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Abstract Title:	**Ablation-Induced Changes in Corneal Shape and Aberrations in a Plastic Cornea Refractive Surgery Model**
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Author Block:	*C. Dorronsoro[1], B. Alonso[1,2], S. Marcos[1].* [1]Instituto de Optica, CSIC, Madrid, Spain; [2]Departamento de Fisica Aplicada, Universidad de Salamanca, Salamanca, Spain.
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Purpose: Previous analytical, computational and experimental studies suggest that the increased asphericity found after myopic refractive surgery (and as a consequence, the induced spherical aberration) is largely due to laser efficiency losses from the corneal apex to the periphery. These effects can be measured experimentally to calculate a correction factor for each laser. This work further investigates the geometrically-related laser efficiency losses for three different lasers, and their effect on plastic corneal models.

Methods: Three narrow-beam flying spot excimer lasers (T: Technolas 217 Z100, Bausch&Lomb; L: Ladarvision 4000, Alcon; A: Allegretto wave Eye-Q, Wavelight) provided with state-of-the-art algorithms were used to ablate flat and spherical (radius of curvature=7.8 mm) artificial eyes with high optical quality surfaces of Filofocon A, a fluro-silicon-acrylate material. Myopic corrections of 3, 6 and 9 D were applied, with optical zones of 6.5 mm. The line of sight of the artificial eye was aligned with the laser fixation reference, using an artificial retina (CCD) and a tip & tilt platform. In-eye artificial pupils allowed centration as in patients' eyes. The 3D shape of the spherical and flat surfaces were measured with a confocal imaging profiler (PLμ Sensofar) pre- and post- ablation.

Results: Ablation shapes were measured with a precision of 1 μm, both on flat and on spherical surfaces. Ablation dephts were 0.34 (T), 0.54 (L) and 0.44 (A) times the nominal value on cornea. The postoperative apical radius of curvature varied across lasers (for -9 D correction, T: 8.12±0.11, L: 8.52±0.05, A: 7.93±0.06 mm), as well as the induced asphericity (T: 0.28±0.11, L: 0.26±0.1, A: -1.6±0.1), which resulted in different amounts of spherical aberration on identical artificial eyes. These differences are not only caused by differences in the ablation algorithm design, but also by different geometry-related laser efficiency losses, which depend on laser properties, primarily laser fluence. 3D correcting factor for each laser was obtained from comparison of the ablation shapes in flat and spherical surfaces. Some deviations from rotational symmetry were found consistently both on flat and spherical surfaces.

Conclusions: Experimental plastic eye models for laser refractive surgery are useful: (1) to assess the outcomes of different lasers or ablation algorithms, (2) for precise calibration and testing of the lasers, and (3) to calculate an experimental correction factor to improve post-operative corneal shape predictability.

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