

Case Report

Use of midazolam for behavioral management in dental care of a child with attention deficit hyperactivity disorder: a case report

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Abstract

Introduction: Attention deficit hyperactivity disorder (ADHD) is a chronic neurodevelopmental condition characterized by variations in levels of inattention, hyperactivity, and impulsivity. Such symptoms may be even more exacerbated when the patient is exposed to dental care. **Objective:** To present a case report of behavioral management in a patient with ADHD, emphasizing the use of sedation techniques such as oral sedation drugs and inhalation conscious sedation. **Case report:** A 10-year-old patient was referred to the basic health unit due to the difficulty of behavioral management during dental treatment. It was reported by the guardian that the patient presents ADHD and is under continuous medication. The dental examination revealed that the patient needed an endodontic treatment on tooth 46, an extraction of residual root of tooth 36, and oral health education strategies. Preventive strategies were successfully carried out through detailed verbal communication, but, in a subsequent session, the patient presented acute symptoms on tooth 46. The dental team chose to proceed to a tooth extraction under inhalation conscious sedation with nitrous oxide/oxygen for care optimization. Even though the procedure was performed, the sedation strategy did not show satisfactory results. Due to this circumstance, the extraction of the residual root (36) was performed by oral drug sedation without any intercurrent. **Conclusion:** Behavioral management in a patient with ADHD was optimized by verbal communication and the use of oral drug sedation.

Introduction

Attention deficit hyperactivity disorder (ADHD) is a chronic neurodevelopmental condition characterized by noradrenergic dysfunctions that compromise the individual's functionality ranging in levels of inattention, hyperactivity, and impulsivity [9, 27]. Studies indicate that this condition, even with great chances of underdiagnosis, is still one of the most common behavioral disorders in childhood and can extend to adulthood in up to 65% of the cases [24, 28].

Focusing on dental practice, we can highlight the high frequency of patients with ADHD [8]. Studies demonstrate a strong association between these patients and risk and activity of dental caries disease [20], periodontal disease [5], dental trauma [23], sleep bruxism [19] and obstructive sleep apnea [29]. However, there is still a big challenge related to behavior management in the dental environment and cooperation in oral health education strategies [18, 25]. Consequently, ADHD patients often give up treatment, worsening their quality of life [1].

Despite the lack of literature, several behavioral management strategies have been discussed to optimize dental care for patients with ADHD [10]. In particular, pharmacological methods like conscious sedation can be described as adjuvant methods in the control of behavioral management of patients with non-collaborating ADHD [10, 14, 17]. Kerins *et al.* [14] show that most dental care provided to non-collaborating ADHD patients was performed through conscious inhaled sedation with nitrous oxide/oxygen with satisfactory results. Currently, this technique has become the most used as ambulatory sedation method in pediatric dentistry care due to safety, flexibility of administration, and reversibility [22]. However, studies with drug sedation are also proposed. Marshall *et al.* [17] demonstrate that oral drug sedation with midazolam maleate may also be a viable alternative in the management of the behavior in non-collaborating ADHD patients, despite the adverse effects such as respiratory depression.

It is suggested that the lack of guidelines about behavioral management for patients with ADHD in the dental environment may be justified by the

heterogeneity of symptoms in each distinct patient. Consequently, besides the strategies already adopted by case reports, it is important to carry out more clinical studies. Therefore, the article presents a case report of behavioral management in a patient diagnosed with ADHD, emphasizing the use of sedation techniques, through conscious inhaled sedation with nitrous oxide/oxygen and oral drug sedation with midazolam maleate.

Case report

A 10-year-old boy, in good health, was referred to the Dental Care Center for Special Patients at Ribeirão Preto School of Dentistry of Universidade de São Paulo (CAOPE) for dental evaluation and treatment. During the general health evaluation, the guardian reported the patient's diagnosis of ADHD at 6 years old. Since then, the child has used 30 mg of lisdexamfetamine (Venvanse®) and 25 mg of imipramine (Imipra®) once a day. According to his dental history, the patient had dental experiences in the previous month, but, due to his aggressive behavior, they were not successful.

During the extra and intraoral clinical examination, the patient also demonstrated non-collaborative behavior. However, it was possible to observe the presence of gingivitis induced by dental biofilm, temporary restoration with chemically activated glass ionomer cement in the lower right first molar (tooth 46) and extensive coronary destruction in the lower left first molar (tooth 36). To complement the clinical diagnosis, an imaging exam was necessary. One more time, due to behavioral difficulties, it was not possible to perform intraoral imaging. Thus, panoramic radiography was chosen (Figure 1). Through the X-ray exam, it was diagnosed taurodontism in teeth 16 and 26; and extrusion of his teeth due to extensive coronary destruction in teeth 36 and 46; apical periodontitis in tooth 46; and residual root of the tooth 36. Dental treatment was planned with preventive strategies, along with behavioral management, and, later, endodontic treatment on tooth 46 and extraction of the residual root of tooth 36.



Figure 1 - Panoramic radiography. Teeth 16 and 26 show taurodontism and are slightly extruded due to extensive coronary destruction in teeth 36 and 46. Apical periodontitis in tooth 46 and residual root in tooth 36 can be attributed

During the preventive strategies, communication management techniques and linguistic approach were adopted, building the patient's interest. The guardian was also advised about supervised tooth brushing (Figure 2). However, during these procedures, the chronic state of tooth 46 was reversed, causing pain, and increasing anxiety to the patient and relatives. Thus, tooth 46 was chosen for extraction. The procedure was planned with the adjuvant use of inhalation conscious sedation by nitrous oxide/oxygen. During the intraoperative, the patient showed signs of aggressiveness, requiring immobilization, such as protective stabilization. The surgery was completed, but the inhalation conscious sedation technique was not feasible in this patient.

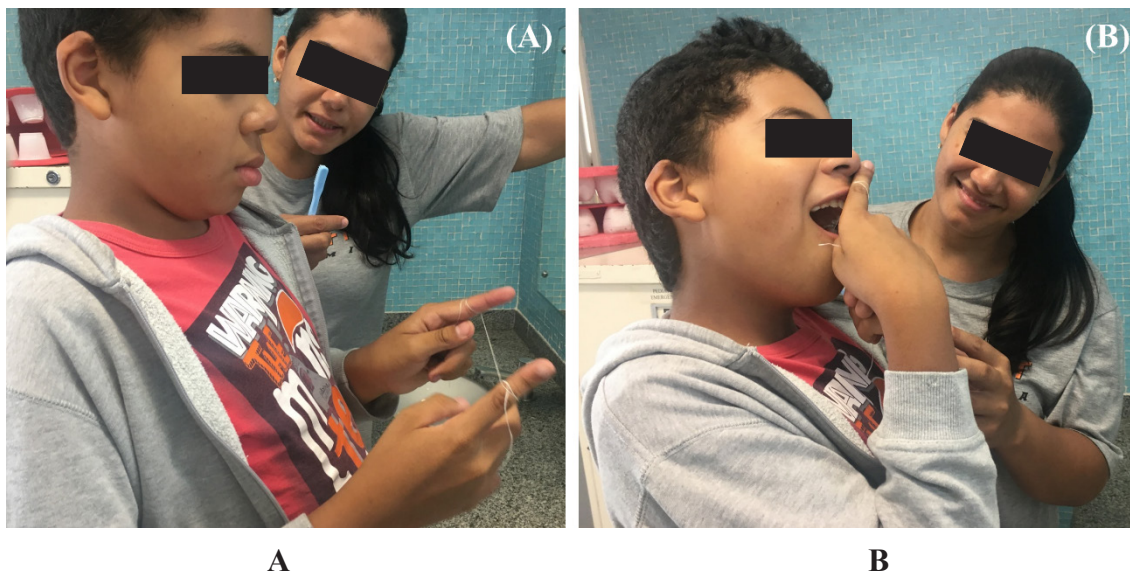


Figure 2 - Oral health education strategies being implemented by the dentist and legal guardian. (A) After the performance of oral hygiene instructions by the dentist, the legal guardian was able to guide and supervise the tooth brushing. (B) The patient accepts the implemented strategies and reproduces what he has learned. It can also be noticed the satisfaction of the relative about the strategies in oral health education

In the following sessions, the patient continued with non-collaborative behavior. Thus, the extraction of the residual root of tooth 36 was planned with the adjuvant use of oral drug sedation. Previous contact with the neurologist was made to clarify possible interaction of sedation due to the continuous use of imipramine hydrochloride. The medication of choice was midazolam maleate – 15 mg 1 hour before the procedure. To avoid involuntary movements and improve the patient's safety, protective stabilization was also applied. The monitoring of vital signs, such as oxygen saturation, heart rate, and blood pressure was performed before, during, and after sedation. Throughout the surgical procedure, it was possible to observe the patient's cooperation and his level of relaxation (Figure 3). The patient showed signs of drowsiness, but he remained responsive to all stimuli. The surgery was performed without exaltation or stress. At the end of all procedures, the guardian was instructed about the postoperative period, as well as the recovery of sedation.



Figure 3 - The procedure by oral drug sedation. (A) The patient was calm and sleepy. Protective stabilization was performed in order to contain involuntary movements. (B and C) Collaborative behavior throughout the surgical procedure

In subsequent visits, it was possible to observe better cooperation from the patient about oral care, as well as in the dental environment.

Discussion

Patients diagnosed with ADHD may exhibit variable behaviors [9, 27]. However, in the dental environment, pre-existing characteristics, such as inattention, hyperactivity, and impulsivity, may still be present in an exacerbated way, contributing to the increase of anxiety and fear [25]. The present case report demonstrates a patient with ADHD and with previous unsuccessful dental experience.

Thus, behavior control strategies such as verbal communication and conscious sedation with drugs were applied. It is noteworthy that patient-professional trust was restored during all visits, even when the method applied did not show positive results. As a result, the patient showed cooperative behavior during follow-up visits.

Initially, behavioral control technique by linguistic approach was used. The main goals were to reduce fear and anxiety in routine dental procedures, to encourage patient participation, and to raise awareness about oral health care. Although there are studies that demonstrate cognitive difficulties in ADHD patients [3], it has been shown that these patients are susceptible to learning, to behavioral modification, and to lifestyle change [25]. Furthermore, some studies show that ADHD signs and symptoms tend to decrease according to psychological counseling and medication use [7, 25]. The patient in this case report was on medication and undergoing psychological and psychiatric follow-up, what justifies the linguistic approach.

The worsening of the endodontic condition on tooth 46 led to the development of excruciating pain, which compromised the initial plan of preventive health strategies. Then, radical treatment with tooth extraction 46 was proposed. Even though rehabilitation would be the treatment of choice, its complexity, plus the lack of specialized professionals and dental care facilities, significantly interferes in the case plan for special need patients. It is part of the role of the specialized dentist to adapt the dental treatment to the individual needs of each patient [12]. Thus, tooth extraction was performed under behavior control strategies by linguistic approach added to inhalation conscious sedation with nitrous oxide/oxygen.

The technique of inhalation conscious sedation with nitrous oxide/oxygen is a safe and effective method for controlling fear and anxiety [7]. Nitrous oxide acts with minimal depression of the level of consciousness without affecting the respiratory capacity, physical, and verbal commands. In addition, its main advantages are fast mechanism of action, individualized incremental dosage, and rapid reversal of sedative effects [7]. The use of inhalation conscious sedation with nitrous oxide/oxygen in ADHD patients has been described in the literature to control behavior and optimize dental care [17]. However, in this report, sedation was interrupted due to exacerbated anxiety and patient's aggressive behavior. The surgical procedure was concluded, but the sedation technique with nitrous oxide/oxygen was unsatisfactory. The study performed by Blumer *et al.* [6] corroborates with our results

since it demonstrates, through clinical research, the ineffectiveness of nitrous oxide/oxygen sedation in ADHD patients.

In subsequent sessions, drug sedation was chosen as an adjunct to the linguistic approach. The most widely oral drug used in children is midazolam maleate 1 mg/kg, up to a maximum of 20 mg [13]. Thus, the adult dose was recommended since our patient was 50 kg. Then, 15 mg of midazolam maleate was administered orally 1 hour before the procedure. Midazolam maleate is an effective medication, it has a wide safety margin against complications and a rapid sedative effect [13, 26]. Although there are few studies regarding its administration for dental care in patients with ADHD [17], drug sedation demonstrates effectiveness in dental care performed in pediatric patients [11] and patients submitted to situations in environments similar to the dental office [15].

Marshall *et al.*'s study [17], the only one available on pediatric patients, ADHD, and sedation with midazolam maleate in dental care, describes paradoxical effects of midazolam maleate when administered to more aggressive patients. However, it is noteworthy that the idiosyncratic reaction was reported in patients aged up to 1.5, being justified by the lack of maturity and systemic development. There are no reports in the literature of similar reactions in older patients [4]. The medication (midazolam) was effective for this case, and the surgery was performed without complications or episodes of anxiety and aggression, corroborating studies that describe a high success rate [13, 26].

The use of sedative drugs should be cautious in patients with ADHD. In the last few decades, there has been a significant increase in the use of dopamine agonist drugs (psychostimulants) to control ADHD [21]. The concomitant use of sedative and psychostimulant drugs, such as lisdexamfetamine, could antagonize the sedative effect of midazolam maleate [30]. Thus, the discussion of the patient's clinical case also involved multidisciplinary care, with the help of the psychiatric and psychological team, which monitored the patient since the first symptoms of ADHD.

With multidisciplinary care, it is important to highlight that other issues were also discussed, such as the possibility of dental care at the hospital level, under general anesthesia. Although there are safety and applicability in the use of general anesthesia for pediatric dental care [16], it should be noted that dental problems are not restricted to a single session. Psychologically dealing with the child to face future treatments with more tranquility is extremely important for his/her well-being. A study

performed by Antunes *et al.* [2] demonstrated that moderate sedation during the dental treatment occurs more positively in the follow-up session, when compared to without sedation or under general anesthesia. Moderate sedation will allow for sufficient contact between the professional and the patient, strengthening the patient-professional relationship. In this present case report, it was possible to observe the cooperative behavior in subsequent sessions after oral drug sedation.

Conclusion

It is relevant to highlight that the heterogeneity of ADHD characteristics and patients' claims and increases the importance of individualized dental care. This work, besides contributing to the enrichment of the literature, also demonstrates the diversity of behavioral responses through some behavioral management techniques in dentistry.

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