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A comprehensive analysis of the various facets of administering general anesthesia in pediatric dentistry for full mouth rehabilitation : An overview

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ABSTRACT

Background: While the majority of children are able to receive dental treatment in a standard office setting, there are some who struggle with being in a conscious state during the procedure and do not respond well to usual methods of management. As a result, the purpose of this review is to explore this topic in greater detail.

Evidence Acquisition: To gather relevant information on dental general anesthesia in children, a computerized search was conducted using various databases such as PubMed, MEDLINE, EMBASE, Google Scholar, and Google. The search focused on articles written in English and included both original research and review articles. There was no limitation on the publication date of the articles. After retrieving the articles, a careful selection process was undertaken to identify those that were relevant to the topic. The selected papers were then studied in detail, and the relevant findings were recorded using a data form designed by the author

Results: A thorough preoperative oral examination, along with a comprehensive evaluation of treatment needs, can only be performed following a clinical and radiographic oral examination. To minimize psychological trauma in children undergoing dental GA, effective collaboration among the dental team is necessary. Additionally, before proceeding with comprehensive dental treatment under GA, it's crucial to accurately assess the child's general health and the success rate of the planned procedures. It's also important to determine the optimal timing for the GA dental operation. Ensuring safety during pediatric dental rehabilitation under GA is of utmost importance

Conclusions: While there are specific criteria for selecting cases that require dental GA, dental practitioners still need to exercise their judgment to make a decision. Although instructing parents or caregivers with pre- and post-operative guidelines can assist in mitigating complications, the utilization of trained resuscitation providers, vigilant monitoring, and advanced equipment is crucial in reducing unfavorable outcomes.

Keywords: *Rehabilitation , Dental Care, General Anesthesia, ECC, Pediatric FMR, Psychology*

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BACKGROUND

Pedodontists typically employ behavioral techniques to effectively treat the majority of children under their care. However, there are some children who are unable to receive treatment through these methods. For such pediatric patients, dental treatment using general anesthesia (GA) may be necessary. GA is a controlled state of unconsciousness that causes a loss of protective reflexes. Comprehensive dental rehabilitation under GA has been available to the pediatric population for nearly three decades.

In some instances, dental general anesthesia (GA) may be the most practical and cost-efficient method of treatment. The American Academy of Pediatric Dentistry (AAPD) advises that specific patient populations who cannot undergo standard dental procedures should only be treated with GA. This includes young pediatric patients, as well as those with physical, cognitive, emotional, or mental immaturity or disability, or severe anxiety that necessitates extensive rehabilitation. Such children are not suitable for traditional in-office treatments and are more appropriately and safely treated under GA. The majority of children who receive dental GA suffer from early childhood caries (ECC), which is a common health issue among otherwise healthy children.

Evidence Acquisition

The purpose of this paper is to provide a comprehensive review of various aspects of dental GA in children. A computerized search was conducted using keywords such as "dental general anesthesia", "comprehensive dental rehabilitation", and "full mouth rehabilitation" in databases such as PubMed, MEDLINE, EMBASE, Google Scholar, and Google. Only English-written articles, including original and review articles, focused on child populations without any publication date restrictions were included in this review. To obtain additional relevant articles, the references of selected papers were also searched, and the content of potential articles was reviewed. After carefully examining the full text of these articles, the misleading ones were excluded, and the most relevant articles were selected. The author used a designated form to record the appropriate findings from the chosen articles

RESULTS

In this review, 36 articles were considered appropriate for analyzing the topic. The key outcomes of the electronic search are discussed below.

Assessment of the patient's overall health and oral condition before surgery

Before dental treatment under GA is offered to a patient, an initial screening must be conducted (Little et al. 2012) . For children who are potential candidates for GA treatment, a detailed medical history and physical examination should be performed to determine their suitability. The physical examination can help determine if GA is a viable option for dental treatment (Shah and Barker 2023).

Preoperative Instructions

Compliance with pre-operative guidelines by parents or caregivers is crucial to ensure the child's safety during GA and decrease the possibility of complications (Shah and Barker 2023; Institute of Medicine et al. 2009). The instructions on food and beverage consumption are typically given to the parent or caregiver during the consultation. This enables parents to plan for the surgery day and alleviate their anxieties. Furthermore, a concise explanation of the necessary dental procedures and expected duration of the surgery can be beneficial in comforting parents (Hockenberry 2022).

Consent

Prior to administering GA for dental treatment, it is important to obtain written and informed consent from the parents or caregivers of the patient (Meiring-Noordstra et al. 2023). The dental practitioner should provide a clear explanation of the use of GA and the dental procedures involved, both in written form and verbally. The parents should be fully informed about the risks and benefits of the GA procedure, and should also be made aware that additional or

alternative treatments may be necessary based on the operator's decision during the course of the operation (National Academies of Sciences, Engineering, and Medicine et al. 2017).

Psychological Preparation

Psychological management is crucial in helping patients manage their anxiety and establishing a positive relationship. Strategies such as simple explanations, games, and distractions can help reduce fear (Stefanac and Nesbit 2015; Teja and Ramesh 2021; Teja et al. 2021). Parental presence during dental procedures is also a possible way to help children cope with their emotional distress. It is important to note that personality changes during dental procedures are more common among children aged 1-5 years, who are often the primary candidates for dental GA (World Health Organization 2013; Asif et al. 2019; Akshayaa, Ravindran, and Madhulaxmi 2021).

Different methods and substances used for inducing dental general anesthesia

There are multiple techniques for inducing anesthesia, such as mask induction, rectal induction, oral or nasal transmucosal agents, and injections via intramuscular or intravenous routes. In pediatric patients, halogenated volatile anesthetics administered through inhalation are often preferred over injections due to fear. Nitrous oxide, isoflurane, desflurane, and sevoflurane are some of the inhalation agents commonly used (Sponheim et al. 2003). Sevoflurane is the favored choice for induction because of its pleasing scent, low blood/gas partition coefficient, and reduced respiratory complications compared to other agents. Moreover, it causes fewer instances of hypotension than halothane (Vardanyan and Hruby 2006). Isoflurane, desflurane, and sevoflurane are all effective options for maintaining anesthesia (Vardanyan and Hruby 2006; Vacanti et al. 2011).

Different procedures and their level of quality

During a single session under GA, a range of dental procedures can be performed, including restorations using amalgam or composite materials, pulp treatments, placement of stainless steel crowns (SSCs), and extractions (Fuks and Peretz 2016). The treatment plan typically involves prioritizing the more invasive procedures such as extractions and SSCs, while limiting the number of pulp treatments and composite restorations performed during a single session (Schwendicke, Frencken, and Innes 2018; Shenoy, Salam, and Varghese 2019; Lakshmanan and Jeevanandan 2021).

During the treatment planning phase, it is recommended to choose more aggressive treatments. Teeth with questionable prognosis should be extracted to minimize the risk of complications and the need for additional dental GA (Institute of Medicine, Division of Health Care Services, and Committee on Medicare Coverage Extensions 2000). Taking these measures can help reduce the likelihood of requiring retreatment with dental GA after the initial full mouth rehabilitation. Avoiding the need for additional GA can also help mitigate the risks associated with this type of procedure, such as morbidity, mortality, and behavioral changes (Institute of Medicine, Board on Health Promotion and Disease Prevention, and Committee on Assuring the Health of the Public in the 21st Century 2003; Marimuthu 2021)

Compared to complex multi-surface amalgam restorations, SSCs have a higher rate of success as a restorative procedure (Institute of Medicine, Board on Health Promotion and Disease Prevention, and Committee on Assuring the Health of the Public in the 21st Century 2003; Institute of Medicine et al. 2009). They are considered to be the most robust and effective restorations, and can substantially reduce the need for retreatment in teeth with interproximal caries, particularly in very young children.

It is recommended to extract grossly unrestorable or questionable teeth, especially when the success rate of the procedure is in doubt. Extraction is now preferred over pulp treatment for teeth with necrotic pulp. Complex treatments such as pulp therapy for teeth with pre-apical lesions or necrotic pulp should be avoided (Fuks and Peretz 2016). Vital pulpotomy is more frequently used when pulp treatment is considered.

The presence of underlying medical or mental conditions may impact the treatment planning for dental GA. In such cases, dentists may prefer treatment modalities that involve tooth extraction rather than restorative treatments (Institute of Medicine, Division of Health Care Services, and Committee on Medicare Coverage Extensions 2000). Additionally, preventive measures may be less emphasized in the dental GA approach for these patients.

The Administration of Additional Local Anesthesia in Combination with General Anesthesia

The administration of local anesthesia during GA may vary among dental practitioners, with some believing that it can enhance hemorrhage control, physiologic parameters, and decrease post-operative pain and complications (Mba and Hobbins 2008). However, others are worried about the potential risk of lip and cheek biting. The extraction of teeth is the most frequent procedure that requires local anesthesia during GA. The use of intraoperative local anesthesia may also be influenced by the level of treatment required (Yamaya et al. 2021).

Determining the best time for dental rehabilitation in children who will undergo GA

One strategy to avoid the need for a second GA is to delay the procedure until the primary dentition has fully erupted and completed its cycle of exfoliation. This approach reduces the risk of premature loss of teeth due to caries, as well as the need for extensive dental work. By waiting until the primary teeth are naturally replaced by permanent teeth, the risk of complications associated with GA can be minimized, and the overall treatment plan can be more effective and efficient (Mba and Hobbins 2008). However, this approach may not be suitable for all patients, and individual factors such as the extent of dental disease and patient age should be carefully considered when making treatment decisions

Duration of Operation

It is important to note that while the average treatment time is 1-4 hours, the actual time can vary depending on the individual case (American Medical Association 1904). Factors such as the number of teeth to be treated, the complexity of the dental procedures, and the patient's medical and dental history can all impact the duration of the operation. Additionally, the time required for the patient to recover from the anesthesia and any post-operative procedures or care may also need to be taken into consideration .

Benefits of Complete Dental Treatment under General Anesthesia

Dental treatment under GA has several advantages, including the ability to perform all necessary procedures in a single session in a hospital setting with efficient and safe services (Institute of Medicine, Board on Neuroscience and Behavioral Health, and Committee on Health Literacy 2004). Pain control can also be effectively managed under GA. Additionally, GA eliminates the need for the child's cooperation during treatment and is often more convenient and cost-effective than office-based treatments. Studies have shown that dental treatments performed under GA have better quality and durability compared to conventional treatments (National Research Council et al. 2015). Oral health has a significant impact on overall well-being and quality of life, and measuring the oral health-related quality of life can be useful in evaluating the outcomes of dental rehabilitation under GA. Recent research has demonstrated that children who undergo dental treatment under GA experience a significant improvement in their quality of life (Wright and Kupietzky 2014).

Disadvantages

The use of anesthesia in dentistry carries some risks and potential harm to the patient's health, with documented cases of both morbidity and mortality. Therefore, pediatric dentists should reserve the use of general anesthesia for cases where conventional dental procedures are not possible. It is also important to note that dental trauma, ranging from minor enamel cracks to

more severe injuries such as avulsion or crown dilacerations, can occur during laryngoscopy, endotracheal intubation, or the improper use of mouth openers (Wright and Kupietzky 2014; James R Hupp, Tucker, and) 2019).

Documentation

It is important to maintain complete clinical records documenting all dental treatment procedures performed, including restorations, pulp treatments, and extractions (Stefanac and Nesbit 2015). Additionally, the anesthesiologist responsible for administering anesthesia must document the details of the procedure as well as any complications that arise during the procedure

Patient Safety

General anesthesia has its own risks and benefits that need to be considered when used in dental procedures. Given the increasing number of children undergoing GA for dental treatments in recent years, it is crucial to prioritize safety in these procedures (World Health Organization 2013). Post-operative complications have been reported in a range of percentages, from negligible to 90%. Complications such as arrhythmias, dislodged or obstructed endotracheal tube, IV infiltrates or disconnects, edema of the tongue or lips, and nasal bleeding can occur during the procedure. Inadequate equipment or inexperienced staff may contribute to adverse events. To minimize the risk of adverse events and maintain safety, it is important to follow guidelines and receive regular training

Team Work

During dental rehabilitation under GA, effective teamwork is essential to ensure optimal care for the child. The operation team must be comprised of trained and experienced individuals who work together to minimize risks and provide high-quality care. Dedicated anesthesia assistants and dental nurses with specialized training are necessary to support the dental anesthesiologist and ensure the child's physiologic functions and breathing are maintained throughout the procedure. The anesthesiologist continuously monitors the child's vital signs during the operation.

After the procedure is complete, the child must be carefully monitored during the recovery phase until they regain consciousness. For patients with certain medical conditions, a pediatric team that includes a pediatrician may be necessary (Perry et al. 2017).

Pediatric dentists are trained to perform treatment under GA in addition to utilizing behavior management techniques for conventional treatment. The focus is on providing the most durable and successful treatments to avoid the need for future GA and improve the child's oral health-related quality of life.

Discharge

Before a child patient can be discharged after dental rehabilitation using GA, their fitness for discharge must be evaluated and documented by the dental practitioner, anesthetist, and recovery staff. This involves assessing the child's orientation, level of alertness, and overall stability. Only when the child is deemed fit for discharge can they be released.

Upon discharge, a legally competent adult should accompany the child patient and receive postoperative instructions from the dental practitioner. These instructions should cover the child's diet, medication, and any specific care instructions for the treated area. The accompanying adult should be informed of any potential complications that may arise and be instructed on when to seek further medical attention if necessary.

Postoperative Discomfort in Children Undergoing Dental Treatment Using GA

Following dental GA procedures, many pediatric patients report various degrees of postoperative discomfort. Common complaints include dental pain, difficulty in eating, nasal bleeding, throat discomfort, nose discomfort, altered sleep patterns, weakness, drowsiness, dehydration, fever, nausea, vomiting, hoarseness, diarrhea, and constipation. Postoperative pain is the most frequently reported complaint. One study

reported postoperative complications in 8.2% of pediatric patients who underwent dental GA. Another study by Enever et al. found that up to 44% of patients experienced postoperative symptoms according to parental reports.

The development of postoperative complaints may be related to factors such as the type of treatment, duration of GA, traumatic intubation, double throat pack, pre-existing medical conditions, provider experience, and the use of local anesthetics (Glick, Cooper, and Ovassapian 2012). Placement of stainless steel crowns (SSCs) and tooth extractions are the most pain-provoking procedures. However, most postoperative complaints resolve within a few days, and patients return to their normal physical activity levels shortly thereafter.

Postoperative Instructions

After the dental GA procedure, it is important for parents to supervise their child for 24 hours and follow the post-operative instructions provided by the dental practitioner. These instructions include information on symptoms that may be experienced and the recommended diet for the first 24 hours. Painkillers such as Paracetamol or Ibuprofen may be given to the child as needed, and parents should be aware that oozing from extraction sites and crowns may occur (Glick, Cooper, and Ovassapian 2012; Hibino et al. 2023). The child should only engage in indoor activities as their coordination and balance may take some time to return to normal. A follow-up appointment is scheduled to evaluate the healing process, and parents should continue to bring their child for regular dental check-ups.

Parental Attitudes

Over time, the attitude of parents towards GA has changed and now they are more favorable towards it. Nowadays, there is an increasing acceptance of GA in parental opinion. Parents perceive dental GA as a treatment method that positively impacts their children's quality of life.

Influencing Factors on Parental Decision to Choose Dental Rehabilitation Using GA

Parents take into consideration several factors when deciding to choose GA for their child's dental treatment, including the child's level of cooperation, the risks associated with the GA procedure, the cost of both the anesthetic and dental procedures, as well as the potential psychological impact of GA on the child.

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Preventive advices

It is crucial to offer additional preventive guidance to parents of children who receive extensive dental care under GA. Parents must be properly informed about preventive measures for at-home care. It is essential to emphasize that without regular oral hygiene, which is the responsibility of the parents or caregivers, optimal outcomes cannot be attained from comprehensive dental treatment under GA.

Go to:

CONCLUSIONS

To minimize the risks and complications associated with dental rehabilitation under GA, it is crucial to schedule a correct treatment plan after a comprehensive examination. Parents should also be consulted about the dental and anesthesia procedures and educated about the importance of maintaining good oral hygiene for their child. Additionally, dental GA personnel should be knowledgeable about the psychological needs of the child patient, and the anesthesiologist should perform the procedures with caution to avoid adverse accidents. As the number of pediatric patients requiring dental rehabilitation under GA increases, it is important to be aware of the inherent risks and take all necessary precautions to ensure the safety and well-being of the patient.

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