Malaysian Journal of Ophthalmology

© Malaysian Journal of Ophthalmology 2024; 6:1-7
*Case report*
*https://doi.org/10.35119/myjo.v6i2.334*

# Symptomatic pigment dispersion with intraocular pressure elevation attributed to intracameral moxifloxacin after open-globe injury

Yamiko Jessica **Chanza**[2], Catherine Marie **Marando**[1], Michael Vincent **Boland**[1], Marisa **Tieger**[1]

*[1]Department of Ophthalmology, Massachusetts Eye and Ear Infirmary, Harvard Medical School, Boston, MA, USA; [2]Loma Linda University School of Medicine, Loma Linda, CA, USA*

## Abstract

*Background:* Intracameral moxifloxacin is commonly used following intraocular surgery to prevent endophthalmitis. Pigment dispersion is a rare complication of moxifloxacin use that has mainly been reported following systemic administration. *Case presentation:* We report a case of unilateral pigment dispersion three weeks after open-globe repair with intracameral moxifloxacin presenting with pain, redness, photophobia, elevated intraocular pressure, marked pigment liberation, new iris transillumination defects and pigment deposits on the anterior iris surface. *Conclusion:* Symptomatic unilateral pigment dispersion with IOP elevation following intracameral moxifloxacin is a rare entity, but it is a crucial complication for clinicians to be aware of as intracameral antibiotic use following intraocular surgery becomes more frequent.

*Keywords:* bilateral acute iris depigmentation, intracameral moxifloxacin, pigment dispersion

**Correspondence:** Marisa Tieger, MD, Department of Ophthalmology, Massachusetts Eye and Ear Infirmary, 243 Charles St, Boston, MA, USA, 02114.
E-mail: Marisa_Tieger@meei.harvard.edu

# Penyakit 'pigment dispersion' bergejala bersama peningkatan tekanan mata disebabkan oleh ubat moxifloxacin ke dalam mata selepas kecederaan terbuka mata


## Abstrak

*Latar belakang:* Injeksi ubat moxifloxacin ke dalam mata biasanya digunakan selepas pembedahan mata untuk mencegah jamgkitan kuman. 'Pigment Dispersion' adalah satu komplikasi yang jarang berlaku berikutan penggunaan ubat moxifloxacin. Kebanyakan dari kes yang dilaporkan berlaku selepas ubat ini diberi melalui laluan sistemik, bukan titis.
*Pembentangan kes:* Kami melaporkan kes 'pigment dispersion' yang berlaku tiga minggu selepas pembedahan kecederaan terbuka bola mata. Ubat moxifloxacin juga telah disuntik ke dalam mata. Pesakit hadir dengan mata yang sakit dan merah, sensitif pada cahaya terang, tekanan mata yang tinggi, pembebasan pigmen yang ketara, iluminasi iris baharu dan mendapan pigmen pada permukaan hadapan iris.
*Kesimpulan:* 'Pigment dispersion' yang bergejala bersama dengan peningkatan tekanan mata berikutan penggunaan ubat moxifloxacin de dalam mata adalah entiti yang jarang berlaku. Walaubagaimanapun, ia merupakan komplikasi penting untuk dipantau oleh doktor kerana injeksi ubat antibiotik seperti moxifloxacin ke dalam mata selepas pembedahan mata adalah satu amalan biasa di dewan bedah.


*Kata kunci:* injeksi moxifloxacin, kehilangan pigmen iris, pigment dispersion

## Introduction

Bilateral acute iris depigmentation (BADI) syndrome was first described by Tugal-Tutkun and Urgancioglu in 2005 and is characterized by an acute dispersion of pigment in the anterior chamber, depigmentation of iris epithelium, and pigment deposition in the angle and posterior surface of the cornea.[1] Bilateral acute iris transillumination (BAIT) has manifestations that are similar to BADI in addition to distinctive iris transillumination defects and atonic pupil with sphincter paralysis.[2] BADI and BAIT are acute self-limiting conditions and have previously been associated with antibiotic use, specifically systemic fluroquinolones. Although the precise aetiology remains unknown, some authors have suggested a viral cause.[3]

Unilateral pigment dispersion following administration of both systemic and topical fluoroquinolones was reported by Kawali *et al.* in 2019, with two patients in

their series developing symptoms after moxifloxacin use.[2] Sánchez-Sánchez *et al.* published the first case series of pigment dispersion following intracameral moxifloxacin after glaucoma surgery.[4] Pigment dispersion was detected in the anterior chamber of 1 patient at the 2-week postoperative visit, the second patient at the 3-week postoperative visit, and in 2 patients at the 1-month postoperative visit.[4] All patients included in this case series were asymptomatic and had normal intraocular pressure (IOP), with the exception of 1 patient who developed a painless elevation in IOP 3 months postoperatively due to occlusion of the surgical sclerotomy with pigment.[4]

We report a novel case of symptomatic pigment dispersion 3 weeks following intracameral moxifloxacin administration presenting with pain, redness, photophobia, elevated IOP, pronounced pigment liberation, iris transillumination defects and pigment deposition on the iris surface.

## Case presentation

A 38-year-old woman presented to Massachusetts Eye and Ear (MEE) with a zone 1 open-globe injury of the right eye due to trauma caused by a screw. Her preoperative visual acuity (VA) was 20/50 and initial exam showed a 1-mm full thickness nasal paracentral corneal laceration. There was no violation of the iris or lens capsule. Preoperative computed tomography (CT) did not reveal any intraocular foreign body (IOFB). The corneal laceration was repaired within 24 hours with a single 10-0 nylon suture and intracameral (IC) moxifloxacin was administered at the end of the case. On postoperative day 1, VA was 20/50, IOP was 17 mmHg, the wound was Seidel negative, and the patient had 0.5+ mixed cell and pigment in the anterior chamber. The external exam is depicted in Figure 1. She was started on topical prednisolone acetate 1.0% (1 drop 6 times daily), moxifloxacin 0.5% (1 drop 4 times daily), and atropine 1.0% (1 drop twice daily) drops as per the usual trauma protocol at Massachusetts Eye and Ear.5

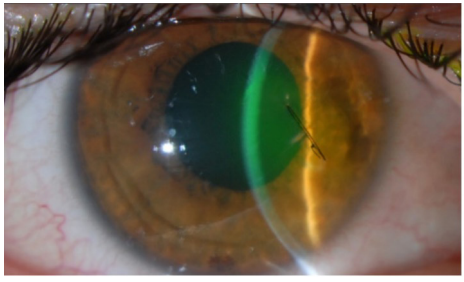

*Fig. 1.* External photograph taken one day following repair of open-globe injury.

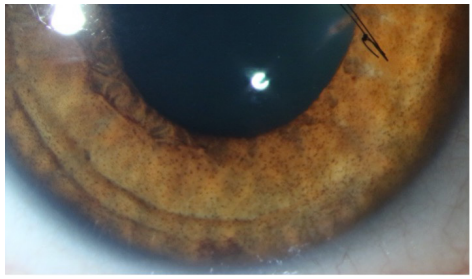

*Fig. 2.* External photograph taken on post-operative day 26 demonstrating pigment deposition on the iris surface.

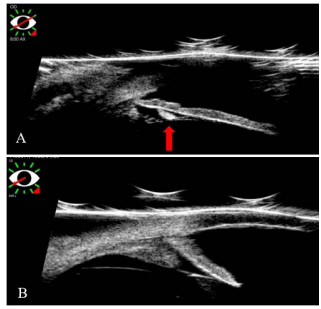


*Fig. 3.* (*A*) Ultrasound biomicroscopy (UBM) at postoperative week 3.5 shows a highly reflective material (red arrow) in the sulcus and abutting the iris at the 8 o'clock position. (*B*) At postoperative week 4, this highly reflective material was no longer present.

On postoperative day 9, the patient reported minimal discomfort and her exam revealed a VA of 20/25, an IOP of 16 mmHg, and 2+ pigment in the anterior chamber. A small superficial foreign body was noted on the surface of the cornea that was removed without complication utilizing a 30-gauge needle. On postoperative day 15, the patient presented with worsening pain and redness of the right eye. At this time, her VA was 20/40, IOP was 11mm Hg, and 2–3+ pigment was noted in the anterior chamber. The following day, she was noted to have worsening 4+ pigment in the anterior chamber, otherwise, her VA and IOP were stable. An ultrasound of the right eye and ultrasound biomicroscopy (UBM) of the angle did not reveal any vitritis or retained foreign body.

On postoperative day 19, she continued to have worsening eye pain, redness, and photophobia. Her VA was 20/40 and her IOP was elevated to 58 mmHg with diffuse corneal oedema and persistent pigment in the anterior chamber. She was started on IOP-lowering drops and oral acetazolamide in clinic, which reduced her pressure to 28 mmHg. On re-examination 4 days later, VA was 20/30 and her IOP had decreased to 22 mmHg on topical IOP-lowering therapy. New numerous deposits of

dark pigment were noted on the iris (Fig. 2). Gonioscopy of the right eye at this time was open to scleral spur with dense pigment in the trabecular meshwork and her iris showed numerous new transillumination defects (TIDs). Repeat UBM showed a highly reflective and irregular interface with a thin membrane overlying it in the sulcus with concern for cyst versus IOFB (Fig. 3A). The UBM was repeated 3 days later by the same trained ophthalmic sonographer, and the reflective material was no longer present (Fig. 3B), which suggested a transient agglomeration of pigment. Importantly, the iris was not concave on UBM, as is typically seen with pigment dispersion syndrome resulting from irido-zonular contact.

The patient was diagnosed with pigment dispersion likely due to IC moxifloxacin. The fellow eye had no signs of pigment dispersion, such as a posteriorly bowed iris, trabecular meshwork pigmentation, or iris TIDs. Oral carbonic anhydrase inhibitor was discontinued and she was monitored on topical therapy. At the patient's 4-month postoperative follow-up, her eye pain had resolved, VA improved to 20/15, and IOP was well controlled on latanoprost. The anterior chamber pigment resolved; however, the pigment deposition on the iris surface as well as the TIDs persisted.

## Discussion

To our knowledge, this is the first case of symptomatic unilateral pigment dispersion with elevated IOP, iris TIDs, and pigment deposition on the iris surface following IC moxifloxacin administration. Unilateral pigment dispersion following IC moxifloxacin has only been reported in 1 other case series published in February 2020.[4] Distinctively, all patients described in this case series were asymptomatic and only 1 patient had an elevated IOP. It is unclear whether other potential IOP elevations were masked by prior glaucoma filtering surgery. In contrast, the patient we report developed classic signs and symptoms of pigment dispersion including eye pain, photophobia, marked elevation in IOP, pigment deposition in the trabecular meshwork, iris TIDs, and a unique finding of pigment deposits on the anterior iris surface.

Fluoroquinolone affinity of ocular melanocytes is well documented. Potential underlying mechanisms for fluoroquinolone-induced melanocyte phototoxicity have previously been described in human skin melanocytes and include inhibition of melanisation by binding to tyrosinase (TYR), a critical regulator of melanin synthesis.[6,7] Mahanty *et al.* described the effect of moxifloxacin and ciprofloxacin on human iris pigment epithelium *in vitro* and demonstrated significant toxicity for doses of moxifloxacin greater than 2500µg/mL.[8] However, the aqueous humour samples treated with 2.5–5.0 µg/mL of moxifloxacin showed TYR activity that was equivalent to the bovine serum albumin control, which indicated little or no toxicity to iris melanocytes. Notably, 0.1 mL of a 5mg/mL solution of moxifloxacin is standard for intraoperative administration.

The data available to define this novel syndrome are limited. The majority of relevant literature describe bilateral pigment dispersion resulting from systemic fluoroquinolone administration and has been termed BADI or BAIT; the latter diagnosis if iris TIDs are present.[9,10] Other reports have described pigment dispersion after application of topical moxifloxacin and a single study has reported pigment dispersion following intracameral moxifloxacin.2,4 The use of intracameral antibiotics after intraocular surgery is trending upward as reported by the American Society of Cataract and Refractive Surgery 2014 survey, which revealed that 50% of cataract surgeons were using intracameral antibiotics after cataract surgery compared to the 30% of respondents in 2007.[11]

## Conclusion

Symptomatic unilateral pigment dispersion with IOP elevation following IC moxifloxacin is a rare entity, but it is a crucial complication for clinicians to be aware of as IC antibiotic use following intraocular surgery becomes more frequent.

## Declarations

**Informed consent for publication**
The patient in this case has provided informed consent for the publication of the clinical data and images contained in this case report.

**Competing interests**
None to declare.

**Funding**
None to declare.

**Acknowledgements**
None to declare.

## References

1. Tugal-Tutkun I, Urgancioglu M. Bilateral acute depigmentation of the iris. Graefes Arch Clin Exp Ophthalmol. 2006;244:742-6. https://doi.org/10.1007/s00417-005-0137-x
2. Kawali A, Mahendradas P, Shetty R. Acute depigmentation of the iris: a retrospective analysis of 22 cases. Can J Ophthalmol. 2019;54:33-9. https://doi.org/10.1016/j.jcjo.2018.03.020

3. Tugal-Tutkun I, Onal S, Garip A, Taskapili M, Kazokoglu H, Kadayifcilar S, et al. Bilateral Acute Iris Transillumination. Arch Ophthalmol. 2011;129:1312-9. https://doi.org/10.1001/archophthalmol.2011.310
4. Sánchez-Sánchez C, Puerto B, López-Caballero C, Contreras I. Unilateral acute iris depigmentation and transillumination after glaucoma surgery with mitomycin application and intracameral moxifloxacin. Am J Ophthalmol Case Rep. 2020;18:100639. https://doi.org/10.1016/j.ajoc.2020.100639
5. Andreoli CM, Andreoli MT, Kloek CE, Ahuero AE, Vavvas D, Durand ML. Low rate of endophthalmitis in a large series of open globe injuries. Am J Ophthalmol. 2009;147:601-8.e2. https://doi.org/10.1016/j.ajo.2008.10.023
6. Beberok A, Buszman E, Wrześniok D, Otręba M, Trzcionka J. Interaction between ciprofloxacin and melanin: the effect on proliferation and melanization in melanocytes. Eur J Pharmacol. 2011;669:32-7. https://doi.org/10.1016/j.ejphar.2011.08.003
7. Beberok A, Wrześniok D, Otręba M, Miliński M, Rok J, Buszman E. Effect of norfloxacin and moxifloxacin on melanin synthesis and antioxidant enzymes activity in normal human melanocytes. Mol Cell Biochem. 2015;401:107-14. https://doi.org/10.1007/s11010-014-2297-7
8. Mahanty S, Kawali AA, Dakappa SS, et al. Aqueous humor tyrosinase activity is indicative of iris melanocyte toxicity. Exp Eye Res. 2017;162:79-85. https://doi.org/10.1016/j.exer.2017.07.006
9. Morshedi RG, Bettis DI, Moshirfar M, Vitale AT. Bilateral acute iris transillumination following systemic moxifloxacin for respiratory illness: report of two cases and review of the literature. Ocul Immunol Inflamm. 2012;20:266-72. https://doi.org/10.3109/09273948.2012.670359
10. Tugal-Tutkun I, Araz B, Taskapili M, et al. Bilateral acute depigmentation of the iris: report of 26 new cases and four-year follow-up of two patients. Ophthalmology. 2009;116:1552-7,7.e1. https://doi.org/10.1016/j.ophtha.2009.02.019
11. Chang DF, Braga-Mele R, Henderson BA, Mamalis N, Vasavada A. Antibiotic prophylaxis of postoperative endophthalmitis after cataract surgery: Results of the 2014 ASCRS member survey. J Cataract Refract Surg. 2015;41:1300-5. https://doi.org/10.1016/j.jcrs.2015.01.014