INTRODUCTION

In the study we sought to examine whether functional outcome after cataract surgery by phacoemulsification depends or not on the type of artificial lens implanted.

MATERIAL AND METHOD

Clinical prospective trial, conducted between 2001-2009 at the Emergency Military Hospital “Dr. Constantin Papilian” from the city of Cluj-Napoca.

We divided the patients into 4 study groups (50 patients in each of them), differentiated by the type of the main incision made. The incision was made according to the artificial lens used (polymethyl-meta-acrylate (PMMA) – rigid intraocular lens (IOL) or hydrophilic or hydrophobic acrylic foldable). For the PMMA lens (mostly implanted between 2001 and 2004) we made a 3.2 mm incision in two planes, at the limbus, through which we performed phacoemulsification, then enlarged it to 6 mm (group I) or 5.5 mm (group II) in order to insert the implant. Between 2005-2009 we implanted mostly foldable hydrophilic IOLs folders (eXcellens-Idea, Rayner, Rotho) and foldable hydrophobic IOLs (Alcon-SA60AT, IQ, MA60AT or Toric), through a clear cornea incisions in 2 planes of 2.8 mm (group III) and 2.2 mm (group IV).

Results

The data was processed using the SIAC_104 program (freeware) that calculated the surgically induced astigmatism and postoperative value based upon the preoperative and postoperative keratometry.

RESULTS

The results of the study showed a statistically significant difference in the surgically induced astigmatism when incisions exceed 5.5 mm. The difference is statistically significant, being higher than that induced by the smaller incision of less than 3 mm. There is also a statistically significant difference of the induced astigmatism when analyzing the 2.8 mm versus the 2.2 mm incisions. Conclusions: The surgeon must take into account the surgical induced astigmatism for a predictable functional postoperative outcome, especially when one wants to implant a toric IOL. Changing the position of the main incision can help reducing the pre-existing astigmatism.
CLINICAL ASPECTS

Table no. 1. Values measured for group I, with a limbal incision of 6 mm located at 95°

Table no. 2. Values obtained in patients where we practiced the incision of 5.5 mm (group II)

Table no. 3. Postoperative results in group III, with clear corneal incision of 3 mm, 110°

Table no. 4. Postoperative astigmatism values in group IV (2.2 mm incision)

For group I, we have the following data:
- Average induced astigmatism value = 0.892 D
- Standard deviation = 0.0372 D
- Max = 2.14 D, Low = 0.16 D
- Median = 0.0860 D
- Average Absolute Deviation from Median = 0.0275 D

For group II, we noted the following figures:
- Average induced astigmatism value = 0.842 D
- Standard deviation = 0.0295 D
- Max = 1.69 D, Low = 0.04 D
- Median = 0.0750 D
- Average Absolute Deviation from Median = 0.0213 D

For group III, we noted:
- Average induced astigmatism value = 0.076 D
- Standard deviation = 0.476 D
- Max = 2.58 D, Low = 0.20 D
- Median = 0.0550 D
- Average Absolute Deviation from Median = 0.0250 D

In group IV, we noted:
- Average induced astigmatism value = 0.439 D
- Standard deviation = 0.0202 D
- Max = 1.18 D, Low = 0.11 D
- Median = 0.0420 D
- Average Absolute Deviation from Median = 0.0144 D

In our series of patients we noted that the incision

DISCUSSIONS

Despite the fact that, as demonstrated by the studies made by Kohnen and Kasper, during the implantation of a foldable lens the incision gets enlarged by 3 - 4.5% extra, this does not influence the postoperative outcome.(4) So, if we eliminate our series of patients this as disturbing factor of the final results.

Comparing similar studies we find that Gogeta refers to a similar study where the incision of 5.5 mm determined a postoperative astigmatism of 0.88 D, while the results with the 3.2 mm incision were much better (0.2 D induced astigmatism). (3)

Bartels shows in his study, at 2 months, an induced astigmatism of 0.78 D for the 5.5 mm incision, but at 6 months the vector calculus showed a value of astigmatism of 0.28 D + / - 0.54 D at the axis of 174°. (2)

In a study made by Sabina Kurz, one identifies in the series of patients (70 eyes) an induced astigmatism (average) of 0.7 D with a 2.75 mm-incision: very close to our obtained value. (5)

Against-the-rule astigmatism is preferred by surgeons, mostly because it allows a better uncorrected visual acuity (UVA). (1,4) The incision in the upper quadrant usually induces against-the-rule astigmatism, and in our study the incision was located at 95-110°. This is supported in a large study by Tejedor (on 574 patients). He found, using a superior incision (2.8 mm) an induced astigmatism of 1.33 + / - 0.81 D for the patients where the overall astigmatism has not changed and 0.77 + / - 0.74 D for those where the type of astigmatism has changed (against-the-rule / with-the-rule). He concludes that 75% of cases which had reversed the pre-and postoperative astigmatism had an initial corneal astigmatism <1.5 D (7)

In our series of patients we noted that the incision depends a lot on the preoperative keratometry values and that we tended to perform the incisions according to these values for optimal results of the surgery. Low levels of surgically induced astigmatism are obtained if the steeper meridian is located near the incision (95 or 110 degrees), and generally for the with-the-rule astigmatisms. (6,10)
As we progress to small incisions (3 mm and below), the induced astigmatism after surgery is statistically significantly reduced, such as can be seen in our study. The small amount of astigmatism induced by the incision of 2.2 mm (0.439 D) compared to that induced by the incision of 2.8 mm (0.676 D) is therefore not the result of chance. We note however that the amount of astigmatism induced by the incisions necessary for PMMA lens implantation was not so high (0.842 D for 5.5 mm and 0.892 D for 6 mm), thanks largely to a good suture and removal of the 10-0 thread on time, not earlier than 12 weeks, to allow a better corneal wound healing and a stable reduction in astigmatism.

During the time of our study the incision necessary for foldable IOL implantation was reduced from 3.2 mm to 2.2 mm.

The surgeon must take the decision upon the type of incision depending on the type of lens that will be inserted (PMMA or foldable). This also depends on a number of medical reasons related to the type of cataract (hard or traumatic etc.), associated diseases (diabetes, cataract in an eye with uveitis, glaucoma), patient age (congenital cataracts, juvenile), or other local conditions. The surgeon should always take into account the preoperative astigmatism when choosing the incision (location and size), and where one uses large incisions the proper placement of a suture thread will help reducing the postoperative astigmatism.

Referring strictly to the incision induced astigmatism, we must mention its importance when we are dealing with toric implants. The power calculation for these IOLs needs a known value of induced astigmatism (usually 0.5 D as standard), which if is not "respected" or falsely chosen may lead to changes in the final postoperative refraction compared to the anticipated outcome.

**REFERENCES**