ORIGINAL ARTICLE

Analysis of the Reasons for Explantation of Intraocular Lenses

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SUMMARY

Aim: To analyze the reasons of intraocular lenses (IOL) explantation.
Methods: Retrospective study of 22 eyes of 21 patients. Those patients underwent explantation of intraocular lenses between the years 2008 to 2011. The study group included two eye groups. Group A included eyes with exptanted monofocal IOL (14 eyes of 13 patients) and group B included eyes with explanted multifocal IOL (8 eyes of 7 patients). Reasons requiring explantation were analyzed based on subjective patient complaints and on objective ocular findings in health documentation as well.
Results: The most common indications of explantation in Group A of monofocal lenses were incorrect IOL power, followed by IOL luxation, decentration and IOL opacity. In Group B of multifocal IOL, the most common reasons for IOL removing were halo and glare, inadequate postoperative expectations and incorrect IOL power.
Conclusion: The main reason for IOL exchange in Group A of monofocal lenses was the incorrect power, while in Group B of multifocal IOL the main reason were the disturbing photic phenomenon like glare and halo. Careful patient selection, good surgical technique, optimally selected IOL power measurements based on precise biometry readings as well high quality of IOL materials are the most important factors in minimizing the risk for IOL explantation.

Key words: cataract operation, explantation, intraocular lens

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INTRODUCTION

Microincision cataract surgery with intracapsular implantation of a soft intraocular lens (IOL) ranks amongst the standard procedures of contemporary cataract therapy. The increasing number of implantations of soft intraocular lenses is followed by an increasing number of performed explantations due to various causes [9]. The resulting effect of the operation depends not only on the precision of the preoperative examinations and the quality of performance of the surgical procedure, but also on the correct selection of the lens with regard to the visual preference of the patient. A no less important factor in the incidence of postoperative complications in connection with an implanted lens is its material, optical design, number of focal points, shape and construction of the IOL. Whilst we encounter certain causes leading to the explantation of lenses essentially with all types of lenses, some are typical only for a certain type of intraocular lens [13]. According to contemporary studies, the most frequent causes of explantation of IOL is decentration, incorrect optical density, strength of the lens and pseudophakic dysphotopsia. The occurrence of photic phenomena is a frequent indication for explanation above all in the case of acrylate and multifocal lenses [10]. Explantation of the lens is frequently conditioned by problems in connection with the material of the IOL. From this perspective it most often concerns the formation of calcium deposits typical of hydrophilic acrylate and “glistening” typical of hydrophobic acrylate [8].
The aim of the study is to conduct an analysis of the causes leading to the explantation of monofocal and multifocal lenses made of hydrophobic acrylate and to define the basic terms leading to the prevention and minimisation of the causes of their explantation.

METHODOLOGY

In a retrospective study we focused on the causes of explantation of IOLs produced from hydrophobic acrylate. This concerned monofocal single-piece SA60AT (Alcon) lenses, diffraction single-piece ReSTOR SN6AD1 (Alcon) lenses and refractive three-piece ReZOOM (Abbott Medical Optics) lenses.
We included in our study a total of 22 eyes of 21 patients, who had undergone explantation of a monofocal or multifocal lens made of hydrophobic material at our workplace in the period from 2008 to 2011. The first group A comprises 14 eyes of 13 patients with an explanted monofocal SA60AT (Alcon) lens, the second group B comprises 8 eyes of 7 patients with an explanted ReSTOR SN6AD1 (Alcon) and ReZOOM (Abbott Medical Optics) lens.
We conducted an analysis of causes partially on the basis of subjective answers provided by the patients and partially on the basis of an objective finding according to the medical documentation.

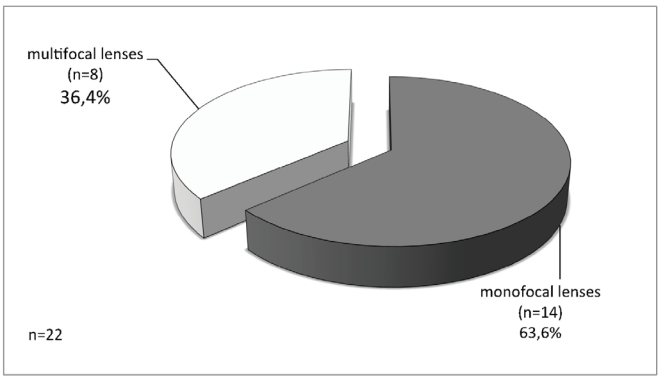
RESULTS

In our group of 22 eyes, explantation of a monofocal lens was performed 14 times (63.6%), with 8 explantations of

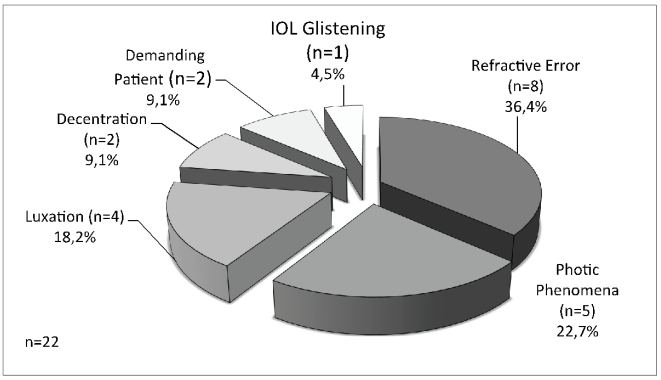
a multifocal lens (36.4%) (Graph 1).
Out of the total number of 22 performed explantations, the most common cause leading to explantation was a refractive error (36.4%, n = 8), followed by undesirable photic phenomena (22.7%, n = 5) and luxation of the lens (18.2%, n = 4). Other, less common causes include decentration of IOL (9.1%, n = 2), unrealistic expectation (9.1%, n = 2) and glistening of lens (4.5%, n = 1) (Graph 2).
Amongst the most frequent causes leading to explantation of a monfocal lens were 7 refractive errors (50.0%), 4 luxations of IOL caused by dehiscence of zonular apparatus either traumatically or as a consequence of pseudoexfoliation syndrome (28.6%), 2 decentrations of the lens as a consequence of concentration of the capsule in the case of pseudoexfoliation syndrome (14.3%) and 1 glistening of the lens (7.1%) (Graph 3).
In group B the causes leading to explantation of the lens were 5x photic phenomena (halo, glare) (62.5%), 2x patient's unrealistic expectation (25.0%) and 1x refractive cause (12.5%) (Graph 4).
In all eight cases, explantation of a multifocal lens was followed by implantation of an intraocular lens of another type (Table 1).

DISCUSSION

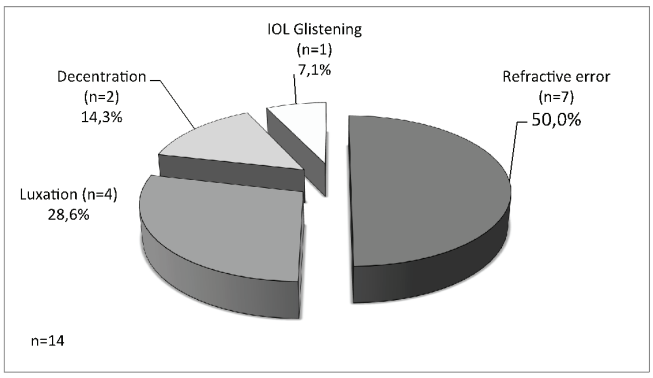
The reasons for explantation of intraocular lenses vary; amongst other factors they depend on the type and material of the intraocular lenses. Certain complications are typical only for a certain type of lens, others may occur in all IOLs [14].
According to the literature, explantation of an IOL is indicated relatively frequently due to a postoperative refractive error as a consequence of poorly chosen optical density of the IOL [14]. We demonstrated this fact also in our study. In our sample group this was the most common cause of explantation in the subgroup of patients with a monofocal lens (single-piece hydrophobic acrylate with haptics). Exact biometry is crucial in order to prevent the incidence of a refractive error. Precisely measured axial length and keratometry are essential for the correct calculation of the intraocular lens. Measurement of axial length using a partial coherent interferometer (IOLMaster, Carl Zeiss Meditec) is



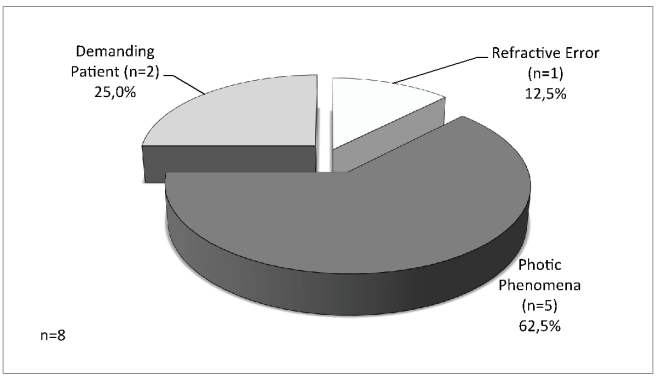
Graph 1 IOL explantation according to the type of lens in the whole group (n = 22).



Graph 2 Analysis of the causes of explanted IOL in the whole group (n = 22).



Graph 3 Analysis of the causes of explantation monofocal intraocular lenses in group A (n = 14).



Graph 4 Analysis of the causes of explantation of multifocal intraocular lenses in group B (n = 8).

Table 1 Causes of explantation and type of multifocal intraocular lens in group B (n = 8) stating type of subsequent secondary implantation of intraocular lens

Cause	Explantation of IOL	Number of eyes	Implantation of IOL	Number of eyes
Refractive error	SN61AD1	1	SN61AD1	1
Photic phenomena	SN61AD1	3	Lentis M plus	3
	Rezoom	1	Lentis M plus	1
	Rezoom	1	SA60AT	1
Exacting patient	SN61AD1	2	SN61AD1	2

significantly more precise and reproducible than standard contact ultrasonography [3]. In addition to optical biometry, also precisely performed immersion ultrasonography provides highly precise measurement of axial length, and results of the calculation of the intraocular lens are similar as in the case of measurement using an IOLMaster [16].

In the case of implantation of multifocal lens the key to patient satisfaction is the selection of a suitable candidate. Generally the given lenses are recommended for patients with minimal ocular comorbidity, it is necessary to take into account the patient's profession, visual preference and personality type. Typical disruptive optical phenomena of multifocal intraocular lenses are halo and glare. It is precisely these phenomena that rank amongst the most common causes leading to explantation of multifocal lenses. They are caused primarily by the diffraction part of the optics (apodization) [14]. Multifocal intraocular lenses with horizontally articulated optics are distinguished by a lower occurrence of glare and halo [1, 15]. This type of lens was chosen for secondary implantation following explantation for one half of patients, who were dissatisfied due to disturbing photic effects. For one patient from our population, for whom photic phenomena and reduced contrast sensitivity were extremely burdensome, we chose a monofocal lens for secondary implantation. Sufficient patient education before the operation concerning photic phenomena and reduced contrast sensitivity are extremely important, and minimise the risk of complications leading to explantation [14]. Unrealistic expectations on the part of the patient may also lead as far as explantation of the lens following implantation of multifocal lenses. In the group of explantations of multifocal lenses, this reason occurred in 25.0% of cases. As a result, in our opinion it is of fundamental importance to ensure careful selection of the candidate for implantation of the multifocal lens on the basis of an individually conducted preoperative analysis of the patient's visual preferences, demands and expectations. In the past, a high refractive index of the lens, sharp edges and uneven biconvex curvature of the lens caused a high incidence of glare and halo effects in acrylate hydrophobic intraocular lenses [4, 5, 7]. Modifications of the design of the lens edge in the case of single-piece hydrophobic acrylate lenses with haptics led to a reduction of the occurrence of the particular complications [6].

Over the last ten years, dislocation and decentration has been the most common cause of explantation of single-piece silicon lenses with plate-haptics [10, 11, 12], and their high incidence has been well documented in the literature [2, 18]. For this reason, in order to ensure greater stabilisation of the lenses in the capsule, holes have been made in the particular lenses [20]. Decentration has also been described in single-piece and multi-piece acrylate lenses and ranks amongst the most common indications for explantation in single-piece acrylate intraocular lenses with haptics [14]. Here the causes is neither the type of the material or the design, but rather the asymmetrical position of the IOL in the capsule, asymmetrical anterior capsulorhexis, or also loose suspension apparatus as in our study. As a result a well performed operation is of fundamental importance. Optimally centred continual anterior capsulorhexis and efficient performance of the operation minimises the risk of decentration and luxation of the intraocular lens.

Turbidity of the lens currently ranks amongst isolated complications. The cause may be an error in the course of production of the lens, the method of storage of the lens, damage during the course of implantation or a combination of a number of factors. The complication may be determined peroperatively, shortly after the operation or at an interval of several months to years after the operation [19]. In our sample group this complication occurred only in one case. Explantation of an intraocular lens brings a certain risk of the occurrence of peroperative and postoperative complications. These include for example the formation of glaucoma, amotion of the retina, decompensation of the cornea and anisometropia [17]. None of the above complications occurred in the observed group of patients.

CONCLUSION

The most common cause leading to explantation of an IOL in our sample group was a refractive error (36.4%), followed by undesirable photic phenomena (22.7%) and luxation of the lens (18.2%). Less common causes included decentration of the IOL, patient's unrealistic expectations and glistening of the lens. The most frequently explanted lenses in our sample group were monofocal lenses (63.6%).

The most common causes leading to explantation of a monofocal lens were refractive error (50.0%), followed by decentration of the IOL as a consequence of dehiscence of the zonular apparatus (28.6%).

The most frequent cause of explantation of multifocal IOLs was subjective complaints of patients in connection with the occurrence of disruptive photic phenomena (62.5%) and patient dissatisfaction as a consequence of inappropriate implantation of a multifocal IOL for persons with unrealistic expectations (25.0%).

On a general level, as factors reducing the risk of occurrence of causes leading to explantation of IOL it is possible to name above all an uncomplicated course of the operation, precise biometry, stipulation of the optical dioptric density of the lens and selection of a suitable type of lens with regard to the ocular finding and visual preference of the patient. Exactly performed biometry and designation of the optimal dioptric strength of the implanted IOL appears to be of fundamental importance from the perspective of patient satisfaction with the postoperative refractive result in the case of both monofocal and multifocal IOLs. In the case of implantation of multifocal lenses it is appropriate to accentuate the selection of a suitable candidate with regard to the visual preference and expectations of the patient. An integral component of the process, leading to postoperative patient satisfaction is also the time devoted to education of the patient, with reference not only to the advantages of the proposed solution but also to its negative elements, limitations or possible complications. A part of a professional approach is also ensuring that the patient understands the therapeutic procedure and understands how his/her vision will be after the operation.

Accurate selection of the patient, sufficient patient education before the operation, well performed cataract surgery, precisely performed biometry, correct indication of the lens individually according to the ocular finding, visual preferences and with regard to the patient's expectation and the material of the intraocular lens rank amongst the most important factors, which can minimise the risk of complications leading to explantation of an intraocular lens.

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