Two-year Results After Deep Sclerectomy With Nonabsorbable Uveoscleral Implant (Esnoper-Clip): Surgical Area Analysis Using Anterior Segment Optical Coherence Tomography

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Purpose: To report 2-year results of deep sclerectomy (DS) with mitomycin C and the uveoscleral implant Esnoper-Clip (AJL Ophthalmics, Álava, Spain), a nonabsorbable hema implant, and the morphologic analysis of the surgical area with anterior segment optical coherence tomography (AS-OCT).

Materials and Methods: In total, 41 eyes of 41 patients with medically uncontrolled open angle glaucoma who underwent DS with the uveoscleral implant were included in this prospective interventional study. Patients were recruited and selected sequentially. All patients were followed at least for 12 months and 36 of them for 24 months. Absolute success was defined as intraocular pressure (IOP) ≤ 18 mm Hg and $\geq 20\%$ of IOP reduction without topical medication. Relative success was defined with the same criteria but with the addition of any antihypertensive medication. Primary outcomes were IOP decrease in the postoperative stage. Secondary outcomes were number of medication, best-corrected visual acuity changes, rate of goniopuncture, needle revision, and AS-OCT analysis of the bleb area. AS-OCT analysis, using Visante OCT, was performed at 1, 12, and 24 months.

Results: Absolute success rate was 68.3% at 12 months and 61.1% at 2 years. Relative success was 78.0% and 71.4%, at 12 and 24 months, respectively. A significant IOP decrease was observed, from 27.3 ± 6.3 to 14.9 ± 4.4 mm Hg at 12 months and 15.3 ± 5.2 mm Hg at 24 months ($P < 0.001$). There was also a significant reduction in the number of medications, dropping from a mean of 2.5 to 0.28 one year and 0.36 two years after the surgery ($P < 0.001$). Main postoperative complications were transient: 4 eyes with seidel phenomenon at 24 hours (10.3%), 3 hyphema (7.7%), and 1 choroidal detachment (2.6%). Mean intrascleral space height, measured by AS-OCT, was 0.78 mm and it showed a significant positive correlation with IOP at 12 months. Neodymium-doped yttrium aluminium garnet laser goniopuncture was performed in 25 eyes (61%) at 12 months and in 27 (66.8%) by 24 months.

Conclusions: DS with the uveoscleral implant is a safe and effective procedure to lower IOP in open angle glaucoma patients. IOP reduction is maintained over 2 years and is correlated to the postoperative height of the intrascleral bleb. Supraciliary implantation reduces intrascleral lake dependency, being a simultaneous drainage alternative to the subconjunctival pathway.

Key Words: ophthalmology, glaucoma, deep sclerectomy, uveoscleral implant, nonpenetrating glaucoma surgery, anterior segment optical coherence tomography, AS-OCT

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Open angle glaucoma (OAG) is a progressive optic neuropathy that leads to blindness in its final stage. Lowering intraocular pressure (IOP) is the only proven intervention to arrest the disease progression.[1] A surgical approach is indicated when medical or laser therapy is unable to sufficiently decrease the rate of visual field loss in these patients. Trabeculectomy is the most commonly performed surgical procedure although deep sclerectomy (DS) is a safe and effective option.[2–14] The use of spacer implants, to avoid future collapse of the intrascleral space, may improve the long-term success of DS.[2,6–9] Some authors have reported better outcomes placing these devices in the intrascleral space[8,11] and some others in the supraciliary[13,14] space. Other authors, though, could not find any benefit after using these devices.[8,12]

Esnoper-Clip (AJL Ophthalmics. Álava, Spain) (EC) is a nonabsorbable foldable hema (2-hydroxyethyl methacrylate) uveoscleral implant developed by our group at the Glaucoma Unit of the Hospital Universitari Germans Trias i Pujol (Universitat Autònoma de Barcelona. Barcelona, Spain). AJL Ophthalmic (Alava, Spain) supports the Institute for Health Science Research Germans Trias i Pujol (IGTP). It has been designed with 2 footplates (Fig. 1): one placed in the intrascleral space and the other in the supraciliary space. The shape of the device has been designed to maintain the patency of both spaces and the aqueous humor outflow in the long postoperative period. We have previously published the first-year results after DS with EC.[15] In this study we report the 2-year results of this technique and the morphologic evaluation of the bleb area using anterior segment optical coherence tomography (AS-OCT).[15–30]

MATERIALS AND METHODS

Patients with OAG, with uncontrolled IOP after standardized maximum antihypertensive medications were prospectively enrolled in this study. Patients were selected sequentially. Exclusion criteria were any previous glaucoma surgery, cataract surgery in the previous 6 months before inclusion, moderate or severe diabetic retinopathy, any

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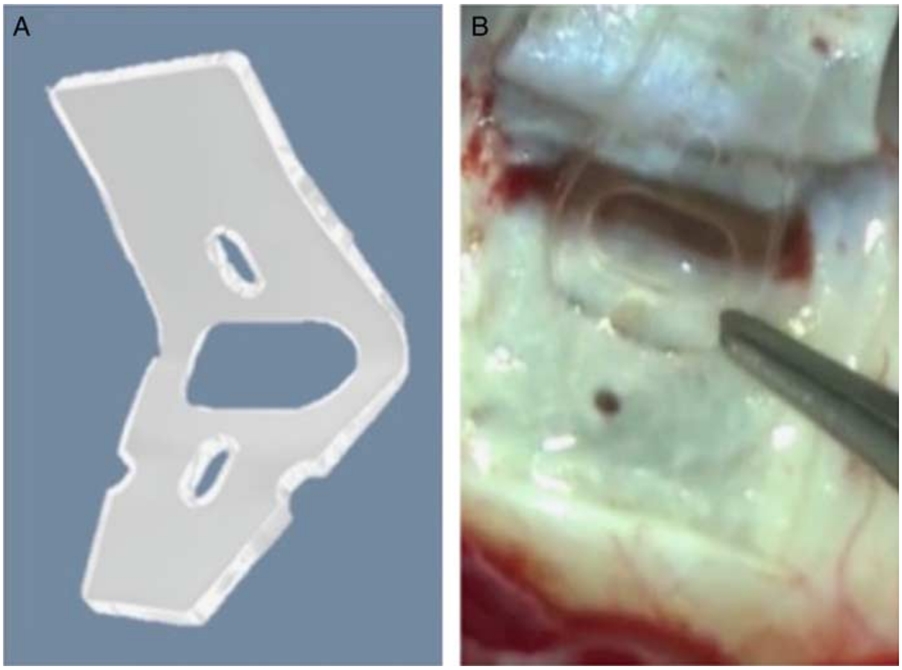

FIGURE 1. A, Esnoper-Clip uveoscleral implant. B, One plate is placed in the supraciliary space and the other in the intrascleral space, without folding. The plate with 2 notches (small one) is placed in the supraciliary space. Figure 1 can be viewed in color online at www.glaucomajournal.com.

cause of ocular neovascularization, juvenile glaucoma, aphakia, ocular inflammation, and traumatic glaucoma.

The study adhered to the tenets of the Declaration of Helsinki and was approved by the Institutional Review Board and Ethics Committee of the Hospital Universitari Germans Trias i Pujol. Informed consent form was discussed and signed by all the patients. This study is part of a doctoral thesis in the Department of Surgery of Universitat Autònoma de Barcelona.

Ophthalmologic Examinations

All patients underwent DS with the nonabsorbable uveoscleral implant using the technique previously described by our group.[15] All surgeries were performed by the same surgeon (J.L.-A.). Mitomycin C (MMC) was used in a 0.2 mg/mL concentration for 2 minutes after superficial flap dissection. Postoperative treatment consisted of topical ofloxacin (Exocin; Alcon Cusí SA, El Masnou, Barcelona, Spain) 4 times a day for 1 week and prednisolone acetate (10 mg/mL) (Predforte; Allergan Pharmaceuticals Ireland, Westport, Ireland) 6 times a day, tapered over 6 weeks. Bleb needle revision with MMC (0.2 mg/mL) was performed when subconjunctival scaring was observed by the investigator and goniopuncture (GP) with YAG laser (Visulas YAG III Combi; Carl Zeiss Meditec, Jena, Germany) was performed when aqueous humor outflow through the trabeculodescemetic membrane was considered insufficient and target IOP was not reached.

Best-corrected visual acuity (BCVA) on a decimal scale, pachymetry (UP-1000; Nidek, Gamagori, Japan), Goldmann tonometry, gonioscopy, fundus examination, and topical medication were recorded in all visits. Visits were scheduled 24 hours, 1, 3, 6, 12, and 24 months after the surgery and data were obtained at all these time frames. Postoperative IOP is shown as a total and percentual decrease. Primary outcomes were IOP decrease in the postoperative stage. Absolute success was defined as IOP $\leq$ 18 mm Hg and $\geq$ 20% of IOP reduction without topical medication. Relative success was defined with the same criteria of an absolute success but with the addition of any antihypertensive medication and its results are also shown. Secondary outcomes were number of medication, BCVA changes, rate of GP, needle revision, and AS-OCT analysis of the bleb area. GP and bleb needle revision were not considered as postoperative failure.

Postoperative Morphologic Bleb Examination

AS-OCT (Visante, Carl Zeiss Meditec) was used to analyze the surgical area and subconjunctival blebs, 1, 12, and 24 months after the intervention. Patients were asked to look downwards and the upper eyelid was retracted to expose the superior bulbar conjunctiva. Between 1 to 3 scans were performed and the highest intrascleral bleb height was selected and measured with the calliper provided by the proprietary software. All scans were analyzed by the same ophthalmologist (P.R.-R.) in a blind manner.

Conjunctival blebs were classified as diffuse, cystic, flat, or encapsulated (Fig. 2) according to the classification described by Leung et al.[19] Conjunctival blebs were also divided into uniform or multiform, when multiple layers or areas of hyporeflectivity were observed. Furthermore, the presence of microcysts (small hyporeflective areas in the subconjunctival space), subconjunctival or suprascleral hyper or hyporeflectivity (compared with normal sclera), and the visualization of the supraciliary space (a thin hyporeflective line between the choroid and the sclera) were registered (Fig. 3). Aqueous humor circulation through the scleral flap reaching the subconjunctival space, defined as transcleral outflow, was also recorded.

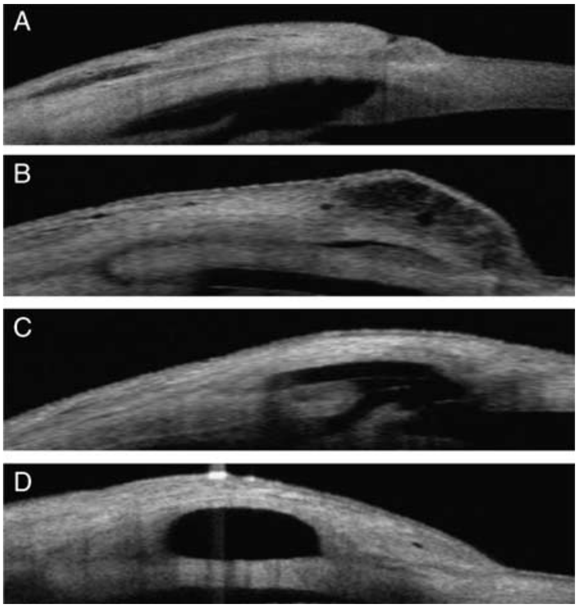

FIGURE 2. Examples of bleb patterns found in our patients: diffuse (A), cystic (B), flat (C), encapsulated (D).

Statistical Analysis

Statistical analysis was performed using SPSS software (version 21.0; SPSS Inc., Chicago, IL). All data were reported as means with SD. Saphiro-Wilk test was used to test the normality of continues variables. The differences in continuous variables (change in IOP) were analyzed with analysis of variance test and the nonparametric Friedman test. The probability of complete success was analyzed by Kaplan-Meier survival curves. The Pearson correlation was used to assess the relationship between IOP and intrascleral space height. The Mann-Whitney *U* and Kruskal-Wallis test were used to compare categorical AS-OCT findings and IOP. Probability values <0.05 were considered to be statistically significant.

RESULTS

In total, 41 eyes of 41 patients were included in this study. All patients were followed for at least 12 months and 36 of them (87.8%) for 2 years. Demographic data are shown in Table 1. Sixteen surgeries (39%) were combined with phacoemulsification. No surgical complications were observed in any procedure.

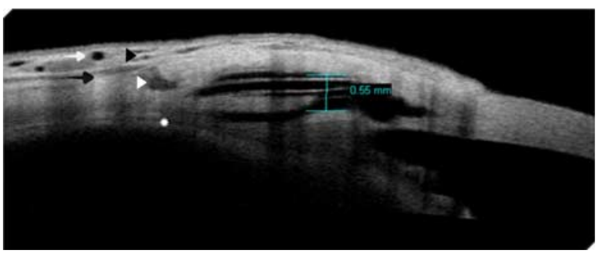

FIGURE 3. Bleb height (mm). Microcysts (white arrow) are seen and low subconjunctival and suprascleral intensity (black arrowhead and black arrow, respectively) with a multiform bleb pattern. Also, it is possible to identify the 2 plates of the implant, a longer one superiorly in the intrascleral space and the lower and shorter that is introduced in the supraciliary area, and a transcleral outflow (with arrowhead) and suprachoroidal flow (white dot). Figure 3 can be viewed in color online at www.glaucomajournal.com.

BCVA changed after DS from 0.72 to 0.74 (decimal Snellen chart) at 12 months ($P=0.64$) and 0.72 at 24 months ($P=0.97$). When cataract surgery was combined with DS, BCVA changed from 0.53 to 0.75 at 12 months ($P=0.034$) and 0.64 at 24 months ($P=0.37$). Main postoperative complications were: Seidel phenomenon at 24 hours in 4 eyes (10.3%), hyphema in 3 eyes (7.7%), and choroidal detachment in 1 eye (2.6%). All complications had a successful resolution.

IOP was significantly reduced after surgery compared with baseline in all assessments ($P<0.0001$). Mean IOP dropped from 27.3 ± 6.3 to 7.8 ± 7.2 mm Hg at 24 hours, 14.5 ± 6.6 mm Hg at 1 month, 14.3 ± 4.4 mm Hg at 3 months, 15.8 ± 4.0 mm Hg at 6 months, 14.9 ± 4.4 mm Hg at 12 months, and 15.3 ± 5.2 mm Hg at 24 months. We did not find significant differences in IOP outcomes or in the number of postoperative medications when we compared simple DS procedures with combined DS with phacoemulsification in any of the time frames during the 2-year follow-up, except for the immediate postoperative assessment at 24 hours, that could be explained by retained viscoelastic or different postoperative inflammation rates ($P=0.004$, Mann-Whitney *U*). The number of antihypertensive topical medications varied from 2.54 ± 0.78 to 0.03 ± 0.16 at 6 months, 0.28 ± 0.68 at 12 months and 0.36 ± 0.76 at 24 months ($P<0.0001$ in all visits). Percentage of patients using medication was 17.1% at 12 months and 22.2% at 24 months (Table 2 and Fig. 4).

Absolute success rate was 68.3% at 12 months and 61.1% at 2 years (Fig. 5). Relative success was 78% and 71.4%, at 12 and 24 months, respectively. Neodymium-doped yttrium aluminium garnet laser GP was performed in 25 eyes (61%) at 12 months and in 27 (66.8%) by 24 months. Needle revision rate was 22.5% and 27.7%, at 12 and 24 months, respectively.

AS-OCT Morphology Analysis

AS-OCT was performed at 1, 12, and 24 months. Intrascleral space was detected in all patients. Mean intrascleral height was 0.77 ± 0.19 mm at 1 month, 0.78 ± 0.22 mm at 12 months, and 0.78 ± 0.22 mm at 24 months ($P=0.68$). We found a statistically significant positive correlation between IOP and intrascleral height at 1 month and 12 months ($r=+0.496$; $P=0.006$ and $r=+0.410$; $P=0.026$, respectively), but not at 24 months ($r=+0.08$; $P=0.72$) showing that higher IOP was associated with higher intrascleral space in our group of patients.

Supraciliary space was observed in 16 (53%), 20 (64%), and 9 (37%) eyes at 1, 12, and 24 months, respectively. Transcleral outflow was seen in 21 (70%), 18 (58%), and 7 (29%) eyes at the same timepoints, respectively. Table 3 shows other bleb area parameters compared with mean postoperative IOP at 1, 12, and 24 months. Table 4 shows the statistically significant results comparing bleb analysis parameters reported at 1, 12, and 24 months with IOP at 1, 12, and 24 months, respectively.

DISCUSSION

DS with the uveoscleral implant (EC) is a safe and effective therapeutical option for the management of OAG. In our study, this surgical technique resulted in a 40% decrease in IOP, sustained over 2 years, and a 61.1% absolute

TABLE 1. Patient Demographics

No. eyes	41
Mean age (years ± SD)	71 ± 7.6
Sex (male/female)	22/19
Race: white	100%
Type of glaucoma (no. eyes)	
Primary open angle glaucoma	32
Pigmentary dispersion glaucoma	1
Pseudoexfoliation glaucoma	5
Myopic glaucoma	1
Corticoid-related glaucoma	1
Normal tension glaucoma	1
Lens status (no. eyes)	
Phakic	31
Pseudophakic	10
Surgery (no. eyes)	
DS	25
DS+phacoemulsification	16
Preoperative IOP (mean ± SD) (mm Hg)	27.3 ± 6.3
Preoperative medications (mean ± SD)	2.5 ± 0.8
Preoperative VA (Snellen, mean ± SD)	0.65 ± 0.23
VA 12 mo after DS (mean ± SD)	0.75 ± 0.26
Pachymetry (mean ± SD) (μm)	533 ± 35

DS indicates deep sclerectomy; IOP, intraocular pressure; VA, visual acuity.

success at 24 months. Our results are in concordance to previous publications on DS.[2–14,31] Mermoud et al[2] and Shaarawy et al[8] had an absolute success rate, at 24 months using a collagen implant, of 69% and 63.4%, respectively, but they defined success as IOP < 21 mm Hg. Anand[4] reported a 75.9% success rate at 24 months with the same threshold and with hyaluronic acid implant (SKGEL, Corneal Inc., France) and MMC. The number of postoperative medications to lower IOP in our study was quite low, being 0.28 and 0.36 at 12 and 24 months, respectively, compared with other authors.[6–8,11,14,31] Our GP rate (61%) is similar to reported in other publications,[4,6,8–11,14] between 41% to 71%. But we do not consider GP as a surgical failure as we perform it routinely when target IOP is not satisfactory in any of the postoperative visits.

From the eyes classified as failure, 30% of them were so within the first month after DS. We attribute this to a superficial dissection during surgery and poor filtration through the trabeculodescemetic membrane or to an early subconjunctival scarring process after the surgical intervention. Consistently, eyes that had a uniform bleb pattern in AS-OCT 1 month after the DS (no multiple layers visible in conjunctival bleb analysis) had a significantly higher IOP at 24 months.

TABLE 2. IOP Variation During the Preoperative and Postoperative Stage in Deep Sclerectomy With the Uveoscleral Implant

	IOP (mm Hg)	% Reduction	Meds	*P*
Preoperative	27.3 ± 6.3		2.54 ± 0.78	
24 h	7.8 ± 7.2	70 ± 28	0.00	< 0.0001
1 mo	14.5 ± 6.6	44 ± 26	0.00	< 0.0001
3 mo	14.3 ± 4.4	45 ± 20	0.00	< 0.0001
6 mo	15.8 ± 4	39 ± 21	0.03 ± 0.16	< 0.0001
12 mo	14.9 ± 4.4	42 ± 20	0.28 ± 0.68	< 0.0001
24 mo	15.3 ± 5.2	40.2 ± 24	0.33 ± 0.73	< 0.0001

Results in mean ± SD.
IOP indicates intraocular pressure; meds, number of medications.

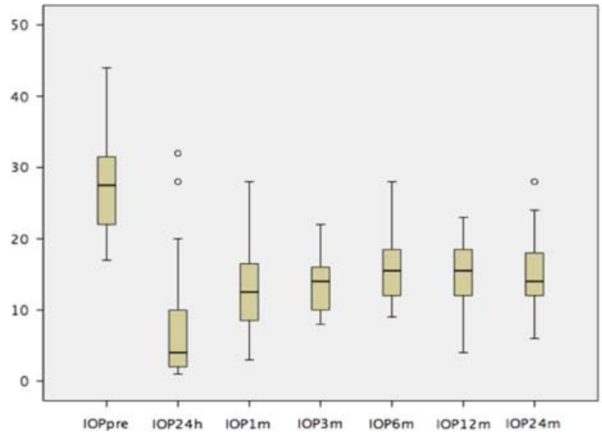

FIGURE 4. IOP variation during the preoperative and postoperative deep sclerectomy with uveoscleral implant. IOP indicates intraocular pressure; pre, preoperative stage. Figure 4 can be viewed in color online at www.glaucomajournal.com.

Morphologic Analysis of the Surgical Area

AS-OCT analysis of surgical area has been described in previous reports,[12,16–30] either in trabeculectomy and DS. Vieira et al[18] published a morphologic analysis of 5 cases of DS with EC without describing changes in the morphology of the surgical area over time. Our study is the first report doing a systematic and sequential bleb analysis with AS-OCT in DS with EC.

We observed intrascleral space in 100% of patients. Previous reports found it in 22% to 100% of cases, with no implant useage.[12,26,29] These huge differences between studies could be explained by the criteria used for the detection of the intrascleral space, considering a positive finding either true spaces or mild hyporeflective areas. In all

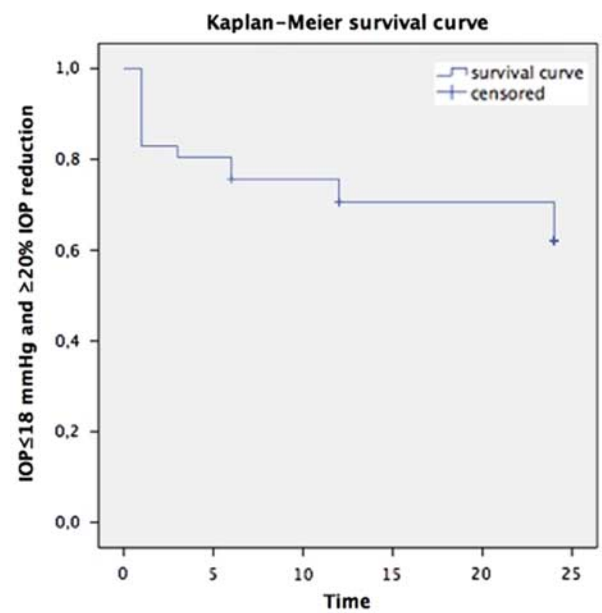

FIGURE 5. Kaplan-Meier survival curve of absolute success (IOP ≤ 18 mm Hg and ≥ 20% IOP reduction). IOP indicates intraocular pressure. Figure 5 can be viewed in color online at www.glaucomajournal.com.

TABLE 3. AS-OCT Analysis of Categorical Variables in Bleb Morphology and IOP 1, 12, and 24 Months After Deep Sclerectomy With Uveoscleral Implant

IOP Factor	1 mo (n = 30)	12 mo (n = 31)	24 mo (n = 24)
Transcleral flow			
Seen	14.5 ± 4.6 (n = 21)	15.4 ± 4.5 (n = 18)	15.7 ± 5.9 (n = 7)
Not seen	15.3 ± 4.6 (n = 9)	15.82 ± 4 (n = 13)	16.5 ± 5.2 (n = 17)
	(P = 0.482)	(P = 0.97)	(P = 0.85)
Supraciliary space			
Seen	14.6 ± 6.2 (n = 16)	15.6 ± 4.1 (n = 20)	16 ± 5.7 (n = 9)
Not seen	15.0 ± 7.4 (n = 14)	15.4 ± 4.7 (n = 11)	16.4 ± 5.3 (n = 15)
	(P = 0.73)	(P = 0.93)	(P = 0.86)
Microcysts			
Seen	13.4 ± 4.7 (n = 24)	14.8 ± 4.4 (n = 7)	8.7 ± 3.1 (n = 3)
Not seen	20 ± 10.2 (n = 6)	15.7 ± 4.3 (n = 24)	17.3 ± 4.6 (n = 21)
	(P = 0.532)	(P = 0.69)	(P = 0.008)
Subconjunctival space			
Low intensity	13.1 ± 4.5 (n = 19)	14.1 ± 5.7 (n = 10)	12.3 ± 5.6 (n = 6)
Medium intensity	17.5 ± 7.3 (n = 8)	17.1 ± 3.3 (n = 11)	17 ± 4.1 (n = 7)
High intensity	17.3 ± 12.9 (n = 3)	15.25 ± 2.9 (n = 10)	18 ± 5.1(n = 11)
	(P = 0.68)	(P = 0.75)	(P = 0.08)
Suprascleral space			
Low intensity	11.6 ± 4 (n = 9)	14.5 ± 6 (n = 8)	14 ± 6.5 (n = 4)
Medium intensity	14.3 ± 4.1 (n = 16)	14.8 ± 3.7 (n = 9)	16 ± 3.7 (n = 9)
High intensity	20.2 ± 11.1 (n = 5)	16.7 ± 3.6 (n = 14)	17.2 ± 6 (n = 11)
	(P = 0.52)	(P = 0.844)	(P = 0.66)
Uniformity			
Not uniform	13.6 ± 4.7 (n = 27)	13.3 ± 4.6 (n = 8)	13.3 ± 5.1 (n = 9)
Uniform	22.7 ± 12.9 (n = 3)	16.4 ± 3.9 (n = 23)	18.1 ± 4.7 (n = 15)
	(P = 0.24)	(P = 0.44)	(P = 0.024)
Bleb morphology			
Flat	20 ± 12 (n = 3)	16.4 ± 3.3 (n = 18)	18.1 ± 4.7 (n = 15)
Diffuse	14.9 ± 6.3 (n = 20)	14.3 ± 5.6 (n = 11)	13.7 ± 5.8 (n = 7)
Cystic	11.5 ± 2.4 (n = 5)	14 ± 2.8 (n = 2)	12 (n = 1)
Encapsulated	12.5 ± 0.7 (n = 2)	(n = 0)	12 (n = 1)
	(P = 0.52)	(P = 0.63)	(P = 0.12)

Results are expressed in mean ± SD.
Statistical analysis Mann-Whitney *U* test or Kruskal-Wallis test.
AS-OCT indicates anterior segment optical coherence tomography; IOP, intraocular pressure.

of our patients, intrascleral height was large enough to contain the implant. Although we found a positive correlation between IOP and intrascleral bleb height, other authors found an inverse correlation.[12,16,25,26] Mavrakanas et al[25] found an inverse correlation in eyes with DS and clinically absent subconjunctival blebs at 8 ± 5 months after the surgery. This apparent contradiction may be due to the size of the uveoscleral implant and to the supraciliary implantation of our device. We found a mean intrascleral height of 0.78 ± 0.22 mm, whereas Mavrakanas et al[25] found a 0.58 ± 0.16 mm with an absorbable porcine device (AquaFlow), Konstantopoulos et al[26] 0.44 ± 0.16 mm and Gutiérrez-Ortiz et al[29] 0.33 ± 0.16 mm, both without using any device. The EC implant footplate is placed in the supraciliary space and it is possible that a significant part of the outflow drains through this route rather than the classic subconjunctival pathway. This would reverse the correlation between IOP and intrascleral bleb height. Theoretically, the presence of both a transcleral (subconjunctival) and a suprachoroidal flow would make this space flatter, whereas when the scleral flap is completely sealed, the intrascleral space will increase due to a direct pressure effect (Fig. 6). Fakhraie et al,[23] in trabeculectomy, found a positive correlation between the bleb height and IOP, and also justified it as a "pushing effect of IOP through the surgical area."

TABLE 4. Statistically Significant Results Comparing Bleb Analysis Parameters Exposed in Table 3 With IOP at 1, 12, and 24 Months

Factor	IOP (24 mo)	P
Uniformity 1 mo		
Not uniform	14.7 ± 4.3	0.038*
Uniform	20.7 ± 4.2	
Uniformity 24 mo		
Not uniform	13.3 ± 5.1	0.024*
Uniform	18.1 ± 4.7	
Microcysts 12 mo		
Seen	11.6 ± 3.3	0.029*
Not seen	16.7 ± 4.5	
Microcysts 24 mo		
Seen	8.7 ± 3.1	0.008*
Not seen	16.6 ± 3.9	

Results are expressed in mean ± SD.
*Statistical analysis Mann-Whitney *U* test.
IOP indicates intraocular pressure (mm Hg).

We observed a transcleral outflow in 58% eyes at 12 months and 29% eyes at 24 months, with no correlation with better IOP control. Konstantopoulos et al[26] found it in 55% of eyes, also with no correlation with IOP. Supraciliary space was seen in 64% of eyes at 12 months and 37% eyes at 24 months. The same author did not detect it in any case whereas other authors[12,29] found it in nearly 80% of cases, in DS or phaco-DS. There is an extreme variability in this

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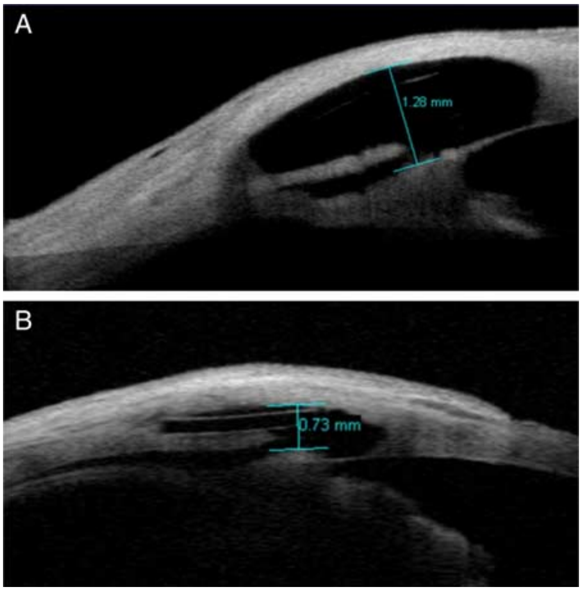

FIGURE 6. Intrascleral bleb height is not related with IOP control 12 months after surgery. A, Uveoscleral outflow decreases intrascleral height dependence (IOP 10 mm Hg). B, Bleb height is not related with IOP control (IOP 18 mm Hg). IOP indicates intraocular pressure. Figure 6 can be viewed in color online at www.glaucomajournal.com.

finding, and it could be explained either due to technique variations or low detection of the supraciliary space with Visante in some cases, for example, in patients with thick bleb walls and elevated blebs, as signal is attenuated before getting into that depth. We believe that ultrasound biomicroscopy could be more useful to detect this space in these situations.

In the conjunctival bleb analysis, eyes with multiform blebs had significantly lower IOP than those with uniform bleb walls. In addition, visualization of microcystic areas correlated with a significantly lower IOP at 24 months. Our findings are in agreement with other reports, which attempted to correlate early postoperative morphologic features of the conjunctival bleb after trabeculectomy with IOP, measured with AS-OCT.[23,30]

In summary, we report favorable outcomes 2 years after DS and EC implantation with maintenance of supraciliary and intrascleral spaces (the second in 100% of cases) avoiding scleral collapse. We observed that a higher intrascleral lake height was not related with IOP control, because supraciliar implantation reduces intrascleral lake dependency. The limitations of this study include not having a control group, decreased number of patients with good quality AS-OCT scans over time, which could have an effect in the results. Other studies comparing different type of implants are necessary to give more information about the benefit of supraciliary implantation in glaucoma surgery.

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