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## Does Intraocular Scattering Increase after Lasik Refractive Surgery?

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### Abstract

**Purpose:** Standard LASIK refractive surgery increases the amount of high order aberrations. However, changes in scattered light after corneal surgery have not been yet clearly reported. We used a new method, based on polarization measurements, to objectively evaluate a possible increment in scattered light in eyes that underwent LASIK.

**Methods:** We used a modified double-pass polarimeter to measure the degree of polarization (DOP) of the light after passing through the ocular media (the fraction of light that remains polarized). Since depolarization is intrinsically related to the scattering of light in an optical media, our technique provides an objective parameter to quantify changes in intraocular scattering. The setup was a double-pass configuration with linearly polarized IR light for illumination, and a linear polarizer together with a quarter-wave plate in the recording stage. Series of four double-pass images for the appropriate orientations of the fast axis of the retarder were recorded to estimate the DOP. This procedure was first tested in an artificial eye with a variable amount of scattering generated by a ceramic opto-electronic material. Measurements were carried out in two groups of young eyes: normal adults, as a reference group, and patients after standard myopic LASIK (7-21 months after surgery; range of pre-operative refraction: -1.75D to -5.25D). The exit pupil diameter was 6 mm.

**Results:** The average DOP in the normal young population was  $0.78 \pm 0.09$ . A value 1 means complete absence of scattered light, while a value 0 means a perfect scattering media. In four post-LASIK eyes with pre-operative refraction below 2.75D the DOP had a value of  $0.75 \pm 0.04$ , similar to that in normal eyes. Nonetheless, in three post-LASIK eyes with pre-operative refraction over 4.25D, the DOP was  $0.53 \pm 0.06$ , indicating a larger presence of scattered light.

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**Conclusions:** In post-LASIK patients with low pre-operative refractions the levels of scattered light were similar to those found in normal young eyes. However, we observed a significant increase of scattering (30%) in post-LASIK eyes with prior refractions above 4.5 D. In these cases, a larger contribution of scattered light after LASIK could explain reduced visual outcomes beyond the well documented increases of high order aberrations.

**Keywords:** refractive surgery • optical quality • optical properties • physiological optics



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