

# Diagnosis and treatment of mysterious light streaks seen by patients following extracapsular cataract extraction

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## ABSTRACT

Complaints of light streaks, such as might be seen with a Maddox rod or Bagolini lens, are becoming more common with the trend toward extracapsular cataract surgery. The light streaks are usually a result of high plus cylinders somewhere in the patient's optical system. Windshields, spectacles, contact lenses, lashes, an excessive tear meniscus, intraocular lens scratches, and posterior capsular opacification are possible causes that can be easily identified and treated.

**Key Words:** Bagolini lens, extracapsular cataract extraction, light streaks, Maddox rod, posterior capsule opacification

The transition from intracapsular to extracapsular cataract extraction (ECCE) over the past ten years has introduced different optical aberrations and new patient complaints. One concerns the mysterious light streak that accompanies headlights or other point sources of light seen at night. This symptom can be annoying to the patient and can convert an otherwise successful cataract operation into one that does not satisfy the patient. This paper discusses the differential diagnosis and treatment of this disorder.

## MATERIALS AND METHODS

Eight patients who complained of seeing a light streak when viewing a point source of light at night were evaluated. Seven of the patients had an uncomplicated ECCE with posterior chamber lens implantation performed from six months to five years prior to the evaluation. One patient was aphakic with a contact lens. All visual acuities exceeded 20/30 and no other eye pathology was present.

Each patient was asked to view a penlight at a distance of ten feet in an examining room with no other light sources. The patient was asked to describe the streak in his or her own words. After the description, the patient was asked to note the axis, length, and

width of the streak specifically. The patient was then asked to remove his or her glasses or contact lenses and again look at the point source of light. If the streak was still present, the patient was asked to describe any change in it.

In patients seeing a persistent streak after all eyewear was removed, a careful slitlamp examination of the anterior segment was performed, noting any abnormalities of the intraocular lens (IOL) or posterior capsule. If no scratches or other abnormalities on the IOL were noted, a Nd:YAG laser discission of the posterior capsule was performed. Patients receiving the Nd:YAG laser capsulotomy were reevaluated approximately two weeks after the treatment to see if their visual complaints had been eliminated.

## RESULTS

Two patients stated that the light streak was no longer present after their spectacles had been removed. One patient, who wore a contact lens for high astigmatism, also noted that the light streak disappeared when the contact lens was removed. The five remaining patients noted that the light streak persisted after removing all eyewear. One of these five patients was observed to have fine linear parallel scratches on

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*Figures provided by David Apple, M.D., Salt Lake City, Utah.*

*Presented at the U.S. Intraocular Lens Symposium, Los Angeles, California, April 1984.*

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the IOL approximately 0.5 mm temporal to the center of the pupil.

The other four patients had linear parallel lines on their posterior capsules, from proliferating spindle-shaped lens epithelial cells, in an orientation perpendicular to the axis of the streak described by the patient (Figure 1).<sup>1</sup> Neodymium:YAG laser capsulotomies were performed on all four patients and created apertures that were greater than the pupil size in dark conditions. After capsulotomy, all four patients reported a reduction or elimination of the light streaks; in addition, three reported that a fine diffuse haze or smoke had been removed from their vision.



Fig. 1. (Holladay) Scanning electron microscopy of linear lines on the posterior capsule from proliferating spindle-shaped lens epithelial cells perpendicular to the axis of the streak described by the patient ( $\times 200$ ).

## DISCUSSION

Seven clinical explanations for light streaks seen by patients following ECCE are listed in Table 1. Light streaks are most often caused by parallel high plus cylinders that create a virtual image perpendicular to the cylinders, commonly referred to by clinicians as the Bagolini lens or Maddox rod effect.<sup>2</sup> In all cases involving the posterior capsule, high plus cylinders must be present to create this effect.

A simple penlight test, with and without eyewear, will determine whether the problem is extraocular or intraocular. The extraocular causes of the effect, such as a windshield or spectacles, can be diagnosed and eliminated by cleaning or removing the device and retesting the patient. The streaks caused by lashes, an excessive tear meniscus, or contact lenses require slightly more careful evaluation. The streak effect caused by lashes or an excessive tear meniscus can be eliminated by having the patient open his or her eyes widely so the lashes and tear meniscus are not within the entrance pupil.

The streaks caused by contact lenses are usually the result of linear scratches on the contact lens. These often dry out a few seconds after a blink and create a Bagolini lens effect. These scratches will not be seen immediately after a blink, but appear as the patient stares at an object and the lens dries. Tasks that reduce blinking such as reading and watching television exaggerate the problem. This problem usually occurs with older lenses that have been polished and need replacing.

If the light streak is still present with the patient's eye widely opened and no eyewear present, the source of the problem must be intraocular. In such cases the problem must be confined to the IOL or the posterior capsule. If the IOL is the cause, linear parallel scratches will be seen with the slitlamp, using oblique direct illumination. Retroillumination is not as helpful because the scratches are so superficial they do not cast a shadow and may not be seen in this manner. The scratches on the IOL must be within the pupil to cause a patient's symptoms. In our patient, these scratches were approximately 0.5 mm from the pupillary center and were caused by the instrument used to insert the lens. The light streak disappeared when the pupil was constricted and the iris covered the scratches. The patient's symptoms were eliminated by using pilocarpine 1% each evening.

The remaining four patients had fine lines visible on the posterior capsule acting as parallel high cylinders. The clarity of the streak and its regularity were always related to the regularity of these lines on the posterior capsule. Patients with a random pattern of these lines commonly complained of glare in addition to the light streak.

Neodymium:YAG laser capsulotomy was performed on the patients in whom fine lines were observed on the posterior capsule. This treatment alleviated the symptoms in each instance. In one case, however, a second laser treatment had to be performed. This patient related that the light streak had diminished in brightness and was shorter after the first treatment, but there was still a small, faint, visible streak. Examination revealed that the capsulotomy, although 3 mm, was not as large as the patient's pupil during scotopic conditions. We also observed that there were parallel lines on the capsule within the pupil. The laser was used to enlarge the capsulotomy so that no capsule was visible through the pupil during scotopic conditions. After this was done, the patient did not see a light streak.

Large waves or corrugations in the posterior capsule occurring after a posterior chamber lens is put in the capsular bag cannot cause light streaks because there is no high plus cylinder involved.<sup>2</sup> Light streaks will not be produced because the capsular surfaces are parallel and therefore plano even though there are

corrugations. Although corrugations may cause distortion, they cannot cause a Maddox rod effect. Fine wrinkles that are seen in the capsule (Figure 2) are no different than larger corrugations and cannot cause a Maddox rod effect. In either case, however, it is possible that thickening of the capsule in the troughs could create high plus cylinders. When this occurs, close inspection under high power magnification with the slitlamp allows detection of this variation in thickness.

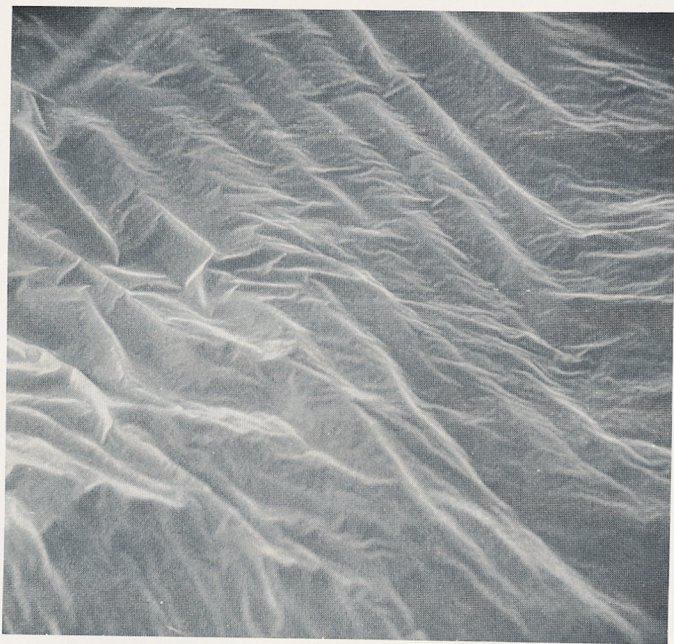


Fig. 2. (Holladay) Scanning electron microscopy of fine wrinkles in posterior capsule, which cannot cause a Maddox rod or Bagolini lens effect ( $\times 200$ ).

Although the first six sources of postsurgical light streak listed in Table 1 can occur with any type of cataract surgery or implant, the seventh, presence of the posterior capsule, is unique to ECCE. The presence of a posterior capsule is associated with a reduced rate of cystoid macular edema and retinal detachment at the expense of glare and light streaks.<sup>3,4,5</sup> The only way to eliminate these annoying visual symptoms is with a capsulotomy large enough to exceed the pa-

Table 1. Sources of high plus cylinders causing visual light streaks.

1. Windshields, windows
2. Spectacles
3. Contact lenses
4. Lashes
5. Excessive tear meniscus
6. Intraocular lens scratches
7. Posterior capsules (lens fibers and debris-filled corrugations/wrinkles)

tient's pupil size at night.<sup>6</sup> Immediately following the capsulotomy, the patient will notice a reduction in glare and disappearance of the light streak.

## CONCLUSIONS

Complaints of light streaks, glare, and other optical aberrations following cataract surgery are annoying to patient and surgeon. Spindle-shaped lens epithelial cells on the posterior capsule may produce a Maddox rod effect that results in light streaks. This cause of light streaks after ECCE can be eliminated with an adequate capsulotomy.

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