The effect of metoclopramide and hydroxyzine in sedation of infants undergoing dental treatment

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Providing comprehensive dental treatment for fearful and uncooperative infants is a challenge for the pediatric dentist. Pharmacologic sedation is frequently employed as an adjunct to behavior management techniques. Nitrous oxide alone or in conjunction with oral hydroxyzine are among the most popular sedation modalities used in pediatric dentistry. Both are extremely safe with no or minimal side effect.1

Schedules and dosages for oral administration of hydroxyzine have varied widely in clinical reports, ranging from 20 to 50 mg taken forty-five minutes to one hour before treatment, without taking into consideration the patient's weight.2 Shapira et al reported a higher number of failures in heavier children receiving a standard 50 mg dose of hydroxyzine, and concluded that the mg/kg ratio might influence the child's behavior.3 These authors concluded that a dose of 3.7 mg/kg of hydroxyzine supplemented by 50 percent nitrous oxide was adequate to sedate pediatric dental patients.

Some children tend to vomit during treatment using nitrous oxide. Metoclopramide (MCP), commercially available as Pramin, is a potent central dopamine-receptor antagonist that has anti-emetic and sedative activity.4 A few pediatric dentists reported that, by administering Pramin before the hydroxyzine, vomiting did not occur, and the children were calm and relaxed. Although these observations are purely anecdotal and are not based on any controlled study we assumed that, using a single dose of Pramin before the sedative, would improve its effectiveness.

The purpose of this study was to assess the efficacy of 3.7 mg/kg of oral hydroxyzine alone or in conjunction with 5 mg Pramin, in sedating young patients undergoing dental treatment.

MATERIALS AND METHODS
Thirty uncooperative young children with a mean age of twenty-nine months (range 19-40) participated in the study. They were examined by a senior pediatric dentist at the Pediatric Dentistry Clinic of the Hadassah School of Dental Medicine. Uncooperative children (ratings 1 and 2 on the Frankl scale) were considered for participation in the study, if they were healthy (ASA 1), had no previous dental experience, and needed two restorative visits.

At the first appointment the children were randomly assigned to receive either 5 mg Pramin in conjunction

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with 3.7 mg/kg syrup hydroxyzine (protocol A) or 3.7 mg/kg hydroxyzine (protocol B). At the second appointment, the alternative regimen was administered. In addition, all the children received 50 percent nitrous-oxide/oxygen.

**Sedation procedures**

All children were NPO for four hours before the appointment, and were treated in the morning. Appointments were planned in such a manner that the child received similar types of treatment in both visits. The sedative agent was administered with the child seated at the parent's lap. In protocol A, Pramin was given initially, and the hydroxyzine was administered five to eight minutes later. After the administration, the child remained with the parent in a quiet area for one hour; then was brought to the operator by the parent, who remained in the room throughout the procedure.

Treatments were performed by two experienced pediatric dentists (DR, EM), and the same dentist completed the two appointments.

The child was placed in a Papoose Board (Olympic Medical Group, Seattle, WA) with an auxiliary head rest. Vital signs were monitored with a precordial stethoscope and a pulse oximeter probe (oxygen saturation monitor – Criticare Systems Inc., Pewaukee, WI). Pulse and oxygen saturation were recorded at the beginning of each session (baseline), and thereafter every five minutes till the end of the treatment. Administration of 50 percent nitrous-oxide/oxygen was initiated using a rapid induction technique with a facial anesthesia mask for two minutes, after which a nasal mask was used. The degree of alertness, movement and crying was assessed before, during and after operative procedures using a rating scale described by Houpt et al (Tables 1-3).

The treatment period comprised two phases: the initial or preparatory phase, which included the administration of local anesthetic, placing a mouth prop and rubber dam; and the treatment phase, when restorative procedures were performed. Ratings during the initial phase were recorded (approximately ten minutes), and thereafter every five minutes during the treatment phase, until the end of the procedure. The ratings were done by a senior investigator (AF), who assessed the overall behavior of the child at the conclusion of each session, and was also blind to the protocol the child received. The patient's behavior was considered acceptable in one session when the scores ranged from 4 to 6 and unacceptable when scores were 1 to 3, according to a scale proposed by Houpt et al (Table 4).

This study had a cross-over design, and each child served as his own control, so the main independent variable would be the sedation protocol and the dependent variables were the effect on the behavior.

The results were submitted to statistical analysis using the t-test for paired samples and the Wilcoxon matched-pairs, signed-ranks test.

**RESULTS**

No differences between the two sedation protocols were observed in the children's behavior. No adverse effects were seen, and all the treatments were completed successfully. The mean scores for alertness are presented in Figure 1. Most patients were awake or slightly drowsy (scores 1.07 ± 0.26) at baseline for both protocols, and became drowsier during treatment (scores 2.12 ± 0.85 for protocol A and 1.75 ± 0.7 for
Mean Scores for Alertness

Mean Scores for Crying

Figure 1. Mean scores for alertness

Figure 3. Mean scores for crying

Mean Scores for Movement

Mean Scores for Overall Behavior

Figure 2. Mean scores for movement

Figure 4. Mean scores for overall behavior

protocol B). These differences were not statistically significant (p > 0.05).

No differences could be observed between the two protocols when movement was assessed (3.07 ± 1.01 protocol A, 2.60 ± 1.22 protocol B p > 0.05).

None of the children presented uncontrollable movement (degree 3) and some of them did not move at all. The graphic representation of movement can be seen in Figure 2.

The summary of ratings for crying is presented in Figure 3. Most of the children cried mildly (score 3), and there were no differences between the two protocols (p > 0.05).

The overall behavior evaluation is illustrated in Figure 4. Successful sedation was observed in both protocols; the mean score for Pramin and hydroxyzine was 4.4 and that for hydroxyzine alone was 4.6 (p > 0.05).

DISCUSSION

Anti-emetic agents are used in a variety of gastrointestinal disorders, to prevent vomiting in cancer chemotherapy and nausea provoked by other drugs. Metoclopramide hydrochloride, a potent central dopamine receptor antagonist, inhibits gastric smooth muscle relaxation produced by dopamine, thus enhancing cholinergic responses of gastrointestinal smooth muscle. Anti-emetic-dopamine antagonist action raises the threshold of activity in the chemoreceptor trigger zone, and decreases the input from afferent visceral nerves. The onset of action, when administered orally, takes from 30 to 60 minutes, and may cause drowsiness. In usual doses, this drug exhibits little or no side effects. Extra-pyramidal reactions may occur at all ages and in any dose; they occur most frequently,
however, in children and young adults following IV administration of high doses of the drug (0.5 mg/kg/day), as in chemotherapy. Thus, metoclopramide should not be used in patients with a history of seizures, in patients receiving drugs that are likely to cause extrapyramidal reactions (as phenothiazines), in patients presenting gastrointestinal hemorrhage, or in asthmatic children, because it may increase the risk of bronchospasm. The dose received by the children in this study was small, and none of these effects could be noticed.

We assumed that, by administering metoclopramide before hydroxyzine, the child would be more sedated, possibly due to a synergistic effect of the two drugs. This hypothesis could not be confirmed in the present study, as no difference was seen in the behavior of the children. It should be emphasized that the participants of this study were very young (mean age twenty-nine months), and most of them could have their treatment completed in two appointments. The restorative procedures were similar in both treatment sessions, and lasted for half an hour in the majority of the cases. In the few occasions, where the restorative sessions were longer (forty-five to sixty minutes), more children fell asleep after receiving protocol A (Pramin + hydroxyzine), suggesting a possible trend to improve effectiveness in these situations. Since not enough cases were available, however, more forty-five- to sixty-minute treatments will be necessary to verify this assumption.

Another point to take into consideration is that the operators in the present study were experienced pediatric dentists, as opposed to the previous studies, performed at the same clinic with postgraduate students. Perhaps, if the present experiment was done with postgraduate students, the same appointments could have lasted forty-five to sixty minutes, and a difference between the two treatment protocols could have been observed.

CONCLUSION

There was no difference in overall behavior between combinations A and B in treatments of infants lasting up to thirty minutes. In cases that lasted more than forty-five minutes, however, more children fell asleep after getting combination A. Another study, using the same drug combination, but needing longer treatment times should be undertaken, to test the validity of this hypothesis.

REFERENCES