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Anesthesia for Pediatric Otorhinolaryngology

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Introduction

A major evolution in monitoring of anesthesia and anesthetic drugs occurred in the last two decades. This has resulted in better safety for the patient and significant reduction in the number of complications. In spite of all these advances, a good relationship between the surgical and the anesthetic team is fundamental, as most otorhinolaryngological surgeries in pediatrics involve manipulation of the airway, with possibilities of extubation and intraoperative bleeding.

The main surgeries performed in the pediatric population are tonsillectomy, adenoidectomy, and tympanotomy, with or without placement of a ventilation tube.

Evaluation Pre-Anesthesia

Evaluation pre-anesthesia is extremely important for the performance of any surgical procedure. When we refer to surgery in a child, we should remember that this evaluation should involve not only the child, but the parents and members of the family as well. It is not always an easy situation, because of the child's anxiety and fear of separation from the parents (depending on the child's age), and the parents' fear of loss. The psychological aspect of this appointment is as important as the clinical. All procedures should be explained to the family clearly, enabling them to understand all the steps of anesthesia and the surgical process (effects of pre-anesthetic drugs on the child, now anesthesia is performed, recovery post-anesthesia, and post-surgical care). We are then able to minimize some of the parents' anxiety, and this is invariably perceived by the child. Very often, a phone call one or two days before the surgery will help to remove the family's doubts and can also guide fasting and prevent cancellation on the day scheduled for the surgery.

A detailed clinical history should always be obtained, of previous hospitalizations and surgeries, information about respiratory (asthma, recent infections of the airway, sleep apnea) and cardiac problems, allergies to drugs, foods, or latex, family history of malignant hyperthermia; use of medications (acetylsalicylic acid), and smokers in the family. A thorough clinical examination, evaluating the airways (determining presence or absence of tumors, craniofacial malformations, peritonsillar abscess), auscultation of the heart and lungs, and evaluation of neuropsychomotor development is also fundamental to performing anesthesia.

Laboratory tests are often not required when patients do not have a previous history, but they are more important in otorhinolaryngologic patients because of the risk of bleeding in a surgical site such as the airway (in adenotonsillectomies, for example). Thus, it is mandatory to have a complete blood count, including platelets, and blood-clotting tests. For patients who have sleep apnea, polysomnography should be considered and even an echocardiogram for cases that show signs of *cor pulmonale* and/or pulmonary hypertension.

If one or more of these signs and symptoms are found, surgery should be postponed four to six weeks or until there is improvement:

- Temperature higher than or equal to 38ºC (100,4º F);
- Productive cough with pulmonary rales;
- Purulent coryza;
- Decreased general health status.

It is important to have an individual evaluation of each case, as many of these children have infections of the airway at shorter intervals than the limits defined above.

The objective of pre-anesthetic medication is to provide the child with amnesia. Children are often not asleep when they get to the surgical center, and the use of medication can minimize the trauma of being separated from parents and the fear of a foreign setting. In most hospitals, midazolan is the most used drug given by oral administration, in doses between 0.25 and 0.5 mg/kg. Other routes of administration such as intramuscular, intravenous, and intranasal, can also be used, but they are not well tolerated by pediatric patients. Clonidine and dexmedetomidine have also been used with positive results, in some studies. Pre-anesthetic medication should be avoided in patients who have a history of obstructive sleep or significant tonsillar hypertrophy. If it has to be given, these patients should be monitored or be assisted by a professional with skills in CPR.

Pre-surgical fasting has also been modified in relation to that advocated in previous decades. Not all patients have to fast for eight hours before the surgical procedure. Fasting is now based on the child's age:

- 0 to 6 months: mother's milk or formula up to four hours before, and clear liquids up to two hours before the surgical procedure;
- 6 to 36 months: solid food and milk up to six hours before and clear liquids up to 2-3 hours before the surgical procedure;
- children older than 36 months: solid food and milk up to 6-8 hours before and clear liquids up to 2-3 hours before the surgical procedure

These new limits for pre-surgical fasting are more comfortable for the child, especially when they are not undergoing surgery in the early hours of the day. It is fundamental that parents fully understand the instructions they are given, thus avoiding cancellation of the surgery because fasting was not adequate.

Anesthesia

The main objectives of anesthesia are: atraumatic induction, good surgical conditions, as little bleeding as possible, replenishment of water, and a calm arousal with reflexes present.

General anesthesia is used for almost all otorhinolaryngological surgeries and procedures. It is very rare that a tonsillectomy is performed with the child sitting, under the effect of ketamine, without orotracheal intubation. Because of the risk of bleeding and aspiration into the airway, with severe potential complications, most anesthesiologists have abandoned this technique.

In most hospitals, induction of anesthesia is made by inhalation when there are no contraindications. The most important change in this procedure has been the introduction of sevoflurane in the 1990's. This agent for inhalation has a less pungent odor, and induction and arousal are faster than with other drugs of its class. When the patient is in an anesthetic plane, venoclysis is performed, and other anesthetic drugs can be associated if necessary (opioids, muscle-relaxants, propofol, for example). Intravenous induction can be performed if the patient already has a venous access, according to the type and duration of the procedure.

The presence of parents during induction of anesthesia should always be considered, taking into account the technical conditions and rules of the hospital and the surgical center as well as the emotional aspect of parents (they can present some discomfort) and of the child. The father or mother who goes into the operating room must be aware of the procedure that is going to be performed and of the behavior the child can present, thus preventing the parent from showing the child their apprehension.

Anesthesia is maintained using inhalation (sevoflurane, isoflurane and halothane) or intravenous agents. The first are more widely used, but venous anesthesia is being more widely adopted as a result of the development of ultrashort-acting drugs such as propofol and remifentanil. The advantage of this technique is that the arousal is rapid and calm, with very little agitation in the child.

After surgery is finished, the child can be aroused in a calm way, with few stimuli. A stimulus at an inadequate moment can lead to severe laryngospasm or bronchospasm, particularly in patients who have a history of hyper-reactive airway. Efficient postoperative analgesia can make an important contribution to arousal with less agitation. The drugs more commonly used are the opioids (fentanyl, nalbufine, tramadol and morphine), dipyrone, paracetamol and the anti-inflammatory drugs (there are controversial reports in the literature about their use in surgeries, with potential bleeding).

Prevention of post-operative nausea and vomiting (PONV) is also a part of the therapeutic armamentarium the anesthesiologist has to use, as this complication can occur in up to 60% of cases. Procedures on the middle ear have a high incidence of this unpleasant event due to the manipulation of the vestibular pathways. It also occurs in surgeries on the adenoids and tonsils, when blood present in the oropharynx is swallowed, generating gastric irritation and triggering PONV. The drugs used more often to prevent PONV are: ondansetron, dexamethasone, dimenhydrinate, or droperidol. Metoclopramide is being less used to prevent

PONV, as it was shown in several studies and meta-analyses to be inefficient in prevention of these events, and it has a significant incidence of side-effects such as agitation and extrapyramidal syndrome.

The child goes to post-anesthesia recovery after surgery. At this time it appropriate that one of the parents remains with the child so that at arousal the child will see a familiar face. Besides, this is an opportunity to reinforce the recommendations on care to be provided after discharge. When possible, venoclysis should be maintained until discharge from the hospital, as this will help to provide for rapid and efficient intervention if there is intense pain, nausea, vomiting or a reintervention is needed.

Postoperative Complications

Bleeding in the airways (present in up to 8.1% of tonsillectomies) is the complication the anesthesiologist fears most among other complications that can occur in the otorhinolaryngological patient. In this case, the anesthesiologist is faced with an urgent situation where both the family and the child will become extremely anxious. The patient will have a full stomach because blood has been swallowed or food was eaten. The airways have been manipulated and can be swollen and filled with blood, which makes it difficult to visualize the vocal folds and perform orotracheal intubation. As one can imagine, this is a dramatic situation, and the patient may die if correct measures are not made urgently. The surgical team must be ready to intervene at the time of induction of anesthesia, as if the intubation fails a surgical airway may be necessary.

Other complications are postoperative pain, nausea and vomiting, dehydration, night terrors, emotional trauma, and behavioral disorders. These complications are usually resolved with clinical treatment (and psychological follow-up in the two last complications). Psychological complications are subjective, and it is difficult to evaluate their impact mid- and long-term. Different from physical complications, they are not related to lack of clinical experience of the team

Criteria for outpatient surgery

A large number of otorhinolaryngological surgeries in the pediatric population are performed in the outpatient setting. It is therefore fundamental that the otorhinolaryngologist should know who are the patients who can be discharged on the same day the surgery was performed. In this way, he will be able to provide the patients with the most adequate information and will avoid misunderstandings with anesthesiologist colleagues.

There is controversy about performing adenoidectomy and/or tonsillectomy in the outpatient clinic, as approximately 3% of these patients will have some degree of postoperative bleeding and some of them will need to be reoperated on or transfused. However, we know that a large part of these bleedings occur during the first 12 hours after surgery. Therefore, these procedures are always scheduled as the first appointments of the day, and patients are discharged at the end of the day or early evening.

Criteria to select patients for outpatient surgery:

- ASA 1 and 2 patients,
- ASA 3 patients who are clinically stable (cases should be individually evaluated)
- Ability of patient and family to follow pre- and postoperative recommendations,
- Presence of an adult to be in charge of following the patient, and if the patient is a child the recommendation is to have two adults.

Outpatient surgery is contraindicated for patients with bronchopulmonary dysplasia and episodes of apnea in the last six weeks.

Criteria for discharge after outpatient surgeries are (the criteria should be followed according to the age of the child and his cognitive development):

- Orientation in time and space
- Vital signs have been stable for more than 60 minutes
- Is able to walk alone
- Is able to swallow liquids
- Is able to urinate
- Absence of significant pain or bleeding

By following the criteria for inclusion and discharge, we are able to have safer surgeries and postoperative periods, and both patients and families will be more satisfied.

Conclusions

A safe and successful anesthetic-surgical procedure starts with adequate preparation of the child and relatives before the surgery. In this manner, we are able to avoid surgeries being cancelled on the day scheduled for the surgery, and chances of a misunderstanding or lawsuit are minimized if there is an adverse result. The criteria for discharge should always be followed for outpatients, and those in charge of the child should receive all information about care at home as well as about situations in which they should contact the medical team or come back to the hospital. Constant communication and mutual trust between members of the anesthetic and surgical teams will result in an undisturbed and safer surgery for the patient.

Recommended readings

1. Teruya SBM. Pré-Anestésico em Pediatria. In: Auler Jr JOC, Teruya SBM, Jacob RSM, Valinetti EA. Anestesia Pediátrica. Atheneu, São Paulo. 35-41. 2008.
2. Laurenti EL, Teruya SBM, Simões CM. Anestesia para Otorrinolaringologia. In: Auler Jr JOC, Teruya SBM, Jacob RSM, Valinetti EA. Anestesia Pediátrica. Atheneu, São Paulo. 343-355. 2008.
3. Pai SI, Tunkel DE. Adenotonsillectomy. In: Richardson MA, Friedman NR. Clinician's Guide to Pediatric Sleep Disorders. Informa Healthcare, New York. 113-138. 2006.
4. Swanson VC, Koh J. Obstructive Sleep Apnea and Anesthesia. In: Richardson MA, Friedman NR. Clinician's Guide to Pediatric Sleep Disorders. Informa Healthcare, New York. 223-242. 2006.