HSPI The Open Access Publisher

IJCEO INTERNATIONAL JOURNAL OF CLINICAL AND EXPERIMENTAL OPHTHALMOLOGY
ISSN 2577-140X

Case Report

New Onset Seizures in a Child Taking 0.01% Atropine Drops

Caitlyn Mulcahey[1]* and Steve Gerber[2]

[1]Indiana University School of Medicine, USA
[2]Clinical Professor, Indiana University School of Medicine, USA

Abstract

Introduction: Myopia is a refractive disorder commonly diagnosed in childhood that follows a progressive course. It is considered a global epidemic with nearly 23% of the world's population being diagnosed with this condition. Moreover, myopia is increasing in prevalence worldwide, demonstrated by studies in Asian and Western populations. This has important implications as myopic progression to high myopia is associated with significant morbidity and visual disability if left untreated. Of these treatments, the pharmacologic agent atropine has demonstrated the greatest efficacy in reducing myopia progression.

Case report: This is a case report of an 11-year-old male treated with 0.01% atropine drops for myopia progression that developed new-onset seizures. The seizures were characterized as benign epilepsy with central temporal spikes and ceased when drops were discontinued.

Discussion: Atropine 1% drops have previously been associated with new or increased seizure activity in a handful of case reports, however, it is our knowledge that this is the first report associated with 0.01% drops. This is important given the growing use of 0.01% drops as well as higher concentrations such as 0.025 % and 0.05% for the treatment of pediatric myopia.

Conclusion: While it cannot be proven that the drops were causative in the seizure events, it is important to consider prior seizures as a relative contraindication to the use of these drops. Atropine has the potential to exacerbate seizure activity, so it is possible that the 0.01% atropine drops played a role in the patient's seizures. Also, any diagnosis of new-onset seizures in pediatric patients should prompt discontinuation of drops at seizure onset.

More Information

***Address for correspondence:**
Caitlyn Mulcahey, Indiana University School of Medicine, USA, Email: catmulca@iu.edu

Submitted: August 07, 2023
Approved: August 16, 2023
Published: August 17, 2023

How to cite this article: Mulcahey C, Gerber S. New Onset Seizures in a Child Taking 0.01% Atropine Drops. Int J Clin Exp Ophthalmol. 2023; 7: 003-005.

DOI: 10.29328/journal.ijceo.1001051

Keywords: Myopia; Seizures; Epilepsy; Atropine; Pediatrics; Cycloplegic agents

Check for updates

OPEN ACCESS

Introduction

Myopia is considered a global epidemic with nearly 23% of the world's population being diagnosed with this condition [1]. Myopia is increasing in prevalence worldwide, demonstrated by studies in Asian and Western populations [1-3]. This has important implications as myopic progression to high myopia is associated with significant morbidity and visual disability if left untreated [4]. Myopia is most frequently diagnosed before the age of 10 and then follows a progressive course [5]. While there is a long history of variable treatments to slow progression, optical devices (contact lenses and spectacles) and pharmacologic treatments have received the most investigation. Of these treatments, the pharmacologic agent atropine has demonstrated the greatest efficacy in reducing myopia progression in pediatric patients [6,7].

Case presentation

The patient is an 11-year-old male with a past ophthalmologic history of bilateral myopic degeneration that was started on 0.01% atropine drops to slow myopia progression. Five months after starting drops, the patient had two seizure events six weeks apart. The seizure events occurred early in the morning upon awakening and demonstrated right facial twitching that progressed to rhythmic jerking of his right upper and lower extremities. The patient then lost consciousness as the convulsions became generalized. History revealed no prior seizure events, no familial component and no developmental abnormalities. His parents discontinued the drops immediately after the second seizure event.

With subsequent neurological evaluation, the MRI was reported as normal, and the EEG was reported as right centrotemporal spikes, consistent with Rolandic seizures or benign epilepsy with central temporal spikes (BECTS). The patient was prescribed midazolam nasal spray as needed for seizures greater than 5 minutes and atropine drops were discontinued. The patient experienced no further seizures or facial twitching and continued to follow as needed with neurology.

Discussion

Historically, atropine has been theorized to lower the seizure threshold due to its anticholinergic effects causing central nervous system depression [7]. This increased risk often disqualifies patients with a history of epilepsy from randomized control trials of anticholinergic eye drops [8]. And yet, this increased risk of seizures largely remains in theory with fewer than a dozen cases reported since 1890 [9-11]. In these few reported cases, 1% atropine drops have been implicated in either new-onset seizures or increased frequency of seizures in pre-existing epilepsy [9,10]. To the best of our knowledge, there are no known reports of 0.01% atropine drops resulting in new-onset seizures in the pediatric population. This is of particular interest given the growing use of 0.01% atropine drops to slow myopic progression in children.

Although 1% atropine has been used for myopia treatment, there is a growing body of literature to support that lower concentrations may be nearly equally efficacious, while limiting the side effects of higher concentrations that often cause patients to drop out of long-term studies [8,12-14]. Moreover, using lower concentrations may reduce cumulative long-term ocular and systemic effects or rebound myopia [13]. In the most recent studies, 0.01% atropine has shown efficacy in reducing spherical equivalent and axial length progression in pediatric patients compared to no intervention or placebo drops [12-14].

In this case, the patient experienced two episodes of right-sided facial twitching that progressed to rhythmic jerking of the right upper and lower extremities. The patient then lost consciousness and progressed to a generalized seizure. These events occurred early in the morning upon awakening. The patient had no prior history of seizures nor a significant family history of epilepsy. The child also had a noncontributory developmental history. Subsequent EEG demonstrated central temporal spikes, and MRI was without structural abnormality. This evaluation was consistent with Rolandic epilepsy, also known as benign epilepsy with centrotemporal spikes (BECTS).

This form of epilepsy peaks between the ages of 7-10 and often resolves by puberty. There tends to be a strong genetic component with 25% of patients having a family history [15]. Episodes occur most frequently at night or upon awakening. The seizures are typically partial - even going unnoticed if occurring during the night. It is rare for these seizures to progress to status epilepticus or sudden unexplained death. Our patient was prescribed midazolam nasal spray as needed for status epilepticus but did not require other medications. The 0.01% atropine drops were discontinued due to the risk of lowering the seizure threshold, and the patient did not have further seizure events.

While it cannot be proven that the drops were causative in the seizure events, it is important to consider any association or risk for new-onset seizures in the pediatric population. The literature has reported cases of 1% atropine drops associated with new onset or increased frequency of seizures, but never before reported this association with 0.01% drops. The support for the use of 0.01% drops over higher concentrations has been to decrease side effects, or ocular and systemic toxicity without sacrificing efficacy. However, if this patient's seizures are associated, the argument that lower concentrations reduce systemic toxicity may need to be evaluated further.

In addition, it is worth noting that some studies have demonstrated that lower concentration atropine drops are not produced with accuracy and can have variable concentrations than labeled [16,17]. These particular drops were not specifically tested for their actual atropine concentration, so it is not possible to know the potential contribution to the seizure events.

Conclusion

This case report suggests additional consideration is necessary for pediatric patients treated with 0.01% atropine drops for myopia progression that have a prior history of seizures. Atropine has the potential to exacerbate seizure activity, so it is possible that the 0.01% atropine drops played a role in the patient's seizures. Also, any new onset seizures should prompt immediate discontinuation of 0.01% atropine therapy, and complete workup of underlying seizure type and treatment options.

References

1. Holden BA, Fricke TR, Wilson DA, Jong M, Naidoo KS, Sankaridurg P, Wong TY, Naduvilath TJ, Resnikoff S. Global Prevalence of Myopia and High Myopia and Temporal Trends from 2000 through 2050. Ophthalmology. 2016 May;123(5):1036-42. doi: 10.1016/j.ophtha.2016.01.006. Epub 2016 Feb 11. PMID: 26875007.
2. Foster PJ, Jiang Y. Epidemiology of myopia. Eye (Lond). 2014 Feb;28(2):202-8. doi: 10.1038/eye.2013.280. Epub 2014 Jan 10. PMID: 24406412; PMCID: PMC3930282.
3. Williams KM, Bertelsen G, Cumberland P, Wolfram C, Verhoeven VJ, Anastasopoulos E, Buitendijk GH, Cougnard-Grégoire A, Creuzot-Garcher C, Erke MG, Hogg R, Höhn R, Hysi P, Khawaja AP, Korobelnik JF, Ried J, Vingerling JR, Bron A, Dartigues JF, Fletcher A, Hofman A, Kuijpers RW, Luben RN, Oxele K, Topouzis F, von Hanno T, Mirshahi A, Foster PJ, van Duijn CM, Pfeiffer N, Delcourt C, Klaver CC, Rahi J, Hammond CJ; European Eye Epidemiology (E(3)) Consortium. Increasing Prevalence of Myopia in Europe and the Impact of Education. Ophthalmology. 2015 Jul;122(7):1489-97. doi: 10.1016/j.ophtha.2015.03.018. Epub 2015 May 13. PMID: 25983215; PMCID: PMC4504030.
4. Tay SA, Farzavandi S, Tan D. Interventions to Reduce Myopia Progression in Children. Strabismus. 2017 Mar;25(1):23-32. doi: 10.1080/09273972.2016.1276940. Epub 2017 Feb 6. PMID: 28166436.
5. Lawrenson JG, Shah R, Huntjens B, Downie LE, Virgili G, Dhakal R, Verkicharla PK, Li D, Mavi S, Kernohan A, Li T, Walline JJ. Interventions for myopia control in children: a living systematic review and network meta-analysis. Cochrane Database Syst Rev. 2023 Feb 16;2(2):CD014758. doi: 10.1002/14651858.CD014758.pub2. PMID: 36809645; PMCID: PMC9933422.

6. Huang J, Wen D, Wang Q, McAlinden C, Flitcroft I, Chen H, Saw SM, Chen H, Bao F, Zhao Y, Hu L, Li X, Gao R, Lu W, Du Y, Jinag Z, Yu A, Lian H, Jiang Q, Yu Y, Qu J. Efficacy Comparison of 16 Interventions for Myopia Control in Children: A Network Meta-analysis. Ophthalmology. 2016 Apr;123(4):697-708. doi: 10.1016/j.ophtha.2015.11.010. Epub 2016 Jan 27. PMID: 26826749.

7. Broderick ED, Metheny H, Crosby B. Anticholinergic Toxicity. 2023 Apr 30. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan–. PMID: 30521219.

8. Walline JJ, Lindsley KB, Vedula SS, Cotter SA, Mutti DO, Ng SM, Twelker JD. Interventions to slow progression of myopia in children. Cochrane Database Syst Rev. 2020 Jan 13;1(1):CD004916. doi: 10.1002/14651858.CD004916.pub4. PMID: 31930781; PMCID: PMC6984636.

9. Wright BD. Exacerbation of akinetic seizures by atropine eye drops. Br J Ophthalmol. 1992 Mar;76(3):179-80. doi: 10.1136/bjo.76.3.179. PMID: 1540568; PMCID: PMC504203.

10. Wygnanski-Jaffe T, Nucci P, Goldchmit M, Mezer E. Epileptic seizures induced by cycloplegic eye drops. Cutan Ocul Toxicol. 2014 Jun;33(2):103-8. doi: 10.3109/15569527.2013.808654. Epub 2013 Jul 2. PMID: 23815170.

11. Fitzgerald DA, Hanson RM, West C, Martin F, Brown J, Kilham HA. Seizures associated with 1% cyclopentolate eyedrops. J Paediatr Child Health. 1990 Apr;26(2):106-7. doi: 10.1111/j.1440-1754.1990.tb02399.x. PMID: 2113819.

12. Azuara-Blanco A, Logan N, Strang N, Saunders K, Allen PM, Weir R, Doherty P, Adams C, Gardner E, Hogg R, McFarland M, Preston J, Verghis R, Loughman JJ, Flitcroft I, Mackey DA, Lee SS, Hammond C, Congdon N, Clarke M. Low-dose (0.01%) atropine eye-drops to reduce progression of myopia in children: a multicentre placebo-controlled randomised trial in the UK (CHAMP-UK)-study protocol. Br J Ophthalmol. 2020 Jul;104(7):950-955. doi: 10.1136/bjophthalmol-2019-314819. Epub 2019 Oct 25. PMID: 31653669.

13. Moriche-Carretero M, Revilla-Amores R, Gutiérrez-Blanco A, Moreno-Morillo FJ, Martinez-Perez C, Sánchez-Tena MÁ, Alvarez-Peregrina C. Five-year results of atropine 0.01% efficacy in the myopia control in a European population. Br J Ophthalmol. 2023 Jun 2:bjo-2022-322808. doi: 10.1136/bjo-2022-322808. Epub ahead of print. PMID: 37268328.

14. Zhao Y, Feng K, Liu RB, Pan JH, Zhang LL, Xu ZP, Lu XJ. Atropine 0.01% eye drops slow myopia progression: a systematic review and Meta-analysis. Int J Ophthalmol. 2019 Aug 18;12(8):1337-1343. doi: 10.18240/ijo.2019.08.16. PMID: 31456926; PMCID: PMC6694061.

15. Amrutkar C, Riel-Romero RM. Rolandic Epilepsy Seizure. 2022 Aug 8. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan–. PMID: 30521266.

16. Richdale K, Skidmore KV, Tomiyama ES, Bullimore MA. Compounded 0.01% Atropine-What's in the Bottle? Eye Contact Lens. 2023 Jun 1;49(6):219-223. doi: 10.1097/ICL.0000000000000990. Epub 2023 Apr 5. PMID: 37022143; PMCID: PMC10194055.

17. Richdale K, Tomiyama ES, Novack GD, Bullimore MA. Compounding of Low-Concentration Atropine for Myopia Control. Eye Contact Lens. 2022 Dec 1;48(12):489-492. doi: 10.1097/ICL.0000000000000932. Epub 2022 Sep 7. PMID: 36083169.