

# Pseudophakic monovision technique with Toric IOL using the SN60T5 platform

## *Técnica de monovisão pseudofácica com LIO tórica utilizando a plataforma SN60T5*

Frederico França Marques<sup>1</sup>, Daniela Meira Villano Marques<sup>2</sup>

### ABSTRACT

We demonstrate the combination of pseudophakic monovision technique with toric IOL in patients with relevant corneal astigmatism to reduce spectacle dependence after cataract surgery. All patients achieved UCDVA  $\geq$  20/30 and UCNVA  $\geq$  J2 and none of them required spectacle correction on the 6<sup>th</sup> postoperative month.

**Keywords:** Astigmatism; Pseudophakia; Cataract extraction/methods; Vision, monocular/physiology; Phacoemulsification; Lens implantation, intraocular

<sup>1</sup>Department of Ophthalmology, Faculdade de Medicina do ABC - FMABC – Santo André (SP), Brazil;

<sup>2</sup>Department of Ophthalmology, Universidade Federal de São Paulo - UNIFESP – São Paulo (SP), Brazil.

The authors received no public or private financial support pertaining to the information published in this article

Recebido para publicação em: 19/2/2010 - Aceito para publicação em 19/3/2010

## INTRODUCTION

The contemporary cataract surgery demands not just cataract removal and IOL implantation, but also, reduction of postoperative optical dependence. This may be achieved using accommodating IOL, multifocal IOL or using the pseudophakic monovision technique (PMT) aiming to correct the dominant eye for distance and the fellow one for near<sup>(1-3)</sup>.

However, in order to reduce the dependence of optical correction without additional enhancements, these options are available only for patients with corneal astigmatism less than 1D. The single-piece toric IOL is used to compensate the astigmatism up to 2.06 diopters at the corneal plane with the SN60T5 model (Alcon®, Fort Worth, TX) with an acceptable rotational stability leading to a predictable refractive result, and making it possible to associate its use for PMT<sup>(2)</sup>.

We report a series of cases to demonstrate the use of toric IOL with the PMT to reduce the postoperative need for optical correction.

### Case report

#### Case 1

A 54-year-old man with reduced visual acuity in both eyes due to bilateral cataract was scheduled for phacoemulsification with IOL implantation. His keratometry (K) readings were OD = 41.5 x 44.8 (180p) and OS = 41.0 x 44.6 (3p) revealing a regular and symmetric astigmatism. The IOL selected was the toric SN60T5 +18D in OD aiming to emmetropia and +21.5D in OS for spherical equivalent (SE) of -2.D<sup>(3)</sup> in order to attempt a reduced postoperative spectacle dependence using the PMT. Due to the amount of corneal astigmatism, we also emphasized the great possibility of a secondary procedure. After extensive explanation about the procedure and assessing patient expectation, he underwent phacoemulsification with IOL implantation in both eyes.

Before surgery, the axis 0p and 180p was marked with the patient seated using a pendulum marker. The surgeries were uneventful with the toric IOLs placed at the position 180p in OD and 5p in OS after calculation using the software provided by the manufacturer ([www.acrysoftoriccalculator.com](http://www.acrysoftoriccalculator.com)). On the 1<sup>st</sup> PO month, the UCVA was 20/25 and J2. On the 6<sup>th</sup> PO month his UCVA was preserved with manifest refraction of OD = 0.75 sph -1.00 cyl @ 90p, OS = -1.00 sph - 1.50 cyl @ 90p with a SE of 0.25D and -1.75D, respectively; the K readings were OD = 41.0 x 44.7 (170p) and OS = 42.2 x 44.8 (10p). (table 1). Despite of the significant IOL axis misalignment in OS of approximately 18p based on the

difference between the expected cylinder (2.6D – 2.06D) and the cylinder measured on the manifest refraction as revealed on figure 1 the patient was very satisfied with his UCVA with complete independence of optical correction.

#### Case 2

A 67-year-old woman complaining of reduced visual acuity and contrast in her daily activities as professional painter due to bilateral cataract was scheduled for phacoemulsification. Her K readings were OD = 42.1 x 46.3 (100p) and OS = 43.0 x 46.0 (91p). The IOL selected was SN60T5 +20.5D in OD aiming for emmetropia and +22.5D in OS for a SE of -2.00 D.

The surgeries were uneventful with the toric IOLs placed at the 100p in OD and 90p in OS. On the 1<sup>st</sup> PO month, the UCVA was 20/30 and J2. On the 6<sup>th</sup> PO month her UCVA was preserved with 20/30 and J2, the IOLs were at the initial position at the slit-lamp without rotation (Figure 2) with complete independence from optical correction, her manifest refraction was OD = 0.75 sph -1.75 cyl @ 160p, OS = -1.50 sph -1.00 cyl @ 145p with a SE of 0.125 D and -2.00 D, respectively; the K readings were OD = 41.2 x 45.3 (100p) and OS = 42.5 x 45.1 (86p). In OS an IOL misalignment of approximately 12p was found based on the difference of the expected cylinder and the manifest cylinder on refraction, as demonstrated on table 2. Although, she reported a subtle difficulty in watching movies on television and reading long texts, she did not ask for optical corrections and was very satisfied with the result.

#### Case 3

A 62-year-old lady with reduced visual acuity in the OS due to nuclear cataract was scheduled for phacoemulsification. Her ocular history was positive for refractive surgery (LASIK) in OD five years ago and she was satisfied with her vision for distance in this eye with a SE of -0.62 D. Her K reading was OS = 41.6 x 45.2 (91p) revealing a regular and symmetric astigmatism.

The IOL SN60T5 +21.5D was selected aiming for -2 D in order to attempt near vision. Surgery was uneventful with the toric IOL placed at 90p. From the 1<sup>st</sup> PO month until her last visit on the 6<sup>th</sup> PO month she was able to read J1 without correction, the K reading was OS = 42.2 x 45.3 (93p) revealing a well centered and positioned IOL.

## DISCUSSION

Nowadays, there are some options available to correct the pseudophakic presbyopia such as multifocal IOLs implanted bilaterally or unilaterally or monofocal implants following the PMT<sup>(1-3)</sup>.

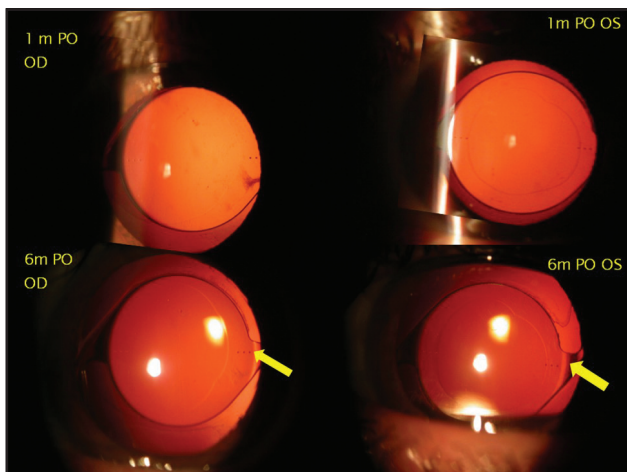


Figure 1: Toric IOLs on the 1<sup>st</sup> and 6<sup>th</sup> PO months, respectively. Note: The superior pictures were rotated to its original position to compensate the patient’s head rotation

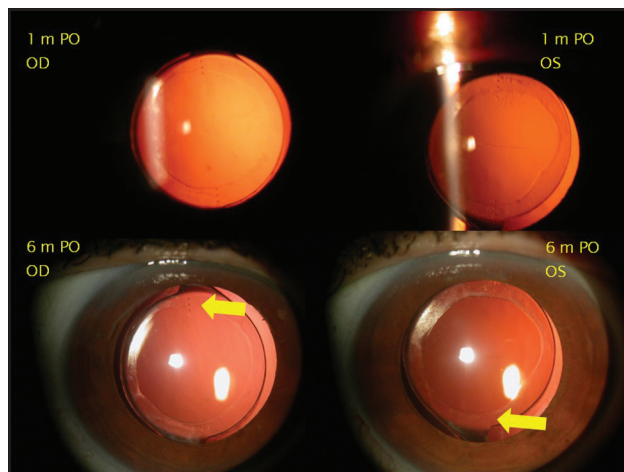


Figure 2: Toric IOLs on the 1<sup>st</sup> and 6<sup>th</sup> PO months

Table 1

Corrected astigmatism, spherical equivalent and UCVA

Eye	dK pre	dK 1m	dK6m	E cyl Rx	Dif E cyl Rx- MRxcyl	SE	UCVA
OD	4.3	2.8	3.7	1.64	0.64	0.25	20/25
OS	3.6	3.1	2.6	0.54	-0.96 (~18p )	-1.75	J2

SE = Spherical equivalent; UCVA = uncorrected; dK = corneal astigmatism; E cyl Rx = expected cylinder on refraction = dK6m - 2.06 (2.06 is the maximum cylinder correction by the SN60T5 at the corneal plane); Dif E cyl Rx - MRxcyl = difference between expected cylinder and manifest refraction cylinder

Table 2

Corrected astigmatism, spherical equivalent and UCVA

Eye	dK pre	dK 1m	dK6m	E cyl Rx	Dif E cyl Rx- MRxcyl	SE	UCVA
OD	4.2	4.5	4.1	2.04	0.29	0.125	20/30
OS	3.0	2.7	2.6	0.54	-0.46 (~12p )	-2.0	J2

SE = Spherical equivalent; UCVA = uncorrected visual acuity dK = corneal astigmatism; E cyl Rx = expected cylinder on refraction; Dif E cyl Rx - MRxcyl = difference between expected cylinder and manifest refraction cylinder

The monovision technique is a well-known technique first described by Westsmith in 1958 for presbyopic correction using contact lenses in phakic patients.<sup>(4)</sup> This technique was adapted for refractive surgery in patients older than 40 years undercorrecting the myopic patient or overcorrecting the hyperopic, as well as, for patients with bilateral cataract to compensate for the pseudophakic presbyopia<sup>(3,5)</sup>.

Recently, we published in cohort of patients that 97.4% were satisfied or very satisfied with this technique

using non-toric IOL achieving spectacle independence in 92.6%. However, these options are suitable for patients with corneal astigmatism up to 1D in order to provide good distance and near vision without needing for enhancements<sup>(6)</sup>.

In cases which the corneal astigmatism is higher than 1D, it is necessary to combine some extra procedures, such as, limbal relaxing incisions (LRI), opposite clear corneal incisions, laser refractive surgery and/or use a toric IOL. The use of acrysof toric IOLs to compen-

sate the corneal astigmatism using has been published showing reliable results due its minimal rotation in the capsular bag and compensating up to 2.06D at the corneal plane, this is an option for patients with astigmatism higher than 1D to combine this technology with PMT<sup>(4)</sup>.

In our small series we demonstrated the use of toric IOL to provide both distance and near vision on the first two cases and the near vision on the third case since the patient had previous laser refractive surgery for distance vision. Although, all patients had corneal astigmatism higher than 2.06 D, the IOLs provided nice results despite of the expected residual astigmatism achieving 20/30 and J2 on the first two cases, and J1 on the third one. Moreover, none of the patients requested any enhancement.

In order to attempt the complete correction at the corneal plane provided by the toric IOL, it must be placed at the corrected axis, since 1p of misalignment corresponds to a loss of 3.33% of its power. On the first two cases, a misalignment of approximately 18p and 12p occurred due its imprecise placement during surgery since the IOL did not rotated as demonstrated by the pictures, losing approximately 57.7% and 38.5% of its cylinder power correction, respectively. The technique with a pen and a pendulum marker at 0p and 180p was used and demonstrated to be imprecise, moreover, during the surgery it is not uncommon to lose the precise axis due to the ink washout by balance salt solution (BSS). Although, many techniques have been developed to determine the postoperative IOL rotational stability, new studies should be worried in precisely mark the axis prior surgery, such as the computer model based on preoperative slitlamp examination demonstrated by Robert Osher, MD on the American Society of Cataract Refractive Surgery meeting- San Francisco- 2009 called "Fingerprinting technique"<sup>(7,8)</sup>.

In order to achieve a good postoperative result, the preoperative explanation follows the same rules of the bifocal IOLs, so, it should be done very carefully, explaining the intention of reduction of dependence and not the complete elimination of postoperative optical correction, as well as, the possible need for enhancements. Another viable option in cases where the preoperative astigmatism is more than the toric IOL is able to correct, is to combine toric IOL with LRIs, however, in the near future, new models of toric IOLs correcting more astigmatism, as well as, its association with bifocal optical zone will provide more accurate option for these patients.

## CONCLUSION

All patients achieved UCDVA of 20/30 or better and UCNVA of J2 or better, none of them required eye-glasses until their last follow-up (6 months). The monofocal toric IOL SN60T5 is a helpful tool to be used with PMT

in patients with relevant corneal astigmatism, leading to a reduction of spectacle dependence, being a good alternative to correct the pseudophakic presbyopia.

## RESUMO

*Nós demonstramos a combinação da técnica de monovisão pseudofácica com lente intraocular tórica em pacientes com astigmatismo corneano relevante para reduzir a dependência de óculos após a cirurgia de catarata. Todos os pacientes apresentaram AVsc  $\geq$  20/30 para longe e  $\geq$  J2 para perto, sendo que nenhum deles necessitou de correção ótica até o sexto mês pós-operatório.*

**Descritores:** *Astigmatismo; Pseudofacia; Extração de catarata/métodos; Visão monocular/fisiologia; Facoemulsificação; Implante de lente intraocular*

## REFERENCES

1. Chiam PJ, Chan JH, Aggarwal RK, Kasaby S. ReSTOR intraocular lens implantation in cataract surgery: quality of vision. *J Cataract Refract Surg.* 2006; 32(9):1459-63.
2. Mendicute J, Irigoyen C, Aramberri J, Ondarra A, Montés-Micó R. Foldable toric intraocular lens for astigmatism correction in cataract patients. *J Cataract Refract Surg.* 2008; 34(4):601-7.
3. Hayashi K, Hayashi H. Optimum target refraction for highly and moderately myopic patients after monofocal intraocular lens implantation. *J Cataract Refract Surg.* 2007; 33(2):240-6.
4. Harris MG, Classé JG. \_Clinicolegal considerations of monovision. *J Am Optom Assoc.* 1988; 59(6):491-5.
5. Miranda D, Krueger RR. Monovision laser in situ keratomileusis for pre-presbyopic and presbyopic\_ patients. *J Refract Surg.* 2004;20(4):325-8.
6. Marques FF, Sato RM, Chiacchio BB, Marques DM, Barreiro J, Caetano RL. Evaluation of visual performance and patient satisfaction with pseudophakic monovision technique. *Arq Bras Oftalmol.* 2009; 72(2):164-8
7. Weinand F, Jung A, Stein A, Pfützner A, Becker R, Pavlovic S. Rotational stability of a single-piece hydrophobic acrylic intraocular lens : new method for high-precision rotation control. *J Cataract Refract Surg.* 2007; 33(5):800-3.
8. Shah GD, Praveen MR, Vasavada AR, Rampal NV, Vasavada VA, Asnani PK, et al. Software-based assessment of postoperative rotation of toric intraocular lens. *J Cataract Refract Surg.* 2009; 35(3):413-8.

### Address correspondence

**Frederico F. Marques, MD, PhD**

**Rua Arapá, 28 apt 31**

**CEP 04363-060 - São Paulo (SP), Brazil**

**Phone: (11) 5677-3513 Fax: (11) 5677-3513**

**Email: fredani2010@hotmail.com**