Original article

Uncorrected visual function after cataract surgery<br>***, †††


Servicio de Oftalmología, Hospital Universitario de Fuenlabrada, Madrid, Spain

**ARTICLE INFO**

Article history:
Received 14 May 2010
Accepted 28 September 2012

Keywords:
Cataract
Questionnaires
Lenses, Intraocular
Vision, Ocular
Eyeglasses

**ABSTRACT**

Purpose: To study the relationship between refraction after cataract surgery and the use of spectacles in patients older than 65 years.

Methods: Retrospective case control study. The study included 40 retired subjects older than 65 years old who fulfilled our inclusion criteria. Clinical ophthalmic and optical information was collected, and patients were requested to complete a validated questionnaire of visual function (VF14) and a test of independence of spectators. The difference between VF14 test results with and without glasses (difVF14) was calculated.

Results: The study included 16 men and 24 women, with a mean age of 74 years. There was a significant correlation between difVF14 and postoperative refraction, with lower difVF14 values associated with postsurgical refraction in the range −0.50 to −1.00 D (OD 0.479 [95% CI; 0.286–0.804]). The questionnaire of independency of lenses did not show significant correlation with postoperative refraction.

Conclusions: Patients with postsurgical refraction between −0.50 and −1.00 diopters displayed better visual function without glasses than those with refraction out of that range. Neutral distant refraction and positive lenses for near vision might not be the ideal solution for every patient. Postsurgical refraction should be individualized for each patient according to their personal preferences, in order to achieve the best visual function and the best vision-related quality of life.

© 2010 Sociedad Española de Oftalmología. Published by Elsevier España, S.L. All rights reserved.

**Función visual sin corrección óptica tras cirugía de cataratas**

**RESUMEN**

Objetivo: Estudiar la relación entre la refracción tras cirugía de cataratas y el uso de corrección óptica en pacientes mayores de 65 años.

Métodos: Estudio retrospectivo tipo casos y controles. Se reclutaron 40 sujetos jubilados mayores de 65 años que cumplieron los criterios de inclusión. Se recogió información clínica y se pidió a los pacientes que completaran un cuestionario validado de función visual (VF14) y otro de independencia de lentes. Se estudió la diferencia entre VF14 con y sin gafas (difVF14).


This paper was accepted for partial presentation at the ASETCIRC Congress held in Madrid January 29–30, allowing the play cornea. The 2010.

* Corresponding author.
E-mail address: hector_fernan@hotmail.com (H. Fernández Jiménez-Ortiz).

2173-5794/$ – see front matter © 2010 Sociedad Española de Oftalmología. Published by Elsevier España, S.L. All rights reserved.
Introduction

Cataracts account for half of reversible blindness cases all over the world and its prevalence is growing exponentially with age, reaching up to 40–60% in patients over 70. Cataract extraction and subsequent intraocular lens (IOL) avoid numerous cases of blindness and disability, and have become one of the most frequent surgical procedures with the best cost/benefit ratio in industrialized countries.

Generally, the target post-surgery refractive result is close to emmetropia (±1 diopter [D]) for far vision, using positive lenses for near vision to provide maximum visual acuity in both fields. However, this refractive condition hinders the execution of middle and short distance activities without correction. Diffractive IOLs allow good, near and far visual acuity without requiring correction but at present they are not funded by the public health system. Meta-analyses with la evidence grade have been carried out demonstrating the greater efficiency of these lenses for near vision with the same degree of efficacy for far vision. However, adverse effects such as halos or diminished contrast sensitivity restrict use because the patient has to be willing to bear these drawbacks.

In order to achieve good post-surgery visual function it is essential to carry out extremely precise biometrics as well as to apply techniques for diminishing residual astigmatism such as incisions performed in the most curved meridian, relaxing limbar incisions, etc.

Both pre- and post-surgery visual function estimation can be carried out by means of a number of validated questionnaires such as VF14 (Visual function, 14 items). The VF14 test was initially designed in English to measure functional impairments caused by cataracts and subsequent validated in Spanish. A number of studies have verified the capacity of this questionnaire to measure post-surgery changes in visual function. Said questionnaire was chosen for this work because it was validated, it was applicable for telephone interviews and included questions about the ability to carry out activities with far and near vision such as reading a book, seeing the steps of the staircase or recognizing people.

The IOL insertion protocols in cataract surgery usually aim at a post-surgery spherical equivalent of 0.00 D, even though this might not be the ideal SE for some patients.

The hypotheses of this study are that post-surgery refraction with SE of −0.75 D in one or both eyes would enable patients optimum visual acuity at middle distances and acceptable near and far vision, thus diminishing dependency on optical correction.

Subjects, materials and methods

A case and control retrospective study. The sample was obtained reviewing consecutive clinical records of surgical programming from April 2008 up to sample size completion. The patients fulfilling the inclusion criteria were contacted over the phone requesting verbal authorization to collect their data in the study and requesting them to fill in a questionnaire according to the Helsinki declaration (D).

The authors have not found data of other studies that could be extrapolated and therefore the sample size was calculated for a pilot study. The sample comprised 30 subjects because this size enables nonparametric statistical analysis.

Inclusion criteria were aged over 65, retired and pseudophakic in both eyes with cataract surgery performed in our hospital at least 12 months prior to the survey.

Exclusion criteria comprised refusing to participate, inability to complete the questionnaire over the phone, previous ophthalmological disease compromising visual acuity, post-surgery refractive surprise and inability to perform over 50% of the activities included in the questionnaire.

The operations were performed by 16 expert surgeons. Biometries were performed by 44 expert optometrists utilizing an optical biometer (IOL MASTER, Carl Zeiss, Jena, Germany). The IOL power was calculated seeking a final refraction of 0 D with the SRK-T formula, following the usual hospital protocol. The surveys were carried out by the main author using the telephone. Two questionnaires were applied, VF14 validated in Spanish to measure visual function and a second questionnaire related to lens independence applied in other studies but not validated (Appendix 1). In addition, interviewees were asked for the self-referred time in percentages by means of the following question: what percentage of hours of each day you do not wear your spectacles?
The post-surgery SE was taken as an independent variable and the difference between VF14 score with and without spectacles (difVF14) as a study-dependent variable.

The value of difVF14 was taken as an indication of the independence of spectacles because the lower the difference between the visual function with and without correction the lower the dependency will be. In order to facilitate the statistical analysis the sample was divided into 2 groups (cases and controls) on the basis of the score obtained in the VF14 questionnaire.

For statistical analysis the patients were classified in 2 groups, i.e., cases and controls, according to the differences between the score obtained in the VF14 test with and without optical correction. Accordingly, the group of cases included patients with a difVF14 score below 16 (representing low dependency of spectacles) and the controls group included subjects with difVF14 above 16 (representing higher dependency of spectacles). The threshold value of 16 in difVF14 was chosen for dividing patients because it was the mean value for said variable.

The post-surgery refractive result was considered as having 2 possibilities: (1) a post-surgery SE comprised between −0.50 and −1.00 D, and (2) a post-surgery SE not comprised within the range of −0.50 to −1.00 D.

For analyzing the main variables the odds ratio (OR) between cases and controls was studied with its corresponding confidence interval at 95%. Subsequently, multivariate analysis techniques were performed for detecting confusion factors (sex, age, astigmatism or type of lens).

The statistical analysis of the quantitative variables was carried out with mean and typical deviation. Associations analysis (objective sphere, independence of lenses and time without self-referred without spectacles) between cases and controls were studied with OR.

Statistically processing and analysis was carried out by means of the SPSS statistical application (version 11.5 for Windows, SPSS statistics, IBM), verifying processing quality by random revision of 10% of records and through data cleaning provided by the application. One hundred percent of contacted patients fulfilling the inclusion criteria responded to the questions.

**Results**

The sample of the study comprised 40 patients, 60% of them female (Table 1). The mean difVF14 between patients having a post-surgery refraction between −0.50 and −1.00 D in one or both eyes was of 12.75 (±7.84; IC95%) and between those not having said refraction was of 25.29 (±12.34; IC95%) (Fig. 1). Among the patients having a refractive target (SE = −0.5 to −1.00 D) a lower difference was found in the VF14 score (cases), with statistically significant results (RE = 0.479 [IC95%; 0.286–0.804]) (Fig. 2 and Table 2). A lower dependency of lenses was observed between patients with post-surgery SE results of slight myopia.

In the lens independence test and self-referred time without spectacles no statistically significant differences were found between the groups with a difVF14 score above and below 16, obtaining an OR 4 lens independence of 0.733 ([0.458–1.174; IC95%] p < 0.01) and for self-referred time without spectacles of 0.701 ([0.445–1.105; IC95%] p < 0.01) (Fig. 3).

Multivariate analysis based on age or sex did not modify the main results of the study, indicating absence of bias due to said reasons. Visual acuity (in the form of Logarithm of the Minimum Angle of Resolution: logMAR) did not exhibit statistically significant differences between the group of subjects with difVF14 score above and below 16, indicating that the results are not explained by better surgical results in one of the 2 groups of the study.

**Table 1** – Sample description.

<table>
<thead>
<tr>
<th>Sample</th>
<th>40 subjects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>74.65 ± 5.24 years</td>
</tr>
<tr>
<td>Sex</td>
<td>16 (40%) males</td>
</tr>
<tr>
<td>Systemic morbidity</td>
<td>24 (60%) females</td>
</tr>
<tr>
<td>Presurgery VA RE</td>
<td>5 (12.5%) arterial hypertension</td>
</tr>
<tr>
<td>Presurgery VA LE</td>
<td>3 (0.7%) diabetes mellitus</td>
</tr>
<tr>
<td>Post surgery VA RE</td>
<td>0.36 ± 0.17</td>
</tr>
<tr>
<td>Post surgery VA LE</td>
<td>0.36 ± 0.16</td>
</tr>
<tr>
<td>Target sphere (−0.50 to −1.00 D)</td>
<td>0.9 ± 0.15</td>
</tr>
<tr>
<td>Post surgery spherical equivalent RE</td>
<td>0.9 ± 0.14</td>
</tr>
<tr>
<td>Post surgery spherical equivalent LE</td>
<td>26 (65%)</td>
</tr>
<tr>
<td>VF14 with spectacles</td>
<td>0.37 ± 0.82 range</td>
</tr>
<tr>
<td>VF14 without spectacles</td>
<td>3.75 to 1.25</td>
</tr>
<tr>
<td>DifVF14</td>
<td>17.36 (±11.43) mean</td>
</tr>
<tr>
<td>Lens type</td>
<td>17.36; median 16.3</td>
</tr>
<tr>
<td>VA: visual acuity; DifVF14: difference between VF14 with and without spectacles; D: diopters; RE: right eye; LE: left eye; VF14: Visual Function 14 test.</td>
<td></td>
</tr>
</tbody>
</table>

**Table 2** – Contingency table between cases and controls for exposure.

<table>
<thead>
<tr>
<th>Cases (difVF14 ≤ 16)</th>
<th>Controls (difVF14 &gt; 16)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exposed</td>
<td>17</td>
<td>9</td>
</tr>
<tr>
<td>(−0.50 &lt; SE &lt; −1.00 D)</td>
<td>2</td>
<td>12</td>
</tr>
<tr>
<td>Not exposed (SE &lt; −0.50 or ≥−1.00 D)</td>
<td>19</td>
<td>21</td>
</tr>
</tbody>
</table>

difVF14: difference in visual function questionnaire with and without spectacles; SE: spherical equivalent.
**Discussion**

Sample distribution based on age and sex is consistent with the epidemiology of cataracts, which exhibits a higher prevalence among females and increases with age.

The main finding of this study is lower need of optical correction in patients having a spherical equivalent between −0.5 and −1.00 D in one or both eyes, this difference being statistically significant (p < 0.01).

The fact that OR was significant for the correlation between difVF14 and the post-surgery SE but did not reach statistical significance for the questionnaire related to lens independence or self-referred time without spectacles could be explained by the bias in the ophthalmologist prescription of post-surgery correction. This means that there could be a group of patients who used spectacles only because they were prescribed even though they did not really need them to improve their visual function.

The instant study was designed for a retired population over 65. This group dedicates a significant proportion of its time to activities carried out in the middle and short distance (cooking, watching TV, sewing, talking, reading, etc.). In addition, the fact of not engaging in working activity poses less strain on far visual acuity.

However, the IOL calculation is usually made considering the best SE for uncorrected far vision, making correction necessary for middle and short distances. This practically obliges patients to depend on spectacles for most of their daily activities.

The strategies currently available to diminish said dependency of spectacles are accommodative or diffractive lenses (which are not available through the public health system) and monovision. Pseudo-phakic monovision diminishes stereopsis, contrast and visual field sensitivity. Not all patients are candidates for this method because they must be able to understand and accept its limitations, particularly taking into account that it is virtually irreversible.

The hypothesis of the study is confirmed with these results, noting that perhaps a post-surgery SE after slightly myopic cataract surgery (in the range of −0.50 to −1.00 D) might provide greater quality of life by making patients less dependent on optical correction.

Current approaches require treatments focused on patient quality of life. Far emmetropia and near vision...
correction might not be the ideal refractive target for all patients. Studies comparing the various methods for correcting or diminishing presbyia after cataract surgery have given similar results, making it essential to individualize treatments.\(^2\-5\) This study proposes a simple way to improve the visual function without optical correction after cataract surgery.

The limitations of this study are the difficulty in controlling bias (routine activity, personal preferences, intellectual level, purchasing power, etc.). In addition, it has not taken into account pre-surgery refraction, which means that patients with lower lens dependency could be those who used them less in the past or whose post-operation refraction was nearer to their post-surgery refraction (presumably, a formerly myopic patient would be more comfortable with slight myopia than a farsighted patient). Due to the limited sample size, it was not possible to analyze differences between those who reached the target sphere in one eye against those who reached it in both eyes.

This study does not allow to confirm conclusions that can be applicable to the entire population. Even so, it is a basis for drawing up hypotheses and designing future studies as well as to raise the question about the possibility of individualizing post-surgery refraction according to what patients need.\(^2\-5\)

**Conflict of interests**

No conflict of interests has been declared by the authors.

**Appendix 1.**

Now I will ask you about the difficulty you have for carrying out some daily activities due to your eyesight, even when you are wearing spectacles.

If you do not carry out some activity for reasons not related to a eyesight problems, please tell me.

Due to your eyesight and even wearing glasses, what degree of difficulty do you have for carrying out the following tasks?

1. Due to your eyesight, how difficult is it for you to read smaller letters such as telephone directories, names of medications or food product labels, even wearing spectacles?
   - 0 None
   - 1 Little
   - 2 Plenty
   - 3 A lot
   - 4 Cannot do it
   - 5 I don’t do it for reasons unrelated to eyesight

2. Because of your eyesight, how difficult is it for you to read a newspaper or a book, even wearing spectacles?
   - 0 None
   - 1 Little
   - 2 Plenty
   - 3 A lot
   - 4 Cannot do it
   - 5 I don’t do it for reasons unrelated to eyesight

3. Because of your eyesight, how difficult is it for you to read large letters of a book or a newspaper or telephone numbers, even wearing spectacles?
   - 0 None
   - 1 Little
   - 2 Plenty
   - 3 A lot
   - 4 Cannot do it
   - 5 I don’t do it for reasons unrelated to eyesight

4. Due to your eyesight, how difficult is it for you to recognize people when they are near, even wearing spectacles?
   - 0 None
   - 1 Little
   - 2 Plenty
   - 3 A lot
   - 4 Cannot do it
   - 5 I don’t do it for reasons unrelated to eyesight

5. Due to your eyesight, how difficult is it for you to see steps or the curb of a sidewalk, even wearing spectacles?
   - 0 None
   - 1 Little
   - 2 Plenty
   - 3 A lot
   - 4 Cannot do it
   - 5 I don’t do it for reasons unrelated to eyesight

6. Due to your eyesight, how difficult is it for you to read signs in streets and shops, read the numbers of houses or see traffic lights, even wearing spectacles?
   - 0 None
   - 1 Little
   - 2 Plenty
   - 3 A lot
   - 4 Cannot do it
   - 5 I don’t do it for reasons unrelated to eyesight

7. Due to your eyesight, how difficult is it for you to carry out minute manual work such as sewing, repairing a plug or hammering a nail, even wearing spectacles?
   - 0 None
   - 1 Little
   - 2 Plenty
   - 3 A lot
   - 4 Cannot do it
   - 5 I don’t do it for reasons unrelated to eyesight

8. Due to your eyesight, how difficult is it for you to do crosswords, fill in forms or lottery numbers, even wearing spectacles?
   - 0 None
   - 1 Little
   - 2 Plenty
   - 3 A lot
   - 4 Cannot do it
   - 5 I don’t do it for reasons unrelated to eyesight

9. Due to your eyesight, how difficult is it for you to play cards, dominoes or bingo, even wearing spectacles?
   - 0 None
   - 1 Little
   - 2 Plenty
   - 3 A lot
   - 4 Cannot do it
   - 5 I don’t do it for reasons unrelated to eyesight
10. Due to your eyesight, how difficult is it for you to participate in activities such as looking for mushrooms, caring for plants or looking at shop windows, even wearing spectacles?

- 0 None
- 1 Little
- 2 Plently
- 3 A lot
- 4 Cannot do it
- 5 I don’t do it for reasons unrelated to eyesight

11. Due to your eyesight, how difficult is it for you to cook, even wearing spectacles?

- 0 None
- 1 Little
- 2 Plently
- 3 A lot
- 4 Cannot do it
- 5 I don’t do it for reasons unrelated to eyesight

12. Due to your eyesight, how difficult is it for you to watch television, even wearing spectacles?

- 0 None
- 1 Little
- 2 Plently
- 3 A lot
- 4 Cannot do it
- 5 I don’t do it for reasons unrelated to eyesight

13. Due to your eyesight, how difficult is it for you to drive in daytime, even wearing spectacles?

- 0 None
- 1 Little
- 2 Plently
- 3 A lot
- 4 Cannot do it
- 5 I don’t do it for reasons unrelated to eyesight

14. Due to your eyesight, how difficult is it for you to drive at night, even wearing spectacles?

- 0 None
- 1 Little
- 2 Plently
- 3 A lot
- 4 Cannot do it
- 5 I don’t do it for reasons unrelated to eyesight

Spectacle independence questionnaire:

How much time would you say you wear spectacles?

For far vision
Always
Almost always
Frequently
Occasionally
Never
I don’t use far vision spectacles

Near vision
Always
Almost always
Frequently
Occasionally
Never
I don’t use near vision spectacles

REFERENCES