Tr. J. of Medical Sciences
29 (1999) 467-470

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Spinal Anesthesia in Children With Rectal Premedication With Midazolam, Ketamine and Atropine

Received: January 12, 1998

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Abstract: This study was designed to investigate the anxiolytic effects as well as acceptance of spinal anesthesia after rectally administered midazolam, ketamine and atropine for postoperative sedation in children. Spinal anesthesia is an easy and safe method in the pediatric age group especially for outpatients.

Spinal anesthesia was administered to 20 patients, aged between 2 months and 2 years, premedicated with 0.5 mg/kg midazolam + 5 mg/kg ketamine + 0.02 mg/kg atropine rectally. During vein puncture 14 children were asleep, 5 children were anxious and 1 child was crying and during spinal anesthesia 7 children were asleep, 10 children were anxious and 3 children were crying. Motor and sensorial blockade was observed in 17 childern. 12 of them were asleep, but 5 children were anxious during surgery.

We found that rectal premedication with midazolam, ketamine and atropine increases tolerance to vein puncture and spinal anesthesia.

Key Words: Spinal anesthesia, rectal premedication, midazolam, ketamine, atropine.

Introduction

The goal of pediatric premedication is to decrease anxiety and promote cooperation without depressing physiological functions. Sedation is recommended only in infants older than 6 to 8 weeks, during induction of anesthesia, vein puncture or spinal anesthesia. Rectal administration is an easy, painless and reliable way of premedication. Midazolam is anxyolitic, and produces amnesia, with a rapid onset and short half–life. It can be administered in several ways, including rectally with fast absorption (1). Ketamine is hypnotic and analgesic, and provides excellent cardiovascular and respitaroy stability. Ketamine may also be administered rectally (2–4).

General anesthesia especially in infants is associated with significant risk. Spinal anesthesia in the high risk infant and child is simple, safe and effective. The hazard of apnea in premature infants is reduced. It has been confirmed that spinal anesthesia can indeed be a safe alternative to general anesthesia in the pediatric age group (5).

This article summarises our experience with spinal anesthesia in 20 patients between 2 months and 2 years of age, who were given rectal premedication.

Materials and Methods

Following approval from the Ethics Committee, twently healthy children (ASA1), aged 2 months–2 years, scheduled for elective lower abdominal surgery, with a body weight ranging form 4 to 14 kg, were studied.

In the operating room after electrocardiographic monitorization, all children were rectally premedicated with a mixture of 0.5 mg/kg midazolam, 5 mg/kg ketamine, 0.02 mg/kg atropine with saline (total volume 10 ml). All children received this solution 3–4 cm proximal to the anal sphincter by means of a disposable applicator and syringe. The buttocks were held together for 1–2 minutes after the administration. Vein puncture and spinal anesthesia were applied approximately 10 and 20–25 minutes after the premedication, respectively.

The children were placed in the lateral decubitus position for spinal anesthesia, and the back was cleansed with an iodophore solution. Lumbar puncture was performed in the lowest most easily palpable interspace below the third lumbar vertebra using a 22 gauge 3.5 cm disposable spinal needle. Skin analgesia was not used. When a free flow of cerebrospinal fluid (CSF) was obtained, 1 mg/kg articaine with 10% dextrose (total volume 0.15 ml/kg) was administered. CSF was not aspirated before or after the injection in order to prevent significant dilution of the small volume of local anesthetic. After removal of the spinal needle, the children were placed in the supine position. The legs were observed for signs of paralysis. The level of sensorial block was assessed using the pinprick method. The time from spinal anesthesia to motor block, the level of sensorial block and the time of motor block were noted. The degree of sedation (sleeping, awake but calm, anxious and very anxious or crying) was obtained preoperatively, on the 5th and 10th minutes after the premedication, during vein puncture and spinal anesthesia and the beginning of the surgery. The heart rate was obtained at the same times, and complications were noted.

All children were monitored and observed postoperatively until they moved their legs. The Wilcoxon rank sum test was employed for the statistical analysis.

Results

Table 1 shows the demographic and clinical variables of the children. Preoperative diagnosis of the patients are presented in Table 2. Heart rates are presented as mean±SD in Figure 1.

Mean time from premedication to vein puncture was 12.05±4.36, mean time from premedication to spinal anesthesia was 23.55±5.61, mean time from spinal anesthesia to motor block was 4.33±2.72, mean duration of motor block was 28.47±12.01 and mean duration of surgery was 37.0±3.9. In 40% of the patients the level of sensorial block was T8, in 60% T10.

Table 1. Demographic and clinical variables of the children (n=20).

	Mean ± SD
Age (months)	12.4 ± 1.94
Weight (g)	9185 ± 696
Sex	18 male/2 female

Before premedication, 3 children (15%) were awake but calm, 17 children (85%) were crying. Five minutes after the rectal premedication, 1 child (0.5%) was asleep, 18 children (90%) were awake but calm, 1 child (0.5%) was anxious. Ten minutes after the rectal premedication, 11 children (55%) were asleep, 9 children (45%) were awake but calm. During vein puncture 14 children (70%) were asleep, 5 children (25%) were anxious, 1 child (0.5%) was crying and during spinal anesthesia 7 children (35%) were asleep, 10 children (50%) were anxious and 3 children (15%) were crying. All 10 patients who were anxious during spinal anesthesia calmed down after the skin was punctured and thereafter remained calm during the procedure. In the 3 children who were crying during spinal anesthesia 0.05 mg/kg midazolam was administered by the intravenous route, and the patients calmed down (Figure 2).

Motor and sensorial block was observed in 17 children (85%). And of these 12 children (70.5%) were asleep, but 5 children (25%) were anxious during surgery. Spinal anethesia was unsuccessful in 3 children (35%). The duration of motor block was sufficient for surgery in 6 children (27.5%), but 11 children (51%) with longer surgical time, 0.05 mg/kg iv midazolam or general anesthesia by mask was necessary.

The side effects (nystagmus hiccough and premature ventricular contractions) are documented in Table 3.

Discussion

In our study, we found that rectal premedication with 0.5 mg/kg midazolam plus ketamine and atropine increases acceptance of vein puncture and spinal anesthesia. The reason for using midazolam, a water soluble benzodiazepine, as premedication for outpatient anesthesia was its shorter action in order to avoid heavily sedated children and subsequent risk of aspiration during the postoperative period. Midazolam is an anxiolytic agent, which produces amnesia, but acts as a hypnotic in high doses (1). Amnesia and drowsiness increase significantly when ketamine is added to midazolam and

Table 2. Diagnosis of the children (n=20).

Preoperative diagnosis	Number of patients
Inguinal hernia	15 (bilateral in 2 children)
Hydrocele	2
Circumcision	2
Umbilical cyst	1

Table 3. Side effects.

Side effects	Number of children (%)
Nystagmus and hiccough	8 (40%)
Hiccough	1 (0.05%)
Premature ventricular contraction	1 (0.05%)

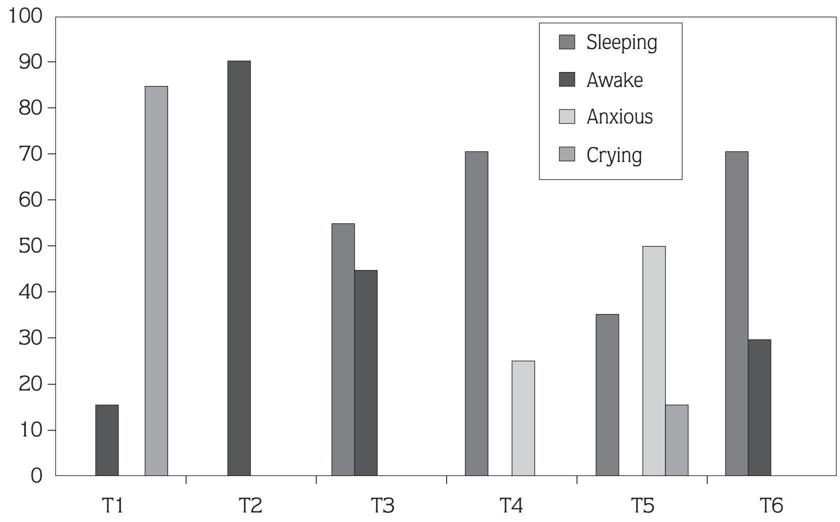

Figure 1. Degree of sedation of children. T1: Before the premedication, T2: Five minutes after the premedication, T3: Ten minutes after the premedication, T4: During vein puncture, T5: During spinal anesthesia, T6: Surgical preface.

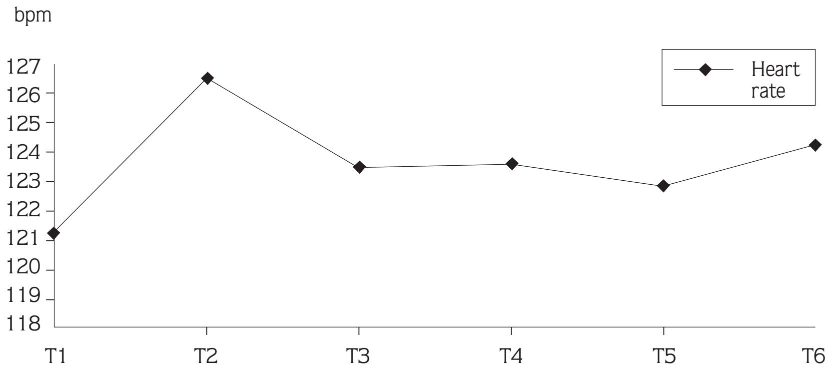

Figure 2. Heart rate of the children (mean±SD). T1: Before the premedication, T2: Five minutes after the premedication, T3: Ten minutes after the premedication, T4: During vein puncture, T5: During spinal anesthesia, T6: Surgical preface.

after rectal administration of the two drugs (4). As salivation may be a problem, the antisialogogue effect of atropine is desirable as an additive to midazolam and ketamine (4).

The dose of midazolam for rectal premedication is recommended as 0.15 to 0.5 mg/kg (6). Anderson et al. found that children receiving 0.4 or 0.5 mg/kg of midazolam showed an increase in the level of anxiolysis (8). In this study, 0.5 mg/kg midazolam was used in order to obtain anxiolytic effect during spinal anesthesia and operation.

Midazolam and ketamine were used by Lokken et al. in 24 children receiving dental therapy and a significant decrease in anxiety and amnesia was observed (8). In another study, sufficient amnesia and sedation in 83 children were obtained by rectal premedication with midazolam (9). Shane et al. compared 0.45 mg/kg midazolam and observed that the sedation degree was good in 87% of children (10). Beebe used 0.5 mg/kg midazolam+3 mg/kg atropine in four groups in different combinations (Group 1: midazolam + ketamine + atropine, Group 2: midazolam + atropine, Group 3: ketamine + atropine, Group 4: just atropine) (11). In the first group, none of the children were crying or anxious and 40% of the children were asleep. In the study of Piotrowski, 66.7% of children accepted the vein puncture very well, and 24% well (12). Similarly, we found that acceptance of vein puncture was very good in 70% and that spinal anesthesia was well tolerated in 35% of the children. This difference is probably caused by the fact that spinal anesthesia is a more painful and difficult procedure than vein puncture.

Inguinal operations in childhood are routinely performed in the outpatient setting. The child is returned to the family after the operation and the emotional stress of hospitalisation is avoided. The advantages of spinal anesthesia in infants and children have been described since 1909 (13). Abajian et al. in 1984 sparked an interest in the use of spinal anesthesia in high risk–infants (14). Subsequent articles have confirmed that spinal anesthesia is effective in this population.

Most experience indicates that a minumum volume of 0.2 ml is necessary in the preterm or newborn infant. Any smaller volume results in frequent failures or inadequate anesthesia (15, 16). In our study, the dose of articaine administered depended on the children's weight. We observed that spinal anesthesia with articaine is indicated in short lower abdominal surgical procedures (duration less than 30 minutes) because of its short duration of action.

It is concluded that rectal premedication with midazolam+ketamine and atropine increased tolerance to vein puncture and spinal anesthesia in children.

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