Simultaneous Surgery for Corneal Edema and Aphakia: DSEK and Placement of a Retropupillary Iris Claw Lens

Mauricio Vélez F, MD, Mark J. Mannis, MD,† Luis Izquierdo, Jr, PhD,‡ Juan G. Sánchez, MD,§ Luis F. Velásquez, MD,¶ and Sebastián Rojas, MD¶*

Purpose: The aim was to report the surgical outcomes of simultaneous Descemet stripping endothelial keratoplasty (DSEK) with a retropupillary fixated iris claw lens in patients with aphakic corneal edema without capsular support.

Methods: The clinical records of aphakic patients with corneal edema and no capsular support who underwent a combined DSEK and implantation of a retropupillary fixated iris claw lens (Artisan) were evaluated. Presurgical and postsurgical best-corrected visual acuity, postsurgical refraction, and endothelial cell count were analyzed at the first and sixth months after the surgery and were imaged with anterior segment ultrasound biomicroscopy.

Results: A total of 9 eyes from 7 females and 2 males were analyzed. The average age was 72.1 years. The mean duration of the postoperative follow-up was 7.7 months. All the patients achieved corrected visual acuities over 0.60 logarithm of the minimum angle of resolution. There was no significant variation in the endothelial count between the first and sixth months. Astigmatism >1 D was induced in all the patients, with 7 patients having against the rule, and 2 patients having oblique astigmatism.

Conclusions: DSEK combined with a retropupillary fixated iris claw lens was shown to be a safe surgical technique in patients with aphakia without capsular support and corneal swelling. This surgery resulted in stable endothelial cell counts during the first 6 months after the surgery and an improvement in visual acuity.

Key Words: iris claw lens, DSEK, aphakia, corneal edema, Fuchs dystrophy

(*Cornea* 2014;33:197–200)

Received for publication May 20, 2013; revision received August 18, 2013; accepted August 22, 2013. Published online ahead of print December 6, 2013.

From the *Department of Ophthalmology, Universidad Pontificia Bolivariana and CLOFAN, Medellín, Colombia; †Department of Ophthalmology and Vision Science, University of California Davis Eye Center, Sacramento, CA; ‡Department of Ophthalmology Universidad Mayor de San Marcos and Oftalmosalud, Lima, Perú; §Department of Ophthalmology, Universidad de Antioquia and CLOFAN, Medellín, Colombia; and ¶Department of Ophthalmology, Universidad Pontificia Bolivariana, Medellín, Colombia.

The authors have no funding or conflicts of interest to disclose.

Supplemental digital content is available for this article. Direct URL citations appear in the printed text and are provided in the HTML and PDF versions of this article on the journal's Web site (www.corneajrnl.com).

Reprints: Mauricio Vélez F, Carrera 48 # 19 A 40, Consultorio 1517, Torre Médica, Ciudad del Río, Medellín, Colombia (e-mail: mauroftalmo@hotmail.com).

Contemporary techniques in cataract surgery offer excellent results for the vast majority of patients. Although capsular rupture and zonular dehiscence are uncommon and are reported in <2% of the surgeries performed,[1] suboptimal visual rehabilitation may result.

Phacoemulsification surgery can accelerate the onset of corneal edema in patients with low endothelial counts, such as in patients with Fuchs endothelial dystrophy, iridocorneal endothelial syndrome, or endothelial inflammatory diseases as a result of iatrogenic surgical trauma.[2]

The correction of aphakia in eyes with corneal decompensation and no capsular support poses a complex surgical challenge with a significant risk of developing complications. The literature describes alternative treatments with variable results, including penetrating keratoplasty (PK) combined with angle-supported anterior chamber intraocular lenses (IOLs) or posterior chamber lenses either fixated to the iris or sutured to the sclera. Descemet stripping endothelial keratoplasty (DSEK) has become an alternative that has replaced PK. Over the last decade, this technique has been refined and popularized. The combination of this technique with an iris-fixated, posterior chamber IOL in aphakia (Artisan; Ophtec, Groningen, The Netherlands) and corneal edema has rarely been reported in the literature.[3] Here, we describe 9 eyes from 9 patients who were successfully managed with endothelial keratoplasty (DSEK) and a retropupillary iris–fixated IOL.

MATERIALS AND METHODS

We evaluated the clinical characteristics of 9 eyes from 9 patients who presented with aphakic corneal decompensation with no capsular support and who underwent an endothelial keratoplasty (DSEK) and implantation of a retropupillary IOL. Figure 1A shows case 1 with a posterior chamber lens implanted in the anterior chamber, and Figure 1B demonstrates the postoperative result.

In all patients, the cause of the aphakia and corneal edema was determined. Presurgical and postsurgical best-corrected visual acuities (BCVA), endothelial cell count at the first and sixth months postsurgery, and the residual refractive error at the end of the follow-up were also analyzed. Anterior segment ultrasound biomicroscopy (ultrasound biomicroscopy Aviso 50-MHz Probe, Quantel Medical) was also performed at 6 months to determine the position of the lenses and their anatomical relationships (Fig. 1C, D).

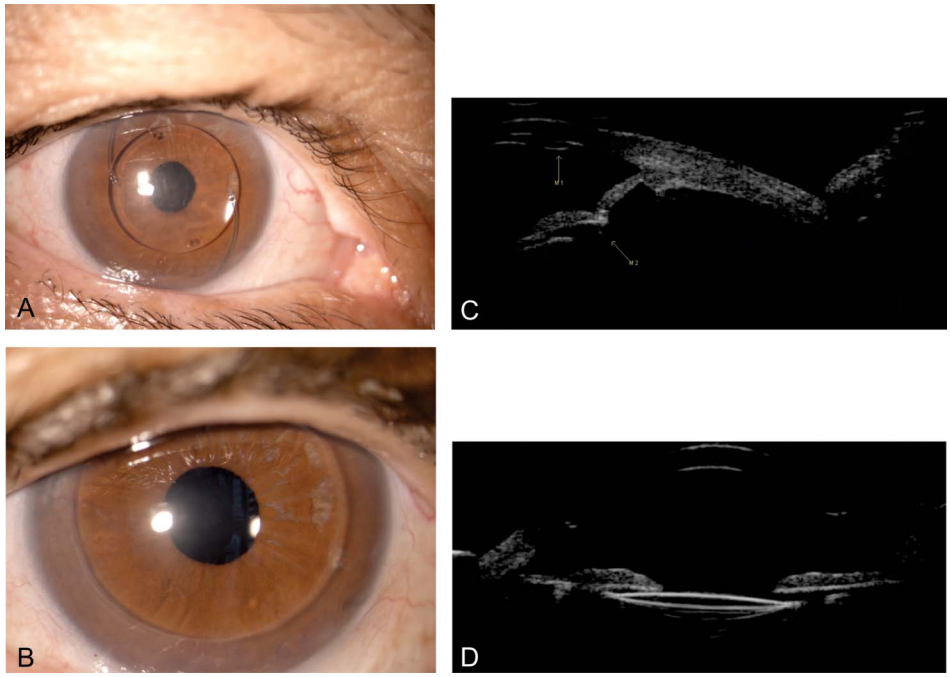

FIGURE 1. A, Anterior chamber lens and corneal edema. B, Results from the sixth postoperative month. C, Iris claw lens and endothelial keratoplasty graft. D, Retropupillary iris claw lens.

Surgical Technique

Superotemporal, superonasal, and inferotemporal sclerotomies were made for performing a 25-G vitrectomy. A posterior segment surgeon performed a pars plana vitrectomy.

A peritomy was then made superiorly, and a 5.5-mm tunnel incision was made at the surgical limbus. Vertical paracentesis at 3 and 9 o'clock was performed with a 15-degree blade. Through a 2.75-mm limbal incision, the surgeon used an inverted Sinskey hook to perform a Descemetorhexis. In all patients with previously implanted lenses in the anterior chamber, the incision was enlarged to facilitate the removal of the IOL.

A retropupillary Artisan lens for aphakia was inserted through the incision and positioned at 3 and 9 o'clock on the posterior side of the iris in a reverse position. By gentle forward elevation of the Artisan, the imprint of its haptic and the site of enclavation were made visible through the iris. Simultaneously, through the paracentesis and using an enclavation needle, the iris was enclavated into the IOL haptic. After fixation and centration of the lens, a peripheral iridectomy was performed.

An artificial chamber (Katena) was used for the dissection of the lenticule, and a Barron punch was used to obtain an 8.5-mm donor button.

The trephined donor corneal lenticule was folded in an asymmetric 60:40 configuration and inserted through the superior 5.5-mm incision into the anterior chamber. Air was used to appose the donor button to the patient stroma. The incision was closed with 10-0 nylon sutures.

Because the patients had been vitrectomized, 4 full thickness perpendicular peripheral incisions were made in the host cornea to reduce the risk of lenticule dislocation. After the removal of the 25-G ports, intraocular pressure and lenticule position were evaluated.

Each patient was observed for 30 minutes in the operating room, and an air-balanced salt solution exchange was performed.

The video can be found in Supplemental Digital Content 1 [see video, http://journals.lww.com/corneajrnl/pages/default.aspx (http://links.lww.com/ICO/A159)].

RESULTS

Of the 9 patients analyzed, 2 were males and 7 were females. Their average age was 72.1 years, and their ages ranged from 36 to 74 years. Eight patients were older than 70 years, and 1 patient was under 36 years old. This last female patient had microcornea and congenital cataracts. The Barron Punch that was used in this case was 6 mm in diameter. The detailed study results are shown in Supplemental Digital Content 1 (see Table 1, http://links.lww.com/ICO/A160).

The average follow-up was for 7.7 months. All the patients had an improved postsurgical BCVA of 0.60 logarithm of the minimum angle of resolution (LogMAR) compared with their presurgical BCVA. Two patients with the highest BCVA (both 0.09 LogMAR) had a longer follow-up (12 and 13 months). The 2 patients with the shortest follow-up period (4 months) had the lowest postsurgical BCVA (LogMAR of 0.58 and 0.60). Postoperatively, all patients had astigmatism >1.00 D. The average astigmatism was -1.7 D. In 7 patients, their astigmatism was against the rule, and in 2 patients, their astigmatism was oblique. The postsurgical refractive error is shown in detail in Supplemental Digital Content 2 (see Table 2, http://links.lww.com/ICO/A161).

The most frequent cause of aphakia with no capsular support was complications resulting from a prior cataract surgery (5 eyes). This resulted in endothelial decompensation, which occurred in 4 patients. Other causes of aphakia with no

capsular support included trauma and surgical lensectomy during childhood for congenital cataracts.

The presence of anterior chamber IOLs was associated with this endothelial decompensation in 4 other cases. There were 2 patients with Fuchs dystrophy who had developed irreversible corneal edema after cataract surgery.

The average endothelial cell count was 2585 cells per square millimeter at the first month and 2478 cells per square millimeter at the sixth month after the surgery. Endothelial cell loss was not significant between the first and sixth months postsurgery. However, data from the sixth month were not available for 2 patients who were only followed up to the fourth month.

No intraoperative complications occurred. Only 1 patient presented with a dislocation of the donor tissue, which occurred on the first postsurgical day. This patient was successfully rebubbled. During the follow-up period, no patients experienced any dislocation of the IOL, graft rejection, or graft failure. Additionally, no patients developed postsurgical ocular hypertension.

DISCUSSION

Ideally, the IOL should be placed where the crystalline lens was removed. When support for the lens in the capsular bag is not present, the surgeon must use alternative techniques.

One alternative technique is PK with the placement of an anterior chamber IOL.[4,5] Although this technique is simpler than are other surgical options, anterior chamber lens implantation is associated with an increased risk of endothelial loss, injury to angular structures causing the formation of synechiae, and secondary glaucoma, and chronic inflammation and cystoid macular edema. Posterior chamber lenses alleviate some of these risks.[5–7,17] The development of iris claw lenses has allowed for the placement of lenses in the anterior chamber without damaging the filtration angle, thereby reducing the number of complications. However, this approach does not prevent the endothelial loss that is caused by anterior chamber lenses and remains a problem, especially in patients who undergo keratoplasty.[8–10]

There have been several studies of PK combined with the implantation of an anterior chamber lens. In general, all show visual improvement and low rates of complications and graft rejection. However, the follow-up for these studies does not exceed 3 years.[4,5] Studies of PK with anterior chamber iris claw lenses reported fewer complications than that of angle support lenses.[4,11,12] Recent reports showed acceptable visual results; however, a significant endothelial loss in patients was observed when endothelial keratoplasty and anterior chamber iris claw lenses were used.[13]

The presence of an anterior chamber lens is associated with corneal edema.[14–16] In our study, 4 patients presented with corneal decompensation associated with the presence of an anterior chamber lens. Increasing evidence suggests that lenses should not be implanted in the anterior chamber if possible.

When capsular support does not exist, a lens can be implanted behind the iris by suturing it to the sclera or by interlocking the haptics to the iris. Patients with sutured scleral lenses are at a higher risk of developing intraoperative bleeding and infection because it is a more complex technique and requires a longer surgery. Additionally, over time, the fixation sutures may break or become exposed, and pose a risk for developing infection. Other complications associated with this technique are lens tilt, pupillary distortion, retinal detachment, and ciliary hemorrhage.[18,19] Several studies have shown that when this procedure is performed in conjunction with PK, the visual results are good and the complication rates are low, but the surgical technique is more complex and demanding.[20–23]

Alternatively, lenses can be sutured to the iris in the retropupillary plane, which offers adequate support for the lens and protection for the endothelium. In general, the procedure, when performed in association with PK, has demonstrated good visual results.[24,25] Although this alternative has a low complication rate, 1 study cited a 28% incidence of cystoid macular edema that was attributed to the irritation of the iris and the release of chronic inflammatory mediators.[25]

The alternative used in this study was lens fixation to the posterior iris. In the literature, this technique has been combined with a PK[4] or endothelial keratoplasty with variable results.[3] These lenses offer several advantages, particularly for patients who undergo a DSEK, including increased endothelial security. In addition, this type of lens implant does not alter the trabecular meshwork dynamic and is easier to implant with a shorter learning curve than are lenses sutured to the sclera or iris.

It is important to highlight the visual outcomes of our study and the fact that patients with a longer follow-up obtained the best visual acuity. In our study, endothelial cell loss was not significant, and the variation found between the first and sixth postoperative months is consistent with the variability observed with specular microscopy.

In our study, astigmatism >1 D occurred in all the patients. The mechanism of astigmatism induction is mixed (sclerolimbal incision and irregularity of the graft). The superior limbal incision may be the most significant factor because in 7 patients, astigmatism was against the rule, whereas in 2 patients, it was oblique. Additionally, astigmatism is common in DSEK because the regularity of the tissue is not always optimal. In the near future, the induction of astigmatism after an endothelial keratoplasty will be better controlled by improved endothelial injectors requiring smaller incisions; however, the iris claw lenses are rigid and require incisions of $\geq$5.5 mm. High visual acuity, high postoperative endothelial cell counts, and a low complication rate during the first year make this surgical technique effective for patients with aphakia, corneal edema, and the absence of capsular support.

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