Retropupillary Iris-Claw Intraocular Lens Implantation: A Refractive and Safety Report

Implantação de Lentes Iris-Claw Retropupilares: Resultados Refractivos e de Segurança

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ABSTRACT

INTRODUCTION: Iris-claw intraocular lenses are one of the surgical alternatives to treat patients without capsular and zonular support after complicated cataract surgery, trauma, or diseases that disrupt the normal anatomy of the eye's posterior chamber. Retropupillary fixation, through the enclavation of the lens to the posterior iris, constitutes a modification of the original technique, and is associated with fewer long-term complications, particularly regarding the loss of corneal endothelial cells. The purpose of this study was to evaluate the visual and refractive results and to report the associated complications of patients who underwent retropupillary implantation of the Artisan Aphakia IOL® (Ophtec).

METHODS: A retrospective, observational, single-center study of consecutive eyes, including 26 patients who underwent surgery in Hospital Pedro Hispano, between 2012 and 2021. The outcome measures consisted of postoperative best-corrected visual acuity, spherical equivalent, intraocular pressure, and complications.

RESULTS: The most common indication for surgery was previous complicated cataract surgery (50%), followed by trauma (26.9%) and spontaneous intraocular lens luxation (11.5%). The mean best-corrected visual acuity was 0.52 ± 0.62 logMAR and the mean spherical equivalent was 0.075 ± 1.46 diopters. Postoperative ocular hypertension occurred in 7.7% of the patients. The most common complication was the luxation of one of the haptics of the lens, which happened to 19.2% of patients. Cystoid macular edema was present in 11.5% of the patients.

CONCLUSION: Retropupillary iris-claw intraocular lens implantation is a valid alternative for treating aphakia in the absence of capsular support. It is a safe technique, with decent functional outcomes. Most long-term complications are related to the status of the eye before surgery, as it is often performed in complex patients, with important comorbidities, and that should be considered regarding the expected final outcome. Alternatives such as scleral fixation of intraocular lenses may provide a more predictable refractive outcome but are technically harder and depend on the surgeon's experience. The surgical technique should be individualized according to the characteristics of the patient, and the preference and experience of the surgeon.

KEYWORDS: Aphakia; Cataract Extraction; Lens, Crystalline; Lenses, Intraocular.

RESUMO

INTRODUÇÃO: O implante de lentes intra-oculares de fixação à íris é uma das alternativas cirúrgicas para tratar doentes sem suporte capsular e zonular após cirurgia de catarata complicada, trauma, ou doenças que alteram a normal anatomia da câmara posterior do olho. A fixação retropupilar, através do enclavamento da lente à face posterior da íris, constitui uma modificação da técnica original, associada a menor taxa de complicações a longo prazo, sobretudo em relação à perda de células do endotélio corneano. O objectivo deste trabalho foi avaliar os resultados visuais e refractivos, e descrever as complicações associadas com a fixação retropupilar das lentes Artisan de Afaquia® (Ophtec).

MÉTODOS: Foi feita uma análise retrospectiva, observacional, de olhos consecutivos, que incluiu 26 doentes submetidos à cirurgia no Hospital Pedro Hispano, entre 2012 e 2021. Foram analisadas a melhor acuidade visual corrigida, equivalente esférico, pressão intraocular e complicações pós-operatórias.

RESULTADOS: A indicação cirúrgica mais comum foi a cirurgia de catarata complicada prévia (50%), seguida de trauma (26,9%) e de luxação espontânea da lente intraocular (11,5%). A melhor acuidade visual corrigida média foi de 0,52 ± 0,62 logMAR e o equivalente esférico médio foi de 0,075 ± 1,46 dioptrias. Dos doentes, 7,7% tiveram hipertensão ocular no período pós-operatório. A complicação pós-operatória mais frequente foi a luxação de um dos hápticos da lente, que ocorreu em 19,2% dos doentes, seguida do desenvolvimento de edema macular cistóide, em 11,5% dos casos.

CONCLUSÃO: O implante de lentes com fixação à íris em posição retropupilar é uma alternativa válida para tratar a afaquia, na ausência de suporte capsular. Trata-se de uma técnica segura, com resultados funcionais satisfatórios. A maioria das complicações a longo prazo estão relacionadas com o estado funcional do olho antes da cirurgia, uma vez que esta é frequentemente realizada em doentes complexos e com comorbilidades importantes, factores que devem ser considerados para o resultado final. Alternativas como a fixação escleral de lentes intraoculares podem proporcionar um resultado refractivo mais previsível, mas são tecnicamente mais difíceis e dependem da experiência do cirurgião. A escolha da técnica cirúrgica deve ser individualizada de acordo com as características do doente e com a preferência e experiência do cirurgião.

PALAVRAS-CHAVE: Afaquia; Cristalino; Extração de Catarata; Lentes Intraoculares.

INTRODUCTION

The surgical approach for the implantation of intraocular lenses (IOLs) in patients with inadequate capsular support is complex. Several causes may lead to the impossibility of placing an IOL in the capsular bag, such as capsular bag disruption during complicated cataract surgery or dislocation of the lens-zonules complex due to pre-existing pathology or following trauma.[1] Several surgical techniques and different types of IOLs have emerged for use in those cases, such as angle-supported anterior chamber IOLs (ASIOLs), scleral-supported IOLs, and iris-claw IOLs (ICIOLs).[2,3]

ICIOLs were introduced by Jan Worst in 1972 to correct aphakia in the absence of capsular or zonular support, as an alternative to angle-supported anterior chamber IOLs.[4] Since ICIOLs are fixed in the mid-periphery of the iris, complications such as damaging the iris root or the iridocorneal angle are inherently avoided. Traditionally, these lenses were placed in the anterior chamber, fixed to the anterior surface of the iris, which potentially led to complications regarding endothelial damage, especially in patients with narrow anterior chambers, endothelial dystrophies, or after corneal transplantation.[5,6] The modification of the technique, with the advent of retropupillary fixation, was first described in the 1980s, but only gained significant popularity during the last two decades.[7] Positioning the lens in the posterior chamber, through the enclavation to the posterior iris, made it possible to decrease complications related to the corneal endothelium while maintaining the centration of the IOL on the pupillary axis.[8]

The Artisan Aphakia IOL® (Ophtec) is an 8.5 mm wide single piece, biconvex, polymethylmethacrylate ICIOL, with an optic zone of 5.4 mm.[9] The iris-claw mechanism consists of two iris-claw pincers on diametrically opposed sides of the optical zone, with a small fissure that permits the enclavation of the IOL to a fold of the mid-peripheral iris stroma. It has a vaulted design, to provide space between the optic and the pupil plane, reducing the risk of pupillary block and the iris chafing phenomenon. When placed in a retropupillary position, the A-constant is accordingly adjusted to 116.8.[9]

The purpose of this study was to evaluate the visual and refractive results of patients who underwent retropupillary implantation of the Artisan Aphakia IOL® (Ophtec) and to report the associated short and long-term postoperative complications regarding this procedure.

METHODS

A retrospective, observational, single-center study of consecutive eyes was conducted, including 26 eyes of 26 patients, who underwent implantation of the Artisan Aphakia IOL® in retropupillary position in Hospital Pedro Hispano – Unidade Local de Saúde de Matosinhos, between 2012 and 2021.

All consecutive cases with a follow-up of at least 1 year were included. The patient's clinical records were analyzed, and information regarding demographic data, indication for surgery, postoperative refractive error, slit-lamp examination, spherical equivalent (SE), best-corrected visual acuity (BCVA), intraocular pressure (IOP) measured by Goldmann applanation tonometry, fundus examination, and intraoperative and postoperative complications were reviewed. Simultaneous ophthalmological pathology and prior ophthalmologic surgery were noted. Optical coherence tomography (OCT) with Avanti RTVue XR, Optovue® was performed, if needed, to exclude cystoid macular edema (CME). The adopted outcome measures were postoperative BCVA, SE, IOP, and postoperative complications.

The Artisan Aphakia Model 205 IOL® (Ophtec BV) was used. All patients included in this study had the lens implanted in a retropupillary position. The formula used for the biometric calculation was SRK-T, with an A-constant of 116.8, as recommended by the manufacturer.[9] The biometer used was the IOLMaster® 500 (ZEISS Medical Technology).

All surgeries were performed by the same surgeon in Hospital Pedro Hispano's operating room, under sub-tenon, peribulbar, or general anesthesia. Regarding the surgical technique, 23G or 25G pars plana vitrectomy was made, using the standard 3 ports at 3.5 mm from the limbus, along with the removal of any remnants of the capsular bag, lens' cortex or vitreal adhesions. In cases of a dropped nucleus, fragments were removed using the phacofragmentor and/or vitrector. When an IOL was dislocated in the posterior segment, it was brought to the anterior chamber, and removed through a scleral tunnel or corneal limbal incision. In cases where a dilated pupil was required, such as IOL exchange, intracameral acetylcholine (Miochol®, Bausch + Lomb) was used to revert the pharmacologic mydriasis. After filling the anterior chamber with OVD, the ICIOL was inserted in the anterior chamber, with its concavity oriented anteriorly, using either a 5.5-6 mm limbal corneal incision or a scleral tunnel at the 12 o'clock position. Inside the anterior chamber, the lens was manipulated with a specific iris-claw forceps, which holds it in the middle of the optic zone, to be pushed under the iris. After manipulation and rotation, when the optic zone is centered on the pupil, and the haptics are at 3 and 9 hour positions, the haptics are gently enclavated using a needle or a hook, which passed through the 3 and 9 o'clock positions, with a gentle push. A peripheral iridectomy is not mandatory when fixating the lens posteriorly.[11-13] Before the end of the procedure, OVD was removed from the anterior chamber, and injections of subconjunctival methylprednisolone and cefuroxime were done. Postoperative medication consisted of topical corticosteroids, non-steroidal anti-inflammatory, and antibiotics.

For statistical purposes, BCVA usually labeled as "counting fingers", "hand movement", and "light perception" was converted to a decimal scale as 0.01, 0.005, and 0.0005, respectively, following the conversion method developed by C. Lange and colleagues.[10] Additionally, visual acuity (VA) represented using the decimal scale was converted to the equivalent logarithm of the minimum angle of resolution (logMAR).

Statistical analysis was conducted using Statistical Package for the Social Sciences (SPSS) version 23.0 for Macintosh. The assumption of normality of distribution and homogeneity of variance were tested by the Kolmogorov-Smirnov test. When these assumptions were verified, a t-test for paired/independent samples was used. When those assumptions were not proved, the Mann-Whitney test for independent samples was used. Statistical significance was defined as $p < 0.05$.

RESULTS

A total of 26 eyes of 26 patients were included in this study. Table 1 shows the demographics and characteristics of the study sample, with 57.7% of the patients being male and 42.3% being female. The mean age of the patients was 72.9 ± 12.97 years old. The mean follow-up time was 64.38 ± 33.27 months. Due to the study design, the minimum follow-up time was 12 months.

Regarding the indications for surgery, shown in Table 2, all included pathologies in which there was a loss of zonular/capsular support, preventing the implantation of the IOL inside the capsular bag. The most common indication, accounting for 50% of the patients, was previous complicated cataract surgery, with posterior capsule rupture or zonular dehiscence, in which there were no conditions to place the lens in the ciliary sulcus. Traumatic injuries were responsible for 26.9% of the cases, due to traumatic cataracts, and/or lens luxations. Spontaneous IOL and capsular bag luxation happened in three (11.5%) patients, all previously diagnosed with pseudoexfoliation syndrome. Finally, there was one case (3.85%) of a scleral-fixated IOL luxation, and two cases (7.69%) of ASIOLs causing endothelial decompensation, in need of removal.

Ophthalmological comorbidities are also shown in Table 1. Patients undergoing this procedure usually have a complex background, with important ocular history. More than one-quarter of the patients (26.9%) had history of glaucoma, mainly pseudoexfoliative glaucoma, a relatively high number, which is explained by the fact that all patients with spontaneous luxations of the IOL+lens complex had pseudoexfoliative syndrome. Due to the high mean age of the patients, about 15% had been diagnosed with age-relat-

Table 1. Demographics and characteristics of the study sample.

Eyes	26
OD	13 (50%)
OS	13 (50%)
Age (years)	
Mean ± SD	72.9 ± 12.97 years
Gender	
Male	15 (57.7%)
Female	11 (42.3%)
Follow-up (months)	26 (1.7)
Mean ± SD	64.38 ± 33.27
Median	69.50
Minimum	12
Maximum	125
Ophthalmological comorbidities	
Glaucoma (including pseudoexfoliative glaucoma)	7 (26.9%)
Age-related macular degeneration	4 (15.4%)
History of previous macular edema (including diabetic macular edema)	4 (15.4%)
History of corneal decompensation	4 (15.4%)
History of ocular perforation	3 (11.5%)
History of previous retinal detachment	2 (7.7%)
Macular hole	1 (3.8%)
Epirretinal membrane	1 (3.8%)

Table 2. Indications for surgery and postoperative results and complications.

Indications for surgery	
Complicated cataract surgery	13 (50%)
Trauma	7 (26.9%)
Traumatic cataract	4 (15.4%)
Lens luxation	3 (11.5%)
Spontaneous IOL + capsular bag luxation	3 (11.5%)
Scleral fixated IOL luxation	1 (3.9%)
Angle-supported AC-IOL with corneal decompensation	2 (7.7%)
Postoperative results	
Best-corrected visual acuity (logMAR)	
Mean ± SD	0.52 ± 0.62
Minimum	0.05
Maximum	2.3
Spherical equivalent (diopters)	
Mean ± SD	0.075 ± 1.46
Minimum	-2.00
Maximum	+3.00
IOP (1 month after surgery, mmHg)	
Mean ± SD	13.89 ± 4.79
Minimum	6
Maximum	26
Postoperative complications	
Haptic luxation	5 (19.2%)
Cystoid macular edema	3 (11.5%)
Panuveitis with choroidal bleeding	1 (3.8%)
Total	8 (30.8%)

ed macular degeneration. Four patients (15.4%) had history of macular edema, including one case of diabetic macular edema. History of corneal decompensation was present in four patients (15.4%), two of them secondary to ASIOLs, and the other two after perforating trauma. Both patients with previous retinal detachment had this complication following complicated cataract surgery.

The mean BCVA after the procedure was 0.52 ± 0.62 logMAR (Table 2), with the highest corrected visual acuity obtained being 0.05 logMAR and the lowest 2.3 logMAR. The final visual acuities are greatly influenced by coexisting ocular pathology, especially for patients who have undergone surgery following severe trauma. Despite this, no statistically significant differences were obtained (p=0.0689) between patients who underwent surgery after complicated cataract surgery compared to those who had traumatic ocular lesions. Patients with BCVA of "hand motion" (logMAR 2.3) had severe ophthalmological comorbidities. One of them had a severe macular hole and the other one had a suprachoroidal hemorrhage after trauma.

The final mean spherical equivalent obtained was 0.075 ± 1.46 diopters, with values ranging from -2.00 and +3.00 diopters (Table 2). Some of the final refractive results were affected by concomitant pathology. The patient with a +3.00 spherical equivalent had a severe corneal laceration resulting from the trauma, with a value of +6.00 diopters of astigmatism. Half of the patients (50%) had a spherical equivalent between -1.00 and +1.00 diopters, while 25% had values ranging between -0.50 and +0.50 diopters. There were no statistically significant differences between the spherical equivalent of patients who underwent complicated cataract surgery and those with ocular trauma (p=1.000).

Concerning the intraocular pressure, measured 1 month after the surgery, and in the last appointment, mean values were, respectively, 13.89 ± 4.79 and 14.42 ± 4.42 mmHg. As shown in Table 2, in the first month after surgery, 2 patients had IOP above 21 mmHg, and in the last measurement, none of them did. An important bias to this analysis is the fact that many patients included in the study had glaucoma, namely pseudoexfoliative glaucoma, and underwent other interventions to decrease IOP, as well as topical hypotensive medication.

Postoperative complications, shown in Table 2, were present in eight (30.77%) patients. The most frequent complication was the luxation of one of the haptics of the ICI-

OL, which happened in five (19.23%) patients. All of them required subsequent surgery to re-grasp the luxated haptic. CME was objectified in three (11.5%) patients. Of those patients, two had previous complicated cataract surgery, and the other one had a history of chronic macular edema, already present before the procedure. The most severe postoperative complication was one case of panuveitis, with choroidal hemorrhage, in an eye that already suffered from an endothelial decompensation due to an ASIOL, which was exchanged at the time of surgery. That patient had a final BVCA of 1.0 logMAR.

DISCUSSION

The implantation of intraocular lenses into the capsular bag after phacoemulsification surgery is the gold standard of cataract surgery. When this option is not possible due to surgical complications, trauma, or concomitant pathologies that compromise the integrity of the capsular bag/zonules complex, other strategies must be carried out.[14,15] In the last decades, several options have emerged to avoid prolonged aphakia. These include ASIOLs, scleral fixation of IOLs, and ICIOLs.[16] Over the last years, ASIOLs have fallen into disuse, as a consequence of the high rates of complications involving damage to the iridocorneal angle and the corneal endothelium.[17] This is evidenced in our work by the fact that two of the patients of our study group had to exchange their ASIOL due to endothelial decompensation. Despite this, currently, there is insufficient evidence to recommend any specific strategy over another.

Scleral fixation of IOLs in the ciliary sulcus accounts for a safe option, where the IOL is placed in a more physiological position, closer to the natural plane of the crystalline lens, avoiding the drawbacks associated with anterior chamber lenses.[18] However, it is a technically challenging procedure, with a steep learning curve. A recent meta-analysis by Lau *et al* compared the efficacy and safety results between the scleral fixation of IOLs and ICIOLs. The final BCVA was not significantly different between groups, with similar visual improvement regardless of the technique. The absolute changes in spherical equivalent and surgically induced astigmatism were also similar. Regarding complications, data did not suggest significant differences, except for vitreous hemorrhage, which was higher in the scleral fixated-IOL group, probably due to the needle damaging vessels in the ciliary body during surgery. Other complications which may be distinct between techniques include the possibility of suture erosion and breakage in scleral fixated-IOLs, and pupillary distortion due to mechanical manipulation of the iris in ICIOLs. Endothelial cell density seems to be more affected by ICIOL implantation, regardless of antero- or retropupillary implantation, considering the greater proximity to the corneal endothelium.[19]

Regarding ICIOLs, they were traditionally associated with complications related to their positioning on the anterior chamber, in proximity to the corneal endothelium. While retropupillary positioning techniques are typically hypothesized to have a protective effect on the corneal endothelium, since the lens is further away from it,[20] the evidence on this topic is not entirely clear. Some studies report no statistically significant differences regarding complications and outcomes.[21,22] While Toro *et al* showed no benefit of retropupillary enclavation, Gicquel *et al* reported a significantly higher endothelial cell count, compared to anteropupillary fixation. Retropupillary enclavation was associated with posterior movement of the iris plane, providing a deeper anterior chamber, which is theoretically associated with better endothelial tolerance.[20,23]

Recent ICIOLs, such as the one used in all surgeries (Artisan Aphakia Model 205 IOL®, Ophtec BV) have a convex-concave vaulted design, preventing pupillary block and secondary glaucoma, without the need for a peripheral iridectomy, which results in a much more favorable safety profile.[24-28] The preference and experience of the surgeon also play a significant role in choosing one technique over the others.[29]

Different surgical approaches may be used for the implantation of the ICIOL. The size of the ICIOL demands an incision of at least 5.4 mm, which is by itself a drawback of this technique. Despite being technically more challenging, authors consider making a sclero-corneal tunnel the preferable option, because it reduces the surgically induced astigmatism, and may also lower the rates of wound leakage and endophthalmitis.[30,31] The drawbacks of this approach are the fact that it is technically hard, requiring surgical experience, and also the fact that, in glaucoma patients, this area should remain untouched, as there may be a need to perform filtering surgery in the future. In our study, some of the surgeries involved a limbic corneal incision, while others were done with the creation of a scleral tunnel. This difference probably has an important impact on the final astigmatism and spherical equivalent of the eyes and constitutes one of the limitations of the analysis made in our work.

Patients submitted to this surgery frequently have important ophthalmological comorbidities, given the fact that it is usually done as a "rescue" procedure after surgical complications, trauma, or the co-existence of other diseases that disrupted the normal anatomy of the eye's posterior chamber. Our most common indications for surgery were previous cataract surgery, trauma, and spontaneous luxation of a previously implanted IOL, the latter always related to the presence of pseudoexfoliative syndrome. These indications are in line with other reports. Cataract surgery, complicated by capsular bag disruption, either during capsulorhexis or phacoemulsification, is by far the most common cause described.[32-34]

Previous ocular pathology was present in most patients and probably had an important impact on visual outcomes, especially on the long-term BCVA. The most frequent disease was glaucoma, followed by corneal and retinal pathology. Pseudoexfoliative syndrome constituted an important bridge between glaucoma and zonular insufficiency. Many of those comorbidities were caused by the initial surgical complication which also led to the loss of capsular support, namely CME and retinal detachment after complicated cataract surgery. It is important to interpret the results with this in mind. Many of the long-term complications after the

ICIOL implantation were not caused by the procedure itself, but by an initial factor that also led to its execution. Our data highlights the fact that this technique is often performed in complex patients, with frequent comorbidities, and that should be considered regarding the expected final result.

The mean long-term BVCA obtained after the procedure was 0.52 ± 0.62 logMAR, heavily influenced by 2 outliers with severe low vision, corresponding to "hand motion", due to concomitant ocular disease. Visual outcomes were acceptable in eyes with no other pathology. This, again, highlights the importance of the status of the eye before surgery. Most cases of low BCVAs were not due to a failure of the procedure, but because those patients had limited visual potential, unrelated to the optical defect. This conclusion was shared in several other studies, which report visual acuities similar to those obtained, and highly dependent on the indication for surgery and the initial state of the eye.[35-39]

Regarding the final refractive status of the eye, shown by the spherical equivalent, the mean value of 0.075 ± 1.46 diopters was obtained, with values ranging from -2.00 and +3.00 diopters. Some of those cases were affected by pathology which induced high rates of astigmatism due to traumatic disruption of the corneal surface. Even though our mean SE was 0.075, only half of the patients had a SE between -1.00 and +1.00 diopters and 25% had a SE between -0.5 and +0.5 which translates decent predictability, considering the complexity of most cases. The mean prediction error reported in many studies ranges from -2.4 to + 0.29 diopters,36-40 corroborating some unpredictability of the final refractive outcome, in part due to concomitant corneal pathology, hindering the lens calculation process. The majority of the studies used the SRK/T formula, as we used, with the A-constant of 116.8, as given by the manufacturer.[8]

The mean IOP values obtained 1 month after surgery and during the last appointment were 13.89 ± 4.79 and 14.42 ± 4.42 mmHg. These results were biased by the fact that many of the patients had glaucoma or other diseases that were treated with medical or surgical procedures to lower IOP. Thus, it is hard to evaluate the direct impact that retropupillary ICIOL implantation had on the patients' IOP. The initial concerns about ICIOLs increases in IOP and the mandatory peripheral iridectomy are no longer an issue, due to the newer lens' design, preventing the possibility of pupillary block.[11,12] Most studies show a mild increase in IOP in otherwise non-glaucomatous eyes, which is usually temporary and responds well to medical treatment. However, ocular hypertension in the immediate postoperative period is not rare, and is probably associated with inflammation and retained OVD,[41,42] as in conventional cataract surgery.

Concerning postoperative complications, the most frequent was the disenclavation of one of the haptics of the ICIOL, which happened in 19.3% of the cases. All those patients required subsequent surgery to re-grasp the luxated haptic. The disenclavation may happen due to an atrophic iris at the site of enclavation, or due to suboptimal surgical technique. According to some reports, the risk of disenclavation is higher in younger patients and those with a trauma history.[3,44] This seemed to be one of the most important limitations of this surgical technique, probably related to the enclaving technique, which is different from the one performed in the anteropupillary implantation. Although the surgical resolution is relatively easy, it adds the important burden of surgical reintervention, with the associated risks, related both to surgery and anesthesia. Across the literature, this complication is reported to happen between 0%-37% of the cases,[43] considerable values, compatible with those found in this study. Patient selection taking into account possible risk factors such as iris atrophy may be useful to minimize this risk.

One of the major causes for a decreased BCVA following cataract surgery is CME.[45] As the most common indication for ICIOL implantation is complicated cataract surgery, there should be a high suspicion rate for the presence of CME, especially when VAs are lower than expected. Our series reported CME in three (11.5%) patients. Two of them had previous complicated cataract surgery, with CME already diagnosed before the secondary lens implant, and the other one had a history of chronic CME. Thus, it was not possible to establish a direct causal relationship between the ICIOL implant and the development of this complication. Authors report CME rates between 0%-25%,[29,45] depending on the duration of follow-up, sample size, and investigative methods. In many cases, it is possible to detect non-clinical CME, if OCTs are done at regular follow-up appointments after surgery. Martínez et al found that diabetic patients had double the risk of developing CME,[48] and Madhivanan reported a higher incidence of CME in patients who undergo scleral-fixated IOL implantation, than in those who implant retropupillary ICIOLs.[41]

CONCLUSION

The implantation of retropupillary ICIOL seems to be a safe and effective procedure, with decent functional outcomes, for patients without adequate capsular/zonular support, namely in the setting of complicated cataract surgery or trauma. The evolution of this technique, with the change in lens position from the anterior to the posterior chamber, added to the newer ICIOL designs, has significantly contributed to the safety of the procedure. The disenclavation of the ICIOL appears to be the most frequent postoperative complication. It cannot be overstated that there is no ideal surgical technique, as it should always be individualized according to the characteristics of the patient, and the preference and experience of the surgeon. The most important limitation of this study was that endothelial cell count in the pre- and postoperative periods was not documented due to lack of data, making it impossible to directly assess the impact that the retropupillary technique had on this factor. Other limitations of this study are related to its design, namely the retrospective analysis, the limited sample of patients, and the fact that it is a single-center study. Possible future contributions may include a direct comparison with other surgical techniques, namely scleral suspension, and a prospective, controlled randomized analysis.

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ACB: Wrote the first draft.

All authors collaborated equally in data collection, analysis and in the discussion of the results and approved the final version.

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