Management of Child Patient Behavior: Quality of Care, Fear and Anxiety, and the Child Patient

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Abstract

Behavior management is a key component when providing dental care to children who have suffered traumatic dental injuries. This article reviews the current status of behavior management including basic communication techniques and advanced techniques used by pediatric dentists. Emphasis is given to oral and inhalation sedation when treating children at initial visits status post dental injury. Little is known about the use of pharmacologic agents in managing young but behaviorally challenging patients who have suffered dental trauma. Future care involving sedation and specialized endodontic procedures of these young patients through collaborative efforts between endodontists and pediatric dentists seems promising and should be pursued.

(J Endod 2013;39:S73–S77)

Key Words

Basic communication techniques, behavior management, children, sedation

The first encounter with a trauma patient is important in terms of managing not only the immediate consequences of the dental injury but also the patient's anxiety and response to the initial and subsequent phases of treatment. The goal is multifaceted:

1. To stabilize the patient’s orofacial trauma
2. To develop trust among the patient, family, and the dental provider
3. To set the stage for the discussions of potential outcomes associated with the trauma
4. To minimize the patient’s fear and anxiety, thus decreasing the likelihood of significant disruptive behaviors

A patient whose anxieties and fears are not addressed and managed initially during treatment may exhibit poor compliance with instructions including failure to return for critical follow-up care.

There is evidence that the patient’s level of anxiety may increase or even result in the onset of fear after treatment subsequent to dental injury or treatment (1–6). In the child population, increased anxiety and fear may manifest itself in many ways including “acting out” or disruptive behaviors at the time of initial treatment or in subsequent visits (7). Likewise, minimizing the patient’s anxiety and fear should theoretically promote a smoother visit and better working conditions for the dental team. One of the possible negative consequences of anxiety and fear in patients is the development of avoidance behaviors (8). Failure to return for follow-up visits may compromise the outcome of care, resulting in early tooth loss or an abscess, all of which may ultimately compound the patient’s avoidance behaviors.

Most likely, any trauma to the anterior primary teeth will be seen and managed first by the pediatric or general dentist. However, as a part of the management, both types of dentists may refer children who have suffered injury to traumatized permanent, immature incisors to the endodontists. Children who have these immature teeth usually range in age from 5½–8½ years. The behavior of a child of this age is beginning to change from immature to mature characteristics. The child's temperament, broadly embraced and defined as the child's temperament, significantly influences children's behavior in clinical settings including dental offices (12, 17–28). Shy or withdrawn, nonapproachable, and moody children generally may not be cooperative for routine dental procedures (19). In fact, some evidence
suggests that they are not good sedation candidates unless the attained depth of sedation is relatively deep (18, 27, 29–31).

Another possible consideration is the degree of procedural challenge a child will undergo during dental treatment. In general, the greater the extent of treatment, potential for multiple visits, and perceived threat of procedures, the greater the likelihood of uncooperative and disruptive behaviors (32, 33). Individuals may respond differently in threatening situations (34). Dental experiences involving the rubber dam, handpiece, and injections seem especially anxiety-provoking in many children. Also patient experiences may be associated with a medical history (eg, cancer) wherein many invasive procedures may have occurred and are recognized and potentially anticipated in a counterproductive way (35). Finally, circadian rhythms may influence basic physiological responses in children in clinical settings (36).

There are some common disruptive behaviors that are elicited in children when they are in the dental setting (10). The range of these disruptive behaviors may vary from delay tactics, defiance, kicking, gagging, and screaming.

The American Academy of Pediatric Dentistry has guidelines on the use of behavior management techniques (www.aapd.org) (37). They broadly characterize these techniques as either communicative or advanced techniques, although in reality they are rarely separated. The most frequently used communication technique is called “tell-show-do.” Probably the second most frequently used technique is that of positive reinforcement. Advanced techniques are characterized as either using restraints or pharmacologic management of the patient and require pre-procedural informed consent before their use.

Pharmacologic methods of behavior management can be broken down into different levels of sedation and general anesthesia. Nitrous oxide is the most frequently used sedation procedure with the child dental patient (38). Sedative/antianxiety agents administered via the oral route of administration are the second most frequently used pharmacologic technique with children. It is imperative to understand that there are 3 recognized depths of sedation: mild, moderate, and deep (39). Most of the time practitioners aim to achieve mild or moderate sedation with their patients; however, very young children or those who are cognitively impaired may require deep sedation to accomplish some procedures. Unfortunately, deeper levels of sedation are most often associated with adverse outcomes including hypoxemia, respiratory depression, cardiovascular collapse, and death (40).

Several different drugs can be used for sedation of children, but the most frequently used drugs historically have been chloral hydrate, meperidine, hydroxyzine, and the benzodiazepines (most specifically, midazolam) (38, 41). Finally, the most effective pharmacologic method of managing children is the use of general anesthesia.

It is imperative that the practitioner knows and understands intimately the sedation guidelines for children as well as their state board rules and regulations associated with sedation. The sedation guidelines appropriate for children are endorsed and published by the American Academy of Pediatrics and the American Academy of Pediatric Dentistry (39).

In those guidelines, 3 recognized levels of sedation are defined and appropriately addressed in terms of practitioner considerations and responsibilities in performing sedations on children. The 3 levels are minimal, moderate, and deep sedation. The levels actually represent a continuum from full wakefulness to unconsciousness. Nonetheless and importantly, the minimal and moderate levels of sedation assume that the patient is interactive with the practitioner and can independently maintain their airway in a patent and appropriately functioning fashion. Thus, a loss of consciousness should not be expected for those levels of sedation. On the other hand, deep sedation can and does occur at times. During deep sedation, the patient is usually unconscious, unable to effectively maintain their own airway and its reflexes, and difficult to arouse. This level of sedation is often indistinguishable from general anesthesia but is characterized as an unstable and potentially dangerous clinical condition during which significant life-threatening events can occur (eg, laryngospasms).

Nitrous oxide, the most frequently used inhalational sedative agent for children during dental procedures, is safe and effective if used appropriately by a well-trained clinician. It rarely causes children to become unconscious when administered in therapeutic concentrations by using dental delivery systems (ie, open system in which room air is entrained along with the gases). It also produces several effects that benefit both the child and the practitioner during their interactions (42, 43).

Let us quickly review nitrous oxide’s general physical properties and characteristics (44–47). Nitrous oxide is heavier than air, and if the gas were colored, which it is not, you would tend to see the nitrous oxide descend from the patient’s level in the reclined position to the floor. The gas itself does not have an odor, although the tubing and nasal hood may have some odor that the child dislikes. Hence, the practitioner would be wise to flavor the inside of the nasal hood by using fluoride foam or drops of flavored liquid to produce vapors that the child finds quite pleasant.

Nitrous oxide is relatively insoluble in the blood, and thus the onset and offset of its effects in children are fairly rapid, a definite benefit for the practitioner. It remains unchanged in the blood and is primarily excreted from the body via the respiratory tree, although a minute amount escapes via the skin. Nitrous oxide, which is stored in color-coded tanks around 750 psi, is essentially a vapor overlaying a liquid in the tank compared with oxygen tanks in which the oxygen is a compressed gas at room temperature. Oxygen or nitrous oxide is not flammable, but both certainly support combustion; open flames around these tanks are definitely contraindicated.

It is important for the clinician to recognize that nitrous oxide as a gas in the body tends to displace other gases, primarily nitrogen, and thus can cause some unpleasant circumstances. A prominent circumstance the practitioner can avoid is the aggravation of otitis media, a common condition in children; therefore, nitrous oxide should be avoided in children with this condition. Other side effects that are annoying are increased likelihoods of flattulence and the perception of the need to void.

There are very few major medical concerns associated with the use of nitrous oxide, but there are several relative issues of which the clinician should be aware. Nitrous oxide, a weak gaseous anesthetic, is not associated with malignant hyperthermia as are some other gaseous anesthetics. Also, there is no known allergy to nitrous oxide. Nonetheless, it is advisable for the clinician to seek medical consultation for certain clinical conditions including recent eye surgery, otitis media, bowel obstructions, and several lung conditions. The lung conditions do not occur frequently in healthy children and thus do not interfere with its use in these children. Also, nitrous oxide has been associated with spontaneous abortions and induction of labor in women and thus should be used cautiously and never during the first and third trimesters in women during elective procedures.

There are several beneficial attributes of nitrous oxide when used in healthy children. It is an adjunct with other sedatives and is especially important in behavior management when the other sedatives are given orally, because the nitrous oxide becomes, in effect, a titrating and settling agent under those conditions (48). This is often overlooked but important consideration for subtle behavior management effects when used by seasoned clinicians.

It also has mild anxiolytic properties that help calm a mild to moderately anxious child (47). Complementing this effect is the onset of an unusual, psychologically receptive mindset, wherein the child’s imagination and their susceptibility to suggestions are amplified.
Clinically favorable effects also include physiological inhibition of the gag and swallowing reflexes (49) and the actual reduction in pain perception (ie, raises the pain perception threshold) (50). Another procedurally related and favorable effect is the tendency to increase young children's tolerance of procedures by reducing their fatigue and natural hyperactivity. These clinically beneficial effects suggest a clear rationale to the use of nitrous oxide to manage potentially behaviorally challenging children.

The administration of nitrous oxide is primarily based on patient cooperation and the practitioners' understanding of its influences and its effects. The standard technique of administering nitrous oxide is slow titration in a series of steps in which the concentration of nitrous oxide is increased by 5%–10% per step. During the steps, the clinician is constantly obtaining patient feedback on symptoms as well as monitoring patient responsiveness and subtle signs of nitrous oxide effects (43). This type of administration is used most often and is well suited for most patients who are cognitively competent.

Another administrative technique is possible but should only be used by trained pediatric dentists familiar with this technique in children. The rapid onset technique involves the immediate administration of nitrous oxide at high concentrations (ie, 50%–70%) in which the nasal hood is held just off the face and over the nose and mouth (45). Once the child is settling and becoming calm, the clinician should immediately reduce the concentration to 50% or less, depending on patient signs and symptoms. It is noteworthy that if settling and calming are not apparent within 5 minutes, nitrous oxide administration should be discontinued.

Children who exhibit defiant, hysterical behaviors and are unresponsive to distraction interventions cannot be expected to inhale nitrous oxide efficiently. Therefore, nitrous oxide administration is generally contraindicated in these children regardless of the administration technique. Other groups of patients who are less likely to benefit from nitrous oxide are those who have reported previous negative reactions to the dental staff (50), have compulsive or type A personalities, suffer from claustrophobic conditions, or have significant personality disorders (45).

Nitrous oxide is well known to have very prominent beneficial effects for cooperative children who are mildly apprehensive, including decreased likelihood of adverse behaviors either at a single visit or during multiple restorative visits. Patients under the influence of nitrous oxide are also generally appreciated to be responsive to hypnotic suggestion; thus, storytelling to young children under its influence works well.

There have been few studies investigating nitrous oxide’s clinical effects on children. A relatively recent study looked at clinical signs of children sedated with nitrous oxide and showed that open, warm hands, limp legs, and a small facial smile were most frequently observed (43). These signs are clues for the clinician in determining whether the young child has reached a sedative state consistent with good behavior and pharmacologic effectiveness.

Different levels or depths of sedation can be targeted as an end point with oral sedatives. Even if one targets a certain depth of sedation, the clinician must always be aware that the patient’s response may be different than expected with therapeutic doses of sedatives (51). Those who, for various reasons, respond in less than expected level of sedation to a therapeutic dose of drug may be referred to as hyporesponders, whereas those who respond more excessively than expected to the same therapeutic dose of drug are referred to as hyperresponders. The distribution of responses tends to follow a bell-shaped curve; thus, patients who tend to respond in the extremes of the distribution are always a concern.

The clinician who uses pharmacologic methods of patient management should always be trained in recognizing and responding to emergent situations, thus rescuing the patient who reaches deeper levels of sedation than targeted. Many children can be managed with minimal to moderate depths of sedation. Various agents, including nitrous oxide, are capable of inducing these depths of sedation.

Drugs can cause many effects in patients. Ideally, drugs used for sedation should have characteristics that influence the patient’s memory, anxiety and fear, movement, and pain elicited by procedures. Unfortunately, there is no ideal sedative, and often more than 1 sedative is needed for any given patient. When 1 or more drugs are used, possible interactions may occur including increased depth of sedation and likelihood of adverse events (52).

It is important for the clinician to understand the concept of timing involved with sedatives administered orally. Intravenous sedation can cause effects in the patient within 15–30 seconds, whereas orally administered sedatives usually have a much slower onset of clinical effects. Each drug given orally has a different onset time that varies from 10 minutes to more than an hour. Working duration refers to the length of time the clinician can expect to do procedures while the patient is comfortable, and again, working duration can vary from 20 minutes to an hour or more. Finally, recovery, or the amount of time a patient must stay in the clinical facility to meet discharge criteria, is dependent on drug metabolism and elimination.

Another important concept to understand is drug reversibility or the ability of a second drug to reverse the effects of the first drug. Currently, there are 2 broad classes of sedatives that can be reversed. Opioids can be reversed with naloxone and benzodiazepines with flumazenil.

Benzodiazepines have become the most popular class of drugs used for sedating children in the United States today. There are many benzodiazepines on the market, with each usually having a singular primary effect and varying degrees of other effects often found to be characteristic of benzodiazepines. The common characteristics of benzodiazepines to varying degrees are relaxation, amnesia, anticonvulsive, hypnotic, sedative, and anxiolytic (46). For instance, midazolam (ie, Versed) causes profound amnestic effects, especially when used via the intravenous route, but can also mediate relaxation, anticonvulsive effects, and to a certain extent anxiolysis. Unfortunately, it can also cause a paradoxical excitement in children (53) that is known by many as “angry child syndrome.”

Benzodiazepines mediate their effects by binding to the γ-amino butyric acid receptor complex whose main effects when activated are inhibition (46). Depending on the type of benzodiazepines, the onset of clinical effects can also vary quite significantly. Midazolam has an onset of only 10 minutes when given orally compared with diazepam (ie, Valium), which takes 60 minutes to reach clinically significant blood levels, mediating its effects.

The benzodiazepines are relatively safe when used in therapeutic doses. Midazolam, the most frequently used benzodiazepine in pediatric dentistry, is used off label (41, 54). Another property of the benzodiazepines is that of reversibility. All can be reversed by an agent known as flumazenil (Romazicon).

Some patients are moderately to severely anxious or frankly fearful about dental procedures. Consequently, very mild agents such as nitrous oxide may not work well with these patients. The clinician is then faced with either increasing doses of single agents, sometimes beyond recommended therapeutic doses, or combining more than 1 agent, all in therapeutic doses, in a “cocktail.” The cocktails may be more effective in aiding the clinician in treating these patients. Most often these patients are preschoolers who have fewer effective coping strategies (55).

Another reason for combining agents is to increase working time so that more dental procedures can be accomplished in a single setting (54). Also, by combining agents that have different properties, the clinician can address 2 or more patient-related challenges while undergoing Injuries to Permanent Dentition Symposium
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procedures. For example, one can combine an analgesic with an anxiolytic agent to address not only potentially painful procedures but also to relax the anxious patient.

The clinician always has to be cognizant of potential adverse events associated with pharmacologic agents. Recognition of the adverse events and appropriate interventions including advanced airway management can only be gained through significant training most often associated with advanced training programs (51). Most often the adverse effects involve the respiratory system in which respiratory depression or apnea may occur and require competent intervention (52, 56).

A relatively safe oral cocktail that is becoming fairly popular now that chloral hydrate is waning from the pharmacologic marketplace is that of midazolam, meperidine, and hydroxyzine (57). Again, it must be emphasized that the individual doses should be conservatively within the therapeutic dose range of each agent. This cocktail has a relatively quick onset of about 15–20 minutes, a longer working time, and the increased likelihood of amnesia.

The use of sedation in children who have suffered orofacial trauma has not been well documented. Certainly sedation has become an expected part of many protocols that occur in emergency departments across the world (54). From a theoretical standpoint, the use of sedation may be quite important in managing children who have suffered dental trauma. Nonetheless, care must be taken to ensure that the child first has been adequately and fully assessed to rule out neurologic and other life-threatening conditions. If any suspected signs or symptoms suggestive of such conditions should be present, immediate referral to medical personnel is the first and only consideration compared to any dental injury.

A review of the literature indicates that only 1 study has been completed in which the services of endodontic and pediatric dentistry specialties in an academic institution have been used to address dental caries and trauma cases with pharmacologic agents (58). In this retrospective study, the charts of 32 pediatric patients who received sedation and either had deep carious lesions or suffered traumatic dental injuries were reviewed. Four of the cases involved tooth trauma. Various sedative agents including midazolam, chloral hydrate, meperidine, and hydroxyzine were used either alone or in combination. The results indicated that midazolam combined with other sedative agents was used in the majority of cases. In fact, midazolam with either meperidine or hydroxyzine was used in 88% of the cases. Only 2 cases (6%) were categorized as “aborted” because of uncontrolled behavior, and no adverse events were noted.

The study demonstrated collaborative interactions between endodontists and pediatric dentists to address the behavioral and dental needs of children. The extent to which such collaboration occurs in the private practice community is unknown; however, such future collaboration would seem reasonable and highly beneficial in rendering quality care to the behaviorally challenging pediatric patient. The American Association of Endodontists and the American Academy of Pediatric Dentistry should endeavor to establish an organized repository that is based on such collaborative efforts for purposes of developing a significant corpus of evidence-based data to better guide quality clinical care of young dental patients.

Acknowledgments

The author denies any conflicts of interest related to this study.

References


