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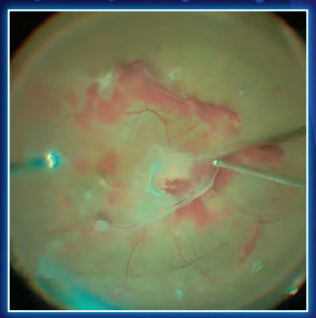
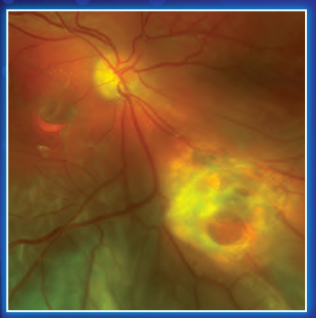
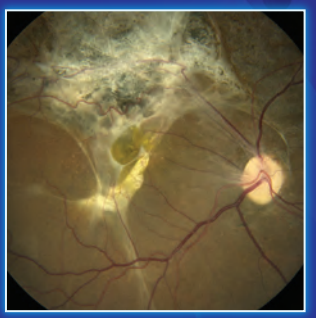
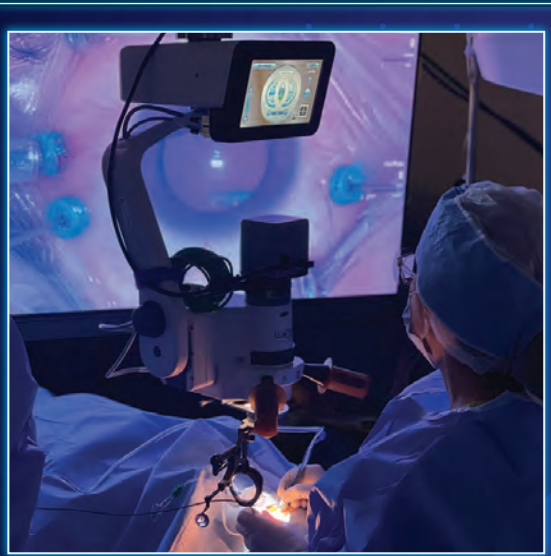
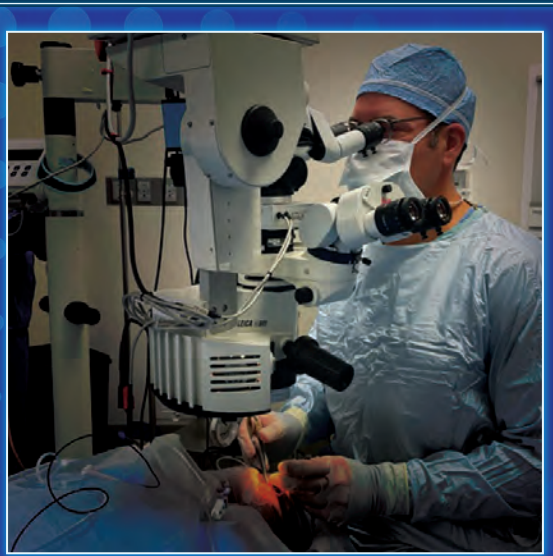
eyetube

THE SURGICAL ISSUE

The latest approaches to retinal detachments, macular holes, and more

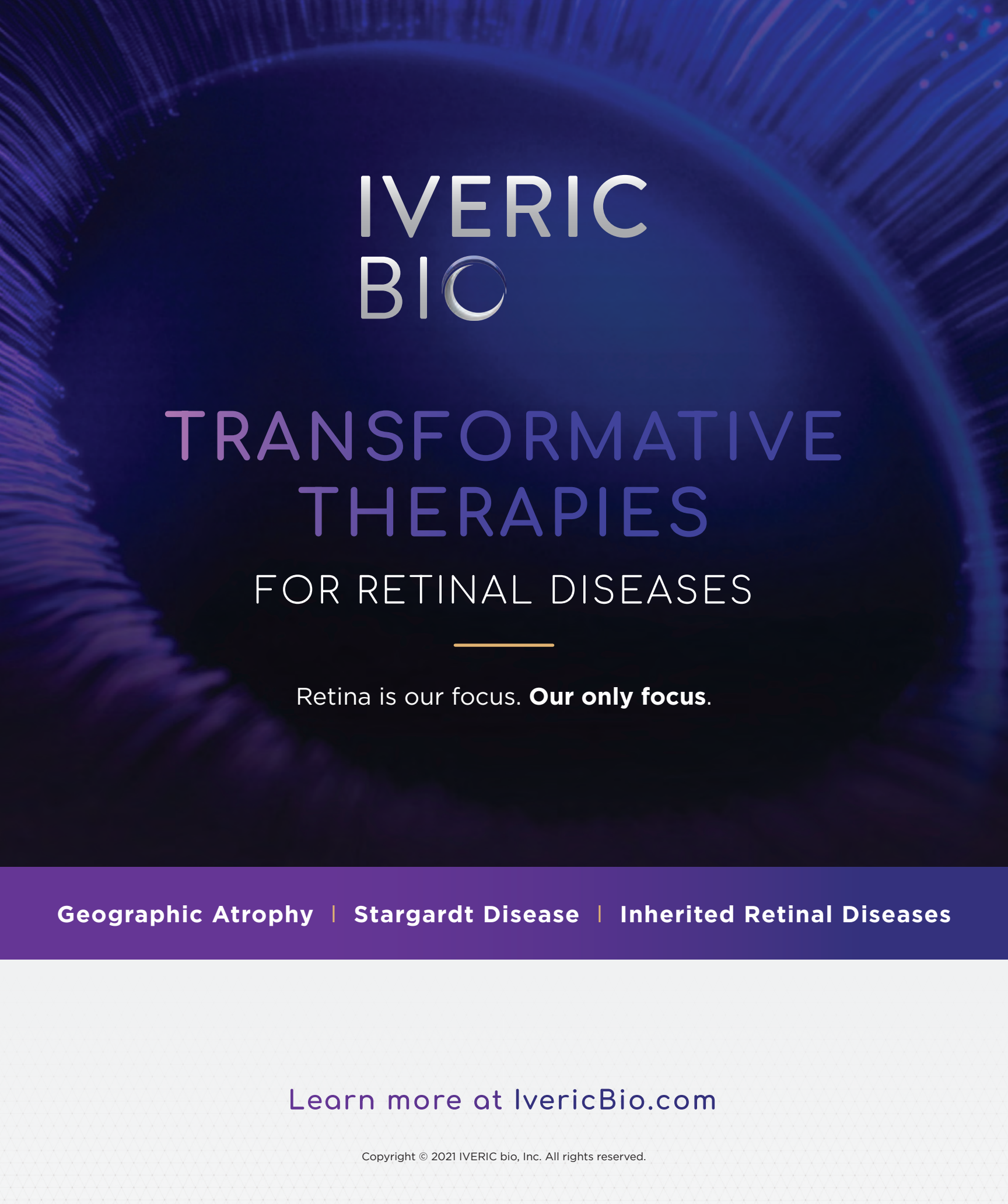


THREE WAYS TO TACKLE TOUGH MACULAR HOLES

RETINAL DETACHMENT SURGERY IN THE AGING EYE

TIPS FOR AUTOLOGOUS RETINAL TRANSPLANTATION



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BREAKS, TEARS, AND HOLES, OH MY!


This year's Euretina 2021 Virtual Conference included a wealth of clinical topics, with a special focus on innovations such as artificial intelligence and pipeline therapies. One session of particular interest for this surgical issue was the Gisbert Richard Keynote Lecture. Heinrich Heimann, MD, FRCOphth, discussed visual acuity outcomes after retinal detachment (RD) repair, and he gave us a lot to think about.

Compared with the founding fathers of modern vitreoretinal surgery from the 1960s, he said, "We are better at treating complicated retinal detachments, and we are better at saving eyes. But if you look critically, one has to say, to be honest, there's not much of an improvement in the success rates, in the primary success rates of the anatomical outcomes as well as in the visual function."

Boy, did that get our attention. Citing *Michels Retinal Detachment*, "the bible for any vitreoretinal surgeon doing this type of surgery," Dr. Heimann noted that the percentage of patients with a postoperative VA of logMAR 0.4 or better used to be 50% to 56%. Now, however, recent research by Edward Ryan, MD, and David Yorston, FRCS, FRCOphth, show that those rates haven't changed much, he said. "We still have about one-third of all patients that we treat with successful surgery that will not be able to read with that eye."

Dr. Heimann went on to provide some baby steps that could improve the results for RD patients, the most applicable for this issue being improved surgical techniques. "We have to go back to the surgery," he said.

So that's what we are doing. In this issue, we have a slate of articles designed to help you improve your surgical techniques for challenging RDs and macular holes—those that are recurrent, chronic, traumatic, complicated. After all, these are our "bread and butter surgeries," according to Dr. Heimann, and it's what we do best.

Several of your colleagues share tips for operating on patients in their 80s, who are more likely to present with macula-off RDs and worse visual acuity. Surgery is effective in improving visual function in these patients, according to Louis Z. Cai, MD, Samir N. Patel, MD, and Yoshihiro Yonekawa, MD, but outcomes may not be as favorable as they are in younger patients.

Yewlin E. Chee, MD, presents two very different patient scenarios to help you navigate the plethora of decisions that must be made on a case-by-case basis when faced with traumatic RDs.

The lift-and-shave technique for tractional RDs, combined with small-gauge vitrectomy—as discussed here by María H. Berrocal, MD, and Luis Acabá-Berrocal, MD—can streamline the removal of fibrovascular tissue and traction while reducing the need for ancillary instrumentation.

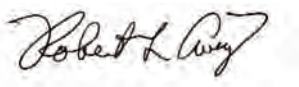
For large, chronic, or atypical macular holes, a squad of top-tier surgeons offers four different approaches: autologous retinal transplantation, macular massage, the use of human amniotic membrane, and the rug technique. If these aren't yet in your wheelhouse, give them a try and see if they help to improve your macular hole closure rates.

Lastly, new sustained-release steroid implants may help you to quell vision-threatening postoperative cystoid macular edema, according to David Eichenbaum, MD.

No matter what type of patient comes to your OR tomorrow, one or more of these techniques and therapeutics might come in handy.

Surgery in the back of the eye can be elegant to perform, but it can also be exceedingly challenging. Hopefully, the surgical approaches described in this issue will arm you with the tools you need to tackle even the toughest cases—and improve upon those static success rate statistics. ■

ALLEN C. HO, MD
CHIEF MEDICAL EDITOR



ROBERT L. AVERY, MD
ASSOCIATE MEDICAL EDITOR

ON THE COVER:

Clinical Images

Top left: Retinal detachment repair with the lift-and-shave technique. More on page 24.
Top middle: A proliferative vitreoretinopathy detachment with a dislodged autologous retinal transplant only partially closing the macular hole. More on page 26.
Top right: A patient with extensive scarring of the posterior pole with preretinal and subretinal membranes, consistent with a sclopetaria injury. More on page 20.

Surgeons in Action

Bottom left: María H. Berrocal, MD
Bottom middle (top): Ravi Pandit, MD, MPH (left), and Yoshihiro Yonekawa, MD, (right) *Photo courtesy of Roger Barone*
Bottom middle (bottom): M. Ali Khan, MD *Photo courtesy of Roger Barone*
Bottom right: David Eichenbaum, MD

0.18 mg
YUTIQ®
(fluocinolone acetonide intravitreal implant) 0.18 mg

Discover continuous calm in uveitis[1]

YUTIQ is designed to deliver a sustained release of fluocinolone for up to 36 months for patients with chronic non-infectious uveitis affecting the posterior segment of the eye[1]

- Proven to reduce uveitis recurrence at 6 and 12 months[1]*
  At 6 months–18% for YUTIQ and 79% for sham for Study 1 and 22% for YUTIQ and 54% for sham for Study 2 (*P*<.01). At 12 months–28% for YUTIQ and 86% for sham for Study 1 and 33% for YUTIQ and 60% for sham for Study 2.
- Extended median time to first recurrence of uveitis[1,2]
  At 12 months–NE† for YUTIQ/92 days for sham in Study 1; NE for YUTIQ/187 days for sham in Study 2.
- Mean intraocular pressure (IOP) increase was comparable to sham[1,2]
  Study was not sized to detect statistically significant differences in mean IOP.

For more information, visit **YUTIQ.com**

*Study design: The efficacy of YUTIQ was assessed in 2 randomized, multicenter, sham-controlled, double-masked, Phase 3 studies in adult patients (N=282) with non-infectious uveitis affecting the posterior segment of the eye. The primary endpoint in both studies was the proportion of patients who experienced recurrence of uveitis in the study eye within 6 months of follow-up; recurrence was also assessed at 12 months. Recurrence was defined as either deterioration in visual acuity, vitreous haze attributable to non-infectious uveitis, or the need for rescue medications.

†NE=non-evaluable due to the low number of recurrences in the YUTIQ group.

INDICATIONS AND USAGE

YUTIQ® (fluocinolone acetonide intravitreal implant) 0.18 mg is indicated for the treatment of chronic non-infectious uveitis affecting the posterior segment of the eye.

IMPORTANT SAFETY INFORMATION

CONTRAINDICATIONS

Ocular or Periocular Infections: YUTIQ is contraindicated in patients with active or suspected ocular or periocular infections including most viral disease of the cornea and conjunctiva including active epithelial herpes simplex keratitis (dendritic keratitis), vaccinia, varicella, mycobacterial infections and fungal diseases.

Hypersensitivity: YUTIQ is contraindicated in patients with known hypersensitivity to any components of this product.

WARNINGS AND PRECAUTIONS

Intravitreal Injection-related Effects: Intravitreal injections, including those with YUTIQ, have been associated with endophthalmitis, eye inflammation, increased or decreased intraocular pressure, and choroidal or retinal detachments. Hypotony has been observed within 24 hours of injection and has resolved within 2 weeks. Patients should be monitored following the intravitreal injection.

Steroid-related Effects: Use of corticosteroids including YUTIQ may produce posterior subcapsular cataracts, increased intraocular pressure and glaucoma. Use of corticosteroids may enhance the establishment of secondary ocular infections due to bacteria, fungi, or viruses. Corticosteroids are not recommended to be used in patients with a history of ocular herpes simplex because of the potential for reactivation of the viral infection.

Risk of Implant Migration: Patients in whom the posterior capsule of the lens is absent or has a tear are at risk of implant migration into the anterior chamber.

ADVERSE REACTIONS

In controlled studies, the most common adverse reactions reported were cataract development and increases in intraocular pressure.

Please see brief summary of full Prescribing Information on adjacent page.

References: 1. YUTIQ® (fluocinolone acetonide intravitreal implant) 0.18 mg full US Prescribing Information. EyePoint Pharmaceuticals, Inc. May 2021. **2.** Data on file.

EyePoint® Pharmaceuticals

480 Pleasant Street, Suite B300, Watertown, MA 02472
08/2021
US-YUT-2100061

YUTIQ® (fluocinolone acetonide intravitreal implant) 0.18 mg, for intravitreal injection
Initial U.S. Approval: 1963

BRIEF SUMMARY: Please see package insert for full prescribing information.

1. INDICATIONS AND USAGE. YUTIQ® (fluocinolone acetonide intravitreal implant) 0.18 mg is indicated for the treatment of chronic non-infectious uveitis affecting the posterior segment of the eye.

4. CONTRAINDICATIONS. 4.1. Ocular or Periocular Infections. YUTIQ is contraindicated in patients with active or suspected ocular or periocular infections including most viral disease of the cornea and conjunctiva including active epithelial herpes simplex keratitis (dendritic keratitis), vaccinia, varicella, mycobacterial infections and fungal diseases. **4.2. Hypersensitivity.** YUTIQ is contraindicated in patients with known hypersensitivity to any components of this product.

5. WARNINGS AND PRECAUTIONS. 5.1. Intravitreal Injection-related Effects. Intravitreal injections, including those with YUTIQ, have been associated with endophthalmitis, eye inflammation, increased or decreased intraocular pressure, and choroidal or retinal detachments. Hypotony has been observed within 24 hours of injection and has resolved within 2 weeks. Patients should be monitored following the intravitreal injection *[see Patient Counseling Information (17) in the full prescribing information]*. **5.2. Steroid-related Effects.** Use of corticosteroids including YUTIQ may produce posterior subcapsular cataracts, increased intraocular pressure and glaucoma. Use of corticosteroids may enhance the establishment of secondary ocular infections due to bacteria, fungi, or viruses. Corticosteroids are not recommended to be used in patients with a history of ocular herpes simplex because of the potential for reactivation of the viral infection. **5.3. Risk of Implant Migration.** Patients in whom the posterior capsule of the lens is absent or has a tear are at risk of implant migration into the anterior chamber.

6. ADVERSE REACTIONS. 6.1. Clinical Studies Experience. Because clinical trials are conducted under widely varying conditions, adverse reaction rates observed in the clinical trials of a drug cannot be directly compared to rates in the clinical trials of another drug and may not reflect the rates observed in practice. Adverse reactions associated with ophthalmic steroids including YUTIQ include cataract formation and subsequent cataract surgery, elevated intraocular pressure, which may be associated with optic nerve damage, visual acuity and field defects, secondary ocular infection from pathogens including herpes simplex, and perforation of the globe where there is thinning of the cornea or sclera. Studies 1 and 2 were multicenter, randomized, sham injection-controlled, masked trials in which patients with non-infectious uveitis affecting the posterior segment of the eye were treated once with either YUTIQ or sham injection, and then received standard care for the duration of the study. Study 3 was a multicenter, randomized, masked trial in which patients with non-infectious uveitis affecting the posterior segment of the eye were all treated once with YUTIQ, administered by one of two different applicators, and then received standard care for the duration of the study. Table 1 summarizes data available from studies 1, 2 and 3 through 12 months for study eyes treated with YUTIQ (n=226) or sham injection (n=94). The most common ocular (study eye) and non-ocular adverse reactions are shown in Table 1 and Table 2.

Table 1: Ocular Adverse Reactions Reported in ≥ 1% of Subject Eyes and Non-Ocular Adverse Reactions Reported in ≥ 2% of Patients

Ocular		
ADVERSE REACTIONS	**YUTIQ (N=226 Eyes) n (%)**	**Sham Injection (N=94 Eyes) n (%)**
Cataract[1]	63/113 (56%)	13/56 (23%)
Visual Acuity Reduced	33 (15%)	11 (12%)
Macular Edema	25 (11%)	33 (35%)
Uveitis	22 (10%)	33 (35%)
Conjunctival Hemorrhage	17 (8%)	5 (5%)
Eye Pain	17 (8%)	12 (13%)
Hypotony Of Eye	16 (7%)	1 (1%)
Anterior Chamber Inflammation	12 (5%)	6 (6%)
Dry Eye	10 (4%)	3 (3%)
Vitreous Opacities	9 (4%)	8 (9%)
Conjunctivitis	9 (4%)	5 (5%)
Posterior Capsule Opacification	8 (4%)	3 (3%)
Ocular Hyperemia	8 (4%)	7 (7%)
Vitreous Haze	7 (3%)	4 (4%)
Foreign Body Sensation In Eyes	7 (3%)	2 (2%)
Vitritis	6 (3%)	8 (9%)
Vitreous Floaters	6 (3%)	5 (5%)
Eye Pruritus	6 (3%)	5 (5%)
Conjunctival Hyperemia	5 (2%)	2 (2%)
Ocular Discomfort	5 (2%)	1 (1%)
Macular Fibrosis	5 (2%)	2 (2%)
Glaucoma	4 (2%)	1 (1%)
Photopsia	4 (2%)	2 (2%)

(continued)

Table 1: Ocular Adverse Reactions Reported in ≥ 1% of Subject Eyes and Non-Ocular Adverse Reactions Reported in ≥ 2% of Patients

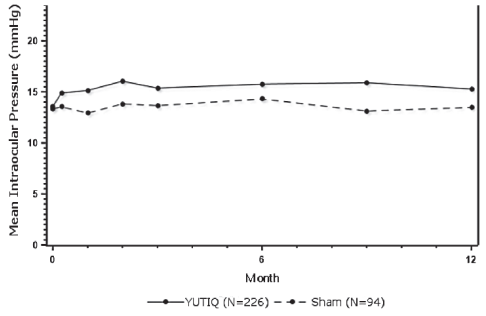
Ocular		
ADVERSE REACTIONS	**YUTIQ (N=226 Eyes) n (%)**	**Sham Injection (N=94 Eyes) n (%)**
Vitreous Hemorrhage	4 (2%)	0
Iridocyclitis	3 (1%)	7 (7%)
Eye Inflammation	3 (1%)	2 (2%)
Choroiditis	3 (1%)	1 (1%)
Eye Irritation	3 (1%)	1 (1%)
Visual Field Defect	3 (1%)	0
Lacrimation Increased	3 (1%)	0
Non-ocular		
ADVERSE REACTIONS	**YUTIQ (N=214 Patients) n (%)**	**Sham Injection (N=94 Patients) n (%)**
Nasopharyngitis	10 (5%)	5 (5%)
Hypertension	6 (3%)	1 (1%)
Arthralgia	5 (2%)	1 (1%)

1. Includes cataract, cataract subcapsular and lenticular opacities in study eyes that were phakic at baseline. 113 of the 226 YUTIQ study eyes were phakic at baseline; 56 of 94 sham-controlled study eyes were phakic at baseline.

Table 2: Summary of Elevated IOP Related Adverse Reactions

ADVERSE REACTIONS	YUTIQ (N=226 Eyes) n (%)	Sham (N=94 Eyes) n (%)
IOP elevation ≥ 10 mmHg from Baseline	50 (22%)	11 (12%)
IOP elevation > 30 mmHg	28 (12%)	3 (3%)
Any IOP-lowering medication	98 (43%)	39 (41%)
Any surgical intervention for elevated IOP	5 (2%)	2 (2%)

Figure 1: Mean IOP During the Studies



8. USE IN SPECIFIC POPULATIONS. 8.1 Pregnancy. Risk Summary. Adequate and well-controlled studies with YUTIQ have not been conducted in pregnant women to inform drug associated risk. Animal reproduction studies have not been conducted with YUTIQ. It is not known whether YUTIQ can cause fetal harm when administered to a pregnant woman or can affect reproduction capacity. Corticosteroids have been shown to be teratogenic in laboratory animals when administered systemically at relatively low dosage levels. YUTIQ should be given to a pregnant woman only if the potential benefit justifies the potential risk to the fetus. All pregnancies have a risk of birth defect, loss, or other adverse outcomes. In the United States general population, the estimated background risk of major birth defects and miscarriage in clinically recognized pregnancies is 2% to 4% and 15% to 20%, respectively. **8.2 Lactation.** Risk Summary. Systemically administered corticosteroids are present in human milk and can suppress growth, interfere with endogenous corticosteroid production. Clinical or nonclinical lactation studies have not been conducted with YUTIQ. It is not known whether intravitreal treatment with YUTIQ could result in sufficient systemic absorption to produce detectable quantities of fluocinolone acetonide in human milk, or affect breastfed infants or milk production. The developmental and health benefits of breastfeeding should be considered, along with the mother's clinical need for YUTIQ and any potential adverse effects on the breastfed child from YUTIQ. **8.4 Pediatric Use.** Safety and effectiveness of YUTIQ in pediatric patients have not been established. **8.5 Geriatric Use.** No overall differences in safety or effectiveness have been observed between elderly and younger patients.

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RT NEWS

OCTOBER 2021

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EMPIRIC MANAGEMENT AND CULTURING YIELDED SIMILAR RESULTS FOR POST-INJECTION ENDOPHTHALMITIS

Managing post-injection endophthalmitis without obtaining microbiologic cultures led to outcomes similar to those in cases in which culturing was obtained, a large retrospective study found.[1]

"When access to [a] microbiologic facility is not available, management of post-injection endophthalmitis using intravitreal antibiotics without microbiologic cultures may be an acceptable treatment strategy," the study authors concluded.

In this single-center study covering a period of 6 years, all eyes with endophthalmitis after an anti-VEGF injection were divided into two groups: those for which culturing was obtained and for which no culture was obtained. In both groups, patients were treated immediately with antibiotics.

Of 165 cases of endophthalmitis identified, 72% were in the culture group and 46% in the no-culture group. There was no significant difference in visual acuity between groups at the time of endophthalmitis presentation. At 6-month follow-up, mean vision loss was 5.5 lines in the culture group and 2.5 lines in the no-culture group ($P = .017$). In the culture group, 24% of eyes required subsequent pars plana vitrectomy, compared with 15% in the no-culture group ($P = .29$). Secondary retinal detachments developed in 5% of eyes in the culture group and no eyes in the no-culture group ($P = .14$).

"The time critical step of treating endophthalmitis remains immediate treatment with intravitreal antibiotics," the authors emphasized.

1. Patel SN, Cai LZ, Mahmoudzadeh R, et al. Endophthalmitis after intravitreal anti-vascular endothelial factor injections: Outcomes of eyes managed without microbiologic cultures: Endophthalmitis outcomes without cultures. Preprint. Published online August 27, 2021. *Am J Ophthalmol*.

RANIBIZUMAB-NUNA FIRST OPHTHALMOLOGY BIOSIMILAR TO GAIN FDA APPROVAL

Ranibizumab-nuna (Byooviz, Samsung Bioepis/Biogen) was approved by the FDA in September for the treatment of wet AMD, macular edema following retinal vein occlusion, and myopic choroidal neovascularization, according to a joint press release from Biogen and Samsung Bioepis. The biologic agent, which references ranibizumab (Lucentis, Genentech), is the first biosimilar in ophthalmology to gain approval in the United States.

Ranibizumab-nuna has demonstrated comparable safety and efficacy to its reference biologic, and it is designed to increase cost savings and patient accessibility to vision-saving therapies, according to the press release. The biosimilar was also approved in 27 countries of the European Union and in the United Kingdom in August.

Approval of ranibizumab-nuna was based on data from a randomized, double-masked, parallel group, multicenter phase 3 study comparing its efficacy, safety, pharmacokinetics, and immunogenicity to ranibizumab in patients with wet AMD; the biologics were found to be comparable at all time points up to 52 weeks, according to the press release.

Cost savings as a result of the use of biosimilars in the United States over the next 5 years are projected to exceed $100 billion, the press release stated.

HIGHER DOSE OF AFLIBERCEPT MET PRIMARY SAFETY ENDPOINTS IN A PHASE 2 TRIAL

Aflibercept 8 mg injection met the primary safety endpoints in a phase 2 clinical trial, according to an August press release from the drug's manufacturer. Aflibercept injection is currently FDA-approved for a 2 mg dose (Eylea, Regeneron). The 8 mg dose is being investigated as a treatment for patients with wet AMD and diabetic macular edema (DME).

(Continued on page 14)

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THE SURGICAL ISSUE

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DEPARTMENTS

THE PRE-LESION–WHERE COMPLEMENT OVERACTIVATION IS CAUSING THE NEXT WAVE OF DESTRUCTION IN GEOGRAPHIC ATROPHY[1,2]

This is where you'll find C3, the linchpin of complement overactivation in the growth of GA lesions

C3 is where all three complement pathways converge, driving multiple damaging downstream effects—inflammation, opsonization, and formation of the membrane attack complex. All of this can lead to permanent retinal cell death in the pre-lesion, which is where your patients have the most to save.[2-9]

Scan the code to explore pre-lesion.com

1. Boyer DS, et al. *Retina*. 2017;37:819-835. 2. Katschke KJ Jr, et al. *Sci Rep*. 2018;8(1):13055. 3. Mastellos DC, et al. *Trends Immunol*. 2017;38(6):383-394. 4. Ricklin D, et al. *Immunol Rev*. 2016;274(1):33-58. 5. Heesterbeek TJ, et al. *Opthalmol Vis Sci*. 2020;61(3):18. 6. Seddon JM, et al. *Nat Genet*. 2013;45:1266-1370. 7. Yates JRW, et al. *N Engl J Med*. 2007;357(6):553-561. 8. Smailhodzic D, et al. *Ophthalmology*. 2012;119(2):339-346. 9. Merle NS, et al. *Front Immunol*. 2015;6:262.

Apellis

ANTI-VEGF THERAPY IN THE SETTING OF ADVANCED VISION LOSS

Data discussed at ARDS 2021 suggest some important treatment benefits for wet AMD patients.

LECTURE BY DENNIS P. HAN, MD; SUMMARIZED BY *RETINA TODAY* STAFF

Every year, the Aspen Retinal Detachment Society honors its founders—William O. Edward, MD, and Ottiwell Wood Jones III, MD—with an award lecture that speaks to the original goal of the meeting: to advance the field of retina surgery by gathering global leaders to share knowledge and exchange ideas. At the 2021 meeting in Snowmass, Colorado, Dennis P. Han, MD, did just that, with his Founders Lecture focused on the question of whether wet AMD patients presenting with advanced vision loss can benefit from anti-VEGF therapy.

THE MISSING PIECES

Dr. Han began the session by asking a question: Which patients with macular degeneration should we treat, and why? Although plenty of studies show that patients with mild to moderate wet AMD benefit from anti-VEGF therapy, the data are less clear on what to do for patients who already have severe vision loss. Most large clinical trials exclude patients with VA worse than 20/320, leaving clinicians unsure about the correct treatment approach, Dr. Han said.

The only randomized trial that included wet AMD patients with severe vision loss who underwent anti-VEGF treatment, he said, was published in 2012.[1] However, the study was highly underpowered with only 11 patients in a treatment group and 10 in the control group. The findings showed a tendancy toward lower logMAR scores for patients in the treatment arm, suggesting improvement over time, according to Dr. Han. Had these findings been confirmed with a larger number of enrolled patients, he said he suspects the data would have reached statistical significance.

NEW DATA

With little else to inform a clinician's choice to treat wet AMD patients with severe vision loss, Dr. Han and his colleagues decided to look at the visual outcomes and prognostic indicators in treating patients with severe visual loss with anti-VEGF therapy.[2] The study was a retrospective chart review of 1,410 patients with wet AMD treated with anti-VEGF therapy. Inclusion criteria included a baseline VA of 20/200 or worse and a minimum follow-up of 6 months; exclusion criteria included any vision-limiting eye condition such as massive subretinal hemorrhage and any previous treatment with anti-VEGF therapy. A total of 131 patients met the study criteria, and 97 were followed for 12 months. The mean age was 82 years, and, interestingly, the mean number of injections at 12 months was only 4.2, although with a wide variation, according to Dr. Han. This emphasized the chronic problem of undertreatment that had been observed early in the era of anti-VEGF therapy, he noted.

Roughly half of the patients received bevacizumab (Avastin, Genentech) and half received ranibizumab (Lucentis, Genentech), with no difference in outcomes, he said. The baseline VA was approximately 1.38 logMAR (20/480 Snellen equivalent), which improved by a mean of 0.23 logMAR ($P < .0001$) at 6 months and 0.17 logMAR ($P = .003$) at 12 months. Patients improved by roughly 2 lines, on average, Dr. Han explained.

There was ≥ 3 lines of visual improvement in almost 50% of patients, no change in about 30%, and worsening of 3

WATCH IT NOW

The Benefits of Anti-VEGF for Advanced Vision Loss in Wet AMD

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lines or more in about 20%. Dr. Han referred to this observation as *the Han Rule*: 50%, 30%, and 20% estimates the chances of a patient experiencing visual acuity improvement, no change, or worsening by 3 lines or more, respectively, in patients presenting with severe vision loss who received clinician-guided anti-VEGF therapy.

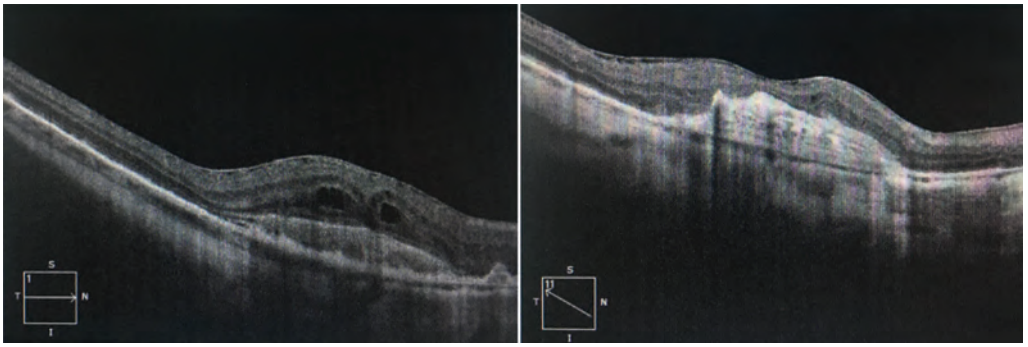

Figure. This patient presented with a baseline VA of 20/200 and struggled to fixate centrally. After 9 months of monthly treatment with bevacizumab, VA improved to 20/80 with central fixation. Although the patient was not impressed with his visual improvement, VA in his other eye was counting fingers at 3 feet. Dr. Han believes he saved the vision in this patient's good eye from becoming just as bad and preserved meaningful visual function overall for the patient.

The study also found that patients with VA worse than 20/400 tended to have greater visual improvements than patients whose VA was 20/400 or better.

As for prognostic indicators, the study found that subretinal fluid and retinal hemorrhage were associated with improved prognosis, whereas intraretinal fluid and retinal pigment epithelial detachment were associated with a worse prognosis. Other factors associated with greater improvement were poor vision at baseline and a larger number of injections, Dr. Han said. These gains are sometimes not appreciated by patients because they continue to have some degree of impairment, and patient-centered benchmarks such as reading and driving may not be met.

BENEFITS BEYOND VISION

Visual loss is an independent risk factor for accidental falls, and wet AMD is associated with a nearly twofold heightened risk of injurious falls.[3] In addition to visual acuity, loss of binocularity and contrast sensitivity are also important predictors of a patient's risk for falls.[4,5] Thus, visual acuity may not be the only appropriate measure of whether a patient might benefit from anti-VEGF treatment, he suggested.

According to the AMA Council on Industrial Health, the positive impact on patient functioning of any visual improvement is two- to threefold greater if the patient has a poor fellow eye (Figure).[6] Dr. Han provided an example to help explain the true benefit based on the fellow eye's vision, calculated with the AMA criteria. If the fellow eye has good vision, a moderate treatment benefit in an affected eye can reduce the patient's impairment of the visual system from 24% to 17%; that's a difference of 7%. However, if the fellow eye's vision is poor, that same treatment might reduce the patient's impairment by a larger amount, from 97% to 75%, which is a difference of 22%.

MANAGEMENT CONSIDERATIONS

Dr. Han wrapped up the session with a look at some of the management pearls he gleaned from the study.

- Hemorrhage and subretinal fluid may be reversible contributors to visual loss, he said, and should not preclude treatment, even if fibrosis and intraretinal fluid are present.
- Clinicians must manage expectations based on the prognosis. The Han Rule (50, 30, 20) is a rough estimate of what can happen when treating wet AMD patients with severe vision loss, and it can help patients decide whether or not to commit to treatment.
- Consider stopping treatment for two reasons: futility and excessive treatment burden. If, after a sustained course of treatment, there is no active exudation but the visual acuity is not useful to the patient, further treatment is probably futile.
- Alternatively, nonstop therapy should be considered if after 6 to 12 months of continuous fixed interval injections the vision is of functional value to the patient. At that point, Dr. Han then considers at least a treat-and-extend approach with up to a maximum interval of 8 to 10 weeks between injections (using bevacizumab or aflibercept [Eylea, Regeneron]). ■

1. Parodi MB, Cascavilla M, Papayannis A, Kontadakis DS, Bandello F, Iacono P. Intravitreal bevacizumab in advanced-stage neovascular age-related macular degeneration with visual acuity lower than 20/200. *Arch Ophthalmol*. 2012;130(7):934-935.
2. Vogel RN, Davis DB, Kimura BH, et al. Neovascular age-related macular degeneration with advanced visual loss treated with anti-vascular endothelial growth factor therapy: clinical outcome and prognostic indicators. *Retina*. 2017;37(2):257-264.
3. Szabo SM, Janssen PA, Khan K, Lord SR, Potter MJ. Neovascular AMD: an overlooked risk factor for injurious falls. *Osteopros Int*. 2010;21:855-862.
4. Coleman AL. Sources of binocular suprathreshold visual field loss in a cohort of older women being followed for risk of falls: an American Ophthalmological Society thesis. *Trans Am Ophthalmol Soc*. 2007;105;312-329.
5. DeBoer MR, Pluijm SMF, Lips P, et al. Different aspects of visual impairment as risk factors for falls and fractures in older men and women. *J Bone Miner Res*. 2004;19:1539-1547.
6. Physicians Desk Reference for Ophthalmology, Section 6. Evaluation of Permanent Visual Impairment. 23rd Edition. Medical Economics: 1995.

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DIAGNOSING PCV WITH OCT B-SCAN

Advanced imaging can help you identify this subtype of wet AMD and adjust therapy accordingly.

BY GREGG T. KOKAME, MD, MMM; JASE N. OMIZO, BS; KELLI A. KOKAME, BA; AND MAYA L. YAMANE, MD

Anti-VEGF intravitreal injection is the current standard of care for the treatment of wet AMD. Although many patients experience dramatic visual and anatomic improvements with this treatment, some eyes may show a poor response. Recently, anti-VEGF resistance has been shown to be more commonly associated with a subtype of AMD, polypoidal choroidal vasculopathy (PCV).[1-4]

PCV is characterized by dilated polyp-shaped vascular lesions within the choroidal neovascular network, often associated with a branching vascular network.[5,6] This subretinal neovascularization is usually anatomically located between Bruch membrane and the retinal pigment epithelium (RPE; type 1) but can be above the RPE (type 2).[7,8]

The diagnosis of PCV has become important in the management of wet AMD because it can predict anti-VEGF resistance. Further, eyes with PCV may exhibit a better visual response with less frequent anti-VEGF treatments combined with verteporfin photodynamic therapy (PDT; Visudyne, Bausch + Lomb).[9,10]

Although the current standard for the diagnosis of PCV is indocyanine green angiography (ICGA),[5,6,11] it is often not available or not ordered in the routine evaluation of wet AMD. OCT is, however, readily available, making it another useful tool in this clinical scenario. The most characteristic signs of PCV on B-scan OCT are its polypoidal lesions and dilated aneurysm-shaped lesions. These appear as inverted-U-shaped elevations of the RPE with heterogeneous reflectivity (Figure 1). Because these lesions can be seen on OCT and are characteristic of PCV, B-scan OCT can be useful for diagnosing PCV in most clinical settings.

B-SCAN CHARACTERISTICS

Kokame and colleagues evaluated the possibility of making a diagnosis of PCV based on OCT B-scan alone in eyes confirmed to have PCV based on ICGA.[12] The polypoidal lesions were confirmed with point-to-point localization to the lesions on the ICG angiogram. B-scan OCT showed visible polypoidal lesions in 56.5% of eyes with PCV (Figure 1). The specificity was 97.7%, the positive predictive value was 97.5%, and the negative predictive value was 58.3%.

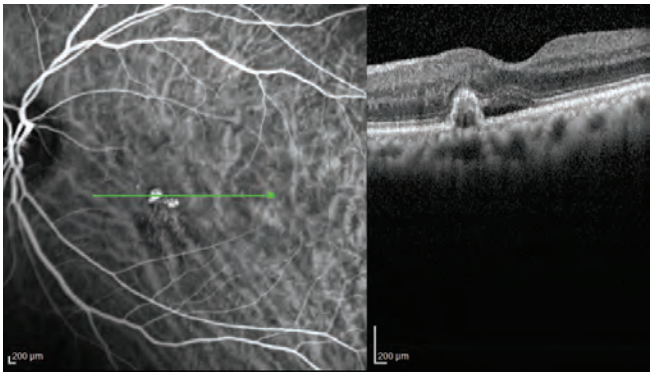

Figure 1. ICGA shows large polypoidal lesions of PCV that correlate point-to-point on B-scan OCT with the inverted-U-shaped elevation of the RPE. Note the heterogeneous reflectivity of the polypoidal lesion on OCT and the serous detachment.

This study showed that, even without more specific testing or dye imaging, PCV can be identified on OCT alone in more than half of cases with high specificity. However, the low negative predictive value implies that the absence of the inverted-U-shaped lesion does not necessarily rule out PCV. Often, PCV is suspected only after a poor response to anti-VEGF therapy.

This study further showed that after 6 to 9 months of anti-VEGF therapy the presence of polypoidal lesions on B-scan OCT decreased from 56.5% of eyes to 24.6%.[12] This finding indicates that, when PCV is suspected, it is important to look at the baseline OCT before anti-VEGF treatment to have the best chance of diagnosing PCV on B-scan OCT.

Another characteristic finding on OCT that can help to identify PCV is a higher prevalence of subretinal fluid in eyes with PCV than in eyes with typical wet AMD. There was no difference regarding macular edema, subretinal hyperreflective material, or RPE detachment.

Members of the Asia Pacific Ocular Imaging Society also looked at non-ICGA characteristics of PCV and found that OCT and color fundus photographs can help differentiate PCV from typical wet AMD in eyes with persistent disease activity.[13] In addition, adjunctive PDT treatment could be

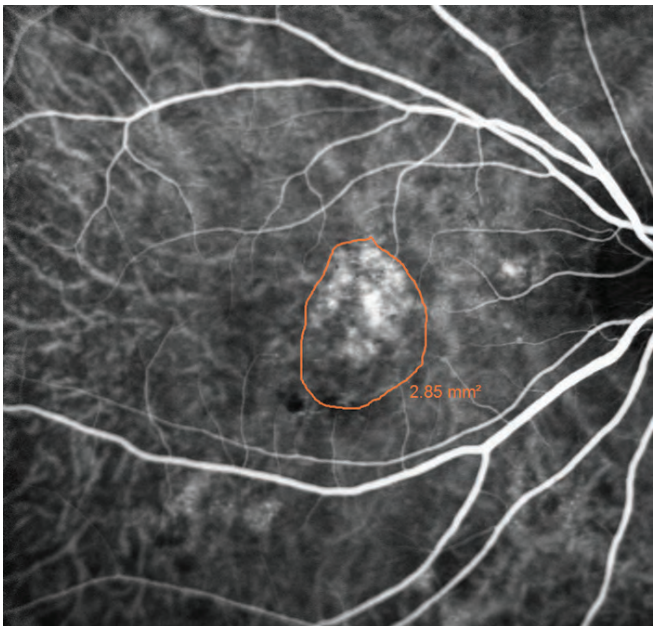

Figure 2. ICGA shows polypoidal vascular complex with the target (orange outline) around the lesion. The PDT beam is set at the greatest linear dimension of the lesion or 300 µm larger.

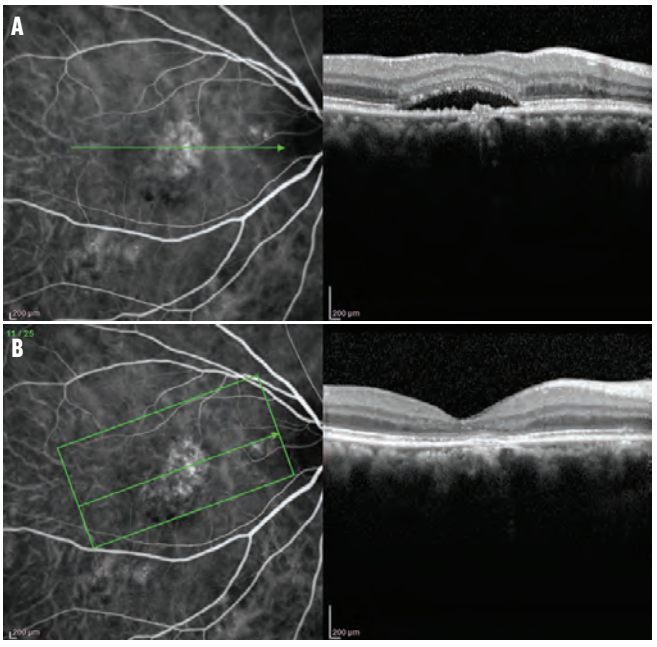

Figure 3. This patient with wet AMD had recurrent subretinal fluid and VA of 20/50 despite 27 ranibizumab injections administered once every 5 weeks, indicating anti-VEGF resistance. ICGA correlated with B-scan OCT showed significant serous retinal detachment (A). ICGA after combined reduced-fluence PDT and intravitreal bevacizumab showed a persistent branching vascular network but decreased vascular complex, with correlated B-scan OCT showing resolution of the subretinal fluid (B). The subretinal fluid remained resolved without treatment for 30 months with VA of 20/40.

chosen with OCT guidance, without the need for ICGA, to allow complete coverage of the polypoidal lesions.

TREATMENT CONSIDERATIONS

Identifying PCV can significantly affect patient care, as the diagnosis suggests the possibility of anti-VEGF resistance and a poor response to anti-VEGF injections. Based on the EVEREST II study,[9,10] which found that combined PDT and ranibizumab (Lucentis, Genentech) improved vision with fewer injections than ranibizumab monotherapy, alternative primary therapy can be considered.

For eyes with PCV, the target of PDT is based on the location of polypoidal neovascular lesions on ICGA. The treatment spot is limited to a diameter matching the greatest linear dimension of the polypoidal neovascular lesion or a localized 300 µm border around the lesion (Figure 2). The combination of PDT and anti-VEGF injection can markedly decrease the need for injections with good visual outcomes and can result in a significant benefit in eyes demonstrating anti-VEGF resistance (Figure 3).

Furthermore, evidence suggests that PCV can have a differential anatomic response depending on the anti-VEGF agent chosen. Aflibercept (Eylea, Regeneron) is the treatment of choice in Asia for PCV, as it has shown a significantly better response in some eyes treated previously with other anti-VEGF agents.[14,15] The HAWK study, which included eyes with PCV, found evidence that brolucizumab (Beovu, Novartis) had a better drying effect than aflibercept in those eyes.[16] Thus, the anti-VEGF agents that elicit the most significant anatomic response in the PCV subtype of wet AMD are brolucizumab, followed by aflibercept, then ranibizumab, and then bevacizumab (Avastin, Genentech). The recently reported risk of uveitis and vasculitis with brolucizumab must be considered in the selection of therapy.

FINAL THOUGHTS

Most ophthalmologists may assume PCV is mainly a disease seen in Asian patients, where a prevalence as high as 50% has been noted in eyes presenting with exudation and bleeding from subretinal neovascularization.[17] However, more recent data regarding PCV have shown that it is a common form of wet AMD in Black patients;[18] PCV is also much more common in White patients than previously thought with a prevalence of up to 25% of wet AMD actually recognized as PCV.[1,19-21] Early studies in White patients with AMD used ICGA fundus camera images, which are less sensitive at detecting PCV than ICGA with the scanning laser ophthalmoscope.[22] Thus, PCV is commonly seen in most practices but is not recognized due to lack of appropriate testing such as ICGA. Other more commonly available testing such as OCT B-scan images can also provide a means of diagnosing PCV, even if ICGA is not available.

The use of OCT B-scan imaging can facilitate more widespread diagnosis of PCV and can significantly affect the management approach to include the choice of anti-VEGF agent or the initiation of combination therapy with PDT and intravitreal anti-VEGF injections, which may lead to potential visual benefits and decreased treatment for PCV eyes. ■

1. Kokame GT, de Carlo TE, Kaneko KN, Omizo J, Lian R. Anti-vascular endothelial growth factor resistance in exudative macular degeneration and polypoidal choroidal vasculopathy. *Ophthalmol Retina*. 2019;3(9):744-752.
2. Stangos AN, Gandhi JS, Nair-Sahni J, Heimann H, Pournaras CJ, Harding SP. Polypoidal choroidal vasculopathy masquerading as neovascular age-related macular degeneration refractory to ranibizumab. *Am J Ophthalmol*. 2010;150(5):666-673.
3. Cho M, Barbazetto IA, Freund KB. Refractory neovascular age-related macular degeneration secondary to polypoidal choroidal vasculopathy. *Am J Ophthalmol*. 2009;148(1):70-81.
4. Hatz K, Prunte C. Polypoidal choroidal vasculopathy in Caucasian patients with presumed neovascular age-related macular degeneration and poor ranibizumab response. *Br J Ophthalmol*. 2014;98(2):188-194.
5. Khan S, Engelbert M, Imamura Y, Freund KB. Polypoidal choroidal vasculopathy. Simultaneous indocyanine green angiography and eye-tracked spectral domain optical coherence tomography findings. *Retina*. 2012;32(6):1057-1068.
6. Kokame GT. Prospective evaluation of subretinal location in polypoidal choroidal vasculopathy (PCV) and response of exudative and hemorrhagic PCV to high dose anti-angiogenic therapy (An American Ophthalmological Society Thesis). *Trans Am Ophthalmol Soc*. 2014;112:74-93.
7. Liang S, Shi X, Rosenfeld PJ, Li X. Type 2 choroidal neovascularization in polypoidal choroidal vasculopathy. *Br J Ophthalmol*. 2018;102:1570-1574.
8. Sia DI, Ebneter A, Sinkar S, Gilhotra J. Polypoidal choroidal vasculopathy: naked polyp. *Int Ophthalmol*. 2013;33:67-69.
9. Kokame GT, Kim JE. Treatment for a subtype of exudative macular degeneration: another mountain climbed. *JAMA Ophthalmol*. 2020;138:942-944.
10. Lim TH, Lai TYY, Takahashi K, et al; EVEREST II Study Group. 24-Month results comparing ranibizumab with or without verteporfin photodynamic therapy for polypoidal choroidal vasculopathy: EVEREST II randomized clinical trial. *JAMA Ophthalmol*. 2020;138:935-942.
11. Kokame GT. Polypoidal choroidal vasculopathy--an important diagnosis to make with therapeutic implications. *Retina*. 2012;32(8):1446-1448.
12. Kokame GT, Omizo JN, Kokame KA, Yamane ML. Differentiating exudative macular degeneration and polypoidal choroidal vasculopathy using optical coherence tomography B-scan. Preprint. Published online May 18, 2021. *Ophthalmol Retina*.
13. Chong Teo KY, Sadda SR, Gemmy Cheung CM, et al. Non-ICGA treatment criteria for suboptimal anti-VEGF response for polypoidal choroidal vasculopathy: APOIS PCV Workgroup Report 2. Preprint. Published online April 15, 2021. *Ophthalmol Retina*.
14. Kokame GT, Lai JC, Wee R, et al. Prospective clinical trial of Intravitreal aflibercept treatment for polypoidal choroidal vasculopathy with hemorrhage or exudation (EPIC study): 6 month results. *BMC Ophthalmol*. 2016;16:127.
15. Lee WK, Iida T, Ogura Y, et al. Efficacy and safety of intravitreal aflibercept for polypoidal choroidal vasculopathy in the PLANET study: a randomized clinical trial. *JAMA Ophthalmol*. 2018;136(7):786-793.
16. Ogura Y, Jaffe GJ, Cheung CM, et al. Efficacy and safety of brolucizumab versus aflibercept in eyes with polypoidal choroidal vasculopathy in Japanese participants of HAWK study. Preprint. Published online July 22, 2021. *Br J Ophthalmol*.
17. Gomi F, Tano Y. Polypoidal choroidal vasculopathy and treatments. *Curr Opin Ophthalmol*. 2008;19(3):208-212.
18. Marcus DM, Singh H, Fechter CM, Chamberlain DP. High-dose ranibizumab monotherapy for neovascular polypoidal choroidal vasculopathy in a predominantly non-Asian population. *Eye (Lond)*. 2015;29(11):1427-37.
19. Lafaut BA, Leys AM, Snyers B, Rasquin F, De Laey JJ. Polypoidal choroidal vasculopathy in Caucasians. *Graefes Arch Clin Exp Ophthalmol*. 2000;238(9):752-759.
20. Mettu PS, Allingham MJ, Nicholas PC, Cousins SW. Neovascular morphology by ICG angiography and response to loading-dose anti-VEGF therapy in patients with neovascular AMD: Results of the PERSIST study. *Invest Ophthalmol Vis Sci*. 2016;57(12).
21. Pereira FB, Veloso CE, Kokame GT, Nehemy MB. Characteristics of neovascular age-related macular degeneration in Brazilian patients. *Ophthalmologica*. 2015;234(4):233-242.
22. Cheung CM, Lai TY, Chen SJ, et al. Understanding indocyanine green angiography in polypoidal choroidal vasculopathy: the group experience with digital fundus photography and scanning laser ophthalmoscopy. *Retina*. 2014;34:2397-2406.

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(Continued from page 7)

The trial included 106 patients and compared those who received the investigational dose of aflibercept with a control group that received the 2 mg dose. During the 16-week trial, adverse events occurred in 15% of patients in the 8 mg group and 22% in the 2 mg group. No intraocular inflammation (including occlusive retinal vasculitis), arterial thromboembolic events, or deaths occurred in either group. One patient in the 8 mg group experienced a retinal tear, and one in the 2 mg group experienced a reduction in visual acuity, the press release stated. No new safety signals were identified with the 8 mg dose. After three initial injections, 43.4% of eyes in the 8 mg group had no retinal fluid, compared with 26.4% in the 2 mg group.

Aflibercept 8 mg is now being evaluated for its efficacy in treating AMD and DME in two large phase 3 clinical trials. These trials will assess the investigational dose compared with the 2 mg dose with 2 years of follow-up. Visual acuity will be measured using ETDRS BCVA at 48 weeks.

PEGCETACOPLAN REDUCED GEOGRAPHIC ATROPHY LESION GROWTH IN A PHASE 3 TRIAL

Intravitreal pegcetacoplan (Apellis Pharmaceuticals), an investigational targeted C3 therapy, reduced geographic atrophy (GA) lesion growth associated with AMD in one of two phase 3 clinical trials, the manufacturer announced in a September press release.

A total of 1,258 participants were evaluated in two phase 3 clinical trials, OAKS and DERBY. In each trial, one group received monthly injections of pegcetacoplan and another received injections every other month. Both treatment regimens met the primary endpoints in the OAKS study; neither met the primary endpoints in DERBY.

However, a prespecified combined analysis of the two studies found that pegcetacoplan reduced GA lesion growth by 17% ($P < .0001$) in the combined monthly groups and 14% ($P = .0012$) in the combined every-other-month groups, compared with pooled sham at 12 months. The analysis also found that the drug had a greater effect in patients who had extrafoveal lesions at baseline, decreasing lesion growth by 26% ($P < .0001$) and 23% ($P = .0002$), respectively.

The drug was well tolerated in both trials. In 6,331 total injections, there were two confirmed cases and one suspected case of infectious endophthalmitis (0.047%), and 13 cases of ocular inflammation were observed.

In May, pegcetacoplan was approved by the FDA for the treatment of paroxysmal nocturnal hemoglobinuria. The company plans to submit a new drug application for pegcetacoplan as a treatment for GA in 2022, according to the press release. ■

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MANAGEMENT OF IDIOPATHIC EPIRETINAL MEMBRANE: TO OBSERVE OR TO PEEL


Two cases illustrate how a new system can help optimally time surgical intervention.

BY CHYONG-YNG HUANG, BS, AND LIHTEH WU, MD

Epiretinal membrane (ERM) was described more than 150 years ago.[1] It is a common finding in people older than 50 years and constitutes a common indication for vitreoretinal surgery.[2] The increasing availability of spectral-domain (SD) OCT in routine clinical practice has led to more frequent detection of ERM. Many patients are asymptomatic or mildly symptomatic and rarely progress, whereas others may progress despite being asymptomatic. Because of this variability, it is unclear when to observe and when to intervene surgically.

Several investigators have assessed the usefulness of preoperative SD-OCT outer retinal biomarkers, such as the integrity of the ellipsoid and interdigitation zones and the length of the photoreceptor outer segments, as possible postoperative prognostic factors.[3-6] However, a major limitation of this approach is that the evaluation of the outer retinal structures on SD-OCT may be hindered by common imaging artifacts.[7] Others have focused, instead, on inner retinal findings, in particular the presence of ectopic inner foveal layers.

Govetto et al recently published a staging classification for ERMs based on these inner retinal layers.[8] In this article we present case reports describing our management of two patients with ERM based on this staging classification.

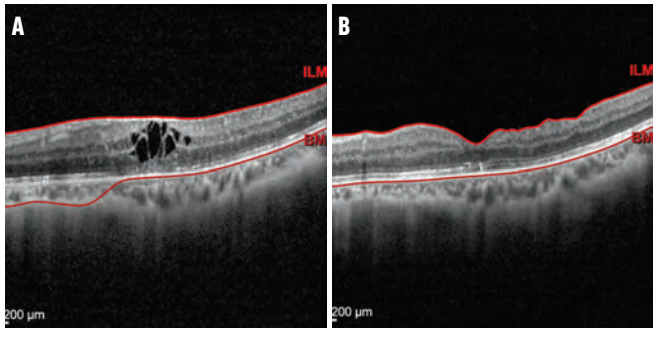

Figure 1. With this stage 2 ERM, notice the loss of the foveal pit. The retinal layers are well-defined and there are no ectopic inner foveal layers. Intraretinal hyporeflective spaces are also present (A). Postoperative SD-OCT shows the reconstitution of the foveal pit and the disappearance of the intraretinal hyporeflective spaces (B).

CASE NO. 1

A healthy 49-year-old woman noted a sudden onset of metamorphopsia and decreased visual acuity in her left eye. Refraction indicated a VA of 20/40 OS. Macular OCT revealed a stage 2 ERM (Figure 1A).

The patient underwent vitrectomy with membrane peel. Four months after the vitrectomy, her VA had improved to 20/25 OS, and her metamorphopsia had mostly disappeared. Macular OCT showed a normalization of her foveal architecture (Figure 1B).

CASE NO. 2

A healthy 65-year-old man who had undergone refractive lens exchange 3 years earlier started complaining of metamorphopsia and decreased visual acuity in his left eye. His VA was 20/50 OS, and macular OCT revealed a

AT A GLANCE

- Whether to observe mildly symptomatic ERM or proceed to surgery remains unclear.
- As prognostic factors for ERM, integrity of the ellipsoid and interdigitation zones and length of the photoreceptor outer segment have limited value.
- Cases presented here illustrate the usefulness of a staging classification for ERMs in determining when to perform surgery.

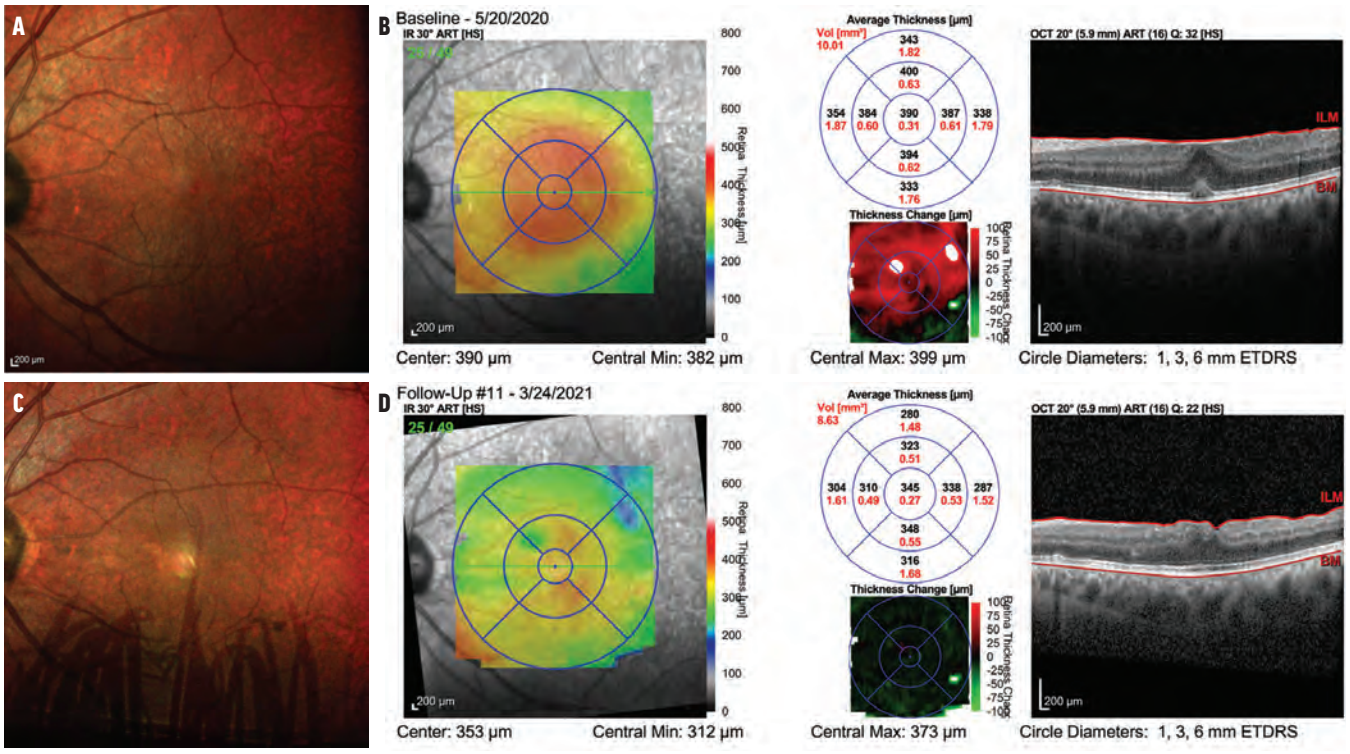

Figure 2. Multicolor imaging demonstrates the presence of a stage 2 ERM (A). Notice the loss of the foveal pit. The retinal layers are well-defined and there are no ectopic inner foveal layers. A cotton-ball sign is also present (B). Postoperative multicolor imaging shows the absence of the ERM (C). Postoperative SD-OCT confirms the absence of an ERM. The foveal pit has not reconstituted but the visual acuity improved to 20/25 (D).

stage 2 ERM with a cotton-ball sign (Figures 2A and 2B). He underwent surgical repair, and 10 months later his VA had improved to 20/25 and most of his metamorphopsia had resolved (Figures 2C and 2D).

DISCUSSION

In the classification system described by Govetto et al, stage 1 ERM is characterized by the presence of the foveal pit with well-defined retinal layers. In stage 2, the foveal pit is absent, but the retinal layers remain well-defined. In stage 3, the foveal pit is absent and the retinal layers remain well-defined, but ectopic inner foveal layers are present. Finally, in stage 4 eyes, the foveal pit is absent, the retinal layers are disrupted, and ectopic inner foveal layers are present.[8] The presence of ectopic inner foveal layers was found to be a negative functional and anatomic prognostic factor for eyes undergoing surgical repair.[9]

Gonzalez-Saldivar and colleagues retrospectively analyzed a series of surgical results according to this staging classification.[10] They reported that 92% of stage 2 eyes achieved postoperative BCVA ≥ 20/40, compared with 42% of stage 3 and 5% of stage 4 eyes. These results were in line with those reported by Govetto et al.[9]

Likewise, the two cases reported here clearly illustrate the usefulness of this classification scheme. We are continuing to use this staging classification and will consider surgical intervention in patients once stage 2 ERM is diagnosed. ■

1. Iwanoff A. Beiträge zur Normalen und Pathologischen Anatomie des Auges. *Graefes Arch Clin Exp Ophthalmol*. 1865;11:135-70.
2. Fraser-Bell S, Guzowski M, Rochtchina E, et al. Five-year cumulative incidence and progression of epiretinal membranes: the Blue Mountains Eye Study. *Ophthalmology*. 2003;110(1):34-40.
3. Falkner-Radler CI, Glittenberg C, Hagen S, et al. Spectral-domain optical coherence tomography for monitoring epiretinal membrane surgery. *Ophthalmology*. 2010;117(4):798-805.
4. Hashimoto Y, Saito W, Saito M, et al. Retinal outer layer thickness increases after vitrectomy for epiretinal membrane, and visual improvement positively correlates with photoreceptor outer segment length. *Graefes Arch Clin Exp Ophthalmol*. 2014;252(2):219-226.
5. Hosoda Y, Ooto S, Hangai M, et al. Foveal photoreceptor deformation as a significant predictor of postoperative visual outcome in idiopathic epiretinal membrane surgery. *Invest Ophthalmol Vis Sci*. 2015;56(11):6387-6393.
6. Shiono A, Kogo J, Klose G, et al. Photoreceptor outer segment length: a prognostic factor for idiopathic epiretinal membrane surgery. *Ophthalmology*. 2013;120(4):788-794.
7. Rii T, Itoh Y, Inoue M, Hirakata A. Foveal cone outer segment tips line and disruption artifacts in spectral-domain optical coherence tomographic images of normal eyes. *Am J Ophthalmol*. 2012;153(3):524-529e1.
8. Govetto A, Lalane RA, 3rd, Sarraf D, et al. Insights into epiretinal membranes: presence of ectopic inner foveal layers and a new optical coherence tomography staging scheme. *Am J Ophthalmol*. 2017;175:99-113.
9. Govetto A, Virgili G, Rodriguez FJ, et al. Functional and anatomical significance of the ecoptic inner foveal layers in eyes with idiopathic epiretinal membranes: surgical results at 12 months. *Retina*. 2019;39(2):347-357.
10. Gonzalez-Saldivar G, Berger A, Wong D, et al. Ectopic inner foveal layer classification scheme predicts visual outcomes after epiretinal membrane surgery. *Retina*. 2020;40(4):710-717.

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RETINAL DETACHMENT SURGERY IN THE AGING EYE

These management considerations can help you succeed in complex clinical scenarios.

BY LOUIS Z. CAI, MD; SAMIR N. PATEL, MD; AND YOSHIHIRO YONEKAWA, MD

As you walk through the clinic of a vitreoretinal specialist, you often find a disproportionate number of older adults in the waiting room. And given that more than 46 million US adults are 65 and older—a number expected to grow to more than 90 million by 2050—this is no surprise.[1] According to the AAO's Committee on Aging, ophthalmologists are second only to geriatricians in the number of patients they see who are older than 65 years.

AMD today accounts for the majority of a vitreoretinal specialist's work with elderly patients, but other conditions are on the rise as the US population ages, including rhegmatogenous retinal detachment (RRD).[1] The prevalence of RRD has a bimodal distribution: a peak at young ages (attributed to high myopia and trauma) and a greater peak between 60 and 69 years.[2]

But what about elderly patients? Octogenarians and nanogenarians are an increasingly important segment of our society and our clinical practices, yet there is little in the literature describing the presentation and outcomes of older adults with RRD. Many factors can make RRD surgery challenging in the elderly patient. For example, positioning after vitrectomy-based procedures may be difficult for those with cervical and lumbar issues, and following postoperative instructions may be challenging for those with Alzheimer disease and other dementias. Patients in their 80s and 90s also have a higher incidence of hearing impairment, which can lead to difficulties communicating in the OR and during postoperative care. Higher anesthesia risk and medical comorbidities are also important considerations.

To better understand the characteristics and treatment outcomes of RRD in elderly patients, our group analyzed data from the Primary Retinal Detachment Outcomes (PRO) study, a large, comprehensive, observational data set from all patients at six centers who underwent primary RRD repair. Within the PRO database, we compared the presentations and outcomes of those over age 80 who underwent repair of RRD with patients between ages 40 and 79.[3]

AT A GLANCE

- Based on data from the Primary Retinal Detachment Outcomes Study, patients 80 years and older were more likely to present with macula-off detachments and preoperative proliferative vitreoretinopathy compared with patients 40 to 79 years old.
- Rhegmatogenous retinal detachment surgery was often more complex in elderly patients and more likely to require membrane peeling, intraoperative perfluoro-n-octane, and silicone oil tamponade.
- Postoperative positioning is crucial to ensure a successful retinal detachment repair; however, postoperative positioning may not be possible for some older adults because of concomitant musculoskeletal disorders.
- In elderly patients, the mean VA improved from preoperative 20/500 to postoperative 20/125, compared with 20/200 to 20/40 in younger patients.

COMPLEX PRESENTATIONS

When compared with younger adult patients (40–79), elderly patients (80 and older) were more likely to present with macula-off retinal detachments (49% vs 66%, respectively, $P < .001$) and preoperative proliferative vitreoretinopathy (7% vs 13%, respectively, $P = .023$). Furthermore, 59% of the elderly patients presented with VA worse than 20/200, and the mean presenting VA was much worse for elderly patients (20/500) compared with those in the younger cohort (20/200, $P < .001$).[3]

One factor contributing to this disparity may be that elderly patients have poorer access to eye care at multiple levels. For example, a population-based study of 6,775 elderly patients in community dwellings in the Netherlands identified older age (> 85), being homebound due to health reasons, and having lower Mini Mental Status Exam scores as risk factors for untreated cataract.[4] Further, in a study in Baltimore, nursing home residents were found to be more than 13 times more likely to be legally blind (VA > 20/200) than community dwelling adults of the same age.[5] In that study, 40% of the cases of visual impairment were treatable or preventable, with cataract surgery being the most important factor.

Examining risk factors for preventable and reversible causes of blindness in the elderly provides insight into the delayed and more complex nature of RRD in this population.

COMPLEX REPAIRS

Before undertaking surgery in an elderly patient, surgeons must carefully consider the type of anesthesia they will use. Although general anesthesia poses more risks with increased comorbidities, it may be necessary in certain cases such as for patients with an inability to hold still or maintain the correct positioning or those with physical disability or cognitive difficulties.[6,7] In our cohort of patients, most underwent monitored anesthesia care and local anesthesia, and not general anesthesia.[3]

The majority of elderly patients in our cohort were pseudophakic (90% vs 44% in the younger patients, $P < .001$), and the most common procedure performed was pars plana vitrectomy (PPV) alone (74%), followed by PPV in combination with a scleral buckle (SB; 27%). However, the surgery itself was often more complex in elderly patients, as the older patients were more likely to require membrane peeling, intraoperative perfluoro-n-octane, and silicone oil tamponade (Figure).

Postoperative positioning is crucial to ensure a successful retinal detachment repair; however, postoperative positioning may not be possible for older adults because of concomitant musculoskeletal disorders. The increased use of silicone oil in older patients in our series reflects both the greater complexity of the RRDs and the potential difficulties with postoperative positioning.

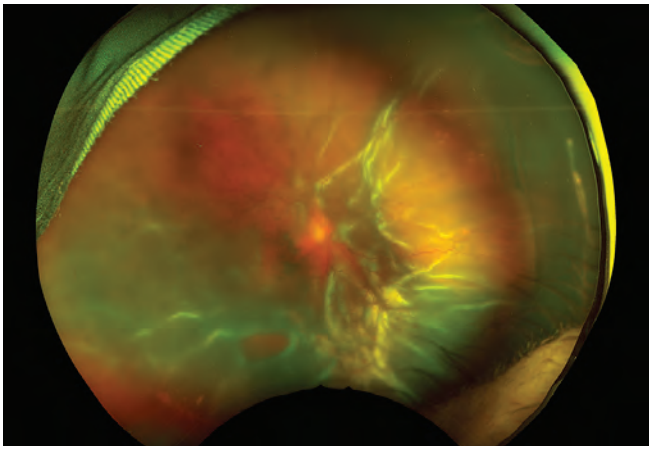

Figure. This is the fundus photograph of an 87-year-old male with multiple medical comorbidities, including newly diagnosed atrial fibrillation. He presented with decreased vision for approximately 2 months during a recent prolonged hospitalization for COVID-19 that required ICU support. On examination, he was pseudophakic with a VA of hand motions. He had a macula-off RRD with star folds and a large inferior break—all suggestive of chronicity. He underwent PPV, membrane peel, inferior retinectomy, perfluorocarbon drain, and silicone oil tamponade.

We also found that, although a greater number of elderly patients with an RRD underwent PPV alone, those who received SB plus PPV had a better single-surgery success rate (91% for SB plus PPV vs 74% for PPV alone, $P = .03$). Because most elderly patients have had cataract surgery, surgeons often prefer to tackle pseudophakic RRDs with PPV alone to prevent myopic shift and other potential SB-related issues. Although most patients have a favorable outcome with PPV alone, the addition of an encircling band may be beneficial in some patients.

Intraoperatively, the surgeon should manipulate the extraocular muscles carefully, as the oculocardiac reflex can result in arrythmias that can be particularly dangerous in geriatric patients with preexisting cardiac comorbidities.[8] Additionally, because elderly patients are more likely to experience osteoarthritis and neuralgia, surgeons should avoid a prolonged surgery whenever possible.

WORSE OUTCOMES

Due to the increased complexity of both RRD presentation and surgical repair, the final outcomes of elderly patients with RRD are often worse than they would be in younger patients. In our cohort, we found that mean VA improved from 20/500 preoperatively to 20/125 postoperatively in the older patients, compared with 20/200 preoperatively to 20/40 postoperatively in the younger patients ($P < .001$). Single-surgery anatomic success rate was 78% in the older patients compared with 84% in younger patients ($P = .03$).

A previous study following patients over age 85 showed similar results.[9] Nearly half of patients in that cohort who underwent PPV had a recurrent retinal detachment after

(Continued on page 22)

HOW TO HANDLE TRAUMATIC RETINAL DETACHMENTS

No two cases are alike, but some tried-and-true principles can help surgeons navigate even the toughest repairs.

BY YEWLIN E. CHEE, MD

Managing posterior segment trauma can be daunting due to the highly variable nature, often uncertain preoperative anatomy, and increased risk of complications such as intraoperative hemorrhage and postoperative proliferative vitreoretinopathy (PVR). Although each trauma case is unique, a set of standard steps and principles can help guide surgeons through the most challenging retinal detachment (RD) repairs. The following case presentations illustrate two different retinal complications that can present after ocular trauma and the management strategies that proved successful for me.

CASE NO. 1: RD REPAIR AFTER OPEN GLOBE INJURY

An elderly man had previously experienced a zone 3 open globe injury of his right eye and had undergone primary repair. The injury was a rupture, and the scleral laceration, located at the insertion of the lateral rectus muscle, extended approximately 10 mm posteriorly in a radial fashion. The laceration was completely closed, and the lateral rectus had been disinserted and replaced during the primary repair.

Although my postoperative examinations were limited by vitreous hemorrhage, B-scan ultrasound demonstrated a temporal macula-involving RD.

In situations in which another surgical team has performed the initial closure of an open globe injury, it is important to study the details of the repair when preparing for the secondary vitrectomy. Information about the zone of injury; wound location, trajectory, and length; and whether muscles were disinserted can help surgeons predict where the retina might be incarcerated and how easily (or not) they can place a scleral buckle. Performing a detailed preoperative B-scan ultrasound is essential to identify any hemorrhagic choroidal detachments, the location of the RD, and the status of the posterior hyaloid.

Having gathered this information, I performed the secondary vitrectomy in this case in a stepwise fashion (Table). During placement of an encircling band, the lateral rectus required additional dissection of scar tissue prior to isolation due to its disinsertion at the primary repair.

Lensectomy was performed, and then vitrectomy was begun superonasally because the preoperative B-scan ultrasound had shown that the hyaloid was elevated and the retina appeared attached in this quadrant. Once the subhyaloidal space was entered, this plane was extended until the entire retina could be visualized. As expected, the retina was incarcerated temporally in the scleral wound, with elevation and temporal dragging of the macula. Diathermy was applied in confluent spots to mark the anticipated retinectomy site, and I used both vertical scissors and the vitreous cutter to complete the retinectomy and release the incarcerated retinal tissue.

AT A GLANCE

- If another surgical team has performed the initial closure of an open globe injury, the surgeon should closely study the details of the repair when preparing for the secondary vitrectomy.
- With larger retinectomies, perfluorocarbon liquid is often useful to flatten the retina; however, in some cases a fluid-air exchange is sufficient to drain the subretinal fluid.
- Because sclopetaria injuries are full-thickness ruptures of the retina and choroid, surgeons must remember that membranes will often traverse the entire thickness of the retina; therefore, they must peel judiciously.

TABLE. STEPS FOR RD REPAIR AFTER OPEN GLOBE INJURY

1. Drain choroidals*
2. Place scleral buckle*
3. Remove lens*
4. Find the retina (peel preretinal membranes)
5. Find the disc
6. Identify and release incarceration site
7. Flatten the retina
8. Laser
9. Tamponade

*Steps 1 through 3 are case-dependent. Ensure that large hemorrhagic choroidal detachments are liquefied on preoperative B-scan ultrasound before attempting drainage. An encircling band is often desirable due to the high risk of PVR; however, placement can be challenging if the rectus muscles were disinserted at the time of primary globe repair. An encircling band might be unnecessary if a 360° retinectomy is performed. Removal of the crystalline lens with a complete capsulectomy can improve intraoperative visualization, allow more complete removal of the anterior vitreous, and reduce scaffolding for anterior loop PVR.

With larger retinectomies, perfluorocarbon liquid is often useful to flatten the retina; in this case, however, the nature of the scleral wound allowed use of a smaller radial retinectomy that ended quite posteriorly, and a fluid-air exchange was sufficient to drain the subretinal fluid. Afterward, two to three rows of laser spots were applied to the retinectomy edge (Figure 1), and silicone oil was inserted as a tamponade.

This repair was successful because I had a good understanding of the anticipated anatomy of the RD (based on my knowledge of the primary open globe repair) and a careful preoperative B-scan ultrasound.

CASE NO. 2: SCLOPETARIA-ASSOCIATED RETINAL DETACHMENT AFTER CLOSED GLOBE INJURY

A 24-year-old man presented 3 months after multiple gunshot wounds to the head and orbit with VA of 20/150 OD and no light perception OS. There was a complete inoperable RD in the left eye, with the retina adherent to the posterior lens capsule. The anterior segment examination of the right eye was normal. The dilated fundus examination of the right eye revealed extensive scarring of the posterior pole with preretinal and subretinal membranes, consistent with a sclopetaria injury (Figure 2). OCT imaging of the right eye confirmed that the retina was detached at the macula (Figure 3). Due to concern for progressive loss of vision in this patient's only seeing eye from the tractional RD, a

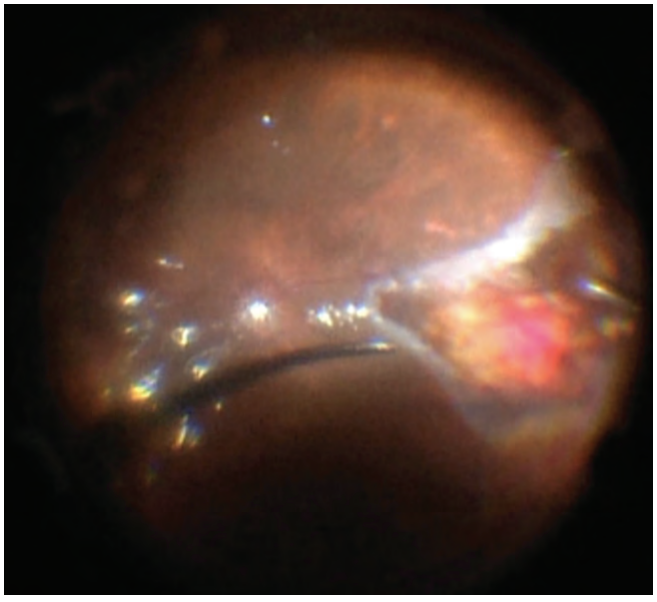

Figure 1. Two to three rows of laser spots were applied to the edge of the retinectomy that was required to release this patient's retina from its scleral incarceration site.

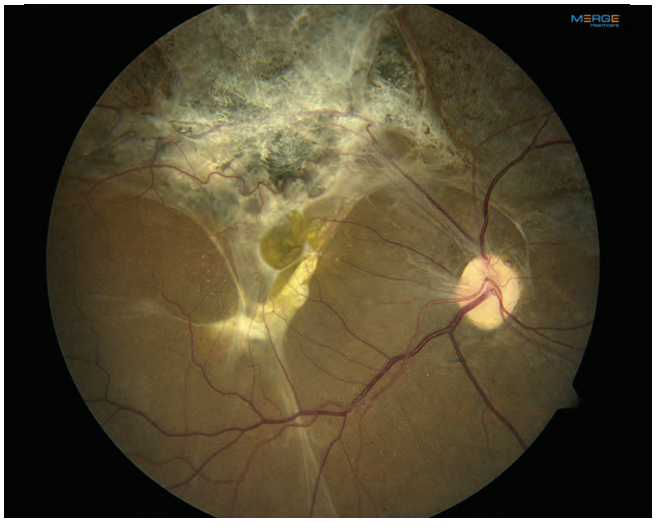

Figure 2. Multiple gunshot wounds to the head and orbit left this patient with extensive scarring of the left eye's posterior pole with preretinal and subretinal membranes, consistent with a sclopetaria injury.

25-gauge vitrectomy with membrane peel was performed.

Because sclopetaria injuries are full-thickness ruptures of the retina and choroid, surgeons must remember that membranes can often traverse the entire thickness of the retina, and therefore they must peel judiciously. Careful assessment of the preoperative OCT can help demonstrate where the membranes span the retina and aid in surgical planning.

In this case, I applied indocyanine green dye to the surface of the retina to stain the internal limiting membrane (ILM) and better delineate the plane where the epiretinal membranes (ERMs) were present. All of the ERMs were removed from the surface of the retina. In the areas where

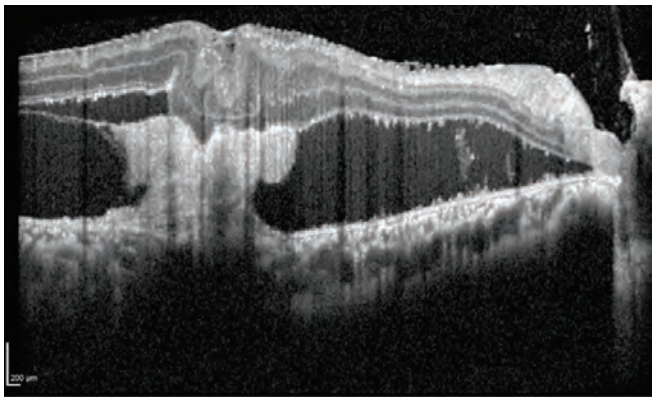

Figure 3. The OCT of the right eye showed an RD at the macula.

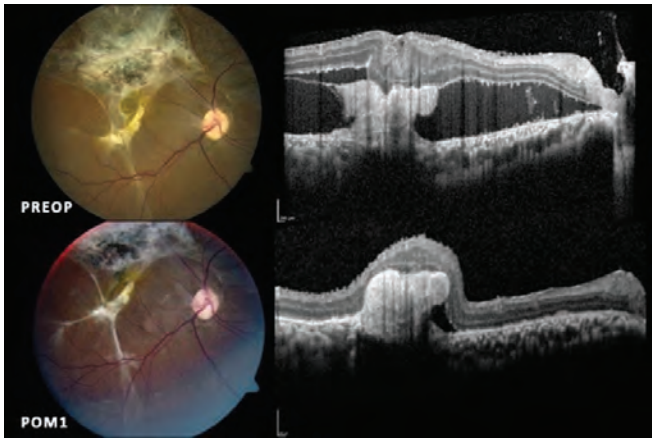

Figure 4. One month after RD repair, the RD had resolved, and VA was 20/100.

the membranes extended posteriorly through the retina into the subretinal space, I used intraocular scissors to truncate the membranes at the surface of the retina to decrease the chance of creating full-thickness breaks. The subretinal membranes were left intact under the assumption that the epiretinal traction alone had been sufficient to cause the RD and that attempts to manipulate these membranes could cause additional photoreceptor damage.

The eye was left under fluid, and within 1 month the detachment had resolved and the patient's VA stabilized at 20/100 (Figure 4).

This case involved a tractional RD associated with sclopetaria, but rhegmatogenous RDs can also occur. In such cases, retinal breaks are often found at the edge of the sclopetaria scars. ■

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(Continued from page 19)

repair (46%, n = 10/22), although the mean VA improved from 1.962 logMAR (20/1832) preoperatively to 1.232 logMAR (20/341) after a mean follow-up of 7.25 months.[9]

WRAP-UP

Although RRDs in the elderly have worse prognoses, there is still an improvement of quality of life that must not be discounted.[10] Retinal detachment surgery remains effective in improving visual function in patients over age 80, but outcomes may not be as favorable as they are in younger patients. Preexisting comorbidities, delayed presentation, difficulties with postoperative positioning, and many other factors likely contribute to worse outcomes for RRD repair in the elderly. Thus, thoughtful and individualized approaches to the care of elderly patients with RRDs are recommended, especially considering that these clinical scenarios are becoming more common as our global population ages. ■

1. Ortmann JM, Velkoff VA. An aging nation: The older population in the United States. US Census Bureau. May 2014. Accessed June 30, 2021. www.census.gov/library/publications/2014/demo/p25-1140.html
2. Mitry D, Charteris DG, Fleck BW, Campbell H, Singh J. The epidemiology of rhegmatogenous retinal detachment: geographical variation and clinical associations. *Br J Ophthalmol*. 2010;94(6):678-684.
3. Patel SN, Starr MR, Obeid A, et al. Characteristics and surgical outcomes of rhegmatogenous retinal detachment in older adults: A multicenter comparative cohort study. *Retina*. 2021;41(5):947-956.
4. Klaver CC, Wolfs RC, Vingerling JR, Hofman A, de Jong PT. Age-specific prevalence and causes of blindness and visual impairment in an older population: the Rotterdam Study. *Arch Ophthalmol*. 1998;116(5):653-658.
5. Tielsch JM, Javitt JC, Coleman A, Katz J, Sommer A. The prevalence of blindness and visual impairment among nursing home residents in Baltimore. *N Engl J Med*. 1995;332(18):1205-1209.
6. Raczyńska D, Glasner L, Serkies-Minuth E, Wujtewicz MA, Mitrosz K. Eye surgery in the elderly. *Clin Interv Aging*. 2016;11:407-414.
7. Chow WB, Rosenthal RA, Merkow RP, et al. Optimal preoperative assessment of the geriatric surgical patient: a best practices guideline from the American College of Surgeons National Surgical Quality Improvement Program and the American Geriatrics Society. *J Am Coll Surg*. 2012;215(4):453-466.
8. Dallinger S, Findl O, Strenn K, Eichler HG, Wolzt M, Schmetterer L. Age dependence of choroidal blood flow. *J Am Geriatr Soc*. 1998;46(4):484-487.
9. Anteby R, Barzelay A, Barak A. Vitrectomy in patients 85 years of age and older: surgical outcomes and visual prognosis. *Clin Interv Aging*. 2018;13:243-249.
10. Ma Y, Ying X, Zou H, et al. Rhegmatogenous retinal detachment surgery in elderly people over 70 years old: visual acuity, quality of life, and cost-utility values. *PLoS One*. 2014;9(10):e110256.

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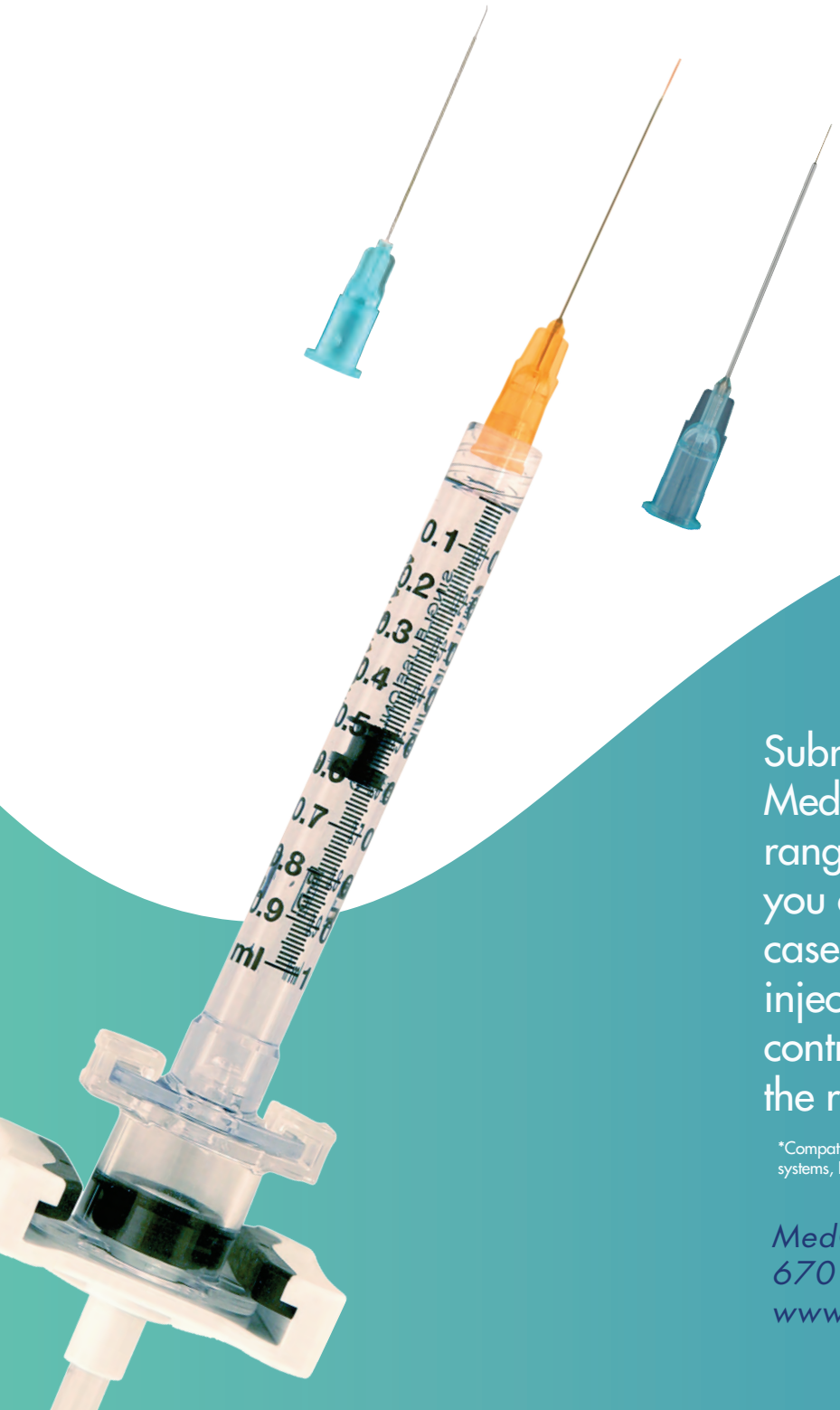

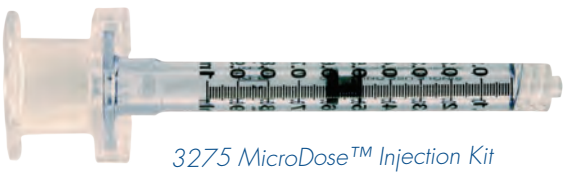

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HOW TO PERFORM THE LIFT-AND-SHAVE TECHNIQUE

Minimize complications of 27-gauge vitrectomy for tractional retinal detachment repair.

BY MARÍA H. BERROCAL, MD, AND LUIS ACABÁ-BERROCAL, MD

The surgical management of tractional retinal detachments (TRDs) can be challenging, and complications such as the creation of iatrogenic breaks may be associated with poor visual prognosis.[1] The use of small-gauge vitrectomy, particularly 27-gauge, with the lift-and-shave technique, can streamline the removal of fibrovascular tissue and traction with minimal need for ancillary instrumentation.[2]

Our preferred platform is the 27-gauge Hypervit Dual Blade Vitrectomy Probe (Alcon) with a cutting speed of 20,000 cpm. The parameters are set at the maximum cutting rate and vacuum, and aspiration is controlled with the foot pedal. Beginners can set the aspiration at 400 mm Hg until they feel at ease with the increased flow of the cutter. The 27-gauge Hypervit system permits increased flow rates that allow efficient removal of vitreous and controlled aspiration through the small 27-gauge vitrectomy probe opening.

PREOPERATIVE CONSIDERATIONS

Imaging with spectral-domain OCT prior to surgery provides invaluable information for the surgical plan. For example, imaging can help the surgeon determine if the fovea is attached, if epiretinal membranes are present, and if there is significant traction.

If vitreous hemorrhage precludes visibility, B-scan echography is essential to confirm whether the retina is attached, the vitreous is detached, or there are areas of traction.

If the fibrovascular tissue is significantly vascular, pretreatment with bevacizumab (Avastin, Genentech) 1 to 5 days before surgery is beneficial.

SURGICAL STEPS

1 Perform a core vitrectomy and remove all of the peripheral vitreous. TRDs are accompanied by at least partial detachment of the vitreous with strong attachments around the fibrovascular plaques. Begin to remove the hyaloid in the detached areas and cut the attachments around the fibrovascular plaques. To detach the vitreous, use the vitrector with aspiration at the maximum setting. Control the traction with the foot pedal to prevent breaks.

2 To remove the fibrovascular tissue, use only aspiration to lift the tissue and create a space between the retina

AT A GLANCE

- The use of small-gauge vitrectomy with the lift-and-shave technique can streamline the removal of fibrovascular tissue and traction with minimal need for ancillary instrumentation.
- The best way to understand the lift-and-shave technique is to see it as unimanual-bimanual dissection—you perform both functions with the vitrectomy probe sequentially, not simultaneously.
- You must control any bleeding. Adjunctive preoperative bevacizumab (Avastin, Genentech) can be helpful for highly vascular tissue.

and the fibrovascular tissue. Place the vitrector under the tissue and blunt-dissect it to separate it from the retina. If you experience any resistance, cut the fibrovascular tissue. Once the tissue is separated, change the aspiration setting to the cutter setting, and segment or back-cut. Switch the probe to aspiration again to continue lifting the fibrovascular tissue from the retina; cut any epicenters with the vitrector. Alternate like this between aspiration and cutting until all of the fibrovascular tissue is removed.

3 In some eyes, the fibrovascular tissue is tightly adherent to the retina, and no safe elevation is possible in the peripheral areas. In this event, detach the fibrovascular tissue around the optic nerve and dissect bluntly from the inside out. The area between the optic nerve and the fovea is often a good access point because it rarely has strong tissue attachments.

4 Once all of the fibrovascular tissue has been removed, aspirate any remaining blood from the retinal surface with the vitrector, or use reflux to lift it from the retina prior to aspiration.

5 Perform panretinal photocoagulation, particularly in the periphery up to the ora serrata. Do not apply laser to areas of elevated retina.

6 If the posterior pole was detached due to traction, perform a fluid-air exchange at the end of surgery, and instruct the patient to maintain a prone position for 1 to 2 days to help flatten the posterior pole.

7 Check sclerotomies for patency and use needling or suturing if needed.

SURGICAL POINTERS

The best way to understand the lift-and-shave technique is to see it as unimanual-bimanual dissection. That is, instead of lifting the tissue with forceps in one hand and cutting with scissors or the vitrector in the other, you perform both functions with the vitrectomy probe sequentially, not simultaneously. This is possible because of the delicate aspiration allowed by the small opening in the 27-gauge vitrectomy cutter tip and the minimal traction exerted on the retina during cutting, made possible by the high cutting speed. You can then lift the tissue and cut from the epicenters once resistance is encountered, repeating these two steps until all the traction is relieved.

You can perform blunt dissection with the vitrector in a manner similar to viscodissection, entering in the plane between the retina and the membrane and blunt-dissecting the tissue laterally. Once you create a separation between the fibrovascular tissue and the retina, you can cut the tissue.

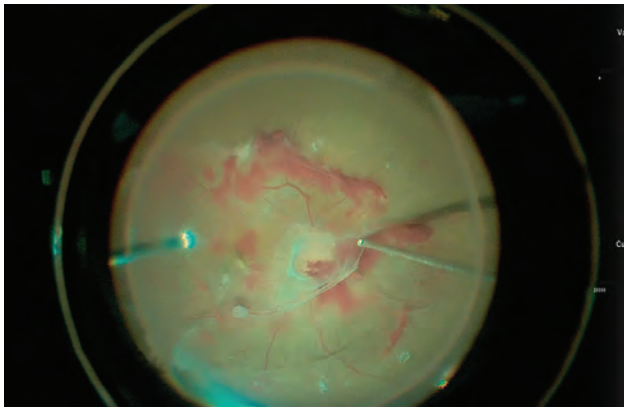
You must control any bleeding. Adjunctive preoperative bevacizumab can be helpful for highly vascular tissue. Be careful that systemic hypertension is controlled during the surgery, and increase IOP if bleeding occurs. If bleeding does not stop with increased IOP, apply direct pressure to the bleeding vessel with the vitrector for a minute, or apply continuous laser or diathermy to the bleeding areas.

Technological advances continue to improve our ability to manage difficult vitreoretinal pathologies and improve visual and anatomic outcomes. The constantly evolving technology calls for the creation of new techniques to take full advantage of these advances. ■

IMPORTANT CONSIDERATIONS

- Removal of all traction is not necessary unless a rhegmatogenous component is present or iatrogenic breaks are created.
- Removal of all vitreous attachments to the fibrovascular tissue is important to prevent increased traction later.
- At the end of the procedure, intravitreal bevacizumab can be injected, particularly in highly vascular cases.
- If postoperative vitreous hemorrhage occurs, perform an in-office fluid-air exchange.

WATCH IT NOW



RD Repair with the Lift-and-Shave Technique

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1. Thompson JT, de Bustros S, Michels RG, Rice TA. Results and prognostic factors in vitrectomy for diabetic traction retinal detachment of the macula. *Arch Ophthalmol*. 1987;105(4):497-502.
2. Berrocal MH. All-probe vitrectomy dissection techniques for diabetic tractional retinal detachments: lift and shave. *Retina*. 2018;38(Suppl 1):S2-S4.

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TIPS FOR SUCCESSFUL AUTOLOGOUS RETINAL TRANSPLANTATION


These pointers can help you handle complications that might arise during this surgery.

BY RYAN A. SHIELDS, MD, AND TAMER H. MAHMOUD, MD, PHD

The closure rate for primary macular holes (MHs) after pars plana vitrectomy (PPV) and internal limiting membrane (ILM) peel is excellent, but sometimes a refractory or atypical hole requires a more aggressive surgical technique. Autologous retinal transplantation (ART) can be a successful primary surgical option in patients with a large, chronic, or atypical MH. Additionally, it can be a secondary surgical option in patients with a refractory MH after PPV with ILM peel or ILM flap.[1-5]

The indications for ART have been expanding as surgeons become more adept at the procedure. For example, ART in combination with autologous retinal pigment epithelium and choroid transplantation can successfully close a chronic MH with underlying geographic atrophy and/or subretinal fibrosis.[6] Additionally, ART can be used to treat refractory optic disc coloboma–associated serous retinal detachments.[7]

The theoretical advantage of ART is that the transplanted retina will integrate into the adjacent tissue, potentially improving visual recovery compared with other inert tissue scaffolds.[8,9] In the Global Consortium Study, 33 vitreoretinal surgeons validated the feasibility of this procedure, achieving a high MH closure rate and good visual recovery in patients undergoing ART.[3] Nevertheless, surgical difficulties and complications of ART persist, including perfluorocarbon liquid (PFCL)-specific complications, graft dislocation, and retinal detachment.

PFCL PITFALLS

Intraoperatively, the use of PFCL is crucial to stabilize the retina during graft harvesting, manipulation, and placement in the bed of the MH. PFCL can be left in the eye as a short-term tamponade (1 to 2 weeks) to secure the graft and allow easier patient positioning (flat on the back). There is also a theoretical improvement in oxygen diffusion through a PFCL-filled vitreous cavity, which may have implications for early graft perfusion.[10] However, a separate surgery for PFCL removal is required as long-term PFCL retention is associated with intraocular inflammation.

Before and at the time of PFCL removal, it is essential to recognize slight graft displacement (as opposed to dislocation), occurring in approximately 10% of ART procedures.[3] If

AT A GLANCE

- The indications for autologous retinal transplantation (ART) have expanded as surgeons become more adept at the procedure.
- Before and at the time of perfluorocarbon liquid removal, it is essential to recognize slight graft displacement, occurring in approximately 10% of ART cases.
- In the authors' experience, delayed retinal detachments occurring weeks after the ART are not associated with a dislocation, as the graft is already integrated within the retina; thus, surgeons can focus on fixing the detachment.

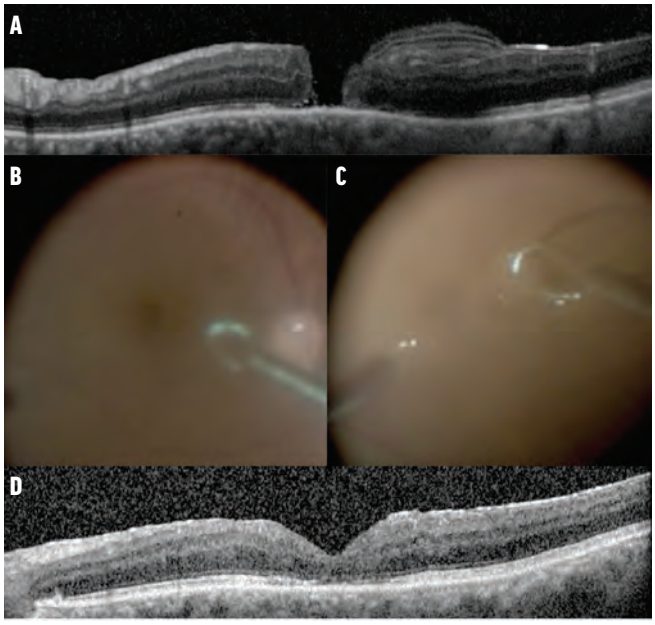

Figure 1. OCT demonstrates an eccentric ART with a nasal opening (A). Intraoperative photographs document before (B) and after (C) an adjustment of the ART. The post-adjustment OCT demonstrates good closure (D).

an eccentrically displaced graft is noted before PFCL removal, an adjustment can be performed. Although ILM forceps can be used for this, the Finesse Flex Loop (Alcon) may serve as a useful tool to gently manipulate the ART in the direction of the eccentric displacement under PFCL (Figure 1). After the adjustment, PFCL-air exchange with subsequent intraocular gas exchange is appropriate.

A dreaded complication of PFCL use is subretinal PFCL, reported in up to 11% of cases in which PFCL was used during vitreoretinal surgery in general.[11] The incidence of subretinal PFCL in the Global Consortium Study was significantly less, at 1.5%, and occurred only when ART was used to treat a combined MH-rhegmatogenous retinal detachment.[3]

The high specific gravity of PFCL that makes it useful in vitreoretinal surgery is also the property that results in its subfoveal migration. Therefore, in the event of subfoveal PFCL after ART, it is imperative to completely remove the PFCL to preserve the integrity of the retinal graft. Although many techniques for removal of subfoveal PFCL have been described, including the use of a small-gauge (39- or 41-gauge) cannula, these approaches are not advised in ART because they could lead to dislocation of the recent transplant. Instead, the following steps can be employed to remove PFCL bubbles under the ART:

- Completely remove PFCL from the vitreous cavity using a backflush soft-tip cannula with the eye tilted toward the optic disc.
- Visualize the subfoveal PFCL bubbles under the ART (Figure 2).
- With the backflush soft-tip cannula, apply gentle pressure over the ART to extrude the bubbles through the transplant edge to the preretinal space.
- Tilt the eye toward the optic disc and remove the bubbles with passive aspiration away from the ART.

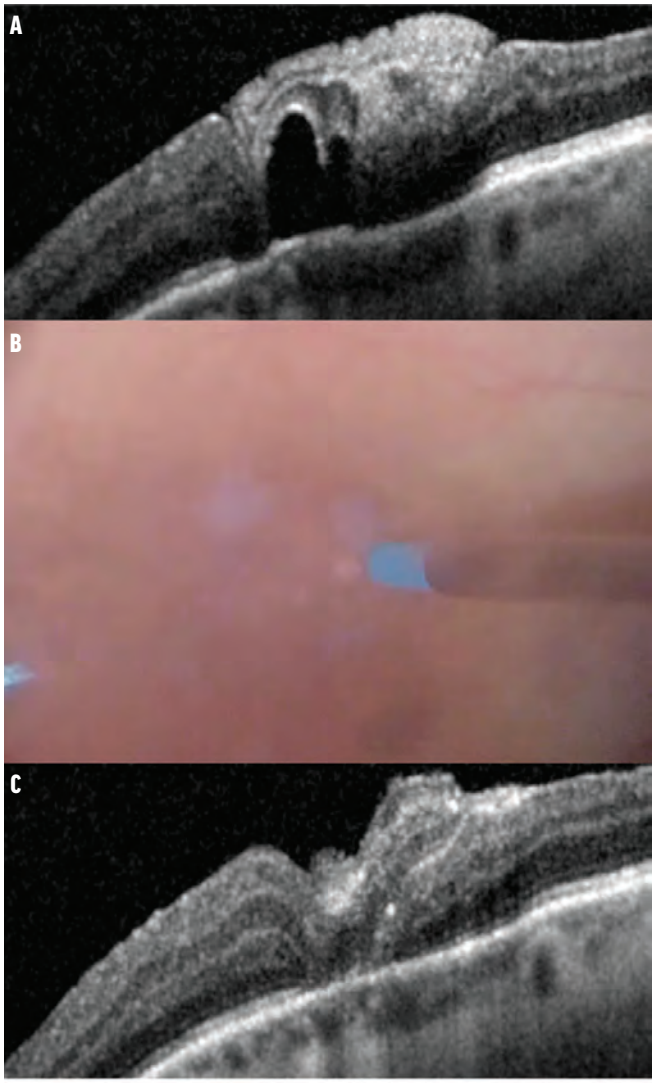

Figure 2. OCT imaging reveals subretinal PFCL after ART (A). During the procedure, gentle pressure is applied to the ART to express the PFCL bubbles around the graft (B). Postoperative OCT shows successful removal of the subretinal PFCL (C).

This technique is highly successful because the fresh transplant has not yet fully integrated within the adjacent macular tissue, allowing a path of minimal resistance for the PFCL bubbles to egress.

GRAFT DISLOCATION

Complete graft dislocation occurs in 3.8% to 4.8% of ART cases, necessitating a second surgery to repair the MH.[2,3] In the event of a graft dislocation, one can consider placing the subsequent ART in the subretinal space. Although the Global Consortium Study showed no statistically

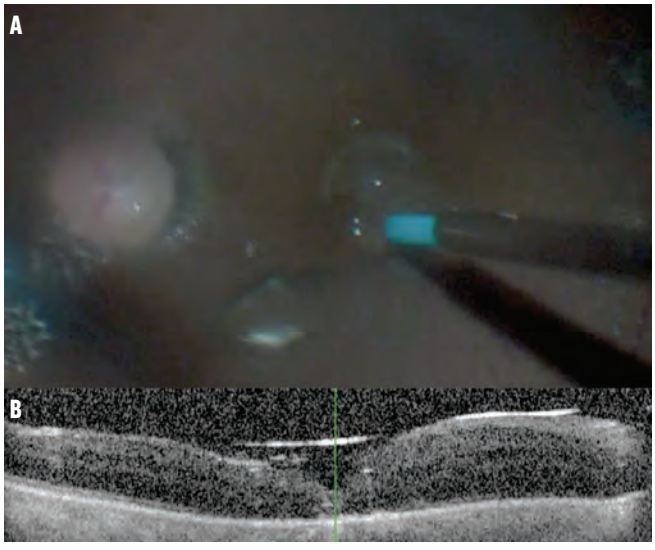

Figure 3. This intraoperative photograph illustrates the use of PFCL to displace an ART in the subretinal space (A). The postoperative OCT shows successful closure (B).

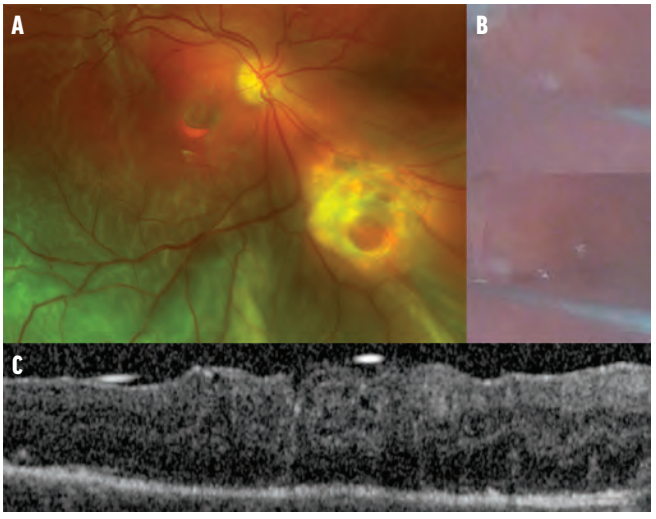

Figure 4. The fundus photograph shows a post-ART PVR detachment with a dislodged ART that is only partially closing the MH (A). The intraoperative photographs demonstrate the use of PFCL to reposit the ART (B). The postoperative OCT shows excellent ART placement (C).

significant improvement in MH closure or visual acuity with a subretinal ART versus a preretinal ART,[3] we recommend placing the second ART in the subretinal space to help minimize the chances of a second dislocation.

One of the difficulties with subretinal ART placement is the bimanual manipulation that is often required. Before attempting bimanual subretinal placement, the surgeon can use PFCL to place the ART in the subretinal space (Figure 3). With PFCL in the backflush line, the surgeon can actively inject a small PFCL bubble over the ART to forcefully position the ART in the subretinal space.

RETINAL DETACHMENT

The risk of proliferative vitreoretinopathy (PVR) secondary to graft harvesting is a concern with ART. Fortunately, the incidence of a PVR retinal detachment after ART is low, occurring in only 3.8% of patients in the Global Consortium Study.[3] If a PVR detachment occurs after a successful ART, standard vitreoretinal surgical techniques can successfully repair the detachment. However, care must be taken to protect the prior ART to prevent a displacement, dislocation, or both. To avoid this complication, PFCL should be used early in the detachment repair to reposit the displaced ART and stabilize the graft during more aggressive maneuvers.

In our experience, delayed detachments occurring weeks after an ART are not associated with a dislocation, as the graft is already integrated within the retina; thus, the surgeon can focus on fixing the detachment. However, a delayed PVR detachment with graft displacement can occur (Figure 4). Once PFCL is injected to reposit the ART, the retina can be successfully attached with excellent stability of the ART.

CONCLUSION

ART can be a useful technique in the repair of atypical, recurrent, and combined retinal detachment–associated MHs. Although it is a complex surgical technique, it is associated with excellent results in most cases. ■

1. Grewal DS, Mahmoud TH. Autologous neurosensory retinal free flap for closure of refractory myopic macular holes. *JAMA Ophthalmol*. 2016;134(2):229-230.
2. Grewal DS, Charles S, Parolini B, Kadonosono K, Mahmoud TH. Autologous retinal transplant for refractory macular holes: Multicenter International Collaborative Study Group. *Ophthalmology*. 2019;126(10):1399-1408.
3. Moysidis SN, Koulisis N, Adrean SD, et al. Autologous retinal transplantation for primary and refractory macular holes and macular hole retinal detachments: the Global Consortium. *Ophthalmology*. 2021;128(5):672-685.
4. Tanaka S, Inoue M, Inoue T, et al. Autologous retinal transplantation as a primary treatment for large chronic macular holes. *Retina*. 2020;40(10):1938-1945.
5. Thomas AS, Mahmoud TH. Subretinal transplantation of an autologous retinal free flap for chronic retinal detachment with proliferative vitreoretinopathy with and without macular hole. *Retina*. 2018;38(Suppl 1):S121-S124.
6. Parolini B, Grewal DS, Pinackatt SJ, et al. Combined autologous transplantation of neurosensory retina, retinal pigment epithelium, and choroid free grafts. *Retina*. 2018;38(Suppl 1):S12-S22.
7. Temmerman IM, Mahmoud TH, Veckeneer MAH. Autologous neurosensory retinal transplant to treat refractory serous retinal detachment secondary to optic disc coloboma. Preprint. Published online June 17, 2020. *Retina Cases Brief Rep*.
8. Patel SN, Mahmoud TH, Kazahaya M, Todorich B. Autologous neurosensory retinal transplantation: bridging the gap. Preprint. Published online May 2, 2021. *Retina*.
9. Tabandeh H. Vascularization and reperfusion of autologous retinal transplant for giant macular holes. *JAMA Ophthalmol*. 2020;138(3):305-309.
10. Lowe KC. Perfluorocarbons as oxygen-transport fluids. *Comp Biochem Physiol A Comp Physiol*. 1987;87(4):825-838.
11. Garcia-Valenzuela E, Ito Y, Abrams GW. Risk factors for retention of subretinal perfluorocarbon liquid in vitreoretinal surgery. *Retina*. 2004;24(5):746-752.

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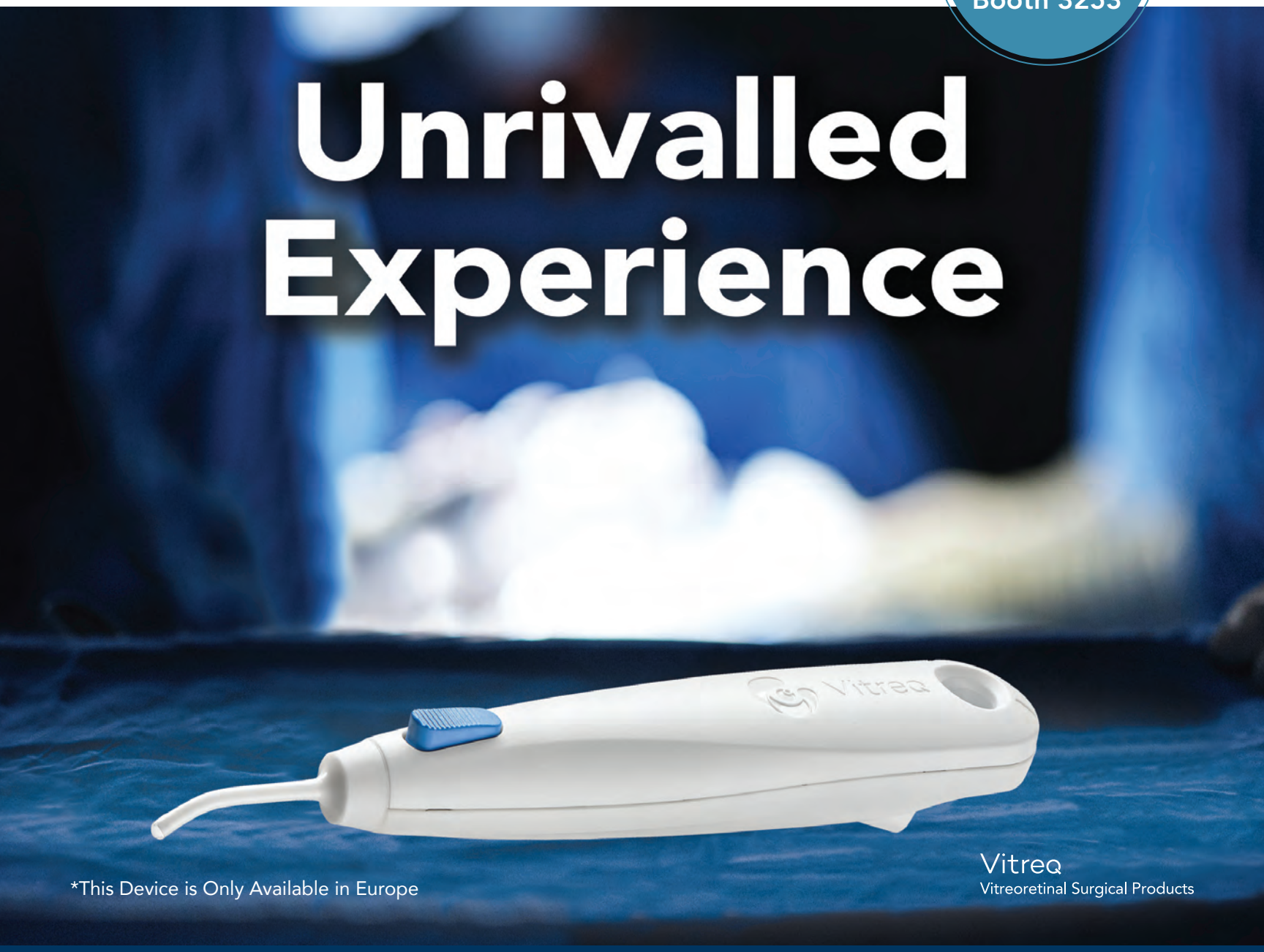

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THREE WAYS TO TACKLE TOUGH MACULAR HOLES

Experts shared their favorite approaches for closing large, chronic, recurrent, or myopic macular holes.

BY DANIELA MEIZNER, MD; JESSICA LEE, MD; AND PRETHY RAO, MD, MPH

Macular hole is one of the most common indications for retinal surgery, and the procedure for small, uncomplicated holes is relatively standard: pars plana vitrectomy (PPV), induction of a posterior vitreous detachment (PVD), internal limiting membrane (ILM) peeling, and fluid-gas exchange. This approach is successful in 93% to 98% of cases when the macular hole is small.[1-3]

Despite this high success rate, however, there are some types of macular hole that tend to have a higher failure rate. The most challenging are macular holes that are > 400 µm diameter, that have been open for more than 6 months, that present in high myopes, or that are recurrent.[4] For macular holes > 400 µm, the closure rate varies widely, with about a third of cases resulting in a flat open configuration with minimal visual improvement.[4,5]

In this article we share our favorite techniques for attempting to close large, chronic, recurrent, or myopic macular holes. We presented these techniques at the 2021 Vit-Buckle Society Annual Meeting.

MASSAGE THE MACULA

By Daniela Meizner, MD

This technique, first described by George A. Williams, MD, in 2013, has proven to be successful for even the most challenging macular holes.[6]

Perform a 25-gauge three-port PPV and induce a PVD if one is not already present. Stain the ILM with brilliant blue dye and peel it as wide as possible. Next, mount a 38-gauge subretinal cannula onto a silicone oil injection system (12 psi to 25 psi) filled with balance saline solution. Introduce the cannula into the subretinal space at three to four sites and inject the solution to produce a localized retinal detachment around the macular hole. Proceed then to gently massage the borders centripetally with a Finesse Flex Loop (Alcon) or a soft-tip cannula to carefully move the edges closer together.

Continue by taking a close look at the entire anterior retinal periphery using a scleral depressor to check for retinal breaks. Once you are satisfied that there are no breaks, perform a fluid-air exchange using a soft-tip cannula.

Finally, inject an isovolumetric concentration of SF_6 gas into the vitreous cavity and suture the sclerotomies, if needed. Postoperative facedown posturing is recommended for 3 days.

AT A GLANCE

- Creating a retinal detachment around a macular hole can help to release firm adhesions between the neurosensory retina and retinal pigment epithelium to facilitate closure of the hole.
- A human amniotic membrane patch placed under a recalcitrant macular hole helps resorb subretinal fluid that may surround the hole, leading to improvement in visual acuity.
- The goal of the rug technique is to release internal limiting membrane (ILM) tension over the hole by creating a single continuous sheet of ILM that ends with a superior hinge beyond the hole; this sheet is then draped back over the hole.

THERE IS STILL NO PERFECT APPROACH TO MANAGE CHALLENGING MACULAR HOLE CASES, AND WE CONTINUE TO LEARN AND INNOVATE WITH NEW TECHNIQUES AND TOOLS. WHEN FACED WITH A CHALLENGING MACULAR HOLE SURGERY, CONSIDER THESE TECHNIQUES.

Creating a retinal detachment around the macular hole can help to release the firm adhesions between the neurosensory retina and retinal pigment epithelium (RPE) to facilitate the closure of the hole. This technique and the injection of the balanced saline solution require a very careful hand to prevent damage to nearby structures such as the nerve fiber layer bundle and the RPE.

There are subtle variations of this technique; for example, the surgeon can decide whether to massage the borders of the hole and whether to use gas or oil as a tamponade. To avoid making extra holes in the macula, some surgeons prefer to inject the balanced saline solution through the original macular hole.

AMNIOTIC MEMBRANE GRAFT

By Jessica Lee, MD

Several innovative surgical techniques have improved the success rate of macular hole closure, including variations of ILM peeling.[7-9] The inverted ILM flap, ILM free flap, and ILM insertion techniques have all led to varying degrees of improvement in success rates.[8] Others have described the use of perifoveal radial incisions; detaching and reattaching the macula; and autologous blood or serum and platelet-rich plasma.[10,11] The use of an autologous retinal autograft has also been proposed, with good success and resulting in improvement in vision.[11]

The use of human amniotic membrane is one of the latest trends in surgical technique for the treatment of recalcitrant macular holes, although it was first described in 1957 by researchers in Germany.[12-14] More recently, Rizzo et al published on the use of human amniotic membrane for the repair of retinal breaks, recurrent macular holes, and macular holes in the setting of pathologic myopia.[12]

A human amniotic membrane patch placed under a macular hole helps to resorb subretinal fluid that may surround the recalcitrant macular hole, leading to improvement in visual acuity. Researchers have suggested that the amniotic membrane in the subretinal space serves as a scaffold for glial cell migration and enhances adherence of the edges of the hole to the underlying RPE.[15]

Here are some tips for performing surgery with human amniotic membrane grafts for recalcitrant macular holes:

- This technique is not for standard macular holes;
- Use a cornea punch biopsy tool;
- Use chandelier light to facilitate a bimanual technique;
- 25-gauge surgery is fine, as the membrane does not get stuck in the valved trocar;
- Use a soft-tip cannula;
- Make sure the sticky side of the amniotic membrane is down;
- You don't need perfluoro-n-octane (PFO);
- You don't need silicone oil.

ILM FLAP: THE RUG TECHNIQUE

By Prethy Rao, MD, MPH

The rug technique is a useful go-to option for all primary, large, chronic, or traumatic macular holes with existing ILM in adult and pediatric patients. It is a variation of an ILM technique first described by Tian et al in 2019, with the

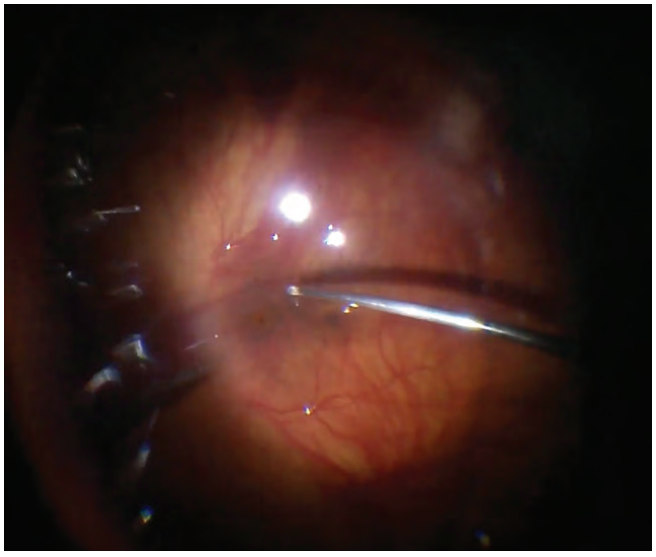

Figure 1. This 60-year-old patient with a full-thickness macular hole underwent a successful macular hole repair with the rug technique. In the final step of the procedure, the surgeon uses the last fluid wave of the fluid-air exchange to roll the ILM flap back over the hole.

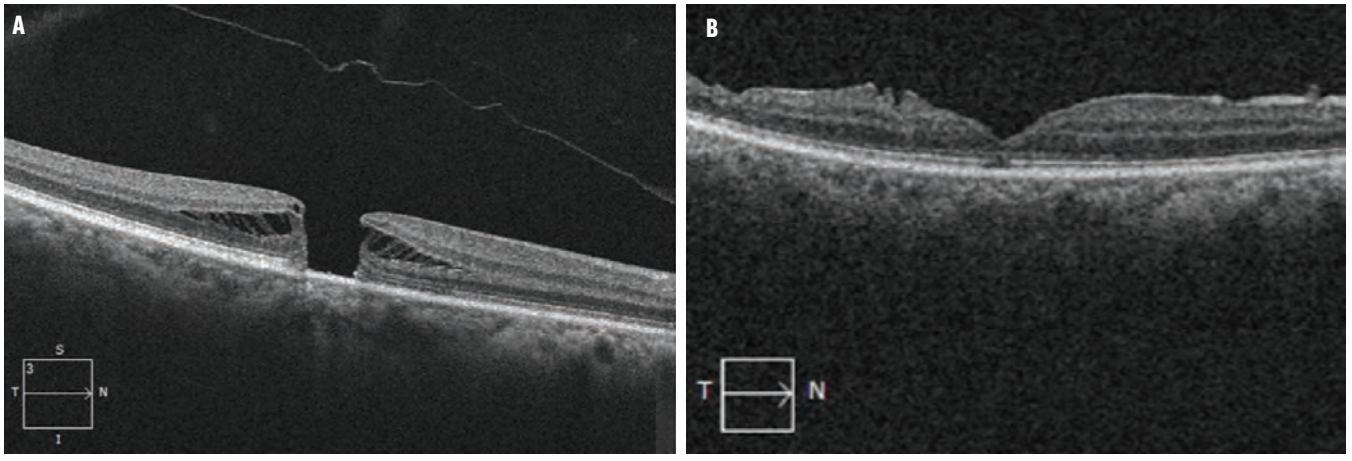

Figure 2. Preoperatively, the patient's VA was 20/70 (A). Postoperatively, VA improved to 20/40 (B).

exception that PFO is not used in our technique.[16] The goal of the technique is to release ILM tension over the hole by creating a single continuous sheet of ILM that ends with a superior hinge beyond the hole; this ILM sheet is then draped back over the hole. The advantage of this technique is its ability to restore or maintain the integrity of the Müller cell footplates, which helps patients achieve a more physiologic postoperative foveal contour with less distortion. Here are the basic steps.

Starting approximately 2 to 3 disc diameters directly inferior to the hole and using a pinch-and-peel technique with ILM forceps or a Finesse Flex Loop, initiate a flap carefully and pull superiorly a few millimeters. Repeat this step starting next to the edge of the initial flap to create a continuous sheet. To prevent amputation of the flap, carefully "walk" the ILM sheet superiorly in parts or segments and stay close to the retina while pulling the flap superiorly. The end of the flap (the superior hinge) should conclude about 2 to 3 disc diameters superior to the hole so that it remains tethered to the surrounding retina.

Initiate a fluid-air exchange. During the last 10% to 20% of the exchange, place the soft-tip cannula inferior to the hole (at the level where you initiated the flap) to allow the last fluid wave to roll the ILM flap back over the hole to its original physiologic position (Figures 1 and 2). A noticeable gap may exist between the inferior edge of the flap and the initial site, suggesting release of the ILM tension on the hole.

Surgeons should avoid using this technique in the presence of a concurrent epiretinal membrane due to the risk of regrowth and reopening of the hole.

FINAL THOUGHTS

There is still no perfect approach to manage challenging macular hole cases, and we continue to learn and innovate with new techniques and tools. When faced with a challenging macular hole surgery, consider these techniques. One of them just might lead to a successful outcome. ■

1. Rahimy E, McCannel CA. Impact of internal limiting membrane peeling on macular hole reopening. A systematic review and meta-analysis. *Retina*. 2016;36:679-687.
2. Lai MM, Williams GA. Anatomical and visual outcomes of idiopathic macular hole surgery with internal limiting membrane removal using low-concentration indocyanine green. *Retina*. 2007;27:477-482.
3. Park DW, Sipperley JO, Sneed SR, Dugel PU, Jacobsen J. Macular hole surgery with internal-limiting membrane peeling and intravitreous air. *Ophthalmology*. 1999;106:1392-1398.
4. Reis R, Ferreira N, Meireles A. Management of stage IV macular holes: when standard surgery fails. *Case Rep Ophthalmol*. 2012;3(2):240-250.
5. D'Souza MJ, Chaudhary V, Devenyi R, Kertes PJ, Lam W-C. Re-operation of idiopathic full-thickness macular holes after initial surgery with internal limiting membrane peel. *Br J Ophthalmol*. 2011;95(11):1564-1567.
6. Wong R. Novel surgical technique for closure of large full-thickness macular holes. *Retina*. 2013;33(9):1977-1979.
7. Smiddy WE, Feuer W, Cordahi G. Internal limiting membrane peeling in macular hole surgery. *Ophthalmology*. 2001;108(8):1471-1476; discussion 1477-1478.
8. Velez-Montoya R, Ramirez-Estudillo JA, Sjoholm-Gomez de Liano C, et al. Inverted ILM flap, free ILM flap and conventional ILM peeling for large macular holes. *Int J Retina Vitreous*. 2018;4:8.
9. Kannan NB, Kohli P, Parida H, Adenuga OO, Ramasamy K. Comparative study of inverted internal limiting membrane (ILM) flap and ILM peeling technique in large macular holes: a randomized-control trial. *BMC Ophthalmol*. 2018;18(1):177.
10. Korobelnik JF, Hannouche D, Belayachi N, Branger M, Guez JE, Hoang-Xuan T. Autologous platelet concentrate as an adjunct in macular hole healing: a pilot study. *Ophthalmology*. 1996;103(4):590-594.
11. Grewal DS, Mahmoud TH. Autologous neurosensory retinal free flap for closure of refractory myopic macular holes. *JAMA Ophthalmol*. 2016;134(2):229-230.
12. Rizzo S, Caporossi T, Tartaro R, et al. A human amniotic membrane plug to promote retinal breaks repair and recurrent macular hole closure. *Retina*. 2019;39:S95-S103.
13. Caporossi T, Pacini B, De Angelis L, Barca F, Peiretti E, Rizzo S. Human amniotic membrane to close recurrent, high myopic macular holes in pathologic myopia with axial length of ≥30 mm. *Retina*. 2020;40(10):1946-1954.
14. Csapody I. [Amnion implantation in therapy of macula hole]. *Ophthalmologica*. 1957;134(4):272-276.
15. Zeng Q, Karahan E, Hondur A, Tezel TH. Comperative anaysis of gliosis induced by covering of macular holes with a patch of retinal autograft vs. human amniotic membrane. *Invest Ophthalmol Vis Sci*. 2020;61(7):4392-4392.
16. Tian T, Chen C, Peng J, et al. Novel surgical technique of peeled internal limiting membrane reposition for idiopathic macular hole. *Retina*. 2019;39(1):218-222.

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MANAGEMENT OF CHRONIC POSTOPERATIVE CME WITH UVEITIS

Sustained-release implants should be considered for patients with chronic CME.

BY DAVID EICHENBAUM, MD

Pseudophakic cystoid macular edema (CME) is one of the most common causes of visual loss after cataract surgery,[1] although modern phacoemulsification and small-incision cataract surgery have reduced its incidence.[2] Pseudophakic CME occurs as a result of a cascade of inflammatory events, leading to the synthesis of prostaglandins and other inflammatory mediators in the anterior segment.[3] Patients with diabetes, autoimmune conditions, narrow angles, concomitant ocular disease, or complicated surgery are at heightened risk for CME after cataract surgery.[2]

Uncomplicated pseudophakic CME usually resolves spontaneously within 12 months after cataract surgery,[4] but it can become chronic in some complex cases. Chronic CME, a common presentation in retina practices, is most likely to occur in eyes that have undergone multiple surgeries subsequent to cataract extraction, complex surgeries that irritated the uvea (eg, from IOL suturing), or in the setting of trauma.

These cases are often frustrating to manage, either because traditional methods of treatment don't resolve the findings or because the need for long-term therapy becomes burdensome to the patient.

In my clinical experience, chronic CME is often a manifestation of noninfectious posterior uveitis. A close look at the posterior segment in patients with postoperative CME often reveals uveitic or vascular changes associated with the ongoing inflammation. Among the most common associated findings noted on examination are few to numerous cellular reflections on OCT imaging, just anterior to the macula. Another common finding is asymmetric optic nerve hyperfluorescence seen on fluorescein angiography.

MANAGEMENT

In most patients with CME, treatment begins with topical steroids, followed by sub-Tenon steroid injection. My next step, in the presence of posterior uveitic findings, is intravitreal injection of a dexamethasone intravitreal implant 0.7 mg (Ozurdex, Allergan), which releases dexamethasone for 3 to 6 months. Most CME will resolve

(Continued on page 36)

AT A GLANCE

- Chronic cystoid macular edema (CME), a common finding in retina practices, is most likely to occur in eyes that have undergone multiple surgeries.
- Most cases of CME will resolve after one or several intravitreal corticosteroid injections, but some are truly chronic, with edema returning after repeated therapy.
- A sustained-release approach can help to reduce patients' injection burdens and eliminate the peaks and troughs of inflammation that can occur with shorter-acting steroids.
- Close follow-up is warranted to ensure that patients with an intravitreal implant do not develop steriod-induced IOP elevation and to confirm reduction of inflammation and uvietic macular edema on OCT.

CASE EXAMPLES

Case No. 1. An 87-year-old White woman was referred to me with chronic CME (Figure 1A). Her history included cataract extraction with IOL implantation, a selective laser trabeculoplasty, two trabeculectomies, and placement of a microinvasive glaucoma surgery device. Although one would initially avoid using a steroid implant in a patient with glaucoma, this patient had a glaucoma drainage device, a functioning trabeculectomy, and no history of a steroid response to topical or shorter-acting intravitreal steroids. Under these circumstances, I felt comfortable giving her a long-acting steroid in the form of a fluocinolone acetonide 0.18 mg implant.

The patient has done well since implantation, with vision maintained at 20/25 to 20/32 in the affected eye and no macular edema (Figure 1B). Her injection burden was reduced, from receiving an intravitreal dexamethasone implant every 2 to 4 months to receiving the one fluocinolone acetonide implant followed by two booster intravitreal dexamethasone implants over the subsequent 2 years.

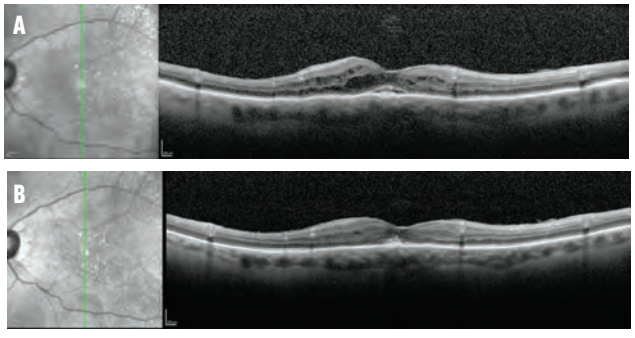

Figure 1. This patient with chronic pseudophakic CME (A) achieved long-term resolution of the edema after injection of a sustained-release steroid (B).

Case No. 2. A 69-year-old White woman presented with CME associated with posterior uveitis (Figure 2A and 2B). She had undergone vitrectomy surgery to repair a retinal detachment with a posterior tear, followed a short time later by cataract surgery and subsequent surgery for a macular pucker. I treated her with topical steroids, a sub-Tenon injection of triamcinolone acetonide (Kenalog, Bristol Myers Squibb), and then dexamethasone intravitreal implants every 2 to 3 months over several years (a total of eight to 10) before implanting the fluocinolone acetonide 0.18 mg implant when it became available. Her IOP is maintained with a single topical glaucoma drop. The ability to control the edema (Figure 2C) while avoiding multiple injections has significantly improved the patient's satisfaction with treatment.

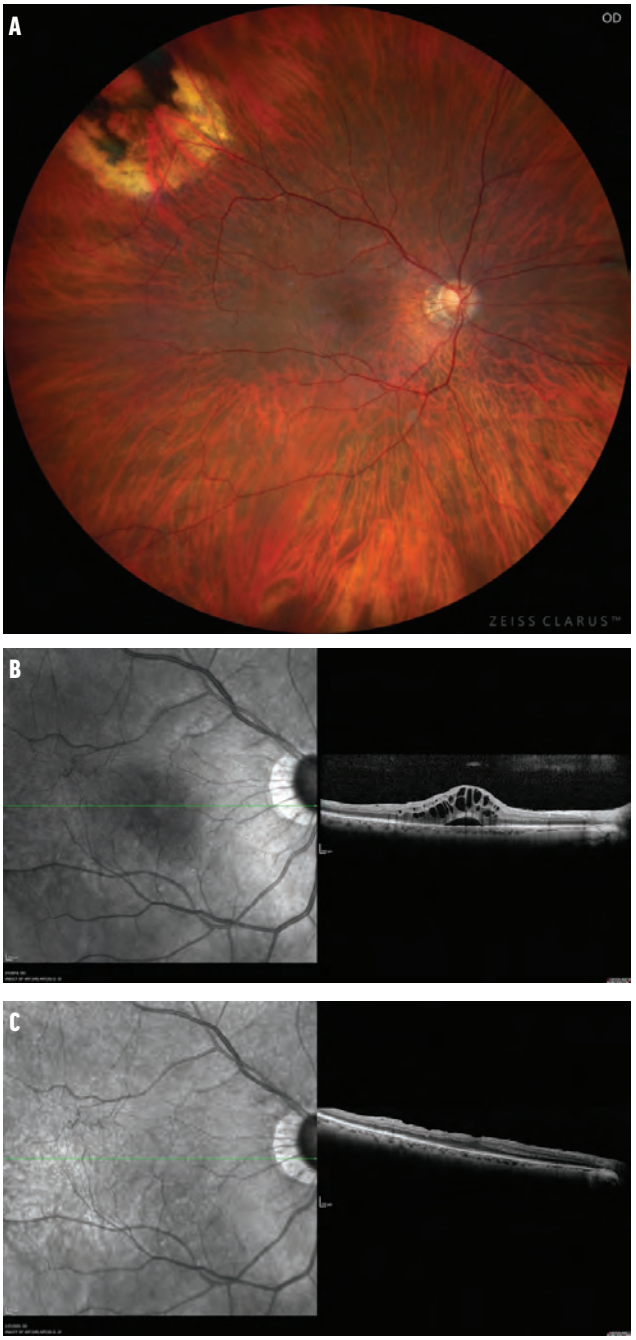

Figure 2. This patient's fundus imaging (A) and horizontal OCT (B) demonstrate chronic uveitic CME after multiple surgeries. She is doing well with the fluocinolone acetonide 0.18 mg implant injected approximately every 2 years (C).

MOST PATIENTS WITH CHRONIC CME DON'T NEED A LOT OF STEROID, BUT THEY DO NEED ONGOING INFLAMMATORY CONTROL OVER AN EXTENDED PERIOD OF TIME—PERHAPS INDEFINITELY.

(Continued from page 34)

after one or several of these injections, but some are truly chronic, with edema returning even after response to repeated corticosteroid therapy.

If CME persists or recurs and uveitic signs have been documented, the historical next-line antiinflammatory therapy is the saturable fluocinolone acetonide intravitreal implant 0.59 mg (Retisert, Bausch + Lomb). This has been a reasonable option, but it requires the patient to consent to an OR procedure, and it has a significant risk of increased IOP.[5] Some authors have advocated for the use of anti-VEGF injectable therapy to treat uveitic CME, but there is often limited applicability of VEGF inhibition in the multi-cytokine-rich environment of intraocular inflammation.[5]

Recently, I have had success treating patients with uveitic CME using the fluocinolone acetonide 0.18 mg injectable implant (Yutiq, EyePoint Pharmaceuticals). This implant is indicated for the treatment of chronic noninfectious uveitis of the posterior segment. The active ingredient is eluted at a low dose (about 0.2 µg per day) over approximately 3 years. I use it in eyes that have not manifested significant IOP elevation after previous shorter-acting steroid injections (Case Examples).

Most patients with chronic CME don't need a lot of steroid, but they do need ongoing inflammatory control over an extended period of time—perhaps indefinitely. Thus, the pharmacokinetics of sustained-release options, offering a slow trickle of steroid to maintain suppression of inflammation, can be beneficial in some patients with chronic CME. A long-term sustained-release approach can help to reduce injection burden and eliminate the peaks and troughs of inflammation that can occur with shorter-acting steroids.

INJECTION PEARLS

There is a learning curve for administering any injectable implant; unboxing and preparing the implant for injection are the most technically challenging parts of the procedure. In preparing a pre-filled injector for use, it is important to avoid inadvertently removing the rear plunger and to keep the injector tilted upward above parallel; otherwise, there is a risk of the implant dislodging from the injector after the trombone wire is removed. In my experience, the fluocinolone acetonide 0.18 mg implant's siliconized 25-gauge needle makes the injection smooth, and the procedure is well tolerated by patients.

After injecting the implant, I see patients every 2 to 4 months for the expected duration of the sustained-release therapy. Close follow-up is needed to ensure that patients do not develop steroid-induced IOP elevation and to confirm the reduction in inflammation and absence of uveitic macular edema on OCT.

As the drug is released from the implant over time, it is important to watch for breakthrough inflammation, an indication that a new implant may be needed.

If I observe breakthrough inflammation or edema, I may consider inserting a dexamethasone intravitreal implant while the fluocinolone acetonide implant is in place. In general, I have found that two implants can coexist well. There is space in the vitreous for both implants at the same time; the dexamethasone intravitreal implant will eventually dissolve or bioerode. Although there is limited literature on using multiple implants, clinicians must be aware of the potential for exacerbating steroid-induced increases in IOP when multiple implants are placed.

Some patients with chronic inflammation may require maintenance with a repeated long-acting steroid implant every 2 to 3 years.

FINAL THOUGHTS

We are fortunate to have a variety of good options now to manage posterior noninfectious uveitis and associated uveitic CME. For patients with chronic edema and inflammation, retina specialists should carefully examine the posterior segment for signs of uveitis and then treat accordingly, using longer-acting steroids if indicated. ■

1. Nelson ML, Martidis A. Managing cystoid macular edema after cataract surgery. *Curr Opin Ophthalmol*. 2003;4(1):39-43.
2. Yonekawa Y, Kim IK. Pseudophakic cystoid macular edema. *Curr Opin Ophthalmol*. 2012;23(1):26-32.
3. Sheppard JD. Topical bromfenac for prevention and treatment of cystoid macular edema following cataract surgery: a review. *Clin Ophthalmol*. 2016;10:2099-2111.
4. Shelsta HN, Jampol LM. Pharmacologic therapy of pseudophakic cystoid macular edema: 2010 update. *Retina*. 2011;31(1):4-12.
5. Shah KK, Majumder PD, Biswas J. Intravitreal therapeutic agents in noninfectious uveitic macular edema. *Indian J Ophthalmol*. 2018;66(8):1060-1073.

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RT Retina Today

Automated Subretinal Injection: Greater Accuracy, Precision, and Reliability

Improving delivery of subretinal injections will take on greater importance as more gene and cell therapies become available for retina patients.

BY CHRISTOPHER D. RIEMANN, MD

Manual techniques for administering subretinal injections during vitreoretinal surgery are associated with a number of challenges. Fundamentally, placing the subretinal injection cannula tip into the subretinal space and maintaining its placement without opening a larger retinotomy requires a good degree of fine motor skill. Even the best surgeons with the steadiest of hands struggle with accuracy in this setting, to say nothing of the additional challenge of depressing the syringe plunger while keeping the attached subretinal cannula in place.

One potential solution is for the surgeon to hold the cannula while an assistant injects the drug. However, even if the surgeon works with the same team during every surgery (which is not always the case), there is no good way to tell how hard the assistant is pushing on the plunger. A lack of reliability and consistency in dose delivery dynamics undermines the ability to know if enough drug has been delivered to achieve a therapeutic benefit, not to mention the risks of transretinal pigment epithelium (RPE) injection and damage from excessive jet pressure at the tip of the cannula.

As gene and cell therapies delivered via subretinal injection move closer to regulatory approval, these concerns become more important. We need to know exactly what dose is being delivered and that it is being delivered safely. If we can't demonstrate that therapeutic modalities are safely delivered in a precise, accurate manner, it may compromise regulatory approval. Furthermore, manual delivery techniques may yield a substantial amount of drug efflux through the retinotomy with some estimates of between 40% and 60% of the delivered product escaping to the vitreous cavity.[1,2] A number of concerning questions arise from this reality: What happens to the live viral vector containing the therapeutic product? Does it percolate into the aqueous and/or transfect the trabecular meshwork? Does it reach the systemic circulation and transfect extraocular structures? If so, what if there is a need to turn off the biologic activity of the gene or stem cell therapy if the product has already reached the bloodstream? We need more confidence in our subretinal injections.

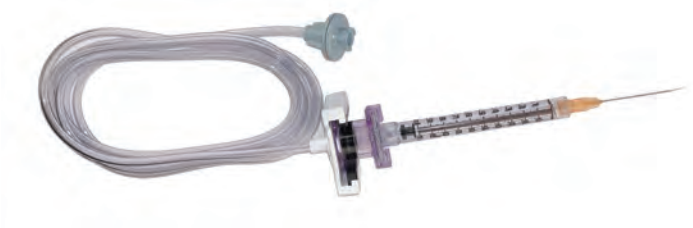

Figure. The MicroDose Injector set up with subretinal cannula and VFI tubing.

AUTOMATED INJECTION DELIVERY

A recently introduced automated injection system may solve several problems with subretinal drug delivery. The MicroDose Injector (MedOne; Figure), a pneumatic powered syringe which received 510(k) clearance from the US Food and Drug Administration earlier this year for low volume ophthalmic injections into the subretinal space, is connected to a vitrectomy machine to allow actuation of the syringe stopper via surgeon foot pedal control. It is fully compatible with most of the currently available vitrectomy platforms, including the CONSTELLATION (Alcon), Stellaris (Bausch + Lomb), and EVA (DORC) platforms. The MicroDose also results in less dead

space and related drug wastage because the tubing between the cannula and the injection syringe (held by the assistant) is eliminated.

The MicroDose is easy to set up, simple to use, has almost no learning curve, and results in predictable, reliable, precise, and accurate drug delivery into the subretinal space. Because a surgical assistant is not involved in the drug injection, the surgeon's hands concentrate on subretinal cannula placement, and foot pedal control injects the drug. I have used the device to inject tissue plasminogen activator mixed with an anti-VEGF agent to treat subretinal hemorrhage secondary to age-related macular degeneration and as part of the protocol in some of the gene therapy studies in which I have participated. Although I have not yet used it in any applications related to subretinal cell therapy, I have been involved in trials with the cell therapies where presumed cell efflux into the vitreous was associated with epiretinal membrane formation.

SET-UP, USE, AND IMPACT ON EFFICIENCY

The MicroDose Injector is simple to use and easy to integrate into one's routine with improved efficiency. The filling process, which takes about 20 seconds, can be completed in one of three ways:

- Inject from a second syringe into the tip of MicroDose syringe whose plunger has been withdrawn;
- Utilize a draw needle from a vial and use aspiration from a vitrectomy machine; or
- If the injectable is in a vial with a luer adapter, screw it onto the syringe and withdraw directly using aspiration from the vitrectomy machine.

The injector is then primed to evacuate any air. Giving the syringe a firm shake drives the injection drug against the syringe plunger and air toward the subretinal injection cannula where it is expelled using a low pressure setting on the vitrectomy machine. Try to avoid creating a constant stream of injectable from the subretinal injection cannula tip to reduce the chance of jet pressure-related damage to the RPE or injection into the choroid. Depending on the viscosity of the drug being delivered, the pressure setting will need to be adjusted. I typically start at 10 psi and adjust until I see a slow drip—about 1 to 2 drips per second.

During the actual injection, the rate of delivery can be adjusted via the foot pedal. In most cases, I set my maximum injection pressure at 14 to 16 psi, but most of the drug injection is delivered at a lower pressure. I use more pressure (closer to the max limit) until a bleb starts to form and then back off the pressure (to the 4 to 6 psi range) while gently pulling the cannula away from the RPE, maintaining it in the subretinal space. I use NGENUITY (Alcon) for all my surgeries, and the heads-up display settings are of great benefit in making real-time dynamic foot pedal-based adjustments to injection pressures in response to changing bleb geometry as the subretinal bleb forms.

CONCLUSION

Automating the plunger depression for subretinal delivery of drugs has several benefits, including improved predictability, reliability, precision, and accuracy. It is also associated with an improved safety profile, less drug wastage due to lower dead space, and a smaller retinotomy, which may reduce drug efflux into the vitreous cavity. As more patients receive precious and expensive gene and cell therapies, better, safer, and more precise drug delivery with less wastage will only become more important. ■

1. Hsu ST, Gabr H, Viehland C, et al. Volumetric measurement of subretinal blebs using microscope-integrated optical coherence tomography. *Transl Vis Sci Technol*. 2018;7(2):19.
2. Sastry A, Li JD, Raynor W, et al. Microscope-integrated OCT-guided volumetric measurements of subretinal blebs created by a suprachoroidal approach. *Transl Vis Sci Technol*. 2021;10(7):24.

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PARALYMPIC SWIMMER WITH STARGARDT WINS GOLD

Gia Pergolini refused to let vision loss stop her from achieving her dream: setting a world record and winning gold at the 2020 Paralympics. **BY REBECCA HEPP, EDITOR-IN-CHIEF**

Beginning in kindergarten, Gia Pergolini of Roswell, Georgia, had trouble seeing. But it wasn't an issue easily corrected with eyeglasses. "There was something wrong with her eyes and no one could tell us what it was," said Alice Pergolini, Gia's mother. Gia and her family spent the next 4 years bouncing from specialist to specialist in their search for answers. The theories of why Gia was having trouble seeing through her central vision were just that, theories. "They couldn't diagnose her, and they thought she fell on her head as a child. They were suggesting she had some sort of brain damage," Alice told *Retina Today*.

Finally, when Gia was in the fourth grade, Alice took her to a neurosurgeon at Emory University who got to the heart of the problem: Stargardt disease. This autosomal recessive dystrophy is the most common form of inherited macular degeneration, affecting an estimated 1 in 8,000 to 10,000 people in the United States.[1]

EARLY STRUGGLES

But a diagnosis was only the beginning. How would Gia see? Alice reached out to the Center for the Visually Impaired (CVI), which was a game-changer for Gia. There, she received the real-world help she needed with video magnifiers and other assistive technology.

"The CVI is what really helped Gia," Alice explained. "After she was diagnosed with Stargardt, I said OK, how do we teach her in school? None of her doctors could help me with that, and the private school she was attending did not have the funding or equipment to help. The CVI tested Gia to see what would work best for her in school, and the experts there listed recommendations that really helped Gia."

"I have dealt with this my whole life, so I didn't know anything different when I was younger, and I didn't struggle as much as people might think," Gia said. "But now it's more about the social aspect, especially since I found out my vision is too bad for me to drive, even with assistive technology."

FINDING HER PLACE

Now, Gia has something that has earned her respect from her peers and quieted any teasing that might have come her way in the past: She competed as a member of the 2020 Paralympic swim team—and brought home the gold for her world-record-setting performance in the 100 m backstroke.

"I started swimming when I was 4, and I just loved it," Gia said. "It was a sport where my vision wasn't as much of a factor, and I was really good at it." Joining a year-round swim team, Gia found that she excelled at the sport, and she developed under the tutelage of several different coaches over the years. Her first coach introduced Gia to the Paralympics, and Alice took her to a competition in Canada, "just to see if she liked it."

"Once we got to Canada and they saw her, the next thing we knew she was on a plane to Berlin," Alice said. "And then she was on the team, and she was traveling. She was having to go to world championship, and all over the world, basically."

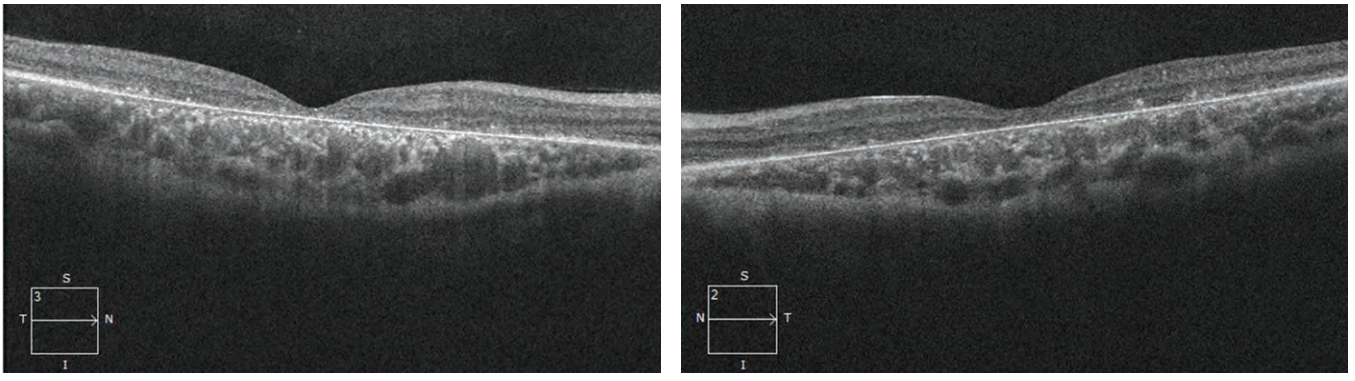

Figure 1. Gia's OCT images show photoreceptor atrophy approximately 1 disc diameter around the fovea in each eye.

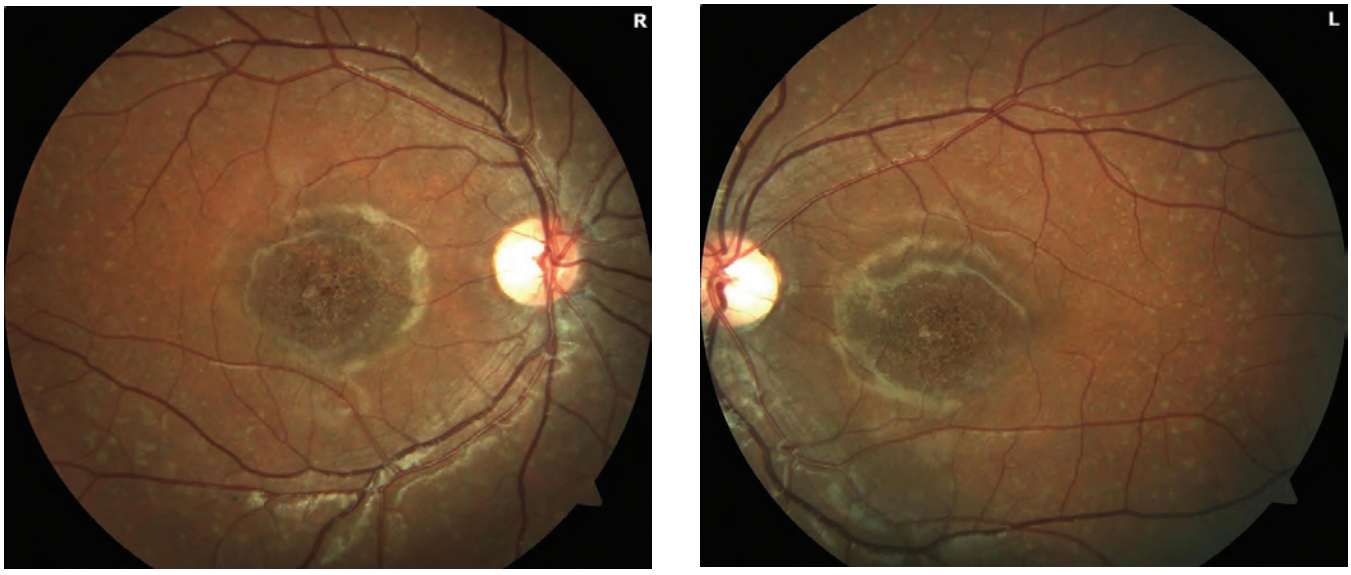

Figure 2. Her fundus photographs shows retinal pigment epithelial mottling around the fovea, indicative of photoreceptor thinning, as well as macular pisciform flecks, which are classic for Stargardt maculopathy.

"DON'T LET THIS DISEASE DEFINE OR CONTROL YOU. ANYTHING IS POSSIBLE IF YOU PUT YOUR MIND TO IT. GO FOR YOUR DREAMS."

Now, she has accomplished what most of us can't even dream of. And her vision didn't get in the way. "My vision has been relatively stable," Gia noted. "In the future, I know it'll progressively get worse, but all I can hope for is a cure. And I'm not really too worried about that right now."

THE CLINICAL PICTURE

Gia began seeing Krishna Mukkamala, MD, a retina specialist at Georgia Retina, in 2017. At the time, Gia's VA was 20/200 distance and 20/50 near in each eye. Her most recent follow-up revealed VA of 20/400 distance and 20/30 near OD, and 8/200 distance and 20/100 near OS (Figures 1 and 2). With recent developments in the field of retinal genetics, Dr. Mukkamala suggested that Gia undergo genetic testing again.

"She was tested years ago, and the results were negative," Dr. Mukkamala explained. "But we just got her new results back from the ID Your IRD panel [Invitae], and it shows that she has two mutations in the *ABCA4* gene, confirming Stargardt and ruling out any differential such as a cone-rod dystrophy. It just goes to show how much the technology is changing and the importance of staying on top of these advances."

Although no therapies are approved for Stargardt disease, a confirmed diagnosis with genetic testing still holds significant clinical value, according to Dr. Mukkamala. Documenting the genetic mutation could allow a patient like Gia to enter appropriate clinical trials or could demonstrate eligibility for treatment if a therapy is approved. It also can help patients and their parents better understand family planning options down the road and inform their decisions on whether to take certain supplements, such as vitamin A.[2]

SUPPORT IS KEY

Dr. Mukkamala's counseling and ongoing communication has been invaluable to Alice and Gia, particularly after their earlier years of searching for answers. "Dr. Mukkamala is on top of everything, and he immediately educated us on potential gene therapies and our other options, including a referral to a low-vision specialist," Alice said.

While Dr. Mukkamala keeps his ears to the ground for potential trial opportunities, Gia stands as a beacon of hope for all patients with vision loss. With a gold medal in hand, she offered sage advice for others living with Stargardt disease: "Don't let this disease define or control you," Gia said. "Anything is possible if you put your mind to it. Go for your dreams." ■

1. Tanna P, Strauss RW, Fujinami K, Michaelides M. Stargardt disease: clinical features, molecular genetics, animal models and therapeutic options. *BMJ Ophthalmol*. 2017;101(1):25-30.
2. Federspiel CA, Bertelsen M, Line Kessel L. Vitamin A in Stargardt disease-an evidence-based update. *Ophthalmic Genet*. 2018;39(5):555-559.

Editor's notes: The clinical data and images contained within this article were provided with full written permission from the patient and her parent. A version of this article was published ahead of print August 10, 2021.

Evolution in Retinal Detachment Surgery

Three case studies featuring the latest innovations and trends.

BY STANISLAO RIZZO, MD; SIEGFRIED PRIGLINGER, FEBO; AND GERARD MCGOWAN, MB CHB, RCOPHTH

Introduction

The treatment of retinal tears and detachments almost always requires surgical intervention, and a variety of surgical options are available. Today, between 10% and 20% of cases require scleral buckling which, when the lesion is limited to one quadrant, could be the only surgery executed. In our opinions, the most relevant latest innovation is cryotherapy with CryoTreq (Vitreq, a Beaver-Visitec International company; Figure 1). During this treatment, extreme cold is applied on the episcleral tissue to induce chorioretinal adhesion by creating a retinopexy that seals the retina against the wall of the eye.

Traditional cryotherapy is cumbersome and expensive, but with CryoTreq, the surgery becomes straightforward. It eliminates the need for foot-controlled bulky equipment, time-consuming and uncertain priming, and unreliable reusable cryoprobes. CryoTreq's tip reaches cryogenic temperatures within a few seconds of activation and can deliver a minimum of 15 freeze dots on the same patient.

Figure 1. The CryoTreq device.

CryoTreq provides an alternative to laser photocoagulation. This is especially helpful for lesions located toward the anterior sector of the eye and initial localized retinal detachments. This minimally invasive, *ab externo* approach to the treatment of retinal tears and detachments requires minimal time for preparation, and it is an intuitive procedure to perform.

The preparation of cryo equipment is preceded by a high level of uncertainty due to the various elements that must work at the same time, including moving the machine into the OR; having the gas tanks charged and the filters cleaned; finding the sterilized probes; educating the nurse who must be able to turn on, perform checks, and set up the cryo equipment; assembling the equipment; verifying probe functionality; and finding an accessible space for the cryo pedal between the many pedals that already crowd the area under the operating bed. These steps add distressing complexity that sometimes cause us to prefer the laser even if it was not explicitly indicated.

Case No. 1: A Simple Episcleral Surgery Technique With CryoTreq and 29-Gauge Spotlight Directional Chandelier

BY STANISLAO RIZZO, MD

The approach to retinal detachment and episcleral surgery scarring is evolving. Often, pneumatic retinopexy is the procedure of choice, but other approaches such as scleral buckling, vitrectomy, silicone oil tamponade, or a combination of these procedures may be preferred in specific situations. In this case, I present a procedure where I use the novel 29-Gauge Spotlight Directional Chandelier (29G SDC; Vitreq, a Beaver-Visitec International company) and a classic episcleral cryosurgery technique with CryoTreq.

CASE PRESENTATION

Background. A 56-year-old woman presented with a retinal detachment in her right eye. Years earlier, she had experienced a detachment in the contralateral eye and had undergone pneumatic retinopexy.

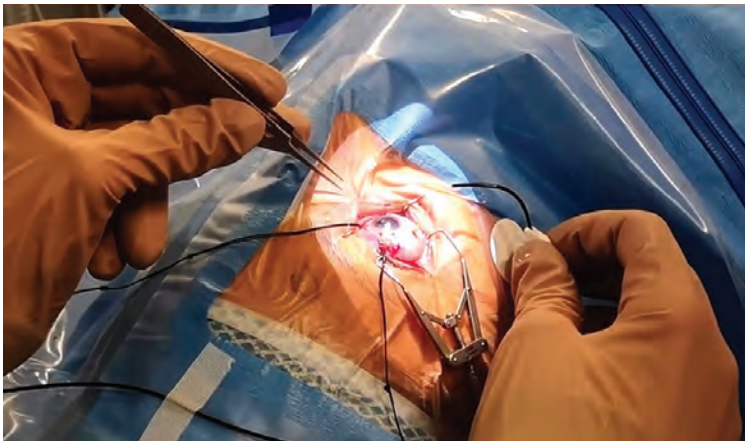

Figure 2. The 29G SDC is placed inside the trocar.

After that failed procedure, she had undergone three additional surgeries (retinal buckling, vitrectomy, and silicone oil tamponade), resulting in a very low visual acuity. When counseling the patient on her options for her right eye, she convinced me—not I convinced her—to do a classic episcleral surgery.

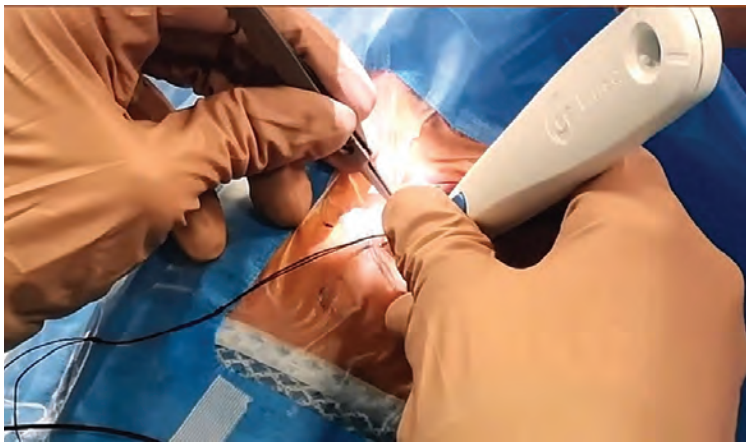

Figure 3. The CryoTreq procedure is performed.

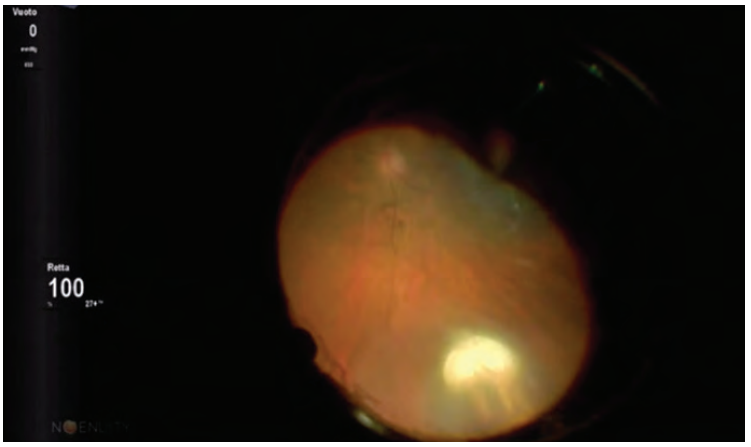

Figure 4. Cryotherapy is supplied at the push of a button.

Surgery. This case involved a minimally invasive episcleral surgery. I needed to open only two layers, the conjunctiva and the tenon, to expose only one quadrant, the superior temporal one. Being in a university hospital, I always try to find good opportunities to teach residents and young surgeons. For this reason, I opted to operate with a 29G SDC because it's a perfect tool also for teaching: it enhances the view of the breaks, having an integrated directional function and coming with a wide-view fiber tip for global endoillumination, I can turn it in every direction to see well everywhere. The 29G SDC includes an integrated valved-entry system and scleral marker to aid with insertion and fixation of the fiber. I can insert it into the trocar using a simple maneuver (Figure 2).

In this case, I was able to easily identify the retinal break indenting the superior quadrants. The directional chandelier was in the temporal inferior quadrant during the treatment, opposite to the break.

To mark the sclera, I used an O'Connor scleral depressor-marker. I then highlighted the indentation with a blue pen and proceeded to treat the retinal break with the CryoTreq (Figure 3), the first and only disposable handheld instrument for ophthalmic cryocoagulation. With the CryoTreq technology, cryosurgery can be completed in as little as a few minutes. The device is quickly prepared with a simple maneuver of the activation lever after which the cryotherapy is delivered through a simple touch of a finger.

The CryoTreq provided perfect control of the retina. I saw the small break in the periphery; once the device was in the correct position centered on the break, I supplied cryotherapy with the push of a button (Figure 4). The device can supply up to 15 freeze cryotherapy applications, which is enough to treat any retinal area within the eye. At the end of the procedure, I placed a 5-mm sponge to close the break.

CONCLUSION

The use of the novel 29G SDC in complex cases has helped to simplify my surgical approach. It helps create a stable eye and a pristine view of the surgical field. Further, cryosurgery with the CryoTreq is a huge step forward, satisfying the needs of reliability and ease of use. These tools are great adjuncts to improving and simplifying one's surgical technique.

Case No. 2: Simplifying Surgery With CryoTreq

BY SIEGFRIED PRIGLINGER, FEBO

As surgeons, we continually strive to refine our procedures and techniques, embracing the latest innovations and trends. In this case, I used the CryoTreq to simplify a multistep procedure with successful results.

CASE PRESENTATION

Background. A 68-year-old man complaining of flashes and reduced visual acuity during prior weeks presented to our clinic. The patient's fundus examination revealed a small retinal detachment at the nasal superior quadrant (Figure 5) and a small full-thickness macular hole with some epiretinal membrane. There were also two small peripheral retinal tears at the 12 and 12:30 clock positions.

Surgery. Due to the patient's age and the presence of an early

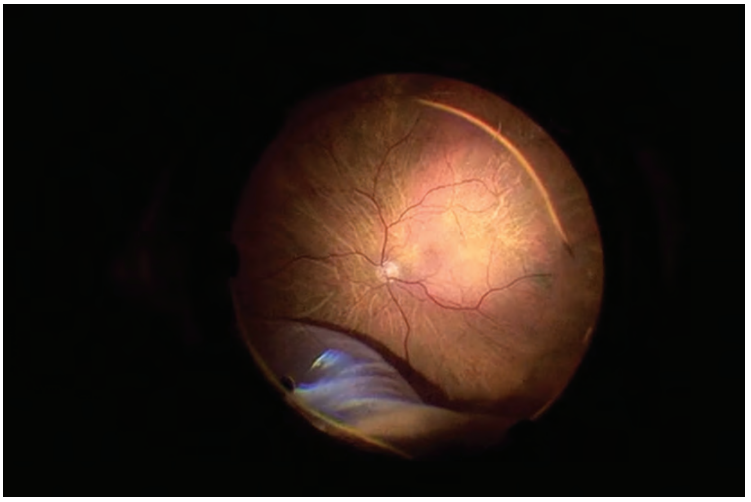

Figure 5. View of the retinal detachment.

cataract, I decided to perform a combined procedure (cataract surgery and internal limiting membrane [ILM] peeling). The tear's peripheral location at the 12 clock position could have converted this into a complicated case due to the difficult position to reach. One of the advantages of the cryosurgery is that, as opposed to laser treatment, it's effective even in the presence of subretinal fluid. In my opinion, this simplifies this case. For this reason, I used CryoTreq.

Initially, I addressed the ILM and epiretinal membrane. My objective was to peel all at once. Due to the epiretinal tissue, however, repeat maneuvers were necessary. I then drained the peripheral subretinal fluid and treated the small tear at the 12 clock position. The retina was attached in that position, so I was able to perform a laser treatment. In the 12:30 clock position, however, the retina was still detached. Therefore, I decided to mark the area with diathermy and then performed fluid/air exchange thereby draining the remaining subretinal fluid and avoiding the use of heavy liquids. As the retinal tear was located extremely anterior and the reduced view aggravated safe laser treatment, I decided to perform a CryoTreq procedure (Figure 6). This simple procedure allowed for safe surgery despite impaired visualization under air. Finally, the remaining subretinal fluid in the macular hole was drained and the hole successfully closed.

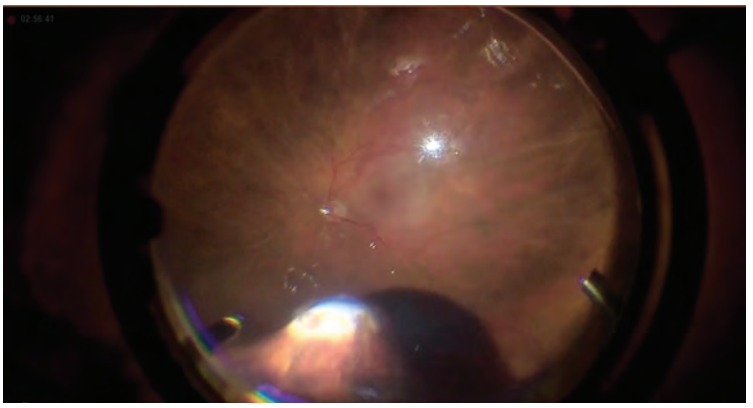

Figure 6. The CryoTreq procedure is performed with good visualization under air.

Case No. 3: Cryotherapy With CryoTreq

BY GERARD MCGOWAN, MB CHB, RCOPHTH

CASE PRESENTATION

Background. A 69-year-old woman presented with a macula-off retinal detachment and VA of 6/60. In cases such as this, my typical approach might consist of a 27-gauge, three-port vitrectomy without perfluorocarbon liquid (PFCL), and I would leave the patient phakic. I tend to use retinotomy to drain the retinal break.

Surgery. With the patient under local anesthesia, I used the entry valved system provided with the 29-Gauge Spotlight Directional Chandelier (29G SDC; Vitreq, a Beaver-Visitec International company). The nice thing about the 29G SDC is that it doesn't move or rotate the eye like other chandeliers do. In this case the macula-off detachment was a bit bullous, so I used self-indentation to control my movements and ensure that I would not catch the retina (Figure 7). I like to avoid the use of PFCL so that there are less concerns about toxicity and subretinal PFCL accumulation. In this case, I completed the maneuvers in the mid-periphery without removing the lens (Figure 8), which is the safest way to perform this surgery in my opinion.

I used diathermy to mark the breaks and then I applied cryotherapy with CryoTreq (Figure 9). The advantages of the CryoTreq are that it doesn't require time consuming preparations and it is immediately available.

DISCUSSION

This case was a simple macula-off retinal detachment in which I could drain the retina through the break. Paired with a straightforward 27-gauge, three-port vitrectomy, I was able to easily perform cryotherapy with the single-use CryoTreq to treat the retinal break.

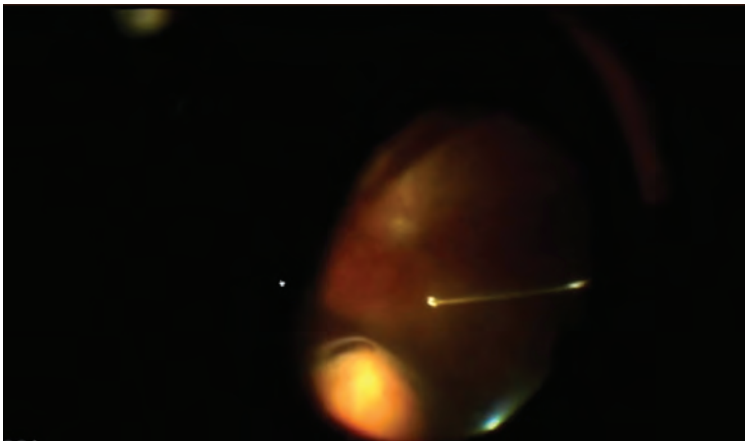

Figure 7. Self-indenting can help to ensure that one does not catch the retina with the vitrector.

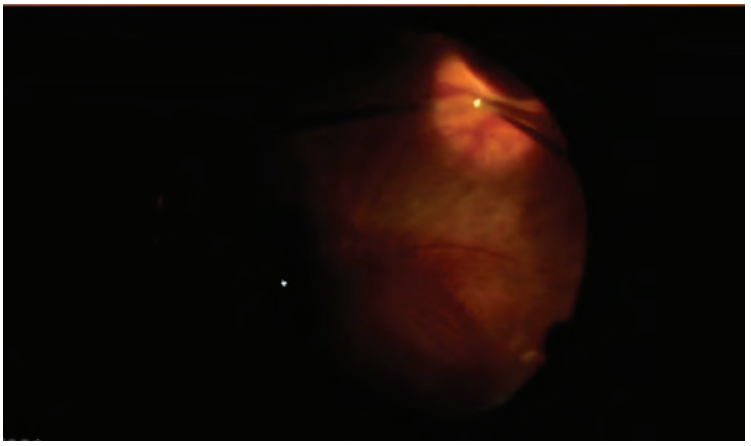

Figure 8. The 27-gauge vitrector is near the retina.

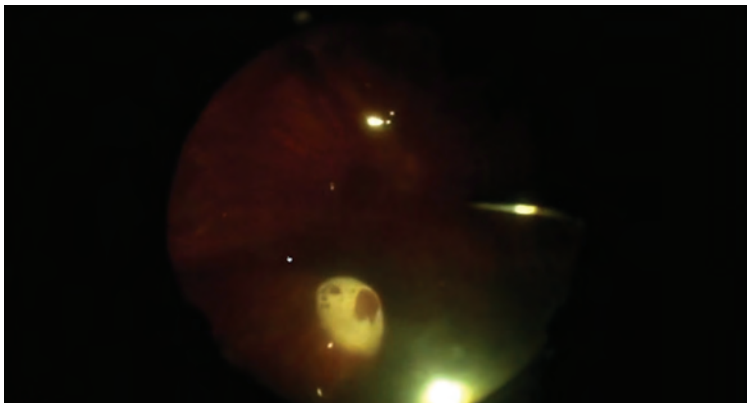

Figure 9. CryoTreq is used to treat the retinal breaks.

Having access to a nimble cryotherapy unit like the CryoTreq is also helpful because now I can go around 360° without worrying about endangering or risking the lens. Lastly, I find it helpful to use the chandelier while indenting the periphery.

CONCLUSION

Cryotherapy for the treatment of retinal tears and detachments is getting easier thanks to disposable, handheld devices such as the CryoTreq. In my experience, it enhances 27-gauge vitrectomy and helps me to ensure safe, effective surgery while providing my patients with the best possible care. ■

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THE IMPACT OF GLOBAL PERIODS ON CORRECT CODING

Stay up to date with Medicare and other payers' guidelines.

BY JOY WOODKE, COE, OCS, OCSR

Every ophthalmic procedure has a designated global surgical period—that is, a period during which charges for normal pre- and postoperative care are bundled into the global surgery fee. Knowing the global period associated with each surgical code is a crucial step in correctly coding and appropriately billing for office visits.

Major surgeries have a designated 1-day preoperative period and 90-day postoperative period included in the surgical payment, in addition to the intraoperative services performed. Minor surgeries include preoperative relative values for the day of the procedure plus either a 0-day or 10-day postoperative period. Let's explore some of the important differences in the global periods that may affect coding and billing for ophthalmic procedures.

EXAMINATION PERFORMED PREOPERATIVELY

When separately billable examinations are performed during the preoperative period, a coding modifier is necessary. To determine the global period and the appropriate modifier, the first consideration is whether the surgery is major or minor (Table 1).

For examinations performed 1 day prior or on the same day as a major surgery, append the -57 modifier to the appropriate evaluation and management (E/M) or Eye Visit code. For a retinal detachment repair with vitrectomy, CPT code 67108, the global postoperative period is 90 days (Table 2).

The global period for retinal laser procedures can vary, depending on whether they are considered major or minor surgery. For example, CPT code 67210 has a 90-day global period, whereas CPT codes 67105 and 67228 each have a 10-day global period and are considered minor surgeries.

TABLE 1. GLOBAL PERIOD DEFINITIONS FOR MAJOR VERSUS MINOR SURGERIES

Decision for Surgery	
Major	**Minor**
Postoperative period is 90 days	Postoperative period is 0 or 10 days
Examination day prior or same day	Examination same day
-57 Modifier	-25 modifier
Decision for surgery, major procedure	Significant, separately identifiable evaluation and management service

In coding for a retinal laser procedure, first determine the appropriate CPT code, which will allow you to identify the global period. For an examination performed on the same day, the appropriate modifier is different for laser procedures defined as major or as minor surgery. For minor surgery laser, the examination must meet the definition of a significant, separately identifiable service (modifier -25).

DURING THE GLOBAL PERIOD

Postoperative visits during the designated global period are not separately payable when they are related to the reason for surgery. Complications evaluated during the global period are also included in the global fee, even if the diagnosis is different from the reason for surgery.

If a patient presents with an unrelated complaint during the postoperative period—for example, a symptom in the fellow eye—and this leads to a new diagnosis or unrelated problem, this service can be billed for. Modifier -24, unrelated

TABLE 2. GLOBAL PERIODS FOR RETINA PROCEDURES

CPT Code	Descriptor	Medicare Global Period
67108	Repair of retinal detachment with vitrectomy	90 days
67105	Repair of retinal detachment, photocoagulation	10 days
67210	Destruction of localized lesion of retina, one or more sessions, photocoagulation	90 days
67228	Treatment of extensive or progressive retinopathy, photocoagulation	10 days
67028	Intravitreal injection	0 days

E/M service during a postoperative period, is appended to the E/M or Eye Visit code.

If additional surgery is performed, confirm if it falls within the global period. If it is outside the postoperative period, no additional modifiers are necessary. If it is performed during the global period, consider which of the following surgical modifiers, followed by the eye modifier, is appropriate:

- -58 modifier: staged or related procedure or service performed by the same physician during the postoperative period.
  - – New postoperative period begins.
- -78 modifier: unplanned return to the OR or procedure room by the same physician following initial procedure for a related procedure during the postoperative period.
  - – No new postoperative period.
- -79 modifier: unrelated procedure or service by the same physician during the postoperative period.
  - – New postoperative period begins.

TRACKING THE POSTOPERATIVE PERIOD

Based on the surgical modifier used, the postoperative period end date may vary. Use of modifiers -58 and -79 will restart the postoperative period while use of -78 modifier will not, and the original global period end date will remain the same. Consider the following examples.

Case No. 1:

67210-RT, performed on 6/1/2021: 90-day postoperative period ends 8/30/2021

67210-79-LT, performed on 7/25/2021: 90-day period restarts, now ending 10/23/2021

Case No. 2:

67108-LT, performed on 6/25/2021: 90-day postoperative period ends 9/23/2021

67108-78-LT, performed on 7/15/2021: postoperative period does not restart, global period still ends 9/23/2021

Appropriately tracking the entire postoperative period is crucial for correct coding. If additional surgery is performed during a global period, the correct modifier must be used. If it falls outside the postoperative period, the appropriate E/M or Eye Visit codes can be billed for office visits as medically necessary.

WHAT ABOUT OTHER SERVICES?

Medically necessary diagnostic tests are not included in a global surgical package. Modifiers are not necessary in coding for a testing service performed during the postoperative period. Confirm, however, that the indication, testing frequency, and documentation meet the payer's guidelines.

Extended ophthalmoscopy, for example, is not separately payable when it is performed during the global period, unless it is unrelated to the reason for surgery, according to local coverage determinations from the Medicare Administrator Contractors CGS and NGS Medicare.

GROUP PRACTICES SHARE GLOBAL PERIODS

Physicians in the same group ophthalmic practice share the global surgical package. If an associate of the operating surgeon in the same practice sees that surgeon's patient during the postoperative period, the office visit would still be covered under the global period.

PAYER NUANCES

As noted, Medicare has defined postoperative periods per surgical code. Other payers' global periods may vary from these, however. For example, as of January 2016, Medicare revised the postoperative period for CPT 67228, treatment of extensive or progressive retinopathy (eg, diabetic retinopathy), photocoagulation, from 90 days to 10 days. Many insurance payers subsequently followed Medicare's change—but not all. Some Medicaid plans, for instance, continue with a 90-day global period for CPT 67228. For this payer, therefore, this laser procedure is considered a major surgery. When an examination is performed on the same day as the procedure, the -57 modifier is correct.

WHERE TO LOOK

The Medicare Fee Schedule Database (www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/PFSlookup) lists the global surgical period for each CPT code. Another source is the AAO's *2021 Retina Coding: Complete Reference Guide* (store.aao.org/2021-retina-coding-complete-reference-guide.html).

Remember that global periods can change each year and can differ by payer. Staying current and creating internal resources to use as guides are two of the best ways to ensure correct coding in your retina practice. ■

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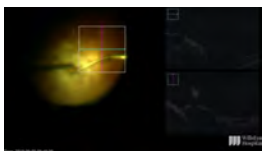

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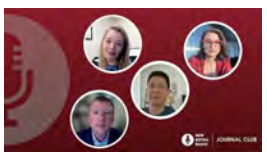

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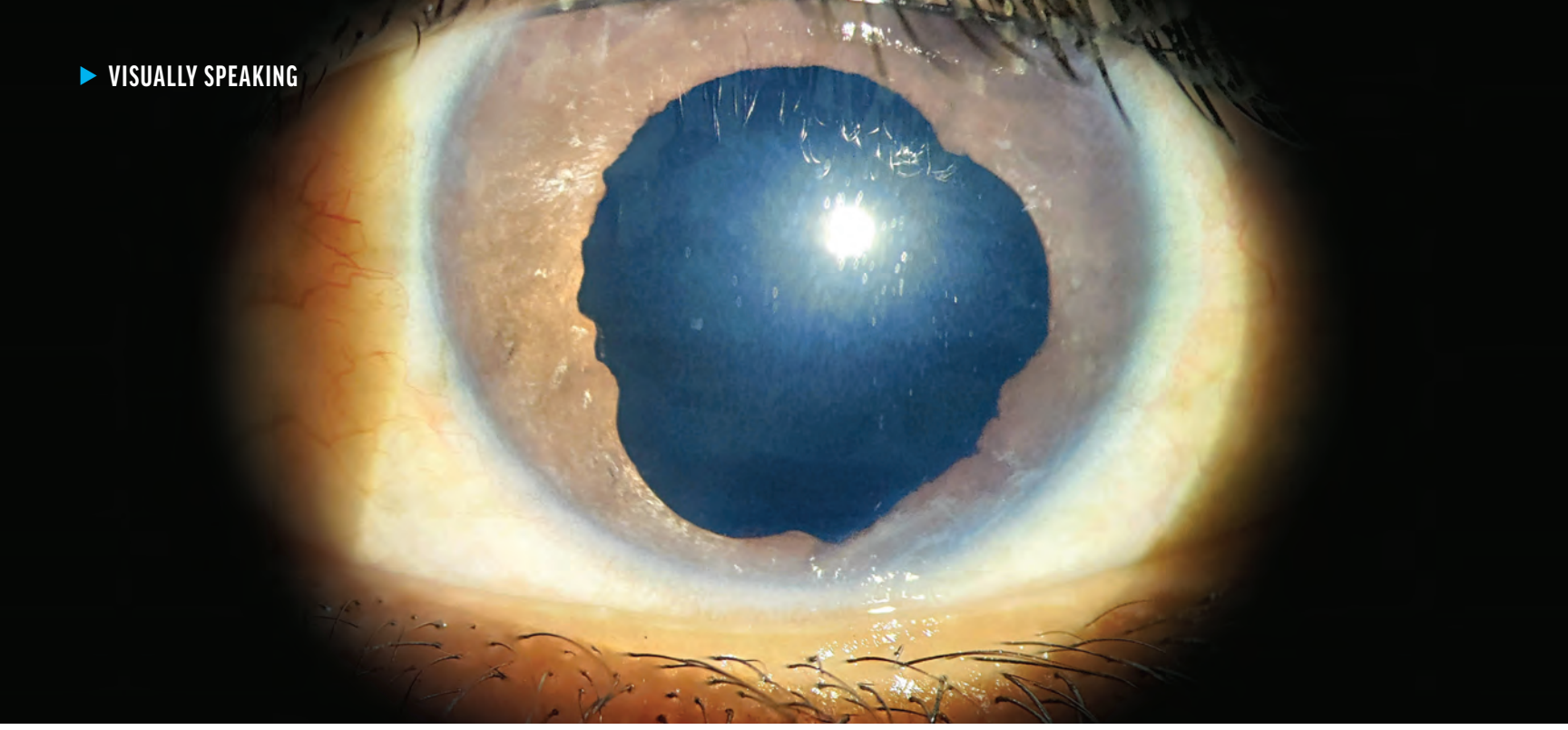


A DROPPED ANTERIOR CHAMBER IOL

A traffic accident dislocated this patient's IOL posteriorly through a dilated pupil.

BY VIPUL K. PRAJAPATI, MBBS, MS; PURVI R. BHAGAT, MBBS, DO, MS, FAIMER (CMCL); AND ABHISHEK H. SHAH, MBBS, MS

A 26-year-old man was referred to us from an outside hospital for management of an injury to the left eye sustained 2 weeks prior in a traffic accident. The patient also reported a history of blunt trauma with a cricket ball 2 years earlier, cataract extraction, and IOL implantation, all in the left eye.

Upon slit-lamp examination, aphakia and a traumatic iris with a dilated and fixed pupil were noted (Main Figure). Dilated fundus examination showed macular scarring—most likely a result of the previous blunt trauma—and a Kelman Multiflex–type anterior chamber IOL freely moving in the posterior vitreous cavity (Figure, next page). We performed a pars plana vitrectomy and anterior chamber IOL explantation, along with implantation of a scleral-fixated IOL with single-pass four-throw pupilloplasty in the same sitting.

DISCUSSION

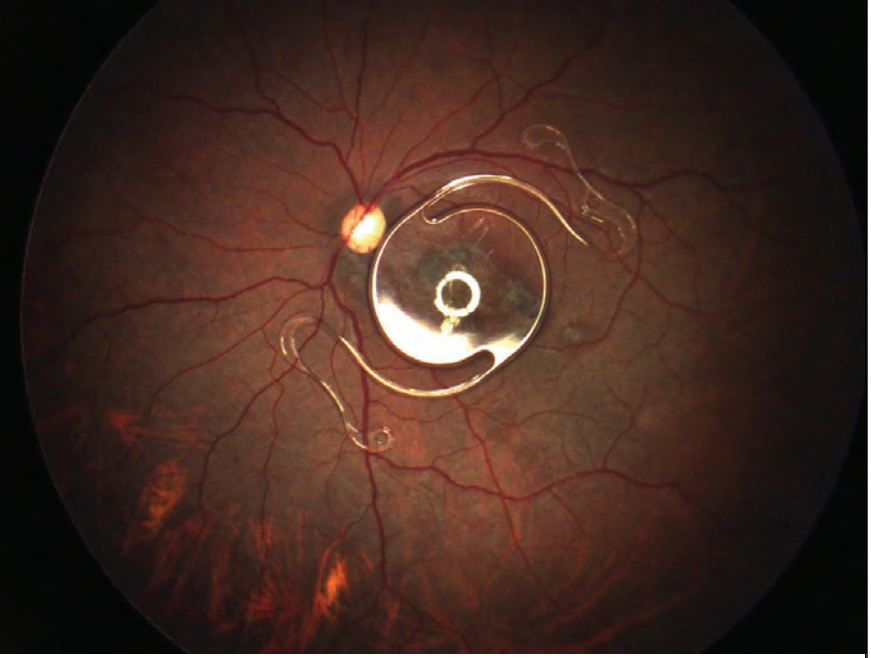
Ocular trauma is relatively common. About one-fifth of adults experience ocular trauma at some point in their lives, and it occurs most frequently in men and young people.[1]

Trauma can affect the crystalline lens in several ways. The lens can be partially displaced from its natural position (subluxated) or completely dislocated (luxated). A subluxated or luxated lens can move forward, resulting in angle-closure glaucoma. Injury to the lens may also lead to phacomorphic, lens-particle, or phacoantigenic glaucoma.[2]

Traumatic lens injury is usually managed by removing the lens with or without IOL implantation, depending upon the integrity of the anterior chamber structures and zonules.[3]

A posterior chamber IOL may be implanted within the capsular bag, if possible, with or without capsular support rings or segments; or it can be sutured or glued to the sclera. An anterior chamber or iris fixated IOL can be implanted in the event of significant zonular damage.[4]

Often, inadequate preoperative evaluation and incomplete surgical management may lead to postoperative IOL displacement, requiring repeat surgery.[5,6] In our patient's case, a subsequent traffic accident possibly caused the anterior chamber IOL—which may not have been adequately stabilized—to dislocate posteriorly through his dilated pupil.



When surgery for a dislocated IOL is planned, the surgeon should explain to the patient the risks and benefits of the procedure, including a guarded prognosis and a possible need for further interventions.[7] ■

1. Serna-Ojeda JC, Cordova-Cervantes J, Lopez-Salas M, et al. Management of traumatic cataract in adults at a reference center in Mexico City. *Int Ophthalmol*. 2015;(35):451-458.
2. Mian SI, Azar DT, Colby K. Management of traumatic cataracts. *Int Ophthalmol Clin*. 2002;42(3):23-31.
3. Blum M, Tetz MR, Greiner C, Voelcker HE. Treatment of traumatic cataracts. *J Cataract Refract Surg*. 1996;22(3):342-346.
4. Synder A, Kobielska D, Omulecki W. [Intraocular lens implantation in traumatic cataract]. *Klin Oczna*. 1999;101(5):343-346 [in Polish].
5. Sitompul R. Intraocular lens dislocation after cataract surgery in Tambolaka, Southwest Sumba, Indonesia: a case report. *Case Rep Ophthalmol*. 2018;9(1):179-184.
6. Esquenazi S. Management of a displaced angle-supported anterior chamber intraocular lens. *Ophthalmic Surg Lasers Imaging*. 2006;37(1):65-67.
7. Cohen SM. Dislocated posterior chamber intraocular lens management. *Retina Today*. 2013;58-66.

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CAROL L. SHIELDS, MD

What led you to pursue ophthalmology as a career path?

As a child, about 7 or 8 years old, I became interested in art and enjoyed the creativity and individuality of exploring art methods, including pencil drawing and other media. In college, between my science courses, I took watercolor—a truly challenging course, but with great rewards. Later, my directions included photography of nature, particularly of rare insects, birds, flowers, and trees.

So, I am a visual person with strong pattern recognition, and ophthalmology fit the bill. I chose ophthalmology because of the vast imaging techniques and the challenges of the details of the various subspecialties.

After work, Dr. Shields takes care of her small farm with goats, chickens, and dogs. Here we see her carrying fresh hay to the pigmy goats.

Why did you choose ocular oncology as a specialty? Who were your mentors, and how did they influence your decision?

When I entered the field, little was known about the imaging of tumors, the genetic abnormalities of tumors, and even less about therapies. Ocular oncology was not so refined when I started. There was a lot of work to be done, so I rolled up my sleeves and got to work.

I was a bit influenced by my then soon-to-be husband, Jerry A. Shields, MD, who was already practicing ocular oncology. Together, we achieved more than we could have done individually, and it was exciting and enjoyable along the way. We met and hosted other ocular oncology staff and fellows and built a strong team.

Ocular oncology can be a difficult subspecialty, as we are dealing with really desperate, sad, and scary situations. The onus is upon us to always be at our best performance and share thoughts on certain cases to be sure we choose the right therapy. It is helpful to have two physicians collaborate in the initial evaluation of a patient.

What are the pros and cons of working in the same field and institute as your husband? Were there challenges you faced, and how did you overcome them?

Some of the pros have been mentioned above, including a trustworthy alignment with the "team direction" of the corporation; honesty and loyalty to each other and the corporation; and an enthusiasm to excel. The cons include being labeled as "the wife" without the true distinction of being a doctor, as well as other downsides of unwanted competition or problems that can occur in any corporation. Jerry and I have enjoyed every bit of our partnership. Nearly every day as we drove to work, Jerry would remark that we have such a good practice, and I would respond that we are lucky to be working together.

What has been one of the most memorable moments of your career?

About 25 years ago, we were blazing a trail of understanding with intravenous chemotherapy for bilateral retinoblastoma. Initially, I did not know what to expect. As years passed, we got to understand which treatments are likely to succeed and which are likely to fail. One patient, a young 4-month-old boy with bilateral retinoblastoma from the mid-South of the United States, was treated with intravenous chemotherapy combined with consolidation of thermotherapy/cryotherapy. He did well and eventually had 20/40 vision in the better seeing eye, a goal we might not have ever achieved with older treatment measures. After a session with him, I spoke to the parents, and the father said, "Thank you, Dr. Shields, for taking the time from your children to care for my son." To me, that was the greatest thank-you I could receive, and to this day I reflect on it.

Another striking moment occurred about 3 or 4 years ago, when I was taking a history on a young girl with possible retinoblastoma and noticed that the family came from my hometown in Western Pennsylvania. Then I noted they were from the street upon which I was born and lived in the same house that I was born in—what a coincidence! I felt that she was an angel reminding me of all that God has given me. I'm happy to say that she did well with systemic chemotherapy; her life was saved, both eyes were saved, and one eye has excellent vision.

What advice do you have for someone who is just starting out in the field of ophthalmology?

Learn your trade to the best of your ability because you will not only use it to care for patients, but you will be teaching your older and younger colleagues the newer information. Work diligently and with dedication to the corporation. Choose your practice not only by what you are reimbursed and how much free time you have, but, equally important, by who you will be working with and their organization and enthusiasm. ■

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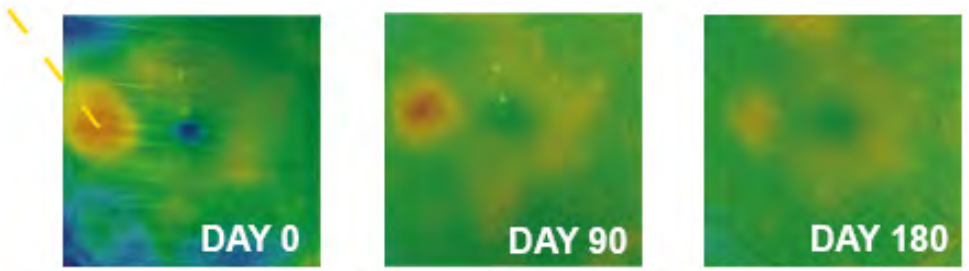

DME treatment - Images courtesy of Alejandro Filloy Rius, MD. Ph.D – Tarragona Spain

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