e-ISSN: 0976-822X, p-ISSN:2961-6042

Available online on http://www.ijcpr.com/

International Journal of Current Pharmaceutical Review and Research 2026; 18(6); 964-968

Original Research Article

Comparative Study of Efficacy of Intranasal Midazolam versus Intramuscular Midazolam in Control of Acute Seizures in Children in the Age Group of 6 Months to 12 Years

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Received: 01-03-2026 / Revised: 15-04-2026 / Accepted: 21-05-2026
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Conflict of interest: Nil

Abstract

Background and Aims: Seizures in children account for up to 25% of all pediatric emergencies. Midazolam has been administered by various routes, however, there are concerns about bioavailability when the drug is administered by other routes. In our study, we are comparing the efficacy of non-intravenous routes of the midazolam administration for the control of seizures.

Methodology: This was a prospective simple randomized control trial conducted at a tertiary care center in India after ethical approval from October 2018 to December 2020.Children in the age group of 6 months to 12 years were enrolled. Enrolled patients were block randomized into two group's namely intranasal and intramuscular midazolam group. The time taken to abort the seizure was noted and monitoring of vital parameters was done.

Results: Out of the 247 enrolled patients, 123 patients received intranasal midazolam whereas 124were treated with intramuscular midazolam. It was observed that there was no statistically significant difference in the therapeutic efficacy of midazolam used for abortion of acute seizures either through the intranasal route or intramuscular route (p=0.4496). There was no difference in the need of a second anticonvulsant for abortion of acute seizures in both the groups and the incidence of recurrence of seizures within 60 minutes of administration of midazolam through either route.

Conclusions: Intranasal midazolam is equally effective as intramuscular in controlling acute seizures in pediatric patients.

Keywords: Intranasal Midazolam vs Intramuscular Midazolam, Pediatric Epilepsy.

DOI: 10.25258/ijcpr.18.6.155

Introduction

Seizures are caused by abnormal electrical discharges from the brain resulting in abnormal involuntary, paroxysmal, motor, sensory, autonomic or sensorial activity [1], associated with significant morbidity and mortality in the pediatric age group. Seizures increase the cerebral metabolic rate exceeding the oxygen and glucose supply to the brain leading to brain ischemia and neuronal death.[2] Thus it is important to control seizures rapidly to minimize the systemic as well as brain damage. [3] Recently, due to its lipid solubility, 3-4 times more potency (compared to diazepam) and availability of various routes of administration like i.v., rectal, intramuscular and intranasal; use of Midazolam has increased [2]. Currently emphasis is not just on control, but also on the speed of control of acute seizures4.Intranasal route assumes more relevance for its convenience in drug administration. Various separate studies of intranasal [5,6,7,8] and intramuscular [5,9,10,11,

12,13] use of Midazolam have found both the routes of administration of to be effective and safe. Hence, the purpose of our study is to compare efficacy of both the routes of administration of Midazolam in aborting acute seizure episodes in children in the age group of 6 months to 12 years presenting to the Emergency department or those developing acute seizure episodes in ward.

Materials and Methods

This was a simple randomised trial conducted between October 2018 to December 2020 in a tertiary care centre of Marathwada region.247 children between age 6 months to 12 years who came in active convulsions were enrolled in the study after approval from institutional ethics committee, amongst which123 patients received intranasal midazolam and 124 patients received intramuscular midazolam. The patients who had hypoglycaemia, hypocalcaemia or were treated elsewhere for the present illness and referred were excluded from the study.The sample size was calculated to be 110 in each group. Enrolled patients were block randomised into 2 groups, namely intranasal and intramuscular midazolam group. The patients were given intranasal midazolam as 0.2mg/kg, and 0.2mg/kg via intramuscular route in another group. The time taken to abort an episode of seizure was measured using a stop clock by a trained health care worker. The patient was monitored for vital parameters every 15 minutes and data was collected appropriate statistical tests were used to analyse the data. If the patients require another antiepileptic, and other details including adverse effects were documented.

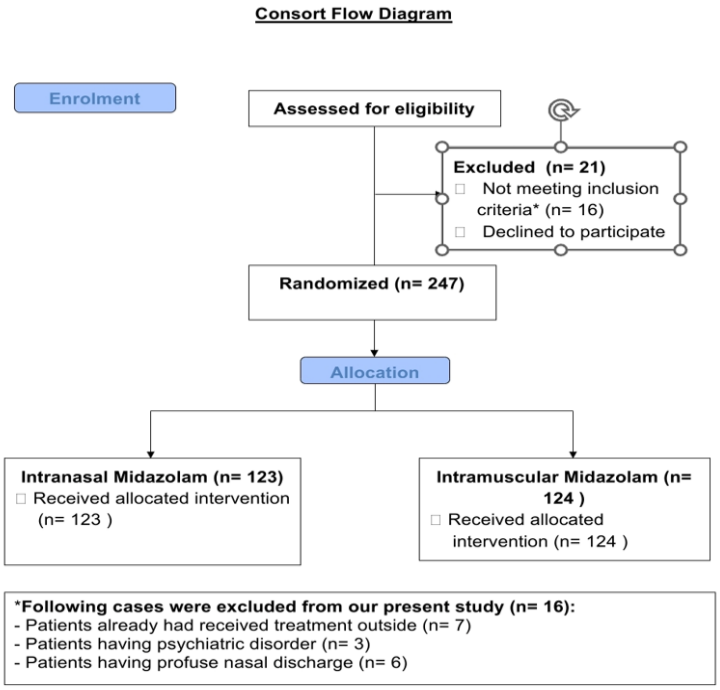

Figure 1:

Table 1: Basic demographic data and diagnosis

Result	Intranasal	Intramuscular	P value
Age			
<1year	1(0.81)	1(0.81)	
1-5years	74(60.16)	78(62.90)	0.794
6-10 years	39(31.71)	33(26.61)	
11-12 years	9(7.32)	12(9.68)	
Gender			
Male	78(63.41)	79(63.71)	0.96
Female	45(36.59)	45(36.29)	
Family history			
Yes	11(8.95)	10(8.06)	0.804
No	112(91.05)	114(91.94)	
Birth history			
Yes	12(9.76)	15(12.10)	0.555
No	111(90.24)	109(87.90)	

Developmental history Yes No	 25(20.33) 98(79.67)	 29(23.39) 95(76.61)	 0.560
Type of Convulsion Focal GTCS Others	 9(7.32) 114(92.68) 0(0)	 12(9.68) 110(88.71) 2(1.61)	 0.659
Diagnosis Febrile Neuroinfection Seizure disorder Other	 74(60.16) 16(13.01) 30(24.39) 0.3(2.44)	 65(52.42) 22(17.74) 34(27.42) 03(2.42)	 0.389
Mean duration of symptoms before administration of drugs	12.86 min	14.77min	0.124

Results

A total of 247 children of age group 6 months to 12 years were enrolled. Male to female ratio was 1.7:1. Most of the children were from 1-5 years (60%). The 2 groups were having similar baseline characteristics in terms of age, gender, family history, birth history, developmental history and type of convulsion as illustrated in Table 1. In this comparison, and the intranasal administration shows a statistically significant advantage of shorter duration of administration of drug. Findings of vital parameters in two groups are as per Table No. 2. The readings of heart rate and respiratory rate did not differ statistically. The mode of administration of drug did not differ from each other in terms of treatment failure, i.e., need of second antiepileptic, or any severe side effects.

Table 2: comparison between intranasal and intramuscular midazolam

Result	Intranasal midazolam	Intramuscular midazolam	Significance
Mean time from arrival to administration of drug	24.69 sec	28.16 sec	**<0.0001**
Mean heart rate at the time of convulsions At 15 min At 30min At 60 min	 101.7/min 95.25/min 90.78/min 88.55/min	 102.17/min 95.62/min 91.5/min 88.58/min	 0.152 0.364 0.252 0.489
Mean respiratory rate At the time of convulsions At 15 min At 30min At 60 min	 29.98/ min 25.56/min 23.18/min 22.39/min	 29.03/min 25.61/min 23.29/min 22.72/min	 0.140 0.462 0.419 0.240
Recurrence of convulsions within 60 mins Yes No	 10(8.13) 113(91.87)	 9(7.26) 115(92.74)	 0.797
Need of second anticonvulsant Yes No	 1(0.01) 122(99.98)	 1(0.01) 123(99.98)	 0.995
Mean Time required from administration of drug to abortion of convulsion Focal GTCS	 233.66 sec 188.21 sec	 201.5 sec 191.43sec	
Median Time required from administration of drug to abortion of convulsion Focal GTCS	 230sec 193sec	 198.5sec 195 sec	

Discussion

Seizure is one of the most frequently encountered emergencies in paediatrics in both developed as well as developing countries. Longer the duration of seizure, higher is the risk for neurological damage Administration20 of antiepileptic drugs to control acute seizures can be a challenging task in ER. Various drugs like diazepam, lorazepam have been used. However, intranasal midazolam is being preferred to treat seizures. [20] Previous studies on use of intramuscular midazolam showed mean time to control seizures being 198 seconds. The mean time to control seizures using intranasal midazolam was 3.5+/- 1.8 seconds and 3.58 +/- 1.68 seconds in studies done by Lahatet.al. And Mahmoudian et. al. In our study time required was 193 seconds and 195 seconds for intranasal and intramuscular midazolam respectively, which was comparable with previous studies.

Our study also showed that time required to administer the intranasal midazolam (24.68 sec) after arrival was shorter and statistically significant as compared to intramuscular midazolam (28.28 sec). This finding was supported by [14,15,16]

Our study have stated that there were no serious side effects like respiratory depression, bradycardia or need of mechanical ventilation which was comparable to other studies. [17,18]

We found that intranasal midazolam is as effective as intramuscular midazolam for controlling acute seizure. There is adequate literature available stating preferential use of intranasal midazolam, but very few studies have compared intramuscular and intranasal administration.

Our study had few limitations including smaller sample size, and a single centre study.

Conclusion

The intranasal midazolam is equally effective as intramuscular in controlling acute seizures in paediatric patients with no serious side effects.

References

1. Veena Kalra, Seizures, Ch. Central Nervous System, Ghai Essential Pediatrics, 8th Edition, Pg.552
2. Seizure/ Status Epilepticus; U of M: Peds PCCM-Teaching files. Available from URL:http://www.peds.umn.edu/division/PCCM/teaching/acp/seize.html
3. Shah I, Deshmukh CT. Intramuscular midazolam vs intravenous diazepam for acute seizures. The Indian Journal of Pediatrics. 2005 Aug;72(8):667-70.
4. Sharma R, Harish R. Comparative Study on the Efficacy of Intranasal Midazolam versus Intravenous Midazolam and Intravenous Diazepam in Convulsing Neonates and Children. Pediatr Oncall J. 2014 Jan; 11:9-11.
5. Rivera RA, Segnini MI, Baltodano AR, Pérez VI. Midazolam in the treatment of status epilepticus in children. Critical care medicine. 1993 Jul1;21(7):991-4.
6. Vaswani RK, Banpurkar AM. A prospective randomised study on intranasal midazolam versus rectal diazepam for acute seizures in children. Int JBasic Appl Med Res. 2016; 5(4):680-8
7. Bhattacharyya M, Kalra V, Gulati S. Intranasal midazolam vs rectal diazepam in acute childhood seizures. Pediatric neurology. 2006 May1;34(5):355-9.
8. Mohandas U, Noushsdali AK; A Study on Intranasal Midazolam versus Rectal Diazepam in Acute Seizures, IOSR Journal of Dental and Medical Sciences (IOSR-JDMS), Volume 15, Issue 5 Ver. I(May 2016), PP 27-32.
9. McDonagh, TJ, Jelinek GA, Galvin GM. Intramuscular midazolam rapidly terminates seizures in children and adults. Emergency Medicine. 1992Jun;4(2):77-81.
10. Egli M. Relief of status epilepticus after im administration of the new short-acting benzodiazepine Midazolam (Dormicum). Excerpta Medica, ICS. 1981; 44:548.
11. Silbergleit R, Lowenstein D, Durkalski V, Conwit R, NETT Investigators. Lessons from the RAMPART study—and which is the best route of administration of benzodiazepines in status epilepticus. Epilepsia.2013 Sep;54:74-7.
12. Gunawan PI, Kurniawan MR, Saharso D. The Efficacy and Safety of Intramuscular Midazolam Compared with Rectal Diazepam for Anticonvulsant in Children. Pak Pediatr J. 2015;39(4):227-32.
13. Kumar MV, Sumi KV. Intranasal versus intravenous midazolam in control of generalized tonic–clonic seizures in children. Indian Journal of Child Health. 2017 Jun 25;4(2):159-61.
14. Lahat E, Goldman M, Barr J, Eshel G, Berkovitch M. Intranasal midazolam for childhood seizures. Lancet. 1998;352(9128): 620.
15. Mittal P, Manohar R, Rawat AK. Comparative study of intranasal midazolam and intravenous diazepam sedation for procedures and seizures. Indian J Pediatr 2006;73(11):975-8.
16. Millikan D, Rice B, Silbergleit R. Emergency Treatment of status epilepticus: current thinking. Emerg Med Clin North Am 2009;27(1):101-13.
17. Kutlu NO, Yakinci C, Dogrul M, Durmaz Y. Intranasal midazolam for prolonged convulsive Seizures. Brain Dev 2000;22(6):359-61.
18. Fişgin T, Gürer Y, Senbil N, et al. Effects of intranasal midazolam and rectal diazepam on

acute convulsions in children: prospective randomized study. J Child Neurol 2002;17(2): 123-6.
19. Mahmoudian T, Zadeh MM. Comparison of Intranasal midazolam with intravenous diazepam for treating acute seizures in children. Epilepsy Behav 2004;5(2):253-5.
20. Javadzadeh M, Sheibani K, Hashemieh M, Saneifard H. Intranasal midazolam compared with intravenous diazepam in patients suffering from acute seizure: a randomized clinical trial. Iran J Pediatr. 2012 Mar;22(1):1-8. PMID: 23056852; PMCID: PMC3448208.