

Intraocular Lens Power Calculation in Traumatic Aphakic Patient Following Myopic LASIK Operation: Case Report

Miyopik LASIK Cerrahi Öyküsü Olan Travmatik Afakik Gözde Göziçi Lens Gücünün Hesaplanması: Olgu Sunumu

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ABSTRACT

A fifty years old female patient with the history of Laser in situ keratomileusis (LASIK) presented at emergency room complaining of insertion of a hair clip piece into her left eye. On slit-lamp examination, there was a foreign body impacted in inferotemporal paracentral cornea extending into the lens via penetrating iris. Two and a half months after the corneal fixation and traumatic cataract extraction, iridoplasty and secondary intraocular lens (IOL) implantation were applied. The stable refraction was $-0.50 - 0.75/160$ degrees at the first year of trauma. In traumatic aphakic eyes with the history of refractive surgery choosing appropriate IOL calculation formula may become more difficult because routinely used methods to calculate IOL power do not guarantee the same accuracy compared with naive eyes. Haigis-L formula might be a preferable method to calculate IOL power for these eyes.

Key words: Refractive surgery; intraocular lenses; traumatic aphakia; penetrating eye injuries.

ÖZ

Geçirilmiş Laser in situ keratomileusis (LASIK) öyküsü olan 50 yaşında kadın hasta sol gözüne saç tokası parçası gelme şikayeti ile acil servise başvurdu. Biyomikroskopik incelemesinde alt temporal parasantral korneadan irisi penetre ederek lense uzanan yabancı cisim izlenmekteydi. Korneal sütürasyon ve travmatik katarakt ekstraksiyonundan 2,5 ay sonra hastaya iridoplasti ve sekonder göziçi lens implantasyonu uygulandı. Travmanın birinci yılında stabil refraksiyon $-0.50 - 0.75/160$ derece düzeyinde idi. Refraktif cerrahi öyküsü olan travmatik afakik hastalarda uygun göziçi lens formülasyonunun seçilmesi rutinde kullanılan diğer yöntemlerin naif gözlerdeki doğruluğu garanti etmemesi nedeniyle zordur. Haigis-L formülünün bu gözler için tercih edilebilir bir yöntem olabileceği düşünülmektedir.

Anahtar kelimeler: Refraktif cerrahi, göziçi lensleri, travmatik afaki, penetran göz yaralanmaları.

INTRODUCTION

In traumatic aphakic eyes with the history of refractive surgery keeping the refraction at emmetropic levels may become more difficult because routinely used methods to calculate intraocular lens (IOL) power do not guarantee the same accuracy compared with naive eyes. Numerous methods have been described to prevent this refraction error in

patients with previous refractive surgery but an appropriate IOL calculation formula for a trauma induced aphakic eye could not be obtained in the literature.

Thus, the aim of this paper was to report outcomes using the Haigis-L formula to calculate IOL power in a traumatic aphakic eye with repaired corneal perforation that had previous LASIK.

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CASE REPORT

A fifty years old Caucasian female patient presented with complaining of insertion of a metal hair clip piece into her left eye. On examination, visual acuity was limited to finger counting. On slit-lamp examination, there was a metal foreign body impacted in inferotemporal paracentral cornea extending into the lens via penetrating iris at 4 o'clock position, and traumatic cataract (Figure 1a). Besides the traumatic findings, a LASIK scar was also observed. A comprehensive fundoscopic examination could not be achieved due to the traumatic cataract.

The patient underwent immediate operation, foreign body was extracted (Figure 1b) and the corneal wound was closed. Next, the perforated anterior capsule was stained with trypan blue, capsulorhexis was performed and lens was aspirated. It was noted that posterior capsule had not been ruptured. (Figure 2a).

Corneal sutures were removed 2 months after primary repair and iris reparation and secondary IOL implantation was planned (Figure 2b).

Axial length (AL), anterior chamber depth (ACD) and keratometry measurements were taken using with the IOLMaster 500 partial coherence interferometer (Carl Zeiss Meditec, Dublin, CA). Preoperative measurements were recorded as follows: AL: 23.80mm, K1: 40.00D/8.43 mm @ 140° , K2: 41.46 D/ 8.14 mm @ 50°, ACD: 3.93 mm.

However, an appropriate IOL calculation formula for a trauma induced aphakic eye could not be obtained in the literature, Haigis-L algorithm within the partial coherence interferometer's software was chosen to calculate the IOL power preoperatively.

In the operation, clear corneal incision (3.00 mm) was performed in the steep corneal axis (50°) to decrease corneal astigmatism. Then, +26.0 D Alcon Acrysof MA60AC (Al-

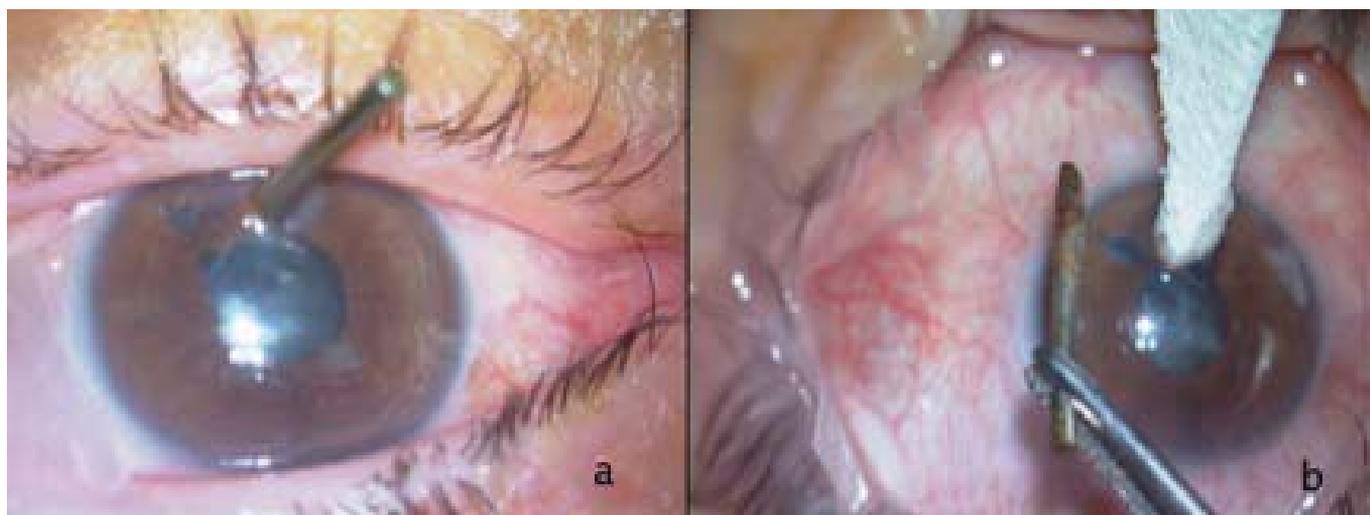


Figure 1: Photographies from operating microscope. a : Preoperatively b: Just after removing of hair clip.



Figure 2: Slitlamp photographies with diffuse illumination postoperative corneal fixation and traumatic cataract extraction a: 1 week postoperative view. b: 2 monhts postoperative view, 1 day after removal of corneal sutures.

con Laboratories, Inc., Texas, USA) three pieces foldable IOL was implanted into the capsular bag based on adequate capsular support.

Then traumatic iris rupture was fixed using PC9 suture with the technique of Siepser sliding knot (Figure 3a). The stable refraction postoperatively was $-0.50 - 0.75/160$ degrees and BCVA was 10/10 at the first year of trauma (Figure 3b).

CONCLUSION

After corneal refractive surgery, routinely used methods to calculate IOL power do not guarantee the same accuracy compared with naive eyes. There are three main reasons for this challenges; incorrect measurement of the corneal radius due to inability to measure the anterior corneal curvature correctly, changed refractive index and incorrect estimation of the effective lens position in IOL calculation formulas. Combination of these errors result in postoperative hyperopic refraction.¹

To prevent or minimize this refraction error numerous new methods have been developed to calculate IOL power. Clinical history method² had been considered as gold standart to calculate IOL power after refractive surgery but nowadays it has been replaced by new methods that do not require historical data.³ At present there are two most popular software packages for post-myopic refractive eyes; the Holladay IOL Consultant Program and the ASCRS IOL Power Calculator. ASCRS IOL Power Calculator system contains Wang/Koch/Maloney method, Shammas No-History with Regression Analysis, the Haigis-L, ASCRS-Average, ASCRS-Minimum and ASCRS-Maximum formula.⁴ These methods calculate the corneal power from standard keratometry using a conversion formula obtained by regression analysis.

There are two benchmark standards which are proposed by the British National Health Service for IOL calculating for-

mulas in virgin cornea cataract surgeries, that is, 55% of the eyes should be within 0.50 D of the target spherical equivalent and 85% within 1.00 D.⁵

The mean absolute error (MAE) is an another index which is used for evaluating accuracy of IOL formulation methods, is defined as the absolute difference between the intended formula-derived spherical equivalent (SE) refractive target and the actual postoperative SE.

Haigis L formula which does not need historical data, uses linear regression analysis to correct corneal power which obtained from the IOLMaster.⁶ We preferred using Haigis -L formula in this case, because it is easy to achieve depending on the availability on the IOL Master and it had acceptable refractive outcome in the studies.^{3,6,7}

Haigis described the Haigis-L formula for the calculation of IOL power after refractive laser surgery in a study of 187 eyes with a mean AL of 27.02 ± 2.01 mm.⁶ In this study, the MAE was 0.37 D and the percentages of correct refraction predictions within ± 1.00 and ± 0.50 D were 84.0% and 61.0%, respectively which fulfill the criteria of British National Health Service.⁶

With the Haigis-L formula, Chee-Wai Wong et al.⁸ found that the overall predictability for achieving ± 0.50 D and ± 1.00 D of the target refraction were 45.2% and 71.0%, respectively and MAE of 0.77 ± 0.74 D in a study of 62 eyes with ALs greater than 25.0 mm. This results still fall short of the benchmark standards proposed by the British National Health Service but when compared with other modern IOL power calculation formulas, had the highest proportion acceptable accuracy to predict and achieve target outcomes.

According to these studies the Haigis-L formula has acceptable accuracy to predict IOL power after phacoemulsification in eyes that had previous LASIK. In the literature there

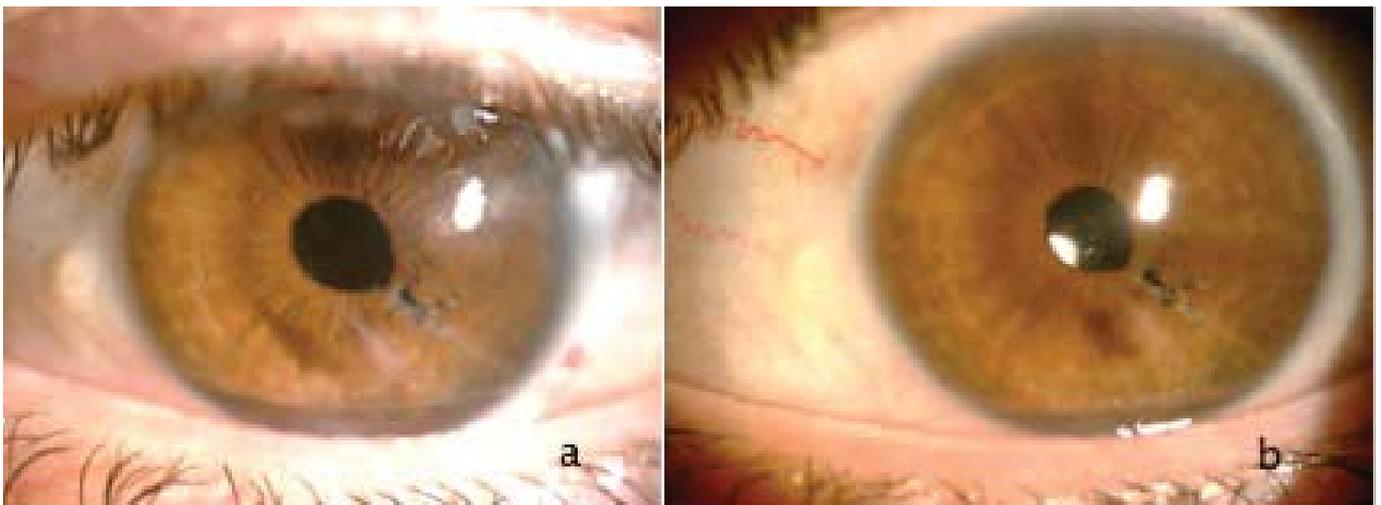


Figure 3: Slitlamp photographs with diffuse illumination postoperative secondary IOL implantation and iridoplasty. a: , 1 day postoperative view. b: 1 year postoperative view.

is no study which shows accuracy of Haigis-L method in traumatic aphakic patients following myopic LASIK operation, also there is not any other study which shows the most suitable method for IOL power calculation in these eyes. In our case we preferred Haigis-L method and patient had acceptable refraction like $-0.50 - 0.75/160^\circ$ at the first year of trauma.

This case provides the first evaluation of the accuracy of Haigis L methods for IOL power prediction in traumatic aphakic patients following myopic LASIK operation and refractive result showed that it might be a preferable method for these eyes.

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