MULTIFOCAL INTRAOCULAR LENS IMPLANTATION IN PATIENTS WITH PRESENILE UNILATERAL PRIMARY AND SECONDARY CATARACT

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SUMMARY

Multifocal intraocular lens implantation was studied in 6 eyes with a unilateral cataract due to ocular trauma. Two patients had an uncomplicated traumatic cataract, two patients had a complicated traumatic cataract and two patients had a unilateral primary presenile cataract.

Postoperative visual acuity for distance and for near vision, with and without additional spectacle correction, as well as the presence of postoperative binocular vision was evaluated.

Additionally, we looked for pre- and postoperative parameters, assuming these criteria determine the success ratio of a multifocal intraocular lens implantation:

- presence of a stereoscopic vision pre-operatively, or absence of a pre-operative strabismus;
- rather good visual prognosis (no retinal damage in the traumatic cases and no amblyopia in the primary cases);
- normal functioning of the pupillary sphincter

SAMENVATTING

Multifocale intra-oculaire lensimplantatie werd bestudeerd bij 6 patiënten met een unilateraal cataract. Twee patiënten hadden een ongecompliceerd traumatisch cataract, twee patiënten vertoonden een gecompliceerd traumatisch cataract en twee patiënten hadden een unilateraal primair preseniel cataract.

Zowel de visus voor ver, nabij, als de binoculaire visus werden postoperatief geëvalueerd.

Bijkomend zochten we ook naar pre- en postoperatieve parameters die het succes van een multifocale lensimplantatie kunnen bepalen:

- aanwezigheid van een stereoscopische visus preoperatief, of afwezigheid van een preoperatief strabisme;
- goede visuele prognose (geen retinapathologie bij de traumatische gevallen en geen amblyopie bij de primaire gevallen);
- geen pupilsfincter afwijkingen

RÉSUMÉ

L'implantation d'une lentille multifocale intra-oculaire a été étudiée chez 6 patients présentant une cataracte unilatérale. Deux patients présentaient une cataracte traumatique non compliquée, deux patients présentaient une cataracte compliquée et deux patients présentaient une cataracte unilatérale primaire présenile.

Le suivi postopératoire comprenait la mesure de l'acuité visuelle de près et de loin ainsi que de la vision binoculaire.

Les paramètres pré- et postopératoires pouvant influencer le succès de l'implantation de ces lentilles ont été recherchés:

- présence d'une vision stéreoscopique préoperatoire, ou abscence d'un strabisme préoperatoire;
- bon pronostic visuel (abscence de pathologie rétinienne dans les cas traumatiques et abscence d'amblyopie dans les cas primaires);
- pas de pathologies du sphincter pupillaire

KEY WORDS

unilateral cataract, multifocal IOL, primary cataract, secondary cataract

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MOTS CLÉS

cataracte présenile unilatérale, lentille multifocale, cataracte primaire, cataracte secondaire

INTRODUCTION

When confronted with a patient with a unilateral cataract the aim of the surgeon is to optimise not only the visual acuity for far but also for near, offering the patient the possibility of an optimal binocular vision (3,4).
In our patient group we implanted a three zone multifocal IOL (true vista multifocal intraocular lens) and evaluated the results obtained for distance and near vision and checked the binocular vision both for near and far distance (1,5,7).
The rationale for having chosen a three zone multifocal IOL was based on the characteristics of the patients that were studied. Since all patients were young, and in addition 4 of the 6 patients suffered from ocular trauma, their risk for postoperative capsular contraction syndrome was high. Capsular contraction plays an important role in IOL decentration, reducing to a great extent the chances of recovering an optimal visual acuity and binocular vision (3,5).

PATIENTS AND METHODS

The main criterion for patient selection was the unilaterality of the cataract. Two patients had a primary presenile unilateral cataract, two patients had a traumatic cataract without additional anterior segment complications i.e. uncomplicated traumatic cataract and two patients had a traumatic cataract with additional anterior segment complications such as iris laceration and/or corneal perforation, i.e. complicated traumatic cataract, and two patients presented primary presenile cataract.

1) uncomplicated traumatic cataract:

patient 1: was a 15 year old girl who had a blunt trauma with hyphema in the anterior chamber, the anterior segment of the eye remaining undamaged.

patient 2: was a 16 year old boy with a corneal perforation at the limbus. The iris was only damaged at the periphery.
In the period between the accident and the development of the cataract both children were

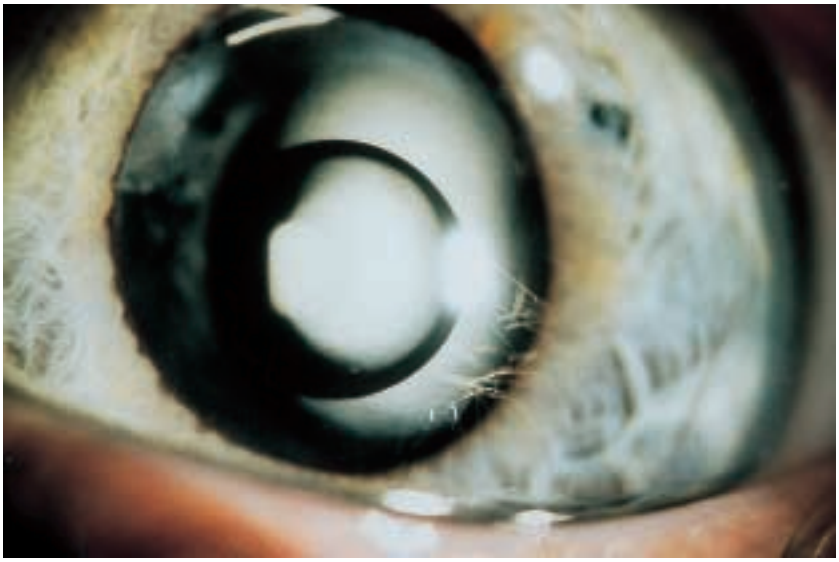


figure 1. Image of refractive three zone multifocal IOL

emmetropic, had normal stereoscopic vision and a preserved pupillary sphincter function.

2) complicated traumatic cataract:

patient 3 and 4: These two boys (10y and 14y) had a central corneal perforation with iris prolaps and rupture of the pupillary sphincter.
After the trauma stereoscopic vision was very poor.
No preoperative data concerning visual acuity or binocular vision were available, but both patients had an uneventful ocular history.

3) primary presenile cataract:

patient 5 and 6: These two patients (boy 16y and woman 34y) had unilateral cataract of unknown aetiology (no indication for metabolic disturbance).
Before cataract formation both patients were emmetropic and had normal stereoscopic vision.

OPERATIVE DATA

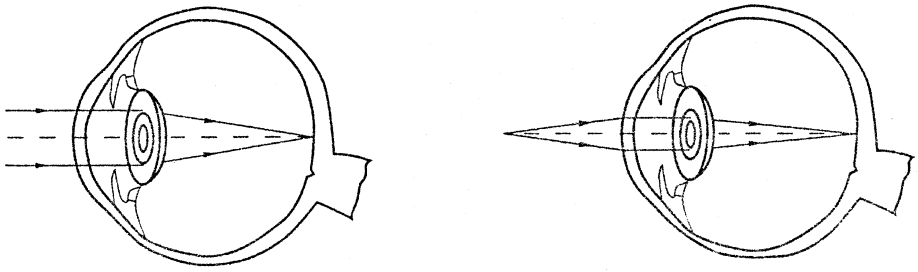
All six eyes received a true vista multifocal intraocular lens (IOL) implant after uncomplicated cataract extraction. The true vista IOL is a refractive three zone multifocal IOL of one-piece polymethyl metacrylate (PMMA) (figure 1). The lens provides pseudo-accommodation through a 4 diopter (D) annular addition zone on the anterior surface of the lens, providing the equivalent of a 3,2D of spectacle addition (2,8) (figure 2).

RESULTS

Visual acuity
In the uncomplicated traumatic cases as well as in the presenile non-traumatic cases good visual acuity for far and for near vision was achieved. This was not the case for the complicated traumatic cases.
Visual acuity for far vision was measured with the Snellen Chart and for near vision with the Dutch chart.

1) uncomplicated traumatic cataract

patient 1:
Far:
UCVA: 0,7 and BCVA: 1,0 with a spherical correction of -1D
Near:
UCVA: 0,4 and BCVA: 0,6 with a spherical correction of +0,5D



Distant object with parallel rays *Near object with divergent rays*

Figure 2. Lens image schematic

patient 2:
Far: UCVA: 1,0
Near:
UCVA: 0,6 and BCVA: 0,75 with a spherical correction of +1D

2) complicated traumatic cataract

patient 3:
Far:
UCVA: 0,1 which could not be improved
Near:
UCVA: 0,1 which could not be improved

patient 4:
Far:
UCVA: 0,4 and BCVA: 0,7 with a cylindrical correction of -1,5 D × 40°
Near:
UCVA: 0,2 and BCVA: 0,6 with a spherical correction of +4 D

3) primary presenile cataract

patient 5:
Far:
UCVA: 0,9 and BCVA: 1,0 with a spherical correction of -1D
Near:
UCVA: 0,75 which could not be improved.

patient 6:
Far:
UCVA: 0,9 and BCVA: 1,0 with a spherical correction of -0,5D
Near:
UCVA: 0,4 and BCVA: 0,75 with a spherical correction of +3D
All these patients have been operated between June 1996 en Sept 1997. The visual acuity remains stable.

Postoperative orthoptic examination

The uncomplicated traumatic and the primary presenile cataracts had a normal orthoptic examination after cataract surgery without correction, indicating that these patients recovered a good binocularity for their daily life activities.
The results of the complicated cataract cases were disappointing.
In **case 3** an absence of stereoscopic vision was noted with total suppression for far and for near vision with and without correction.
In **case 4** stereoscopic vision was present with correction, but absent without correction. The patient was orthotropic with correction, but esotropic without correction and rare episodes of binocular diplopia were found. These 2 patients did not recover binocularity for their daily life activities.

DISCUSSION

Most multifocal intraocular lenses are implanted bilaterally in presbyopic patients who prefer not to wear any kind of glasses. This is of course a completely different target group than in our investigation.

Multifocal intraocular lens implantation is suggested as a possible correction of pseudophakia. Since the optical properties of such an IOL are not peculiar (figure 2), the postoperative outcome will depend mainly on the accuracy of the centration of the IOL in the capsular bag with regard to the pupillary area (6).
When implanting an intraocular lens in the capsular bag the centration will depend on the contraction forces within in the capsular bag. These forces will depend on the accuracy of the surgical technique and the biological properties of the tissue. Both factors can present some variants and thus can be considered as unpredictable. This is the main reason to use a three-zone refractive multifocal IOL and not a five or more zone multifocal IOL.
The second very important factor is the pupil and the integrity of the pupillary sphincter. It is not known if the pupil has a natural and best optical centration when taking the optical properties of the natural lens into consideration. It is obvious that an intact pupillary sphincter will guarantee better optical conditions compared to a sphincter dysfunction.
Additional criteria in favour for multifocal IOL implantation are good preoperative binocular vision and good visual prognosis. When possible, a pre-operative orthoptic examination can give useful information concerning the eligibility for multifocal IOL implantation. If good visual acuity is not expected because of underlying retinal problems, it is not advisable to implant a multifocal IOL.

CONCLUSION

Several criteria determine the success ratio of a multifocal intraocular lens implantation in unilateral primary or secondary cataract.
Since multifocal IOL's are more expensive for the patient, a few parameters have to be checked before deciding the implantation of these IOL's. Criteria appearing to favour good visual results, that lead to favourable results with regard to visual acuity and binocular vision, are the presence of good pre-operative binocular vision, absence of pupillary sphincter dysfunction, and absence of retinal damage. As soon as one of these criteria is missing, the implantation of a multifocal IOL is useless.
Fulfilment of these criteria is a prerequisite for successful implantation of a multifocal IOL.

REFERENCES

(1) AVITABILE T., MARANO F., GANNIO E.G., BIONDI S., REIBALDI A. – Long-term visual results of bifocal intraocular lens implantation. J Cataract Refract Surg 1999; 25:1263-1269
(2) BOESTEN I.E., BEEKHUIS W.H., HASSMANN E., PAMEYER J.H., BAARSMA G.S. – Comparison of the Storz bifocal zonal and the 3M diffractive multifocal intraocular lenses. Cataract Refract Surg 1995; 21:437-441
(3) CAVALLARO B.E., MADIGAN P., O'HARA M.A., KRAMER K., BAUMAN C. – Posterior chamber intraocular lens use in children. J Pediatr Ophthalmol Strabismus 1998; 35:254-263
(4) GRAY P.J., LYALL M.G. – Diffractive multifocal intraocular lens implants for unilateral cataracts in prepresbyopic patients. Br J Ophthalmol 1992; 76:336-337
(5) JAVITT J.C., WANG F., TRENTACOST D.J., ROWE M., TARANTINO N. – Outcomes of cataract extraction with multifocal intraocular lens implantation: functional status and quality of life. Ophthalmology 1997; 104:589-599
(6) KOCH D.D., SAMUELSON S.W., VILLARREAL R., HAFT E.A., KOHNEN T. – Changes in pupil size induced by phacoemulsification and posterior chamber lens implantation: consequences for multifocal lenses. J Cataract Refract Surg 1996; 22:579-584
(7) SHOJI N., SHIMIZU K. – Clinical evaluation of a 5.5 mm three-zone refractive multifocal intraocular lens. J Cataract Refract Surg 1996; 22:1097-1101
(8) TCHAH H., CHOI W.J. – Near add power of the diffractive multifocal intraocular lens. J Cataract Refract Surg 1996; 22:1232-1235

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