

## Myopic Surprises and Other Misdirections

**F**or the past year, Camila Campos,\* a 46-year-old woman, had been experiencing progressive, bilateral, painless vision loss, glare, difficulty driving at night, and significant eye strain when working on the computer. She presented to our office for evaluation.

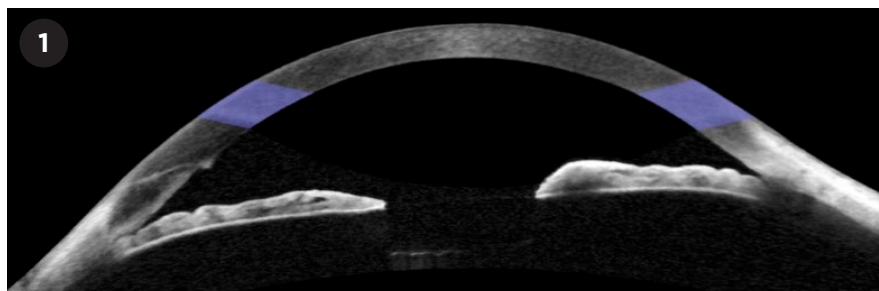
### We Get A Look

When we took Ms. Campos' history, we learned that she had received multiple cortisone shots for neuropathic pain following childbirth within the previous year. Also, her grandmother had glaucoma, which was controlled with topical medications. She had no other medical, ocular, or family history.

**Exam.** On examination, BCVA was 20/40 in her right eye and 20/25 in her left eye, worsening to 20/400 in both eyes on glare testing. Her refraction was  $-6.00$  D sphere and  $-1.25 +1.25 \times 168$  in her right and left eyes, respectively. IOP was 30 mm Hg in the right eye and 35 mm Hg in the left.

**At the slit lamp.** The slit-lamp examination revealed shallow anterior chambers without observable angle structures on gonioscopy in both eyes. Grade 3+ posterior subcapsular cataracts were present in both eyes.

**Fundus exam and OCT.** The fundus view was poor due to the cataracts, but OCT demonstrated no thinning of the retinal nerve fiber layer and no macular disease in either eye.



**POST-OP WEEK 1.** The anterior chamber depth had shallowed from 2.52 mm before surgery to 2.30 mm afterward.

**Decision for surgery.** After extensive discussion with the patient, the decision was made to proceed with cataract extraction in both eyes. The patient opted for diffractive multifocal IOLs because she had an active lifestyle and wanted reduced spectacle dependence.

### Surgery on the Right Eye (With Post-Op Surprises)

**Post-op day 1.** Following an uneventful right eye cataract extraction, the patient's uncorrected VA was 20/200 in the distance, and J1+ at near, with an IOP of 22 mm Hg on post-op day 1.

**A surprise at post-op week 1.** On post-op week 1, the patient returned with complaints of persistent blurry distance vision, and she was found to have a BCVA of 20/20 at distance and J1 at near with a  $-1.50$  D correction. The IOP in her right eye had increased to 30 mm Hg.

**Reviewing the data.** Given this myopic surprise, we reviewed the preop-

erative lens calculations: axial length was 21.02 mm, keratometry values were 46.30 and 47.27, and anterior chamber depth (ACD) was 2.52 mm.

**Imaging.** Postoperative anterior segment OCT (AS-OCT) found that the ACD of her right eye had shallowed to 2.30 mm, raising suspicion for aqueous misdirection (Fig. 1). Ms. Campos was referred for B-scan ultrasonography and ultrasound biomicroscopy (UBM) imaging, which did not find anterior rotation of the ciliary body or ultrasonographic evidence of aqueous misdirection, choroidal effusion, or suprachoroidal hemorrhage. Nevertheless, we maintained a high degree of suspicion for aqueous misdirection; atropine and aqueous suppressants were initiated, and Ms. Campos' manifest refraction improved to  $-0.25$  D, with an IOP of 15 mm Hg and ACD of 3.2 mm (Fig. 2) in her right eye.

### Treatment

In the following weeks, Ms. Campos' refraction and IOP remained stable on medical treatment. Our attempt to stop topical medication resulted in recur-

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rence of anterior chamber shallowing and IOP elevation. We then performed an Nd:YAG capsulotomy and hyaloidotomy, but there was no improvement (Fig. 3). Finally, we performed a laser peripheral iridotomy and hyaloidotomy, which resulted in resolution of the right eye's IOP to 11 mm Hg and ACD to 3.2 mm; manifest refraction was plano (Fig. 4).

### Surgery on the Left Eye (Here We Go Again)

Two months later, due to continuing vision and glare problems, Ms. Campos opted for cataract surgery in the left eye.

**Patient declines prophylactic measures.** We talked to Ms. Campos about prophylactic preoperative and intraoperative interventions that could reduce the risk of aqueous misdirection. These included iridotomy and hyaloidotomy, pars plana or anterior vitrectomy, and irido-zonulo-hyaloido-vitrectomy (IZHV), all of which she declined.

**Uneventful surgery.** The second eye surgery was, again, uneventful. Postoperatively, atropine was initiated and IOP was 14 mm Hg, ACD was 3.2 mm, and manifest refraction was  $-0.25$  D.

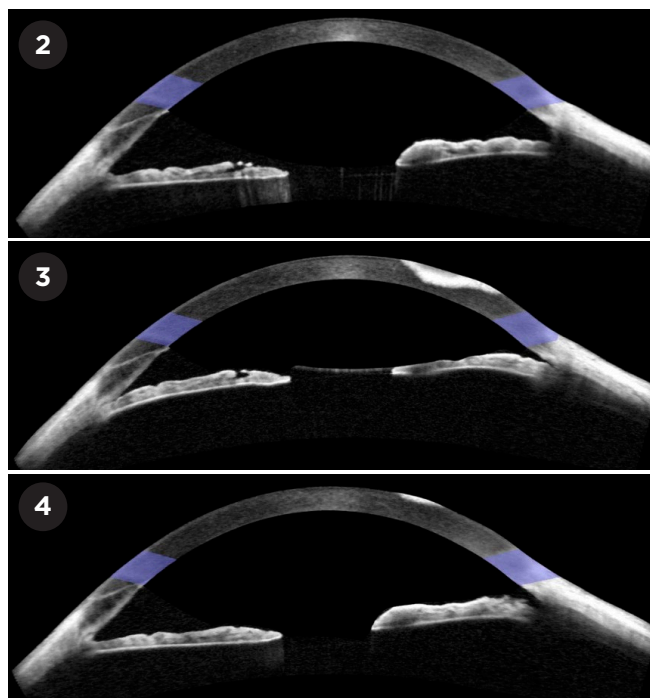
**Another myopic shift.** Subsequent discontinuation of atropine resulted in a myopic shift to  $-2.50$  D, an IOP of 19 mm Hg, and ACD of 2.0 mm.

**Successful treatment.** Laser peripheral iridotomy and hyaloidotomy were performed, resulting in an IOP of 12 mm Hg, ACD of 3.2 mm, and manifest refraction of  $+0.25$  D.

### Discussion

Aqueous misdirection syndrome has been classified under numerous names, including malignant glaucoma and ciliary or lens block glaucoma.

**Etiology.** Although not completely understood, aqueous misdirection is believed to involve an alteration



#### ANTERIOR SEGMENT OCT DURING POST-OP TREATMENTS.

(2) We saw some improvement after medical therapy with atropine and aqueous suppressants. (3) However, once Ms. Campos was taken off medical therapy, the anterior chamber shallowed and IOP increased despite a Nd:YAG capsulotomy and hyaloidotomy. (4) Finally, laser peripheral iridotomy and hyaloidotomy through the peripheral iridotomy resolved her IOP and ACD problems.

of aqueous dynamics in the eye that results in posterior flow of aqueous fluid behind the vitreous and decreased resistance to aqueous flow through the vitreous. Subsequently, the vitreous compresses, and there is an anterior displacement of the entire lens-iris diaphragm, obstruction of aqueous outflow, and elevation in IOP. Some also suspect choroidal inflammatory congestion or anterior rotation of the ciliary processes toward the lens, further narrowing the limited posterior chamber space.

**Risk factors.** This syndrome is most commonly observed after glaucoma filtering surgery but also may occur after cataract surgery and certain laser procedures. Intraoperative fluid misdirection is a similar phenomenon in which irrigating fluid enters the anterior vitreous or Berger's space, leading to an acute aqueous misdirection syndrome. Other risk factors include hyperopia, preexisting narrow angles or angle closure, and female

sex. (In women, the lens is more anteriorly displaced, resulting in both a shallower anterior chamber and decreased distance between the lens equator and ciliary body.<sup>1-3</sup>)

**Imaging.** Imaging studies like UBM and B-scan ultrasonography may be helpful in ruling out other causes of anterior iris-lens diaphragm displacement including pupillary block, choroidal detachment or effusion, suprachoroidal hemorrhage, or other secondary causes of angle closure.

**Treatment.** In some case studies, anterior rotation of the ciliary body on UBM has been shown to return to a normal configuration after successful treatment.<sup>4-6</sup> In our case, UBM did not demonstrate this anterior ciliary body rotation; however, ACD measured on AS-OCT was a useful tool to monitor response to treatment.

In terms of medical management, multiple studies have suggested the use of preoperative hyperosmotics to dehydrate the vitreous and possibly increase vitreous permeability. Postoperative cycloplegic agents help shift the lens-iris diaphragm posteriorly, and aqueous suppressants help decrease the flow contributing to further cyclical misdirection.

Unfortunately, there is a very high recurrence rate with cessation of medical treatment, and more invasive treatment is often required.

Laser treatments—including anterior hyaloidotomy or transscleral cyclophotocoagulation—have been shown to help some patients with aqueous misdirection.

If those treatments are unsuccessful, surgical techniques to disrupt the anterior hyaloid face, such as IZHV or pars plana vitrectomy, may be needed to reestablish the flow between the vitreous cavity and the anterior chamber.<sup>1-6</sup>

## Summary

Postoperative myopic surprise after cataract surgery should trigger several considerations. In addition to reviewing the surgical case for complications, it also is important to look back at the preoperative refraction, calculations, transcription, and IOL selection. However, in cases that involve an otherwise uncomplicated surgery and accurate preoperative measurements in a patient with known risk factors, as with Ms. Campos, surgeons should also suspect aqueous misdirection.

Before performing cataract surgery in a patient's second eye, one should consider and discuss prophylactic medical and/or surgical intervention with the patient.

However, as demonstrated in our case, an excellent visual outcome can still be achieved despite the myopic shift. Adjunctive imaging such as B-scan ultrasonography, UBM, and AS-OCT may be helpful, though not diagnostic for, aqueous misdirection. Early consideration, diagnosis, and effective management of aqueous misdirection syndrome will help to ensure both stabilization of IOP and satisfactory outcomes.

\* Patient name is fictitious.

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