Instrument Focus

Optiwave Refractive Analysis (ORA)

Chirakshi Dhull, Sandhya Gaur, Sudarshan Khokhar
Dr Rajendra Prasad Centre for Ophthalmic Science, AIIMS, New Delhi, India

Abstract *In the current era, there is increasing demand for optimal refractive outcomes following cataract surgery. Optical methods have been identified as a gold standard for Intraocular lens (IOL) power calculation but there is always a scope of improvement. Intraoperative wavefront aberrometry with devices such as Optiwave refractive analysis (ORA) calculates IOL power on the basis of lower order aberrations intraoperatively. This provides an alternate method for IOL calculation.*

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***Keywords:** ORA, Optiwave refractive analysis, intraoperative aberrometry , IOL power, Post refractive.*

Introduction

Intraoperative wavefront aberrometry provides real-time refractive information to increase the precision and accuracy of IOL selection and positioning. The first commercially available intraoperative wavefront aberrometer was the Orange (WaveTec Vision Systems Inc, Aliso, CA), which was later updated to the Optiwave Refractive Analysis (ORA) system.[1,2]

Principle

The devices project light onto the retina and the reflected images pass through the optical system of the eye, distorting its wavefront which is subsequently analyzed according to optical and mathematical principles proprietary to the device. Instead of a laser light, ORA uses a super luminescent light-emitting diode (SLED) and Talbot-Moire′ interferometer to take 40 measurements in less than 1 minute.[2] The ORA analyzes and combines data from the central 4 mm optical zone with a dynamic range of – 5.00 to + 20.00 D and an accuracy of ± 0.30 D. The Talbot-Moire′ fringe patterns are produced by the reflected wavefront after it passes through 2 gratings placed at a specific distance and angle to each other. The resulting fringe patterns provide information about the spherical, cylindrical, and axis components of the refractive error. ORA take into account parameters such as posterior corneal astigmatism and higher-order aberrations, allowing the surgeon to confirm or revise the IOL power chosen according to preoperative biometry.

Technique

The aberrometry device is attached to the microscope with a display adjacent to it. After phacoemulsification, irrigation and aspiration, chamber is formed with visco-cohesive viscoelastic devices to increase IOP to >25 mmHg. Cornea is washed. ORA is performed in aphakic mode after thorough corneal wash in topical anesthesia (Figure 1-3) (Video 1 - available on djo website). Patient has to look in the target green light and ORA can be captured. This can be performed when the patient in under block as well by manual head adjustment by the surgeon. There are settings available for special circumstances such as post Laser in-situ keratomileusis (LASIK), post radial keratotomy (RK) etc. They can be selected as required.

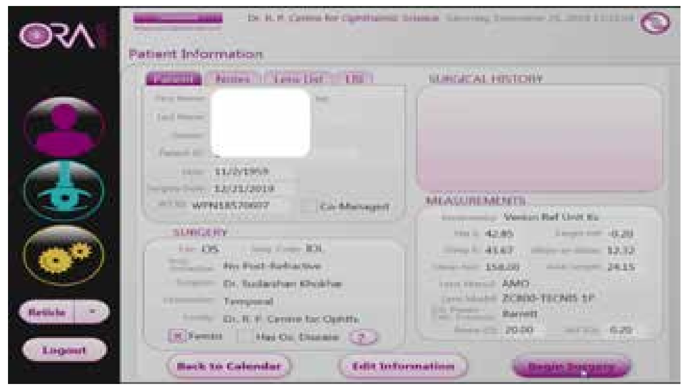

***Figure 1:** ORA display with data entry from conventional biometry technique*

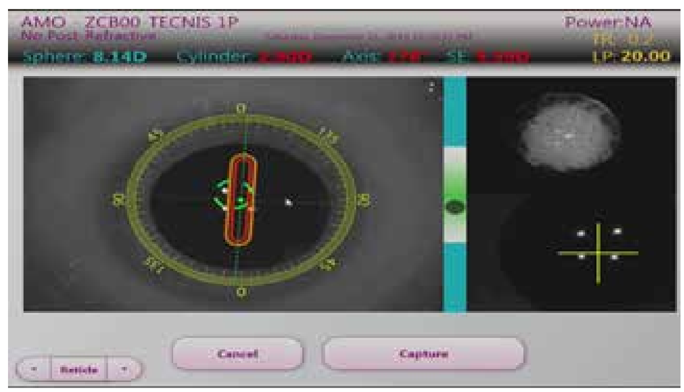

***Figure 2:** Intraoperative ORA display in aphakic mode used to capture IOL power. Patient looks at the target light.*

***Figure 3:** IOL power calculated on the basis of aphakic refraction by ORA*

For toric IOL, ORA can be captured in pseudophakic mode. It suggests the required rotation as clockwise or counter-clockwise which can be used to check the correct alignment.

Uses

ORA can be used for IOL power calculation in normal, small or longer eyes with equal or superior results compared to standard IOL power calculation methods.[3-5] It has been found to more usesful in longer eyes than conventional biometry.[6]

Intraoperative aberrometry has the ability to measure the refractive power of the eye in different meridians and is uniquely suited for use with toric IOLs. These devices are able to combine anterior corneal power, posterior corneal power, and the toricity of the implanted IOL within the capsular bag, improving the accuracy of the IOL selection.

In addition to optimizing lens selection and alignment, the devices can also help surgeons choose the meridian and length of corneal relaxing incisions when correcting astigmatism with this alternate method.

Biometric data in combination with standard IOL calculation formulas are insufficient for the determination of IOL power in eyes with prior keratorefractive surgery. ORA has been shown to be very effective in IOL power calculation in post-LASIK eyes.[7] It has also been found useful for Toric IOL implantation following keratorefractive surgery.[8]

Difficulties

There are several potential issues with the use of ORA. The fact that measurements taken during surgery do not reflect the postoperative state of the eye can introduce inaccuracies in power calculation. In addition, the biometry of the eye can be affected at the time of surgery. Potential causes of this include patient factors (such as eyelid squeezing, eye motion, healing), surgical equipment or devices (such as the eyelid speculum or use of certain ophthalmic viscosurgical devices) and/or intraoperative manipulation (such as stromal hydration); these factors can change intraocular pressure and axial length, corneal thickness and the refractive index of the anterior chamber. Studies suggest that these operative variables may be adequately controlled, especially with increased surgeon experience using intraoperative aberrometry.[9]

Conclusion

ORA is an intraoperative aberrometry device which calculated IOL power on the basis of lower order aberrations calculated intraoperatively. It has been shown to have good results in cataract surgery patients over a wide range. In addition, it has been found to be successful in difficult situations such prior keratorefractive surgery and axial myopia where conventional biometry may result in under or overcorrection in significant number of cases. In the current era, where there is very low tolerance to suboptimal refractive errors, ORA may serve as a guide to ensure correct IOL power correction when using standard biometry techniques.

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Address for correspondence

Chirakshi Dhull MD, DNB, FICO
486, 4th Floor,
Dr Rajendra Prasad Centre for Ophthalmic Science, AIIMS, New Delhi
Email id: chirakshi@gmail.com

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