anesthetic procedure, but it is just the use of EI in GA, especially for a short term procedure, which should be considered somewhat inappropriate for a number of reasons, which can increase costs, duration and risks of the intervention: 1. EI is an invasive procedure, leading sometimes to mucosal trauma, or significant although transient cardiovascular reflexes such as hypertension or tachycardia. 2. EI involves the use of muscle relaxants that systematically have a longer duration of effect than "probing" with unavoidable consequent use of antagonist drugs. 3. Cough, stridor, bronchospasm and laryngospasm occur frequently after extubating the patient (38% of the cases) 4.Discomfortable vomiting occurs in 40 % of cases of intubated patients until discharge.

Therefore, in the effort to seek alternative devices for probing in pediatric patients, the Laryngeal Mask Airway (LMA) surely is to be considered an important resource for a safe airway control, providing a lack of mechanical stimulation and an effective management of anesthesia. Clinically LMA, being a supraglottic device, is more invasive than the facemask but certainly less than the tracheal tube [12,13,16,17].

MATERIALS AND METHODS

18 children (ASA grade I-II) 11-18 months.y.o. (Body weight 10.0-15.0 kg) were scheduled for syringing and probing from june 2019 to june 2021. 2 cases (11.11%) were suffering from bilateral obstruction.

Anesthesia management standard protocols

Anesthetic management was standardized according to literature protocols [14]. Then written and informed consent was obtained from parents. The preoperative evaluation by the anesthetist was done the day before surgical procedure was undertaken. We always precede our visit with a preliminary evaluation by the pediatrician about general status and to exclude recent Upper Respiratory Infections (URI)

All the patients were prescribed nothing orally since the previous midnight and no sedative or effective drug on the airway preoperatively

Midazolam dose (0.5-0.75 mg/kg body weight) was given orally or nasally for pre-medication one hour before surgery; the children received also premedication with atropine to reduce secretions

Venous cannulation (22/24 G) is a safety measure which is made easier by sedation however, due the frequent children uncooperation or agitation state, it is frequently necessary to deeper the level of sedation by face mask and inhalation of anesthetic gases [14]. Sevoflurane [18] was used for inhalation induction (6-8% vol. up to reduce to 2-2.5%); the sevoflurane induction 8% involves often the use of nitrous oxide mixed with oxygen 40-50% as second gas effect for a faster induction. The LMA was inserted when the patient was deemed deep enough by not reacting to a bimanual jaw-thrust manoeuver (average time 120 sec) The LMA size was chosen based on the standard "weight sizing" for pediatric anesthesia. (LMA 1.5 up to 10 kg body weight, LMA 2 10-20 kg body weight) maximum inflation volume 8-10 ml. Typical gas-flow ranged between 2 and 4 litres min-1 via a T-piece at induction. Ventilation was applied as deemed appropriate by the anesthetist. Sevoflurane 2-2.5% was used for the maintenance of anesthesia in 18/18 patients. Minimal and standardized routine anesthesia monitoring included electrocardiography, non-invasive blood pressure measurements, capnometry, and pulse oximetry. LMA tightness after cuff inflation was controlled by spirometry (Inspiration /Expiration volume ratio, lost of airway pressure into the respiratory circuit) and auscultation applying an end inspiratory airway pressure not higher than 20 mm Hg. Some short procedures as syringing and probing can be performed by Spontaneous Assisted Ventilation (SAV). SAV in association to Sevoflurane 2.5% inhalation allows a deep anesthesia plan without the use of muscle blockers. The average duration of the procedure ranged from 8 to 15 minutes. At the end of procedure Sevoflurane flow was stopped switching from SAV to complete spontaneous breathing within 45/90 sec. (Sevoflurane end tidal expiration 0.1-0.2%). During slight awake state, LMA was removed after progressively deflating the cuff.

Measured outcomes for procedure

While the surgeon carries out probing and syringing, a transparent suction catheter is inserted into the hypopharynx and a continuous suction is applied to the catheter [19,20]. A total of 4-5 ml of dilued solution (0,5 ml trypan blue plus 4.5 ml saline solution) is used for syringing The staining of the

catheter is regarded as a sign of patency of the duct.. An adequate LMA cuff inflation pressure prevents the dye entering into the airways

The patient surveillance involves also the postoperative pain control by 125 to 250 mg of paracetamol per rectum according to the weight of patients; any adverse event was recorded and managed until discharge. Discharge took place in the same day within five or six hours after the surgery, a complete recovery from anesthesia and an ophthalmological check

Considerations about procedure

Induction and emergence from anesthesia are the most critical phases in children. The inhalation induction by mask may be used as starter especially in the absence of venous access or if venous cannulation is difficult. Sevoflurane is the most commonly used agent for inhalation induction due to poor airway irritation, no pungent odor and both a smooth and relatively rapid induction and elimination depending on his lower blood-gas solubility. The preoperative administration of atropine reduces significantly the salivation. The facial mask is indicated only up to the induction because: 1.the facial mask positioning hinders syringing and pumping maneuvers. 2.it doesn't prevent or avoid vocal cord stimulation or cough triggered by the inhalation of dye fluids descending into the oropharynx [18]. It is difficult to achieve a safe control of airways and a stable anesthesia level if technical or anatomical factors prolong the unblocking maneuvers with probing over time.

A relatively large tongue, a higher and more anterior larynx with a relatively large floppy epiglottis and a frequent presence of tonsillar hypertrophy may make the correct placement of LMA more difficult in pediatric patients. Hence, the insertion of the LMA by a standard technique sometimes is not easy (30% of cases in the literature). Alternative techniques such as a) rotational, b) LMA cuff partially inflated and c) lateral approaches have been used to achieve an easy and successful LMA insertion in children. In our experience a rotational technique with partially inflated cuff is associated with the highest success rate of insertion and a lowest incidence of complications and could be the technique of first choice for LMA insertion in pediatric patients [12,13]. In pediatric patients there are some different strategies [12,13] for ventilating children by LMA during surgical procedures: Spontaneous Ventilation (SV), Pressure Support Ventilation (PSV), Pressure-Controlled Ventilation (PCV) and Assisted Spontaneous Ventilation (SVA) considered by us the best way to overcome the respiratory drive of the child. Literature reports that GA ant TI may have significant effects on cardiovascular functions .including mainly transient tachycardia and hypertension. In our experience LMA provides a reasonable alternative due to minimal effects on blood pressure and heart rate.

At the end of operation, the optimal time for removing LMA is controversial [21,22] LMA should be removed in awaked state but some studies suggest that removal in deep patients was associated with less adverse respiratory effects. These contradicting results explain why the anesthetists generally base some procedures on their experience. Generally the awake state is defined as return of airway reflexes, purposeful movement and eye opening. A deeply anaesthetized state is defined as recovery of spontaneous ventilation but depressed airway reflexes with age-appropriate minimum alveolar concentration of Sevoflurane (0.1-0.2%). In our experience we prefer a careful removal of the laryngeal mask during slight awake state in children, achieving a reduction of coughing in the immediate postoperative period. Furthermore a lateral positioning of children during LMA removal provides the safest conditions during recovery from anesthesia [18,21-30].

RESULTS

In our experience we didn't record relevant adverse effects with LMA except for transient slight cough in two patients (11.11%) and a Sp02 decrease around 90% in two patients (11,11%) promptly treated by 100% oxygen; in 16/18 pts (88.88%) the lacrimal duct obstruction was successfully release whereas in 2/18 patients (11.11%) probing and pumping maneuvers were unsuccessful. They were subsequently directed to a more invasive surgical treatment. Blood pressure and Heart rate were maintained within acceptable values according their age. The dislocation is very difficult if LMA positioning is correct; this grants good respiratory performance and avoids pressure losses in the circuit and fluid penetration into airways The success rates, complications and recurrences were recorded from 1 week to 6 months after surgery. No cases needed reintervention in the medium term. However, it is important underline the importance of the timing of probing because a significant percentage (88.88%) of children

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achieves a spontaneous resolution before or within 12 months of age, so that deferring the treatment up to 12 to 18 months of age by follow up is a reasonably therapeutic option

CONCLUSION

In conclusion the use of LMA, taking care of the positive pressure ventilation, offers some advantages: 1.provides a better seal in the oropharynx to allow ventilation at adequate high airway pressures; 2. avoids the risk to inhalation of the fluids used for syringing; 3. prevents cough and laryngospasm resulting from fluid stimulation of mucosa; 4.protects the stomach from gastric insufflation. Furthermore LMA allows an easy control of breathing, level and duration of anesthesia in case of procedure prolongation. Emergence from anesthesia is faster and the recovery of respiratory performance is immediately satisfactory since muscle relaxants have not been used. The incidence of cough, postoperative sore throat and postoperative vomiting is really very low [31]. In conclusion LMA provides lesser perioperative airway complications [32], in comparison to the conventional tracheal tube. However, our study includes few patients, is not strictly comparative and has an almost anecdotal value: comparisons among different LMA types, different patient's conditions and different surgical procedures should be explored.

REFERENCES

1. Petersen RA, Robb RM. (1970). The natural history of congenital obstruction of the nasolacrimal duct. J Pediatr Ophtalmol and Strabismus. 15: 246-250.
2. Kushner, Burton J. (1982). Congenital Nasolacrimal System Obstruction. Arch Ophthalmol. 100: 597-600.
3. Robb RM. (1998). Success rates of nasolacrimal duct probing at time intervals after 1 year of age. Ophthalmology. 105: 1307-1309.
4. Ciftci F, Akman A, Sonmez M, Yaylali V, et al. (2000). Systematic, combined treatment approach to nasolacrimal duct obstruction in different age groups. Eur J Ophthalmol. 10: 324-329.
5. Casady DR, Meyer DR, Simon JW, Stasior OG, Zobal-Ratner JL, et al. (2006). Stepwise treatment paradigm for congenital nasolacrimal duct obstruction. Ophthal Plast Reconstr Surg. 22: 243-247.
6. Baker JD. (1985). Treatment of congenital nasolacrimal system obstruction. J Pediatr Ophthalmol Strabismus. 22: 34-6.
7. Katowitz JA, Welsh MG. (1987). Timing of initial probing and irrigation in congenital nasolacrimal duct obstruction. Ophthalmology. 94: 698-705.
8. Stager D, Baker JD, Frey T, et al. (1992). Office probing of congenital nasolacrimal duct obstruction. Ophthalmic Surg. 23: 482-484.
9. Kashkouli MB, Beigi B, Parvaresh MM, Kassaee A, Tabatabaee Z. (2003). Late and very late initial probing for congenital nasolacrimal duct obstruction: What is the cause of failure? Br J Ophthalmol. 87: 1151-1153.
10. Honavar SG, Prakash VE, Rao GN. (2000). Outcome of Probing for Congenital Nasolacrimal Duct Obstruction in Older Children. Am J Ophthalmol. 130: 42-48.
11. Mannor, GE, Rose, GE, Frimpong-Ansah, K, Ezra, E. (1999). Factors affecting the success of nasolacrimal duct probing fro congenital nasolacrimal duct obstruction. Am J Ophthalmol. 127: 616-617.
12. Li WX, Shuang S. (2018). The laryngeal mask airway in pediatric anesthesia. Biomedical J Sci & Tech Res. 7: 5813-5814.
13. Patki A. (2011). Laryngeal mask airway vs the endotracheal tube in paediatric airway management: A meta-analysis of prospective randomised controlled trials. Indian J Anaesth. 55: 537-541.
14. Miller RD (Ed). (2015). Miller's Anesthesia. Eighth edition ed. Philadelphia, PA: 33Elsevier/Saunders.
15. Vagge A, desideri FA, Nucci P, Serafino M, Giannaccare G, et al. (2018). Congenital Nasolacrimal Duct Obstruction (CNLDO): A review. Disease. 6: 96.
16. Drake-Brockman TF, Ramgolam A, Zhang G, Hall GL, von Ungern Sternberg BS. (2017). The effect of endotracheal tubes versus laryngeal mask airways on perioperative respiratory adverse events in infants: a randomised controlled trial. Lancet 389: 701-708.
17. Lopez Gil M, Brimacombe J, Alvarez M. (2020). Safety and efficacy of laryngeal mask airway. A prospective survey of 1499 children. Anesthesia. 5: 969-972.

18. Sigston P, Jenkins A, Jackson E, Sury MR, Mackersie AM, et al. (1999). Rapid inhalation induction in children: 8% Sevoflurane compared with 5% halothane. Br J Anesth. 78: 362-365.
19. Galante D, Pellico G. (2006). A technique to improve the safety of laryngeal mask airway when used in lacrimal duct surgery. Pediatric Anesthesia. 16: 896-896.
20. Herrema I. (2006). The laryngeal mask airway and suction of lacrimal duct injectate. Pediatric Anesthesia. 17.
21. Splinter WM, Reid CW. (1997). Removal of the laryngeal mask airway in children: deep anesthesia versus awake. J Clin Anesth. 9: 4-7.
22. Templeton TW, Goenaga-Diaz EJ, Downard MG, McLouth CJ, Smith TE, et al. (2019). Assessment of common criteria for awake estubation in infants and young children. Anesthesiology. 131: 808-808.
23. Gulati M, Mohta M, Ahuia S, Gupta VP. (2001). Comparison of laryngeal mask airway with tracheal tube for opthalmic surgery in paediatric patients Anesth Intensive Care. 32: 383-389.
24. Holden R, Morsman CD, Butler J, et al. (1991). Intraocular pressure changes using the laryngeal mask airway and tracheal tube. Anaesthesia. 46: 922-924.
25. Lamb K, James MFM, Janicki PK. (1992). The laryngeal mask airway for intraocular surgery: effects on intraocular pressure and stress responses. Br J Anaesth. 69: 143-147.
26. Watcha MF, White PF, Tychsen L, Stevens JL. (1992). Comparative effects of laryngeal mask airway and endotracheal tube insertion on intraocular pressure in children. Anesth Analg. 75: 355-360.
27. Tangwiwat S, Kumphong P, Surasaraneewong S, Audchaneeyasakul L, Surachatkumthornkul T, et al. (2002). Intraocular pressure changes during general anesthesia in children comparing no mask, under mask and laryngeal mask airway. J Med Assoc Thai. 85: 975-979.
28. Duman A, Ogun CO, Okesli S. (2001). The effect on intraocular pressure of tracheal intubation or laryngeal mask insertion during sevoflurane anaesthesia in children without the use of muscle relaxants. Paediatr Anaesth. 11: 421-424.
29. Pawar M, Kohli M, Usha G, Gupta R. (2001). A comparative study of the effect of placement of laryngeal mask airway vs. tracheal tube on haemodynamic parameters and intraocular pressure in children. Indian J Anaesth. 45: 123-127.
30. Fujii Y, Saitoh Y, Tanaka H, Toyooka H. (1998). Cardiovascular responses to tracheal extubation or LMA removal in children. Can J Anaesth. 45: 178-181.
31. McHardy FE, Chung F. (1999). Postoperative sore throat: cause, prevention and treatment. Anaesthesia. 54: 444-453.
32. Pandit UA. (2001). Risk factors for perioperative adverse respiratory events in children with upper respiratory tract infections. Anesthesiology. 95: 299-306.
33. Kushner, Burton J. (1982). Congenital nasolacrymal system Obstruction. Arch Ophtalmol. 100: 597-600.