

PAEDIATRIC PREMEDICATION: The assessment of psychomotor function and sedation with oral midazolam and ketamine

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ABSTRACT

Objective: Premedication in children should aim to relieve anxiety and facilitate the induction of anaesthesia. This study was designed to assess the effects of midazolam and ketamine on preoperative psychomotor functions and sedation of children when given orally.

Methods: Twenty-six patients aged 3-6 years were included in the study. The day before surgery, children were familiarised with a postbox toy used for psychomotor performance assessment and the completion times were recorded. Forty-five minutes before surgery children were allocated into two groups (n=13). Group 1 received midazolam 0.5 mg/kg and group 2 received ketamine 5 mg/kg orally. In all the patients, before premedication, at 10th, 20th, 30th, 40th minutes of premedication, during separation from parents, arrival at the operating room and IV cannulation, sedation scores and oxygen saturations were recorded. At the 45th minute of premedication, the postbox tests were again performed. Side effects during induction and recovery were recorded.

Results: Both in groups 1 and 2, the postbox test completion times and sedation scores increased significantly after premedication. But 15% of children in group 1 and 46% of children in group 2 were afraid of IV cannulation. One had hallucinations in group 2.

Conclusion: Midazolam is superior to ketamine for paediatric oral premedication.

Key Words: Anesthetics, intravenous; midazolam
Anesthetics, intravenous; ketamine
Premedication; oral

INTRODUCTION

Preanaesthetic medication in children should aim to relieve anxiety facilitating both the separation from parents and induction of anaesthesia without prolonging recovery. Although various combinations of drugs and routes of administration have been used in children for premedication, controversies about optimum doses were reported.

Oral, sweetened midazolam is a suitable agent for paediatric premedication as it has anxiolytic properties. When administered 0.5 mg/kg orally, it is a safe and effective premedicant (1). With this dose and route of administration its peak sedative effect begins within 30 minutes (2). Another premedicant agent for children is ketamine. When given orally 5-10 mg/kg ketamine produces sedation without significant effects on cardiovascular and respiratory functions (3).

This study was designed to assess the effects of midazolam and ketamine on preoperative psychomotor functions and sedation of children when given orally.

MATERIALS AND METHODS

After the Hospital Ethical Committee approval and informed parental consent, 26 patients aged 3-6 years were studied. All patients were ASA physical status I outpatients scheduled for elective inguinal hernia repair and tonsillectomy / adenoidectomy.

A modified postbox test by Jones and Visram (1) was simplified for psychomotor performance assessment and each child was on his/her own control. A modified postbox test by Jones and Visram (1) was

simplified for psychomotor performance assessment and each child was on his/her own control. A behaviour scoring system modified from Wilton (4) was used to grade the sedation (Table I).

The day before surgery, each child was familiarised with a postbox toy and the completion times of his/her best performance on several occasions were recorded. On the day of surgery, 45 minutes before entering the operating room, the children were randomly allocated into two groups. Group 1 received midazolam 0.5 mg/kg and group 2 received ketamine 5 mg/kg orally sweetened with orange juice in a total volume of 5 cc.

All the children were monitored with a pulse oxymeter and were graded with 'Wilton behaviour scoring system' for sedation level before premedication. Following premedication, Wilton scores and oxygen saturations were recorded with 10 minute intervals during 40 minutes and after then, at the time of separation from parents, arrival at the operating room and during intravenous cannulation.

At the 45th minute, usually just before separation from parents, the postbox tests were again performed and the completion times were recorded.

As soon as arriving at the operating room, oxygen saturation, heart rate and blood pressure were monitored. Children having Wilton score of 1 during intravenous cannulation were induced with face mask.

All children were observed for laryngospasm and arrhythmias at the anesthetic induction.

All children were assessed for hallucination, agitation and recovery characteristics at the postoperative care unit.

RESULTS

There was no difference between groups with respect to age and weight ($p>0.05$) (Table II).

Both in groups 1 and 2, the postbox test completion times increased significantly after premedication ($p<0.05$) (Table III).

There was no significant difference between the postbox test completion times of groups neither before nor after premedication ($p>0.05$). Two patients in group 1 (15%) and one patient in group 2 (0.7%) were unable to complete the postbox test at 45th minute of premedication.

The peak sedative effect was observed at 40th minute in group 1 and at 30th minute in group 2 after premedication. In both groups sedation scores at the 30th minute of premedication were significantly higher than the scores before premedication ($p<0.001$), but there was no difference in Wilton scores of groups at any time interval ($p>0.05$) (Fig.1). Two patients in group 1 (15%) and six patients in group 2 (46%) had a Wilton score of 1 during i.v. cannulation and mask induction was performed in these patients.

In both groups, there was no significant difference between the SpO₂ values ($p>0.05$). None of the patients had arrhythmias or laryngospasm during induction period.

In the recovery room, hallucination-agitation and a nightmare was observed in a 6-year-old girl in group 2.

DISCUSSION

Although several studies documented the effectiveness of midazolam as a premedicant, the optimal dose and route of administration required for adequate preoperative sedation in children remains unclear. In a study by Mc Millan et al. (5) three doses of oral midazolam (0.5, 0.75, 1 mg/kg) were found to be effective for sedation and anxiolysis at 15-30 minutes after premedication, during separation from parents and mask induction. In this study, we showed that all the children treated with midazolam 0.5 mg/kg orally were sedated at any time interval. We observed that this dose and route of administration sedated children effectively for silent mask induction. We could perform intravenous induction to all patients in group 1 except the two. These two patients (15%) were afraid of intravenous cannulation. In a study by Jones et al. (6) two children (17%) were frightened of the IV cannula and two children (17%) has expressed fear of postoperative pain in a group of children given midazolam 0.5 mg/kg orally. Karl et al. (4) has given midazolam intranasally or sublingually 0.2 mg/kg and they also concluded that these patients were sedated at the time of separation from parents. These authors reported that the sublingual route was tolerated better than the intranasal route by children. We observed that the children were unpleasant after swallowing the bitter taste of midazolam even when given with orange juice.

In a study by Jones et al. (1) 0.5 mg/kg midazolam when given orally to 30 children aged 4-12 years, one of the children, was drowsy and ten of them (33%) were frightened of IV cannula. In our study, two children (15%) in midazolam treated group were afraid of cannulation and none of them were drowsy.

Table I. Wilton behaviour scoring system.

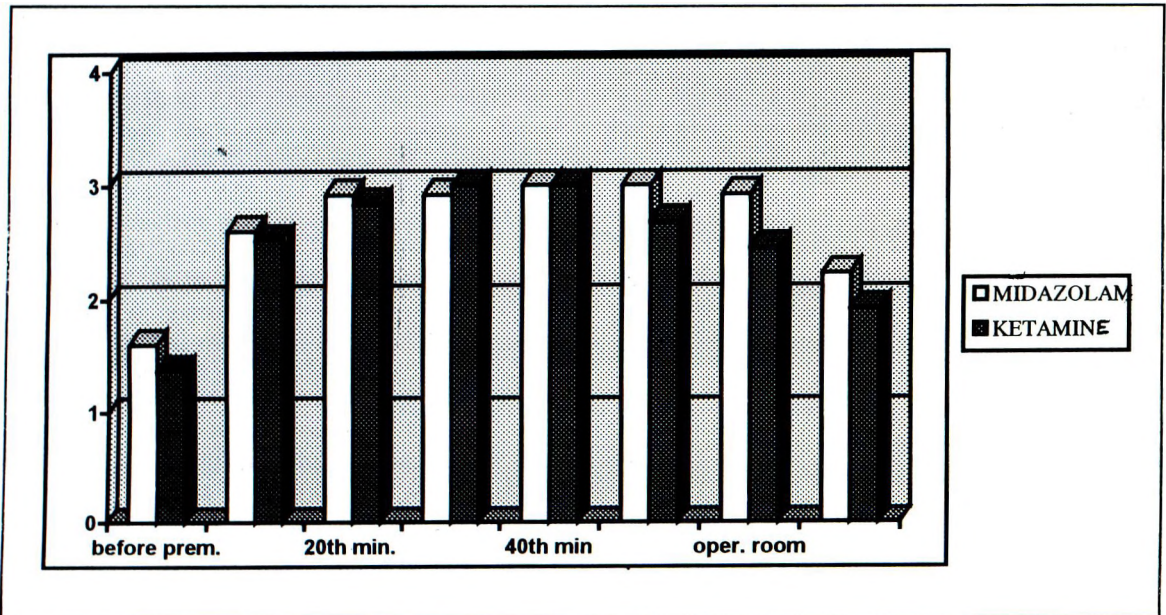
CRITERION	SCORE
Agitated, clinging to the parent and/or crying.	1
Alert, awake but not clinging to the parent; may whimper but not cry, anxious.	2
Calm, sitting or lying with eyes open; relaxed.	3
Drowsy, eyes closed but responds to minor stimulation.	4
Asleep, does not respond to minor stimulation.	5

Table II. The demographic data of patients (Mean±SD)

	GROUP 1	GROUP 2
AGE (years)	4.38±1.12	4.61±0.96
WEIGHT (kg.)	19.23±6.01	18.84±4.05

Table III. The postbox test completion times (sec) (Mean±SD)

	GROUP 1	GROUP 2
Before premedication	13.0±10.47	14.5±9.40
After premedication	25.0±34.53	27.0±25.05

**Fig. 1:** Wilton sedation scores of patients

The postbox test (PBT) required recognition of simple-colored shapes of fruits and placement in the matching holes therefore PBT required fine muscle control and coordination. Most children enjoyed the PBT completion assessment during this study as in the other authors' (1). These authors have observed the preoperative completion times of PBT as 18.1 sec. and after premedication the completion times

were prolonged significantly ($p < 0.001$) with the poorest psychomotor performance being at 30th minute. In this study, we observed that the completion times of postbox test at 45th minute of premedication was 42.9 sec. being significantly longer than the completion times of 17 sec. before premedication.

We observed neither desaturation nor laryngospasm during the study period in any of the patients treated with midazolam.

In the postoperative period, none of the children treated with midazolam 0.5 mg/kg orally, has shown dysphoria, blurred vision or prolongation of recovery in this study. In a study by Weldon et al. (2) there also has not been prolongation of recovery in children treated with midazolam 0.5 mg/kg orally, but Mc Millan et al. (5) have observed blurred vision and dsyphoria in two children with the doses of midazolam 0.75 mg/kg and 1 mg/kg orally, respectively.

Ketamine 2 mg/kg IM was recommended for sedation of young outpatient children with a notably short onset of about 3 minutes (7). Oral administration of ketamine 10 mg/kg was also reported to be advantageous for premedication in cardiac surgery patients (8). In a study by Audenaert et al. (9), when combination of ketamine 5 mg/kg and midazolam 0.2 mg/kg were given by nasal route, sedation without cardiac or respiratory effects was achieved in 58 young children, but these authors have not instituted a sedation scoring system and also a psychomotor performance assessment.

In this study, children treated with ketamine 5 mg/kg orally were also sedated after 30 minutes of premedication and psychomotor performance reduced significantly as with midazolam 0.5 mg/kg orally, but clinically less effective than the midazolam group as 46% of ketamine treated patients were frightened of IV cannulation during induction. Neither desaturation nor laryngospasm was observed in any patient but postoperatively one patient given ketamine had hallucination that prolonged the recovery.

Even though both midazolam and ketamine were safe and suitable in providing adequate sedation and reduced psychomotor performance in paediatric patients, we conclude that midazolam is superior to

ketamine as it provides more qualified and effective sedation during intravenous cannulation and it lacks the hallucinogenic effects of ketamine which also prolongs the recovery compared to midazolam.

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