Sedation in pediatric patients undergoing dental treatment: case reports

Sedação em pacientes pediátricos em tratamento odontológico: relato de casos

Received: 2023-00-00 | Accepted: 2023-00-00 | Published: 2023-00-00

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ABSTRACT

Anxiety, fear and phobia of dental treatment are present in a large part of the population. As an effective method to control anxiety, sedation is currently present in dental offices, acting in a positive way in dental care procedures. In pediatric dentistry, the fear regarding consultation is mainly caused by the fact that the environment is new and unknown, and sometimes it is necessary to use sedative drugs, so that the care is efficient, fast and safe. This study is a case report involving two pediatric patients with dental treatment phobia who underwent sedation performed in an outpatient clinic under the supervision of an anesthesiologist. We conclude that drug sedation is a technique that should be considered in cases where there was no success in behavioral management to control aversive behavior in pediatric patients with phobia and the incorporation of this technique enables safe and effective dental care.

Keywords: Sedation; Pediatric dentistry; Anxiety

RESUMO

A ansiedade, o medo e a fobia de tratamento odontológico estão presentes em grande parte da população. Como método eficaz no controle da ansiedade, a sedação está presente atualmente nos consultórios odontológicos, atuando de forma positiva nos procedimentos odontológicos. Na odontopediatria, o receio em relação à consulta é causado principalmente pelo fato do ambiente ser novo e desconhecido, sendo por vezes necessário o uso de medicamentos sedativos, para que o atendimento seja eficiente, rápido e seguro. Este estudo é um relato de caso envolvendo dois pacientes pediátricos com fobia de tratamento odontológico que foram submetidos a sedação realizada em ambulatório sob supervisão de um anestesista. Concluímos que a sedação medicamentosa é uma técnica que deve ser considerada nos casos em que não houve sucesso no manejo comportamental para controle do comportamento aversivo em pacientes pediátricos com fobia e a incorporação desta técnica possibilita um atendimento odontológico seguro e eficaz.

Palavras-chave: Sedação; Odontopediatria; Ansiedade.

INTRODUÇÃO

Anxiety and phobia about dental treatment are present in a large part of the population, being aggravated by sounds and vibrations from rotating instruments, anesthesia and mainly negative dental experiences shared by family and friends (Fiorillo et al., 2019).

In pediatric dentistry, fear of care may be caused by anxiety, which varies from mild to severe, or by dentophobia. Phobia is related to excessive and lasting fear of dental stimuli and results in significant suffering. Anxiety corresponds to the fear of procedures that may or may not be associated with the phobia. Children and teenagers suffering from dentophobia or dental anxiety may exhibit disturbing behaviors during examination and treatments, ranging from restlessness to tantrums (Gao et al., 2023). The Pediatric Dentist
should identify the psycho-emotional profile of the child in order to propose a humanized treatment (Guideline on Behavior Guidance for the Pediatric Dental Patient., 2015).

Parental support poses a great influence in the behavior of their children, but this is not always enough, requiring the use of linguistic techniques, psychological support and, finally, sedative drugs, seeking efficient, fast and safe care (Gao et al., 2023). The uncooperative patient can interfere with the quality of care and increase treatment time, as well as also increasing the risk of injury to the child. In addition, many parents have not accepted aversive control techniques as protective stabilization, which makes sedation an important option for controlling anxiety and phobia (Patel et al., 2016).

That being said, highly anxious or phobic children may require targeted pharmacological support, in addition to behavioral guidance strategies, nitrous oxide sedation, intravenous sedation, or general anesthesia (Gao et al., 2023). As an effective method to control anxiety, sedation is currently present in dental clinics, acting in a positive way in the collaboration of care, reducing the level of activity and aversive behavior of some patients. Sedation is indicated when all cognitive and behavioral control approaches have failed (Guideline on Behavior Guidance for the Pediatric Dental Patient., 2015). According to the International Committee for the Advancement of Procedural Sedation, the practice of sedation is the administration of one or more pharmacologic agents to facilitate a diagnostic or therapeutic procedure aimed at a state during which airway patency, spontaneous breathing, respiratory reflexes and hemodynamic stability are preserved, alleviating anxiety and pain (Green et al., 2021).

For effective sedation in an outpatient setting with no complications, a qualified professional trained in sedation must have knowledge of the pharmacodynamic and pharmacokinetic effects of the drugs used. In addition, a team must be present to monitor vital signs for patient safety. Sedative agent selection and approach are influenced by the type of procedure, comorbidities, patient temperament, and clinician preferences. The primary goals of sedation include anxiolysis, analgesia, amnesia, safety, efficacy, and the ability to facilitate procedure completion (Green et al., 2021).

Knowing the indications is an important factor for the use of sedative drugs. Professionals should do a complete anamnesis, know the past medical history, and if the patient has allergies and illnesses. In addition, it is extremely important that the place where the procedure will be performed is equipped with an emergency kit (adrenaline and oxygen mask) in case of complications (Green et al., 2021).
Given the importance of pediatric dentists' knowledge about methods of pharmacological sedation to control phobia and anxiety, the present study aimed to report the successful use of sedative medications in an outpatient setting in two pediatric patients who had dentophobia.

**CASE REPORTS**

The present work consists of two case reports of a 3 and a 4-year-old patient who attended the UDF teaching clinic for dental treatment and showed aversive behavior. They were then referred for medical sedation care. The work started after approval of the project by the Research Ethics Committee of the UDF University Center (CAEE: 64332722.4.0000.5650) and the signing of the Terms of Free and Informed Consent by the legal guardians, in addition to the signing of the Term of Assent by the patients.

**CLINICAL CASE 1**

Patient L.A.S, 3 years and 10 months old, female, white, there for a cavity treatment. The parents reported that the child was healthy and was not using medication. In the anamnesis, it was verified the absence of allergies and sensitivity, absence of diseases or systemic alterations and no neurological alterations.

Regarding the child's oral health, she had a cavity-related problem. The child never received dental anesthesia and according to the parents' report, "the child was very afraid, and they did not want her to suffer during dental treatment".

On clinical examination, the patient had cavity in teeth: 54, 55, 74, 75 and 85. Tooth 74 had a possible cavity, with pulpal involvement. After the unsuccessful attempt at clinical treatment due to the patient's non-cooperation, treatment with support from an anesthesiologist was suggested.

In the second session, the proposed treatment with sedation was carried out. Due to the non-cooperation of the patient for venipuncture, an anesthetic induction with ketamine + dexmedetomidine (precedex) intranasally was chosen as the initial plan.
Induction was then performed with 34 mcg of dexmedetomidine + 17 mg of intranasal ketamine, through an atomization device for nasal use (Table 1).

Even after 30 minutes, the patient was still wide awake and uncooperative to perform the dental procedure and venous access. Therefore, the anesthesiologist decided to administer a second dose of precedex + ketamine, this time intramuscularly, in order to make the treatment viable. A dose of 17mg of ketamine + 17mcg of precedex was then administered (Figure 1).

**Figure 1:** Clinical Case 1

A: Administration of intramuscular sedative; B: administration of intramuscular midazolam in the left lower limb; C: patient after placement of venous access and spectacle-type intranasal catheter; D: Monitoring of the patient's vital signs; E and F: performance of dental procedures with patient already sedated.

After 10 minutes there was a better result of the state of sedation, but even so it was still not possible to perform venoclysis, as well as the procedure. One more dose of anesthetic was preferred in order to improve the patient's anesthesia plan. Then, in this third moment, 2.5mg of intramuscular midazolam was administered.

After 5 minutes of administration, the patient entered an ideal anesthetic plane, so it was possible to perform venous access in the left upper limb with 24G Jelco. Saline solution 0.9% 250ml was then installed and intranasal oxygen was administered with a spectacle-type catheter at a flow of 1 to 2 l/m at the beginning of the procedure.
During the procedure, it was possible to shut off the oxygen flow at certain times without jeopardizing the ventilatory part and also without compromising the patient's O2 saturation; however, at times it was also necessary to hyperextend the patient's chin region (chin) in order to make the patient's airway patent and, therefore, avoid respiratory compromise.

The procedure was then performed successfully and uneventfully and lasted around 1h and 30min. The patient woke up 1 hour after the end of the procedure.

As a side effect of the anesthetic medications in the postoperative period, the patient had 2 episodes of nausea and vomiting, requiring the administration of an antiemetic medication called bromopride.

During sedation, it was possible to perform the complete dental treatment with a minimally invasive technique.

CLINICAL CASE 2

Patient T.A.M, 4 years and 10 months old, male, white, there for a procedure related to teeth aesthetics. Parents reported that the child was undergoing neurological follow-up and was not using medication. In the anamnesis, the absence of allergies and sensitivity was verified, he had no systemic alteration, he was never hospitalized or underwent surgery, and he never received a blood transfusion. Regarding the child's oral health, he showed cavities in several teeth, including endodontic involvement. Parents reported that the child had already abandoned a dental treatment because he was not collaborative. The family also reported that the patient did not visit the dentist frequently and had difficulty brushing his teeth.

The patient required dental treatment to perform multiple restorative procedures on teeth 63, 71, 81, 85, with the placement of an acetate crown on teeth: 51, 52, 61, 62, in addition to endodontics on tooth 74 with the placement of a steel crown. After an unsuccessful attempt at clinical treatment and conditioning in a previous consultation due to the patient's non-cooperation, outpatient treatment under intravenous sedation performed by an anesthesiologist was suggested (Figure 2).
Figure 1: Clinical Case 2

A: Vital signs monitoring; B: Medication handling; C: patient after placement of venous access and spectacle-type intranasal catheter; D: Oxygen; E: initial clinical aspect of the teeth; F: Final clinical appearance of the upper anterior teeth.

For the beginning of sedation, intramuscular pre-anesthetic medication Ketamine 35mg + Dexmedetomidine (precedex) 35mcg was administered (Table 1). The patient had full monitoring with ECG, non-invasive blood pressure, pulse oximetry and vital signs.

Venoclysis was performed on the left upper limb, with a 20G Jelco. Glasses-type oxygen catheter with low O2 flow (1-2L/min - SOS) was used. The following drugs were used to perform intravenous sedation: Midazolam 2mg + 1.5mg, Ketamine 10mg, Dexmedetomidine 10mcg, Propofol 15mg + 15mg + 15mg + 15mg (Table 1)

The procedure was then performed successfully and uneventfully and lasted around 4h and 30min. The patient woke up immediately after discontinuing the medication.

The patient had no side effects and was discharged being lucid and oriented.
Table 1: Drugs used during sedation procedures.

<table>
<thead>
<tr>
<th>Drug</th>
<th>Use status in pediatrics</th>
<th>Dose</th>
<th>Route of administration</th>
<th>Main adverse effects</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ketamine</td>
<td>There are no studies. Off-label use.</td>
<td>IM: range of 9 to 13 mg/kg, effect starts within 3 to 4 minutes after application and lasts for 12 to 25 minutes. IV: 0.5 - 1mg/kg/dose</td>
<td>Intravenous, intramuscular, oral and nasal.</td>
<td>Delirium on waking, hallucinations, nightmares.</td>
<td>Stoeltinkg, ., et al. Manual de farmacologia e fisiologia na prática anestésica. 3. ed. Porto Alegre: Artmed, 2016.</td>
</tr>
</tbody>
</table>
| Midazolam     | Indicated for some cases in pediatrics. Off-label use. | **IM: 0.05 to 0.15 mg/kg, administered 5 to 10 minutes before the procedure.**  
**IV: 0.05 to 0.1 mg/kg**  
<table>
<thead>
<tr>
<th>Drug</th>
<th>Indication</th>
<th>Route</th>
<th>Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Propofol</td>
<td>Indicated for some cases in pediatrics. Off-label use.</td>
<td>Intravenous</td>
<td><strong>Induction</strong> 3-16 years: 2.5 to 3.5 mg/kg; IV: for 20 to 30 seconds; <strong>Maintenance</strong> 2 months to 16 years: 125-300 mcg/kg/min IV: 7.5 to 18 mg/kg/h</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Central respiratory depression, decreased respiratory response to CO₂, hypoxia, “propofol infusion syndrome”</td>
</tr>
</tbody>
</table>

**DISCUSSION**

The number of sedations outside the traditional operating room environment has increased in recent decades (Coté et al., 2019). Safe sedation of children requires a systematic approach that includes supervision performed by professionals qualified in anesthesia, pre-sedation evaluation, medications, adequate fasting, balancing the depth of sedation, risk for patients who cannot fast in urgent surgeries, examination focused on the airways, understanding pharmacokinetic and pharmacodynamic effects, drug interactions, adequate training for patient rescue, adequate equipment for age, airway size, venous access, and post-procedure monitoring. Sedation protocols must be structured to guarantee the patient safety principles to reduce morbidity (Coté et al., 2019).

In general, in medical and dental treatments, children are subjected to the use of anesthetics, sedatives or analgesics to relieve recurrent pain in invasive procedures. The ideal anesthetic and sedative technique for the pediatric patient should be personalized and offer a fast, safe action and with minimal discomfort (Green et al., 2021). Sedation is recommended as a last resort after failed attempts at linguistic approaches and protective
stabilization. The patients in this study match this profile, since it was impossible to perform dental procedures due to odontophobia. Parents reported that they approved the sedation very much and would recommend it for use with other children.

Faced with these behavioral management difficulties and with the aim of reducing the demand for a surgical center for simpler procedures, outpatient sedation has become an alternative (Coté et al., 2019).

The advance of the pharmaceutical industry has allowed the market to have several sedative medications for different purposes and types of patients, however, the use of these drugs in pediatrics is still very controversial, as there are few studies that address these drugs, with that some drugs are used off-label (Coté et al., 2019).

The medications used for sedation in our study were Ketamine (Ketamine), Dexmedetomidine (Precedex), Midazolam and Propofol. It is important to emphasize that the patients in our research were over 3 years old.

Ketamine (ketamine hydrochloride) was used for the sedation of the two patients in our study. In the first patient, it was used intranasally and intramuscularly, and in the second, intravenously and intramuscularly. This drug produces dissociative anesthesia, being the only drug that causes intense analgesia at sub-anesthetic doses. It is characterized by potent analgesia, sedation and amnesia, while preserving spontaneous ventilation, so it is considered a suitable drug to promote anesthesia in pediatric patients during brief painful periods or emotionally disturbing procedures (Drummond et al., 1996) The combination of ketamine and other sedatives or analgesics is favorable to reduce side effects and improve quality of sedation (Novak et al., 2008).

Karacaer et al (2018) used ketamine associated with remifentanil compared with ketamine associated with propofol to sedate patients who would undergo colonoscopy. Seventy children were recruited for the study and randomly assigned to one of the groups. Only one child in the ketamine-remifentanil group had respiratory arrest supported by positive pressure ventilation at induction and was excluded from the study. Then, 69 children aged 2 to 16 years completed the study and there was no statistical difference between the groups regarding age, weight, gender, duration of colonoscopy and recovery time, however patients in the ketamine-remifentanil group had sedation scores better than patients in the ketamine-propofol group (Karacaer et al., 2018).

Dexmedetomidine (precedex) was also applied to both patients, the first being administered intranasally and intramuscularly, and the second intramuscularly and intravenously. This drug is a potent, highly selective, and specific alpha-2 adrenergic
agonist with sedative to analgesic effects. When dexmedetomidine is administered through the nasal mucosa, it is an easy and non-invasive route with a high bioavailability of 81.8%. This drug administered intranasally provides better pre-anesthetic sedation when compared to other drugs. Benefits include reduced incidence of postoperative nausea and vomiting, nasal irritation, and need for rescue analgesics (Jun et al., 2017).

Despite the marked analgesia and dose-dependent sedation produced by this drug, there is a slight depression of ventilation. Patients used a spectacle-type oxygen catheter throughout the procedure. The medication is contraindicated for those who are hypersensitive to any excipient substance in the formula (Jun et al., 2017).

Midazolam can be given to supplement opioids, propofol and/or inhalational anesthetics during maintenance anesthesia, providing reliable sedation and anxiolysis in children. It is effective for sedation during regional anesthesia, as well as for short-term therapeutic procedures. In both cases, the drug was administered intravenously. It is the most commonly used oral preoperative medication in children. Its side effects are: fatigue and drowsiness, which should be avoided in patients with chronic lung disease, as there may be a decrease in motor coordination, compromising cognitive function. It is contraindicated in cases of hypersensitivity to the components of the formula and children younger than 6 months (Manso et al., 2019). The literature shows a systematic review of the use of midazolam for children and adults before procedures and the authors concluded that there is not enough high-quality evidence to determine whether midazolam produces more effective sedation than other medications, but patients appear to prefer to be sedated with midazolam during a procedure than receiving no sedation at all. For this reason, sedation with this medication may be offered if clinically appropriate (Conway et al., 2021).

Propofol is indicated for the induction and maintenance of anesthesia in procedures and unconscious sedation. In our study, only the second patient underwent anesthesia with propofol, which was administered intravenously. It is a short-acting general anesthetic agent with an onset of action of approximately 30 seconds and a half-life of 30 to 60 minutes (Lundström et al., 2010). We observed that propofol was more efficient because it had a short sedation time and caused a quick awakening. At the end of the procedure, the second patient was released awake and conscious, unlike the first who woke up after one hour. The drug is contraindicated in some situations such as hypersensitivity, in children under 3 years old, with respiratory tract infection, with diphtheria or with epiglottitis (Lundström et al., 2010).
CONCLUSION

Medicated sedation is an important technique for controlling aversive behavior in pediatric patients with odontophobia, and the incorporation of this technique enables safe and effective dental care. The technique must be performed by professional anesthesiologists, who monitor the patient throughout the procedure; however, dental surgeons must have knowledge of the medications and know the indications and contraindications of the medications most used for sedation in children and adolescents, in addition to knowing when and how to use the technique.

REFERÊNCIAS


