

# EDITORIAL

## Should We Expect the Rise of Nd:YAG Laser Capsulotomies in the Future?



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**P**OSTERIOR CAPSULAR OPACIFICATION (PCO) MANIFESTED by the proliferation and migration of lens epithelial cells (LECs) and intraocular straylight may impair visual function and quality of life of patients, even with good postoperative visual acuities.<sup>1,2</sup> Although PCO can be easily treated with neodymium-doped yttrium aluminum garnet (Nd:YAG) laser capsulotomy, the procedure is associated with health care costs, treatment burden, and rare adverse events.<sup>3</sup> Optimization of intraocular lens (IOL) design and materials has substantially decreased the rates of Nd:YAG treatment.<sup>4,5</sup> Specifically, the sharp optic edge of the IOL and a firm capsular-IOL adhesion forming a “barrier effect” is emphasized to inhibit LEC migration and PCO.

Advances in cataract surgery and refractive lens exchange have consequently raised patients' expectations for excellent uncorrected near, intermediate, and distance visual acuity. Nontoric and toric multifocal IOLs were introduced to fulfill the desire for freedom from spectacles for both noncataractous and cataractous eyes. A retrospective study by Kim and associates<sup>6</sup> reviewed 913 eyes implanted with plate-haptic refractive segmented nontoric (n = 767) and toric (n = 146) multifocal IOLs. Nd:YAG laser capsulotomy rates were higher among patients wearing toric multifocal IOLs (16.4 %) than their nontoric versions (9.0 %) in 6.6- and 7.0-month follow-up examinations, respectively. The hypothesis of more frequent capsulotomies in toric versions of the multifocal IOLs was based on asymmetrical contacts between the posterior toric surface of the lens and posterior capsule. Nd:YAG rates tended to decrease with higher degrees of multifocal IOL toricity; this is counterintuitive to the concept that asymmetrical apposition of the posterior capsule and posterior IOL surfaces are causes for increased

PCO with posteriorly toric multifocal IOLs. Nevertheless, only 4.1% (n = 6) of toric multifocal IOLs represented cylinder power other than 1.50 diopter (D) or 2.25 D.<sup>6</sup>

Moreover, these findings, may not be generalized to other more commonly used haptic designs.

Multifocal IOLs tend to be affected more by the mild PCO than the monofocal IOLs.<sup>7</sup> Nd:YAG rates were found to be up to 15% at approximately 2 years after multifocal IOL implantation.<sup>8</sup> Moreover, among dissatisfied multifocal IOL recipients experiencing visual symptoms, 54% to 67% of patients exhibited PCO.<sup>9,10</sup> Considering those reports, the Nd:YAG rates seem consistently higher than real-world evidence when monofocal IOLs are used.<sup>5</sup> Primary posterior continuous curvilinear capsulorhexis was proposed to eradicate PCO,<sup>7</sup> but data are lacking for the safety of the procedure conducted in randomized clinical trials; neither the effect of the procedure on rotational problems of toric lenses has been documented. The high Nd:YAG rates among multifocal IOL recipients raises the question whether Nd:YAG laser capsulotomy should be considered an adjunct treatment during the follow-up or whether the procedure should remain a proxy for undesired late-onset complications. Future studies are warranted to address the quality of vision in patients with multifocal IOLs after Nd:YAG laser capsulotomy.<sup>11</sup> The centration of multifocal IOL is very important. One could argue whether Nd:YAG laser capsulotomy increases the risk of decentration or tilt, leading to visual phenomena deriving from higher-order aberrations, along with astigmatism, halos, and dysphotopsia.

Previous studies have highlighted the significance of patient-related risk factors for development of PCO. Younger patients and eyes receiving low-D IOLs have the highest risk for PCO.<sup>12</sup> Axial length of the eye was also associated with toric IOL rotational problems.<sup>13</sup> Interestingly, high-speed swept-source optical coherence tomography revealed that the type of capsular bend created by sharp optic edges was an important predictor of PCO.<sup>14</sup> For instance, in myopic eyes, poorer contact of the IOL on the capsular bag (probably due to thinner optic or larger capsular bag) led to delayed and incomplete capsular bend types, predisposing to epithelial cell migration onto the capsule and, ultimately, PCO formation. The present authors believe that it is fairly difficult to conduct a

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Accepted for publication Dec 31, 2020.

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randomized setup in this area of research, as probably every patient would prefer to choose the IOL based on personal preferences, rather than to be randomized among mono- and multifocal and nontoric and toric characteristics of the IOLs.<sup>15</sup>

The retrospective nature of the registry-based studies for the incidence of PCO do not allow for randomization with equal distribution of certain patient characteristics and parameters. Such bias, although nonsignificant for the Nd:YAG laser capsulotomy rates, was also observed in a study of by Kim and associates<sup>6</sup> The following differences were characterized between nontoric and toric multifocal IOL groups: recipients of toric multifocal IOLs were

younger, their eyes were nearly 0.5 mm higher in axial length, and the implanted lenses were more than 2 D less in optical power. In a real-world approach, the cumulative incidence of Nd:YAG laser posterior capsulotomy could be estimated with competing risks survival analysis considering the long-term effects of most relevant confounding risk factors.<sup>5</sup> The different Nd:YAG rates between monofocal and multifocal IOLs and between nontoric and toric versions provide us with an opportunity to concentrate on the mechanisms of PCO formation, the effects of PCO on visual function in pseudophakic eyes with premium IOLs, and the future development of these lenses.

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THE AUTHORS HAVE COMPLETED AND SUBMITTED THE ICMJE FORM FOR DISCLOSURE OF POTENTIAL CONFLICTS OF INTEREST and none were reported. The study was funded by the University of Warmia and Mazury, Olsztyn, Poland, and the Foundation for Ophthalmology Development, Poznan, Poland. A.G. has received grants, personal fees, and nonfinancial support from Pfizer, Santen, Bausch & Lomb, Alcon, Topcon, and Zeiss outside the submitted work. R.T. has received personal fees from Alcon, Bayer, and Novartis outside of this work. Neither author has any proprietary interests and conflicts of interest related to this submission. The corresponding author confirms that each of the coauthors has seen and agrees with each of the changes made to this manuscript in the revision. Both authors take full responsibility for all aspects of this work and each take full responsibility for the entire work.

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