

How do You Select an Anesthesia Method Prior to Tympanostomy Tube Insertion for a Child?

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The use of general (face-mask inhalation and intravenous) anesthesia has been the method of choice for tympanostomy tube insertion in children. However, there is no exact guideline for the choice of anesthesia method and there is no evidence to support the use of one anesthesia method over another. Clinically, the anesthesia method used to be decided by old customs and the surgeon's blind faith that children cannot bear tympanostomy tube insertion under local anesthesia. Clinicians should keep in mind that pediatric anesthesia has a potential risk. Despite infrequent serious complications, their seriousness necessitates that sedation or general anesthesia should be done by an anesthesiologist and thus children requiring tympanostomy tube insertion should be referred to secondary or tertiary hospitals, even if they have been followed by a primary care physician for a long time. Previous evidence showed that local anesthesia is appropriate for tympanostomy tube insertion in selected children, especially in children older than 5 years are older. Proper choice of anesthesia method is helpful for both patient and medical service provider. Local anesthesia can give psychological relief to children and their parent. It is easier for the medical service providers to schedule the operation and allocate the medical resources in their hospital. Local anesthesia can reduce individual, social, and national burdens for the health care services.

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Introduction

Together with myringotomy or tympanocentesis, tympanostomy tube insertion (TTI) has been one of the most commonly performed otologic surgical procedures in children. When a child is unable to stay calm during minor otologic surgery, most otologic surgeons typically choose general (intravenous or endotracheal) anesthesia. Young children who receive general anesthesia often have "bad experience" such as delirium and agitation when they wake up. Following sedation or general anesthesia, prolonged drowsiness, paradoxical hyperstimulation, gastrointestinal upset, and motor imbalance can occur late. Serious hazard, such as hypoxia, may

be as high as 11% in children sedated with oral chloral hydrate and 17% in children sedated with intravenous pentobarbital [1]. These unwanted reactions may increase the risk of anesthesia-related injury to the child and decrease the parent's satisfaction with the care their child is receiving.

During the surgery, the type and dosage of anesthetic drugs is decided and administered by the anesthesiologist at an operating room. However, the type of anesthesia method is decided by the otologic surgeon in most clinical situation, before a child enters into the operating room. Even though the otologic surgeon contacts the anesthesiologist before the procedure, it is not sure what basis they can choose the anesthesia method for each individual. On what basis does the anesthesiologist choose the appropriate anesthetic for minor otologic surgery? The choice of best anesthesia is not simple for the patient, surgeon, and anesthesiologist because each of them has own objectives for the outcome of the operation as well as anesthesia. Otologic surgeon or anesthesiologist is faced

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with the task of choosing the “best” anesthesia method for a child having a minor otologic surgical procedure as well as his/her parent. The factors influencing this decision are different for every patient and surgeon or anesthesiologist, limiting usefulness of standardized guideline. Types of anesthesia are classified into local, and regional (such as caudal epidural block), and general anesthesia. For general anesthesia, an anesthetic drug is administered either by inhalation through a breathing mask or endotracheal tube, or by injection through an intravenous line.

This review considers how otologic surgeon or anesthesiologist can choose the appropriate anesthesia method for a child having a minor otologic surgical procedure, balancing relative importance between objectives of the patient/parent and medical doctors.

General Anesthesia for Minor Surgical Procedure in Children

To choose the anesthetic method for minor surgical procedure in a pediatric population, clinicians should consider more aspects than in the cases of adult patients. The concerns about which anesthesia is appropriate for a child have been addressed in the field of dentistry. Especially in the UK, tooth extraction under general anesthesia has been a routine treatment option for young children and guidelines for the use of sedation and general anesthesia was published for safe sedation and anesthesia [2-5]. For minor surgical procedures, such as TTI or tooth extraction, it is important for clinicians to ensure that children receive effective pain control from the start to end of the surgical procedure. To achieve this purpose, clinicians can use a range of techniques, comprising four: behavioral/psychological techniques, local anesthesia, sedation, and general anesthesia.

Disadvantages of General Anesthesia for Minor Surgical Procedure

Most textbook stated that general anesthesia is required to children for TTI through intravenous or masked inhalational anesthesia [6-8]. General anesthesia for minor surgical procedures in children can be a good option for clinicians or parents. However, this option can be limited because of morbidity, limits of service provision and medical cost [3]. In most countries, the limitation of health care service provision has increased because of many legal and ethical considerations to keep safe sedation and general anesthesia. The increase in general anesthesia induces excessive pre-procedures assessment or consultation; leads to the referral from a clinic to a

hospital; requires more use of health care services and medical resources; and inevitably results in the increase of health care costs and social burdens. If clinicians decrease the rate of general anesthesia, social or national burdens on health care costs will be lightened. The author reported that total medical costs can be decreased 2- to 3-fold, and patient charges can be decreased 1.5- to 2-fold in South Korea, when outpatient TTI is performed under local anesthesia rather than general [9]. This suggestion was supported by reports of other country, which has different medical insurance systems from South Korea. Shiley, et al. [10] reported that average hospital charges were significantly about 4 times higher for general anesthesia in the USA.

Generally, universal indications for general anesthesia can be classified in three main groups: 1) patients having special medical problems, 2) patients needing extensive surgical procedures, and 3) patients who do not cooperate. Patients with medical problems tend to be contraindicated for general anesthesia but some patients may be risky to operate them in the usual way. Representative examples are mental problems, uncontrollable epilepsy or uncontrollable motor problems, which makes it impossible even for adult patients to collaborate the surgery. Is the minor surgical procedure in a child really included into the indication for general anesthesia? Is all of children indicated for general anesthesia, even for the minor surgical procedure, such as TTI?

Local Topical Anesthesia for Minor Surgical Procedure in Children

The main reason for a surgeon to prefer general anesthesia for pediatric TTI is children’s uncooperation and irritability. Once a child gets the fear or phobia before the procedure starts, further surgical procedure is impossible in most cases. This is because of a physical or mental immaturity, but not because of invasiveness of the surgical procedure itself. Actually, local anesthesia can achieve enough pain control for younger children to get minor surgical procedures, including TTI. But local infiltrative anesthesia is not suitable for children because anesthetic procedure itself hurts a child a little bit. Once after a child feel any pain or even discomfort, any further treatment will be rejected violently and any other type of control will be impossible. For local infiltrative anesthesia, the anticipation of receiving a “shot” tends to increase anxiety in children and even seeing a needle in a medical setting may make younger children cry or agitated. Contrary to adult patient who are willing to endure minor discomfort of the injection, younger children do not have the ability to do this.

Therefore, local topical anesthesia, together with behavioral/psychological techniques is appropriate for younger patients. The author usually uses a 10% xylocaine solution to get effective topical anesthesia for minor otologic surgeries at outpatient clinic. Before anesthesia, the ear canal was thoroughly cleaned using microforceps or microsuction under an operating microscope. This step is very important because the crust or ear wax hinders the anesthetic drug from contacting with the skin of the ear canal as well as tympanic membrane. Small cotton ball is then inserted into the ear canal in contact with the tympanic membrane. A 10% xylocaine solution is sprayed to soak the cotton ball completely. After 15–20 minutes, the xylocaine solution is sucked out by a microsuction and the cotton ball is removed by microforceps. During the procedure, it is important for xylocaine not to enter the middle ear cavity because it enters the perilymph of the inner ear through round window membrane, paralyzes the peripheral vestibular afferent neurons and induces unilateral vestibular loss [11]. Even though this vestibular suppressing effect disappears gradually over time, the patient suffers from severe vertigo and disequilibrium at least for several hours.

The author's report demonstrated that TTI could be performed successfully under local topical anesthesia for children aged 5 years and older. It also showed that most children did not feel any pain at the time of myringotomy or tube insertion because author's anesthesia method controlled pain enough. However, some children complained excessively annoying or startling noise while middle ear effusion was sucked out and fullness sensation or vague discomfort while the tube was inserted and pressed a tympanic membrane medially. Despite of deep analgesia provided by local anesthesia, clinicians should always consider the psychological aspects of pain. Even though the pain disappears, younger children may focus their attention on other feelings or noise and misperceive them as "pain". Therefore, behavioral/psychological management before the procedure is needed to handle of it: clinicians and nurses should try to explain and calm down a child before the procedure starts. These discomforts can be controlled enough by behavioral/psychological techniques and do not interrupt the completion of TTI under local anesthesia. To my experience, the youngest child who underwent TTI under local anesthesia was a 36 month-old boy.

Advantages of Local Anesthesia for Minor Surgical Procedure in Pediatric Population

Compared with general anesthesia, there are many benefits of local anesthesia. One of them is psychological relief of chil-

dren and their parent before as well as after the minor otologic surgical procedure. Local topical anesthesia can provide appropriate analgesia, which gives ideal psychological conditions to recovering children and indeed their parents. Because an alert, calm, and cooperative child is less likely to interfere with postoperative dressings, postoperative workload for the parent and nurses is reduced to take care of them in the recovery room. The other benefit is that it can be used when general anesthesia is contraindicated, considered technically difficult or associated with increased morbidity and mortality. Local anesthesia can avoid a long wait for an operation schedule as well as excessive preoperative assessment including consultations. As mentioned above, local anesthesia can save medical resources in a hospital and reduce resultant health care costs. Minor but very real benefit of local anesthesia is that it may remain "good" memory of surgery and anesthesia to a child. For younger children, to be awoken in a foreign environment, surrounded by strangers may be "bad" experience. Children who undergo early painful experiences related to TTI are likely to exhibit negative behavior during postoperative follow-up.

Conclusion

This review suggests that minor surgical procedures such as TTI can be successfully performed under local topical anesthesia in pediatric population. Compared with general anesthesia in pediatric population, local anesthesia can give psychological relief to children and their parent during the surgical procedure as well as postoperative care. It can reduce postoperative workload for the parent and nurses. It can make the medical service providers easier for the operation schedule and allocation of medical resources.

The author hopes that the otologic surgeon chooses the anesthesia method comprehensively for children who get the minor otologic surgery. Clinicians should not blindly choose general anesthesia for the minor otologic surgical procedures merely because the patient is younger children.

Conflicts of interest

The author has no financial conflicts of interest.

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