Children Sedated For Dental Care: A Pilot Study of the 24-hour Postsedation Period

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Abstract

Purpose: The purpose of this prospective, pilot study was to investigate postsedation events during the first 24 hours after discharge from the treatment facility in children sedated for dental treatment.

Methods: This prospective study involved a convenience sample of 30 healthy patients, ranging from 2 to 5 years of age, who were scheduled to undergo sedation in the dental clinic for operative procedures. Depending on the extent of dental need, child temperament, and other preoperative assessment variables, the children received either a triple combination of chloral hydrate, meperidine, and hydroxyzine ranging in dose from 20 to 30 mg/kg, 1 to 2 mg/kg, 1 to 2 mg/kg, respectively, or midazolam alone (0.5-0.75 mg/kg). Care was provided consistent with the American Academy of Pediatric Dentistry (AAPD) and hospital sedation guidelines. Parents were given a questionnaire concerning events that may occur during the 24 hours after the sedation and were told they would be interviewed via telephone regarding these events. The principal investigator called 24 hours after the sedation visit and interviewed the parents using the questionnaire given to the parents. Data analysis included descriptive statistics, frequency, and chi-square analysis.

Results: Data from 30 sedations were used. Differences were noted between a chloral hydrate, meperidine, and hydroxyzine regimen compared to midazolam alone for incidence of sleep on the way home or shortly after arriving at home, but not for postoperative pain, vomiting, eating, evening sleep, and memory. Those receiving the combination regimen were more likely to sleep on the way to and at home than those who received midazolam alone.

Conclusions: It may be concluded that: (1) opportunities for the occurrence of an adverse event may occur on the way or at home following a sedation appointment; and (2) discharge criteria of the AAPD guidelines on elective use of minimal, moderate, or deep sedation and general anesthesia for pediatric dental patients should be met or exceeded as a precautionary measure to prevent adverse events once a child who has received sedative agents leaves a health care facility. (Pediatr Dent 2006;28:260-264)

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A significant body of research on various factors associated with oral sedation of children undergoing oral health rehabilitation has been published. For instance, chloral hydrate, alone or in combination, and its effects on behavioral and physiological variables in children has been investigated.[2-15] Several parameters are important considerations when sedating children for dental care including: (1) sedative agents and their dose; (2) extent of operative care; (3) patient age; (4) temperament; and (5) personality traits.[16-19]

It has been suggested that children are discharged prematurely from hospital settings following sedative appointments.[20,21] Premature discharge may result in the occurrence of an adverse event that may not be detected by the caregiver in a nonmedical setting. Because adverse events happen during and shortly after sedations,[22,23] it is possible that they occur during later periods after the patient has been discharged from a health care facility. Children may be discharged prior to being fully recovered and experience adverse events at home similar to those that occur during sedations. For example, a child who is discharged and placed in a car seat may fall asleep, leading to a blocked airway, as

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has been suggested by others.[21] The authors' knowledge of the patient's condition and recovery from a sedation procedure during the first 24 hours postoperatively, however, is limited.[24]

The purpose of this prospective, pilot study was to investigate postsedation events in children sedated for dental treatment during the first 24 hours after discharge from the treatment facility.

Methods

This prospective, pilot study was approved by the Colorado Institutional Review Board of The Children's Hospital, Denver, Colo. A convenience sample of 30 healthy (ASA I) patients were studied. Reflective of the general class of patients receiving sedative appointments in the authors' clinic, these patients exhibited situational anxiety in the dental operatory and ranged from 2 to 5 years of age with no gender, race, or ethnic restrictions. They were scheduled to undergo sedation appointments in the dental clinic for operative procedures.

Informed consent for the study was obtained by the primary investigator upon arrival of the parent and child. The standard sedation protocol of the dental clinic at The Children's Hospital and guidelines of the AAPD and the hospital were followed in each case. In summary, this included:

1. a review of the patient's medical, social, and dental history;
2. a review of systems;
3. a preoperative physical assessment including oropharyngeal examination;
4. a collection of vitals signs;
5. assessment of the extent of dental need;
6. child temperament as displayed clinically in the operatory; and
7. preoperative assessment (eg, tonsil size)[25] used to empirically determine the sedative regimen and dose to be used in each case.

For this study and consistent with most sedations in the authors' clinic, either the triple combination of chloral hydrate, meperidine, and hydroxyzine ranging in dose from 20 to 30 mg/kg, 1 to 2 mg/kg, 1 to 2 mg/kg, respectively, or midazolam alone ranging in dose from 0.5 to 0.75 mg/kg was used. Following the administration of the sedative regimen and according to hospital and AAPD guidelines, the patient was monitored:

1. during the initial latency period when the drug was reaching its appropriate effect;
2. throughout the intraoperative period; and
3. postoperatively before discharge.

Nitrous oxide (50%) was used in all sedations.

Routine operative care was used, including local anesthesia, rubber dam, and other dental armamentarium. Xylocaine (2% with epinephrine 1:100,000) was used for local anesthesia in all cases and did not exceed 4 mg/kg. Standard discharge instructions, including emergency numbers and conditions they should be aware of (eg, difficulty in breathing), were given to the parents just prior to discharge.

Table 1. No. of Children Who Slept in the Car as a Function of Drug Regimen*

Slept in car	Drug category		Total
	Triple combination	Versed	
Yes	12	1	13
No	2	15	17

*Chi-square=19.2; P<.001.

The principal investigator gave a 20-item questionnaire to the parent. The survey consisted of questions regarding the child's:

1. amount and frequency of napping;
2. discomfort;
3. food intake;
4. changes in diurnal rhythms, including:
   a. length of overnight sleep;
   b. frequency of urination; and
   c. memory of the dental visit that occurred within 24 hours post sedation.

The response categories were dichotomized (eg, "yes" or "no") or ranked (eg, 0-30 minutes, 31-60 minutes, and so forth) for recording purposes, depending on the question asked. The questionnaire was reviewed with the parent by the principal investigator. Clarifications were provided as needed and requested by the parent. The parents were informed that the principal investigator would contact them by phone approximately 24 hours after the dental appointment and seek information related to the questions on the questionnaire. The parent's answers to the questionnaire were taken over the phone and recorded into a spreadsheet 24 hours after the sedation.

Statistical analysis

The responses were entered into an Excel spreadsheet and analyzed using SPSS Statistical Package, version 13 (SPSS Inc, Chicago, Ill). Descriptive statistics, frequency analysis, and cross-tabulation procedures were performed. Chi-square analysis involving the different sedation regimens and cross-tabulations were done and the significance level was set a priori at .05.

Results

A total of 30 subjects, 14 in the triple combination group and 16 in the midazolam group, were enrolled in the study. Fourteen were male, and 16 were female. The children were 2 to 5 years of age.

There were significant differences between the 2 sedation regimens in terms of postoperative sleep on the way home from the hospital ($P<.05$) and degree of difficulty in awakening ($P<.05$; see Tables 1 and 2). The children who

Table 2. No. of Children Who Were Difficult to Awaken as a Function of Drug Regimen*

Drug category	Difficult to awaken		Total
	Yes	No	
Triple combination	10	2	12
Versed	0	1	1

*Chi-square=3.6; P<.057.

received the triple combination were more likely to sleep and more difficult to awaken once the family arrived home. Thirteen children fell asleep on the way home: 12 in the triple combination group (92%) and 1 in the midazolam group. The majority of parents (73%) had to drive between 15 to 60 minutes to arrive home. Ten of 12 parents (83%) of children who received the triple combination and fell asleep reported difficulty in awakening the child, while the 1 patient receiving midazolam was not difficult to awaken.

None of the patients vomited on the way home or once they arrived there. There were no significant differences between the regimens in postoperative pain; only 6 patients reported postoperative pain (20%). Two patients who had received midazolam reported moderate pain, while 4 patients who received the triple combination reported mild pain. The pain was reportedly managed with over-the-counter acetaminophen or ibuprofen. Nine (30%) children reportedly complained of a "fat" lip, cheek, or jaw, but there was no difference as a function of drug regimen.

Importantly, there was no significant difference in memory of the appointment. Children who received the triple combination (43%) or midazolam (44%) had some memory of the appointment, according to the parent's report. In both groups, the memory included recalling details such as:

1. taking the medication;
2. the sights, sounds, and conversations occurring intra-operatively; and
3. getting a popsicle at the end of the appointment.

There were no differences in eating habits between groups. All parents reported that their child had a normal night's sleep following the sedation appointment. Most children:

1. had urinated within 3 hours of being discharged (77%);
2. had a bowel movement within 6 hours (73%);
3. were reportedly lethargic after returning home (60%); and
4. played after returning home (57%).

The parents of 15 children (8 triple combination and 7 midazolam) had to care for other children at home on the day of the sedation. The other children's ages ranged from 4 months to 19 years, with the average being 68.7 months. Thirteen of 21 siblings were between the age of 1 and 5 years old.

Discussion

The results suggest some cause for concern following sedative appointments involving children in terms of lingering effects that could potentially result in adverse events on the way to or at home. For example, the triple combination was more likely than midazolam to result in sleep during transit from the office to home, and these children were apparently more difficult to awaken. The concern is that a potential airway blockage may occur in transit or shortly after arriving at home. The child may be unable to maintain an open airway without assistance. The increased sleep occurring with the triple combination did not occur in all cases involving that regimen, but raises questions as to why it was seen in a subset of patients and how best to prevent an adverse outcome when it does occur. Unfortunately, no other studies exist with data comparable to this study. Because the triple combination contains chloral hydrate, a hypnotic agent, it was expected that some of the children who received this combination would sleep. Nonetheless, this finding emphasizes:

1. a clinician's need to rigidly adhere to discharge criteria of sedation guidelines; and
2. the profession's need to reassess and develop more specific and measurable discharge criteria for children prior to discharge from the health care facility.

This is consistent with the recommendations of others.[21]

Unfortunately, the authors were unable to find other studies that addressed factors similar to those in this study in the 24-hour-period following sedations in children. It was because of this lack of such studies that this study was undertaken, albeit in a pilot format.

As part of the work-up prior to sedation, a thorough oropharyngeal examination and queries of the parents about their child's snoring characteristics are highly advisable whenever the triple combination is administered. Larger tonsils, associated with snoring, may signify a greater likelihood of airway blockage when the child is placed in the supine position[25] or when the neck is flexed forward, as would occur if the child falls asleep on the way home when sitting in a car seat. Inability of the parent to adequately monitoring the sleeping child while driving or parents who must watch more than one child when they arrive home have significant safety implications.

No difference was found between regimens regarding the child's memory of the appointment, as measured in this pilot study. Nonetheless, in both regimens approximately 43% of the children reportedly had some memory of the appointment—even though midazolam is purported to have an amnestic effect.[26] Amnestic effects may be influenced by various mechanisms. Recent evidence suggests, however, that learning may occur even if recall is affected by drugs.[27] Since no discriminatory, nonbiased mechanism or measure was used to elicit specific memories of the sedation in this study's children, the finding of any degree of amnestic effect must be regarded with skepticism. Nonetheless, it is interesting that no difference between sedation regimens was found.

If memory was truly affected by the triple combination to a similar degree of that of midazolam, it may be due to deeper levels of sedation obtained with the triple combination. This speculation, however, needs further evaluation.

Vomiting does not appear to be a common postsedation event and was not witnessed in this study. Furthermore, circadian rhythms or normal physiologic processes such as sleeping, urination, and bowel movement may not be significantly affected by these sedative agents. Complaints of "fat" lips, cheeks, and jaw are empirically a well-known consequence of local anesthetic use in children, and its occurrence was not unexpected in this study. Even good coaching of the parent by the clinician may not prevent this phenomenon from occurring. Nonetheless, these outcomes associated with local anesthesia do not usually pose a significant, long-term problem for the patient.

Finally, it is important to recognize that this is a pilot study with limitations, including:

1. a small number of participants; and
2. no attempt to associate to the postdischarge events:
   a. depth of sedation;
   b. pre-, intraoperative, and postoperative behaviors;
   c. age;
   d. weight; nor
   e. the type and number of restorations, pulpotomies, and extractions.

Therefore, this study's findings need to be tempered by implications contained within these limitations and further research seems indicated.

Conclusions

The results of this pilot study suggest the following conclusions:

1. The opportunity exists for an adverse event related to a sedation appointment to occur after a child is discharged from a dental office or clinic.
2. It is important that discharge criteria of sedation guidelines (eg, AAPD) are met or exceeded to decrease the likelihood of an adverse event in children sedated for dental care after leaving the dental office or clinic.

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Abstract of the Scientific Literature

A Modified Screening Tool for Autism for Chinese Children

Recent trends suggest a worldwide increase in the incidence of autistic spectrum disorder. Therefore, early identification and intervention is beneficial. The Checklist for Autism in Toddlers (CHAT) was developed in the United Kingdom in 1992 as a simple screening tool for identification of autistic children at 18 months of age. The Modified-CHAT (or M-CHAT), developed in 2001 in the United States, had better sensitivity than the original CHAT. The 6 best questions of the M-CHAT addressed areas of: (1) social relatedness (interest in other children and imitation); (2) joint attention (protodeclarative pointing and gaze monitoring); (3) bringing objects to show parents; and (4) responses to calling. To date, there has been no investigation of the application of either the original CHAT or the M-CHAT to children from different ethnic backgrounds.

CHAT-23 is a new checklist translated into Chinese, combining 23 questions from the M-CHAT and 5 items from the observational section of the CHAT. The aim of this study was to determine whether CHAT-23 could discriminate autism at mental ages of 18 to 24 months in Chinese children. This cross-sectional cohort study included 212 children with mental ages of 18 to 24 months: n=87 with autistic disorder and n=125 nonautistic children. Discriminant function analysis found that 7 key questions—addressing areas of joint attention, pretend play, social relatedness, and social referencing—were identified as discriminative for autism. Failing any 2 of 7 key questions yielded sensitivity of 0.931 and specificity of 0.768. Failing any 2 of 4 observational items produced sensitivity of 0.736, specificity of 0.912, and positive predictive value of 0.853. Integrating the screening questions of the M-CHAT and the observational section of the original CHAT yielded high sensitivity and specificity in discriminating autism at 18 to 24 months of age for this cohort of Chinese children.

Comments: Pediatric dentists report treating increased numbers of children with autism spectrum disorder. This anecdotal observation is supported by the scientific literature. In addition, the ethnic diversity in pediatric practices is increasing. A simple 2-stage method of identifying Chinese toddlers with autism is described by the authors. The method, which includes a simple parental questionnaire followed by referral for observation by trained assessors, may have a place as a screening procedure in pediatric dental practices. Screening by pediatric dentists might facilitate earlier identification of previously undiagnosed children. Further assessment of the CHAT-23 screening tool in children from other ethnic communities is recommended. **RLH**

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Wong V, Hui LH, Lee WC, Leung LS, Ho PK, Lau WL, Fung CW, Chung B. A modified screening tool for autism (Checklist for Autism in Toddlers [CHAT-23]) for Chinese children. Pediatrics 2004;114:166-176.

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