
Oral ketamine for deep sedation of difficult-to-manage children who are mentally handicapped: case report

CASE REPORTS

Morton Rosenberg, DMD

Abstract

For a small subset of mentally handicapped individuals, the medical and dental setting can be so threatening that they react violently to health care providers. Deep sedation can be administered enterally using oral ketamine, 6–8 mg/kg, combined with glycopyrrolate mixed in simple syrup and preceded by a dose of an oral benzodiazepine and sodium citrate. A case utilizing this technique to sedate an extremely combative mentally handicapped female requiring dental treatment planning in an ambulatory surgical center is described. A review of this use of ketamine and caveats concerning its use are covered. (Pediatr Dent 13:221–23, 1991)

Introduction

Delivering dental care to mentally handicapped patients may be difficult, time consuming, expensive, and extremely anxiety producing for both the patient and the health care professional. This only is compounded in cases involving those mentally handicapped patients who also are violent and combative. Sedation and/or general anesthesia often are necessary to provide definitive dental treatment for these individuals (Barr et al. 1977; Musselman and Dummett 1979) This problem, which is not unique to dentistry, has been reported by other specialties (Elkins et al. 1988).

An oral medication would be the ideal agent to produce deep sedation in violent individuals. The ideal oral sedative medication should taste good, produce predictable effects, be delivered in a small volume, and result in no adverse side effects (Nicolson et al. 1989). Unfortunately, no drug exists which fulfills all these criteria. This is a report of the use of a combination of oral ketamine and glycopyrrolate in conjunction with an oral benzodiazepine and sodium citrate to produce profound sedation for a violent, mentally handicapped patient.

Case Report

A 16-year-old, 96 kg mentally handicapped female with a history of combative behavior in the dental and medical environment was scheduled for dental treatment planning and a routine gynecologic examination in the ambulatory surgical center of a major teaching hospital. During the last attempt at IM sedation at a gynecological clinic, she had fractured a nurse's mandible. She had been institutionalized since age 4, and had no other contributory medical problems except obesity. It was elected not to obtain laboratory data. The patient was NPO from midnight the night before sedation.

Before arrival at the hospital, the patient received diazepam (15 mg orally) and sodium citrate (15 ml orally). An oral solution was prepared consisting of ketamine, 700 mg, (100 mg/ml), and glycopyrrolate, .6 mg, (0.2 mg/ml) combined with 5 ml of simple syrup. After the patient sampled the medication on her finger, she eagerly ingested the solution in the operating room. Within 15 min, horizontal nystagmus was observed, and the patient became sedated deeply. Appropriate monitoring devices were applied, including precordial stethoscope, pulse oximeter, blood pressure monitoring, and electrocardiogram. An intravenous catheter was inserted in the right antecubital fossa and an infusion of lactated Ringer's solution was begun. Nitrous oxide (50%) and oxygen (50%) were administered via nasal hood. A comprehensive oral examination was performed, and complete radiographs were exposed. The dental findings revealed numerous carious teeth. A gynecologist then performed a pelvic examination without difficulty. The combined time of both procedures was 35 min. Vital signs and oxygen saturation (SaO₂–98–100%) were within normal limits. No abnormalities were noted on the electrocardiogram throughout the procedure. Recovery was uneventful, with no postanesthesia emergence delirium, nausea, or vomiting. Within 70 min after the procedure had ended, the patient met routine outpatient discharge criteria, and was returned to her institution.

Discussion

The mere presence of health care personnel may be enough to make some mentally handicapped people extremely anxious; a small subset of this population may become violently aggressive (Adams and Delong 1980). This may be related to separation from parents or other care givers, or as the result of other unpleasant or

painful experiences during the past delivery of health care.

The use of oral ketamine and an oral benzodiazepine to sedate combative mentally handicapped patients has been described for accomplishing pelvic examinations (Elkins et al. 1988) in a special multidisciplinary clinic created to treat gynecologic problems in the mentally handicapped population. In this report, a protocol using oral ketamine, 2–8 mg/kg, and oral midazolam, 0.2–0.4 mg/kg, was found to be superior to either IV or IM diazepam in combination with oral chloral hydrate in providing adequate sedation in performing pelvic examinations in mentally handicapped females. They concluded that the use of oral ketamine and midazolam was well tolerated, allowing for examination of most patients in their population who could not be examined by other means.

Oral ketamine has been described as an induction technique prior to the administration of general anesthesia for dentistry (Bragg and Miller 1990). In this case report, oral ketamine and oral diazepam sedated an extremely combative mentally handicapped female so that the induction of general anesthesia via mask could be performed without difficulty.

Other reported applications for oral ketamine include its use in changing burn dressings in a pediatric patient (Morgan and Dutkiewicz 1983) and as an induction agent (Hain 1983) for general anesthesia.

The patient described in this report already had injured one health care professional, so the use of an oral agent which could cause a gentle induction to unconsciousness without accompanying excitement was desired. The success of oral ketamine in achieving these goals has been described (Elkins et al. 1988; Bragg and Miller 1990). The advantages of oral ketamine over the IM route are patient acceptance and avoiding mechanical restraint. The main disadvantage is the long onset time. In a 1981 study, Grant et al. 1981 compared the effects of IM ketamine, 0.5 mg/kg and oral ketamine, 0.5 mg/kg in six healthy adult subjects. The onset of analgesia after the oral administration of ketamine was within 30 min.

The dose of oral ketamine used was in the range of 6–8 mg/kg (Elkins et al. 1988; Bragg and Miller 1990) for the deep sedation required in combative patients. "Emergence phenomena" after IV or IM administration of ketamine is a potential side effect which has been well described (White et al. 1982), and also has been reported after oral ingestion (Hain 1983). Even though it is impossible to evaluate the incidence of postsedation psychotropic phenomena in this poorly verbal group, oral benzodiazepines should be given preoperatively to reduce the incidence of this problem, and to facilitate a quiet emergence. The oral diazepam administered in

this case did not cause any noticeable sedation preoperatively. It is possible to substitute oral diazepam with oral midazolam (Elkins et al. 1988). The use of an antacid, oral sodium citrate, was an attempt to raise the gastric pH to decrease the morbidity of a chemical pneumonitis if aspiration did occur.

Ketamine is a potent sialagogue (White et al. 1982). Adding an anticholinergic drug, such as atropine or glycopyrrolate, to the oral ketamine solution is recommended highly because of their effectiveness as antisialagogues. This will contribute to easier airway management by reducing the incidence of laryngospasm. Using a simple syrup (concentrated sucrose solution) makes the combination palatable. We have found that once patients taste this sweet concoction on their fingers, there is little resistance to swallowing the mixture.

Since our initial experiences with the combative patient described here, this oral ketamine solution has been used successfully in five other pediatric dental cases involving mentally handicapped children and teenagers with histories of combativeness. In two of these cases, this technique was used for treatment planning, and in the other three cases oral ketamine and oral diazepam were used for deep sedation before inducing general anesthesia. Recovery from the sedation cases was uneventful, and the patients were discharged from the facility within 60 min of the procedure. All of these procedures were performed in an outpatient hospital facility. The patient in this report was scheduled for definitive dental therapy, sedated with oral ketamine and oral diazepam, and easily assisted onto the operating table. An IV catheter was inserted without difficulty, and general endotracheal anesthesia induced.

Oral ketamine in combination with an anticholinergic and simple syrup following oral benzodiazepine is an effective technique for deeply sedating a combative, mentally handicapped individual. The level of sedation achieved with this technique is outside of the realm of conscious sedation, and must be classified as deep sedation as promulgated by the NIH Consensus Conference on Anesthesia and Sedation in the Dental Office (Dionne and Laskin 1986). As in any procedure involving deep sedation, the patient should be fasting, and an intravenous line inserted as soon as possible. Oral ketamine should not be administered by anyone without sufficient training in general anesthesia, or at facilities lacking necessary monitoring devices and proper anesthesia equipment (Creedon 1986). The technique can be used as a deep sedative alone or as an induction regimen for general anesthesia. Further work on establishing a dose/response curve will aid in predicting lighter levels of sedation, and in determining the incidence of postoperative emergence phenomena.

Dr. Rosenberg is associate professor of anesthesia, Tufts University School of Medicine, and associate professor of oral and maxillofacial surgery, Tufts University School of Dental Medicine, New England Medical Center, Boston, MA.

Adams RD, DeLong GR: Developmental and other congenital abnormalities of the nervous system. In Harrison's Principles of Internal Medicine. 9th ed. Isselbacher KJ, Adams RD, Braunwald E, Petersdorf RG, Wilson JD, eds. . New York: McGraw-Hill, 1980, pp 2004-13.

Barr ES, Wynn RL, Spedding RH: Oral premedication for the problem child: placebo and chloral hydrate. *J Pedod* 1:272-80, 1977.

Bragg CL, Miller BR: Oral ketamine facilitates induction in a combative mentally retarded patient. *J Clin Anesth* 2:121-22, 1990.

Creedon RL: Guidelines for the elective use of conscious sedation, deep sedation and general anesthesia in pediatric patients. *Anesth Prog* 33:189-90, 1986.

Dionne RA, Laskin DM (eds.): *Anesthesia and Sedation in the Dental Office*. New York: Elsevier Science Publishing Co., 1986.

Elkins TE, McNeeley SG, Rosen DA et al: A clinical observation of a program to accomplish pelvic exams in difficult-to-manage patients with mental retardation. *Adolesc Pediatr Gynecol* 1:195-98, 1988.

Grant IS, Nimmo WS, Clements JA: Pharmacokinetics and analgesic effects of i.m. and oral ketamine. *Br J Anaesth*, 53:805-9, 1981.

Hain WR: Oral Ketamine. *Anaesth* 38:810-11, 1983.

Morgan AJ, Dutkiewicz TWS: Oral Ketamine. *Anaesthesia* 38:293, 1983.

Musselman RJ, Dummett CO Jr: Hospitalization and general anesthesia for behavior control, in *Management of Dental Behavior in Children*, Ripa LW, Barenie JT eds. Littleton, NY: PSG Publishing, 1979, pp 205-38.

Nicolson SC, Betts EK, Jobes DR, Christianson LA et al: Comparison of oral and intramuscular preanesthetic medication for pediatric inpatient surgery. *Anesthesiology* 71:8-10, 1989.

White PF, Way WL, Trevor AJ: Ketamine — its pharmacology and therapeutic uses. *Anesthesiology* 56:119-36, 1982.

Study: why caries shows up mainly in poor children

A University of Connecticut Health Center research team wants to find out why tooth decay, once rampant in all children, now shows up primarily in low-income kids.

What is especially perplexing, said Norman Tinanoff, DDS, a pediatric dentist who heads the team, is that decay appears in some poor children but not in others. This mystery is the target of a study funded by a grant from the National Institute for Dental Research that will follow 500 children from the time they are 3 years old until they are 6.

Tinanoff noted that the dramatic drop in tooth decay in children over the last 30 years is credited largely to the use of fluorides, especially the fluoridation of public water supplies. He said the team will focus on why the widespread benefits have failed to reach some poor children.

"Fluoridated water doesn't seem to be enough for some kids," Tinanoff said. "There are other factors at play that overwhelm the benefits of fluoride." Tinanoff believes those other factors have psychological, social, and biological roots.