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Case Report

Increase of Intraocular Pressure after Application of 0.125% Atropine Eye Drops in Children Using Ortho-K Contact Lenses

Yu Ri Lee Jehyung Hwang Jae Suk Kim

Department of Ophthalmology, Sanggye Paik Hospital, Inje University College of Medicine, Seoul, Republic of Korea

Keywords
Atropine eye drop · Intraocular pressure · Myopia · Ortho-K

Abstract
Introduction: This report describes a case of elevated intraocular pressure following the use of 0.125% atropine eye drops in a child wearing orthokeratology lenses. ***Case Presentation:*** A 9-year-old boy presented to our clinic with myopia, and he had been wearing orthokeratology lenses overnight for 23 months. He was treated previously with a once-daily administration of topical 0.125% atropine eye drops to reduce myopic progression. Three days after treatment, his intraocular pressure was 36 mm Hg in the right eye and 32 mm Hg in the left eye. Two days after the discontinuation of atropine eye drops and overnight orthokeratology lenses, the intraocular pressure was 18/20 mm Hg in both eyes. ***Conclusion:*** Low-dose atropine eye drops can cause intraocular pressure elevation in patients wearing overnight orthokeratology lenses. Although it may resolve promptly, short-term follow-up with intraocular pressure checks may be necessary for the early diagnosis and treatment of this complication.

Yu Ri Lee and Jehyung Hwang contributed equally to this work.

Correspondence to:
Jae Suk Kim, s5535@paik.ac.kr

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Introduction

Myopia, one of the most common ocular diseases, is primarily characterized by blurry vision if left uncorrected. With the increasing severity of myopia, the risk increases for serious eye complications that can cause irreversible blindness, such as rhegmatogenous retinal detachment, myopic choroidal neovascularization, glaucoma, cataract, and myopic macular degeneration [1–3]. Myopia is common in East Asia and is currently the leading cause of preventable blindness in children and adolescents [4]. Preventing the progression of myopia is crucial for clinicians, researchers, and medical practitioners. Several interventions have been attempted to reduce myopic progression, including increasing outdoor activity; optical methods such as orthokeratology, bifocal, progressive spectacles, and defocus spectacles; and pharmacological methods, including atropine eye drops [5–8]. Some have shown no effect, whereas others were effective with limitations. Atropine is widely used in Asian countries to reduce the progression of myopia. The daily use of low-dose atropine (<0.125%) is the most common treatment for myopia because it is less likely than other methods to cause adverse and rebound effects while remaining efficacious for the treatment of myopia [9, 10]. The primary ocular side effects of topical atropine eye drops include photophobia, loss of accommodation resulting in blurred near vision, and local allergic responses.

The present case report describes an unusual complication after administration of 0.125% atropine eye drops. Herein, intraocular pressure elevation was observed following the use of low-dose atropine eye drops in a patient with myopia. The CARE checklist has been completed by the authors for this case report, attached as online supplementary material (for all online suppl. material, see https://doi.org/10.1159/000538332).

Case Presentation

A 9-year-old boy presented to our clinic with myopia, and he had reported a history of myopic progression that had not been arrested using orthokeratology lenses for 23 months. He had no medical history of glaucoma or pigment dispersion syndrome. On ocular examination, his best-corrected distance visual acuity (BCVA) was 20/20 in both eyes. The refractive power was −1.50 Dsph −0.25 Dcyl Axis 110 in the right eye and −2.00 Dsph −0.25 Dcyl Axis 50 in the left eye. The refractive corneal power was 42.18 D in the right eye and 41.77 D in the left eye. On slit-lamp examination, the cornea and conjunctiva were unremarkable, and there was no evidence of active inflammation in the anterior chamber or neovascularization in the iris. Corneal topography showed slight lateral decentration in both eyes (shown in Fig. 1). The axial length was 25.39 mm in the right eye and 25.24 mm in the left eye, and the anterior chamber depth was 3.79 mm in the right eye and 3.77 mm in the left eye, as measured by AL-Scan (Nidek Co., Ltd., Gamagori, Japan) (shown in Fig. 2). The intraocular pressure measured using air-puff non-contact tonometer was 20 mm Hg in the right eye and 21 mm Hg in the left eye. An intraocular pressure of between 10 and 21 mm Hg is defined as the normal range, as reported in previous studies.

On ocular examination 2 weeks after the patient discontinued the use of orthokeratology lenses, his refraction was −2.50 Diopter in the right eye and −3.50 Diopter in the left eye, and the best-corrected distance visual acuity was 20/20 in both eyes. We recommended that the patient's parents refit the orthokeratology lens; however, the parents wanted to keep the orthokeratology lens because of cost considerations. The patient was prescribed topical 0.125% atropine eye drops two times a day in both eyes to prevent myopia progression and maintain the orthokeratology lenses.

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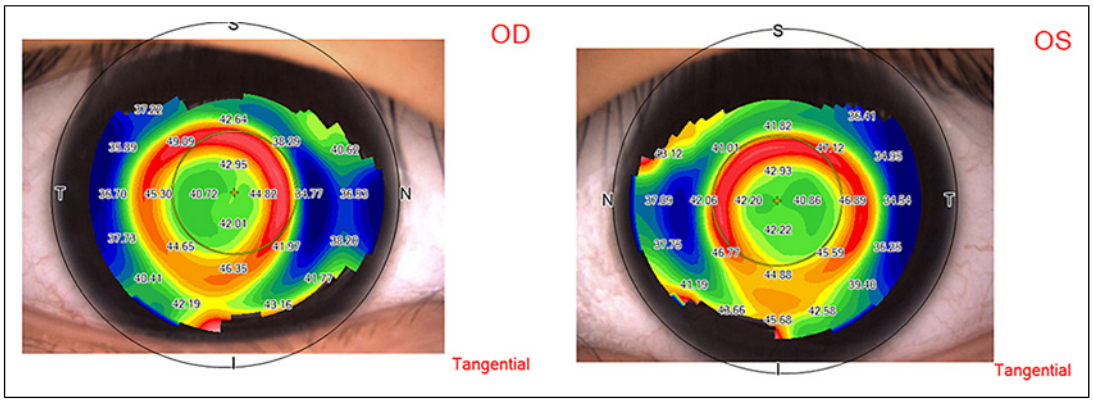

Fig. 1. Coreal topography image of both eyes.

Three days after the treatment, his intraocular pressure rose to 36 mm Hg in the right eye and 32 mm Hg in the left eye, and the best-corrected distance visual acuity was 20/200 in the right eye and 20/100 in the left eye. On slit-lamp examination, the cornea and conjunctiva were unremarkable, and there was no evidence of active inflammation in the anterior chamber. The patient did not use any eye drops or medications, including steroids, did not eat any unusual foods, and did not exhibit any behaviors that increased intraocular pressure, such as Valsalva.

Because of the high intraocular pressure, the patient was started on dorzolamide and timolol eye drops twice daily, and 0.125% atropine eye drops and orthokeratology lenses were discontinued. One day later, the intraocular pressure was 26/24 mm Hg, and 2 days later, the intraocular pressure was 21/20 mm Hg. Two months after the discontinuation of all eye drops and orthokeratology lenses, the best-corrected distance visual acuity was 20/20 in both eyes, and the intraocular pressure was 19/20 mm Hg.

Discussion and Conclusions

Atropine is considered to retard axial length elongation in myopic eyes, and some studies have reported that it reduces the progression of axial myopia [9, 10]. Common side effects of atropine eye drops include photophobia and near-vision compromise, and several prior studies have investigated the use of various atropine concentrations to control myopia. The Atropine in the Treatment of Myopia 2 study reported that children receiving higher doses of atropine showed a lower prevalence of rapid myopia progression than those receiving lower-dose atropine [11]. However, Lin et al. [12] reported that axial length elongation can be retarded by lower-dose atropine treatment and that low-dose atropine has fewer visual side effects and less chance of a rebound effect than higher-dose atropine [13]. The daily use of low-dose atropine (<0.125%) is the most common treatment for myopia because this dose is less likely to cause adverse and rebound effects while remaining adequate for the treatment of myopia [13]. As mentioned above, most of the reported side effects of atropine include glare and decreased near vision due to dilated pupils, as well as allergic reactions to the drug. Except for confirmed eye complications, the potential complication was that atropine led to elevated intraocular pressure, owing to pupil dilation [14]. However, there have been no reports of rapidly increasing intraocular pressure after the administration of 0.125% atropine. Bukhari et al. [14] reported that 0.01% atropine eye drops did not considerably increase the risk of elevated intraocular pressure.

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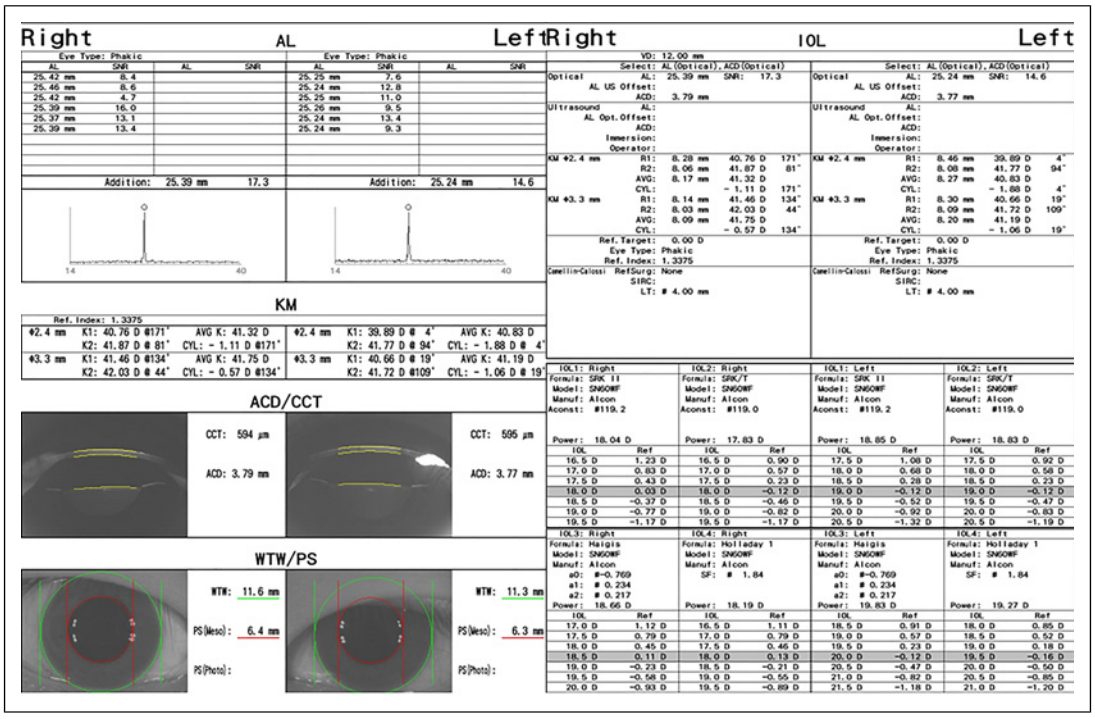

Fig. 2. Optical biometry image of both eyes.

In this case, the patient did not have uveitis or a history of elevated intraocular pressure, did not use eye drops or medications, including steroids, and did not eat any unusual foods. The patient did not engage in any exercise or activity that would increase his intraocular pressure. On slit-lamp examination, the cornea was clear, and there was no evidence of active inflammation in the anterior chamber.

In addition, since this patient was using orthokeratology lenses, the lenses may have pressed the cornea and narrowed the anterior chamber without pressing the periphery of the cornea. This patient's anterior chamber was deeper than 3.5 mm in both eyes, and reportedly, atropine instillation can shorten the axial length but deepen the anterior chamber [14]; therefore, it is unlikely that the increased intraocular pressure was caused by the narrowing of the angle. In a large series of myopic children treated with atropine, Wu et al. [15] reported that atropine may elevate intraocular pressure when its baseline level exceeds 14 mm Hg. The patient described in this case report had a high baseline intraocular pressure of 20/21 mm Hg, which may have increased his susceptibility to intraocular pressure elevation following atropine administration. Because most patients who use low doses of atropine are children, and because intraocular pressure measurement is not routinely performed due to the difficulty of measuring intraocular pressure in children, an increase in intraocular pressure that does not affect vision may go undetected.

To the best of our knowledge, this is the first reported case of acute intraocular pressure elevation after the application of 0.125% atropine eye drops. Although it may resolve promptly, short-term follow-up of the intraocular pressure check may be necessary for the early diagnosis and treatment of this complication, especially in patients using overnight orthokeratology lenses. Prior to prescribing atropine, careful consideration of the eye's parameters is crucial. Furthermore, in cases with non-standard anatomical parameters, the use of atropine should be avoided to ensure patient safety.

Statement of Ethics

Written informed consent was obtained from the parent of the patient for publication of the details of their medical case and any accompanying images. This retrospective review of patient data did not require ethical approval in accordance with the local guidelines. All procedures were performed in accordance with ethical standards and the Declaration of Helsinki.

Conflict of Interest Statement

The author declares that he has no conflicts of interest related to the publication of this study.

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Author Contributions

Substantial contributions to the conception or design of the work: J.S.K. Acquisition of data for the manuscript: J.H. and J.S.K. Drafting the manuscript: Y.R.L.

Data Availability Statement

All data generated or analyzed during this study are included in this article and its online supplementary material, and further inquiries can be directed to the corresponding author.

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