



ORIGINAL

Intramuscular midazolam versus intravenous diazepam for treatment of seizures in the pediatric emergency department: A randomized clinical trial[☆]



J.L. Portela^{a,b}, P.C.R. Garcia^{c,d,*}, J.P. Piva^{e,f}, A. Barcelos^{b,g}, F. Bruno^{c,d},
R. Branco^h, R.C. Tasker^{i,j}

^a Pediatric Emergency Department, Hospital Universitário de Santa Maria, Universidade Federal de Santa Maria (UFSM), Av. Roraima, Prédio 22, Campus, Bairro Camobi, Zip Code: 97105 900, Santa Maria, RS, Brazil

^b School of Medicine, Pontifícia Universidade Católica do Rio Grande do Sul (PUCRS), Porto Alegre, RS, Brazil

^c Department of Pediatrics, School of Medicine, PUCRS, Brazil

^d Hospital São Lucas, PUCRS, Porto Alegre, RS, Brazil

^e Department of Pediatrics, School of Medicine, Universidade Federal do Rio Grande do Sul (UFRGS), Brazil

^f Hospital de Clínicas de Porto Alegre, Porto Alegre, RS, Brazil

^g Pediatric Emergency Department, Hospital Universitário de Santa Maria, UFSM, Brazil

^h Pediatric Intensive Care Locum Consultant, Addenbrooke's Hospital, Cambridge, UK

ⁱ Pediatric NeuroCritical Care Program, CHMC, Boston, USA

^j Harvard Medical School, USA

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KEYWORDS

Seizures;
Benzodiazepines;
Status epilepticus;
Epilepsy

Abstract

Aim: To compare the therapeutic efficacy of intramuscular midazolam (MDZ-IM) with that of intravenous diazepam (DZP-IV) for seizures in children.

Design: Randomized clinical trial.

Setting: Pediatric emergency department.

Patients: Children aged 2 months to 14 years admitted to the study facility with seizures.

Intervention: Patients were randomized to receive DZP-IV or MDZ-IM.

Main measurements: Groups were compared with respect to time to treatment start (min), time from drug administration to seizure cessation (min), time to seizure cessation (min), and rate of treatment failure. Treatment was considered successful when seizure cessation was achieved within 5 min of drug administration.

[☆] Work center: Pediatric Emergency Department, Hospital Universitário de Santa Maria Universidade Federal de Santa Maria (UFSM), Av. Roraima, Prédio 22, Campus, Bairro Camobi, Zip Code: 97105-900 – Santa Maria, RS, Brazil.

* Corresponding author.

E-mail addresses: celiny@pucrs.br, celiny@terra.com.br (P.C.R. Garcia).

Results: Overall, 32 children (16 per group) completed the study. Intravenous access could not be obtained within 5 min in four patients (25%) in the DZP-IV group. Time from admission to active treatment and time to seizure cessation was shorter in the MDZ-IM group (2.8 versus 7.4 min; $p < 0.001$ and 7.3 versus 10.6 min; $p = 0.006$, respectively). In two children per group (12.5%), seizures continued after 10 min of treatment, and additional medications were required. There were no between-group differences in physiological parameters or adverse events ($p = 0.171$); one child (6.3%) developed hypotension in the MDZ-IM group and five (31%) developed hyperactivity or vomiting in the DZP-IV group.

Conclusion: Given its efficacy and ease and speed of administration, intramuscular midazolam is an excellent option for treatment of childhood seizures, enabling earlier treatment and shortening overall seizure duration. There were no differences in complications when applying MDZ-IM or DZP-IV.

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PALABRAS CLAVE

Convulsiones;
Benzodiazepínicos;
Estado epiléptico;
Epilepsia

Midazolam intramuscular frente a diazepam intravenoso para el tratamiento de convulsiones en el Servicio de Urgencias Pediátricas: ensayo clínico aleatorizado

Resumen

Objetivo: Comparar la eficacia de midazolam intramuscular (MDZ-IM) con la de diazepam intravenoso (DZP-IV) para convulsiones en niños.

Diseño: Ensayo clínico aleatorizado.

Ámbito: Servicio de Urgencias Pediátricas.

Pacientes: Niños de entre 2 meses y 14 años internados con convulsiones.

Intervención: Los pacientes fueron aleatorizados para recibir DZP-IV o MDZ-IM.

Mediciones principales: Tiempo hasta el inicio del tratamiento (minutos), tiempo hasta el cese de la convulsión (minutos), y tasa de fallo del tratamiento. El tratamiento fue considerado exitoso cuando las convulsiones cesaron en los 5 min tras la administración del medicamento.

Resultados: Completaron el estudio 32 niños (16 por grupo). No fue posible obtener acceso intravenoso en 4 pacientes (25%) del grupo DZP-IV. El tiempo entre la internación y el tratamiento fue menor en el grupo MDZ-IM (2,8 vs. 7,4 min; $p < 0,001$), así como el tiempo hasta el cese de la convulsión (7,3 vs. 10,6 min; $p = 0,006$). En 2 niños de cada grupo (12,5%), las convulsiones continuaron después de 10 min de tratamiento. No hubo diferencias entre los grupos en los parámetros fisiológicos o eventos adversos ($p = 0,171$); un niño (6,3%) del grupo MDZ-IM presentó hipotensión, y 5 del grupo DZP-IV (31%) presentaron hiperactividad o vómitos.

Conclusión: Dada su eficacia, facilidad y velocidad de administración, MDZ-IM es una excelente opción para el tratamiento de convulsiones infantiles, posibilitando un tratamiento precoz y reduciendo la duración de la convulsión. No hubo diferencias en las complicaciones al aplicar MDZ-IM o DZP-IV.

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Introduction

Background

Epileptic seizures are a common cause of pediatric emergency department visits. The vast majority of seizures cease within 5 min; however, some are prolonged and may progress to status epilepticus (SE).¹ SE, defined as continuous or recurring seizure activity lasting longer than 30 min, is associated with major morbidity rate and carries a mortality rate of up to 20%.² Prolonged seizure activity leads to failure of cerebral autoregulation, which consequently reduces cerebral blood flow and eventually results in cerebral hypoxia.^{2,3}

Importance

Benzodiazepines (BZDs) have been used in the urgent care of seizures for over 40 years, and are considered first-line therapy for this purpose. The BZDs, which act on GABA_A receptors, are effective in the treatment of various types of seizure, have a rapid onset of action after intravenous administration, excellent penetration into the central nervous system, and a good safety profile. Persistent generalized seizure activity increases benzodiazepine resistance; therefore, there is a consensus as to the need for immediate treatment of seizures.^{2,4–8} Lorazepam, diazepam, and midazolam are the three BZDs used in this setting. Lorazepam is the drug of choice due to its rapid

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