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■ This patient represents one of the most frustrating problems for cataract surgeons because she has a beautiful surgical outcome from a technical perspective but has debilitating dysphotopsia symptoms. In my experience, patients with the most troublesome negative dysphotopsias are always those with perfect IOL centration and uniform anterior capsule overlap of the optic. The various treatments that have been documented to alleviate negative dysphotopsia include IOL exchange, secondary piggyback IOL placement, and reverse optic capture, where the IOL optic is intentionally displaced in front of the anterior capsule.

This patient presents a few unique problems. She had previous hyperopic LASIK, which increased the already prolate cornea and can induce increased negative asphericity. After uneventful cataract surgery with spherical IOL placement, she had unrelenting negative dysphotopsia symptoms and had that IOL exchanged for a collagen copolymer plate IOL. This IOL has a low index of refraction (1.442), which should reduce the chance of unwanted optical aberrations, such as dysphotopsia. However, the negative dysphotopsia persisted in this patient after placement of the collagen copolymer IOL. The UBM of this patient shows the IOL is in a fairly anterior position, which would preclude safe placement of a piggyback IOL in the ciliary sulcus.

Although this patient has already had cataract surgery and an IOL exchange, her corneal endothelium is normal and the anterior segment of the eye is quiet and stable. I would recommend a second IOL exchange to place an AQ2010V IOL in the capsular bag. This IOL is made of silicone and is one of the few IOLs on the market with a truly round optic edge. The round edge combined with the low index of refraction make this IOL a good choice for minimizing the risk for dysphotopsia. In addition, because this patient has had hyperopic LASIK, this spherical IOL is optimal for counteracting the induced negative asphericity of the cornea.

I have used the AQ2010V as my IOL of choice for treating negative dysphotopsia. I have explanted 32 IOLs for negative dysphotopsia symptoms since March 2008—26 SN60WF (Alcon Laboratories, Inc.), 1 SN6AD1 (Alcon Laboratories, Inc.), 2 SN6AT (Alcon Laboratories, Inc.), 1 MA60AC (Alcon Laboratories, Inc.), 1 SI40NB (Advanced Medical Optics), and 1 Tecnis ZCB00 (Abbot Medical Optics). Thirty-one of these were replaced with an AQ2010V IOL, and 1 was replaced with a Sofport LI61AO IOL (Bausch & Lomb). Twenty-eight of the IOLs were placed fully in the capsular bag, 3 were placed in the sulcus, and 1 was placed with the haptics in the sulcus and the optic captured in the bag. Of the patients having these IOL exchanges, 91% reported complete resolution of negative dysphotopsia symptoms and the remaining 9% had a reduction in symptoms and did not require further surgical intervention.

The most common IOL explanted in this series was the Acrysof SN60WF; however, it is also the primary IOL used in my practice (approximately 17 500 implanted since 2008). Although negative dysphotopsia is a frustrating problem, the percentage of patients requiring IOL explantation is relatively small.

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■ Plate-haptic IOLs have a discontinuity at the optic–haptic junction, similar to IOLs with non-plate haptics. Because of this discontinuity, the optic–haptic junction can be seen clearly by the bright partial ring seen nasally (2:30 to 5:30 o'clock in Figure 1). Temporally, the optic–haptic junction is well delineated, with the area within the optic appearing dark and the area within the haptic appearing light due to the significant difference in refractive power (skiascopy). This optic–haptic discontinuity nasally can cause negative dysphotopsia by the same mechanism as non-plate haptic IOLs with sharp truncated optic edges and partially looped haptics, as shown by ray tracing.[1] Negative dysphotopsia occurs when a temporal pencil of incoming light passes through a small pupil, through the peripheral anterior nasal surface of the IOL, is then split between the nasal edge and nasal peripheral posterior surface of the IOL by the sharp truncated posterior edge, and strikes functional retina.

When the peripheral anterior nasal surface of the IOL is covered by a clear anterior capsule, nothing changes. However, the peripheral anterior capsule is never perfectly clear because it is covered with lens epithelial cells (LECs) on the interior surface, which scatter light (Lambertian scatter). Even when the backscatter (seen by the clinician) is minimal, there may be significant forward scatter (seen by the patient). When the LECs differentiate into myofibroblasts, they turn white and their number increases, so the forward scatter and backscatter increase significantly, as in this case. The light scatter from the

anterior nasal capsule diffuses the light so that some of the light is directed toward the nasal edge and posterior surface, which would once again create a temporal arcuate shadow. This alternative path requires the anterior nasal capsule overlying the nasal IOL optic to act as a diffuser, scattering light.

As discussed in our article on negative dysphotopsia,[1] clarified in our reply to Masket and Hong,[2] and clinically confirmed by Cooke and Platt[3] and Folden,[4] the least invasive treatment would be to use the Nd:YAG laser to perform an anterior capsulectomy of the nasal sector of the capsule overlying and just beyond the optic from 1 to 6 o'clock so that no scattered light from the remaining anterior capsule can strike the nasal optic–haptic junction. This technique will remove the alternative path from scattered light but cannot ensure elimination of the original path. From the cases reported,[3,4] this technique has better than a 50% chance of eliminating the symptoms with non-plate haptics, although the success with plate haptics is unknown.

If this fails, a secondary piggyback silicone IOL of plano power with a round edge can be placed in the sulcus. This may cause a slight posterior axial shift of the plate-haptic IOL, inducing a mild hyperopic shift, the amount depending on the power of the current IOL. The probability that the piggyback IOL will eliminate the patient's symptoms is greater than 90% based on experience. If the symptoms persist, her functional retina extends far anterior to the normal location. Explantation of both posterior chamber IOLs with implantation of an anterior chamber IOL is the only surgery that can guarantee elimination of the negative dysphotopsia.

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■ I have performed IOL exchange in 6 eyes of 6 patients who were highly symptomatic with intolerable negative dysphotopsia. A 3-piece secondary posterior chamber IOL was implanted in the bag in 1 case and in the ciliary sulcus in the other 5 cases. In the former case, the negative dysphotopsia symptoms persisted, while in the latter cases the negative dysphotopsia–related complaints disappeared and the IOL was in direct contact with the iris. All 5 patients who had IOL exchange and ciliary sulcus secondary IOL implantation were satisfied with the result.

The literature findings and my experience lead me to believe that we have 3 useful treatments for negative dysphotopsia. They are reverse optic capture,[1] secondary piggyback IOL placement in the sulcus,[2] and IOL exchange with ciliary sulcus secondary IOL implantation.[3]

In the present case, the right eye had 2 previous operations. For this reason, I would prefer less traumatic procedures first; that is, reverse optic capture or secondary piggyback IOL implantation. However, the former would not work here because of the plate-haptic, single-piece configuration of the posterior chamber IOL. I would therefore start with secondary piggyback IOL placement in the sulcus. Some excellent add-on IOLs for ciliary sulcus implantation have recently become available in Europe. In the event of further symptoms, I would suggest IOL exchange with replacement by a 3-piece secondary posterior chamber IOL in the ciliary sulcus.

My strategy would be similar in the left eye. I would start with implantation of a 3-piece posterior chamber IOL in the bag, completed with reverse optic capture. The next step would be secondary piggyback posterior chamber IOL placement in the sulcus and finally IOL exchange with replacement by a 3-piece secondary posterior chamber IOL in the ciliary sulcus.

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■ In uneventful cataract surgery, pseudophakic dysphotopsia is the biggest reason for dissatisfaction and has been shown to result in actual visual dysfunction.[1,2] This case is a good example. We know this has to be far temporal light that is interacting with the nasal IOL edge, casting a shadow that can reliably be relieved when the patient cups his or her hand to the side, blocking this light, if this is classic negative dysphotopsia. Holladay et al.[3] studied this with ray tracing and showed that increasing the IOL-to-iris distance, using a square-edged IOL, increasing the