Reduction of Ketamine-induced Emergence Phenomena by Preoperative Promethazine

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A double-blind study of 100 healthy children was done in an attempt to investigate the effectiveness of promethazine (Phenergan) with regard to the incidence and severity of ketamine-induced emergence phenomena. This study indicates that preoperative administration of Phenergan syrup is effective in reducing postoperative psychomimetic reactions, recovery time, patient apprehension, and the incidence of postoperative nausea and vomiting.

Ketamine hydrochloride has been used as an anesthetic agent in pediatric outpatient oral surgery for over ten years. The major drawback in the use of this agent is its ability to induce psychomimetic manifestations, such as screaming and visual hallucinations, and nausea and vomiting on emergence. Several studies have been conducted with the use of various ataractic agents in an effort to reduce these side effects; however, the resulting reports have often been conflicting and lacking in consistency.

A review of records at the Louisiana State University Medical Center in Shreveport revealed that over the past two years, general anesthesia was given to approximately 200 pediatric outpatients in the Oral and Maxillofacial Surgery Clinic, using ketamine hydrochloride intramuscularly at a dose of 1 mg/lb either alone or in combination with nitrous oxide. Despite previous reports showing the occurrence of psychomimetic emergence phenomena in children to be less than 12%, it was determined from these records that some degree of postoperative hallucinations or excitement had occurred in approximately 21% of these patients. For this reason, preliminary investigations were initiated using several ataractic agents preoperatively in an attempt to reduce this problem. Of these, promethazine (Phenergan) appeared to be most promising. It was the purpose of this investigation, therefore, to examine the effects of promethazine with regard to the incidence and severity of ketamine-induced emergence phenomena in children undergoing outpatient oral surgery.

Materials and Methods

The double-blind study used 100 healthy children, ranging in age from 2 to 10 years, who required outpatient oral surgical procedures. Patients received either Phenergan syrup at a dose of 0.5 mg/lb, not to exceed a total dose of 25 mg, or a placebo syrup of the same color and consistency, 30 to 45 minutes before induction. These were administered and recorded by a registered nurse, and the surgeon was not informed which agent was used until after the patient had been discharged. Vital signs were recorded at intervals preoperatively, intraoperatively, and postoperatively until recovery was complete.

For induction of anesthesia, ketamine hydrochloride was administered intramuscularly at a dose of 1 mg/lb. Following induction, 2% lidocaine with 1:100,000 epinephrine was used to achieve local anesthesia and aid in hemostasis. The conditions of all patients were evaluated by the surgeon as to induction time, length of procedure, recovery time, and emergence phenomena. In addition, comments were recorded with regard to patient apprehension, acceptance of intramuscular injection, nausea, or any unusual occurrence.

Postoperatively, patients were placed in a dark, quiet room. They were then observed and categorized as follows:

1. Smooth recovery, without hallucinations, excitement, or loud crying.
2. Hallucinations and excitement. Patient agi...
tated, with loud crying and visual hallucinations or obvious dreaming with incoherent motor activity; some response to reassurance.

3. Severe hallucinations or excitement. Patient crying loudly and having obvious hallucinations; no response to reassurance.

Recovery was judged to be complete when the patient could sit up, recognize the parent, and perform coordinated movements.

Results

The dose of ketamine used was found to be adequate in all patients for the length of procedure performed. The average length of procedure was approximately 5½ minutes. Cardiovascular and respiratory dynamics did not differ significantly between the Phenergan and placebo groups, nor did the patients in this study differ significantly in this regard from those in other reports.5,6

Those patients receiving Phenergan preoperatively had a significant reduction in emergence phenomena. There were nine incidents of hallucination and excitement, three of them severe, among the 50 patients receiving placebo (18%). There was one such incident among the 50 patients receiving Phenergan (2%). No patient given Phenergan had nausea or vomiting, but four of the 50 given placebo (8%) had nausea, and two of these also had vomiting. A surprising finding was that the average recovery time was decreased by almost 12 minutes in the Phenergan group (33.8 min, compared with 45.4 min). Subjectively, on the basis of comments recorded during the study, the Phenergan group also had less apprehension and better acceptance of the intramuscular injection.

Discussion

The high therapeutic index and distinctive characteristics of ketamine hydrochloride have been well documented in previous reports.1,6,10 It is well suited for many of the short pediatric outpatient procedures performed by the oral and maxillofacial surgeon. However, one drawback in its use has been the development of emergence phenomena in some children, which is disrupting to the smooth flow of clinic work, tying up additional office personnel as well as frightening and upsetting other patients. Although some previous reports show only mild problems in children, one study reported prolonged reactions lasting up to a year.11 Our rate of adverse reactions was higher in the placebo group (18%) than the average reported rate of less than 12%. However, this may be due to differences in evaluating these phenomena and the degree of their severity. The patients characterized in this study as crying loudly and dreaming, but responding to reassurance, may have been excluded in other studies. In addition, a better environment for recovery may have been provided in other studies. The environment in this study was as good as is possible in a busy oral and maxillofacial surgery clinic but admittedly was not ideal. In any case, all patients classified as having emergence phenomena were disrupting to the clinic, and the incidence of these phenomena was significantly less in the Phenergan group. The decrease in recovery time in the Phenergan group could not be explained but was certainly beneficial, for obvious reasons.

On the basis of the clinical findings in this study, we believe that Phenergan is advantageous as a preoperative medication for use in conjunction with intramuscular ketamine general anesthesia for pediatric outpatients. It significantly reduced postoperative psychomimetic phenomena and nausea, while incidently providing less apprehension, better acceptance of the intramuscular injection, and reduced recovery time, thereby increasing the efficiency of the outpatient clinic.

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References