Full Length Research Paper

Comparison of oral to intranasal administration of midazolam in children for dental surgery

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The current study compares intranasal and oral midazolam for effect on sedation for patients requiring dental procedure. Eighty subjects between the ages of 5 and 12 years were received randomly either intranasal (0.2 mg/kg) or oral (0.5 mg/kg) midazolam. The observer assessed the children for sedation level at the following time points: Immediately before the drug was administered, and 20 and 30 min after drug administration. There were significant differences in sedation level among the both groups at the time of parental separation and at the time of induction. 39 (97.5%) and 40 (100%) of the forty patients who received oral midazolam were calm, drowsy or asleep at 20 and 30 min after drug administration, respectively. For patients who received intranasal midazolam, 32 (80%) and 33 (82.5%) of the forty patients were either calm or drowsy at 20 and 30 min after drug administration, respectively. None of the patients from the intranasal group was rated as ‘asleep’. Oral midazolam was found to be statistically more effective in providing a better sedation level at the time of parental separation and at the time of induction than intranasal administration. Our findings indicate a tendency for oral midazolam to be more effective as a premedication in children before general anesthesia.

Key words: Preoperative, midazolam, sedation, anesthesia, pediatrics.

INTRODUCTION

The pre-anesthetic management in pediatric patients undergoing extensive dental treatment may be a challenge, particularly during parental separation and induction of anesthesia. The use of sedative premedication may help reduce the anxiety and minimizing psychological trauma related to anesthesia and surgery (Beeby and Hughes, 1980; Rosenbaum et al., 2009). MDZ is a potent, short-acting benzodiazepine sedative hypnotic, which has been used as a premedication for general anesthesia and routinely used in pediatric dentistry for dental procedures (Hartgraves and Primosch, 1994).

Midazolam has been used as a preoperative sedative agent via the intramuscular (Taylor et al., 1986), intranasal (Hartgraves and Primosch, 1994), oral (Hartgraves and Primosch, 1994; Cox et al., 2006), and rectal (Saint-Maurice et al., 1986) routes. The different routes of administration of midazolam (intranasal, oral, and rectal) for sedative premedication have been previously studied (Baldwa et al., 2012; Chhibber et al.,

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Table 1. Demographic data for the subjects.

<table>
<thead>
<tr>
<th>Group</th>
<th>Oral</th>
<th>Intranasal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age year mean (±SD)</td>
<td>7.12(1.713)</td>
<td>7.22(1.702)</td>
</tr>
<tr>
<td>Sex (M/F)</td>
<td>20/20</td>
<td>22/18</td>
</tr>
<tr>
<td>Weight kg mean (±SD)</td>
<td>26.75(5.633)</td>
<td>26.8(5.667)</td>
</tr>
<tr>
<td>Mean duration of anesthesia (min)</td>
<td>10</td>
<td>11</td>
</tr>
</tbody>
</table>

Table 2. Sedation score following oral and intranasal midazolam at 20 min after premedication administration.

<table>
<thead>
<tr>
<th>Group</th>
<th>Agitated</th>
<th>Alert</th>
<th>Calm</th>
<th>Drowsy</th>
<th>Asleep</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oral midazolam (N=40)</td>
<td>0</td>
<td>1</td>
<td>7</td>
<td>32</td>
<td>0</td>
</tr>
<tr>
<td>Intranasal midazolam (N=40)</td>
<td>1</td>
<td>7</td>
<td>7</td>
<td>25</td>
<td>0</td>
</tr>
</tbody>
</table>

Patient sedation was evaluated by observer using a five-point sedation scale:

1. Agitated, that is, clinging to parent and / or crying.
2. Alert, that is, a wake but not clinging to parent.
3. Calm, that is, sitting or lying comfortably with eyes spontaneously open.
4. Drowsy, that is, sitting or lying, comfortably with eyes closed but responding to minor stimulation.
5. Asleep, that is, eyes closed and not responding to minor stimulation.

The scale was devised by Wilton et al. (1988) to evaluate level of sedation of preschool children before anesthesia for surgery.

All children received a standardized GA by the same anesthesiologist. The anesthesiologist used mask induction with sevoflurane, oxygen and nitrous oxide. Thereafter, 2 g/kg of fentanyl and 0.5 mg/kg of atracurium were injected to facilitate tracheal intubation. Sevoflurane was the inhalational anesthetic used for maintenance of anesthesia. Patients’ electrocardiogram, arterial blood pressure, pulse oximetry, were monitored as part of standard GA procedure following surgery, the patient was taken to the post anesthesia care unit (PACU), where the patient was monitored continuously for 1 h. The means for weight and age were analyzed using a paired t test.

Findings for sedation levels were analyzed for statistically significant differences between the groups at 20 and 30 min after midazolam administration using the Mann-Whitney U test. Mann-Whitney U test at the 95% significance level was used to compare the effectiveness of the two routes of midazolam administration. P < 0.05 was considered significant. The independent variable in the study was drug administration route (oral or intranasal). The dependent variable in the assessment of the effectiveness of each route was the sedation level.

RESULTS

Both groups were comparable with respect to age, weight, and duration of anesthesia as shown in Table 1. The children’s reaction to being separated from their parent(s) 20 min after receiving premedication is displayed in Table 2. Changes in sedation levels following oral and intranasal midazolam at 30 min after
Table 3. Change at 30 min.

<table>
<thead>
<tr>
<th>Group</th>
<th>Agitated</th>
<th>Alert</th>
<th>Calm</th>
<th>Drowsy</th>
<th>Asleep</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oral midazolam (N=40)</td>
<td>0</td>
<td>0</td>
<td>7</td>
<td>32</td>
<td>1</td>
</tr>
<tr>
<td>Intranasal midazolam (N=40)</td>
<td>1</td>
<td>6</td>
<td>8</td>
<td>25</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 4. Vital signs values across procedure.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Oral</th>
<th>Intranasal</th>
</tr>
</thead>
<tbody>
<tr>
<td>HR (beat/minute)</td>
<td>90-128</td>
<td>92-120</td>
</tr>
<tr>
<td>SBP (mm hg)</td>
<td>70-120</td>
<td>80-120</td>
</tr>
<tr>
<td>DBP (mm hg)</td>
<td>50-70</td>
<td>50-80</td>
</tr>
<tr>
<td>Oxygen saturation</td>
<td>95-98</td>
<td>95-98</td>
</tr>
</tbody>
</table>

The results of the present study must be interpreted in light of the small number of participants enrolled. Further investigation with a greater number of patients might yield more meaningful results.

The dental anesthesiologist noted that the intranasal route of midazolam administration could produce a burning sensation when the liquid is administered. Furthermore, the drug can have a noxious taste when administered via the intranasal route and more can be lost through the oronasal pathway, rendering the intranasal midazolam less effective.

Time points should be appropriate to achieve onset time of premedication. Further investigation with a greater number of time points to determine the minimum time interval between oral midazolam or intranasal midazolam premedication and separation from parents to ensure a smooth separation should be conducted.

**Conclusion**

Oral midazolam could be more effective as a
premedication than the intranasal route was noted in the present study. When used before general anesthesia, the oral route allowed for a better sedation level at the time of parental separation and anesthesia than the intranasal route.

**Conflict of Interest**

The authors have not declared any conflict of interest.

**REFERENCES**


Baldwa NM, Padvi AV, Dace NM, Garasia MB. (2012). Atomised intranasal midazolam spray as premedication in pediatric patients: comparison between two doses of 0.2 and 0.3 mg/kg. J. Anesth. 26:346-50. http://dx.doi.org/10.1007/s00540-012-1341-6


