Clinical Case Report

Medicine®

OPEN

Sumatriptan-induced angle-closure glaucoma

A case report

Cherng-Ru Hsu, MD, Yi-Hao Chen, MD, PhD, Ming-Cheng Tai, MD, PhD, Da-Wen Lu, MD, PhD*

Abstract

Rationale: Drug-induced bilateral angle-closure glaucoma is a rare event and should be treated correctly and promptly to prevent visual loss.

Patient concerns: We report a rare case of sumatriptan-induced bilateral angle-closure glaucoma in a young woman with migraine, and explore the possible mechanism.

Diagnoses: We describe the clinical outcome of a patient with sumatriptan-induced bilateral angle-closure glaucoma. The patient presented with bilateral acute elevation of intraocular pressure (IOP) and myopic shift.

Interventions: The clinical symptoms and signs resolved rapidly after treatment with a topical cycloplegic agent, topical steroid, and aqueous suppressant.

Outcomes: Based on the suspicious of malignant glaucoma, we prescribed topical phenylephrine, whose application immediately lowered the IOP. All symptoms resolved after treatment with a long-acting cycloplegic agent, topical steroid, and aqueous suppressant for 3 days.

Lessons: We presume that the mechanism underlying sumatriptan-induced bilateral angle-closure glaucoma may be correlated to the malignant glaucoma. Timely diagnosis and appropriate treatment are essential for resolving this ophthalmic emergency.

Abbreviations: μm = micrometer, 5-HT = 5-hydroxytryptamine 5-HT, AAC = acute angle closure, IOP = intraocular pressure, mg = milligram, mm = millimeter, mm Hg = millimeter of *mercury*.

Keywords: angle-closure glaucoma, drug-induced glaucoma, intraocular pressure

1. Introduction

Simultaneous bilateral secondary acute angle closure (AAC) is rare but has been reported to develop as a secondary effect of certain drugs. Numerous systemically used medications, mostly sulfa drugs, are known to cause drug-induced glaucoma. Medications have a direct or secondary effect that stimulates sympathetic or inhibits parasympathetic activation and causes pupillary dilation. This, in turn, causes pupillary-block-induced AAC glaucoma in predisposed patients or the thickening and forward movement of the lens, anterior rotation of the ciliary body, and choroidal effusion in patients with an open or narrow iridocorneal angle with a nonpupillary block. The latter is usually accompanied by refractive shifts.

Drug-induced bilateral secondary AAC glaucoma is an ophthalmic emergency. Therefore, clinicians should be able to distinguish this entity from bilateral angle-closure glaucoma, because the treatment protocols for these entities are markedly different.

Here, we present a rare case of bilateral AAC glaucoma that occurred within 1 week of initiating sumatriptan therapy for migraine.

2. Case report

A 26-year-old woman presented with a history of severe unilateral throbbing headaches associated with nausea and photophobia. The migraine used to recur when she was under tension and lasted for 2 to 3 days. She used to get relief, sometimes, with sleep and consumption of nonsteroidal anti-inflammatory drugs. She denied any medical history. Because of the exacerbating headache during a migraine attack, she took 1 tablet of sumatriptan (100 mg) prescribed by a neurologist, and this improved her symptom. One week later, however, she complained of sudden loss of vision in both the eyes when she woke up in the morning. She visited her local clinic, where elevated intraocular pressure (IOP) was noted in both eyes (50 mm of *mercury*). She was treated using intravenous mannitol, systemic acetazolamide, and topical medication including a fixed combination of dorzolamide–timolol and brimonidine tartrate to reduce the IOP. She was referred to our hospital the following day. An examination revealed that her IOP was 26 mm Hg in the right eye and 25 mm Hg in the left eye. The best-corrected visual acuity of both eyes was 6/60. A slit-lamp examination revealed mild chemosis with ciliary injection. Both the anterior chambers were markedly shallow with uniform flattening of both the central and peripheral sides (Fig. 1A and B). Gonioscopy revealed closed angles in both eyes. Moreover, acute myopia developed in both eyes, with refractive errors of 7.75 diopters in the right eye and 8 diopters in the left eye. B-scan ultrasonography revealed

Editor: Iok-Hou Pang.

The authors have no conflicts of interest to disclose.

Department of Ophthalmology, Tri-Service General Hospital, National Defense Medical Center, Taipei, Taiwan.

** Correspondence: Da-Wen Lu, Department of Ophthalmology, Tri-Service General Hospital, Neihu Dist, Taipei City, Taiwan. (e-mail: ludawen@yahoo.com).*

Medicine (2017) 96:22(e6953)

Received: 27 December 2016 / Received in final form: 15 April 2017 / Accepted: 22 April 2017

http://dx.doi.org/10.1097/MD.0000000000006953

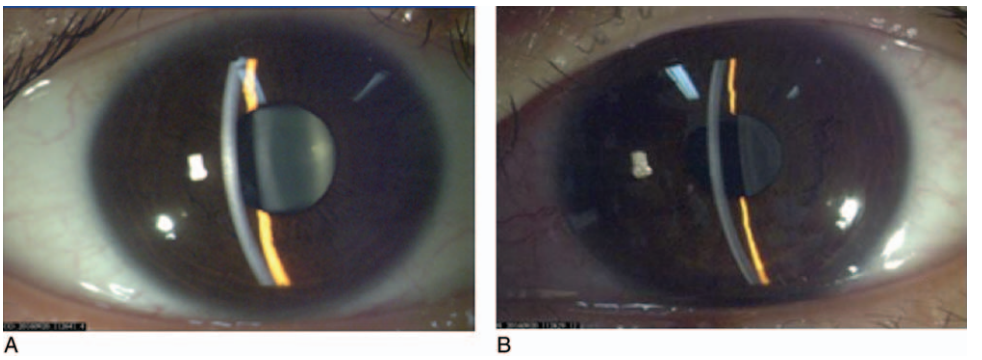

Figure 1. Slit-lamp photographs acquired at presentation, revealing a markedly shallow anterior chamber in the right (A) and left (B) eyes.

choroidal effusion (Fig. 2A and B). The central corneal thickness was 581 μm for the right eye and 585 μm for the left eye (Fig. 3A and B). The axial lengths measured using IOLMaster were 24.41 mm for the right eye and 25.03 mm for the left eye. Because the patient was highly suspected of having malignant glaucoma, a topical phenylephrine was given immediately. One hour later, the IOP drastically decreased to 16 mm Hg in the right eye and 18 mm Hg in the left eye. The slit-lamp examination revealed pupil dilation and mildly increased anterior segment depth. No pupillary block was confirmed. Finally, topical atropine, topical steroid, and topical timolol were prescribed for treatment.

On the second day, the myopic refractive error decreased to 2.5 diopters in the right eye and 4.5 diopters in the left eye, and the IOP decreased to 8 mm Hg in the right eye and 7 mm Hg in the left eye. Deepening of the anterior chamber and dilation of the pupil were also noted on the slit-lamp examination. However, the decreased vision persisted. The slit-lamp examination performed on the fourth day revealed that the anterior chamber depth in both eyes had normalized (Fig. 4A and B). The angles of both eyes had an open appearance on anterior segment optical coherence tomography (Fig. 5A and B). B-scan ultrasonography revealed the disappearance of choroidal effusion in both the eyes (Fig. 6A

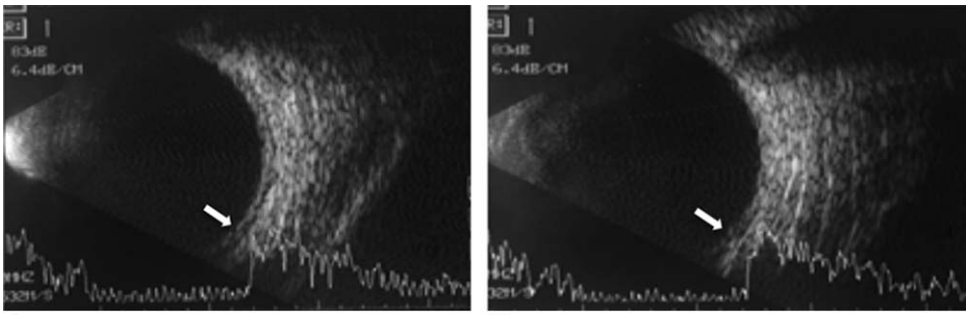

Figure 2. B-scan ultrasonographic images acquired at presentation showing peripheral choroidal effusions (white arrows) in the right (A) and left (B) eyes.

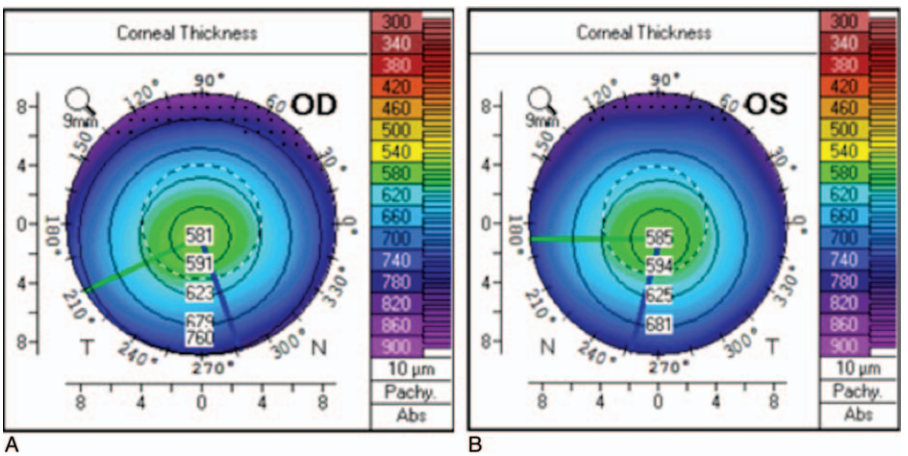

Figure 3. Central corneal thickness of the right (A, 581 μm) and left (B, 585 μm) eyes; both thicknesses were within the normal range.

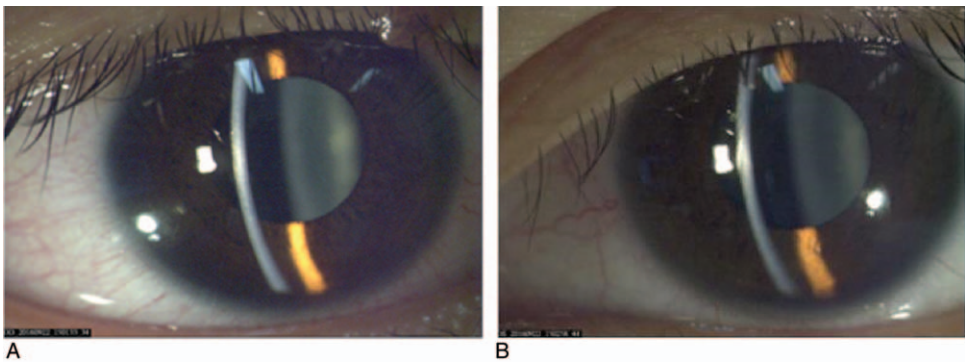

Figure 4. Slit-lamp photographs acquired on day 4 revealing a deep anterior chamber in the right (A) and left (B) eyes with dilated pupils.

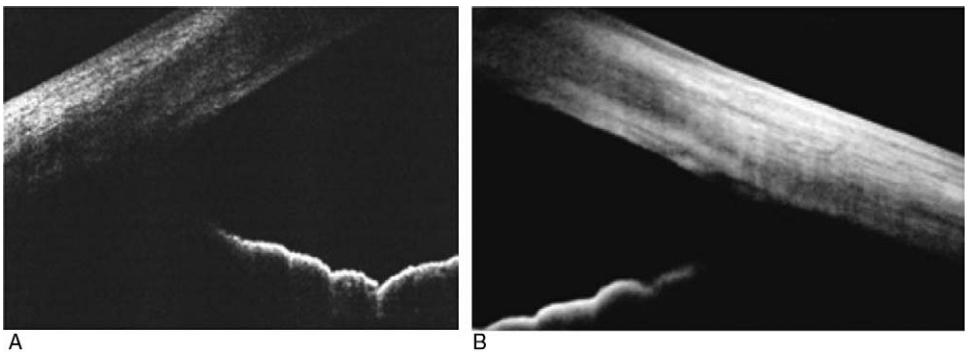

Figure 5. Anterior segment optical coherence tomographic images acquired on day 4 showing deepening of the angle structures in the right (A) and left (B) eyes.

and B). The best-corrected visual acuity also recovered to 6/6 in both eyes. The refractory error also returned to –0.5 diopters in her right eye and –2.25 diopters in her left eye, which were equal to her previous refractive errors. The axial lengths showed a negligible change before and after atropine treatment (24.47 mm for the right eye and 25.07 mm for the left eye). Therefore, all medications were discontinued.

Our case report was waived from the ethical approval or institutional review board of Tri-Service-General-Hospital, based upon their policy to review case report including >3 cases. An informed consent was explained to this patient and signed by herself.

3. Discussion

This report documents the case of a patient who experienced an AAC attack with myopic shift after consuming 1 tablet of sumatriptan. On conducting a literature review, we came across only few reports of sumatriptan-induced angle closure in humans, and development of a reaction to a single dose is rare.

There are 7 distinct families of 5-hydroxytryptamine (5-HT) receptors. Sumatriptan is a selective 5-HT receptor subtype agonist, which binds with high affinity to human cloned 5-HT1B/1D receptors. It stimulates vasoconstriction in the basilar artery and in the blood vessels of the dura mater, and this action is presumed to relieve migraine and cluster headaches. Serotonin-

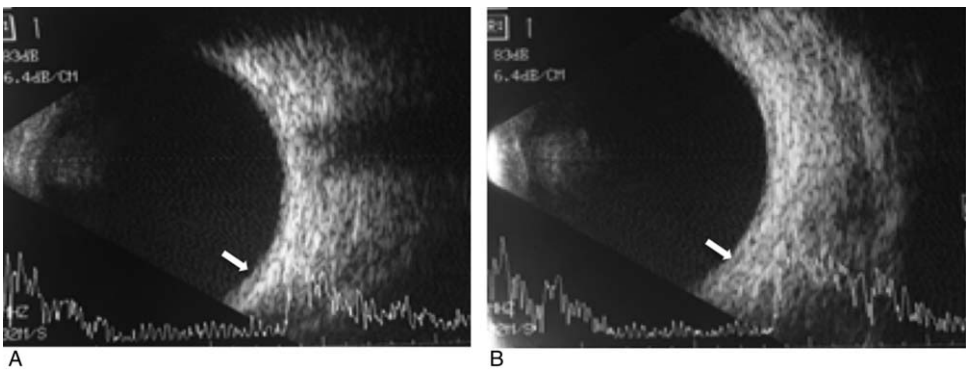

Figure 6. B-scan ultrasound images acquired on day 4 show resolution of the choroidal effusions (white arrows) in the right (A) and left (B) eyes.

ergic receptors have been identified in the iris–ciliary body complex in humans,[1] suggesting that serotonin has an important role in the modulation of ocular pressure. The agonism of 5-HT1A receptors reduces the IOP by decreasing the production of aqueous humor. In contrast, binding of the 5-HT7 receptors augments the production of aqueous humor and induces an increase in IOP.[2] However, the influence of IOP elevation or decrease via the activation of 5-HT1B/1D receptors has not yet been conclusively elucidated.

Although the mechanism underlying this phenomenon is not fully understood, it could be attributed to drug-induced malignant glaucoma, which includes the forward rotation of the lens–iris diaphragm, and marked zonular relaxation secondary to ciliary body swelling with increased curvature of the lens surface. These would contribute to the myopic shift, accommodation spasm, shallowing of the anterior chamber, and blockage of the trabecular meshwork by the iris. In our patient, acute IOP elevation was noted secondary to the blockage of trabecular outflow caused by the anterior shift of the iris, and the acute myopic shift occurred because of the forward rotation of the lens–iris diaphragm. These phenomena were compatible with the possible mechanism. Multifactorial alteration of choroidal vascular permeability may also trigger the drug-induced malignant glaucoma.[3] The 5-HT1B/1D receptor agonist sumatriptan may also have an effect on the blood vessels, and this may be another cause of the sumatriptan-induced bilateral AAC glaucoma.

One method of resolving malignant glaucoma is the administration of a cycloplegic agent. These agents stimulate the iris dilator and cause constriction of the ciliary body vasculature, which would reduce ciliary body swelling and eliminate the lens–iris apposition, thereby lowering the IOP. As sharing the similar mechanism of malignant glaucoma, the short-acting topical mydriatic agent phenylephrine was initially used for treating the malignant glaucoma in our patient. This is because the effect of phenylephrine is temporary and can be reversed if unsuitable. Fortunately, the usage of phenylephrine increased the anterior chamber depth and terminated the vicious cycle.

As with most drug-induced secondary angle-closure glaucomas, sumatriptan-induced angle closure is an idiosyncratic reaction and can occur in otherwise normal eyes with normal anterior chamber angles.[4,5] The hapten hypothesis postulates that these drugs bind to the choroidal tissue and act as foreign antigens inciting an immune reaction.[6] Anterior chamber depth may decrease gradually after starting sumatriptan administration, and the acute myopic shift could be up to 8 diopters without any changes in axial length. The presentation of supraciliary effusion on B-scan ultrasonography indicated a forward rotation of the ciliary processes and angle closure indirectly. The management required the discontinuation of sumatriptan and aggressive administration of a cycloplegic agent that helped retract the ciliary process, deepen the anterior chamber, and relieve the attack of malignant glaucoma. The topical steroid helped reduce the inflammation. However, the use of pilocarpine or laser peripheral iridotomy, which are the standard treatments of pupillary block angle-closure glaucoma, may further narrow the angles and exacerbate the clinical symptoms and signs.[7] If this condition remains unidentified as a drug-related event, serious outcomes—even permanent visual loss—could occur.[8] However, in the present case, appropriate treatment resulted in a good final visual outcome characterized by IOP normalization in both the eyes.

In conclusion, we reported a case of sumatriptan-induced bilateral AAC glaucoma that had a good prognosis because of adequate treatment. Our results highlight the importance of timely diagnosis and appropriate treatment for drug-induced bilateral AAC glaucoma. Moreover, patients and clinical physicians should be cautious about this potential side effect of sumatriptan and are instructed to be attentive to the development of blurred vision or eye pain following the initiation of sumatriptan therapy.

References

[1] Martin XD, Malina HZ, Brennan MC, et al. The ciliary body—the third organ found to synthesize indoleamines in humans. Eur J Ophthalmol 1992;2:67–72.
[2] Costagliola C, Parmeggiani F, Semeraro F, et al. Selective serotonin reuptake inhibitors: a review of its effects on intraocular pressure. Curr Neuropharmacol 2008;6:293–310.
[3] Kozner P, Simonova K, Borzek B, et al. Late acute myopia syndrome induced by combination of sulfonamide drugs. J Glaucoma 2014;23: e119–21.
[4] Fraunfelder FW, Fraunfelder FT, Keates EU. Topiramate-associated acute, bilateral, secondary angle-closure glaucoma. Ophthalmology 2004;111:109–11.
[5] Pirmohamed M, Naisbitt DJ, Gordon F, et al. The danger hypothesis—potential role in idiosyncratic drug reactions. Toxicology 2002;181: 55–63.
[6] Razeghinejad MR, Pro MJ, Katz LJ. Non-steroidal drug-induced glaucoma. Eye 2011;25:971–80.
[7] Chalam KV, Tillis T, Syed F, et al. Acute bilateral simultaneous angle closure glaucoma after topiramate administration: a case report. J Med Case Rep 2008;2:1.
[8] Murphy RM, Bakir B, O'Brien C, et al. Drug-induced bilateral secondary angle-closure glaucoma: a literature synthesis. J Glaucoma 2016;25: e99–105.