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ORIGINAL ARTICLE

Sedation of Uncooperative Pediatric Dental Patients

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ABSTRACT

The approach to managing the behavior of children in the dental environment must be based on empathy with a child in order to understand why the child is distressed, anxious or afraid.

Any dentist treating children needs a spectrum of behavioral techniques from the simplest—tell and show all the way through to a full general anesthetic. Its use is indicated in specific situations and used only when appropriate.

On this basis, the caring dentist discusses with the parent the likely need for various behavioral techniques in the child's management. In this study, we show our experience with oral and nasal sedation in a group of pediatric uncooperative dental patients.

Keywords: Chlordemethyldiazepam, Midazolam, Pediatric sedation in dentistry.

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INTRODUCTION

Children are considered uncooperative patients and often need preoperative sedation to be treated by dentist, particularly for long and repeated treatments. Differently from adult, the child manifest his/her fears and emotions, with behaviors that impede dental treatment.

It can be the simplest of hand restraint on a moving arm or head to protect the child from self-harm or to stabilize the child during the operative procedures. But, it can also include the use of blankets, sheets or devices, especially designed for the purpose. Resorting to a general anesthetic should only come after all other avenues of management have failed. The question that any dentist who is treating children must ask themselves is whether they should use all behavioral techniques, including restraint, or subject the child to an outpatient general anesthetic for multiple extractions. Consequently, some authors suggest that the child be familiar with the dental armamentarium.[1]

But, this is a time-spending strategy, not always possible in a busy dental office. Sedation with drugs administered by parenteral, rectal, oral and nasal route is a more suitable technique. Nasal administration (NA) of midazolam (MZ) is characterized by rapid absorption in the blood stream and, avoiding the first-pass hepatic effect, it has a bioavailability of 57% with a peak effect after about 15 minutes.[2] Preoperative sedation of the uncooperative child, with benzodiazepines, may be useful to the subsequent administration of N_2O/O_2 during surgery.[3]

In this study, we assess if the sequential administration of oral chlordemethyldiazepam (CHDDZ) and nasal MZ may be a valid alternative to the inhalation technique with N_2O/O_2 also thanks to the synergy of the two benzodiazepines.

PATIENTS AND METHODS

The study was performed on 51 consecutive pediatric dental patients. All children were escorted by the mother that answered to a personal history questionnaire and to the questions of the manifest anxiety scale (MAS).[4-6]

The aim of this interview was to assess the past and present child's behavior toward medical and dental treatments (Table 1) and, at the same time, the mother's anxiety level. After informed consent was obtained, the results of MAS gave a first indication about the need of sedation. Definitive indication for sedation was based on the results of the resistance and operability test submitted to the dentist[7] (Table 2).

Anxiety Management

The children were treated, at first, with oral administration of 1 mg (0.5 ml) of CHDDZ (EN®) in water, obtained from the parenteral vial preparation containing 1 ml = 2 mg, After about 15 minutes, the child lying on the dentist's chair, was treated with MZ (Ipnovel®) 0.2 mg/kg, obtained from the parenteral vial preparation containing 1 ml = 5 mg, and administered by nebulizer or syringe into the nostrils. The patient stayed in the waiting room for about 15 minutes, then his/her sedation and acceptance level was assessed by a numerical evaluation scale.

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Table 1: Questionnaire for the parent MAS

Select your answer to the following questions
Which kind of reaction has had your child toward past medical and dental treatment?
1. Very bad
2. Rather bad
3. Good enough
4. Very good
Which kind of reaction will have your child toward present dental appointment?
1. Very bad
2. Rather bad
3. Good enough
4. Very good
How is, in your opinion, the anxiety (fear, dread, irritability) of your child?
1. High
2. Moderately high
3. Moderately low
4. Low
How is your anxiety (fear, dread, irritability), as parent, at this moment?
1. High
2. Moderately high
3. Moderately low
4. Low

Table 2: Resistance and acceptance score at the beginning of the dental surgery, as seen by the operator[7]

Resistance score
1. Active bodily resistance. He/she protests and screams
2. He/she cries. Uncooperative
3. Signs of resistance and muscle tension. He/she does not respond but follows the verbal instructions with little cooperation
4. Relaxed, composed eyes, he/she speaks and shows interest for the procedure. Good cooperation with the operator
Operability score
1. Treatment is possible only under general anesthesia or by force
2. The beginning of treatment must be delayed. Active bodily resistance interferes with treatment
3. Treatment may start without delay. Active bodily resistance do not interferes with treatment
4. Treatment may start immediately

1: Negative judgment; 2: slightly negative judgment; 3: Slightly positive judgment; 4: Positive judgment

Sedation/acceptance level score was as follows: excellent = 5, intense = 4, moderate = 3, medium = 2, minimal = 1 and absent = 0.

With a total sedation/acceptance score equal to zero, the surgery was postponed and scheduled under general anesthesia and the patient excluded from the study.

After the Surgery

At the end of the procedure, the dentist was requested to express a global opinion on the child's intraoperative behavior, by means of six questions with a total score from 0 to 100 (Table 3).

Table 3: Multiple questionnaire with scored answer, from 0 to 100, used to evaluate the intraoperative behavior of the child. Completed by the operator

1. How quiet the child has been?
Unquiet 0, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100 quiet
2. How the child has accepted the treatment?
No acceptance 0, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100 full acceptance
3. How difficult the child's management has been?
Impossible 0, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100 without problems
4. How the child's vocalization has been?
None 0, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100 greatest
5. What do you think about your contact with the child?
Impossible 0, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100 greatest
6. Do you feel empathy with the child?
None 0, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100 greatest

The Sedation Attending Person

Anxiety control in uncooperative children was performed by the dentist, trained in conscious sedation techniques, without supervision of anesthesiologist.

STATISTICAL ANALYSIS

When necessary, comparison among groups was performed by means of analysis of variance with χ^2 after Yates. The level of significance was set at $p < 0.05$.

RESULTS

Table 4 reported the demographic data and the characteristics of anesthesia technique in both the groups. The body weight of 30 nonsedated children was greater than that of the 21 sedated patients ($F = 8.2$; $p < 0.01$). Moreover, local anesthesia was performed more often in sedated than nonsedated children ($\chi^2 = 5.8$; $p < 0.05$).

Table 4: Demographic data and characteristics of regional anesthesia

	Nonsedated patients	*Sedated patients*
Patients (n)	30	21
Age (years)	3-12	3-12
Weight (kg)	30.1 ± 7.7	24.2 ± 6.1**
Sex (M/F)	18/12	9/12
Local anesthesia (yes/no)	15/15	18/3*
Infiltration	14	16
Nerve block	1	1
Topical	—	1
First treatment	18	15
Subsequent treatment	12	6

Data are mean ± SD; *p < 0.05; **p < 0.01

Table 5 reported the parent's opinion about past and present dental experience. Parents of sedated children gave more information, through the MAS, than parents of nonsedated children: the former reported more often past negative reactions to dentistry ($F = 33.9$; $p < 0.01$); they had foreseen a bad reaction ($F = 24.4$; $p < 0.01$) with high anxiety level ($F = 31.6$; $p < 0.01$) for the current surgery; finally they reported that the parent itself, like son, suffered from dentist's anxiety ($F = 10.7$; $p < 0.01$).

Sedated patients reported sedation level score, before surgery, included between moderate and medium values (3.0 ± 1.3) and acceptance score included between medium and minimal values (2.8 ± 1.3). A number of 20 sedated children were successfully treated by the dentist; only one sedated patient needs general anesthesia, performed some week later. Sedation level score, in not sedated children, was included between moderate and medium values (3.0 ± 1.0; $F = 0.04$; $p > 0.05$), whereas acceptance level score was greater, included between excellent and intense (4.8 ± 1.2; $F = 17.3$; $p < 0.01$).

Table 6 summarized the averaged scores of dentist's opinion about the child's behavior during surgery. Sedated patients, in comparison to non-sedated ones, show lower score in every parameter: sedation ($F = 12.3$; $p < 0.01$), acceptance ($F = 14.5$; $p < 0.01$), direction ($F = 11.9$; $p < 0.01$), contact ($F = 17.4$; $p < 0.01$), empathy ($F = 16.8$; $p < 0.01$). Only vocalization score was the same in both the groups ($F = 0.04$; $p > 0.05$).

Table 5: Manifest anxiety scale's scores expressed by parents

	Nonsedated patients	*Sedated patients*
Patients (n)	30	21
Past behavior	3.2 ± 0.5	1.9 ± 0.8**
Present behavior	3.4 ± 0.6	2.4 ± 0.7**
Child's anxiety	3.1 ± 0.7	1.7 ± 0.9**
Parent's anxiety	3.0 ± 0.8	2.1 ± 1.0**

Data are mean ± SD; **p < 0.01

Table 6: Averaged scores of the sedated and nonsedated children. Scores are determined by the operator through a numeric scale from 0 to 100 points

	Nonsedated children	*Sedated children*
Patients (n)	30	21
Calmness	88.2 ± 8.4	76.0 ± 14.2**
Acceptance	88.5 ± 9.1	74.0 ± 12.4**
Direction	88.5 ± 8.7	77.0 ± 14.8**
Vocalization	50.5 ± 29.2	43.2 ± 34.1
Contact	87.5 ± 9.1	72.5 ± 16.6**
Empathy	87.5 ± 10.5	74.0 ± 17.7**

Data are mean ± SD; **p < 0.01

DISCUSSION AND CONCLUSION

Nasal MZ was used as premedicant in many surgical procedures, under general anesthesia. Fuks et al (1994)[8] employed nasal MZ in uncooperative children, scheduled for dental surgery, getting high level of sedation. These authors used doses of 0.2 to 0.3 mg/kg, followed by inhalation of $N_2O/O_2 = 50/50\%$.

Hartgraves et al (1994)[9] obtained good results in 64% of uncooperative children with nasal MZ, 0.2 mg/kg and N_2O/O_2 40/60%. Also, Fukuta et al (1997)[10] reported very good results in 69.2% of disabled patients, administering nasal MZ and $N_2O/O_2 = 30/70\%$. Nevertheless, these studies showed that a lower percentage of managed patients were uncooperative and some authors suggested the further intravenous. Administration of MZ to obtain a deeper sedation and finish the surgery. This last technique is just for anesthesiologists and dentists skilled in deep sedation and airway management.

In the USA, there are many different techniques to manage the uncooperative child. Many different pharmacological associations are used as premedication as follows:

- Chloral hydrate, hydroxyzine and N_2O/O_2
- Chloral hydrate, hydroxyzine, meperidine and N_2O/O_2
- Nasal MZ and N_2O/O_2 (Easton, 2000).

In the present study, we have used oral CHDDZ for premedication and nasal MZ for sedation, avoiding N_2O inhalation and searching for summation of sedative effects. The time elapsed between oral CHDDZ and nasal MZ administrations, was variable and, in any case, too short to obtain the peak concentration and effect of oral CHDDZ, that is 45 to 60 minutes.[11]

The average times elapsed between MZ administration, after CHDDZ, and surgery, were about 23.5 ± 7.7 minutes; at this time, doses of 0.2 mg/kg of nasal MZ, give the maximal sedative effects corresponding to maximal plasma concentration of the drug, 157.0 ± 24.6 µg/ml.[12]

This should be a reliable technique reaching a sedated state through summation of the growing plasma concentrations and effects of both oral CHDDZ and nasal MZ. The studied technique has given satisfactory results, but not like that of cooperative, nonsedated children. This sedation technique has made possible the scheduled local anesthesia and surgery in all cases. Behavioral parameters of sedated children showed lower scores when compared to nonsedated children. Only one patient needed treatment under general anesthesia.

Òur results seem to confirm that, in the uncooperative child, sedation with benzodiazepines, collaboration and

tranquillity levels during dental surgery are lower, in respect to the cooperative child. This means that sedation techniques need more suited modifications to get better results. The selected anxiety treatment was ineffective to assure a state of full calmness and acceptance of dental treatment by both the patient and the dentist. For these reasons we suggest that, in uncooperative children scheduled for dental treatment, better results may be obtained through the association of benzodiazepines and N_2O.

The pharmacological association that we have used, also according to Lindsay et al (1985),[13] is safe and without severe side effects; sometime a prolonged sedative effect was observed. Our study has shown a sharp correlation between parent and child's anxiety; this means that using a simple questionnaire for the parent, it is possible to anticipate anxiety and fear level of the child and, therefore, planning an adequate pharmacological treatment.

Alwin et al (1991)[14] suggest the measurement of anxiety level by means of the Corah's dental anxiety scale (1978);[15] our study shows that MAS is a powerful test to identify, through the parents, uncooperative children.[16] Many are the possible reasons of anxiety in the child: indifference to dental problems,[17] loss of reception about dental treatment;[18] previous painful dental experiences.[1]

Our study suggests a sedation technique with the pharmacological combination of oral CHDDZ and nasal MZ. These drugs produce in the uncooperative child, a summation of sedative effects that may be sufficient but not exhaustive, especially if the complementary inhalation of N_2O/O_2 is lacking.

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