Toric and phacic IOLs for the Treatment of Astigmatism and or High Myopia. Our Experience at Prince Hashem Hospital Zarqa.

Abstract

Aim: to share our experience in treating patients with high myopia and or astigmatism using toric and phacic intraocular lenses at Prince Hashem Hospital Jordan.

Patients and methods:

This is a retrospective study of fifty eyes of 36 patients who were treated between June 2015 and July 2016 at Prince Hashem Hospital in Jordan. Patients' age ranged between 22 years and 54 years. All patients had high myopia (≥6 dipoters) and or astigmatism and were not eligible for surface laser ablation and intolerant to contact lenses. Preoperative best corrected visual acuity BCVA, ophthalmological slit lamp examination, manifest and cycloplegic refraction, corneal topography using Oculus Pentacam and IOL master were obtained in all patients.

Results:

In all the patients preoperative refraction ranged between -4 to -33 sphere and -3.5 to -8 cylinder. Phacoemulsification and implantation of toric intraocular lenses (IOL) was done in 21 patients, Visian implantable collamer lens (sphere and toric ICL) were implanted in 18 patients and toric iris claw lenses (Ophthec Artisan/ Artiflex) were used for the remaining 11 patients. All surgical procedures were done under local anesthesia. All patients showed improvement in their visual acuity after surgery and spectacle independence.

Complications were minimal in the form of lens rotation resulting in decrease in BCVA seen in 3 patients with toric IOLs and two Visian ICLs patients. High intraocular pressure was seen in one patient.

Mean follow-up period was between 6 months to 1 year.

Conclusion

Toric and phacic IOLs can be very useful in correcting astigmatism and or myopia. Proper patient selection and counseling is essential to ensure best refractive outcome and avoid complications.

Keywords: astigmatism, intraocular lenses, Myopia, phacic IOLs.

Introduction:

With the advancing industry and manufacturing of toric intraocular lenses and phacic implantable collamer lenses (ICL) and iris claw lenses (Ophtec ARTISAN, ARTIFLEX) increasing numbers of patients have benefited from these advances in improving their visual acuity and allowing spectacle independence.

Since the introduction of toric IOLs in 1992, variation in lens material, design and alignment has been the cornerstone of optical industry to guarantee best refractive outcomes and lens stability and ensure patient and surgeon satisfaction.[1]

Patient selection plays the most important role in determining the type of surgical procedure and type of lens to be used in addressing the patient's refractive error, whether he/she had cataract that needed to be removed or he/she was asking for spectacle independence and was not eligible for surface laser ablation due to various reasons such as abnormal corneal topography and or high degrees of refractive error.[2,3]

Patients and methods:

We introduced the use of toric intraocular lenses and Visian implantable collamer lenses ICL for visual rehabilitation to Prince Hashem Hospital in Jordan for the first time in June 2015. This is a retrospective randomized study to evaluate our results. Our selection criteria included patients with high refractive errors (myopia and or astigmatism) who had normal posterior segments, patients with cataract, and Keratoconus patients with stable corneas.

Fifty eyes of 36 patients underwent surgery and visual correction with various types of intraocular lenses. Preoperatively, all patients underwent a thorogh ophthalmologic examination. This included manifest and cycloplegic refractions, uncorrected and best-corrected visual acuity (BCVA), slit lamp microscopy, intraocular pressure measurement using Goldmann applanation tonometry. Fundus examination was performed to rule out any retinal lesions. IOL Master biometry (Carl Zeiss Meditec AG, Germany) was used to calculate IOL power. Oculus Pentacam was used to perform pachymetry, determine the anterior chamber depth, and detect keratoconus. Horizontal white-to-white measurement was performed by a manual caliper to choose the appropriate Visian ICL size.[1, 2, 4] We excluded any patient with ocular disease other than myopic astigmatism and cataract (glaucoma, corneal opacities, uveitis, retinal disorders). We also excluded patients with zonular dehiscence, poor pupillary dilatation as this will affect lens alignment by obscuring the axis. Keratoconus patients with corneal thickness less than 400um were and patients with amblyopia were excluded as well and patients with unrealistic expectations [2,4,5,6]

Patients refractive errors ranged between- 4 to -33 diopters of myopia and -3.5 to -8 diopters of astigmatism.

Fifteen eyes of 11 patients who had cataract underwent phacoemulsification and implantation of a toric intraocular lens. We used the Acri Lisa toric (Carl Zeiss Meditec) intraocular lenses available for our use at that time. Axis determination was done intra-operatively using hand held axis marker in the sitting position. No intraoperative complications were encountered during surgery or lens implantation or alignment.

Young patients who had high refractive errors of astigmatism and or high myopia and were not amenable for surface laser ablation underwent correction with phacic IOLs. Twenty seven eyes of 16 patients who had astigmatic errors of up to -4 cylinders underwent correction with Visian Toric ICL (implantable collamer lenses). Patients who had higher astigmatic errors up to 8 diopters of cylinder were corrected using the Iris claw lens (Ophtec Artisan/ Artiflex). The Ophtec Artisan iris claw lens is a rigid lens that fitted through a 5.7mm incision and needed closure with 10 0 nylon stitches. The foldable form of the iris claw lens (Artiflex) fitted through a 3.2 incision and didn't need any sutures but it only corrected astigmatism up to 5 diopters.[6,7]

Surgical technique

We used cyclopentolate HCl 1% and phenylephrine 2.5% eye drops to dilate the pupil administered 30 minutes before surgery. For patients with astigmatism, a horizontal hand held axis marker was used while the patient was sitting to mark the desired axis to avoid the cyclotorsion effect in the supine position.,[3,7,8]

For the Visian ICL lens insertion a 3-mm temporal clear corneal incision was made and a STAAR injector (Visian Toric ICL; STAAR Surgical AG) was used. Anterior chamber formation was done using Provisc (sodium hyaluronate; Alcon Laboratories, Inc.). the lens was loaded into the special injector by the surgeon.The four haptics were tucked under the iris with the dialer provided by the manufacturer, after which rotation of the ICL to the desired axis was done. Irrigation was performed to remove the sodium hyaluronate using balance salt solution through a cannula, and the wounds were hydrated.

The same preoperative steps were carried out in the case of a toric IOL under either topical or peribulbar anesthesia. Phacoemulsification was carried out through a 3.2mm superior incision using the Abbott Whitestar Signature machine. Polishing of the posterior capsule was done in every case to reduce the chance of subsequent posterior capsular opacification and the viscoelastic was aspirated before final alignment of the lens to the desired axis.[3,5,8]

In the case of an Ophtec Artisan or Artiflex lens the procedure was different. Two lateral stab incisions were made with a 30 gauge disposable MVR blade and acetylcholine-chloride (miochol-e) from Bausch and Lomb was used to constrict the pupil.[8] Viscoelastic was then used to fill the anterior chamber and protect the endothelium. A 3.2 mm corneal incision was then fashioned superiorly between the stab incisions for the insertion of the lens. The Artiflex lens was then mounted on the insertion spatula provided by the manufacturer. The front tip of the lens was coated with viscoelastic to protect the cornea and facilitate insertion. Once the optic is inside the eye the proximal haptic would be pushed to allow the spatula to be withdrawn smoothly. The lens is then rotated so that the claws of the lens are aligned with the axis of the astigmatism. An enclavation needle was then inserted through the lateral side ports to fix and enclave iris tissue into the claws of the lens while the optic is stabilized with the other hand. The iris tissue is enclaved away from the pupil to avoid distortion of the iris. A superior iridectomy is then fashioned and the viscoelastic irrigated out of the eye through the main wound.[7,8]

The surgical technique for an Artisan IOL only differed in that the main wound needed to be larger so that the rigid lens was inserted into a 5.7mm wound that was closed using 10 0 nylon sutures at the end of the procedure. We removed stiches between four to five weeks post operatively.

All patients received topical antibiotic eye drops and topical steroid drops for four weeks after surgery. Moxifloxacin 0.3% (Vigamox; Alcon Laboratories) was administered six times a day for 1 week, and 1% prednisolone acetate (PRED FORTE; Allergan) were administered six times a day for 1 week and then four times daily for three weeks. Patients who underwent Visian ICL lens implantation received Carteol LP 2% (Carteol Hydrochloride; Bausch and Lomb) eye drops once daily for the first week.

Results:

All patients had satisfactory improvements in their visual acuities. Three of the patients who underwent toric intra-ocular lens implantation had lens rotation few days after surgery that resulted in decrease in their visual acuity and that was overcome by realignment of their IOL intraoperatively.[6,7] they were followed for up to three months with no change in their BCVA or their lens status.

Three of the patients who received Visian ICLs had lens rotation after surgery and this was due to under sizing of the lens.[4,6] They underwent lens exchange and replaced with a larger ICL with more stable alignment. One patient had a high intraocular pressure of 32mmHg after ICL implantation in both eyes and this was treated with anti-glaucoma drops and acetazolamide 250mg tablets. This patient was found to be a steroid responder as her intraocular pressure went down after shifting to pressure sparing steroid drops Lotemax (Latoprednol estabonate; Bausch and Lomb).

None of the toric or phacic intraocular lenses or surgery caused corneal edema. One patient with keratoconus who had an Visian ICL implanted showed progression of his keratoconus despite that his cornea was cross-linked with the use of isotonic Riboflavin and was observed for one year before surgery. We observed him for another six months to make sure he did not progress more before deciding on exchanging the ICL in one of his eyes. All patients with keratoconus underwent cross linking before attempting refractive correction.

Table one shows patients' data and visual outcomes:

Patient no.	Refractive error	Preop VA	Lens type	Postop VA (1 month)
1	-5 /-4.25 @110	6/36 OD	Toric ICL	6/9
2	-4.4/-4.50@75 -4.0/-5.75@85	6/36 OD 6/24 OS	Toric ICL Toric ICL	6/6 6/9
3	-17/- -22/-	CF 3M 6/60	ICL ICL	6/9 6/9
4	-11/-4.5@65	CF 3M	TORIC ICL	6/12
5	-7/-5.75@110 -3.75/-6.0@85	6/24 6/24	ARTIFLEX TORIC ARTIFLEX TORIC	6/6 6/9
6	-5 /-3.25 @110 -7/-4.0@ 145	CF 1M CF 3m	ARTISAN toric ARTISAN toric	6/12 6/12
7	+1.00/-3.5@15	6/36	Acri Lisa toric Zeiss	6/6
8	-/-4.0@140	6/60	AcrI ilisa toric Zeiss	6/9
9	+0.25/-3.5@60	6/36	Acri Lisa toric Zeiss	6/12
10	-1/-4.0@170 -1.25/-4.0@175	6/24 6/36	Acri Lisa toric Zeiss Acri Lisa toric Zeiss	6/9 6/18
11	-22	6/60	ICL	6/6
12	-17/-- -16/-1.25@15	Cf 6m CF 6m	ICL ICL	6/6 6/6
13	-0.25/5.5@80	6/60	Acri Lisa toric Zeiss	6/9
14	+0.25/-3.5@65 -0.25/-4.5@120	6/36 6/36	Acri Lisa toric Zeiss Acri Lisa toric Zeiss	6/6 6/12
15	-11/-4.0@55 -10/-3.75@65	CF 3M CF 5M	TORIC ICL TORIC ICL	6/12 6/9
16	-6.25/5.5@60	6/60	ARTISAN toric	6/6

	-6.25/4.5@80	6/60	Artisan toric	6/9
17	-15/-- -12/--	CF3M CF3M	Artiflex Artiflex	6/12 6/9
18	+0.25/-3.50@60 +0.25/-3.75@60	6/36 6/36	Acri Lisa toric Zeiss Acri Lisa toric Zeiss	6/6 6/9
19	-8.00 -9.00	6/60 6/36	ICL ICL	6/6 6/6
20	-11.25/3.5@60	CF 4m	TORIC ICL	6/6
21	-/-4.0@120 -0.25/-3.75@ 85	6/36 6/24	Acri Lisa toric Zeiss Acri Lisa toric Zeiss	6/9 6/9
22	-6/-3.75@35	6/36	TORIC ICL	6/6
23	+0.25/4.5@60 -1.25/3.5@75	6/36 6/36	Acri Lisa toric Zeiss Acri Lisa toric Zeiss	6/6 6/9
24	-18.00 -23.00	CF3M	ICL ICL	6/6 6/12
25	-5.25/-7.0@110 -4.75/-6.5@130	CF 4M	ARTISAN toric Artisan toric	
26	-12.25/-3.5@75 -12.25/-4.75@75	6/60 6/60	TORIC ICL TORIC ICL	6/6 6/9
27	-10.00	6/36	Artiflex	6/6
28	-10.25/-4.75@75 -10.25/-3.75@80	6/60 6/36	TORIC ICL TORIC ICL	6/9 6/9
29	-9.0/-3.5@105 -8.5/-4.5@85	CF 4M CF5M	ARTISAN toric Artisan toric	6/12 6/9
30	-4.5/-7.5@85 -3.5/-6.5@100	6/60 6/60	ARTISAN toric Artisan toric	6/9 6/6
31	-14/-3.5@65	6/60	TORIC ICL	6/6
32	-/-4.5@110	CF 3m	Acri Lisa toric Zeiss	6/9
33	-15.00	CF4m	ICL	6/6
34	-18.00	CF 4m	Artiflex	6/6
35	-12.0/-3.5@85 -11.0/-2.5@75	6/60 6/60	TORIC ICL TORIC ICL	6/9 6/9
36	-0.25/3.5@170	6/24	Acri Lisa toric Zeiss	6/9

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148 Discussion

Keratorefractive procedures such as LASIK and PRK are safe and effective methods to treat refractive errors in most patients. In those with high myopia and or astigmatism and unfavourable corneal thickness surface laser ablation poses the risk of irreversible ectasia [7,8,9] . However phacic IOLs and toric IOLs are associated with an increased risk of retinal complications such as retinal detachment and cystoid macular edema[8.] It is the proper counseling of the patient and choosing the best refractive procedure with weighing the risks and benefits that makes the difference at the end.

Our results show that using toric and phacic IOLs is very effective in reducing astigmatism and improving visual acuity in all our patients with minimal complications. We chose patients with large refractive errors to start with and build our experience with this special kind of refractive lenses as small deviation in axis would not affect the visual acuity in patients with already poor preoperative vision compared to patients with small errors who would be intolerant to minimal alterations in their refraction. Given a fairly large sample size our good results relied on good patient selection and counseling and on stratifying different kind of lenses to different patients' needs. For example, a young patient with myopia, keratoconus, and astigmatism was corrected using the artiflex troic lens as it gave a larger area for astigmatic correction compared to the Visian toric ICL lens and given that later on he might need a a keratoplasty the Ophtec Artifelx lens is very simple to extract compared to other phacic IOLs. On the other hand a myopic patient in his fifties with astigmatism was given the option of a toric IOL with removal of his early cataract and such decreasing spectacle dependence and improving visual quality in one step.

Refractive intraocular lenses have added a new dimension for patients with high refractive errors and- to some extent- risky eyes and gave them hope for spectacle free life. Balancing the risks and benefits and building up experience is very important to optimize results and ensure patient satisfaction.

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