Intra-operative assessment of toric intra-ocular lens implantation

Ioannis T Tsinopoulos, Chrysanthis Symeonidis, Konstantinos T Tsaousis, Dimitris Tsakpinis, Nikolaos G Ziakas, Stavros A Dimitrakos

We report a new procedure for intra-operative toric intra-ocular lens (IOL) axis assessment in order to achieve optimal implantation. IOL implantation procedure was directly recorded. An assessor estimated the angle formed by the marked 0–180 axis and the toric IOL axis after implantation with the use of the appropriate software. If IOL implantation was assessed to be inaccurate, the surgeon was advised to correct IOL positioning by rotating the IOL clockwise. The assessment procedure was repeated until accurate IOL positioning was achieved.

Key words: Toric intraocular lens, toric lens implantation assessment procedure, surgical technique

Indian J Ophthalmol: 2011;59:60-62

DOI: 10.4103/0301-4738.73726 PMID: 21157078

Intra-operative correction of corneal astigmatism was developed in the 1990s but was considerably improved in the beginning of the past decade. In order to achieve the desired outcome, accurate pre-operative data (axial length, keratometric data and accurate intraocular lens (IOL) power calculation with the use of the appropriate biometric formula) and proper surgical technique are required. All existing techniques are based on the fact that the IOL is implanted in the desired axis, as marked pre-operatively.

The growing use of the toric IOL in everyday clinical practice revealed the need for an accurate intra-operative IOL
Materials and Methods

The patient’s keratometric and topographic data were determined with the use of the Magellan Mapper (Nidek, Vigonza, Italy). Corneal topographic data were then inserted in the IOL manufacturer’s software in order to obtain the axis of the desired astigmatic correction as well as the model and refractive power of the IOL. Afterwards, the 0–180 and the desired astigmatic axis correction were marked on the limbus with the use of the appropriate eye marker (Nujits Pre-Op toric reference marker with bubble-AE-2791TBL, ASICO LLC, Westmont, IL, USA) according to the manufacturer’s instructions, with the patient sitting right before the beginning of the surgical procedure. The bubble ensured proper marking.

The surgical procedure was directly streamed and recorded in a computer in the anterior segment unit of our department. “Streamed pictures” is an alternative expression to describe the captured video frames. They provided (due to the availability of different time units and depending on the frame rate of the video recording) optimal conditions, such as angle of viewing and perpendicularity of IOL alignment, in order to calculate the IOL axis position and/or rotation. After sideport incisions and before the use of the viscoelastic, the desired astigmatic axis was marked in the limbus with the use of an Intra-Op toric axis marker, utilizing the acquired keratometric and topographic data and with the marked 0–180 axis as reference (AE-2792, ASICO LLC, Westmont, IL, USA).

After an uneventful IOL implantation, the viscoelastic was aspirated thoroughly and an air bubble was placed above the IOL (in order to maintain the IOL centered). The air bubble was then removed with the use of Balanced Salt Solution (BSS) infusion through the sideport. If, at this point, IOL implantation was considered by the surgeon to be perfect, a digital photograph was taken with a digital video camera and evaluated with the use of the following procedure. Medical personnel were responsible for the intra-operative toric IOL assessment. In the digital photograph, a protractor was superimposed on the IOL optic; its positioning was determined by the pre-operatively marked 0–180 axis on the eye and on the toric IOL axis (determined by three marks on each side-Screen Protractor, Iconico, v.4.0, Fig. 1). The assessor then evaluated the angle formed by the two above-mentioned axes in order to verify proper IOL implantation. The duration of this additional procedure was <30 s. The desired correction was not known to the assessor. Thus, bias was reduced. Immediate IOL axis evaluation was quite inconvenient to be performed by the surgeon because he/she operated under sterile conditions and could not operate a personal computer.

If IOL implantation was assessed to be inaccurate, the surgeon was advised to correct IOL positioning by rotating the IOL clockwise. The assessment procedure was repeated until accurate IOL positioning was achieved. It was essential to visualize the 0 and 180-degree mark and the reflection of the microscope lamp on the same corneal plane as well as to use streamed pictures of the surgical procedure and not just intra-operative digital photographs in order to achieve a perfect alignment of the above marks.

In a small case series (21 eyes), in one (5%) toric IOL (Alcon SN60T3) implantation there was an intra-operative deviation of 5 degrees recorded and corrected according to the procedure described above.

Discussion

Potential factors that may lead to inaccurate toric IOL implantation are incorrect marking of the 0–180 axis and relatively thick marking lines. Furthermore, IOL rotation is still possible following implantation.

A potential merit of our method may be the use of one instrument compared with two (Nuijts Toric axis marker, AE-2740 and Mendez Degree Gauge AE-2765) in the method proposed by Bauer et al. Furthermore, our proposed method may serve as an additional precaution measure for an accurate implantation assessment. A possible shortcoming of our assessment method may be the limitations of our instruments; the marker used employs a 10-degree step while the marker used by Bauer et al. employs a 5-degree step. Moreover, the axis marker employed by our group does not permit easy intra-operative visualization and assessment of the final IOL axis. These limitations led to the development of an alternative assessment procedure.

The proposed assessment procedure may prolong IOL implantation by only a few minutes and may contribute to increased implantation accuracy in addition to intra-operative direct surgeon visualization because a standardized assessment method is employed. A potential shortcoming of this proposed procedure may be the cost of the video equipment required in order to obtain the streamed pictures. It is well established that every degree of misalignment results in a 3% reduction of astigmatic power in the IOL plane. Thus, the magnitude of astigmatic error potentially introduced is dependent on cylinder power itself; the higher the cylinder power, the more accurate one needs to be. According to our experience (21 eyes) and with the use of the above-mentioned marker, the proposed procedure may serve as an additional precaution measure in order to avoid misalignments (especially in the case of higher cylinder powers) and may sufficiently assist in accurate toric IOL implantation as well as positioning assessment.
Bevacizumab, choroidal neovascularization, toxoplasmosis

The natural history of CNV secondary to toxoplasmosis reveals a poor visual prognosis. The development of CNV adjacent to retinochoroidal scars is a well-known late complication contributing to loss of useful vision due to foveal involvement. Treatment modalities for CNV secondary to toxoplasma retinochoroiditis include laser photocoagulation, submacular surgery, photodynamic therapy (PDT) and anti-vascular endothelial growth factor (VEGF) agents.

A 14-year-old girl presenting with visual loss in both eyes was diagnosed to have healed toxoplasma retinochoroiditis in the right eye with active choroidal neovascularization (CNV) adjacent to a subretinal scar [Fig. 2A]. The routine hemogram, kidney function tests and liver function tests were within the normal range. Mantoux test was negative and chest X-ray was unremarkable. On ocular examination not only showed a punched-out pigmented lesion [Fig 1B] and Optical coherence tomography [Fig 1C], but also a choroidal neovascular membrane with profuse leakage. Blocked choroidal fluorescence due to the overlying pigmented scar [Fig. 2A].

Clinical findings were confirmed on fluorescein angiography that was suggestive of a healed toxoplasma lesion [Fig. 1A]. FFA of the left eye revealed an active subfoveal choroidal neovascular membrane (CNVM) and subretinal fluid hemorrhage was also noted [Fig. 2B]. OCT revealed subfoveal leakage. Blocked choroidal fluorescence due to the overlying pigmented scar [Fig 2A].

The clinical findings were confirmed on fundus fluorescein angiography and optical coherence tomography [Fig 1D] which showed the presence of a choroidal neovascular membrane with subfoveal fluid. The FFA of the left eye revealed an active subfoveal CNVM.

At 8 weeks follow-up, the CNV showed regression with no evidence of subretinal fluid or hemorrhage on clinical examination or OCT. The BCVA improved to 20/30, N6 and visual acuity improved from 20/120 to 20/30. Combination therapy with PDT and intravitreal bevacizumab as secondary to toxoplasmosis in the left. She underwent combination photodynamic therapy (PDT) and anti-vascular endothelial growth factor (VEGF) agents.

Case Report

Discussion

The results of this case report suggest that combination therapy with PDT and intravitreal bevacizumab appears to be effective in the treatment of CNV secondary to toxoplasma retinochoroiditis. However, further studies are needed to confirm these findings.

References

1. Grabow HB. Early results with foldable toric IOL implantation. Eur J Implant Refract Surg 1994;6:177–8.
2. Novis C. Astigmatism and toric intraocular lenses. Curr Opin Ophthalmol 2000;11:47–50.
3. Bauer NJ, de Vries NE, Webers CA, Hendrikse F, Nuijts RM. Astigmatism management in cataract surgery with the AcrySof Toric intraocular lens. J Cataract Refract Surg 2008;34:1483–8.

Eur J Implant Refract Surg 1994;6:177–8.

Indian J Ophthalmol: 2011;59:62-64

DOI: 10.4103/0301-4738.73728