Light Scatter and Disability Glare After Intraocular Lens Implantation

Forward light scatter measurement provides information about optical imperfections as the cause of glare disability. Glare disability refers to a reduction in visual performance caused by a glare source, resulting in retinal contrast loss secondary to intraocular stray light. Lens extraction reverses the strong age increase in stray light, which is considered an independent source of symptoms. Stray light is a possible source of unwanted visual phenomena related to patients with implanted multifocal intraocular lenses (IOLs). Recent studies reported little difference in retinal stray light between patients with monofocal IOLs and patients with multifocal IOLs. Pupil miosis during retinal stray light measurement and neural adaptation after multifocal IOL implantation may overcome possible differences. However, the best way to analyze the change in visual and optical quality of the eye is to measure before and after a surgical procedure. For multifocal IOLs, measurements should be done in refractive lens exchange (RLE) cases. A recent report concluded that higher-order aberration (HOA) levels are similar before and after RLE with multifocal IOL implantation. Then, if patients refer to any visual phenomenon, this may come from the scatter created by multifocality of the IOL; measurements of retinal stray light should be done before and after RLE to corroborate this point. We describe a patient who had symptomatic glare disability despite visual acuity of 20/20 after uncomplicated RLE.

Report of a Case. A 54-year-old woman underwent RLE surgery with the AcrySof ReSTOR Natural IOL (SN60D3) implant (Alcon Laboratories, Inc, Fort Worth, Texas) to correct ametropia and presbyopia. Three months after surgery, the patient experienced glare disability under monocular and binocular conditions. Preoperative and postoperative refractions were +3.00–1.00×90° and +0.50, respectively, in the right eye and +2.50–0.50×85° and +0.25, respectively, in the left eye. Low-order (defocus and astigmatism) and higher-order (coma-like and spherical-like) aberrations were measured with the LADARWave aberrometer (Alcon Laboratories, Inc) for 3.0- and 5.0-mm pupils. The root mean square of HOAs (excluding defocus and astigmatism) were similar before and after the surgery: in the right eye, 0.049 µm and 0.052 µm, respectively, for the 3-mm pupil and 0.311 µm and 0.299 µm, respectively, for the 5-mm pupil; in the left eye, 0.043 µm and 0.058 µm, respectively, for the 3-mm pupil and 0.287 µm and 0.291 µm, respectively, for the 5-mm pupil. Retinal stray light was measured with the C-Quant stray light meter (Oculus Optikgeräte GmbH, Wetzlar, Germany). In this case, the difference in retinal stray light before and after RLE was considerable: in the right eye, 0.82 log(s) and 1.41 log(s), respectively; in the left eye, 0.87 log(s) and 1.38 log(s), respectively (s indicates the stray light parameter). Best-corrected distance visual acuity was also measured, being 20/20 OU before and after surgery for distance and near vision.

Comment. Recent designs of multifocal IOLs effectively improve visual acuity at distance and near vision. However, they can adversely affect visual function owing to the superimposed retinal images on the retina. Theoretical predictions suggest that multifocal IOLs would induce more scatter than monofocal IOLs. The increase of light scatter in our patient was not associated with postoperative reductions in visual acuity or increases in HOA values as both visual acuity and HOA values were similar to those found before the surgery. In comparison, stray light increased more than 3-fold in each eye after surgery (by 3.9 OD and 3.2 OS). The disproportionate effect of light scatter relative to visual acuity and HOA likely reflects differences in scale. Light scatter varies with the wavelength of light measured in micrometers. Visual acuity reflects local distances measured in millimeters; HOAs are determined by Hartmann-Shack sensors, which are spaced 100 µm apart. The results of this case show that perceived effects of retinal stray light are substantially higher after multifocal IOL implantation, and this may be the cause of glare disability reported by the patient. However, this conclusion cannot be extended to intermediate or near distances, which are still within the operational range of the multifocal lens but not the native lens of this 54-year-old patient. Although the multifocal lens provides a range of fixed focal lengths, the trade-off is increased light scatter and reduced contrast sensitivity at each focal length owing to overlap of multiple defocused images. Measurement of visual acuity under suprathreshold contrast conditions may underestimate the effect of RLE on visual function. Surgeons should be careful with RLE in case an eye has low stray light values. Stray light is an independent source of symptoms, and it should be measured clinically independently from visual acuity–associated symptoms.

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**Extensive Drusen in Type I Membranoproliferative Glomerulonephritis**

A case of extensive drusen formation associated with type I membranoproliferative glomerulonephritis (MPGN) is reported. Although similar findings have been noted with type II MPGN, to our knowledge this association has not been previously described in type I MPGN.

**Report of a Case.** A 26-year-old woman was noted to have a fundus abnormality during a routine eye examination. Her medical history was significant for proteinuria and biopsy-confirmed type I MPGN developing in conjunction with meningococcal meningitis and meningococcemia 7 years previously. Serological analyses then showed low C3 and total complement levels. Renal biopsy with light and electron microscopy showed mesangial interposition, scattered subendothelial deposits, abundant immune complex deposits within the mesangium, and focal thickening of the glomerular basement membrane, consistent with type I MPGN. A repeat biopsy 5 years later showed immunohistopathologic staining of IgM and C3 in the mesangial capillary wall and glomerular basement membrane but no dense deposits indicative of type II MPGN. Her mother had senile cataracts. Two siblings were noted to have “normal eye exams” performed elsewhere.

On examination, visual acuity with spectacles was 20/30 OD and 20/20 OS. Near visual acuity was Jaeger 1 + OU. Anterior segment examination results were normal in both eyes. Ophthalmoscopy showed bilateral, multifocal, 200- to 300-µm, yellowish, elevated lesions at the choroid and subretinal pigment epithelial level, concentrating in the posterior pole but extending to the midperiphery (Figure 1). The peripheral lesions were most easily visualized overlying choroidal vessels. Optical coherence tomography showed multiple, optically lucent, focal elevations of the retinal pigment epithelium (Figure 2). Fluorescein angiography and indocyanine green angiography showed staining of lesions throughout the fundus, more numerous than those observed by ophthalmoscopy (Figure 3). Old fundus photographs (not shown) confirmed presence of the lesions 2 years previously, with gradual enlargement and increased confluence until examination 14 months after her initial visit to us. Visual acuity was unchanged.

**Comment.** Extensive drusen formation has been described previously in association with type II MPGN. However, a MEDLINE search (1950 until the time of submission) revealed no citations of drusen formation in as-

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**Figure 1.** Red-free photographs show large drusenlike retinal pigment epithelial lesions in the central macula and temporal paramacular regions in the right (A) and left (B) eyes.

**Figure 2.** Optical coherence tomography of the right macula shows focal retinal pigment epithelial elevation corresponding to foveal retinal pigment epithelial lesions. Shadowing from a retinal arteriole is seen at the far right.