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Case Report

Cataract Surgery following Sequential Myopic and Hyperopic LASIK

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Abstract
We report a case of patient dissatisfaction after sequential myopic and hyperopic LASIK in the same eye. We discuss the course of management for this patient involving eventual cataract extraction and intraocular lens (IOL) implantation with attention to the IOL power calculation method used.

Introduction

Intraocular lens (IOL) implant calculations after refractive corneal ablation treatments are known to pose challenges for precise refractive outcomes. Current approaches to accurately determine the true power of ablated corneas include historical data, intraoperative aberrometry, and OCT-based and non-OCT-based formulas, which overall achieve a spherical prediction accuracy of ±0.50 D in approximately 70% of cases [1–5]. A carefully crafted approach needs to be considered when encountering IOL calculation with multiple prior ablations.

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Case Report

A 61-year-old female presented for cornea consultation for blurry vision in both eyes, with glare and monocular diplopia specifically worse in her left eye. Both eyes had undergone prior LASIK 11 years prior to presentation. The prior refraction and treatment history was otherwise unknown. She noted immediate improvement in distance visual acuity without spectacle correction in the postoperative period but was dissatisfied with the loss of near vision and had additional treatment of her left eye for near-vision difficulties. It was unclear that a monovision trial had been performed preoperatively. She reported further dissatisfaction with both distance and near vision in the left eye that was not remedied with various combinations of spectacles and contact lens trials (contact lens intolerance). Binocular vision was also reported to be poor.

Her best corrected distance visual acuity was 20/20 in the right and 20/50 in the left eye. Refraction was –2.25 + 1.25 × 150 in the right eye and –5.75 + 0.50 × 100 in the left eye. The central corneal thickness was 485 and 470 μm in the right and the left eye, respectively, as measured by noncontact pachymetry. Assessed with an ATLAS 9000 (Carl Zeiss Meditec, Inc., Dublin, CA, USA), the corneal topography revealed an asymmetry between the two eyes with relative central steepening of the left cornea centrally (Fig. 1). Her eye examination revealed well-healed prior LASIK flaps (Fig. 2), mild nuclear lens changes, and mild peripheral pigmentary retinal changes. A 6-month trial with spectacle correction for far, near, and intermediate distances was prescribed with limited satisfaction. Intentional partial distance correction of the left eye for far distance to reduce the amount of anisometropic aniseikonia was unsuccessful. The patient was therefore offered cataract extraction with IOL implantation with the goal of decreasing anisometropia. Details pertaining to refractive outcome predictability and the risks of surgery were discussed with the patient. Optical biometry was also obtained with the IOL Master (Carl Zeiss Meditec) (Fig. 3).

The patient underwent uneventful phacoemulsification with posterior-chamber IOL implantation in the left eye using a scleral tunnel approach to avoid the previous LASIK flap edges and ablation zones. A ZCB00 (Abbott, Abbott Park, IL, USA) IOL with a power of +15.5 D for a refractive target of between –0.50 D and emmetropia was selected based on review of the IOL Master and American Society of Cataract and Refractive Surgery (ASCRS; http://iolcalc.ascrs.org/) post-hyperopic LASIK IOL, given the relative overall central steepening of the left eye and presumed myopic followed by hyperopic ablation profiles used for treatment 11 years previously. Data from the IOL Master and topographer were utilized in the calculation with no prior data (Fig. 4). Uncorrected distance visual acuity at 1 month was 20/25 postoperatively without any surgical complications, with additional patient satisfaction at each visit. There was no improvement of the manifest refraction in the left eye attributed to corneal alterations.

Discussion

The challenges of IOL power calculations after refractive ablative corneal surgery are well acknowledged [6, 7]. It has become paramount for the surgeon to have a sound understanding of how to best determine IOL power in these patients, where the true corneal refractive power is less easily determinable. Patients that have had refractive corneal ablation (LASIK and PRK) undergo changes in their anterior and posterior corneal curvature in different proportions. This causes conventional IOL formulas that use corneal power to determine effective lens positioning to be relatively inaccurate [8]. Considerable effort has been made to correct for this

problem with multiple methods ranging from historical data and regression analyses to technologies such as corneal topography [3], OCT [4], or Scheimpflug technology-assisted total corneal power measurements and intraoperative aberrometry. The ASCRS postrefractive calculator offers many such methods in a Web-based format (ASCRS http://iolcalc.ascrs.org/).

In this case, without any historical data, parameters such as excimer platform, flap size (diameter, depth), ablation depth zones, and pattern (custom vs. conventional) were all unknown. The differential hydration, biomechanics, and ablation rates in the anterior versus posterior and central versus peripheral cornea also introduced other variables. However, there was good interformula agreement of the IOL power determination with the ASCRS post-hyperopic ablation IOL calculator with a relatively low variance. Interestingly, the Holladay 1 formula for normal eyes also determined a similar IOL power for a refractive target close to emmetropia (15.5 D for a refractive target of –0.19). Wang et al. [9] determined that the use of surgically induced change in refraction using no previous data yielded less variance and a higher percentage of refractive targets within ±0.50 D than using pre-LASIK/PRK corneal power values.

The methods have improved the chance of a successful refractive target for patients. Nonetheless, a careful and informed discussion with patients undergoing cataract surgery after refractive laser surgery is paramount to manage patient expectations and improve patient satisfaction after surgery. Even with the best methods, achieving a refractive success of within ±0.50 D is achieved in up to 70% of patients, compared to 91% in native eyes, leaving much room for improvement [10].

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Statement of Ethics

Patient consent was obtained along with IRB approval for publication of this case report. No personally identifiable information was utilized.

Disclosure Statement

The authors have no conflicts of interest or proprietary interest in any of the topics or products presented in this manuscript.

References

1 Fram NR, Masket S, Wang L. Comparison of Intraoperative Aberrometry, OCT-Based IOL Formula, Haigis-L, and Masket Formulae for IOL Power Calculation after Laser Vision Correction. Ophthalmology. 2015 Jun;122(6):1096–101.
2 Huang D, Tang M, Wang L, Zhang X, Armour RL, Gattey DM et al. Optical coherence tomography-based corneal power measurement and intraocular lens power calculation following laser vision correction (an American Ophthalmological Society thesis). Trans Am Ophthalmol Soc. 2013 Sep;111:34–45.

3 Kwitko S, Marinho DR, Rymer S, Severo N, Arce CG. Orbscan II and double-K method for IOL calculation after refractive surgery. Graefes Arch Clin Exp Ophthalmol. 2012 Jul;250(7):1029–34.
4 Wang L, Tang M, Huang D, Weikert MP, Koch DD. Comparison of Newer Intraocular Lens Power Calculation Methods for Eyes after Corneal Refractive Surgery. Ophthalmology. 2015 Dec;122(12):2443–9.
5 Shammas HJ, Shammas MC, Garabet A, Kim JH, Shammas A, LaBree L. Correcting the corneal power measurements for intraocular lens power calculations after myopic laser in situ keratomileusis. Am J Ophthalmol. 2003 Sep;136(3):426–32.
6 Stakheev AA, Balashevich LJ. Corneal power determination after previous corneal refractive surgery for intraocular lens calculation. Cornea. 2003 Apr;22(3):214–20.
7 Wang L, Booth MA, Koch DD. Comparison of intraocular lens power calculation methods in eyes that have undergone LASIK. Ophthalmology. 2004 Oct;111(10):1825–31.
8 Szaflik J, Kamińska A, Gajda S, Jedruch A. [Accuracy of the SRK II, SRK/T, Holladay and Hoffer Q IOL power calculation formulas in hyperopic patients after phacoemulsification]. Klin Oczna. 2005;107(10–12):615–9.
9 Wang L, Hill WE, Koch DD. Evaluation of intraocular lens power prediction methods using the American Society of Cataract and Refractive Surgeons Post-Keratorefractive Intraocular Lens Power Calculator. J Cataract Refract Surg. 2010 Sep;36(9):1466–73.
10 Koch DD. The Enigmatic Cornea and Intraocular Lens Calculations: The LXXIII Edward Jackson Memorial Lecture. Am J Ophthalmol. 2016 Nov;171:xv–xxx.

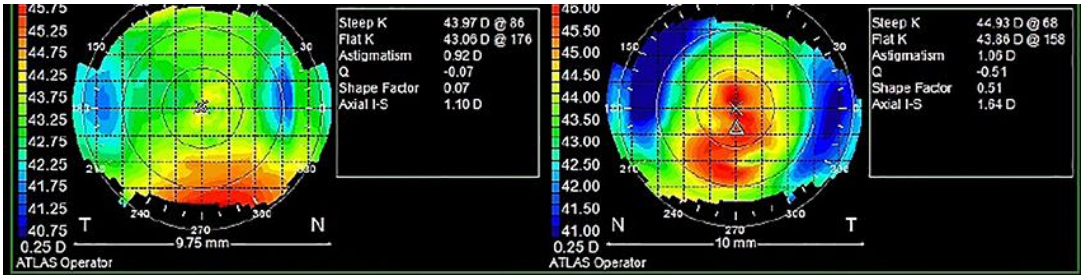

Fig. 1. Preoperative corneal topography of the right eye (left side of image) and the left eye (right side of image).

Fig. 2. Anterior segment OCT revealing prior LASIK flap creation in the left eye.

OD right

AL: 24.61 mm (SNR = 267.1)
K1: 43.55 D / 7.75 mm @ 150°
K2: 44.41 D / 7.60 mm @ 60°
R / SE: 7.67 mm / 43.98 D
Cyl.: 0.86 D @ 60°
ACD: 3.94 mm

Status: Phakic

AMO Tecnis 1 ZCB00		Alcon AcrySof MA60AC	
SF:	2.02	SF:	1.90
IOL (D)	REF (D)	IOL (D)	REF (D)
20.0	-1.62	19.5	-1.44
19.5	-1.29	19.0	-1.10
19.0	-0.96	18.5	-0.77
18.5	**-0.63**	**18.0**	**-0.44**
18.0	-0.31	17.5	-0.12
17.5	0.01	17.0	0.20
17.0	0.32	16.5	0.52
Emme. IOL: 17.51		Emme. IOL: 17.31	

OS left

AL: 24.60 mm (SNR = 259.9)
K1: 45.36 D / 7.44 mm @ 9°
K2: 46.17 D / 7.31 mm @ 99°
R / SE: 7.38 mm / 45.77 D
Cyl.: 0.81 D @ 99°
ACD: 3.99 mm

Status: Phakic

AMO Tecnis 1 ZCB00		Alcon AcrySof MA60AC	
SF:	2.02	SF:	1.90
IOL (D)	REF (D)	IOL (D)	REF (D)
17.5	-1.44	17.5	-1.57
17.0	-1.12	17.0	-1.25
16.5	-0.81	16.5	-0.93
16.0	**-0.50**	**16.0**	**-0.61**
15.5	-0.19	15.5	-0.30
15.0	0.11	15.0	0.00
14.5	0.41	14.5	0.31
Emme. IOL: 15.18		Emme. IOL: 15.01	

Fig. 3. Preoperative biometry with recommended intraocular lens calculations.

Fig. 4. ASCRS post-hyperopic ablation intraocular lens recommendations with no clinical history.