



REVIEW

Pain and anxiety management for pediatric dental procedures using various combinations of sedative drugs: A review



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Abstract For fearful and uncooperative children behavioral management techniques are used. In order to control the pain and anxiety in pedodontic patients, pharmacologic sedation, anesthesia and analgesia are commonly used. Midazolam is commonly used as an oral sedation agent in children; it has several features such as safety of use, quick onset and certain degree of amnesia that makes it a desirable sedation agent in children. This review paper discusses various aspects of oral midazolam, ketamine and their combinations in conscious sedation including, advantages of oral route of sedation, pharmacokinetics, range of oral doses, and antagonists for clinical dental treatment procedures.

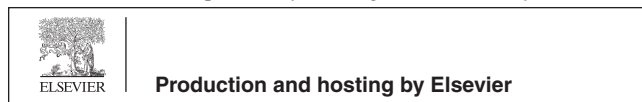
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1. Introduction

Management of child patients for various dental procedures in dental office is very challenging. The behavioral problems are commonly seen in children under the age of 6 years due to various elements such as immature reasoning, restricted coping skills and anxiety/fear causing (Henry and Jerrell, 1990). Conscious sedation is a proven and well documented approach to assist in such a kind of situations. Conscious sedation is defined as a controlled state of low consciousness that conserves protective and unconditioned reflexes, permits continuance of a patient's airway impartially and allows the patient to communicate appropriately to physical and verbal stimuli (Kauffman et al., 1992). Hence, conscious sedation can be very supportive in allaying anxiety, uneasiness, fear and minimizing an uncooperative child's attempt to resist treatment procedures (Lanza et al., 1988; Field et al., 1993). Procedural conscious sedation includes providing an adequate level/degree of sedation whereas decreasing pain and anxiety, maximizing amnesia, curtailing the potential for adverse drug-related events, monitoring and governing behavior, and sustaining a stable cardiovascular and respiratory status. Sedation drugs can be administered through various routes such as oral, inhalational, nasal, intramuscular, subcutaneous, and intravenous routes (Mistry and Nahata, 2005).

There are a variety of drugs available that can be used for conscious sedation for dental office procedures. Midazolam is an anxiolytic agent having a short acting time of action (Krauss and Green, 2006; Warncke et al., 1997) that limits its utilization to short dental strategies only (Kain et al., 2000; Kupietzky and Houpt, 1993; Dionne, 1999; Nathan and Vargas, 2002). Midazolam has likewise been demonstrated to upgrade anterograde amnesia when utilized preoperatively in young children (Al-Zahrani et al., 2009; Curran, 1986; Smith et al., 1998). Ketamine provides excellent amnesia and analgesia. It maintains muscle tone and ensures air route reflexes and spontaneous breathing (Krauss and Green, 2006; Warncke et al., 1997). Despite of its obvious advantages over other agents, many dental practitioners are hesitant to use ketamine alone secondary to its propensity to cause vivid and frightening emergent reactions (Green et al., 1998a,b). It has been suggested that merging these two agents for conscious sedation may preserve sedation efficacy while reducing their side effects. This is relatively due to the fact that many of the aforementioned potential unfriendly impacts are relying upon measurement dose, and when utilized in combination

the reduction of dose has a beneficial role in reducing the unwanted effects. The objective of this review paper was to represent the recommendations for safety profiles of key sedative drugs for pediatric dental patients. In addition, it was aimed to explore the beneficial role of using ketamine and midazolam in various drug combinations for the intended applications.

2. Sedative drugs

The use of sedative drugs alongside local anesthetics is often appropriate to reduce anxiety and fear among patients. In certain studies (Kauffman et al., 1992; Al-Zahrani et al., 2009; Smith et al., 1998), patients preferred dental extractions and other dental procedures under local anesthesia with sedation to local anesthesia only.

There are a number of sedative drugs that can be used for dental procedures (Table 1). Midazolam belongs to benzodiazepine groups (Table 1) that is used as a short and fast acting drug prior to general anesthesia (GA) or several other medical diagnostic approaches (Golpayegani et al., 2012). On the other hand, several other studies (Sener et al., 2011; Chudnofsky et al., 2008; Warner et al., 2007; Karapinar et al., 2006; Shende et al., 2003), have looked at the sedative effects of similar drugs used along with midazolam with a synergic effect to reduce the required dose of midazolam. Ketamine and midazolam combination has already been used successfully for the surgical treatment of young fearful and anxious children (Golpayegani et al., 2012; Sener et al., 2011; Chudnofsky

Table 1 General mechanisms for sedation.

| Drugs group | Mode of action |
|------------------------|---|
| Benzodiazepines | Potentiate GABA-mediated chloride ion influx |
| Barbiturates | Potentiate GABA and directly enhance chloride ion influx |
| Ketamine | Antagonize excitatory influences of glutamate |
| Antihistamines | Antagonize excitatory influences of histamine & acetylcholine |
| Opioids | Activate mu and kappa opioid receptors |
| Inhalation anesthetics | Potentiate inhibitory neurotransmission |

(Al-Zahrani et al. (2009), Kauffman et al. (1992), Curran (1986), Mistry and Nahata (2005), Kupietzky and Houpt (1993) and Dionne (1999)).

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