



## Original Research Article

## Intranasal midazolam: Sedation for radiological procedures

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## ABSTRACT

**Context:** Preoperative stress, anxiety and lack of cooperative ability of paediatric patients need sedation for radiological procedure.

**Aims:** The purpose of study is to compare and evaluate efficiency and safety of two doses of intranasal midazolam.

**Settings and Design:** This is a prospective Randomized controlled study of interventional type of study.

**Methods and Material:** Sixty patient of age 1 to 4 years, ASA 1 and ASA2 undergoing radiological procedure were randomly divided into two groups. Group A received 0.3 mg/kg and Group B received 0.5 mg/kg of intranasal spray of midazolam. Sedation score, haemodynamic variations, ease of separation, Venepuncture response and side effect were studied.

Statistical analysis used: Data analysis was performed using SPSS for Windows, version 20.0 (SPSS Inc., Chicago, IL)

**Results:** Higher sedation score achieved earlier with 0.5mg/kg dose, Parenteral separation and IV line insertion was more easier with 0.5 mg/kg dose but recovery slight delay compare to 0.3 mg/kg dose after 20 min of procedure completion but there was no much prolongation of recovery time, at 30 min of all patient discharged in both groups.

**Conclusions:** High Sedation score, parenteral separation and response to IV line was earlier and easier with 0.5 mg/kg dose.

**Key Messages:** Intranasal Midazolam is safe and effective as sedative in paediatric radiological procedure.

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## 1. Introduction

Many drugs as premedication available for easy separation of children from parents and allay environment. Route of administration is important for reduction of anxiety. Benzodiazepines are commonly used drug having anxiolytic, sedative, anticonvulsant & anaesthetic property. Unique advantage of Midazolam like short duration of action, highly lipophilic, high water solubility, reduction of stress response and rapid recovery favour its more common use in Benzodiazepines. Midazolam has been used for preoperative sedation by various routes like intravenous, intramuscular, oral, rectal and sublingual. Each has own advantages and disadvantages.<sup>1</sup> Intranasal route has

rapid and reliable onset of action. Avoidance of painful injection, easy administration has made it convenient way to premedicate the children.<sup>1</sup>

## 2. Subjects and Methods

This is a prospective Randomized controlled study of interventional type conducted after obtaining the Institutional ethical committee approval.

Sixty pediatric patients of ASA physical status 1 or 2, age between 1 to 4 years scheduled for elective MRI studies were taken and written informed consent taken from the parents/ guardian of patients standard NPO guideline were followed. The exclusion criteria were: Age above 4 years, known allergy or hypersensitivity reaction to midazolam, organ dysfunction, General contraindication for MRI (like

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cardiac pacemaker Ferro-magnetic implants etc.), Major respiratory and cardiac diseases.

Patient of group A received Intranasal midazolam 0.3 mg/kg while Group B received Intranasal midazolam 0.5 mg/kg. Intranasal midazolam was administered 15 min before MRI scan in presence of Parents. The time of drug administration Baseline HR, Respiratory rate & Oxygen saturation were noted. HR, RR & SpO<sub>2</sub> monitored every 10 min up to 90 min and at time of discharge. The degree of separation was assessed using Ramsay sedation score. A sedation score more than 3 was considered as statistically significant and at time patient separated from parents and Venepuncture was done. At that time response to parents separation and IV cannulation recorded. If sedation score not achieved >3 than at 15 min patient taken to the procedure.

In both group the following data was recorded and compared.

1. Sedation score
2. Ease of parenteral separation
3. Response to Venepuncture
4. Recovery score
5. Side Effects

All patient were taken for radio imaging chamber. Patients were observed in recovery zone after completion of procedure. They are observed for complication like nausea, vomiting, respiratory depression, excessive sedation etc.

### 3. Results

This study is implemented on sixty paediatric patients aged between 1 to 4 years who are randomly divided into two groups. Group A receives 0.3 mg / kg and Group B receives 0.5 mg/kg intranasal Midazolam spray.

Demographic data and ASA physical status distribution were statistically not significant in both group. (Table 1)

In haemodynamic baseline parameter has no significant difference. Heart rate at 10 min after drug administration, pulse rate of Group A 139/min while Group B 128/min, showed statistically significant difference between the Group ( $P < 0.005$ ). Heart rate of group B were slightly lower than Group A but significant difference not seen in both group (except 10 min). (Table 2)

Time of procedure between group A and Group B was not significant. (Table 3)

Mean sedation score analysed at 5 min, 10 min and 15 min. At 5 min group A was  $1.63 \pm 0.76$  and group B was  $1.93 \pm 0.63$ , at 10 min group A was  $2.7 \pm 0.91$  and group B was  $3.06 \pm 0.63$ , at 15 min group A was  $3.4 \pm 0.49$  and group B was  $3.86 \pm 3.4$ . So at 10 min 40 % of group A patients have sedation score > 2 while in group B 100% patients have sedation score > 2. At 15 min 40% patient of group A have sedation score > 3 while in group B 86.66 % patients have sedation score > 3.(Table 4)

Separation from parents was much easier in both group compared to Normal saline.<sup>1</sup> But in comparison of two different doses intranasal midazolam 63 % children of group A and 76% group B separate easily from parents. (Table 6)

In group A 73% children responded satisfactorily to Venepuncture whereas in group B 83 % responded satisfactorily.

In our study crying due to intranasal irritation seen and some of patient experienced sneezing otherwise no any serious adverse effects detected in children.<sup>2</sup>

Recovery score is recorded at 10 min, 20 min and 30 min after procedure is over. At 20 min, 12 children of Group A & 6 children of Group B had sedation score >8. At 30 min almost 100 % patient had score > 8. (Table 5)

### 4. Discussion

Paediatric premedication is a very challenging situation. Midazolam has proven to be a safe and effective drug in alleviating preoperative anxiety, provide smooth transition from anaesthesia and preventing adverse postoperative outcomes. Furthermore studies evaluating intranasal route of administration, also concluded midazolam to be safe and effective premedication. Intra nasal midazolam has emerged an excellent alternative to IV, IM, rectal and other invasive routes in children.<sup>3</sup>

In this study, Intranasal Midazolam used in dose of 0.3 mg/ kg and 0.5 mg / kg because earlier report suggest that dose less than 0.2 mg / kg was ineffective.<sup>4,5</sup> So we tried to find out which dose gives better effect without any side effect.

We selected children in the age group of 1 to 4 year with both sexes equally distributed in both the groups because this age group is best susceptible to separation anxiety. The demographic parameters of this study were comparable. There were no statically difference ( $P > 0.05$ ) among the groups in age, sex, weight and ASA status.<sup>2</sup> Similar result was seen in study of F. Preerbhay et al, A. M. Elsheikhomer et al. They achieved 97 % of children in study present with sedation score 2. In study of A. A. Chokshi et al mean sedation score at 10 min and 15 min were highly significant.

In present study 10 min after drug administration all patients achieved sedation scale of 2. Results of present study are consistent with the studies of H. S. Rawat et al. A higher percentage of children 22% achieved a relaxed and calm state and cooperated well during all stages of treatment with the 0.5 mg/kg, whereas only 9% of children achieved a relax and calm state with 0.3mg/kg dose of intranasal Midazolam. This confirms that the 0.5 mg/kg dose produced greater anxiolytic than 0.3 mg/kg dose.<sup>2</sup> At 15 min, sedation score of group A was 3.4 compared to group B was 3.8, which shows statistically significant difference( $P < 0.05$ ) suggest higher dose of intranasal midazolam achieved high level of sedation.

**Table 1:** Asa grade wise distribution

	Group A	Group B	P value
Grade I	20 (66.6%)	16 (53.3%)	0.6417
Grade II	10 (33.3%)	14 (46.6%)	
Total	30 (100%)	30 (100%)	

**Table 2:** Duration of surgery wise distribution

	Group A	Group B	't' test	P value
Total	21.03 ± 2.35	21.66 ± 2.45	1.016	0.3136

**Table 3:** Pulse rate wise distribution

	Group A	Group B	't' test	P value
0 min	141.06 ± 19.98	141.43 ± 19.94	0.071	0.9430
10 min	128.3 ± 19.95	139.2 ± 21.20	2.051	0.0448
20 min	125.96 ± 19.21	134.26 ± 21.69	1.569	0.1221
30 min	121.16 ± 14.51	128.73 ± 20.01	1.677	0.0988
45 min	119.83 ± 14.60	123.36 ± 18.32	0.825	0.4126
60 min	119.93 ± 12.76	120.3 ± 17.43	0.093	0.9256
90 min	120.96 ± 12.86	123.26 ± 15.75	0.620	0.5380

**Table 4:** Mean sedation score distribution

	Group A	Group B	't' test	P value
0 min	1.1 ± 0.3	1.13 ± 0.4	0.219	0.7436
05 min	1.63 ± 0.76	1.93 ± 0.63	1.665	0.1014
10 min	2.7 ± 0.91	3.06 ± 0.63	1.782	0.0801
15 min	3.4 ± 0.49	3.86 ± 0.34	4.225	0.0001

**Table 5:** Recovery time wise distribution

	Group A	Group B	't' test	P value
10 min	7.36 ± 0.49	7.33 ± 0.47	-0.242	0.8096
20 min	8.16 ± 0.37	8.43 ± 0.50	2.378	0.0207
30 min	9.2 ± 0.40	9.23 ± 0.43	0.280	0.7806

**Table 6:** Recovery time wise distribution

	Group A		Group B		X <sup>2</sup>	P value
	≤ 8 min	> 8 min	≤ 8 min	> 8 min		
10 min	30	0	30	0	0	1.0000
20 min	25	5	17	13	5.079	0.0242
30 min	0	30	0	30	0	1.0000

Satisfactory sedation score (sedation >3) was observed at 10 min in group B while in group A was achieved at 15 min suggest rapid onset of sedation with higher dose.

In hemodynamics, baseline pulse rate had not significant difference but at 10 min after drug given pulse rate of group A 139 / min while in group B 128/ min, shared statistically significant difference but at 20 min, 30, 45, 60 and 90 min, HR of group B was lower than group A but difference was not significant. This results matches with study of F. Preerbhay et al & A. M. Elsheikhomer et al. Respiratory rate and oxygen saturation remain within normal limits in all patient and no statistically significant difference seen

between two group.<sup>2</sup> This result similar of study of F. Preerbhay et al & A. M. Elsheikhomer et al. and Devulapalli et al.

Aldrete recovery score was used to assess discharge time. A score more than 8 is consider for discharge. At 20 min of procedure 13 patient of group A and only 5 patient of group B has score more than 8. This difference is statistically significant. At 30 min 100 % patient have score more than 8. So recovery was slight earlier in Group A at 20 min as compare to group B. similar result seen in F. Preerbhay et al & A. M. Elsheikhomer et al who found higher proportion of patients achieving discharge sooner in 0.3 mg/kg dose. In

study of H.S.Rawat et al children discharge at 30 min.

Children of both groups have no any serious side effects such as apnoea, respiratory distress, cardiovascular instability etc. Crying seen in 14 children of study group that is due to unacceptability of intranasal spray. Similar result seen in study of F. Preerbhay et al & A. M. Elsheikhomer et al Minor side effect like sneezing and coughing seen in 12 patient of study group.

## 5. Conclusion

Intranasal sedation with midazolam in both 0.3 mg/kg and 0.5 mg/kg dose was safe and effective for radiological procedures. The dose of 0.5 mg/kg was achieved earlier high sedation score and recovery takes slight higher time than 0.3 mg/kg dose with stable hemodynamic and without any side effect.

## 6. Source of Funding

None.

## 7. Conflict of Interest

None.

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