Coll. Antropol. 39 (2015) 1: 233–235
Professional paper

Comparison of IOL – Master and Ultrasound Biometry in Preoperative Intra Ocular Lens (IOL) Power Calculation

Marija Škara Kolega[1], Suzana Kovačević[1], Samir Čanović[1], Ana Didović Pavičić[1] and Jadranka Katušić Bašić[2]

[1] General Hospital Zadar, Department of Ophthalmology, Zadar, Croatia
[2] General Hospital Dubrovnik, Department of Ophthalmology, Dubrovnik, Croatia

A B S T R A C T

Postoperative refractive outcome largely depends on the accuracy of calculating power of implanted IOL. Lens power calculation can be done by conventional ultrasound biometry and partial coherence laser interferometry (IOL Master). The aim was to compare the accuracy of IOL power calculations using conventional ultrasound biometry and partial coherence laser interferometry.40 eyes were included in this prospective randomized trial. Twenty eyes underwent IOL master and 20 eyes had aplanation ultrasound biometry. There were included only eyes with age-related cataract and postoperative natural visual acuity (VA) 0.7. Visual acuity was performed 6 weeks after cataract surgery. After 6 weeks best natural visual acuity were 0.9 (±0.1) in IOL-Master group and 0.85 (±0.15) in ultrasound biometry. The postoperative mean absolute refractive error was 0.75 (±0.5) D for ultrasound biometry and 0.50 (±0.50) D for IOL-Master. Optical biometry with the IOL-Master proved to be slightly more accurate than ultrasound biometry for IOL power calculation.

Key words: *IOL Master, ultrasound biometry, IOL power calculation*

Introduction

Cataract extraction and intraocular lens (IOL) implantation is one of the most common performed surgical procedures. In order to provide the best postoperative refractive outcomes, the IOL power measurement is one of the most critical calculations. It depends of keratometry, axial length measurements, anterior chamber depth, IOL power formulae and quality of IOL[1,2]. Almost half of the errors in IOL power calculation are attributed to axial length measurements error[1]. IOL power calculation can be done by conventional ultrasound biometry and partial coherence laser interferometry. A scan ultrasound biometry is the contact method that requires the use of a topical anaesthetic and the previously done keratometry on a manual or automatic keratometer. It has a longitudinal resolution of 200 µm and an accuracy of axial length measurement (ALX) of 100–120 µm. An error of 100 µm in ALX measurements lead to 0.28 D of postoperative error[3]. IOL Master is non-contact method for measuring the lens power by laser beam. It is performed without the usage of a local anaesthetic. This technique of optical biometry is reported to have a resolution 12 µm and precision of 0.3–10 µm in ALX measuring[4,5]. The aim was to compare the accuracy of IOL power calculations using conventional ultrasound biometry and partial coherence laser interferometry (PCI) on IOL-Master.

Methods

This prospective analysis performed on 40 eyes of 40 patients who underwent pacoemulsification cataract surgery with IOL implantation in General hospital of Zadar. The patients were divided in two groups. First group with 20 eyes underwent aplanation ultrasound biometry (Alcon Ultra Scan Biometry) and second one with 20 eyes underwent Optical biometry (IOL-Master V.5, Carl Zeiss) for IOL power calculation. In the study were included only eyes with age-related catarct and postoperative natural visual acuity (VA)>0.7. Eyes with other ocular pathology or intraoperative complication were excluded. Preoperative visual acuities were from 0.2–0.4. Age of operated patients was 60–84 years, 17 men (42.5%), and 23 women (57.5%). The keratometric value used for ultrasound biometry was measured by authomated keratometry, Righton

Received for publication June 12, 2014

Speedy-K type**.** The keratometric value in IOL master group was measured on same IOL-Master. Holladay II formula was applied for IOL power calculation. All patients had the same clear corneal phacoemulsification surgery technique from two surgeons. A foldable IOL was implanted in the capsular bag to all patients. The postoperative natural visual acuity and refractive error was carried out 6 weeks after catarct surgery. We compared the mean natural visual acuity and refractive error of those two groups with t-test.

Results

Visual acuities before surgery ranged 0.2–0.4.

Mean best natural visual acuity (BNVA) after 6 weeks were 0.9 (±0.1) in IOL-Master group and 0.85 (±0.15) in ultrasound biometry.

The postoperative mean absolute refractive error (MAE) was 0.75 (±0.5) D for ultrasound biometry, and 0.50 (±0.50) D for IOL-Master (Figure 1).

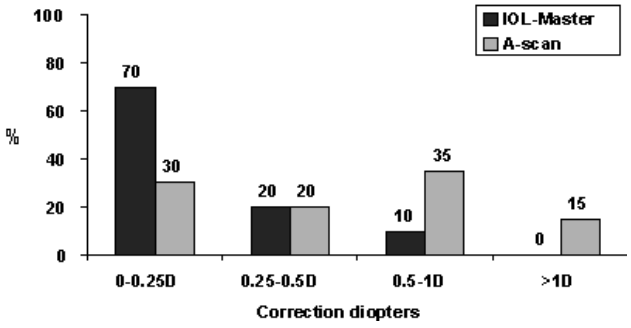

Fig. 1. Refractive outcome after 6 weeks.

In IOL-Master group refractive error from 0–0.25 D have 14 patients (70%), 0.25–0.50 D have 4 patients (20%), 0.5–1.0 D have 2 patients (10%) and none more than 1D. In ultrasound group refractive error from 0–0.25 D has 6 patients (30%), 0.25–0.50 D 4 patients (20%), 0.5–1.0 D 7 patients (35%), and more than 1D have 3 patients (15%). Summary, in IOL –Master group all patients (100%) did better in reaching ±1D of the expected post-operative refraction, while in ultrasound biometry group 85%.

Discussion and Conclusion

This study compared the refractive outcome between A-scan ultrasound biometry and partial coherence laser interferometry on IOL-Master device after phacoemulsification. We found that in IOL–Master group all patients (100%) did better in reaching ±1 D of the expected postoperative refraction, while in ultrasound biometry group 85%. This is comparable to Kim et al study[6] (95.7% using PCI technique) and Roy et al study[7] (100% in PCI group and 71.42% in US group). Raymond et al in their prospective double-blind randomised clinical study demonstrated no clinical advantages of PCI technology over conventional aplanation US for IOL power calculation[8]. Also, Moeini et al in their study show that was no significant difference in IOL power calculation[9]. Some other studies demonstrated comparable values of refractive outcomes after phacoemulsification[10–12]. Other authors demonstrate that results with PCI are more precise and have more predictable refractive outcome than the conventional ultrasound biometry[13,14]. Some newer studies compare the standard optical biometer (IOL Master) with new optical biometer (AL-Scan) in calculation of IOL lens power and conclude that both devices have excellent repeatability and reproducibility[15, 16]. It is generally accepted that the IOL master offers superior reproducibility of axial length measurement in comparison with aplanation ultrasound biometry[17]. In generally is agreed that the accurate biometry is the most important factor in achieving a successful refractive outcome after IOL implantation. Currently aplanation ultrasound biometry is the most widely used technique for biometry[18]. If measurement using ultrasound biometry is done correctly, results of both methods correspond significantly and the methods are mutually replaceable[19].

Our results showed that optical biometry with the IOL-Master proved to be slightly more accurate than ultrasound biometry for IOL power calculation. We did not evaluate the accuracy of each method in different type of cataract and preoperative refraction. Comparing our study with other studies in the literature we can conclude that the optical biometry is slightly more accurate but the ultrasound biometry is adequate in case optical biometry cannot be used.

REFERENCES

1. OLSEN T, J Cataract Refract Surg, 18 (1992) 125. DOI: 10.1016/S0886-3350(13)80917-0. — 2. HOFFER KJ, J Catarct Refract Surg, 19 (1993) 700. DOI: 10.1016/S0886-3350(13)80338-0. — 3. OSLEN T, Acta ophtalmol (Copenh), 67 (1989) 141. PMID: 2658459. — 4. FINDL O, DREXLER W, MENAPACE R, HEINZL H,HITZENBERGER CK, FEREY AF, J Cataract Refract Surg, 27 (2001) 861. PII: S0886-3350(00)00699-4. — 5. VERHULST E, VRIJGHEM JC, BSCRS Journal, 9 (2001) 35. PMID: 11702645. — 6. KIM SM, CHOI J, CHOI S, Korean J Ophthalmol, 23 (2009) 6. DOI: 10.3341/kjo.2009.23.1.6. — 7. ROY A, DAS S, SAHU SK, RATH S, Ophthalmology, 119 (2012) 1937. DOI: 10.1016/j.ophtha.2012.06.006. — 8. RAYMOND S, FAVILLA I, SANTAMARIA L, Invest Ophthalmol Vis Sci, 50 (2009) 2547. DOI: 10.1167/iovs.08-3087. — 9. MOEINI H, ESLAMI F, RISMANCHIAN A, AKHLAGHI M, NAJAFIANJAZI A, J Res Med Sci, 13 (2008) 43. — 10. MONTÉS-MICÓ R, CARONES F, BUTTACCHIO A, FERRER-BLASCO T, MADRID-COSTA D, J Refract Surg, 27 (2011) 665. DOI: 10.3928/1081597X-20110202-01. — 11. SALOUTI R, NOWROOZZADEH MH, ZAMANI M, GHOREYSHI M, SALOUTI R, Optometry, 82 (2011) 140. DOI: 10.1016/j.optm.2010.07.025. — 12. KISS B, FINDL O, MENAPACE R, WIRTITSCH M, PETTERNEL V, DREXLER W, RAINER G, GEORGOPOULOS M, HITZENBERGER CK, FERCHER AF, J Cataract Refract Surg, 28 (2002) 230. PII: S0886-3350(01)01274-3. — 13. HSIEH YT, WANG IJ, Optom Vis Sci, 89 (2012) 1697. DOI: 10.1097/OPX.0b013e31827717ae. — 14. LANDERS J, GOGGIN M, Clin Experiment Ophthalmol, 37 (2009) 566. DOI: 10.1111/j.1442-9071.2009.02091.x. — 15. SRIVANNABOON S, CHIRAPAPAISAN C, KOODKAEW S, J

Cataract Refract Surg, 40 (2014) 709. DOI: 10.1016/j.jcrs.2013.09.020. — 16. HUANG J, SAVINI G, LI J, LU W, WU F, WANG J, LI Y, FENG Y, WANG Q, Br J Ophthalmol, (2014). DOI: 10.1136/bjophthalmol-2014-305150. — 17. OLSEN T, Acta Ophthalmol Scand, 85 (2007) 472. DOI: 10.1111/j.1600-0420.2007.00879.x. — 18. NARVAEZ J, CHERWEK DH, STULTING RD, Ophthalmic Surg Lasers Imaging, 39 (2008) 30. DOI: 10.3928/15428877-20080101-08. — 18. CECH R, UTIKAL T, JUHASZOVA J, Cesk Slov Oftalmol, 70 (2014) 3. PMID: 24862369.

M. Škara Kolega

General Hospital Zadar, Department of Ophthalmology, Bože Peričića 5, 23 000 Zadar, Croatia
e-mail: maskara@net.hr

USPOREDBA IOL-MASTERA I ULTRAZVUČNE BIOMETRIJE U PREOPERTAIVNOM IZRAČUNU JAKOSTI INTRAOKULARNE LEĆE

S A Ž E T A K

Postoperativna refrakcijska greška ponajviše ovisi o točnosti izračuna jakosti implatirane intraokularne leće. Izračun jakosti IOL može se uraditi konvencionalnom ultrazvučnom biometrijom i parcijalnom koherentnom laserskom interferometrijom (IOL-Master). Cilj rada je bio usporediti točnost izračuna IOL na konvencionalnom ultrazvučnom biometru i IOL-Masteru. U prospektivnu randomiziranu studiju smo uključili 40 očiju. 20 očiju je urađen izračun IOL na IOL-Masteru i 20 očiju na aplanacijskoj ultrazvučnoj biometriji. U studiju smo uključili samo oči sa staračkom mrenom i postoperativnom vidnom oštrinom većom ili jednakom 0,7. Vidnu oštrinu smo ispitali nakon 6 tjedana postoperativno. Nakon 6 tjedana najbolja naturalna vidna oštrina je bila 0,9 (± 0,1) D u IOL-Master grupi i 0,85 (±0,15) D u grupi ultrazvučne biometrije. Postoperativna srednja refrakcijska greška je bila 0,75 (±0,5) D u grupi ultrazvučne biometrije I 0,50 (±0,50) D u IOL-Master grupi. Optička biometrija na IOL-Masteru se pokazala blago točnijom metodom od ultrazvučne biometrije za izračun IOL jakosti.