ABSTRACT

Purpose: To evaluate the reduction of pre-existing corneal astigmatism at the time of cataract surgery with limbal relaxing incisions (LRIs).

Methods: A prospective study of two groups of patients (treatment and control) with pre-existing astigmatism ≥1D was performed. The 30 patients in the control group had a temporal clear corneal phacoemulsification and the 32 patients of treatment group had combined temporal clear corneal phacoemulsification and LRIs. Holladay analysis was used to assess the efficacy of treatment. An astigmatism distribution and prevalence study in our population is also presented.

Results: Three months after surgery, the mean astigmatism change was -0.55D (-0.75 to -0.35) in the treatment group and 0.04D (-0.3 to 0.3) in the control group (p<.0001).

Conclusions: LRI is a simple, safe and effective method not only for reducing pre-existing astigmatism but also for achieving a lower residual astigmatism.

RESUMEN

Objetivo: Evaluar la reducción del astigmatismo corneal preexistente en la cirugía de catarata mediante incisiones limbares relajantes (ILRs).

Método: Estudio prospectivo de dos grupos de pacientes (tratamiento y control) con astigmatismo prequirúrgico ≥1D. Los 30 pacientes del grupo control fueron sometidos a facoemulsificación por incisión temporal en córnea clara y los 32 pacientes del grupo tratamiento a ILRs junto a facoemulsificación por incisión temporal en córnea clara. Se usó el test de Holladay para valorar la eficacia del tratamiento. Asimismo, presentamos un pequeño estudio de la prevalencia y distribución del astigmatismo en nuestra población de trabajo.

Resultados: El seguimiento promedio de los 62 pacientes fue de 3 meses, con un cambio astigmático medio a los 3 meses de -0.55D (-0.75 a -0.35) en el grupo tratamiento y de 0.04D (-0.3 a 0.3) en el grupo control (p<.000).

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San Juan de Alicante University Hospital. Alicante. Spain.
1 Graduate in Medicine.
2 Ph.D. in Medicine.

Correspondence:
Itziar Coloma González
Hospital Universitario San Juan de Alicante
Ctra. Nacional Alicante-Valencia, N-332, s/n
03550 San Juan (Alicante)
Spain
E-mail: icg_ct@yahoo.es
In recent years our aim with cataract surgery has gone from a simple extraction to achieving improved visual acuity (VA) without correction and, thus, to reduce dependence on glasses, either for near or farsightedness. This is why it can now be considered as «refractive cataract surgery».

This change has been possible thanks to the integration of technical and theoretical advances, all driven by the increasing demands of ophthalmologists and patients alike.

This implies that, when planning a surgery, we must take into account both the spheric and the astigmatism components to achieve the objective of emmetropia. The spheric component is compensated by implanting an intraocular lens (IOL), for which all factors will be analyzed in order to choose the type of lens and power according to the biometrical data obtained with good apparatus and a skilled technician, appropriate formula and constant, as well as patient characteristics and those of surgical technique chosen. The astigmatism component is planned according to keratometry and/or corneal topography primarily but other factors also need to be taken into account, such as age, contralateral eye, corneal characteristics … We must choose among all the technical alternatives the most appropriate one for each patient.

Our study included 62 cataract patients with astigmatism ≥1D programmed for IOL implant by the same surgeon, randomly divided into two groups (control and treatment). In the treatment group, patients were subject to phacoemulsification through temporal clear cornea incision, implant of multifocal IOL and performance of LRIs according to Dr. Louis D. Nichamin’s nomogram (fig. 1). In the patients in the control group we performed phacoemulsification through temporal clear cornea incision plus implant of monofocal IOL.

We excluded patients with corneal pathology, irregular astigmatism, wearers of contact lenses and with pterygium.

We conducted a full ophthalmological examination in all patients which included visual acuity (VA) with and without correction, keratometry and autorefractometry, tonometry, pachymetry and endothelial cell count, biomicroscopy and funduscopy.

To conduct LRIs, prior to surgery with patient sitting before a slit lamp, we performed horizontal meridian marking (0º-180º) with a purple gentian marker. This way we do not lose orientation following the ocular rotation that occurs after placing

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patient on the stretcher. Once in the operating theater we marked the LRIs to be performed with a Méndez ring and a 15º blade, and, finally, we performed 1 or 2 arched incisions upon the perlimbal clear cornea with a pre-calibrated diamond blade at 600 m (500 m if ≥80 years old).

Phacoemulsification and IOL implant was conducted through a 2.20 mm temporal clear cornea incision (≈30º in right eyes and 30º in left eyes) and watertightness was ensured with a nylon 10/0 corneal stitch, which was removed one month after the procedure.

On patients with LRIs we placed a therapeutic lens after cleansing it with BSS, which was removed the day after the procedure.

All patients received a regimen of antibiotics and corticosteroids during a minimum period of 6-8 weeks after surgery.

Keratometry was measured at 6 weeks and at 3 months, ruling out for statistical analysis values collected at 6 weeks given the relative proximity in time with removal of the corneal suture. Data were analyzed with a Student’s T test for independent data in order to assess any possible differences between the two groups. Statistical analysis was conducted with the software suite SPSS version 10 (SPSS for Windows, SPSS Inc, Chicago, USA).

RESULTS

Randomization of the sample prevents possible biases in the selection and makes the two groups of the study comparable, even for the pre-operative keratometric values (control 1.51 SD 0.5; treatment 1.53 SD 0.47).

To analyze the astigmatism change occurring after surgery, we used Holladay’s vectorial analysis test as it is the one providing the most information on the effect the surgical procedure itself has to describe the relationship between the initial cylinder and the resulting one (1). In the control group we found an average astigmatism reduction from pre-operative of -0.55D, range -0.75 to –0.35D, 3 months after surgery. In the control group the average change was 0.04 D; range -0.3 to 0.3 D, and when comparing results (difference means) of the two groups with Student’s T analysis for independent data, we found a clinically significant difference (p<.000). Therefore, LRIs provide a greater astigmatism change and in a more controlled manner than by traditional incision for phacoemulsification.

Expressing the results of both groups in a graph according to the astigmatism change (end cylinder-initial cylinder) we can see in the control group the central tendency is 0 (no change) whereas in the treatment group it is a reduction of pre-operative astigmatism (negative values) (fig. 2).

There were no cases of irregular astigmatism and only one of hypercorrection <1D. The discomforts reported by patients were similar in both groups (itching, tearing, foreign body sensation...).

DISCUSSION

Advances in phacoemulsification and IOLs have allowed achieving corrected VA after surgery ≥0.5 in approximately 90% of eyes in general, and 95% of eyes without prior eye disease (2). However, this always achieves a greater control of the spheric component than the astigmatic one and if the aim is to achieve post-operative outcomes as close to emmetropia as possible, correction, or at least reduction, becomes also essential. There are different alternatives to reduce pre-existing astigmatism during cataract surgery. These include incision techniques, intracorneal rings, toric IOLs and excimer laser surgery.

Taking into account that, according to a study conducted in our unit, approximately 63% of our...
patients with cataracts have astigmatism ≥1D and 30% between 1-1.5 D (fig. 3), we decided to include in our surgical protocol performance of a corneal incision technique, namely LRI. This technique consists of performing two small curvilinear cuts at the limbus that act by changing the corneal curvature. They produce a flattening of meridian where they are performed due to the addition of tissue (3) and at the same time they incure the perpendicular meridian (fitting together effect) (1,4).

Our results prove effectiveness in reducing preoperative astigmatism and are also particularly useful in our country because we usually encounter moderate astigmatism, which is very well controlled. Likewise, the learning curve and the material necessary (fig. 4) are minimal, the same as the complications found.

We consider it more appropriate to perform LRIs prior to phacoemulsification given the changes in the corneal thickness it produces and which could alter results. And we attribute the lower effect of this technique observed in our study compared to the one found in others with similar characteristics (5) to using suture for main incision, although a new study would be necessary without its use to ensure this is the only cause.

Fig. 3: Graphic representation of the distribution of astigmatism in our population.

Fig. 4: Surgical material employed for limbal relaxing incisions.

Among the advantages observed when associating a technique to control astigmatism to phacoemulsification and implant of multifocal IOL, special importance is given to reduction for optical correction for every day life and improved stereoscopic vision.

The most notable disadvantages were the possible corneal weakening for these already senile corneas and regression of the effect with time.

In conclusion, we consider LRIs are simple, safe and effective to reduce pre-operative corneal astigmatism during cataract surgery.

REFERENCES