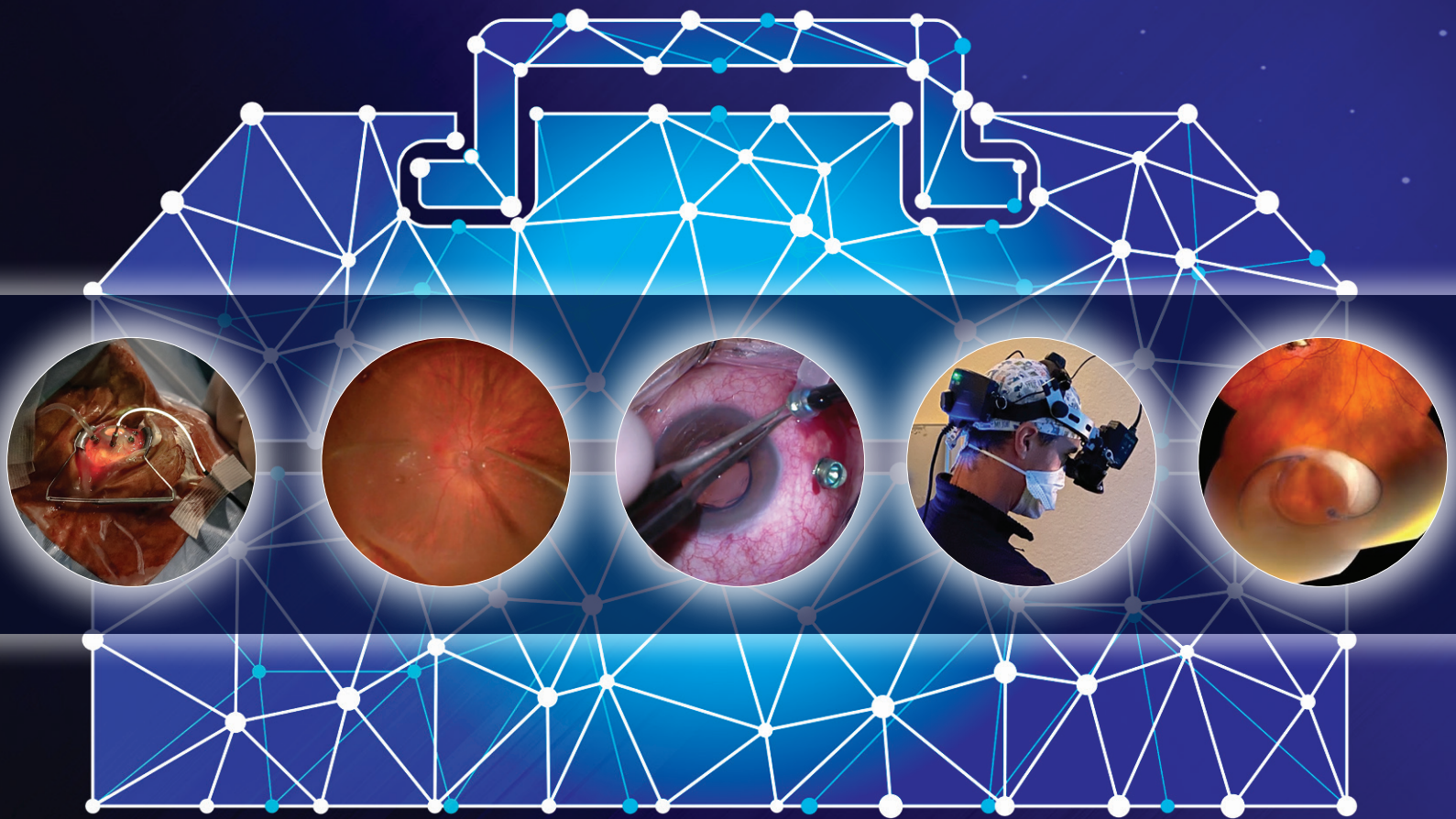
RT
Retina Today
JAN/FEB 2021 VOL. 16, NO. 1 | RETINATODAY.COM

eyetube

UPDATE YOUR SURGICAL TOOLBOX



New instruments and techniques are improving the OR experience for surgeons and patients alike.

DIGITALLY ASSISTED SURGERY FOR RETINAL DETACHMENT WITH GIANT RETINAL TEAR

BRINGING LASER TECHNOLOGY INTO THE 21ST CENTURY

DIABETIC VITRECTOMY: PEARLS FOR THE VITREORETINAL FELLOW

NORLASE®

LION™

All-In-One Green Laser and LIO

GREEN LASER LIO • LION • GREEN LASER LIO • LION •
INDUSTRY FIRST

- Built-in Laser Source
- Battery-Powered
- No Fiber Tether
- Voice Control
- Wireless User Interface

NORLASE IS REINVENTING THE LIO

LION is the first fully integrated LIO and green laser. The laser source is built seamlessly into the headset eliminating a cumbersome fiber. With LION's untethered and portable design, physicians can move freely between treatment rooms, the OR and satellite offices– treating patients anywhere, anytime.

That's efficiency at your fingertips!

> VISIT NORLASE.COM TO LEARN MORE

Web: www.norlase.com | Email: contact@norlase.com | Phone: 1.650.489.0083

MK0100 Rev. A

Retina Today (ISSN 1942-1257) © 2020 Bryn Mawr Communications LLC is published January/February, March, April, May/June, July/August, September, October, and November/December by Bryn Mawr Communications LLC, 1008 Upper Gulph Road, Wayne, PA 19087. Subscription is free to all applicable US retina physicians. All others, applicable subscription charges apply. For subscription information call +1 800 492 1267 (US only) or e-mail retinatoday@bmctoday.com. Pending periodical postage paid at Wayne PA and additional entry offices. POSTMASTER Please send address changes to Bryn Mawr Communications LLC, 1008 Upper Gulph Road, Wayne, PA 19087. Bryn Mawr Communications LLC provides certain customer contact data, which may include customer names, addresses, phone numbers and e-mail addresses, to third parties for promotional and/or marketing purposes. If you do not wish Bryn Mawr Communications LLC to make your contact information available to third parties for any marketing purposes, please contact us at 800-492-1267 or e-mail us at retinatoday@bmctoday.com. This publication is intended for health care professionals and providers only. The information contained in this publication, including text, graphics and images, is for informational purposes only and is not intended to be a substitute for professional medical advice. Bryn Mawr Communications LLC, via its Editors and the Publisher, accepts no responsibility for any injury or damage to persons or property occasioned through the implementation of any ideas or use of any product described herein. While great care is taken by the Publisher and Editors to ensure that all information is accurate, it is recommended that readers seek independent verification of advice on drug or other product usage, surgical techniques and clinical processes prior to their use. The opinions expressed in this publication are those of the authors and are not attributable to the sponsors, the publication or the Editorial Board. References made in articles may indicate uses of medical equipment or drugs at dosages, for periods of time and in combinations not included in the current prescribing information. Inclusion of advertising material in this publication, or in supplements thereof, does not constitute any representation or guarantee by Bryn Mawr Communications LLC of the quality of such products or of the claims made by the manufacturers.

A NEW YEAR LIKE NO OTHER


It's finally a new year, and a fresh start is long overdue. Unfortunately, the COVID-19 pandemic is still in full swing, and we might be better served tempering our expectations; look what happened when we claimed 2020 was going to be "our year"! Still, 2021 has a lot going for it, especially for retina specialists, many of whom barely saw a dip in patient care despite the pandemic. The vaccines are rolling out, providing much-needed security for health care workers and high-risk patients, conference planners—and attendees—are looking forward to in-person meetings (hopefully) later this year, and everyone has a robust collection of fashionable face masks.

We have a long road ahead before we make it out of this pandemic. Hospitalizations are at an all-time high, and a recent national survey found that Americans were less motivated to get the vaccine in December 2020 than they were back in April when this whole thing started, despite the spike in cases after the Thanksgiving holiday.[1] Weekly tracking surveys show that 74% of respondents stated they were likely to get the COVID-19 vaccine when asked between April 1-14, when new cases were hovering around 40,000 daily; that percentage fell to 56% by November 25-December 8, even though new cases were skyrocketing to more than 200,000 daily.[2] Notably, though, close to 70% of those over age 65 still said they were willing to get the vaccine as of December 8.[2]

Added to that less-than-stellar public perception, the logistics of vaccinating the nation are getting in the way, with myriad distribution and administration hurdles. Delayed shipments, holiday schedules, and exhausted local health care systems have slowed the rollout considerably. Officials projected having 20 million people vaccinated by the end of 2020, but they were reporting less than 2.8 million vaccines administered as of New Year's Eve.[3,4] Updated reporting had that number up to about 4.2 million by January 2.[4]

If 2020 taught us anything, it was patience, so don't cancel your Zoom account just yet. We are on our way to taming this virus and getting back to traveling, lecturing, and collaborating in person with one another—soon, but not yet. We can't do much in the way of speeding up the process, but we can encourage our patients, many of whom are high-risk, to get vaccinated as soon as possible.

As we wait for the world to right itself, let's focus on giving our practices a fresh start in 2021. Our annual surgical techniques and technologies issue is brimming with articles highlighting new instruments and approaches to help you improve the eye care experience for your patients and yourself. Experts weigh in on the best techniques for intraocular foreign body removal, IOL repositioning, diabetic vitrectomy, subretinal injection of tissue plasminogen activator, limited vitrectomy for epiretinal membranes, and transradial intraarterial chemotherapy for retinoblastoma. In addition, new technologies such as flexible chandelier systems, heads-up 3D viewing systems, and untethered head-mounted laser indirect ophthalmoscopes are changing the face of vitreoretinal surgery for the better.

Also in this issue you will find a thought-provoking discussion about the fellowship interview process during COVID-19 and a beautiful visual of optic disc coloboma, macular schisis, and serous detachment in the Visually Speaking column on page 44.

We are excited to see what 2021 has in store for us, and we can't wait to share the latest and greatest in retina within the pages of this and future issues of *Retina Today*.

Happy reading and happy New Year! ■

ALLEN C. HO, MD
CHIEF MEDICAL EDITOR

ROBERT L. AVERY, MD
ASSOCIATE MEDICAL EDITOR

1. Szilagyi PG, Thomas K, Shah MD, et al. National trends in the US public's likelihood of getting a COVID-19 vaccine—April 1 to December 8, 2020 [published online ahead of print, 2020 Dec 29]. *JAMA*.
2. Centers for Disease Control and Prevention. Trends in number of COVID-19 cases and deaths in the US reported to CDC, by state/territory. covid.cdc.gov/covid-data-tracker/#trends_dailytrendscases. Accessed December 31, 2020.
3. Robbins R, Robles F, Arango T. Here's why distribution of the vaccine is taking longer than expected. *New York Times*. December 31, 2020.
4. Centers for Disease Control and Prevention. CDC COVID Data Tracker. covid.cdc.gov/covid-data-tracker/#vaccinations. Accessed December 31, 2020.

Discover continuous calm in uveitis

YUTIQ® (fluocinolone acetonide intravitreal implant) 0.18 mg:

- **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.]
- **Innovative Durasert® technology is designed for a sustained release of fluocinolone acetonide for up to 36 months with just 1 YUTIQ implant[2]**

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

J code: J7314

*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 noninfectious 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 noninfectious uveitis, or the use of prohibited medications.[1,3]

INDICATIONS AND USAGE

YUTIQ® (fluocinolone acetonide intravitreal implant) 0.18 mg is indicated for the treatment of chronic noninfectious 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.

References: 1. YUTIQ® (fluocinolone acetonide intravitreal implant) 0.18 mg full U.S. Prescribing Information. EyePoint Pharmaceuticals, Inc. October 2018. **2.** EyePoint Pharmaceuticals Receives FDA Approval of YUTIQ™ (fluocinolone acetonide intravitreal implant) 0.18 mg. Global Newswire. https://www.globenewswire.com/news-release/2018/10/15/1621023/0/en/EyePoint-Pharmaceuticals-Receives-FDA-Approval-of-YUTIQ-fluocinolone-acetonide-intravitreal-implant-0-18-mg.html. Accessed February 7, 2020. **3.** Data on file.

Please see next page for Brief Summary of full Prescribing Information.

EyePoint PHARMACEUTICALS

480 Pleasant Street, Suite B300, Watertown, MA 02472

2/2020
US-YUT-2000020

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

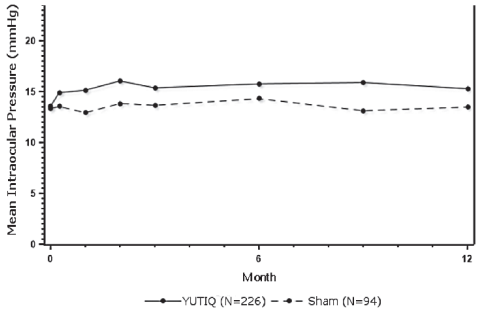
Ocular		
ADVERSE REACTIONS	**YUTIQ (N=226 Eyes) n (%)**	**Sham Injection (N=94 Eyes) n (%)**
Vitreous Hemorrhage	4 (2%)	0
Iridocyclitis	3 (1%)	7 (7%)
Eye Inflammation	3 (1%)	2 (2%)
Choroiditis	3 (1%)	1 (1%)
Eye Irritation	3 (1%)	1 (1%)
Visual Field Defect	3 (1%)	0
Lacrimation Increased	3 (1%)	0
Non-ocular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

Manufactured by:
EyePoint Pharmaceuticals US, Inc., 480 Pleasant Street, Watertown, MA 02472 USA
Patented.

TABLE OF CONTENTS

Cover image credit: ©iStockphoto.com

UPDATE YOUR SURGICAL TOOLBOX

DEPARTMENTS

UP FRONT

SURGICAL PEARLS

FELLOWS' FOCUS

GLOBAL PERSPECTIVES

SPECIAL REPORT

MEETING MINUTES

VISUALLY SPEAKING

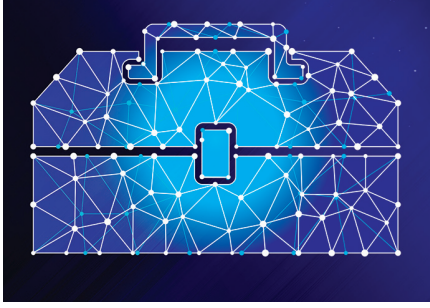
CODING ADVISOR

IN THE BACK

RT NEWS

JANUARY/FEBRUARY 2021

VOL. 16, NO. 1 | RETINATODAY.COM



GENE THERAPY ADVANCES IN AMD AND DR CLINICAL TRIALS

Regenxbio's gene therapy candidate is moving forward in clinical trials for both AMD and diabetic retinopathy (DR), the company announced. The first patient has received RGX-314 in the phase 2 ALTITUDE trial in patients with DR, Regenxbio announced in December. Separately, the company announced in January that its phase 3 ATMOSPHERE trial of RGX-314 in AMD is active, and patient screening is ongoing.

The phase 2 ALTITUDE trial is evaluating suprachoroidal delivery of RGX-314 using the SCS Microinjector for the treatment of DR. The trial is expected to enroll approximately 40 patients with DR across two cohorts. Patients will be randomly assigned to receive RGX-314 at one of two dose levels versus observational controls. The primary endpoint of the trial is the proportion of patients who improve on a DR severity scale at 48 weeks. Regenxbio expects to report initial data from this trial in 2021.

ATMOSPHERE is the first of two planned pivotal trials to evaluate RGX-314 as a potential one-time treatment for AMD, according to the company. Regenxbio intends to enroll approximately 700 patients total in the two trials; the first will evaluate the noniferiority of RGX-314 to ranibizumab (Lucentis, Genentech) for the primary endpoint of change in BCVA at 1 year. The second trial, with a similar design, will use aflibercept (Eylea, Regeneron) as the comparator drug. The company said it expects to submit a biologics license application to the FDA in 2024, based on these trials.

STUDY: AFLIBERCEPT AS EFFECTIVE AS PRP IN PDR AT 6 MONTHS

In patients with vitreous hemorrhage from proliferative diabetic retinopathy (PDR), no statistically significant difference in visual acuity was seen at 24 weeks between those treated with aflibercept (Eylea, Regeneron) and those who underwent vitrectomy with panretinal photocoagulation (PRP), a recently published clinical trial found.[1]

For decades, PRP has been the standard treatment for PDR, but this has begun to change as intravitreal injection of anti-VEGF agents has shown equivalent efficacy in clinical trials.[2] This most recent trial (NCT02858076) compared initial treatment with intravitreous aflibercept versus vitrectomy with PRP in 205 patients with vision loss due to vitreous hemorrhage in PDR.

In the primary study outcome of visual acuity at 24 weeks, the mean VA letter score was 59.3 (Snellen equivalent, 20/63) for the aflibercept group and 63.0 (Snellen equivalent, 20/63) for the vitrectomy with PRP group, a difference that was not statistically significant. The study authors noted, however, that the study may have been underpowered to detect a clinically important benefit in favor of initial vitrectomy with PRP.

In the trial, 100 participants received aflibercept and 105 underwent vitrectomy with PRP. Those assigned to aflibercept initially received 4 monthly injections. Both groups could receive aflibercept or vitrectomy during follow-up based on protocol criteria. Secondary study outcomes included mean visual acuity at 4 weeks and 2 years.

1. Antoszyk AN, Glassman AR, Beaulieu WT, et al. Effect of intravitreous aflibercept vs vitrectomy with panretinal photocoagulation on visual acuity in patients with vitreous hemorrhage from proliferative diabetic retinopathy: a randomized clinical trial. *JAMA*. 2020;324(23):2383-2395.
2. Glassman AR. Results of a randomized clinical trial of aflibercept vs panretinal photocoagulation for proliferative diabetic retinopathy: is it time to retire your laser? *JAMA Ophthalmol*. 2017;135(7):685-686.

MULTIMODAL IMAGING DETECTS RETICULAR PSEUDODRUSEN IN AMD

Multimodal imaging with spectral-domain OCT (SD-OCT) and infrared reflectance (IR) had significantly greater sensitivity than color fundus photography for visualizing reticular pseudodrusen (RPD) in AMD, a cross-sectional study found.[1] RPD was detected in eyes without other features of AMD and could represent an earlier disease state, the study authors speculated.

The study included 946 eyes from 473 women, aged 69 to 101 years old, enrolled in the Carotenoids in Age-Related Eye Disease Study 2 (CAREDS2), an ancillary study of the Women's Health Initiative Observational Study. Its aim was to determine the prevalence and morphologic features

of RPD and their association with participant demographics and AMD status.

The investigators used multimodal imaging, including SD-OCT and IR, to identify RPD characteristics such as location and pattern of RPD, presence of peripapillary RPD, and RPD area. Severity of AMD was also categorized for each eye.

The prevalence of RPD was noted to increase with age and was associated with AMD severity. RPD were present in 130 eyes (14%); 7% in those younger than 78 years, 14% in those 78 to 83 years, and 30% in those older than 83 years. Based on clinical classification of AMD with color fundus photography, RPD were seen in 2.4% of eyes with no AMD or aging changes, 11.5% in early AMD, 25.1% in intermediate AMD, and 51.1% in late AMD.

1. Cleland SC, Domalpally A, Liu Z, et al. Reticular pseudodrusen characteristics and associations in the Carotenoids in Age-Related Eye Disease Study 2 (CAREDS2) [published online ahead of print, 2020 Dec 30]. *Ophthalmol Retina*.

META-ANALYSIS FINDS NO BENEFIT OF ILM PEELING IN IDIOPATHIC ERM

Peeling of the internal limiting membrane (ILM) during the surgical removal of idiopathic epiretinal membrane (ERM) did not significantly improve postoperative visual outcomes or decrease recurrence, a meta-analysis of randomized controlled trials (RCTs) found.[1] Rather, ILM peeling resulted in greater central macular thickness (CMT), the authors of the meta-analysis said, indicating that ILM peeling is "inessential" in surgery for idiopathic ERM.

The authors identified eight RCTs including a total of 422 eyes. Their analysis found no significant difference in BCVA or recurrence rate between the groups with and without ILM peeling. However, patients with ILM peeling had greater CMT at 3 months, 6 months, and final follow-up.

1. Sun Y, Zhou R, Zhang B. With or without internal limiting membrane peeling for idiopathic epiretinal membrane [published online ahead of print, 2020 Dec 19]. *Retina*.

EFFICACY OF ABICIPAR IN AMD SUSTAINED IN YEAR 2 WITH LESS INFLAMMATION

Abicipar pegol (AbbVie) demonstrated continued efficacy in patients with wet AMD in year 2 of two phase 3 clinical trials, with a reduction in new onset of intraocular inflammation (IOI) compared with year 1 of the trials. These results from the CEDAR and SEQUOIA clinical trials were published online ahead of print in *Ophthalmology* in November.[1]

The 1-year results of the two trials, published earlier last year,[2] showed that abicipar, whether given every 8 weeks or every 12 weeks after three loading doses, was noninferior to ranibizumab (Lucentis, Genentech) given every 4 weeks in the primary endpoint of stable vision at week 52. However, higher incidence of IOI was seen with abicipar than with the comparator drug (15.4% and 15.3% with dosing every 8 and every 12 weeks, respectively, vs 0.3% with ranibizumab). The FDA subsequently declined to approve apicipar, citing an unfavorable benefit-risk ratio.

In the 2-year results, which pooled data from the two trials with identical protocols, the efficacy of abicipar was maintained through week 104, with stable vision in 93.0%, 89.8%, and 94.4% of patients receiving abicipar every 8 or 12 weeks or ranibizumab, respectively. In year 2, the first onset of IOI adverse events (AEs) with abicipar was greatly reduced and was comparable to that with ranibizumab (0.8% and 2.3% vs 1.0%, respectively), the study authors reported.

"The increased risk of IOI AEs with abicipar seen in the first year of the study was not sustained, and the incidence of IOI in patients with no previous IOI was low and comparable across treatment groups after week 52," the authors concluded. "Abicipar demonstrated noninferiority to monthly ranibizumab when used in an unadjusted, quarterly regimen in patients with [wet] AMD."

1. Khurana RN, Kunimoto D, Yoon YH, et al. Two-year results of the phase 3 randomized controlled study of abicipar in neovascular age-related macular degeneration [published online ahead of print, 2020 Nov 19]. *Ophthalmology*.
2. Kunimoto D, Yoon YH, Wykoff CC, et al. Efficacy and safety of abicipar in neovascular age-related macular degeneration: 52-week results of phase 3 randomized controlled study. *Ophthalmology*. 2020;127(10):1331-1344.

BROLUCIZUMAB SHOWED EFFICACY, SAFETY IN SECOND PHASE 3 TRIAL IN DME

Brolucizumab (Beovu, Novartis) met the primary endpoint of noninferiority in change in BCVA from baseline in comparison with 2 mg aflibercept (Eylea, Regeneron) at week 52 in the phase 3 clinical trial KESTREL in patients with diabetic macular edema (DME), Novartis announced in December. The company had announced positive top-line results from another phase 3 study in DME, KITE, in September.

KESTREL assessed the efficacy and safety of 3 mg and 6 mg brolucizumab in patients with DME; 6 mg is the dose of brolucizumab indicated for treatment of wet AMD. Noninferiority in change in BCVA for 3 mg brolucizumab was not demonstrated in KESTREL.

In a secondary endpoint of the trial, more than 50% of patients receiving 6 mg brolucizumab were maintained on a 3-month dosing interval through year 1 after a loading phase. Significant improvement was also seen with 6 mg brolucizumab in change in central subfield thickness from baseline from week 40 through week 52. The drug also demonstrated an overall well-tolerated safety profile.

In a press release announcing these top-line results, Novartis said it intends to submit the data from KESTREL and KITE to health authorities in the first half of this year for regulatory approval for treatment of DME. ■

BETTER SURGEON CONTROL FOR SUBMACULAR HEMORRHAGE INJECTION

A new approach to subretinal injection of tPA can help to keep things simple and cost-effective.

BY SJAKON G. TAHIJA, MD; EMIL SJAHREZZA, MD; CHRISTOPHER RYAN, BS; UDY IRIANTO, ADN; AND ANTONIUS SUSANTO, MD

A submacular hemorrhage can have devasting consequences for vision with irreversible destruction of photoreceptors within 24 hours.[1] Research shows that 60% of submacular hemorrhage cases in Asia are caused by polypoidal choroidal vascularization (PCV).[2] This condition is more prevalent in Black and Asian populations (predominantly Japanese) compared with the White population.[3]

Because treatment of submacular hemorrhage with displacement techniques is more successful when the blood clot has not organized, prompt referral is crucial. Generally, the patient notes a central scotoma, and the hemorrhage is readily apparent on examination. Physicians should suspect a submacular hemorrhage in patients with a history of AMD or PCV who present with an acute loss of central vision.

CURRENT OPTIONS

Surgeons often turn to one of three management strategies for submacular hemorrhage:

- Pneumatic displacement with an intravitreal expansile gas bubble injection either alone or in combination with intravitreal tissue plasminogen activator (tPA);[4,5]
- Vitrectomy and subretinal injection of tPA followed by tamponade with air or an expansile gas; or[5-10]
- Retinotomy and manual removal of the subretinal clot in cases of massive subretinal hemorrhage followed by silicone oil tamponade.[11]

Of these options, intravitreal injection of expansile gas and tPA has the advantage of being simple and cost effective. In more complex cases we prefer performing a vitrectomy and injecting subretinal tPA followed by tamponade with an expansile gas. In the latter approach, injecting the tPA subretinally in a controlled manner can be challenging.

In the past, we used a 1-cc syringe connected to a 25-gauge subretinal cannula for subretinal tPA injection. For this procedure, the surgeon held the syringe while the assistant depressed the plunger. This method often resulted in an uncontrolled flow of fluid into the subretinal space and was dependent on the steadiness of the assistant's hand.

Specialized equipment for subretinal injection, such as the MicroDose injection kit (MedOne Surgical), has been developed. However, this product is not marketed or approved in Indonesia, and if it were, it would likely increase the expense of surgery. Novelli et al recently reported a novel method in which an insulin syringe with a 41-gauge cannula coupled with the viscous fluid control unit of a standard vitrectomy system is used for subretinal tPA injection.[9] We were also looking for a more efficient method, and we developed a simpler and more cost-effective method using the materials supplied with standard vitrectomy packs.

A NEW APPROACH

In our approach, 0.2 cc of the tPA alteplase (Actilyse, Boehringer Ingelheim) is injected into one end of an infusion

WATCH IT NOW

Preparing Subretinal tPA Injection

BIT.LY/TAHIJA

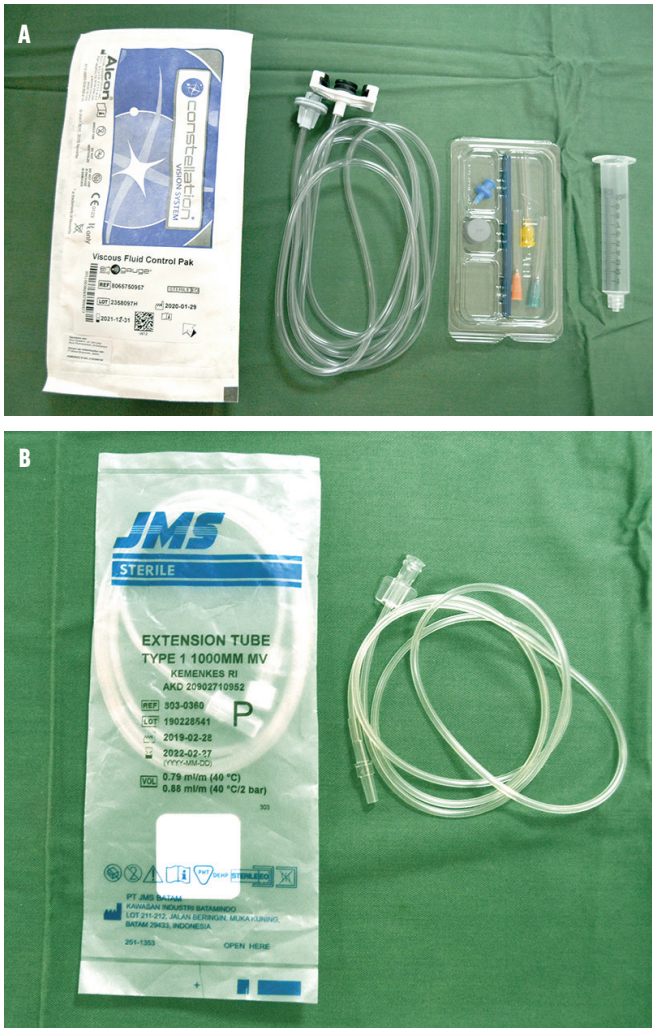


Figure 1. The authors' method uses the Alcon Viscous Fluid Control Pak (A) and 1-mm diameter extension tubing (B).

extension tube. The same end of the tube is connected to a subretinal cannula, and the other end to a 10-cc syringe supplied with the Viscous Fluid Control Pak injection system for the Constellation Vision System (Alcon; Figures 1 and 2).

The pressure of the viscous fluid injection is lowered to between 4 psi and 8 psi, which is enough to allow controlled flow of the solution through the subretinal canula. The surgeon can adjust the speed of injection using the footpedal.

When the footpedal is depressed, the plunger of the 10-cc syringe moves slightly forward, flushing the alteplase through the extension tubing into the subretinal cannula.

In some cases, the surgeon may choose to inject a subretinal air bubble before the alteplase is injected; to do this, the surgeon can aspirate a small amount of air into the infusion line ahead of the alteplase.

One possible complication is the risk of injecting too much fluid too quickly into the subretinal space, causing the injected fluid to burst through the macula.

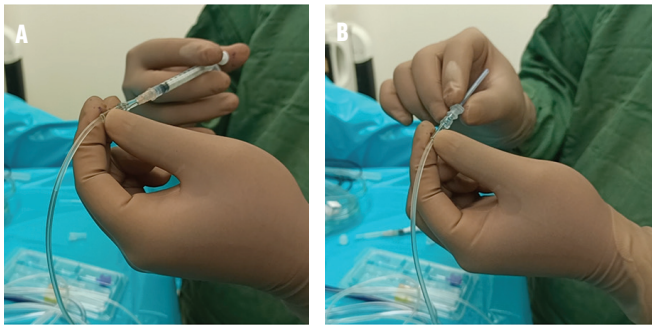


Figure 2. tPA is injected into one end of the extension tubing (A), after which a subretinal cannula is attached (B).

CLINICAL PERSPECTIVE

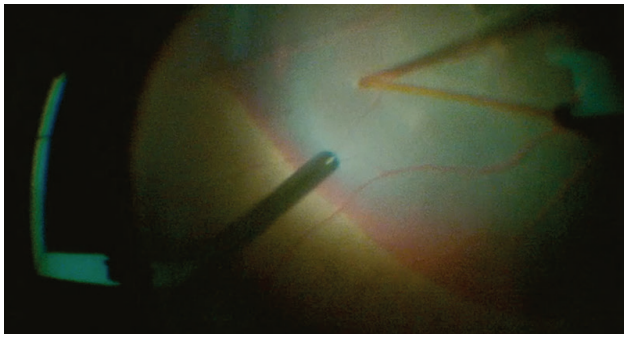
All previous patients were injected manually with difficulty keeping the flow steady, and we did not dare inject in more than one site for fear of causing a complication. We have used this new method on three patients with good results. Here are the clinical outcomes of two of them:

A 64-year-old woman presented with a sudden decrease in vision in the right eye from 1.0 to 0.2 based on the ETDRS protocol. She had a history of PCV and multiple injections of aflibercept (Eylea, Regeneron) in the right eye, and her left eye is blind. She had a submacular bleed involving the fovea. We performed a 25-gauge vitrectomy with subretinal alteplase injection followed by tamponade with SF_6 gas (Figure 3). Vision has improved slightly to 0.3.

A 61-year-old man presented with sudden loss of vision to counting fingers in the left eye. His examination revealed a large subretinal hemorrhage involving the macula. We performed a 25-gauge vitrectomy with subretinal injection of alteplase in three different areas followed by tamponade with SF_6 gas. Three weeks after displacement, vision had improved to 0.8 (Figure 4). ■

1. Glatt H, Machemer R. Experimental subretinal hemorrhage in rabbits. *Am J Ophthalmol*. 1982;94(6):762-773.
2. Kunavisarut P, Thithuan T, Patikulsila D, et al. Submacular hemorrhage: visual outcomes and prognostic factors. *Asia-Pacific J Ophthalmol*. 2018;7(2):109-113.
3. Palkar AH, Khetan V. Polypoidal choroidal vasculopathy: An update on current management and review of literature. *Taiwan J Ophthalmol*. 2019;9(2):72-92.

WATCH IT NOW



Subretinal tPA Injection

BIT.LY/TAHIJA1

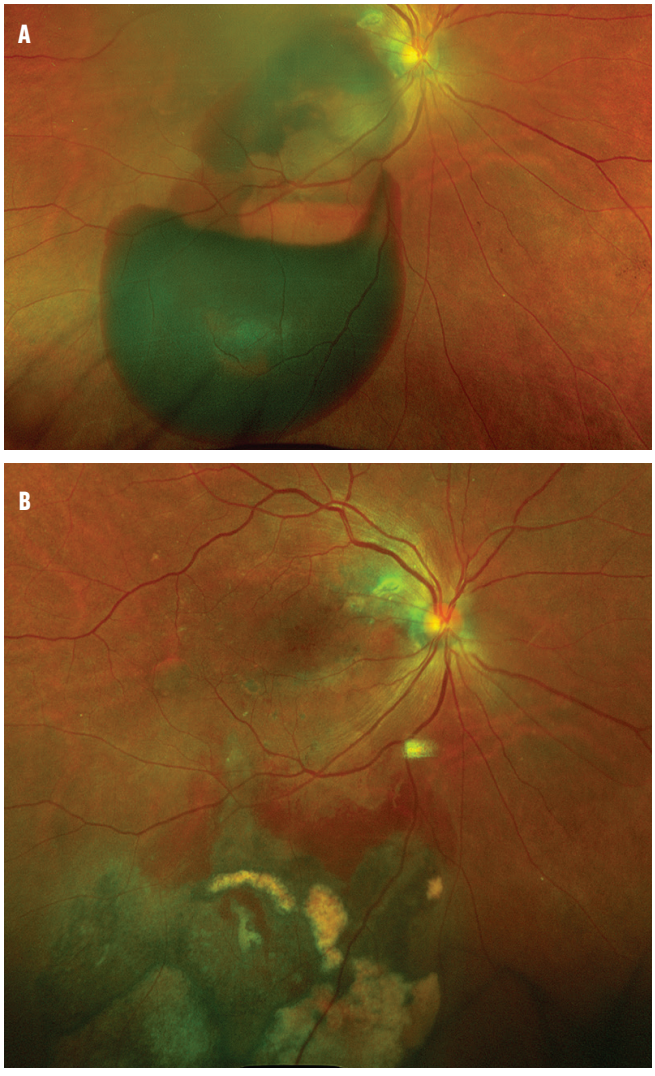


Figure 3. Before (A) and after (B) displacement of a patient's submacular hemorrhage with subretinal alteplase injection.

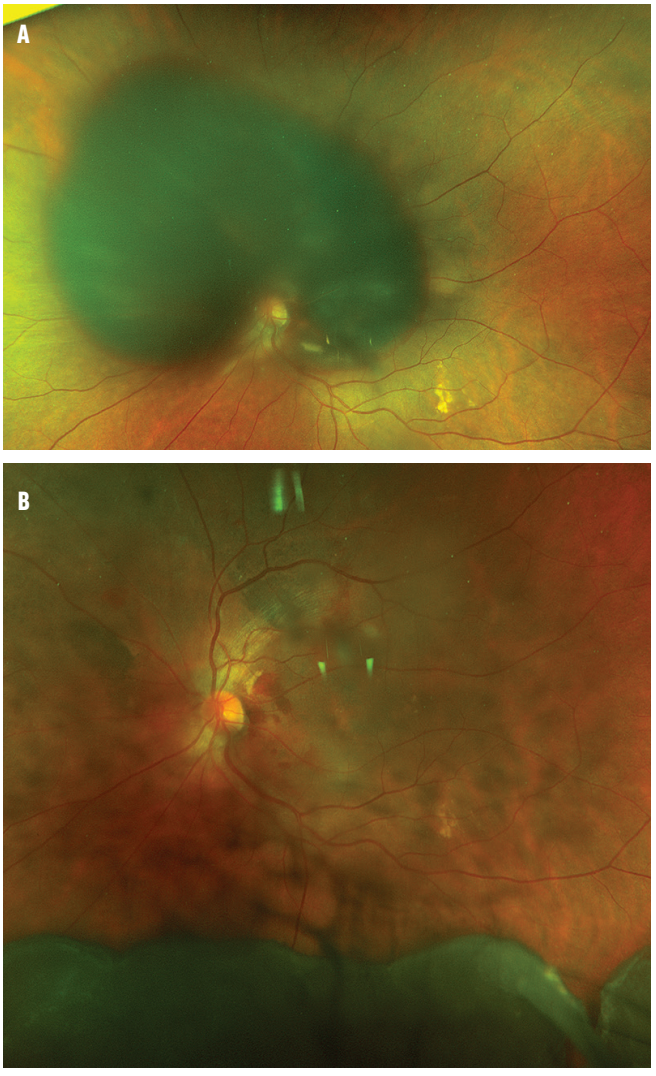


Figure 4. Before (A) and 3 weeks after (B) displacement of a patient's submacular hemorrhage with subretinal tPA with gas tamponade.

4. Chen CY, Hooper C, Chiu D, Chamberlain M, Karia N, Heriot WJ. Management of submacular hemorrhage with intravitreal injection of tissue plasminogen activator and expansile gas. *Retina*. 2007;27(3):321-328.
5. Hillenkamp J, Surguch V, Framme C, Gabel VP, Sachs HG. Management of submacular hemorrhage with intravitreal versus subretinal injection of recombinant tissue plasminogen activator. *Graefes Arch Clin Exp Ophthalmol*. 2010;248(1):5-11.
6. Haupert CL, McCuen BW 2nd, Jaffe GJ, et al. Pars plana vitrectomy, subretinal injection of tissue plasminogen activator, and fluid-gas exchange for displacement of thick submacular hemorrhage in age-related macular degeneration. *Am J Ophthalmol*. 2001;131(2):208-215.
7. Olivier S, Chow DR, Packo KH, MacCumber MW, Awh CC. Subretinal recombinant tissue plasminogen activator injection and pneumatic displacement of thick submacular hemorrhage in age-related macular degeneration. *Ophthalmology*. 2004;111(6):1201-1208.
8. Bell JE, Shulman JP, Swan RJ, Teske MP, Bernstein PS. Intravitreal versus subretinal tissue plasminogen activator injection for submacular hemorrhage. *Ophthalmic Surg Lasers Imaging Retina*. 2017;48(1):26-32.
9. Novelli FJD, Preti RC, Monteiro MLR, Nobrega MJ, Takahashi WY. A new method of subretinal injection of tissue plasminogen activator and air in patients with submacular hemorrhage. *Retina*. 2017;37(8):1607-1611.
10. Kimura S, Morizane Y, Hosokawa MM, et al. Outcomes of vitrectomy combined with subretinal tissue plasminogen activator injection for submacular hemorrhage associated with polypoidal choroidal vasculopathy. *Jpn J Ophthalmol*. 2019;63(5):382-388.
11. Isizaki E, Morishita S, Sato T, et al. Treatment of massive subretinal hematoma associated with age-related macular degeneration using vitrectomy with intentional giant tear. *Int Ophthalmol*. 2016;36(2):199-206.

UDY IRIANTO, ADN
■ Surgical Nurse, KMN EyeCare, Jakarta, Indonesia
■ Financial disclosure: None

CHRISTOPHER RYAN, BS
■ Video and Photography Technician, KMN EyeCare, Jakarta, Indonesia
■ Financial disclosure: None

EMIL SJAHREZZA, MD
■ Vitreoretinal Surgeon, KMN EyeCare, Jakarta, Indonesia
■ Financial disclosure: None

ANTONIUS SUSANTO, MD
■ Anesthesiologist, KMN EyeCare, Jakarta, Indonesia
■ Financial disclosure: None

SJAKON G. TAHIJA, MD
■ Founding Director and Vitreoretinal Consultant, KMN EyeCare, Jakarta, Indonesia
■ Editorial Board Member, *Retina Today*
■ sjakon.tahija@gmail.com
■ Financial disclosure: Consultant (Alcon Pharmaceuticals)

VIRTUAL RETINA FELLOWSHIP INTERVIEWS

How did remote interviewing go in 2020? Top fellowship directors review their experiences.

AN INTERVIEW WITH ARUNAN SIVALINGAM, MD; TAREK S. HASSAN, MD; AND SUNIL K. SRIVASTAVA, MD
BY MATTHEW STARR, MD

The interview process for ophthalmology residencies and fellowships this past cycle was uniquely disrupted by the COVID-19 pandemic. This interview focuses on how fellowship directors at three top surgical retinal fellowships adjusted to the virtual interview process. They also offer tips for future fellowship applicants.

Matthew Starr, MD: Was it difficult to make the transition from in-person to virtual interviews?

Sunil K. Srivastava, MD: By the time the interview season came around this past year, all of us were already pretty used to the virtual format. There are multiple advantages to the virtual format. For applicants, there is a significant reduction in cost, and scheduling becomes much easier. For programs, there are fewer logistical challenges in arranging an interview day. However, what concerned us about the virtual format was our ability to communicate our culture and camaraderie to interviewees.

Arunan Sivalingam, MD: We hired a third-party company to manage all of the logistics required for our preinterview virtual dinner with applicants and interview day. We provided a schedule of events, and the company managed the three applicant pools, one for the interview, one to meet with the current fellows and clinical staff, and one to meet with some of our alumni. The Wills Eye Retina fellowship is unique, with over 20 active teaching attendings. In addition, the fellows play an essential role in resident teaching in the retina service clinic, the Wills Eye ER and the Jefferson consult service.

Tarek S. Hassan, MD: Getting over the idea that we would not be able to sit in the room with our candidates, and that they would not be able to see our program live and in person, was difficult in the beginning as it put us in such a novel situation. We have always enjoyed spending time with our candidates and getting to know them as well as possible during our interview period. It is always wonderful to meet these future colleagues.

It was good that we were more than 6 months into the pandemic before our interview days. During that time, all of us—staff members and candidates—had gotten comfortable with online meeting platforms and had been able to explore innovative new ones, so that we could maximize our opportunities to evaluate our potential new trainees under these strange circumstances. We found an innovative platform we could use to interact somewhat socially, and were also able to run a timely and personal formal interview process.

Dr. Starr: What did you do to try to give applicants a feel for your program?

Dr. Srivastava: We engaged them. We did some things differently for our interviewees this year. We sent each one short video clips made by the faculty with the theme of teaching. Some were serious, some attempted to be humorous, but all were successful in communicating to interviewees some insights into our personalities. We then asked our interviewees to do the same, and we were impressed by the responses. We learned a lot about our interviewees and their own passions and hobbies.

It was fun to then be able to talk about their videos or about our own videos during subsequent interviews, and this really sparked conversations. To give them a feel for our teaching styles and how our teaching faculty interacts, we invited our interviewees to our weekly teaching rounds (case conferences, surgical conferences) in a virtual format. Finally, we held two virtual hangouts toward the end of the season with our faculty, nurses, and fellows to give the candidates a feel for our culture.

Dr. Hassan: It is important for any good program to highlight aspects that stand out about them for a fellow to want to train there. We wanted our applicants to get to know us better, first as people and not as their future attendings. They can read about our professional accomplishments and the specifics of the program online, but they become part of our family when they become our fellows, and we want them to view us in that way—future teachers, mentors, and lifelong family members. We used a fun virtual platform for our cocktail-socializing hour the evening before the formal interview process. The applicants and our current fellows and attendings got to spend time chatting, joking, pranking, and simply enjoying each other's company.

We also provided videos about living, working, and playing in Royal Oak and Birmingham, Michigan, as well as information about local real estate. Certainly this is not a perfect substitute for being shown the area on an in-person visit, but we wanted to at least give the applicants a flavor of what it is like to enjoy the area outside of work. During the formal interview sessions, we provided the applicants with a guided video tour of all the physical spaces they would work in as fellows, again trying to give them a sense of what they would have seen had they come to visit.

Dr. Sivalingam: We created a prerecorded video tour and had as many current and past fellows as possible available for questions during a preinterview dinner as well as on the day of the interview. We also created a live webinar before the virtual dinner to go over the fellowship and show the candidates around the hospital. We wanted to give the information about the Wills family during and after fellowship. Contact information for the participating fellows was available to the applicant pool for follow up questions.

Dr. Starr: Did you do anything differently when selecting candidates for interviews or when ranking candidates?

Dr. Sivalingam: It was extremely difficult not meeting the candidates in person. We have many connections within the retina community, and thus we relied more on recommendations from faculty and follow-up phone calls with the residency programs.

Dr. Hassan: We didn't change anything about the process of selecting candidates to interview. The application review process was the same. But we spent as much time as possible with the virtual evaluation of each candidate and then spent even more time calling many friends and colleagues who are mentors to the applicants with whom we were most interested in matching. In short, we were left relying more than usual on the insights and impressions of others to help complete our picture of the candidate pool.

Dr. Srivastava: We tried to select applicants for interviews using similar criteria as in years past. Our ranking process this year was also pretty similar to years past. Application, interview, and letters of recommendation are all still the main criteria for our ranking process.

Dr. Starr: Did any applicants do anything during the virtual interview that really made them stand out?

Dr. Srivastava: Our interviewees spent some time producing short video clips for us. This was a really useful medium to get to know them.

Dr. Hassan: No single applicant did anything too out of the ordinary, but we did take special notice of those who were particularly adept at accepting and being comfortable with the virtual format and were thus able to be more relaxed and natural in showing us their true personalities.

Dr. Sivalingam: No candidate did anything in particular to make themselves stand out. Some applicants may have had a slightly better virtual setup, but, while these facets are nice, they did not outweigh the important details from the applicants' CVs.

Dr. Starr: What would be your best piece of advice for future applicants during virtual interviews or meetings?

Dr. Sivalingam: Camera placement and strong WiFi are essential. Applicants should be looking straight into the camera rather than down at their screens.

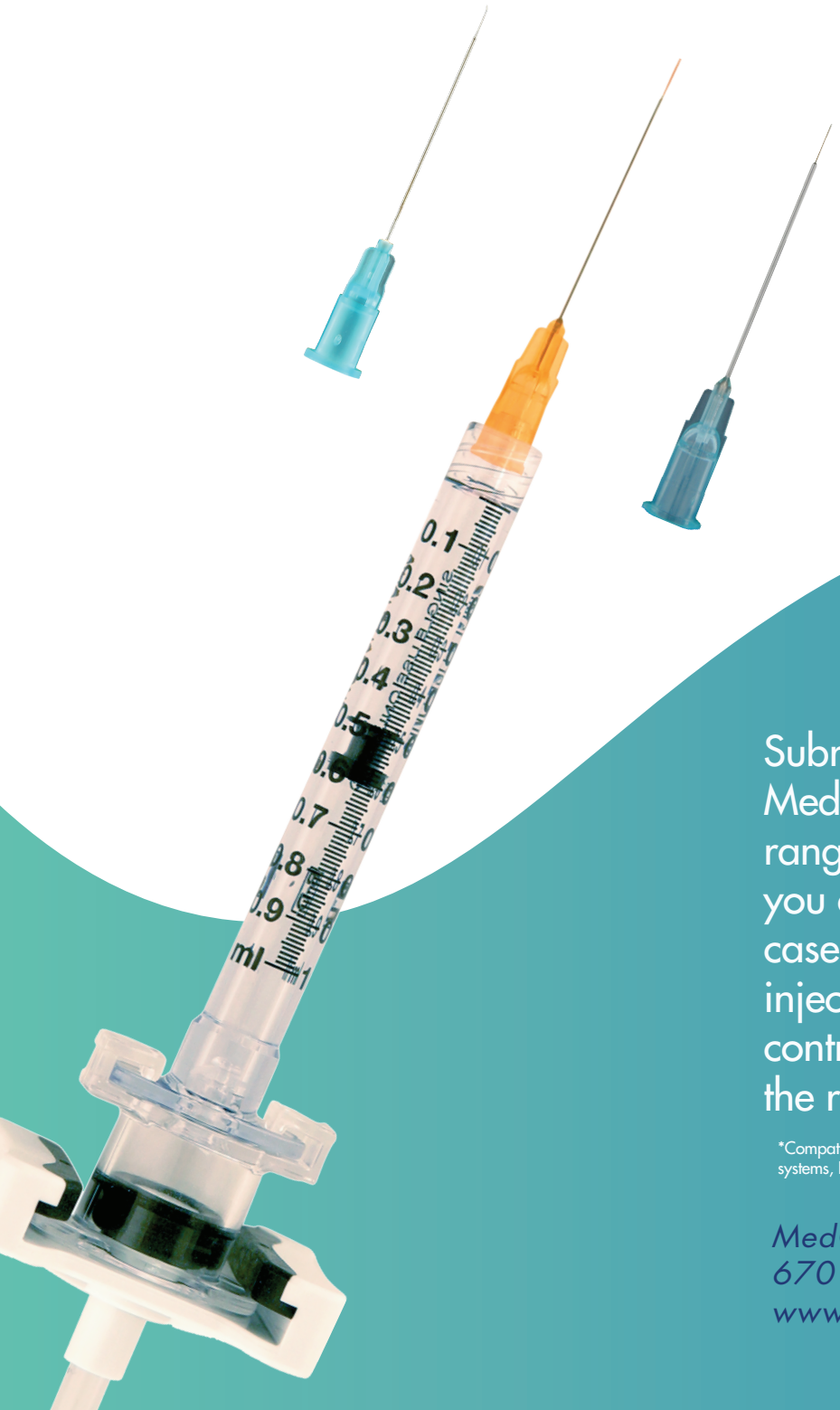
Dr. Srivastava: Allow your personality to shine through as best you can. Be engaging. Show us you can connect with people you have just met, similar to how we must connect with patients quickly when we care for them.

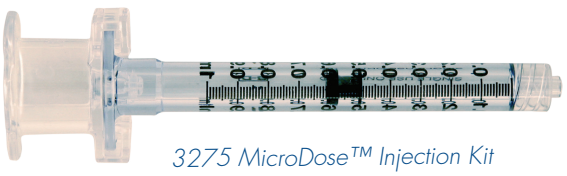
Dr. Hassan: The best advice for applicants for any interview or meeting—most particularly in the virtual setting—is to be yourself. It sounds trite, but in fact there is nothing we consider more highly than the personality and character of the applicant when we meet him or her at the interview. The specifics of their record, their recommendations, and their goals and aspirations are largely known from their applications. Fellowship interview situations are used to create a match—not only an academic one, but a much more

(Continued on page 49)

PROVIDING SOLUTIONS FOR SUBRETINAL INJECTIONS

Control + Precision with our MicroDose™ Injection Kit and Subretinal Cannulas





3275 MicroDose™ Injection Kit

Kit includes preassembled adapter and syringe

MedOne®

Subretinal injections are challenging. Let MedOne help make it easier with our wide range of subretinal injection cannulas so you can select the one that is best for each case. Connect that with our MicroDose injection Kit to give you precision and total control over the injection process. Having the right tools can make the job easier.

*Compatible with the Alcon Constellation®, Bausch & Lomb Stellaris® and DORC Eva® systems, Developed in cooperation with David M. Brown, MD, Houston, TX.

MedOne Surgical, Inc. • TEL: 941.359.3129
670 Tallevast Road, Sarasota, FL 34243 USA
www.MedOne.com • MedOne@MedOne.com

LIMITED OR COMPLETE VITRECTOMY FOR ERM?


Shorter surgical time doesn't necessarily translate to an increased rate of complications.

BY MATTEO FORLINI, MD, AND PURVA DATE, DNB, FVRS; WITH DOMENICO D'ELISEO, MD; PAOLO ROSSINI, MD; ADRIANA BRATU, MD; ANDREA VOLINIA, MD; GIOVANNI NERI, MD; TOMMASO VERDINA, MD; MARIA ROSARIA CARBOTTI, MD; GIAN MARIA CAVALLINI, MD; LUIGI SBORGIA, MD; ALESSANDRA GALEONE, MD; AURELIO IMBURGIA, MD; ALESSANDRO MULARONI, MD; AND ALESSANDRO MEDURI, MD

Traditional vitreoretinal surgical teaching emphasizes that the entire vitreous must be removed in any form of vitreoretinal surgery.[1] Although this rule may hold in cases of rhegmatogenous retinal detachment (RRD) and other pathologies in which the peripheral vitreous cortex is causative, it may not be true for eyes with predominantly macular pathologies.

Performing a complete vitrectomy with base dissection is time-consuming and requires a panoramic wide-angle viewing system for proper visualization. The procedure is dependent on a skilled assistant's ability to bring the extreme peripheral cortex and ora serrata into view, and it is associated with the risk of lens touch and subsequent cataract formation in phakic eyes.

Because it is challenging to excise the peripheral vitreous cortex and vitreous base and these structures are unlikely to be associated with most macular pathologies, it may be prudent to forgo base excision and perform limited vitrectomy alone in these cases.[2]

However, leaving the pre-equatorial residual vitreous skirt in place may increase the risk of retinal tears and predispose vitrectomized eyes to RRD. Bonfiglio et al reported the use of limited vitrectomy for phakic eyes with RRD but without macular pathology with excellent results.[3] Although Boscia et al proposed the use of minimal vitrectomy up to the equator almost a decade ago,[4] no follow-up studies have established the safety of this approach.

We performed a multicenter retrospective study to compare the efficacy of limited vitrectomy versus complete vitrectomy with base excision in eyes with epiretinal membranes (ERM). Surgical times and complication rates were secondary outcomes.

METHODS

We used electronic health records and OR registers to identify all patients with idiopathic ERMs who underwent standard three-port pars plana vitrectomy (PPV) with or without combined phacoemulsification and IOL implantation with a minimum of 6 months follow-up at four institutions. Eyes with other coexistent ocular pathologies such

AT A GLANCE

- It may be prudent to perform a limited vitrectomy alone when the peripheral vitreous cortex and vitreous base are challenging to excise and the case is not associated with most macular pathologies.
- The authors found no significant differences between eyes that underwent limited versus complete vitrectomy in terms of BCVA, macular thickness, or other postoperative complications such as cystoid macular edema.
- The surgical time was significantly reduced in the limited vitrectomy group with more than 90% of surgeries completed in less than 1 hour.

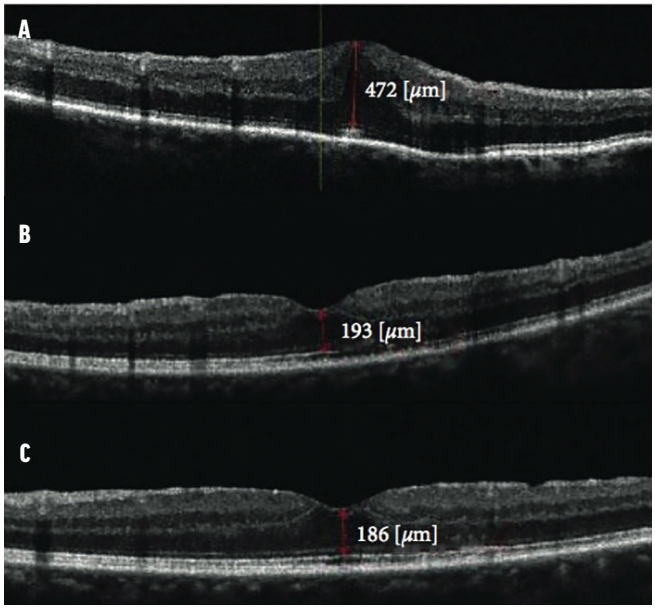


Figure 1. These OCT scans show a patient who underwent limited vitrectomy with ERM removal. The preoperative scan (A) shows the ERM with CMT of 472 µm with BCVA measuring 0.5 logMAR. The 1-month postoperative scan (B) shows CMT reduced to 193 µm with BCVA improvement to 0.8. The 1-year follow-up scan (C) shows CMT of 186 µm with normal foveal contour and vision improvement to 0.9 logMAR.

as corneal opacities, uveitis, and ERMs occurring secondary to other retinal pathologies such as trauma, previous RRD, or retinal vascular disorders were excluded. Patients with diabetes with any sign of retinopathy or maculopathy were also excluded.

Intraoperative complications, especially peripheral retinal tears and the need for laser photocoagulation, were noted. The duration of surgery was recorded in five categories: 30 to 45 minutes, 46 to 60 minutes, 61 to 90 minutes, 91 to 120 minutes, and more than 120 minutes. Data gathered during follow-up visits at 1 week, 6 months, and final follow-up included BCVA, central macular thickness (CMT), and complications (Figures 1 and 2).

SURGICAL PROCEDURE

Standard three-port PPV was carried out under local anesthesia. Eyes with coexistent cataract underwent phacoemulsification with IOL implantation. In eyes that underwent limited vitrectomy alone, after three standard ports were created at the pars plana a posterior vitreous detachment (PVD) was induced up to the equator, and limited vitrectomy was completed without disturbing the peripheral cortical vitreous and vitreous base (Figure 3, Video 1).

In complete vitrectomy, PVD was induced up to the vitreous base, and the entire vitreous body, including the peripheral cortex and base, were removed to the extent possible (Figure 4, Video 2). In phakic eyes, the entire peripheral vitreous was removed. After vitrectomy, the ERM was stained and peeled using microforceps. The

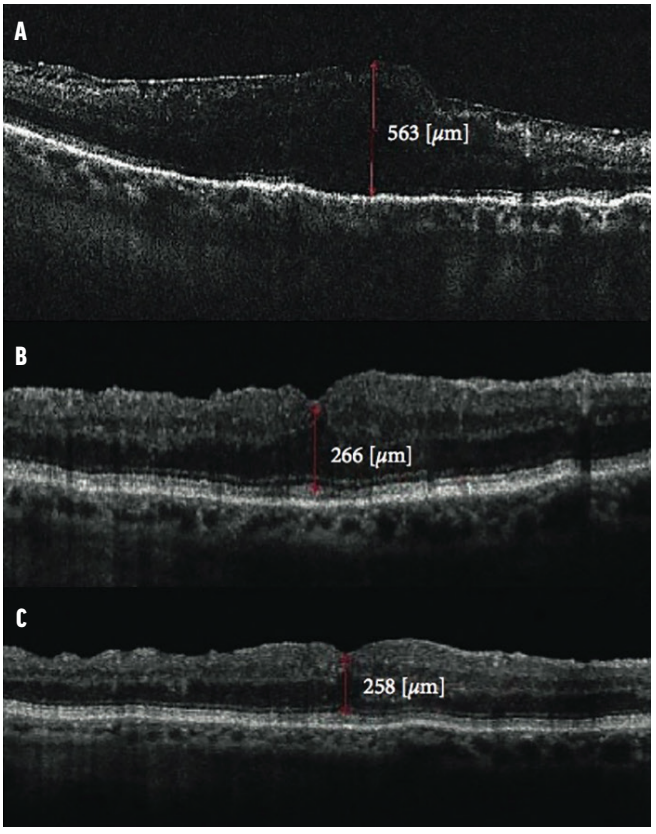


Figure 2. These OCT scans show a patient who underwent complete vitrectomy with ERM removal. The preoperative scan (A) shows the ERM with loss of foveal contour, CMT measuring 563 µm, and BCVA of 0.5 logMAR. The 1-month postoperative scan (B) shows a reduction in CMT to 266 µm and BCVA of 0.8 logMAR. At 1 year (C), CMT was 258 µm and BCVA had improved to 0.9 logMAR.

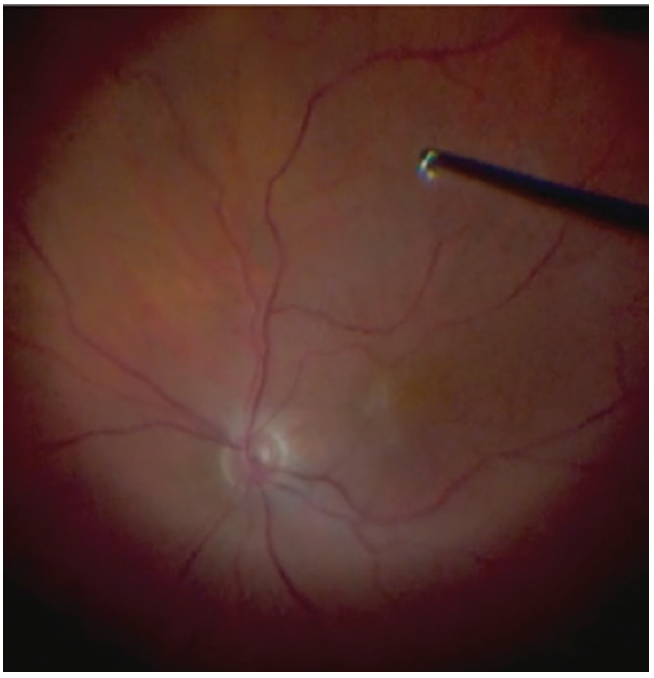


Figure 3. During limited vitrectomy, PVD was induced with core vitrectomy.

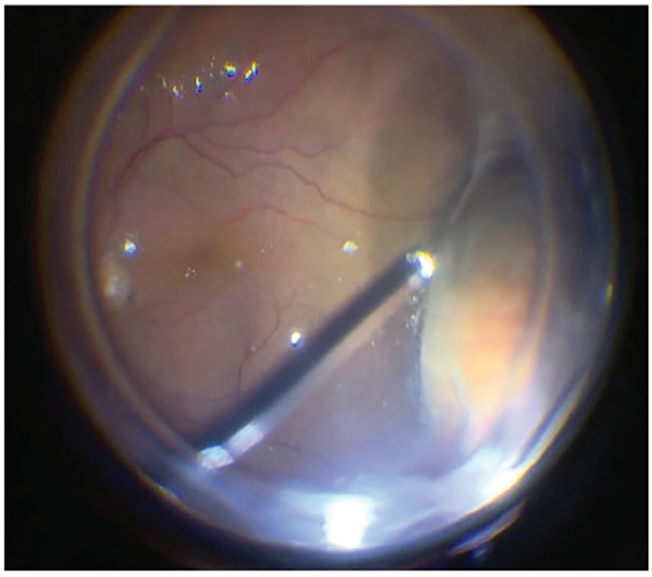


Figure 4. In complete vitrectomy, the peripheral vitreous was removed, with vitreous base shaving using dynamic pre-equatorial scleral indentation.

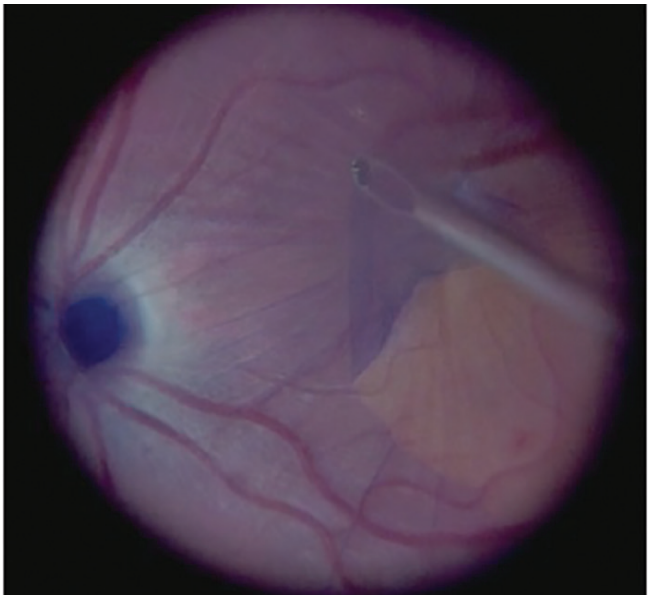


Figure 5. After ERM removal, the ILM was peeled under brilliant blue staining.

internal limiting membrane (ILM) was then stained and peeled around the center of the fovea for approximately 2 disc diameters (Figure 5). Ports were removed after application of tamponade. Eyes were filled with either saline or another tamponade per the surgeon's choice.

RESULTS

Our analysis included 139 eyes of 139 patients. Sixty-five eyes (47%) underwent limited vitrectomy prior to ERM removal, and 74 eyes (53%) underwent complete vitrectomy with peripheral base excision. Patients undergoing limited vitrectomy were marginally younger, although this difference was not statistically significant (P = .06). More eyes in the limited vitrectomy group than in the complete vitrectomy group were phakic (P = .01). All other preoperative parameters were comparable between groups.

Table 1 illustrates the intraoperative characteristics of each group. Iatrogenic peripheral retinal tears occurred in eight eyes overall (6%) with no intergroup differences, and all tears received prophylactic intraoperative barrage laser. Surgical time was significantly shorter in the limited vitrectomy group, with more than 90% of surgeries completed in less than 1 hour compared with 70% in the complete vitrectomy group (Table 2).

After adjusting for possible confounders influencing duration of surgery such as operating surgeon, gauge of PPV used, lens status, and PVD status, we found that performing phacoemulsification along with PPV required an extra 3.4 minutes compared with PPV alone (P = .04).

A comparison of outcomes and complications between the groups at 6 months is shown in Table 3. The mean follow-up was 14.3 ± 2.3 months. At 1-week follow-up, BCVA had

TABLE 1. INTRAOPERATIVE CHARACTERISTICS

	Limited Vitrectomy (n = 65)	Complete Vitrectomy (n = 74)	*P* value
Gauge			< .001
23	19 (29%)	29 (40%)	
25	43 (66%)	32 (43%)	
27	3 (5%)	13 (17%)	
Peeling			< .001
ERM only	17 (26%)	2 (3%)	
ERM + ILM	48 (74%)	72 (97%)	
Stain			< .001
Dual	9 (14%)	61 (82%)	
Brilliant blue dye	39 (60%)	3 (4%)	
Triamcinolone	11 (17%)	9 (12%)	
Other	6 (9%)	1 (1%)	
Tamponade			< .001
Gas	9 (14%)	5 (7%)	
Air	43 (66%)	68 (92%)	
Saline	13 (20%)	1 (1%)	
Combined phacoemulsification	39 (60%)	44 (59%)	.95
Peripheral retinal breaks	3 (5%)	5 (7%)	.49

TABLE 2. DURATION OF SURGERY

	Limited Vitrectomy	Complete Vitrectomy	Total	*P* value
30–45 min	2 (3.5%)	15 (20%)	17 (12%)	< .0001
46–60 min	58 (89%)	37 (50%)	95 (68%)	
61–90 min	3 (4%)	17 (23%)	20 (15%)	
91–120 min	2 (3.5%)	4 (5.5%)	6 (4.3%)	
>120 min	0 (0%)	1 (1.5%)	1 (0.7%)	

TABLE 3. COMPLICATIONS AND OUTCOMES AT 6 MONTHS POSTOPERATIVE

	Limited Vitrectomy (n = 65)	Complete Vitrectomy (n = 74)	*P* value
BCVA (logMAR)	0.3 ± 0.2	0.22 ± 0.2	.18
Central macular thickness (µm)	286 ± 87	358 ± 75	.09
Complications			
Retinal detachment	2 (3%)	0	.22
Cystoid macular edema	5 (8%)	8 (11%)	.45
Macular hole	1 (1.5%)	0	

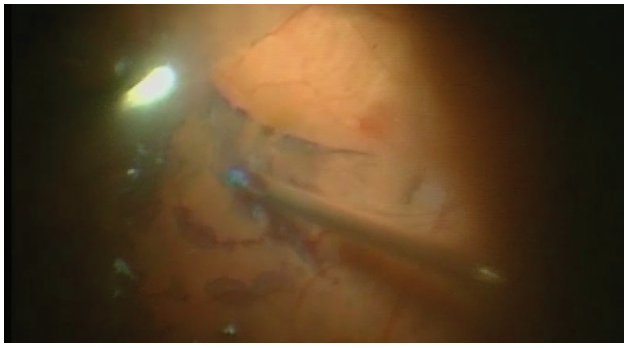
improved to 0.5 ± 0.2 logMAR in the limited vitrectomy group and 0.43 ± 0.2 logMAR in the complete vitrectomy group (*P* = .21). BCVA improved in both groups compared with baseline, and there was no difference in BCVA between groups at 6 months.

RRD was seen in two eyes (3%) in the limited vitrectomy group and no eyes in the complete vitrectomy group. None of the RRDs occurred in eyes that had experienced iatrogenic retinal tears during surgery. One detachment occurred 2 months after surgery and another 10 months after surgery. Both underwent successful retinal reattachment surgery with silicone oil tamponade. Self-limiting cystoid macular edema was the most common complication, seen in fewer than 10% of patients in each group.

DISCUSSION

In this multicenter retrospective European study, we found that performing limited vitrectomy along with ERM peeling yielded results comparable with those achieved with complete vitrectomy with base excision. Both study groups experienced the same number of iatrogenic retinal tears during surgery, and the incidence was not statistically significant between groups. Limited vitrectomy was significantly faster, with most surgeries taking less than 1 hour.

WATCH IT NOW



Video 1. Core Vitrectomy With Epiretinal Membrane Removal

BIT.LY/FORLINI1

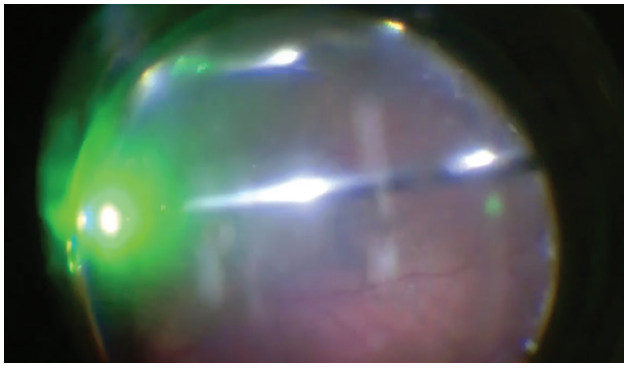
Boscia et al, in a noncomparative study, performed limited vitrectomy in 176 eyes with ERM and vitreomacular traction syndrome with favorable results.[4] At a mean follow-up of 15 months, they reported excellent visual and anatomic results with RRD in only two eyes (1%). Similarly, Ozkaya et al performed limited vitrectomy with membrane peeling for ERM and idiopathic macular hole in 52 eyes.[2] They noted a transient rise of IOP in three (5.9%) patients, endophthalmitis in one (2.0%) patient, and RRD in one patient (2.0%) during follow-up. In our comparative study, we found similar results in the limited vitrectomy group, with RRD occurring in only two eyes.

The main concern with performing limited vitrectomy for macular pathologies is the possibility of condensation and contraction of the residual peripheral vitreous cortex. This may then lead to an increased risk of retinal tears with subsequent RRD. The incidence of retinal detachment has varied from 1% to 18% in previous studies.[5-8] In a large multicenter study of 474 eyes with macular pathologies, Matonti et al reported that iatrogenic retinal breaks were seen in 1.7% of cases, and an additional 2.7% experienced RRD.[5] In another large study of more than 1,600 eyes in which an ultrahigh-speed 25-gauge cutter was used, Mura et al reported that the risk of iatrogenic breaks (1.8%, n = 25) was higher when PVD was induced intraoperatively.[6]

Tarakcioglu et al postulated that induction and extension of PVD or performing peripheral vitreous shaving could be a cause of iatrogenic peripheral retinal tears.[9] Rahman et al reported a much higher incidence of iatrogenic retinal breaks (18%) in eyes with macular pathologies and attributed this to a more adherent posterior hyaloid.[8] Thus, it may be prudent not to induce a PVD beyond the equator when vitrectomy is performed for macular pathologies. Before concluding such surgeries, clinicians must perform a detailed examination of the periphery with indentation and prompt laser treatment when necessary.

Our study showed that performing limited vitrectomy

WATCH IT NOW



Video 2. Complete Vitrectomy + ILM Peeling

BIT.LY/FORLINI2

along with ERM and ILM peeling was significantly faster than performing complete vitrectomy in most instances. Reduced surgical time may improve surgical performance, especially in a high-volume surgical setup. Additionally, a patient's subjective experience may also be better with a shorter surgical time. We did not find any other significant differences between eyes that underwent limited versus complete vitrectomy in terms of BCVA, macular thickness, or other postoperative complications such as cystoid macular edema.

FINAL THOUGHTS

The merits of our study include its multicentric nature and the inclusion of a comparison group. The study was limited by its retrospective nature, relatively small sample size, and few cases of retinal tears and detachments, making safety assessment a challenge. The findings may have limited utility in eyes with complex ERMs, for which the surgical time may be prolonged.

In summary, we found that limited vitrectomy was at least as effective as complete vitrectomy in the management of macular pathologies. Limited vitrectomy also reduced operative time without increasing the rate of complications. Further prospective, randomized studies with larger sample sizes will be required to confirm these observations. ■

1. Sullivan P. *Vitreoretinal Surgery*. London: Eyelearning; 2014:306.
2. Ozkaya A, Erdogan G, Tulu B, Tarakcioglu HN. The outcomes of subtotal vitrectomy in macular surgeries: a single surgeon case series. *Int Ophthalmol*. 2019;39(3):589-595.
3. Bonfiglio V, Toro MD, Longo A, et al. Modified vitrectomy technique for phakic rhegmatogenous retinal detachment with intermediate break. *J Ophthalmol*. 2018;6127932.
4. Boscia F, Milano A, Sborgia G, et al. Minimal vitrectomy for epiretinal membranes and vitreomacular traction syndrome. *Invest Ophthalmol Vis Sci*. 2009;50(13):4208-4208.
5. Matonti F, Meyer F, Rouhette H, et al. Anatomical and functional prognosis of secondary retinal detachments after sutureless macular surgery. *J Fr Ophtalmol*. 2014;37(1):58-63.
6. Mura M, Barca F, Dell'Omo R, et al. Iatrogenic retinal breaks in ultrahigh-speed 25-gauge vitrectomy: a prospective study of elective cases. *Br J Ophthalmol*. 2016;100(10):1383-1387.
7. Rizzo S, Belting C, Genovesi-Ebert F, et al. Incidence of retinal detachment after small-incision, sutureless pars plana vitrectomy compared with conventional 20-gauge vitrectomy in macular hole and epiretinal membrane surgery. *Retina*. 2010;30(7):1065-1071.
8. Rahman R, Murray CD, Stephenson J. Risk factors for iatrogenic retinal breaks induced by separation of posterior hyaloid face during 23-gauge pars plana vitrectomy. *Eye*. 2013;27(5):652-656.
9. Tarakcioglu HN, Tulu B, Ozkaya A. Subtotal vitrectomy in idiopathic macular hole surgery. *Saudi J Ophthalmol*. 2019;33(4):369-373.

ADRIANA BRATU, MD
■ Department of Ophthalmology, "S. Maria delle Croci" Hospital, Ravenna, Italy

MARIA ROSARIA CARBOTTI, MD
■ Institute of Ophthalmology, University of Modena and Reggio Emilia, Modena, Italy

GIAN MARIA CAVALLINI, MD
■ Institute of Ophthalmology, University of Modena and Reggio Emilia, Modena, Italy

PURVA DATE, DNB, FVRS, CORRESPONDING AUTHOR
■ Valvekar Medical & Research Centre, Solapur, India
■ drpurvadate@yahoo.in

DOMENICO D'ELISEO, MD
■ Department of Ophthalmology, "S. Maria delle Croci" Hospital, Ravenna, Italy

MATTEO FORLINI, MD
■ Division of Ophthalmology, San Marino Hospital, Republic of San Marino

ALESSANDRA GALEONE, MD
■ Department of Ophthalmology, University of Bari, Italy

AURELIO IMBURGIA, MD
■ Division of Ophthalmology, San Marino Hospital, Republic of San Marino

ALESSANDRO MEDURI, MD
■ Clinic of Ophthalmology, Department of Biomedical Sciences, University of Messina, Messina, Italy

ALESSANDRO MULARONI, MD
■ Division of Ophthalmology, San Marino Hospital, Republic of San Marino

GIOVANNI NERI, MD
■ Institute of Ophthalmology, University of Modena and Reggio Emilia, Modena, Italy

PAOLO ROSSINI, MD
■ Department of Ophthalmology, "S. Maria delle Croci" Hospital, Ravenna, Italy

LUIGI SBORGIA, MD
■ Department of Ophthalmology, University of Bari, Italy

TOMMASO VERDINA, MD
■ Institute of Ophthalmology, University of Modena and Reggio Emilia, Modena, Italy

ANDREA VOLINIA, MD
■ Department of Ophthalmology, "S. Maria delle Croci" Hospital, Ravenna, Italy

None of the authors has any financial interests to disclose.
The authors acknowledge the help of Sabyasachi Sengupta, MD, from Sengupta's Research Academy, Mumbai, India, for content editing and English prose.

Pearls for Intraocular Foreign Body Removal


Timely initial assessments and the right tools are keys to success.

BY JUSTIN H. TOWNSEND, MD, AND JONATHAN F. RUSSELL, MD, PHD

Surgery for intraocular foreign bodies (IOFBs) requires critical thinking and an intellectually flexible framework. No two IOFB cases are the same, but there are some common principles that retina surgeons can draw on when approaching each case.

Here, we review how the history of each patient with an IOFB can inform surgical decision-making, including instrument choices and surgical strategies. We also discuss several clinical pearls for IOFB removal and whether all IOFBs have to be removed.

IOFB PARTICULARS

Acquiring a thorough history of the patient's injury is key to success in IOFB cases. The size of the IOFB, its material composition, and the circumstances that led to the injury are all important in deciding whether to proceed with surgery and, if so, how to remove the IOFB.

IOFB removal requires an incision larger than the IOFB itself to provide the extra space needed for instrument manipulation and width during extraction. Although it may be tempting to create an incision that is barely larger than the IOFB to reduce the trauma of surgery, doing so invites the risk of dropping the IOFB during extraction, leading to the possibility of retinal contusion or macular infarction. Also, if the incision is too small, the IOFB can become trapped in the sclera during attempted removal, after which it may be challenging to locate and remove.

All patients with an IOFB, by definition, have a ruptured globe. To guard against endophthalmitis, we administer topical, intraocular, and/or systemic antibiotics to patients as appropriate, depending on the circumstances. Generally, we initiate topical antibiotics and give a single dose of systemic antibiotics at the time of diagnosis. Although eyes in need of IOFB removal usually go to surgery quickly, if we have to wait until the next day for surgery for logistical reasons, we sometimes give intraocular antibiotics the night before surgery. This is particularly true if there is concern for early endophthalmitis. In these instances, antibiotics are typically given intravitreally in clinic; rarely, they are given intracamerally if there is concern for retinal or choroidal detachment or the IOFB is in the anterior chamber rather than the vitreous. We always administer intravitreal antibiotics at the conclusion of surgery. We also immunize against tetanus. Risk factors for developing endophthalmitis include older age, retained IOFB in the vitreous cavity, and IOFBs of plant-based or mixed composition.[1]

In some instances, the surgeon may elect to observe an IOFB rather than remove it. These may include situations in which inert glass or plastic IOFBs have not caused a retinal

AT A GLANCE

- Details about the composition of an IOFB are key to surgical decision-making.
- Specific instruments designed to remove IOFBs can be useful tools.
- The surgical strategy, including the route of explantation, may differ for each case.
- Topical, intraocular, and/or systemic antibiotics can help to guard against postoperative endophthalmitis.

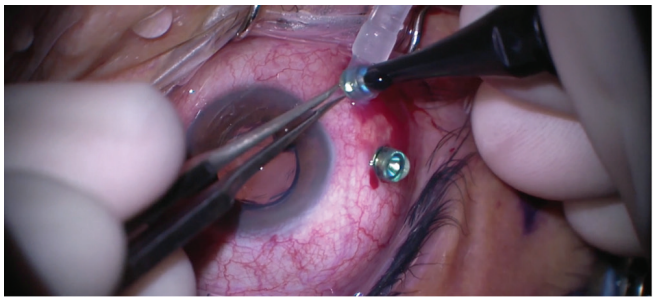


Figure. The FreeFlow infusion line (Bausch + Lomb) allows the entire internal diameter of the trocar-cannula to be used for infusion. The result is higher flow rates with 23-, 25-, and 27-gauge platforms that may improve stability of intraoperative fluidics.

tear, retinal detachment, or endophthalmitis or otherwise impaired vision. Metallic IOFBs should generally be removed, as iron and copper may cause siderosis and chalcosis, respectively, if they remain in the globe. On some occasions, however, metallic IOFBs can be observed, particularly if they have been present chronically and become encapsulated. If there is any possibility of endophthalmitis, the IOFB should be removed, regardless of its composition.

INSTRUMENTATION AND SURGICAL APPROACH

Instrument choice and surgical approach are influenced by many variables, including IOFB material and size and the fluidics of the eye. In our experience, glass is difficult to grasp and usually requires forceps with strong purchase. Metallic IOFBs may best be explanted with a magnetic instrument such as an 18-gauge IO Foreign Body Magnet (Bausch + Lomb/Synergetics). The 18-gauge BB Removal Forceps (Bausch + Lomb/Synergetics) are, to the best of our knowledge, the only surgical instrument specifically designed for BB removal.

Reusable foreign body forceps are available, but these occasionally break during sterilization. Small-gauge instruments, such as 25-gauge active aspiration silicone-tipped instruments[2] and 23-gauge forceps,[3] can be used for small IOFBs or to move a larger IOFB into the anterior chamber for explantation through a corneal incision or wound.

Maintaining stable fluidics during surgery for IOFB removal often presents a challenge. The size of the entry (and perhaps exit) wounds may lead to difficulty maintaining the structural integrity of the globe. Here, being familiar with the settings of your vitrectomy platform is key. We use the Stellaris Elite (Bausch + Lomb), which allows a higher level of infusion flow compared with earlier infusion systems via a feature called FreeFlow. With typical systems, the infusion line is fed through a trocar-cannula. With FreeFlow, the infusion line is coupled to the top of the trocar-cannula (Figure). This allows infusion through the entire internal lumen of the trocar-cannula, resulting in higher flow rates through the same gauge sclerotomy and more stable fluidics. This is especially helpful in cases involving a large wound.

SURGICAL STRATEGY

Retinal surgeons initiating IOFB removal face a decision: to close the traumatic wounds and then remove the IOFB, or vice versa. For eyes with small, centrally located corneal wounds, we generally extract the IOFB first and then suture the entry wound; closing the corneal wounds first can degrade the quality of the view for vitrectomy and IOFB extraction. In eyes with large or peripheral corneal wounds, we suture the wound before extracting the IOFB.

We rarely remove an IOFB via the entry wound. We prefer to explant through a pars plana scleral incision or a clear corneal incision. In many cases, we perform pars plana lensectomy, including removal of the lens capsule, prior to IOFB extraction. We prefer this to lens removal via phacoemulsification, which may impair visualization because of corneal edema. Patients are left aphakic.

Occasionally, when there is no lenticular violation or traumatic cataract, we leave the lens in situ and explant the IOFB via a pars plana scleral incision.

If a retinal tear or detachment is present, it is treated at the time of IOFB removal using standard vitrectomy techniques. We inject intravitreal antibiotics and/or antifungals at the end of every IOFB removal.

Because delayed retinal detachment and proliferative vitreoretinopathy are common after penetrating ocular trauma, we wait several months before considering IOL implantation. IOL placement can be performed by an anterior segment colleague or by the retina surgeon. Aphakic contact lenses are a nonsurgical option.

FINAL THOUGHTS

Meticulous attention to trauma history, surgical equipment selection, and endophthalmitis prophylaxis gives the retina surgeon the best chance to preserve vision in patients with IOFB injuries. ■

1. Duan F, Yuan Z, Liao J, et al. Incidence and risk factors of intraocular foreign body-related endophthalmitis in Southern China. *J Ophthalmol*. 2018;2018:8959108.
2. Singh R, Kumar A, Gupta V, Dogra MR. 25-gauge active aspiration silicon tip-assisted removal of glass and other intraocular foreign bodies. *Can J Ophthalmol*. 2016;51(2):97-101.
3. Huang Y, Yan H, Cai J, Li H. Removal of intraocular foreign body in anterior chamber angle with prism contact lens and 23-gauge foreign body forceps. *Int J Ophthalmol*. 2017;(5):749-753.

JUSTIN H. TOWNSEND, MD
- Assistant Professor of Clinical Ophthalmology, Bascom Palmer Eye Institute, Miami
- jtownsend@med.miami.edu
- Financial disclosure: Speaker (Bausch + Lomb)

JONATHAN F. RUSSELL, MD, PHD
- Chief Resident, Director of Ocular Trauma, and Second-Year Vitreoretinal Surgery Fellow, Bascom Palmer Eye Institute, Miami
- jfrussell@med.miami.edu
- Financial disclosure: None

BVI

Unrivalled Experience

*This Device is Only Available in Europe

Vitreq
Vitreoretinal Surgical Products

CryoTreq
Ophthalmic Cryo-Surgery

Unique | Straightforward | Compelling

- First and Only Single-Use, stand-alone device for ophthalmic cryosurgery
- Only seconds required for activation to reach cryogenic temperatures(1)
- Up to 15 freezing cycles per surgery

bvimedical.com

1) References CryoTreQ Technical File STED 2.2.4 "Performance Specifications: In a water bath at a temperature of 37 °C, an ice ball will be formed with a layer thickness of 0.8 mm within 6 seconds".

Tips for Repositioning Three-Piece IOLs

Using a sutureless intrascleral fixation technique can help ensure well-centered and secure placement.

BY ASHKAN M. ABBEY, MD

Today there are numerous approaches to address IOL fixation in eyes without adequate capsular support. Each technique has unique advantages and disadvantages that are worth consideration prior to each surgical case, and there is no consensus on the best method of secondary IOL fixation.[1]

My preferred technique involves transconjunctival sutureless intrascleral (SIS) fixation of a three-piece IOL using trocar-cannulas (Video). I have now performed more than 500 SIS procedures, and I recently reported the outcomes of the first 488 eyes.[2] If a patient presents with a relatively undamaged, dislocated three-piece IOL, I believe the SIS technique is the most efficient, simple, and effective means by which to rescue and reposition the lens.

PREOPERATIVE PLANNING

When evaluating a patient with a dislocated IOL in the office, the surgeon should first perform a thorough assessment of conjunctival mobility with a cotton tip applicator. If there is extensive conjunctival scarring or poor mobility, I recommend performing an exchange for an anterior chamber IOL or placement of an iris-fixated IOL to avoid the possibility of conjunctival erosion and subsequent endophthalmitis with a scleral-fixated IOL.

The surgeon must review the patient's surgical history and note prior surgical sites involving the sclera (tube shunts, blebs, ruptured globe repair, etc.) to avoid them when creating the scleral tunnels.

Before surgery, I tell all of my patients that it is important that they avoid rubbing their eyes after surgery. I have seen several cases of postoperative IOL dislocation due to aggressive eye rubbing.

RESCUE OR NOT?

In my early experience with the SIS technique, I noted a relatively high early postoperative dislocation rate after repositioning previously dislocated IOLs.[2] This was partially due to my aggressive attempts at removing residual capsule and calcified cortex, causing damage to the haptics, the haptic-optic junctions, or both.

When preparing to fixate the IOL, it is important that the optic and haptics be free from vitreous, capsule, and calcified cortex so that the IOL can be easily positioned in the intended location (Figure 1). However, this can be difficult to achieve without over-manipulation of the haptics. When excessive

AT A GLANCE

- Transconjunctival sutureless intrascleral fixation is an efficient, simple, and effective means by which to rescue and reposition a relatively undamaged, dislocated three-piece IOL.
- The surgeon should educate patients on the importance of avoiding eye rubbing after surgery.
- When excessive manipulation of the IOL is necessary, the surgeon should have a low threshold for exchanging the IOL to reduce the risk of postoperative dislocation.
- The author found a statistically significant decrease in the rate of retropupillary block with the use of intraoperative prophylactic peripheral iridotomy.

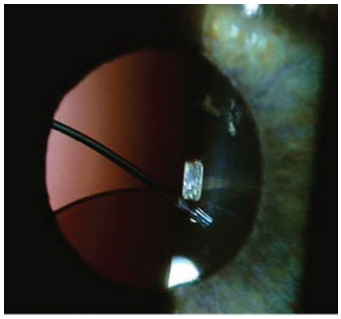


Figure 1. This IOL is relatively free of cortex and capsule and does not appear warped or damaged, making it an ideal three-piece IOL for rescue using the SIS technique.

manipulation of the IOL is needed to attempt repositioning, surgeons should have a low threshold for exchanging the IOL to reduce the risk of postoperative dislocation (Figure 2). If an existing IOL appears even remotely warped or damaged, I strongly consider an exchange due to the high risk of dislocation.

When it is necessary to free the IOL, certain techniques can help the surgeon to minimize manipulation and avoid damaging or breaking the haptics. The surgeon should use the forceps to grasp the optic rather than the haptics. The surgeon should also avoid using a 23-gauge vitrector, given its propensity to damage the haptics; the larger lumen of the 23-gauge vitrector can more easily cut the haptics when removing cortex and capsule. In my experience, a 25- or 27-gauge vitrector is better for safely and effectively freeing the IOL without inadvertent haptic damage.

Chandelier illumination can facilitate a bimanual technique, so that the surgeon can grasp the IOL optic with forceps while removing cortex and capsule with the vitrector.

Large pieces of calcified cortex can be removed with a fragmatome or moved into the anterior chamber and extracted through a sclerocorneal or limbal incision. These steps avoid extended use of the vitrector around the IOL and augment surgical efficiency by eliminating repeated obstruction of the vitrector by the large calcified cortical fragments.

SURGICAL TECHNIQUE AND TIPS

The surgeon should place three 25- or 27-gauge transconjunctival valved cannulas in the nasal and temporal pars plana, as is typical for pars plana vitrectomy (PPV). No peritomy is performed. A toric marker is used to mark the edge of the limbus at the 12 and 6 clock positions, where the surgeon will later create two scleral tunnels to accommodate the IOL haptics.

Calipers are then used to mark 2 to 3 mm posterior to the limbus at the 6 clock position. The scleral tunnels may be placed anywhere between 2 and 3 mm posterior to the limbus, based on surgeon preference, axial length, and other factors, including the presence of iridodonesis. The surgeon should consider placing the tunnels more posterior to the limbus in longer eyes (> 26.5 mm axial length) or eyes with iridodonesis to avoid postoperative complications, such as retropupillary block (RPB), optic capture, and uveitis-glaucoma-hyphema syndrome.

Tip: It is important to account for pannus when using calipers to mark the tunnels' distance from the limbus, as improper placement of the scleral tunnels can lead to IOL tilt or intraoperative hemorrhage from the ciliary body incision (Figure 3).

An additional 25- or 27-gauge trocar with a valved cannula is used to create a scleral tunnel 2 to 3 mm in length. The trocar is inserted with a 30° to 45° bevel to create a 2- to 3-mm scleral tunnel. When the trocar is removed, the valved cannula remains in place. A similar scleral tunnel is then created 180° from the first in the opposite direction, leaving a second valved cannula in place. The surgeon should take care to insert the superior trocar at the same angle as the inferior trocar to avoid IOL tilt. The scleral tunnels are oriented so that they will allow the haptics to externalize and position the IOL in the correct inverted-S configuration (Figure 4).

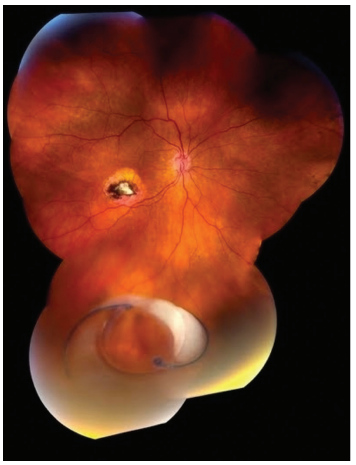


Figure 2. When a three-piece IOL is surrounded by a large amount of calcified cortex and an intact capsule, it may require aggressive manipulation to prepare for repositioning. This can weaken or damage the haptics and/or haptic-optic junction, resulting in high risk of postoperative dislocation. The surgeon should have a low threshold for performing an IOL exchange in these cases.

Once all the trocars have been placed, the surgeon should perform core and anterior vitrectomy. The vitreous is shaved closely near the scleral tunnels, as excess vitreous around the scleral tunnels can trap a haptic and prevent externalization. The surgeon must remove residual lens cortex and capsule and minimize manipulation of the dislocated IOL. A peripheral iridotomy (PI) is created using the vitrector to prevent RPB.

Tip: In my case series, I found a statistically significant reduction in the rate of RPB when I performed intraoperative prophylactic PI ($P = .0297$), and I recommend performing a prophylactic PI in every case.[2]

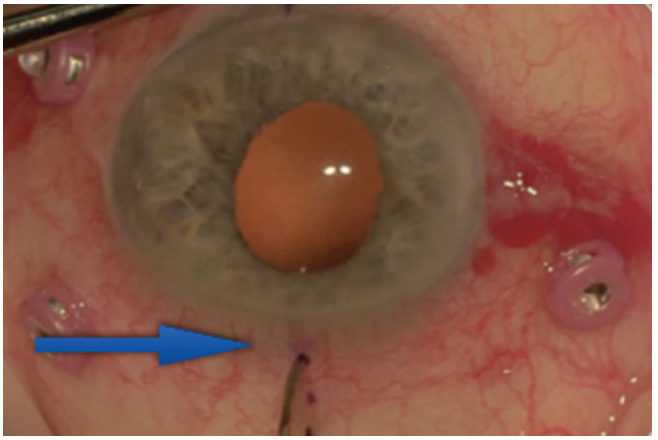


Figure 3. The surgeon should place calipers at the edge of the limbus, below the superior pannus, to ensure proper placement of the scleral tunnel.

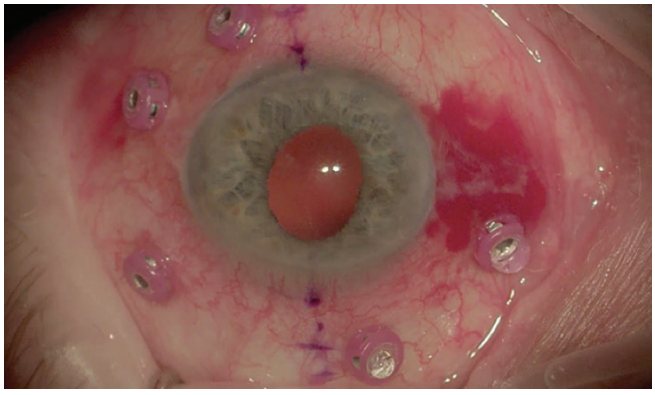


Figure 4. Placement of five 27-gauge trocars prior to vitrectomy. The haptics will be placed through the scleral tunnels at the 12 and 6 clock positions.

For surgical ease and to reduce haptic manipulation with the bimanual handshake technique, the surgeon can place the IOL on the retina before externalizing the haptics through the scleral tunnels. The 27-gauge forceps are inserted through the inferior cannula to grasp the distal tip of the inferior haptic. The surgeon then externalizes the haptic through the scleral tunnel after advancing the cannula up the shaft of the forceps. The cannula is removed before externalizing the haptic to minimize stress on the haptic and reduce the risk of intraoperative haptic dislocation.

Tip: I find that the haptic exits the tunnel with minimum resistance when it is externalized at the same angle as the initial tunnel creation. Placing posterior pressure with another pair of forceps just distal to the tunnel also facilitates smooth externalization.

The surgeon then repeats the same procedure for the superior haptic.

Tip: If you have difficulty visualizing the second haptic, I recommend pushing the center of the optic with forceps to displace the IOL and haptic posteriorly. More often than not, this maneuver will provide a better view to allow you to grasp the haptic.

With the haptic tips now externalized, they are cauterized using low-temperature cautery to create a flange. In my case series, there was a statistically significant reduction in the rate of IOL dislocation with flanged versus unflanged haptics ($P < .001$).[2] Thus, I recommend creating flanges for all SIS fixation cases.

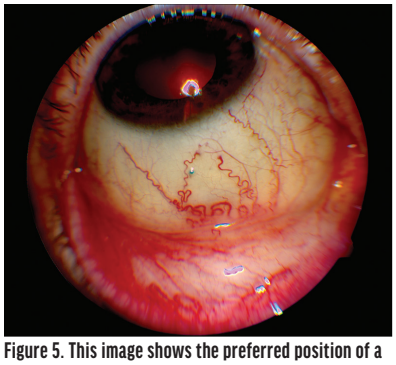


Figure 5. This image shows the preferred position of a flanged haptic under the conjunctiva.

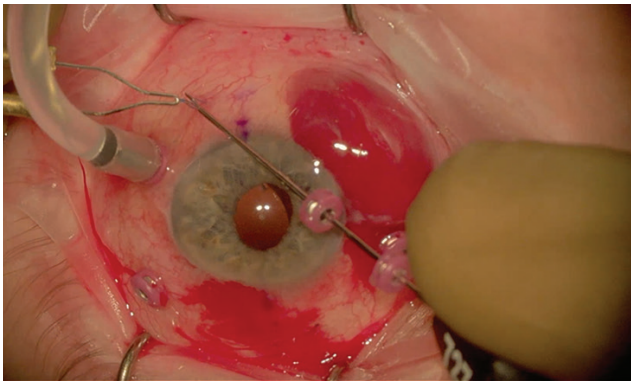
Tip: Although most three-piece IOL haptics will form a flange when cauterized, some will not. It has been reported that the haptics of the VA70AD (Hoya) do not form a flange on heating.[3] I recommend exchanging all three-piece IOLs that cannot be flanged, as the dislocation rate with unflanged repositioned IOLs in our series was significant (32%).

Tip: To help prevent haptic exposure, I prefer to leave the least amount of haptic under the conjunctiva by tucking the haptics into the scleral tunnel until only the flange remains visible (Figure 5). I then elevate the conjunctiva over any exposed haptic not covered by the scleral tunnel.

The scleral tunnels created for IOL fixation may leak during the immediate postoperative period, resulting in hypotony. The overall rate of hypotony in my series was 8.8%. However, the vast majority of hypotony cases occurred in eyes with scleral tunnels created with 25-gauge trocars (91%). The rate of hypotony was 13% in the 25-gauge eyes compared with only 2% in 27-gauge eyes ($P < .00001$).

Tip: The risk of postoperative hypotony can be significantly reduced by using the smallest possible gauge of instrumentation for creating the scleral tunnels.

WATCH IT NOW



IOL Repositioning With Sutureless Intrascleral Fixation

BIT.LY/AABBEY

CONCLUSION

SIS fixation with haptic flanging is a promising technique that maximizes efficiency and simplicity in eyes without adequate capsular support for IOL placement, particularly dislocated three-piece IOLs. ■

1. Wagoner MD, Cox TA, Ariyasu RG, Jacobs DS, Karp CL. Intraocular lens implantation in the absence of capsular support: a report by the American Academy of Ophthalmology. *Ophthalmology*. 2003;110(4):840-859.
2. Abbey AM. 25- and 27-gauge sutureless intrascleral fixation of intraocular lenses: clinical outcomes and comparative effectiveness of haptic flanging in a large single-surgeon series of 488 eyes. Presented at: 2020 American Society of Retina Specialists Meeting; July 24-26, 2020.
3. Yamane S, Sato S, Maruyama-Inoue M, Kadonosono K. Flanged intrascleral intraocular lens fixation with double-needle technique. *Ophthalmology*. 2017;124(8):1136-1142.

ASHKAN M. ABBEY, MD
■ Director of Clinical Research, Texas Retina Associates, Dallas
■ ashkanabbey@gmail.com
■ Financial disclosure: None

Diabetic Vitrectomy: Pearls for the Vitreoretinal Fellow


These nine tips can help fellow surgeons optimize outcomes in patients with diabetic retinopathy.

BY MICHAEL A. KLUFAS, MD, AND M. ALI KHAN, MD

Complications from diabetic retinopathy (DR) are a leading cause of visual impairment in working-aged individuals in the United States.[1] Our armamentarium for treating DR in the office continues to grow, now including panretinal photocoagulation (PRP), anti-VEGF therapy, and promising clinical trials of more durable agents, including gene therapy. Nonetheless, many patients still require surgical management for complications of DR.[2-4]

Indications for pars plana vitrectomy (PPV) in patients with DR include vitreous hemorrhage, retinal detachment, and recalcitrant diabetic macular edema.[5,6] Vitrectomy may also benefit patients with neovascular glaucoma and fibrovascular complications such as epiretinal membrane. Case complexity can range from simple to the most advanced, while surgical goals can vary from restoring 20/20 vision to preventing phthisis.

Despite the varied surgical indications and case complexity, surgeons can follow several basic principles to help ensure surgical success. In this article we share nine pearls to help you optimize vitreoretinal surgical outcomes in patients with diabetic retinopathy.

PREOPERATIVE CONSIDERATIONS

Pearl No. 1: Establish Goals and Confirm Informed Consent

This may be the most important tip: be sure that both you and the patient are ready to operate. Establish goals for surgery, including an estimation of visual potential as guided by your preoperative examination and, possibly, fluorescein angiography or OCT angiography.

This is important to ensure that the patient has realistic expectations regarding postoperative vision. Visual acuity in the fellow eye and history of complications from any prior surgery are important for context. Similarly, it is always crucial to ensure the patient understands that multiple surgeries may be necessary if the underlying systemic disease remains uncontrolled. Implementing the best systemic and ocular management of each patient's diabetes and DR before surgery is critical for surgical success.

Even with the best interventions, some patients will experience poor visual outcomes, as intraoperative bleeding or progression of ischemia can result in irreversible blindness. The patient and surgeon must accept this possibility before agreeing to move forward with surgery.

Pearl No. 2: If Possible, Place PRP

When the view of the retina allows it, placement of PRP in patients with severe or proliferative DR with high-risk characteristics is a critical preoperative step.[7] Naïve

AT A GLANCE

- Establish goals for surgery, including an estimation of visual potential.
- Many cases can be successfully managed with use of the cutter alone to dissect and/or segment diabetic membranes.
- At the conclusion of surgery, consider lowering the infusion pressure to 10 to 15 mm Hg to look for bleeding that may not occur when the infusion pressure is at 25 mm Hg or higher.

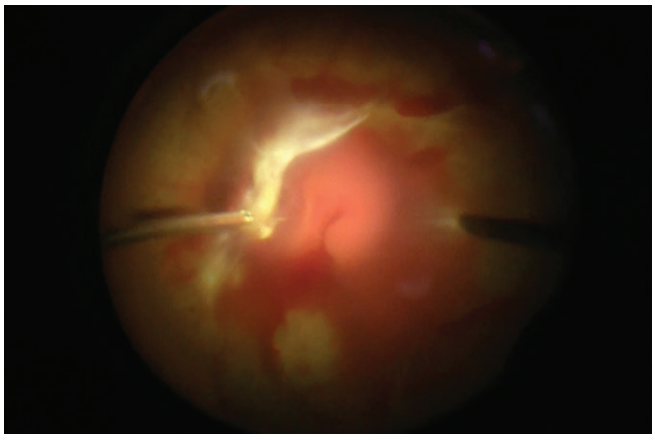


Figure 1. In this left eye undergoing diabetic TRD repair, intraoperative bleeding from neovascular fronds resulted in the formation of a pseudomembrane overlying the macula.

neovascular fronds and fibrovascular membranes are often more difficult to dissect than inactive, fibrotic plaques and are more likely to bleed intraoperatively (Figure 1). One study found that incomplete PRP prior to vitrectomy was a risk factor for postoperative vitreous hemorrhage.[8] In addition, PRP provides an area of tacked-down retina from which the hyaloid can be removed. Even if all quadrants are not visible, placing PRP in a single quadrant can be helpful. In some cases, placement of PRP may stabilize focal extramacular tractional retinal detachments (TRDs) and preclude the need for surgery.

Preoperative PRP treatment also offers a chance to form and foster the treatment pact between the physician and patient—an important aspect of care, particularly for patients who require a long, nuanced course of treatment.

Pearl No. 3: Perioperative Anti-VEGF Therapy Reduces Intraoperative Complications

Several studies have demonstrated that perioperative anti-VEGF therapy results in decreased operative times, fewer iatrogenic breaks, and reduced risk of intraoperative hemorrhage in patients with diabetes undergoing vitrectomy.[9-12]

Use of perioperative anti-VEGF therapy was previously controversial, particularly in patients with TRD, given the concern for abrupt progression, or "crunch," of TRD after anti-VEGF injection.[13] Thus, we recommend treating with anti-VEGF approximately 3 to 7 days before surgery. This time interval may allow regression of neovascular tissue without significant fibrovascular contraction.

INTRAOPERATIVE CONSIDERATIONS

Pearl No. 4: Handle the Hyaloid

The initial steps of diabetic vitrectomy often include removal of anterior-to-posterior traction and lifting and removal of the posterior hyaloid attachment. No matter how difficult or inoperable a TRD may seem, success can be achieved with a disciplined approach (Figure 2).

Removal of the hyaloid has numerous benefits, although it can be one of the most difficult aspects of a challenging TRD in a young patient (eg, younger than age 40) with diabetes. In some instances of recurrent vitreous hemorrhage after initial diabetic PPV, persistent traction from a retained hyaloid can lead to traction on neovascularization elsewhere, despite full PRP (Video 1).

In addition, removing the hyaloid establishes the correct surgical plane, which can aid in removal of any fibrovascular membranes. Nevertheless, there may be some instances in which the hyaloid is tightly adherent in the periphery, and you may not be able to safely complete its removal during an initial surgery.

Pearl No. 5: Choose the Right Instruments

Use of 23-, 25-, or 27-gauge instrumentation with valved cannulas is now the standard for diabetic vitrectomy.[14] Valved cannulas create a closed system, allowing good IOP control that can limit bleeding during instrument exchanges.

Multiple manufacturers offer instruments, in all gauge sizes, commonly used for diabetic vitrectomy, including

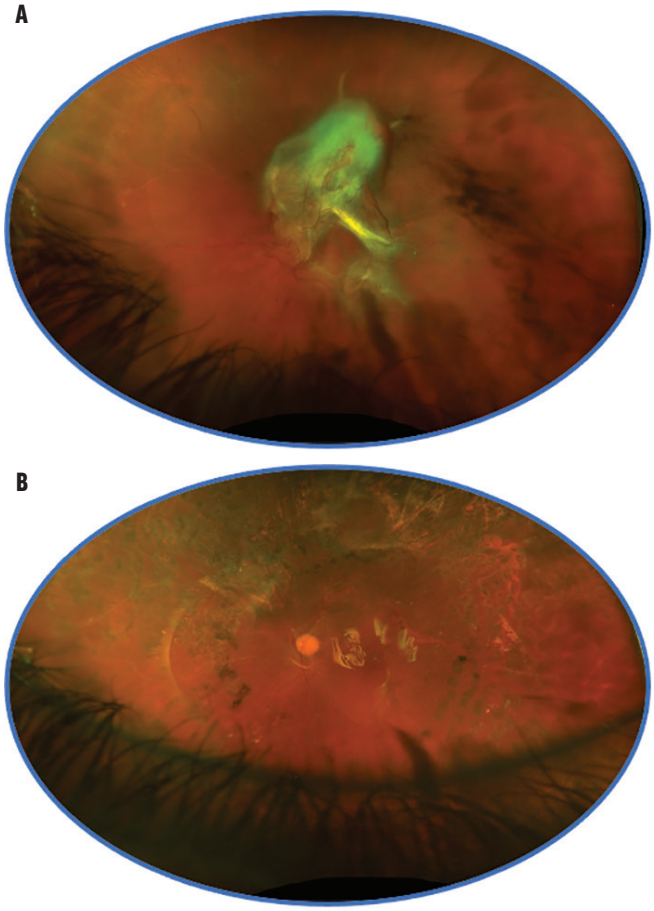
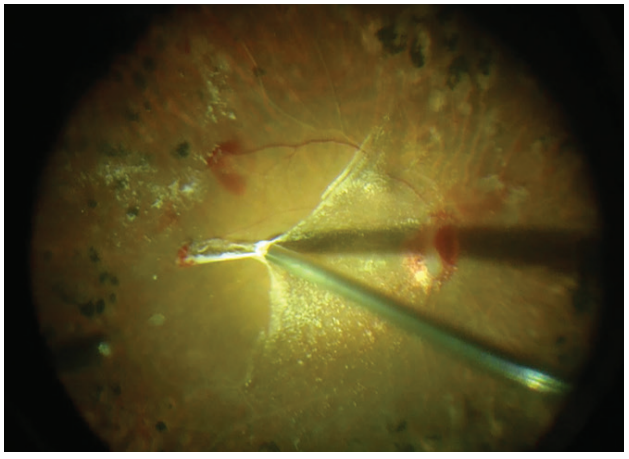


Figure 2. A 47-year-old patient with an advanced, macula-involving TRD (A) underwent vitrectomy, membrane peel, PRP, and silicone oil tamponade. Three months postoperatively, the retina was attached with significant improvement in DR severity (B).

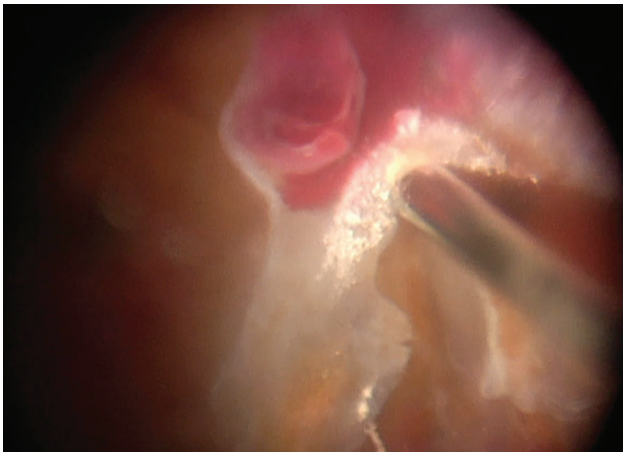
WATCH IT NOW



Video 1. Hyaloid Removal in Diabetic Vitrectomy

BIT.LY/DIABETICPPV

WATCH IT NOW



Video 2. Hybrid Vitrectomy in Diabetic Tractional Retinal Detachment

BIT.LY/HYBRIDPPV

scissors (horizontal, vertical, or pneumatic), lighted picks, intraocular forceps such as the Maxgrip (Greishaber/Alcon) or ILM-style forceps, and chandelier light sources for use with bimaual techniques. Learning what instrumentation your surgical facility has available is an important exercise to undertake before surgery.

Several factors come into play in choosing gauge size. Larger 23-gauge instrumentation can offer more rigidity, easier and faster clearance of dispersed hemorrhage, and better access to peripheral vitreous gel removal. Smaller-gauge instruments, in particular vitreous cutters, provide a reduced sphere of influence that can make dissection of membranes more precise and reduce iatrogenic breaks. Small-gauge and beveled cutters also place the cutting port closer to the end of the instrument, which may allow better access to membranes and potential space.[15]

Given the small gauge and improved fluidics of vitreous cutters, many cases can be successfully managed with use of the cutter alone to dissect and/or segment diabetic membranes. Consider switching to a 27-gauge cutter before moving to a bimanual technique.

Because different gauges provide different benefits, hybrid vitrectomy—the use of valved cannulas and instruments with multiple gauges—can be useful in some instances. Hybrid vitrectomy allows the surgeon to capitalize on the entire breadth and variety of tools available (Video 2).[16]

Pearl No. 6: Maintain Hemostasis

You must control bleeding early and throughout surgery. Prolonged and uncontrolled bleeding can obscure the source of the hemorrhage, and pseudomembranes can form as the blood coagulates, leading to further difficulty in dissecting membranes. Elevated tamponade pressure can be helpful, but you must address the underlying source of the bleeding with diathermy or long-duration endolaser. Prolonged tamponade pressure can lead to premature corneal edema, worsening of ischemia, and optic neuropathy.

At the conclusion of surgery, consider lowering the infusion pressure to 10 to 15 mm Hg to look for bleeding that may not occur when the pressure is at 25 mm Hg or higher. Also, have a low threshold to suture sclerotomies to reduce postoperative hypotony that can lead to hemorrhage.

Pearl No. 7: Improve Your View

Visualization is paramount, especially in eyes that require extensive dissection and long operative times. The corneal epithelium is fragile in diabetics, and the benzalkonium chloride in your hydroxypropyl methylcellulose formulation can degrade the cornea; consider using other viscoelastic agents, such as Ocucoat (Bausch + Lomb), Genteal (Alcon), or Refresh gel (Allergan). In phakic patients, adding dextrose to the balanced salt solution infusion helps to minimize lens opacity intraoperatively. In fact, in patients with more advanced cataract it may be best to consider combined cataract extraction to provide a clear view for vitrectomy.

Lastly, intravitreal triamcinolone can be helpful to visualize the hyaloid. Vitreoschisis has been reported in patients with diabetes, highlighting the utility of repeated rounds of triamcinolone staining.[17]

Pearl No. 8: Identify and Address Rhegmatogneous Breaks

It is vital to identify and address any full thickness breaks, especially in eyes with combined TRD/rhegmatogenous retinal detachment or when an iatrogenic break is encountered during vitrectomy. Ensure that any fibrovascular tissue is dissected away from retinal breaks to achieve anatomic success. Consider using longer-acting tamponade agents, such as C_3F_8 gas or silicone oil.[18]

(Continued on page 35)

The Benefits of Trocar-Based Chandelier Vitreoretinal Surgery

A new option eases surgical maneuvers in challenging cases.

BY ANDREAS POLLREISZ, MD

In the past few decades, we have seen numerous technological advances for vitrectomy, the most notable being the reduction of surgical instrument sizes. Now, vitreoretinal surgeons are performing transconjunctival microincision vitrectomy with 23- to 27-gauge systems, making possible sutureless surgical procedures that significantly improve patient safety, comfort, and recovery.

However, these smaller gauges require powerful endoillumination systems. The first optical fiber probes introduced by Peyman in 1976 for 20-gauge systems have largely been replaced with wide-angle endoillumination models.[1,2] Today, a wide variety of products are available from different manufacturers ranging from single-fiber to dual-fiber chandeliers. Some are inserted into the vitreous cavity through a separate sclerotomy without a cannula, and others are inserted through standard 23- to 27-gauge trocar systems. One of the main advantages of a chandelier endoillumination system is that it frees up one of the surgeon's hands, allowing bimanual surgical procedures.

RETHINK MANEUVERABILITY

A new flexible chandelier system (Oertli Instruments) is a single-fiber trocar-based self-retaining system available with or without sheathing of the fiber at the distal end; the version without the sheathing is extremely flexible. After a 25- or 27-gauge trocar is placed in the pars plana region, the tip of the endoillumination fiber is attached with a snap-lock connection (Figure 1). Flexible repositioning is possible with other trocars from the Oertli Caliburn system.

Forming a loop with the flexible part of the unsheathed fiber allows the chandelier to be moved freely during the surgical procedure (Figure 2). The fiber with sheathing must be inflected manually to create the loop necessary for correct positioning. A sterile strip is then used to fix the sheathed part of the fiber. Creating a flap in the strip (Figure 3) allows the chandelier to be lifted and repositioned in all directions with ease.

CLINICAL PERSPECTIVE

The most important aspect of the self-retaining Oertli chandelier illumination system for me is its ability to provide hands-free homogeneous and diffuse widefield illumination, allowing fully bimanual surgical procedures.

My preference for the placement of the chandelier system is at the 12 clock position. This casts the instrument shadows anteriorly so that they do not coincide with my working area. In addition, I can easily modify the tip of the optical fiber from this position without any obstacles. However, there are certain conditions in which a different chandelier location provides better visualization.

There are a number of surgical indications in my clinical routine that require both hands for intraocular manipulations, including the following:

Retinal Detachment

In complex retinal detachment (RD) cases with advanced proliferative vitreoretinopathy presenting with pre- or subretinal membranes, bimanual excision of the fibrotic tissues is

AT A GLANCE

- A chandelier endoillumination system frees up one of the surgeon's hands, allowing bimanual surgical procedures.
- Placing the chandelier system at the 12 clock position casts the instrument shadows anteriorly, avoiding any shadowing in the working area.
- A number of surgical indications require both hands for intraocular manipulations, including complex tractional retinal detachments in diabetic eyes, foreign body retrieval and pediatric cases.

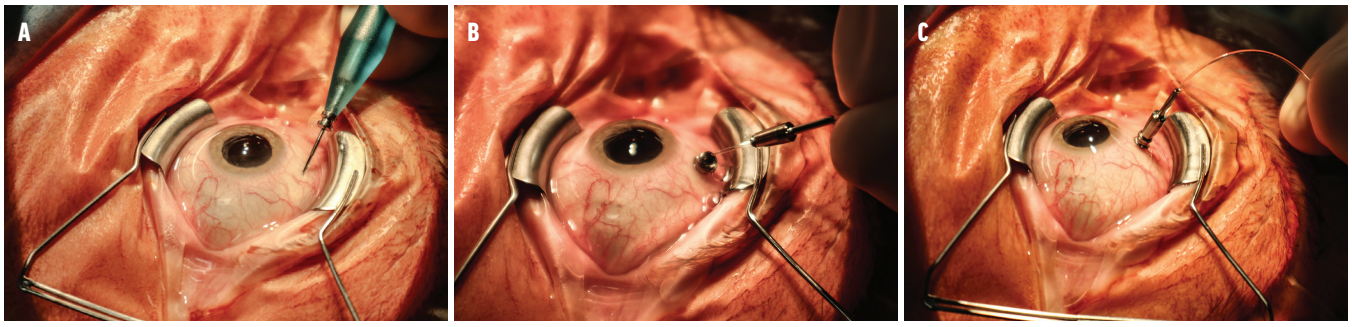


Figure 1. Setup of the 25-gauge single-fiber trocar-based chandelier system connected to the OS4 surgical platform (Oertli Instruments). After the trocar is inserted (A), a snap-lock connection (B) ensures a tight seal between the fiber tip and the trocar (C).

often the only maneuver possible to relieve the retina, allow reattachment, and prevent redetachment (Figure 4).[3]

Eyes with tractional RDs due to proliferative diabetic retinopathy are ideal candidates for bimanual procedures. Particularly, the use of 25- and 27-gauge continuous flow cutter probes with a dual blade design at high cutting rates and a cutting port close to the tip of the instrument allows controlled removal of membranes and delamination of the fibrovascular membrane from the underlying retina.

For a secure procedure, I usually have forceps or a spatula in the other hand to grasp and stabilize the retina, which requires hands-free illumination. With this technique, I can better visualize the plane for dissection and thereby limit the risk of creating a break.

The self-holding chandelier allows me to have one hand available for scleral indentation when I perform RD surgery without an assistant. With this setup, I can accomplish controlled, safe shaving of the peripheral vitreous base and complete removal of vitreous from the retinal defects. I can also perform autonomous endolaser treatment of peripheral retinal areas accessible only with indentation (Figure 5). If a retinal defect cannot be sufficiently dried to permit endolaser treatment, I can use a soft-tip cannula in one hand and the endolaser in the other to apply laser burns.

Chandelier illumination is quite useful when performing a scleral buckling procedure for the treatment of rhegmatogenous RD, as the localization of the retinal breaks and cryoretinopexy can be accomplished through the surgical microscope and a wide-angle viewing system.[4] In most of my RD cases I choose primary vitrectomy; thus, my preferred view of the retina is through a noncontact wide-angle viewing system. This allows me to adjust magnification and image focus to detect small defects under indentation that I would potentially miss under indirect ophthalmoscopy.

Because more surgeons are using vitrectomy for RD repair, many are now less experienced with ab externo detachment procedures. This makes chandelier-assisted buckling attractive as a safe alternative. In placing a scleral buckle, I position the chandelier fiber in the pars plana area opposite from the region where the buckle will be sutured onto the sclera. With this positioning, the wide-angle viewing system provides the best visualization, with no shadowing of the retinal defects, an optimal view for successful cryoretinopexy, and the correct location after placement of the buckle.

Diabetic Retinopathy

In diabetic patients, blood leaking from neovascularization can severely impair visualization, and applying diathermy at the location of the leak may not be feasible due to quick blood accumulation. In these instances, a bimanual procedure with a soft-tip cannula in one hand and the endodiathermy probe in the other can help significantly.

In our clinic we see many patients with diabetes who have vitreous hemorrhage and dense cataract. A phacoemulsification-vitrectomy is the preferred treatment choice when intraocular bleeding is not clearing or a concurrent RD is

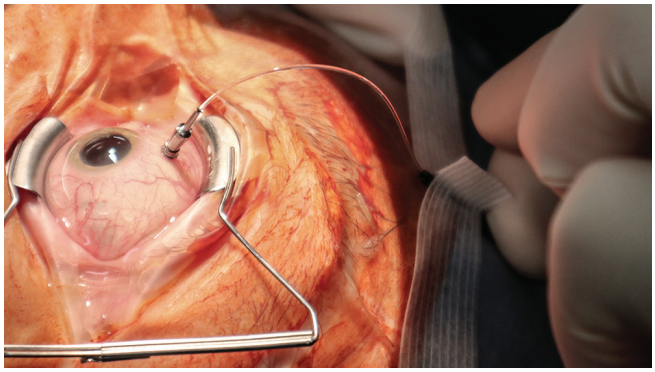


Figure 2. Making a loop in the fiber allows compensation for surgical movements.

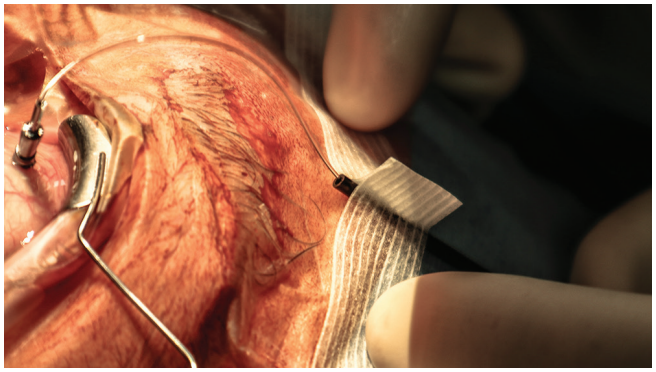


Figure 3. Creating a flap in the sterile strip allows easy repositioning of the chandelier.

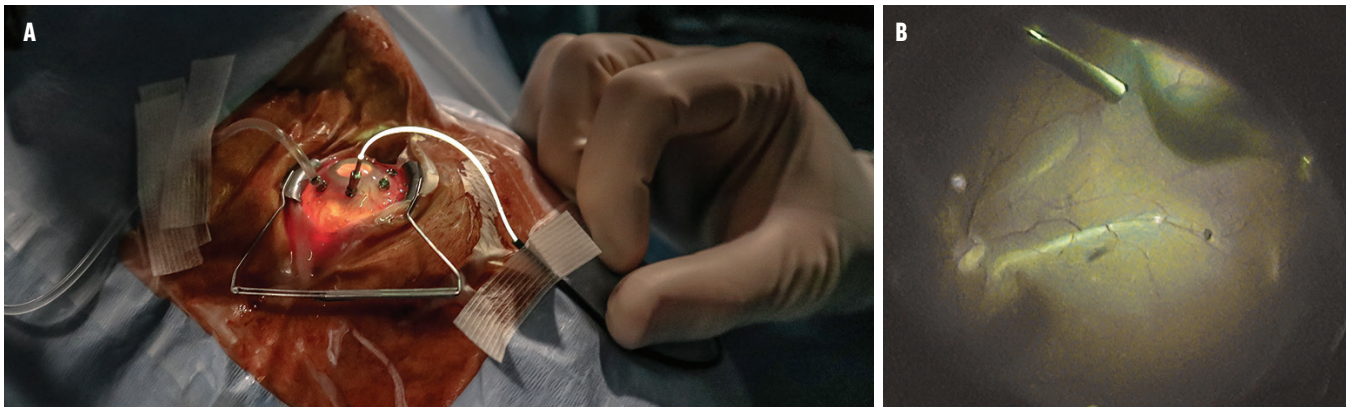


Figure 4. In this eye with a retinal detachment affecting all four quadrants, widefield endoillumination is achieved with the 25-gauge Oertli flexible endoillumination system (A). Quickly repositioning the chandelier tip to the upper temporal trocar provided the best illumination of the nasal retinal quadrant. The surgeon performed indentation with one hand while shaving the vitreous base with the cutter held in the other hand without the need of a skilled assistant (B).

diagnosed on ultrasound. However, phacoemulsification can be challenging in eyes with dense intravitreal hemorrhage because the structure of the lens cannot be visualized sufficiently due to the missing fundus red reflex.[5]

In my experience, using a chandelier-based intraocular lighting system can significantly reduce complications such as posterior capsular tears, as the retroillumination improves visualization. I typically sit at the 12 clock position and place the chandelier at the temporal side in the pars plana. After completing the lens extraction and IOL implantation, I continue using the chandelier system to address the hemorrhage, but I often reposition it more superiorly for better intraocular views.

Pediatric Cases

In pediatric vitrectomy, achieving posterior vitreous detachment is often challenging, and operating with the vitreous cutter in one hand and forceps in the other facilitates a successful maneuver. Similarly, epiretinal membrane removal in children may be complicated, and a bimanual approach using forceps and scissors can help.

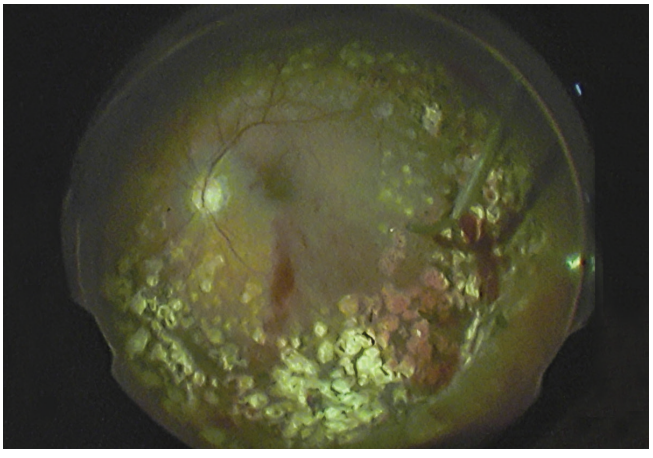


Figure 5. The self-retaining Oertli 27-gauge chandelier system frees one hand for indentation to perform endolaser treatment in peripheral retinal areas after the vitreous cavity is cleared of hemorrhage. In this patient with a branch retinal artery occlusion, recurrent vitreous bleeding occurred in a previously vitrectomized and photocoagulated eye due to active neovascularization.

Object Retrieval

Chandelier illumination can be particularly useful when retrieving a dropped nucleus after cataract surgery or an intraocular foreign body located on the retina. With a bimanual approach, one hand brings the object into the mid-vitreous with forceps or a soft-tip cannula, respectively. I prefer not to grasp a foreign body directly when it is located on the retinal surface, particularly in the macular area, as this might induce retinal damage. Instead, from the center of the vitreous cavity, I transfer the object directly to a hook or forceps held in the other hand for secure placement of the lens into the anterior chamber or removal of the foreign body through a sclerotomy.

FINAL THOUGHTS

The use of a trocar-based chandelier system for endoillumination can significantly increase the surgical success rate in a number of vitreoretinal indications by allowing bimanual intraocular manipulation. The ease of use, compatibility with 23- to 27-gauge systems, and the extrawide and homogeneous endoillumination provided by the Oertli chandelier allows me to safely and efficiently perform many challenging cases. ■

1. Peyman GA. Improved vitrectomy illumination system. *Am J Ophthalmol*. 1976;81(1):99-100.
2. Peyman GA, Canakis C, Livir-Rallatos C, Easley J. A new wide-angle endoillumination probe for use during vitrectomy. *Retina*. 2002;22(2):242.
3. Idrees S, Sridhar J, Kuriyan AE. Proliferative vitreoretinopathy: a review. *Int Ophthalmol Clin*. 2019;59(1):221-240.
4. Cohen E, Rosenblatt A, Bornstein S, Loewenstein A, Barak A, Schwartz S. Wide-angled endoillumination vs traditional scleral buckling surgery for retinal detachment - a comparative study. *Clin Ophthalmol*. 2019;13:287-293.
5. Nagpal MP, Mahuvakar SA, Chaudhary PP, Mehrotra NS, Jain AK. Chandelier-assisted retroillumination for phacoemulsification in phacovitrectomy. *Indian J Ophthalmol*. 2018;66(8):1094-1097.

ANDREAS POLLREISZ, MD
- Associate Professor of Ophthalmology, Vitreoretinal Surgeon, Department of Ophthalmology, Medical University Vienna, Vienna, Austria
- andreas.pollreisz@meduniwien.ac.at
- Financial disclosure: Consultant (Hoffmann-La Roche, Novartis, Oertli Instruments)

Digitally Assisted Surgery

For Retinal Detachment With Giant Retinal Tear

A 3D heads-up viewing system offered advantages in this challenging case.

BY NILÜFER KOÇAK, MD, FEBO; MAHMUT KAYA, MD; TAYLAN OZTURK, MD, FEBO; AND SULEYMAN KAYNAK, MD, FEBO

Giant retinal tears (GRTs) are full-thickness circumferential retinal tears extending more than 3 clock hours or 90° that develop in association with a posterior vitreous detachment.[1,2] The incidence of GRTs is about 0.09 per 100,000 of the general population per year.[3]

GRTs account for approximately 1.5% of rhegmatogenous retinal detachments (RDs), and surgical management of an RD associated with a GRT can be challenging.[3]

Although GRTs are mostly idiopathic, they are often associated with one or more conditions; these can include ocular trauma, high myopia, aphakia, pseudophakia, genetic mutations involving collagen, and young age.[1-4]

Today, with the availability of improved vitreoretinal surgical instrumentation and wide-angle viewing systems that allow surgeons to better visualize the operative field, phakic lens-sparing surgery has become common. In addition, the use of chandelier illumination aids in performing scleral depression and clearing of the anterior vitreous without traumatizing the lens.

HEADS-UP SURGERY

In the case presented here and in the accompanying video, we evaluated the advantages of heads-up 3D surgery using the Ngenuity (Alcon) digitally assisted vitreoretinal viewing system in a patient with RD with GRT.

Digitally assisted viewing systems offer advantages over optical microscope–based approaches to vitreoretinal surgery. Besides the clear advantages of 3D technology over the traditional approach, the Ngenuity also incorporates a 4K monitor, delivers decreased light phototoxicity, and provides digital enhancements and magnification capacity without dimming of illumination. The high-definition screen of the Ngenuity system provides retinal surgeons excellent 3D visualization of the back of the eye with greater depth

AT A GLANCE

- Digitally assisted viewing systems offer advantages over optical microscope–based approaches to vitreoretinal surgery.
- The authors evaluated the advantages of heads-up 3D surgery using a digitally assisted vitreoretinal viewing system in a patient with retinal detachment with giant retinal tear.
- The system provided the advantages of reduced phototoxicity and improved visualization of the retinal periphery up to the ora serrata with good magnification.

and detail during surgery than traditional microscopes. These platforms can also be integrated with other commercially available visualization systems.[5,6]

SURGICAL TECHNIQUE

Here, we explain how heads-up 3D visualization, specifically with the Ngenuity 3D system, can be used in a case with retinal detachment associated with GRTs.

Case Report

A 58-year-old man presented with counting fingers vision and a retinal detachment with GRT involving his macula. He has bilateral high myopia (-10.50 D).

We performed 25-gauge vitrectomy using the Ngenuity heads-up 3D system. While performing vitrectomy in the periphery, we used the system's chandelier illumination, allowing the surgeon to perform scleral indentation unaided.

We performed vitrectomy as thoroughly as possible around the giant tear. To check for peripheral vitreous fibers, we injected triamcinolone, which allowed us to identify remaining strands (Figure 1).

When vitrectomy was successfully completed, we injected perfluorocarbon liquid (PFCL) gently over the posterior pole to flatten the retina (Figure 2). Under the PFCL, we then smoothed down the posterior flap of the tear with the help of a diamond dusted scraper.

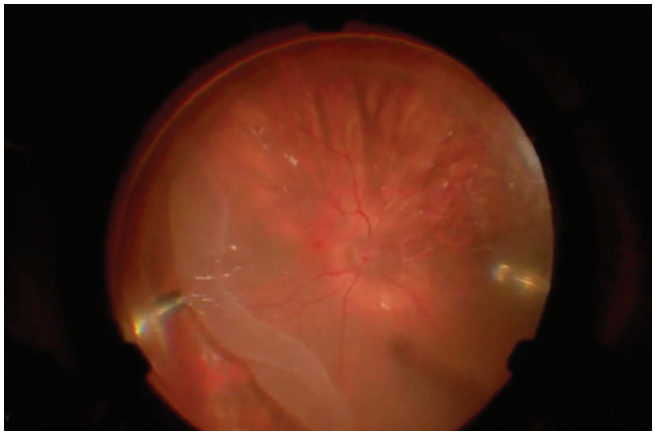


Figure 1. Triamcinolone staining was used to detect vitreous fibers.

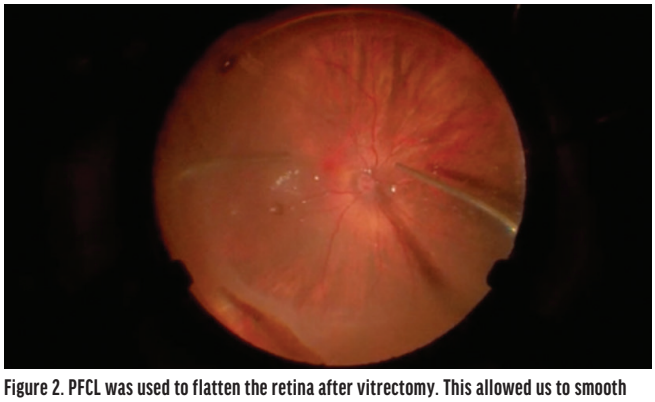
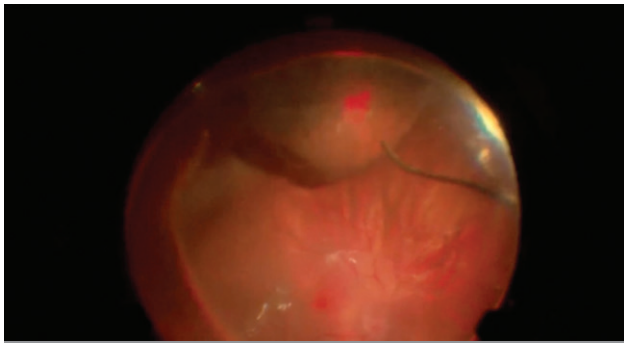


Figure 2. PFCL was used to flatten the retina after vitrectomy. This allowed us to smooth the posterior flap of the GRT.

WATCH IT NOW



Giant Tear and Retinal Detachment

BIT.LY/KOCAKRD

After the retina was flattened, we applied laser around the edges of the tear (Figure 3). In most RD cases, we use sufficient laser to tack down the edges of the tear. However, for GRT cases, we apply laser 360° around the peripheral retina. As we progress around the periphery, we apply additional laser around other small holes.

After checking the edges of the giant tear to ensure that it was reattached and the retina was completely flat in every quadrant, we performed PFCL–silicone oil exchange. The 25-gauge trocars were removed at the end of the case.

At the 6-month follow-up, no neurosensory retinal detachment was observed.

DISCUSSION

The Ngenuity 3D visualization system provides the advantages of digital viewing over analog viewing, including superior ergonomics for the surgeon; enhanced capabilities for surgical observation and teaching; improved depth of field; real-time digital signal processing to enhance visualization, even with low light levels; and the ability to overlay preoperative diagnostic studies and digital templates onto the live surgical field.

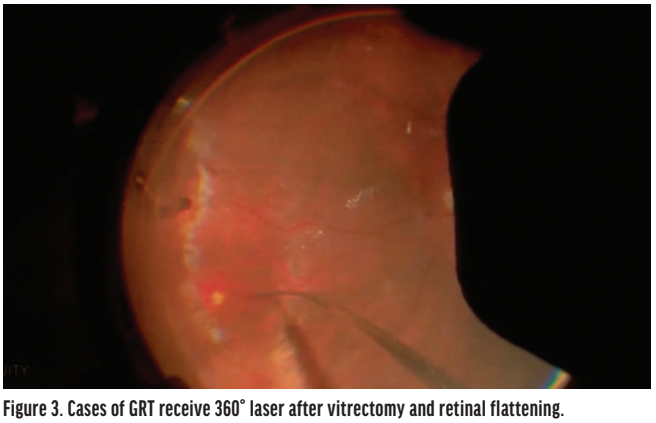


Figure 3. Cases of GRT receive 360° laser after vitrectomy and retinal flattening.

Specifically in patients with RD with GRT, the Ngenuity system provides the added advantages of reduced phototoxicity and improved visualization of the retinal periphery up to the ora serrata with good magnification and less asthenopia.

CONCLUSION

In the near future, robotic surgical technologies will become increasingly available, and telesurgery may one day become practicable. The first step of telesurgery is digitally assisted surgery, allowing the surgeon to see via screen-based facilities. The next steps will be robotic intervention using joysticks and quantum internet that connects the surgeon to patients prepared in ORs in another city or country.

Heads-up digitally assisted viewing technology delivers excellent depth perception and better control of screen parameters, resulting in high-quality surgical performance in patients with RD with GRT and other surgical indications. The technology allows high-definition visualization of the retinal periphery with better magnification, the option of filters to enhance visualization of anatomic structures, and lower illumination levels.

Screen-based surgical systems help to significantly improve surgical procedures, teaching, and learning. This technology is the first step on the road to telesurgery, which will continue with the incorporation of robotics in the decades to come. ■

1. Mathis A, Pagot V, Gazagne C, Malecaze F. Giant retinal tears: surgical techniques and results using perfluorodecalin and silicone oil tamponade. *Retina*. 1992;12(3 Suppl):S7-10.
2. Kertes PJ, Wafapoor H, Peyman GA, Calixto Jr N, Thompson H. The management of giant retinal tears using perfluoroperhydrophenanthrene: a multicentre case series. Vitreon Collaborative Study Group. *Ophthalmology*. 1997;104(7):1159-1165.
3. Shunmugam M, Ang GS, Lois N. Giant retinal tears. *Surv Ophthalmol*. 2014;59:192-216.
4. Mehdizadeh M, Afarid M, Hagigi MS. Risk factors for giant retinal tears. *J Ophthalmic Vis Res*. 2010;5:246-249.
5. Eckardt C, Paulo EB. Heads-up surgery for vitreoretinal procedures: An experimental and clinical study. *Retina*. 2016;36:137-147.
6. Dutra-Medeiros M, Nascimento J, Henriques J, et al. Three-dimensional head-mounted display system for ophthalmic surgical procedures. *Retina*. 2017;37:1411-1414.

MAHMUT KAYA, MD
■ Associate Professor in Ophthalmology, Dokuz Eylul University, Izmir, Turkey
■ mahmutkaya78@yahoo.com
■ Financial disclosure: None

SULEYMAN KAYNAK, MD, FEBO
■ Professor in Ophthalmology, Dokuz Eylul University, Izmir, Turkey
■ skaynak@retina-gm.com
■ Financial disclosure: None

NILÜFER KOÇAK, MD, FEBO, CORRESPONDING AUTHOR
■ Professor, Dokuz Eylul University, Izmir, Turkey
■ nkocak@yahoo.com
■ Financial disclosure: None

TAYLAN OZTURK, MD, FEBO
■ Associate Professor in Ophthalmology, Dokuz Eylul University, Izmir, Turkey
■ ataylan6@yahoo.com
■ Financial disclosure: None

(Continued from page 29)

Pearl No. 9: Live to Fight Another Day

Depending on the case, trying to accomplish everything in one surgery may not always be the best option. Prioritize clearance of media, release of anterior-to-posterior traction on the macula and nerve, and placement of PRP. In advanced disease, working in stages with multiple planned surgeries may be the best approach.

CONCLUSION

Every surgeon can be a CHAMP in diabetic vitrectomy. Follow this acronym to achieve success: a **C**lear view with **H**yaloid removal, use of preoperative **A**nti-VEGF therapy, **M**ultiple surgical techniques, and **P**lacement of PRP. ■

1. Zhang X, Saaddine JB, Chou C-F, et al. Prevalence of diabetic retinopathy in the United States, 2005-2008. *JAMA*. 2010;304(6):649-656.
2. Gross JG, Glassman AR, Jampol LM, et al. Panretinal photocoagulation vs intravitreous ranibizumab for proliferative diabetic retinopathy: a randomized clinical trial. *JAMA*. 2015;314:2137-2146.
3. Lin J, Chang JS, Smiddy WE. Cost evaluation of panretinal photocoagulation versus intravitreal ranibizumab for proliferative diabetic retinopathy. *Ophthalmology*. 2016;123:1912-1918.
4. Berrocal MH, Acaba LA, Acaba A. Surgery for diabetic eye complications. *Curr Diab Rep*. 2016;16:99.
5. Smiddy WE, Flynn Jr HW. Vitrectomy in the management of diabetic retinopathy. *Surv Ophthalmol*. 1999;43(6):491-507.
6. Berrocal MH, Acaba LA, Acaba A. Surgery for diabetic eye complications. *Curr Diab Rep*. 2016;16(10):99.
7. Goodart R, Blankenship G. Panretinal photocoagulation influence on virectomy results for complications of diabetic retinopathy. *Ophthalmology*. 1980;87(3):183-188.
8. Khuthaila MK, Hsu J, Chiang A, et al. Postoperative vitreous hemorrhage after diabetic 23-gauge pars plana vitrectomy. *Am J Ophthalmol*. 2013;155:757-763.
9. Gupta A, Bansal R, Gupta V, Dogra MR. Six-month visual outcome after pars plana vitrectomy in proliferative diabetic retinopathy with or without a single preoperative injection of intravitreal bevacizumab. *Int Ophthalmol*. 2012;32:135-144.
10. Oshima Y, Shima C, Wakabayashi T, et al. Microincision vitrectomy surgery and intravitreal bevacizumab as a surgical adjunct to treat diabetic traction retinal detachment. *Ophthalmology*. 2009;116:927-938.
11. Rizzo S, Genovesi-Ebert F, Di Bartolo E, Vento A, Miniaci S, Williams G. Injection of intravitreal bevacizumab (Avastin) as a preoperative adjunct before vitrectomy surgery in the treatment of severe proliferative diabetic retinopathy (PDR). *Graefes Arch Clin Exp Ophthalmol*. 2008;246:837-842.
12. Smith JM, Steel DHW. Anti-vascular endothelial growth factor for prevention of postoperative vitreous cavity haemorrhage after vitrectomy for proliferative diabetic retinopathy. *Cochrane Database Syst Rev*. 2015;2015(8):CD008214.
13. Arevalo JF, Maia M, Flynn Jr HW, et al. Tractional retinal detachment following intravitreal bevacizumab (Avastin) in patients with severe proliferative diabetic retinopathy. *Br J Ophthalmol*. 2008;92(2):213-216.
14. Yokota R, Inoue M, Itoh Y, Rii T, Hirota K, Hirakata A. Comparison of microincision vitrectomy and conventional 20-gauge vitrectomy for severe proliferative diabetic retinopathy. *Jpn J Ophthalmol*. 2015;59:288-294.
15. Dugel PU, Zhou J, Abulon DJK, Buboltz DC. Tissue attraction associated with 20-gauge, 23-gauge, and enhanced 25-gauge dual-pneumatic vitrectomy probes. *Retina*. 2012;32(9):1761-1766.
16. Khan MA, Samara WA, Hsu J, Garg S. Short-term outcomes of hybrid 23-, 25-, and 27-gauge vitrectomy for complex diabetic tractional retinal detachment repair. *Retina Cases Brief Rep*. 2019;13(3):244-247.
17. Adhi M, Badaro E, Liu JL, et al. Three-dimensional enhanced imaging of vitreoretinal interface in diabetic retinopathy using swept-source optical coherence tomography. *Am J Ophthalmol*. 2016;162:140-149.e1.
18. Oellers P, Mahmoud TH. Surgery for proliferative diabetic retinopathy: new tips and tricks. *J Ophthalmic Vis Res*. 2016;11:93-99.

M. ALI KHAN, MD
■ Vitreoretinal Surgeon, Mid Atlantic Retina, Philadelphia
■ Assistant Professor of Ophthalmology, Thomas Jefferson University, Philadelphia
■ ali.khan.05@gmail.com
■ Financial disclosure: Consultant (Allergan, Genentech, Apellis), Grant support (Regeneron)

MICHAEL A. KLUFAS, MD
■ Vitreoretinal Surgeon, Mid Atlantic Retina, Philadelphia
■ Assistant Professor of Ophthalmology, Thomas Jefferson University, Philadelphia
■ Retina Chief, Eyetube.net
■ mklufas@midatlanticretina.com
■ Financial disclosure: Consultant (Allergan, Novartis, Genentech), Speaker (Genentech. Regeneron)

Bringing Laser Technology Into the 21st Century


A new laser indirect keeps you mobile—in the office and between locations.

BY S.K. STEVEN HOUSTON III, MD, AND JOHN KITCHENS, MD

Vitreoretinal surgeons have always been at the forefront of biologic and technologic innovation in a constant drive to improve care and outcomes for our patients. Anti-VEGF agents, OCT, ultrawide-field imaging, and small-gauge vitrectomy platforms are a few of the innovative technologies we have embraced. In the next few years more novel medications will come to market, the OR will shift from analog to digital, and telehealth will bring care closer to the patient's home.

Unfortunately, our office laser technologies haven't always kept pace with this flurry of advances. Now, the Norlase Lion is helping to bring laser indirect ophthalmoscopes (LIOs) into the 21st century. We were fortunate to get our hands on one of the first Lion devices, and we have been putting it through its paces in the clinic and the OR over the past few months. Here's what we have learned.

WHAT'S NEW

On most modern LIOs, the headset connects to the external laser and power source through a long fiber. These external devices are heavy, must be housed on a table or cart, and are not easily moved. Additionally, the laser and power source must be plugged into an electrical outlet.

The critical innovation that sets the Lion apart from other current models is the miniaturization of the laser source. Its green laser source is half the size of a dime and is housed within the indirect ophthalmoscope headset itself (Figure 1). This allows the surgeon to be untethered from the external laser and power source. The Lion also incorporates a rechargeable battery source, so that it is not tied to an electrical outlet. The entire setup weighs less than 2 pounds.

Instead of a tabletop control unit, the Lion uses an Android tablet with a clean and intuitive interface (Figure 2). Setup is rapid, with a quick turn of a key on the headset and one-touch Bluetooth pairing with the tablet.

The Lion is voice-controlled, allowing the surgeon to change parameters (power, duration, interval) the same way we change the volume on our smartphones and speakers: Just say, "Hey Norlase … ."

AT A GLANCE

- The miniaturization of laser technology has led to development of an untethered, head-mounted, laser indirect ophthalmoscope.
- The Norlase Lion, housed on the Keeler LED indirect ophthalmoscope, is battery-powered and uses a tablet-based controller with voice activation.
- The laser system does not use a fiber-optic cable, eliminating a major regular maintenance cost.

Figure 1. The laser source, half the size of a dime, is integrated into portable headset.

Figure 2. The Lion system is controlled with a user-friendly Android tablet and voice activation.

CLINICAL PERSPECTIVE

The portability and flexibility of this LIO have been key features that have benefited our practice efficiency. We can move the device around in clinic and transport it easily among satellite offices.

After just a few months of use, the Lion has helped us decrease the time from diagnosis to laser treatment because we can bring the laser into any treatment room whenever we need it. There is no wait for the laser to heat up or for a laser room to become available.

For example, I (Dr. Houston) recently evaluated a patient and diagnosed a retinal tear. When I left that room to do an injection, a staff member brought in the laser and turned it on. After I performed the injection, I walked back

OTHER LIO OPTIONS

Norlase isn't the only manufacturer to capitalize on the many innovations in LIO technologies. Here are some other companies offering feature-rich LIO systems:

The Smart LIO (Lumenis), also mounted on a modified Keeler indirect ophthalmoscope, offers a lightweight design with wireless capabilities. This multiwavelength system is compatible with all of the company's photocoagulators and multi-application platforms.[1]

Iridex offers both single-mirror (LIO Plus) and double-mirror (LIO Premiere) options, each of which provide excellent peripheral visualization and treatment flexibility, according to the company. The LIO Premiere also touts a rechargeable battery system, eliminating the need for a power cord.[2]

Alcon's LIO, featuring Purepoint laser technology, boasts a wireless system with a rechargeable battery, independent control of illumination and laser, and a 16' fiber-optic cable for improved freedom of movement.[3]

Topcon's Pascal LIO provides increased access to the far periphery of the retina, according to the company, within a headset that provides 2 hours of battery life.[4]

The Visulas Trion (Carl Zeiss Meditec) can pair with the company's LIO to provide excellent aiming beam contrast against the retinal background within a lightweight yet durable frame, according to the company.[5]

1. Lumenis. Lumenis Smart LIO. lumenis.com/medical/eye-care-products/lios. Accessed December 14, 2020.
2. Iridex. Iridex Laser Indirect Ophthalmoscopes. www.iridex.com/Products/RetinaDeliveryDevices/LIO.aspx. Accessed December 14, 2020.
3. The Alcon LIO featuring Purepoint laser technology. eyetube.net/portals/alcon-vitreoretinal/docs/US-PPT-17-E-0381%20-%20LIO%20Sales%20Aid%20LoRes%20FINAL.pdf. Accessed December 14, 2020.
4. Topcon Healthcare. Pascal Synthesis Photocoagulator [product borscure]. topconhealthcare.com/us/wp-content/uploads/sites/8/2020/07/PASCALSynthesis_brochure_E_201603.pdf. Accessed December 14, 2020.
5. Zeiss. VISULAS Trion. www.zeiss.com/meditec/us/products/ophthalmology-optometry/retina/therapy/therapeutic-lasers/visulas-trion.html#options---accessories. Accessed December 14, 2020.

into the first patient's room and completed the laser within 5 minutes of the initial evaluation and diagnosis.

In our practice setting, where the surgeons travel to multiple office locations each week, the lightweight, portable unit is a significant benefit. The entire setup, including the headset with integrated laser, footpedal, and control tablet, packs into a small suitcase. For surgeons who perform missions or other outreach trips, the carry-on sized case would make the Lion an excellent option for traveling to remote areas.

COST AND MAINTENANCE

From a cost and maintenance perspective, a major drawback of traditional laser systems is the fiber-optic cable that connects the LIO headset with the laser and power source. We use several different units and models in our offices, and we are replacing or repairing fiber-optic cables at least once a year, to the tune of several thousand dollars. The Lion does not use a fiber-optic cable, thereby eliminating this major regular maintenance cost.

WATCH NOW

The Lion Laser Indirect Ophthalmoscope Receives FDA Clearance.

BIT.LY/NORLASE

Regarding other maintenance issues, we don't have a long history of use with the Lion, and only time will tell how the system holds up.

A BETTER VIEW

Above and beyond mobility and maintenance, the most important benefit that we have experienced with this new LIO has been its enhanced optics and visualization. The Lion is housed on the Keeler LED indirect ophthalmoscope, and we have found that the view is superior to that of other LIOs with the addition of the Lion's laser and filters.

Some lasers may make viewing difficult in the far periphery or with media opacities such as cataract or capsular opacities, but the same is not true with the Lion. In addition, the Lion provides enhanced depth of focus, so it allows laser uptake with greater variation in focal length—almost double that of other LIOs.

FINAL TAKEAWAY

The Norlase Lion, the first fully integrated, battery-powered, Bluetooth-enabled, green laser LIO, is poised to disrupt the laser industry. We are excited to be using it in our clinics, and we anticipate continued innovation in this space. ■

S.K. STEVEN HOUSTON III, MD
- Vitreoretinal Surgeon, Director of Telemedicine, Florida Retina Institute, Orlando, Florida
- CEO and Cofounder, HealTheia
- Editorial Advisory Board Member, *Retina Today*
- shouston3@gmail.com
- Financial disclosure: None

JOHN W. KITCHENS, MD
- Partner, Retina Associates of Kentucky, Lexington, Kentucky
- Editorial Advisory Board Member, *Retina Today*
- jkitchens@gmail.com
- Financial disclosure: None

OPTIMIZING INTRAVITREAL INJECTION CAPACITY IN AN OPHTHALMOLOGY DEPARTMENT


An external audit helped to pinpoint organizational changes.

BY AUDREY GIOCANTI-AURÉGAN, MD, PHD; AND FRANCK FAJNKUCHEN, MD

Our ophthalmology department is located in Seine-Saint-Denis, a suburb of Paris known for its high rate of unemployment, low salaries, and poor medical follow-up.[1] There are 2 million people living in this area—almost the same as the population of Paris—but they are served by one-tenth the number of physicians. About 50% of patients in our catchment area do not speak French fluently. Our center mainly specializes in medical and surgical retina care, and we currently perform approximately 3,000 intravitreal injections (IVIs) per year.

In recent years, we have faced a large increase in demand for IVIs as the number of treatment indications has risen. During the summer of 2016 we modified the architecture of our IVI rooms to increase our IVI capacity without increasing staff numbers (Figure 1).

Despite this physical alteration, we still faced organizational difficulties that limited the potential of our new rooms. Moreover, during this period the use of a treat-and-extend (TAE) regimen became the first-choice therapeutic strategy for most retinal diseases. This type of regimen, although it improves visual outcomes, also makes the organization of our IVI program much more complex.

In 2017, we had the opportunity to undergo an external audit of our procedures. This article outlines the outcomes of the audit, the changes our department made as a result, and the effect of those changes on our clinical efficiency within our IVI program.

BEFORE THE AUDIT

The idea of conducting an audit was suggested by Allergan, which then helped us to fund the audit. An auditor spent two consecutive days in our department and observed our organization (or, rather, disorganization).

At that time, patients had to wait for hours. One physician was responsible for performing IVIs and another handled the clinical assessment of patients following the TAE regimen; however, these IVI patients were clinically assessed in the middle of a general clinical practice. Patients had only one appointment, regardless of their regimen. During a TAE follow-up visit, patients did not understand why their IVI was performed long after the time of their clinic appointment.

The auditor interviewed every person involved in IVI administration and held two meetings to collect feedback from all professionals regarding the organization of IVIs. The auditor also helped us to develop a satisfaction scale to assess the reactions of our patients treated with IVIs.

RESULTS OF THE AUDIT

The auditor identified the following points:

- We often did not offer a TAE regimen to our patients (< 10% of cases) due to the organizational difficulties.
- Orthoptists and physicians were dedicated to multiple

AT A GLANCE

- ▶ An audit of intravitreal injection management in one ophthalmology department yielded key ideas for improving capacity.
- ▶ Each department has its own problems and needs its own solutions. A given rule is not applicable everywhere, and outside help with organization is often needed.
- ▶ Regular reassessment is mandatory to maintain practice efficiency.

Figure 1. In our intravitreal injection area, two rooms were optimized (A, B) so that clinicians could access both rooms without exiting (black arrow shows route), while patients had two different entrances. A corridor was made available for patient preparation (C). The intravitreal area has its own waiting room.

tasks: that is, to general clinical practice and performing IVIs at the same time.
- The list of patients and the eyes to be treated (OD, OS, or both) was verified on the same morning the IVIs were scheduled.
- We participated in multiple clinical trials with differing follow-up protocols.

The auditor found that the staff was dissatisfied with the organization but was very sensitive to the audit process. The patient survey showed that 40% of patients had to wait more than 1 hour to receive their IVI, regardless of the type of regimen they received, with a mean total time of 45 minutes in our department.

On a 6-point scale, with 1 corresponding to "completely satisfied" and 6 corresponding to "very dissatisfied," our department earned an overall satisfaction score of 4 from our patients (Figure 2).

After this observation phase, the auditor suggested several ways to change our IVI management approach:
- Improve the use of our own staffing resources (residents, nurses, orthoptists).
- Optimize patient flow (the main goal), including flow direction and appointment scheduling.
- Improve our department's visibility and the patient information provided.

Specifically, the auditor recommended dedicating two clinicians to the intravitreal activity at the start of an IVI session but then assigning different tasks thereafter. There would be two practitioners to conduct the BCVA measurement and OCT scans at the start of a session, and then after 30 minutes one of them would be dedicated to those tasks and the other one dedicated only to the IVI procedure itself.

The auditor also advised that we schedule two appointments for each patient: one for measuring BCVA and performing OCT, and another one 30 minutes later for the IVI. The list of appointments for BCVA measurement and OCT would be scheduled to start 30 minutes before the list of IVI appointments.

These measures aimed to reduce patient waiting time, increase the number of injections performed, increase the number of patients followed with a TAE regimen, and achieve a good balance between the number of IVIs performed and the number of appointments.

The auditor also recommended that we verify patient charts the day before, rather than the morning of, the IVI sessions to ensure starting on time.

RECOMMENDATIONS APPLIED

We implemented several changes based on the recommendations of the auditor:
- We created two scheduling lists starting 30 minutes apart for patients treated with a TAE regimen: one for measuring BCVA and performing OCT and another for the IVI session.
- We scheduled two appointments for patients treated with a TAE regimen.
- We dedicated two health care professionals to the BCVA measurement and OCT scans, and then, 30 minutes later, their tasks were split between those

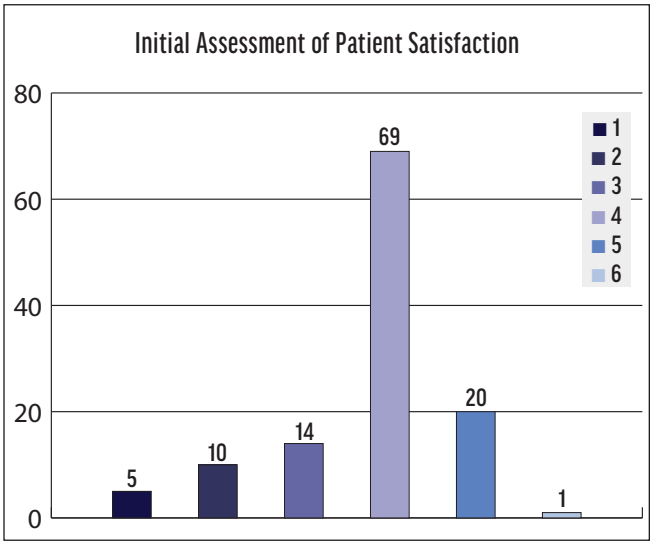


Figure 2. This chart shows the assessment of patient satisfaction regarding time spent in the clinic prior to the audit, based on a scale of 1 to 6 (1, completely satisfied; 2, very satisfied; 3, satisfied; 4, not quite satisfied; 5, not satisfied at all; 6, very dissatisfied).

WE FOUND THAT THE NUMBER OF IVIS PERFORMED HAD INCREASED, AND WE WERE ABLE TO PROPOSE A TAE REGIMEN TO MORE PATIENTS (50% VS < 10%). THESE CHANGES ALLOWED US TO IMPROVE OUR IVI CAPACITY BY 30% BETWEEN 2016 AND 2019.

tasks and performing the IVI (apart from the general clinical practice), with the IVI scheduled later during the session.
- We verified IVI lists the day before the session instead of that morning.

We made these changes in March 2017 and then reassessed our practice that November. We found that the number of IVIs performed had increased, and we were able to propose a TAE regimen to more patients (50% vs < 10%). These changes allowed us to improve our IVI capacity by 30% between 2016 and 2019 (Figure 3).

However, the overall time that patients spent in the clinic did not decrease (mean 45 minutes in March vs 44 minutes in November).

We tested and applied these recommendations within the constraints of a public hospital, which included insufficient numbers of health care practitioners (orthoptists, physicians, nurses), a large number of medical students, and frequent turnover of practitioners.

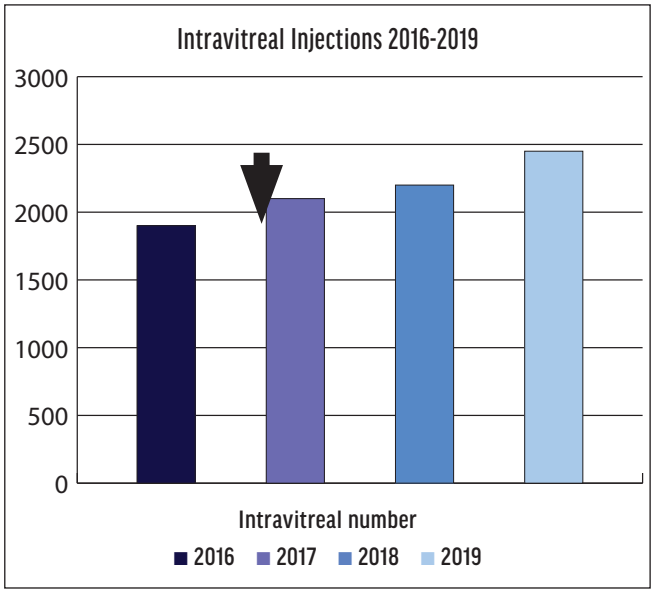


Figure 3. This chart depicts the number of intravitreal injections performed annually in the department during the past few years. The arrow indicates the date of the audit.

THREE YEARS LATER

We recently participated in a European meeting on the optimization of IVI capacity in retina departments, and this provided a good opportunity to assess our practice 3 years after the audit. In reviewing our performance, we noted that our use of the TAE regimen had recently decreased.

We recognized that the changes implemented after the 2017 audit were no longer being followed. These practices had lapsed due to the regular turnover among practitioners, including residents, nurses, and schedulers.

As a result of the reassessment, we decided to once again reorganize our scheduling and other practices as recommended by the auditor. This experience helped us to understand that regular reassessment is mandatory to maintain efficiency in practice.

CONCLUSION

Even though we improved our local IVI capacity by 30% over the past 3 years, we did not reduce the mean overall time patients spent in our clinic. Still, we were able to increase the number of patients treated with a TAE regimen and to formalize this type of regimen with two appointments, which has helped to increase patient satisfaction.

We also realized through this audit experience that each department has its own problems and requires its own solutions. A given rule is not applicable everywhere, and small changes can make a big difference. ■

1. Stéphan S, Fajnkuchen F, Addou-Regnard M, et al. Severity of diabetic macular edema (DME) in Seine St Denis among patients treated by anti-VEGF [in French]. *J Fr Ophtalmol*. 2014;37(9):717-721.

FRANCK FAJNKUCHEN, MD
- Assistant Attending, Ophthalmology Department, Avicenne Hospital, APHP, Sorbonne Paris Nord University, Bobigny, France
- Private Consultant, Centre d'Imagerie et de Laser, Paris, France
- Financial disclosure: Consultant (Allergan, Bayer, Novartis)

AUDREY GIOCANTI-AURÉGAN, MD, PHD
- Professor, Head of Department, Ophthalmology Department, Avicenne Hospital, APHP, Sorbonne Paris Nord University, Bobigny, France
- Financial disclosure: Consultant (Allergan, Bayer, Horus, Novartis, Roche)

PERFLUOROCARBON LIQUIDS: PEARLS AND PITFALLS

Each year, the Aspen Retinal Detachment Society (ARDS) hears from a select group of highly distinguished speakers. In several of our past meetings, we have made sure to reserve time on the podium to discuss pediatric retinal care.

ARDS leadership knows that most retina conferences give little attention to pediatric retina care. The reasons are obvious: Pediatric retina is a sub-subspecialty of eye care, and dedicating valuable podium time on an otherwise filled agenda to a discipline that only a small subset of attendees may practice could be unwise.

Still, we know our attendees. ARDS participants' hunger for learning deeply about a number of subjects is not limited to the topics that pertain most immediately to them and their practices. They're polymaths. They know that rounding out their retina education gives them a more holistic sense of the space. And hey, you never know when those pediatric retina pearls will come in handy.

Be sure to keep an eye on MedConfs.com for the latest updates about ARDS 2021 and our focus on an in-person meeting.

—Timothy G. Murray, MD, MBA

Presentation by
Carl D. Regillo, MD
Summarized by
Abdallah Mahrous, MD

At last year's ARDS meeting, Carl D. Regillo, MD, shared pearls and suggestions for the use of perfluorocarbon liquid (PFCL) in retinal detachment (RD) surgery. This article summarizes portions of his presentation.

Since the FDA approval of purified perfluoro-n-octane liquid (Perfluoron, Alcon) in 1996, PFCL has become an indispensable tool for RD repair. In the setting of primary RD, there are three main ways to drain subretinal fluid:

- directly through a preexisting retinal break;
- through a posterior drainage retinotomy; or
- by using PFCL to drain through the preexisting break.

PFCL has several advantages over the other options in this situation, including minimizing macular distortion or folds. It can also be advantageous in surgery for giant retinal tears and proliferative vitreoretinopathy (PVR).

However, PFCL has limitations, including its cost. It can also create complications, such as retained PFCL bubbles under the retina.[1] Although such bubbles are nontoxic and can be observed if outside the macula, a visually significant retained bubble under the fovea should be removed.

PFCL should be used cautiously. If excessive amounts are used with anteriorly displaced subretinal fluid, the fluid can be pushed posteriorly at the time of PFCL–air exchange, potentially causing problems such as macular folds.

PFCL TECHNIQUES

Dr. Regillo reviewed several techniques that can be used to optimize PFCL use.

Valved cannulas help to maintain a closed system in the eye, minimizing variation in fluidics and thus reducing the chance of dispersion and bubbling of PFCL.

Keeping the PFCL in one big bubble minimizes the chance of smaller bubbles breaking off and migrating under the retina or becoming retained elsewhere. Therefore, care should be taken with PFCL use so as to not engage the vitrector as the instrument is entering or exiting the eye, as this can permanently damage the trocar valve.

Another technique is the all-or-none strategy, in which the entire vitreous cavity is filled with PFCL. This decreases the chance for smaller bubbles to migrate subretinally. A full PFCL fill can be facilitated by initially amputating the anterior flap of the retinal tear, which makes it easier for the subretinal fluid to egress and for the retina to settle down while PFCL is filling the eye.

The retinal break can also be extended anteriorly to enlarge it and maximize fluid drainage. This also facilitates laser uptake and minimizes residual subretinal fluid. Very peripheral breaks can be extended out to the ora serrata.

When filling the eye with PFCL, it is recommended that you tilt the eye away from the break. This will cause the retina to flatten as the PFCL fills the eye, squeezing and draining the subretinal fluid through the break.

INJECTING AND EXTRUDING PFCL

It is important to inject PFCL into the eye cautiously and slowly in order to maintain one single, big bubble. It's also important never to inject over the macula. A high velocity of PFCL injection can force the liquid under the retina. A good technique is to start injecting over the optic nerve, moving nasally as the bubble enlarges and ensuring an eye tilt of 180° away from the break while filling all the way up to the ora.

In removing the PFCL, it's important to first remove the balanced salt solution anterior to the PFCL. Next, drain

IT IS IMPORTANT TO INJECT PFCL INTO THE EYE CAUTIOUSLY AND SLOWLY IN ORDER TO MAINTAIN ONE SINGLE, BIG BUBBLE. IT'S ALSO IMPORTANT NEVER TO INJECT OVER THE MACULA.

WATCH IT NOW

PERFLUOROCARBON LIQUIDS: PEARLS AND PITFALLS
Carl Regillo, MD, reviews the pros and cons of using perfluorocarbon liquids for both primary and complicated retinal detachments and explains that–although it can be used to ensure the best possible macular anatomy and visual outcomes–use of perfluorocarbon liquids still carries the risk of retention under the macula.

BIT.LY/REGILLO

over the break until the PFCL is below the level of the break. After draining from the retinal break, the rest of the PFCL should be removed from over the optic nerve to complete the PFCL–air exchange.

To prevent reflux of PFCL from the extrusion cannula, it is recommended to continue aspirating while the cannula is pulled out of the eye. A brief venting of the eye after PFCL–air exchange is also useful to let any peripherally retained PFCL fall back to the posterior pole.

If PFCL is used correctly and subretinal fluid is successfully drained, postoperative facedown positioning is not required. The patient will simply need to position to tamponade the break.

USE IN PVR

Dr. Regillo noted that the same principles of injecting and aspirating PFCL inside the eye apply to PVR detachments. It is especially essential in retinectomies of 180° or greater. In such cases, it is recommended to apply diathermy to any vessels at the retinectomy margins to prevent bleeding.

The retinectomy should be done as anteriorly as possible to prioritize retinal preservation. Any retina anterior to the retinectomy should be removed. PFCL is then used to flatten the retina and apply laser. Then a PFCL–air exchange is done, followed by an air–silicone oil exchange. During PFCL removal, drainage should start at the edge of the retinectomy until the PFCL is below the level of the retinectomy, after which the rest of the drainage can be performed from the disc.

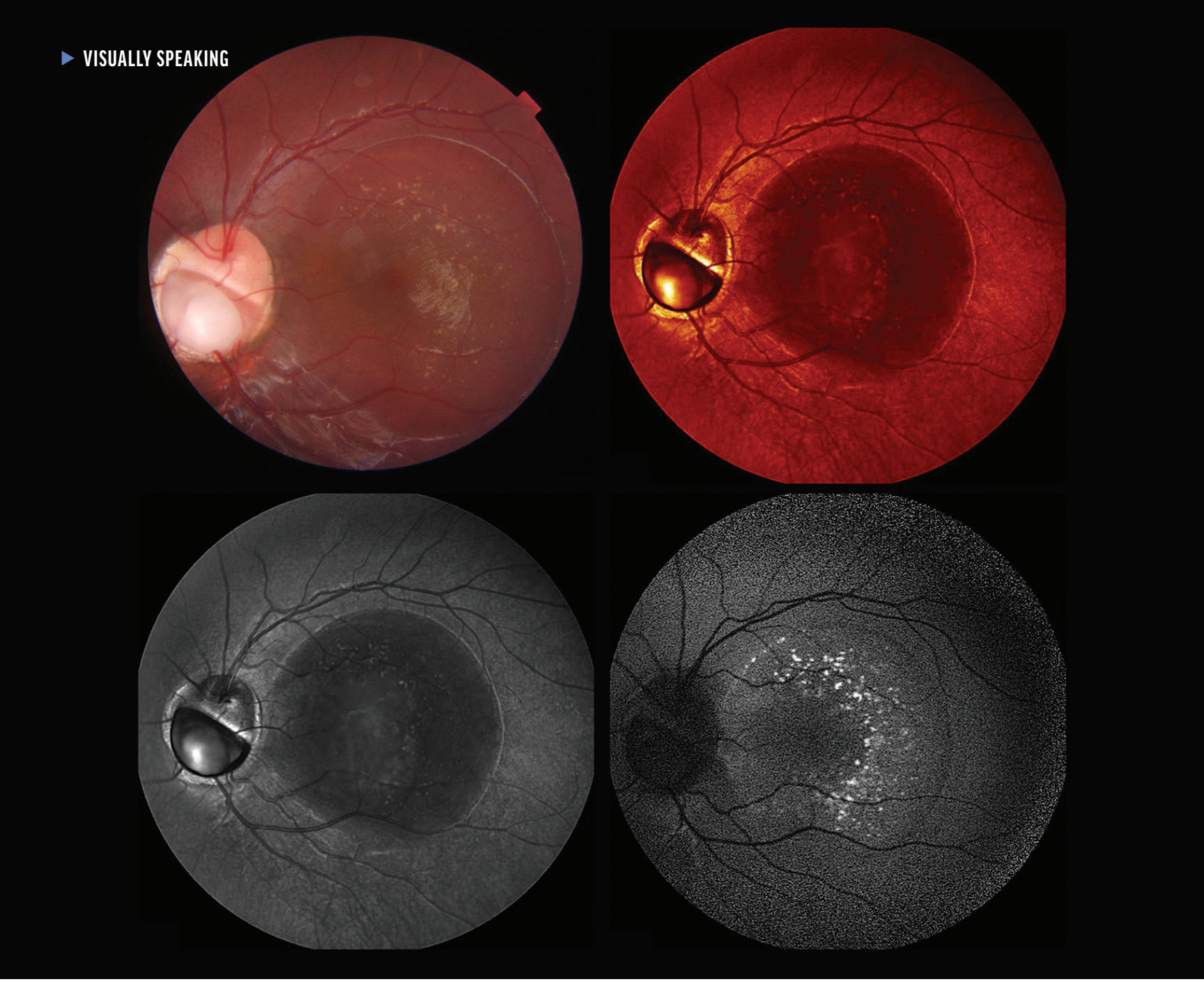
SUMMARY

The introduction of PFCL was one of the major advances in techniques and technologies for RD repair, whether primary or complicated. PFCL provides excellent displacement of subretinal fluid, eliminates the need for a posterior drainage retinotomy and facedown positioning, and prevents slippage of large retinectomy edges. It also provides good visualization for laser application. To minimize the risk of retained PFCL bubbles, it is important to use valved cannulas to inject PFCL as one bubble, remove the PFCL completely, and vent the eye before completing the air–gas exchange. ■

1. Figueroa MS, Contreras I. Characteristics of retained subretinal perfluoro-n-octane on optical coherence tomography. *Retina*. 2012;32(10):2177-2178.

CORRESPONDING AUTHOR
ABDALLAH MAHROUS, MD
- Vitreo-Retinal Surgery Fellow, Weill Cornell Medicine, New York
- amahrus89@gmail.com
- Financial disclosure: None

CARL D. REGILLO, MD
- Chief, Retina Service, Wills Eye Hospital
- Professor of Ophthalmology, Thomas Jefferson University, Philadelphia
- Editorial Advisory Board Member, *Retina Today*
- cregillo@aol.com
- Financial disclosure: Consultant (Adverum Biotechnologies, Aldeyra Therapeutics, Allergan, Chengdu Kanghong Pharmaceutical Group Eyepoint Pharmaceuticals, Genentech, Graybug Vision, Iconic Therapeutics, Iveric bio, Kodiak Sciences, Lineage Cell Therapeutics, Merck, Notal Vision, Novartis, Opthea, Takeda), Research grant support (Adverum Biotechnologies, Allergan, Astellis, Chengdu Kanghong Pharmaceutical Group, Genentech, Graybug Vision, Iveric bio, Kodiak Sciences, Notal Vision, Novartis, Opthea, Regeneron, RegenxBio)

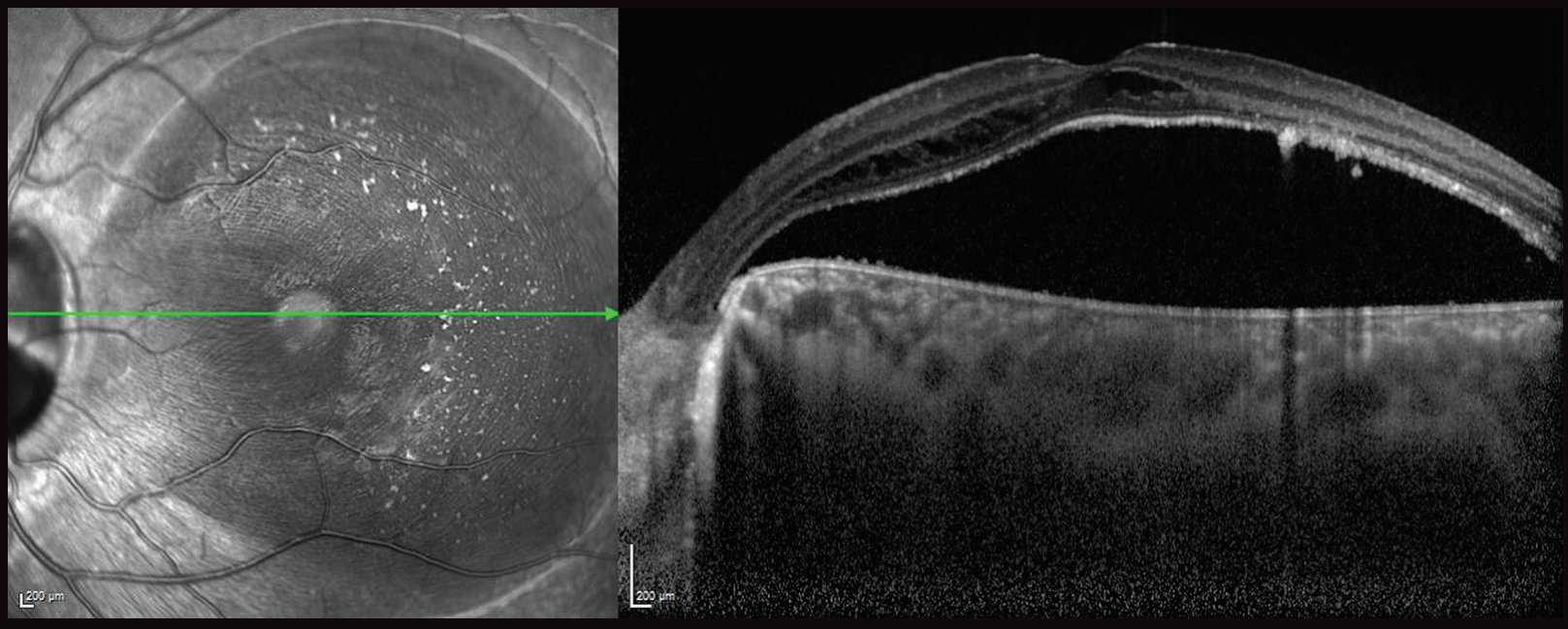


A CASE OF OPTIC FISSURE FAILURE

BY SEFIK CAN IPEK, MD; AYLIN YAMAN, MD; AND ALI OSMAN SAATCI, MD; EDITED BY MANISH NAGPAL, MBBS, MS, FRCS

Optic disc coloboma, macular schisis, and serous detachment were to blame for this patient's poor vision in the left eye.

A 4-year-old boy was referred to us from an outside clinic for further evaluation of his left eye, which was the only eye with good vision. VA in the left eye was 4/10 based on the Allen chart. The anterior segment examination was unremarkable, but dilated fundus examination revealed a



disc coloboma inferiorly approximately 0.50 disc diameters in size, a serous macular detachment, and multiple yellow deposits in the subretinal space (Main Figure, Left).

Spectral-domain OCT confirmed the serous retinal detachment, macular schisis, and hyperreflective material in the inner segment/outer segment layer, most likely due to photoreceptor degeneration (Figure, Above).

As the left eye was the child's good eye, pars plana vitrectomy was offered to the family to possibly preserve the vision; however, the parents withheld the surgical option and elected to wait.

DISCUSSION

Optic nerve coloboma (both typical and atypical), optic pit, morning glory disc anomaly, and extrapapillary cavitation comprise a continuum of anomalies that arise from the failure of the optic fissure to close during embryogenesis.[1] Serous maculopathy occurs in more than 50% of eyes with cavitary disc anomalies.[2,3]

The exact origin and pathogenesis of the intra- and subretinal fluid associated with these conditions remain unknown. Researchers postulate that either vitreous or cerebrospinal fluid might be the underlying pathology causing the macular detachment.[4]

No consensus exists on treatment timing and modality. Laser photocoagulation, pars plana vitrectomy with or without internal limiting membrane peeling, intravitreal gas tamponade, subretinal drainage, inner retinal fenestration, and macular buckling are among the surgical methods that have been described.[1,5,6] ■

1. Kiang L, Johnson MW. Formation of an intraretinal fluid barrier in cavitary optic disc maculopathy. *Am J Ophthalmol*. 2017;173:34-44.
2. Brown GC, Shields JA, Goldberg RE. Congenital pits of the optic nerve head. II. Clinical studies in humans. *Ophthalmology*. 1980;87(1):51-65.
3. Haik BG, Greenstein SH, Smith ME, Abramson DH, Ellsworth RM. Retinal detachment in the morning glory anomaly. *Ophthalmology*. 1984;91(12):1638-1647.
4. Jain N, Johnson MW. Pathogenesis and treatment of maculopathy associated with cavitary optic disc anomalies. *Am J Ophthalmol*. 2014;158(3):423-435.
5. Kalogeropoulos D, Ch'ng SW, Lee R, et al. Optic disc pit maculopathy: a review. *Asia Pac J Ophthalmol (Phila)*. 2019;8(3):247-255.
6. Uzel MM, Karacorlu M. Optic disk pits and optic disk pit maculopathy: A review. *Surv Ophthalmol*. 2019;64(5):595-607.

SEFIK CAN IPEK, MD
- Fellow, Department of Ophthalmology, Agrı Research and Training Hospital, Agrı, Turkey
- sefikcanipek@gmail.com
- Financial disclosure: None

SECTION EDITOR MANISH NAGPAL, MBBS, MS, FRCS
- Senior Consultant, Retina and Vitreous Services, The Retina Foundation, Ahmedabad, India
- drmanishnagpal@yahoo.com
- Financial disclosure: Consultant (Nidek)

ALI OSMAN SAATCI, MD
- Professor, Department of Ophthalmology, Dokuz Eylul University, Izmir, Turkey
- Financial disclosure: None

AYLIN YAMAN, MD
- Professor, Department of Ophthalmology, Dokuz Eylul University, Izmir, Turkey
- Financial disclosure: None

If you have an image or images you would like to share, email Dr. Nagpal.
Note: Photos should be 400 dpi or higher and at least 10 inches wide.

CODING ADVISOR
A Collaboration Between *Retina Today* and AMERICAN ACADEMY™ OF OPHTHALMOLOGY Protecting Sight. Empowering Lives.

WHY WAS MY INTRAVITREAL INJECTION CLAIM DENIED?

Here are 10 possible reasons—and ways to avoid these errors.

BY JOY WOODKE, COE, OCS, OCSR

Correct coding for intravitreal injections is a complex process. Done right, it will lead to proper reimbursement. Done wrong, it may lead to a denial. There are many variances related to specific insurance policies and specific claim submission requirements that must be observed to result in a clean claim.

When you receive a denial, review these 10 common errors to resolve the problem before resubmission or appeal.

ERROR NO. 1: IMPROPER ICD-10-CM

Confirm that the ICD-10-CM code reported on the CMS-1500 claim form supports medical necessity and chart documentation. For example, if a diagnosis of nonexudative macular degeneration is incorrectly linked to CPT code 67028 and/or the medication, the claim will be denied. A bilateral ICD-10-CM code or a right eye diagnosis linked to a left eye injection code (CPT 67028-LT) can also cause rejections.

Additionally, check that the ICD-10-CM code is indicated for the specific drug or included as an expanded payable diagnosis per the unique insurance payer policy in question. Due to off-label use of bevacizumab (Avastin, Genentech), payable diagnoses are per payer policy and based on current medical literature. Table 1 lists the indications for common anti-VEGF drugs and steroidal intravitreal implants.

ERROR NO. 2: NDC REPORTED INCORRECTLY

The National Drug Code (NDC) for the injected drug entered on the insurance claim form should follow these guidelines:

- NDC code converted to 5-4-2 format. Typically, NDC codes are listed on the vial in a 10-digit format. To be recognized by payers, however, it must be formatted in the 11-digit 5-4-2 sequence. This requires placing a zero in a specific position. Table 2 illustrates this conversion.
- On the CMS-1500 form, report the converted NDC code, in item 24a or EDI loop 2410, preceded by the qualifier *N4*.

ERROR NO. 3: ADDITIONAL INFORMATION REQUIRED

Per payer policies, report additional claim information in item 19 of the CMS-1500 form or the electronic equivalent. For example, in billing for bevacizumab injections,

AT A GLANCE

- Errors in coding can include use of wrong codes or modifiers, failure to report wastage, and omitting required information.
- Lack of prior authorization and failure to follow step therapy can also cause denials.
- Reference sheets with specific requirements for each payer and medication can help physicians and coding staff members avoid errors.

TABLE 1. INDICATIONS FOR COMMON ANTI-VEGF DRUGS AND STEROID IMPLANTS

Drug	Indications
Aflibercept (Eylea, Regeneron)	DR, DME, wet AMD, ME following RVO
Ranibizumab 0.3 mg (Lucentis, Genentech)	DME, DR
Ranibizumab 0.5 mg	ME following RVO, wet AMD, myopic choroidal neovascularization
Brolucizumab-dbll (Beovu, Novartis)	Wet AMD
Steroid Implant	
Fluocinolone acetonide intravitreal implant 0.19 mg (Iluvien, Alimera Sciences)	DR with DME
Fluocinolone acetonide intravitreal implant 0.18 mg (Yutiq, EyePoint Pharmaceuticals)	Noninfectious intermediate, posterior, and panuveitis
Dexamethasone intravitreal implant (Ozurdex, Allergan)	DME, ME following RVO, noninfectious uveitis

Abbreviations: AMD, age-related macular degeneration; DME, diabetic macular edema; DR, diabetic retinopathy; ME, macular edema; RVO, retinal vein occlusion.

most carriers require the coder to provide the name of the medication and dosage as additional information.

ERROR NO. 4: WRONG HCPCS CODE

Healthcare Common Procedure Coding System (HCPCS) codes are used to report medications on insurance claim forms. For bevacizumab, HCPCS J9035 may be recognized for ophthalmic use, but many insurance payers require a miscellaneous HCPCS code, J7999, J3490, or J3590. Several Medicare Administrative Contractors (MACs) have local coverage determinations (LCDs), local coverage articles (LCAs), or published bulletins specifying the HCPCS code required for ophthalmic use of bevacizumab, and these can be reviewed at aao.org/lcds. Table 3 outlines these variances. Although a MAC may require a specific HCPCS for bevacizumab billing, other payers may require a different code. Confirm the policies for bevacizumab for each insurance carrier.

ERROR NO. 5: UNITS ERROR

The units reported on the insurance claim should accurately reflect the medication dosage used and match the chart documentation for the intravitreal injection. For instance, the HCPCS code J0178 for aflibercept (Eylea, Regeneron) is defined as injection, aflibercept, 1 mg. Based on the descriptor, 1 unit equals 1 mg. If 2 mg (the labeled dosage) is injected, you should report 2 units. Incorrect billing for 1 unit may lead to a claim denial or may trigger a chart review.

TABLE 2. CONVERSION FROM 10-DIGIT TO 11-DIGIT CODE FORMAT

Drug	10-Digit Code	NDC Code	NDC 5-4-2 Format
Fluocinolone acetonide intravitreal implant 0.18 mg (Yutiq, EyePoint Pharmaceuticals)	5-3-2	71879-136-01	71879-**0**136-01
Dexamethasone intravitreal implant (Ozurdex, Allergan)	4-4-2	0023-3348-07	**0**0023-3348-07

TABLE 3. MEDICARE ADMINISTRATIVE CONTRACTORS' PUBLISHED BEVACIZUMAB (AVASTIN) VARIANCES

MAC	LCD/LCA	J-Code
Cigna Government Services	No active policy	J3490 or J3590
First Coastal Service Options	A56716 L36962	J7999
National Government Services	A52370	J9035
Noridian	A53008-JE A53009-JF	J7999
Novitas	A53121	J7999
Palmetto	No active policy	J9035
WPS Government Health Administrators	No active policy	J3590

For an intravitreal injection of ranibizumab (Lucentis, Genentech) for diabetic macular edema (DME), the indicated dosage is 0.3 mg, and the HCPCS code J2778 descriptor is injection, ranibizumab, 0.1 mg. The correct coding in this case would be 3 units. If you incorrectly report 5 units (dosage of 0.5 mg) for this case with a diagnosis link of DME, the claim may be denied or recouped in an audit. The chart documentation would not match the claim submission, and the diagnosis linked is not indicated for that dosage.

ERROR NO. 6: INJECTION SOONER THAN 28 DAYS

Most MAC LCDs or articles related to intravitreal injections state that frequency should not be less than 28 days per eye. Based on these Medicare policy guidelines, many other payers also include these frequency edits in their policies.

ERROR NO. 7: WASTAGE NOT REPORTED

Since January 2017, Medicare has required the use of modifier -JW to indicate measurable drug wastage of 1 unit or greater. Wastage is an issue for several ophthalmic drugs. For example, triamcinolone acetonide injectable suspension

RESEARCH AND IDENTIFY INSURANCE CARRIERS WITH STEP THERAPY POLICIES RELATED TO ANTI-VEGF TREATMENT, AND PROVIDE INTERNAL RESOURCES AND PRACTICE MANAGEMENT SYSTEM FLAGS FOR STAFF AND PHYSICIANS TO AVOID THIS ERROR AND ITS POTENTIAL IMPACT ON REIMBURSEMENT.

40 mg/mL (Triesence, Alcon) is provided in a single-use vial of 40 mg, with an HCPCS descriptor of injection, triamcinolone acetonide, preservative free, 1 mg. If 1 mg of this formulation was injected and the remaining 39 mg discarded, this is reported on two lines of the CMS-1500:

- J3300, 1 unit
- J3300-JW, 39 units

As another example, in coding for photodynamic therapy (PDT) with verteporfin for injection (Visudyne, Bausch + Lomb), using the HCPCS code J3396 (injection, verteporfin, 0.1 mg), report a total of 150 units for full reimbursement on two separate lines. Failure to report the wastage separately will result in a claim denial or audit. In fact, PDT laser (CPT 67221) with erteporfin is currently the focus of Medicare Recovery Audit contractors, targeted toward identified failures to report drug wastage.

ERROR NO. 8: MODIFIER MISHAP

The misuse of modifiers is a frequent reason for claim denials. Coding for intravitreal injection with CPT code 67028 requires use of the eye modifier(s) -RT, -LT, or -50 (bilateral), as appropriate. If the injection is performed during a global period, a surgical modifier should be appended, preceding the eye modifier:

- -58 modifier: staged or related procedure or service by the same physician during the postoperative period.
- -78 modifier: unplanned return to the OR/procedure room by the same physician following initial procedure for a related procedure during the postoperative period.
- -79 modifier: unrelated procedure or service by the same physician during the postoperative period.

The definition of *same physician* includes all physicians in the same group practice under the same tax identification number (EIN).

ERROR NO. 9: LACK OF PRIOR AUTHORIZATION

Failure to obtain a necessary prior authorization for an intravitreal injection will cause a rejected claim. Requests for prior authorizations made retroactively after a claim denial are often rejected.

Best practice is to develop internal resources that define, per payer and medication, when a prior authorization is required. This resource then provides a quick reference to confirm if a prior authorization is necessary prior to providing the treatment.

ERROR NO. 10: STEP THERAPY NOT FOLLOWED

An insurance payer may require the use of a preferred drug for intravitreal injections, typically a lower-cost medication such as bevacizumab, before initiating treatment with a higher-cost drug such as aflibercept. If the step therapy policy was not followed, this can lead to a costly claim denial that may not have appeal rights.

Research and identify insurance carriers with step therapy policies related to anti-VEGF treatment, and provide internal resources and practice management system flags for staff and physicians to avoid this error and its potential impact on reimbursement.

TAKE A PROACTIVE APPROACH

As claim denials are resolved and reasons identified, communicate these problems and their solutions to all physicians and staff in the practice to avoid perpetuating the same rejections. Proactively review claims before submission for potential errors, and consider any insurance payer policy nuances. Taking these crucial steps and doing a final scrub of each claim will reduce denials and increase efficiencies.

To learn more about coding intravitreal injections and to identify new resources, visit aao.org/retinapm. ■

JOY WOODKE, COE, OCS, OCSR

- Coding and Practice Management Executive, American Academy of Ophthalmology, San Francisco
- jwoodke@aao.org
- Financial disclosure: None

(Continued from page 14)
personal one that allows a program to confidently take on a new fellow who will forever be part of the family.

Dr. Starr: Given the option, would you prefer virtual or in-person interviews next year?

Dr. Sivalingam: Definitely in-person interviews. Not only is it easier for us, but the applicants truly get to experience the Wills Retina Service interview process and get a sense of what makes Wills special. This intangible is not quite captured without an in-person interview.

Dr. Srivastava: I can tell you about all of the good stuff that came from the virtual process, and how the process was easier, but I would take in-person interviews over virtual.

Dr. Hassan: Although I love that the applicants were able to save a great deal of money and time by not flying all over the country interviewing for fellowships, I think both applicants and programs gain a much better sense of one another on an in-person visit. We were forced to use virtual platforms this year, but I think we may eventually come up with somewhat of a hybrid system using some combination of in-person and virtual interviews—potentially even with multiple programs cooperating in ways that would combine efforts to help candidates lessen their overall travel and time burdens. These details must be further studied and worked out, beginning soon after the match this year. ■

TAREK S. HASSAN, MD
- Fellowship Director of Vitreoretinal Training and Partner, Associated Retinal Consultants, Royal Oak, Michigan
- Director of Vitreoretinal Training and Partner, Associated Retinal Consultants, Royal Oak, Michigan
- tsahassan@yahoo.com
- Financial disclosure: None

ARUNAN SIVALINGAM, MD
- Surgical Retina Fellowship Director, Wills Eye Hospital, Mid Atlantic Retina, Philadelphia
- asivalingam@midatlanticretina.com
- Financial disclosure: None

SUNIL K. SRIVASTAVA, MD
- Surgical Retina Fellowship Director, Cleveland Clinic, Cole Eye Institute, Cleveland
- srivass2@ccf.org
- Financial disclosure: None

MATTHEW STARR, MD
- Second-Year Surgical Retina Fellow, Wills Eye Hospital, Philadelphia
- mstarr1724@gmail.com
- Financial disclosure: None

INDEX OF ADVERTISERS

YOSHIHIRO YONEKAWA, MD

When were you first interested in becoming a retina specialist? What led you to pursue specialized fellowship training in adult and pediatric retina surgery?

My first exposures to ophthalmology as a medical student at Cornell were in pediatric retina with R.V. Paul Chan, MD. I often tagged along for retinopathy of prematurity (ROP) rounds in the NICU. My "wow, this is the most amazing thing ever" moment was seeing stage 3 ROP with a 28 D lens. Being able to see physiology in action and feeling the VEGF swirling in the hot eye was a profound moment. And then, watching Paul and the team talk to the parents and saving the child's vision for potentially the next 100 years was simply inspirational, and I never looked back after that.

What are some of the challenges and rewards of treating pediatric patients?

There are many challenges and many rewards. But the challenges become rewarding, and the rewards outweigh the challenges! The surgeries are technically challenging, very high risk, and never "just a vit." Pediatric vitreoretinal surgeries require creativity and thinking outside the box, and the usual tenets of adult surgery can take you down the wrong path. Not only are the eyes smaller, but also the anatomic proportions are different, and you're dealing with a whole different set of diseases. Also, not only are you treating the child in front of you, but the parents require healing as well.

There's nothing like releasing the traction on a persistent fetal vasculature stalk and watching the eye snap open. Being able to diagnose and treat genetic diseases for an entire family can save the vision of generations to come, or telling a mother that her baby will be able to see, there's nothing better than that.

You have an ongoing visiting faculty position with Kyorin University in Tokyo. What have you learned from your colleagues there?

Japanese retina specialists have contributed numerous groundbreaking techniques to our field, from the first descriptions of laser to treat ROP, to pioneering intraarterial chemotherapy for retinoblastoma, to the first open-sky vitrectomy, and even closed-eye vitrectomy.

There are so many things that we can learn from our international colleagues. Every time I participate in an international meeting, I come away with ideas that may be unorthodox from a US perspective but may result in interesting studies or better surgical techniques. For example, when I have difficult myopic macular cases, I usually reach out to my friends in Asia and ask them about the latest techniques they are using. We also have ongoing research collaborations and stay connected at the society levels.

Halloween is a favorite time of year for Dr. Yonekawa's family. 2020 was the year of the mask.

What are some of the latest techniques that most excite you?

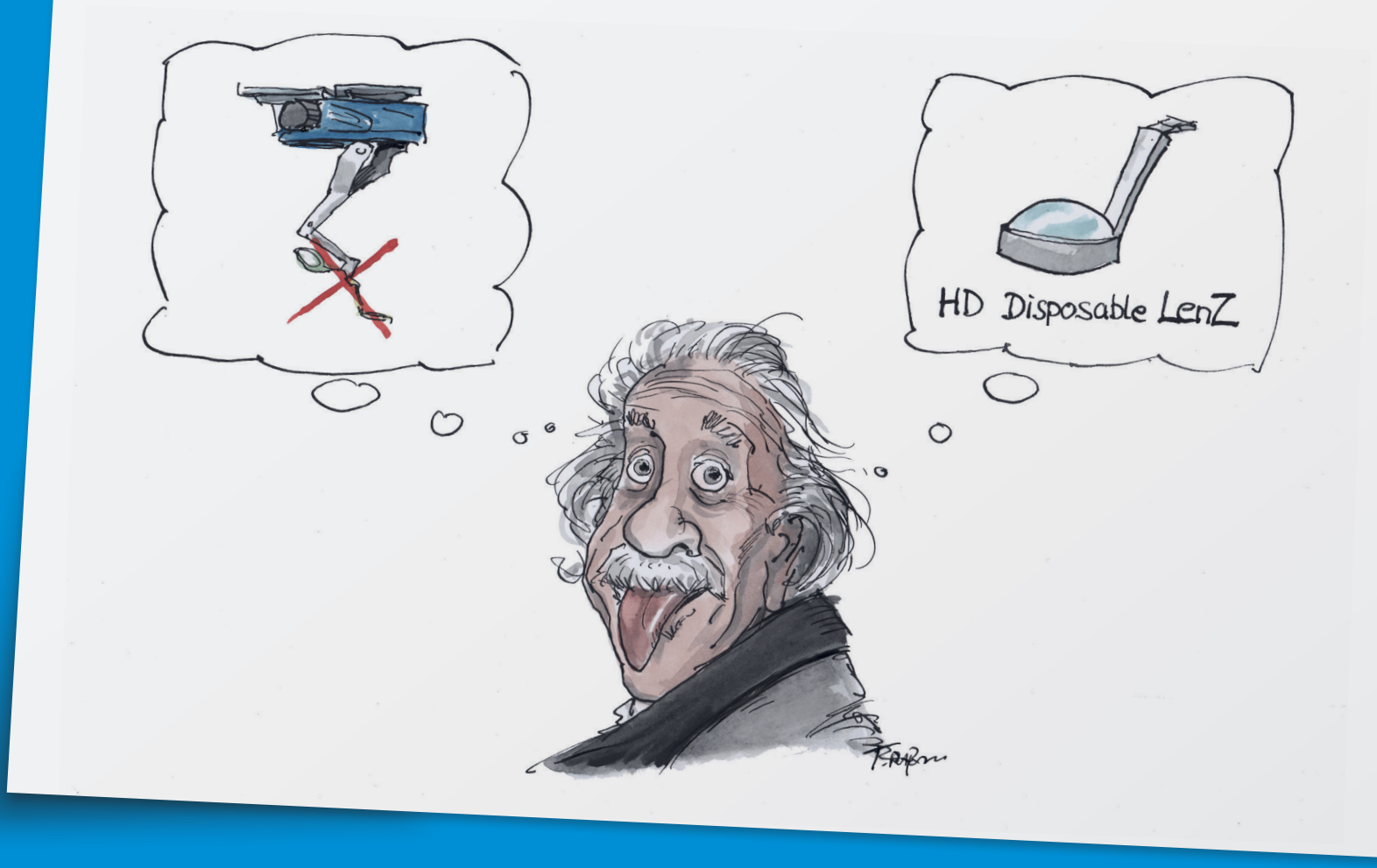
There's never a dull moment in our ORs. At Wills Eye Hospital we take care of a tremendous volume of surgical patients, both adult and pediatric. My partners and fellows are amazing, and we're always learning new techniques from each other. I'm also fortunate to be on several editorial boards of retina journals, and I follow the literature closely for creative and new approaches. Some new techniques that I'm looking forward to employing include repositioning of the internal limiting membrane (ILM) for macular holes (ie, peeling the ILM off and then placing it back), using the hypersonic vitreous cutter, trying some new scleral buckling acrobatics, pushing the envelope on 27-gauge surgeries, and hopefully in the near future performing more surgeries for gene therapies and implantable devices.

What is a favorite family tradition you have?

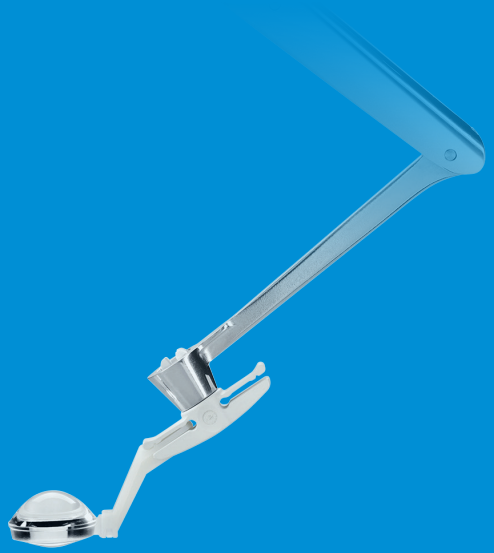
I'm blessed with a wonderful wife and four awesome kids. Our parents and extended family now live in Tokyo, so we try to visit as much as possible. When we do, we try to sneak in a trip to the hot springs. We never fail to fit in a trip to a local *kaiten* sushi place. That's where sushi comes down a circular conveyer belt and you pick up what you want. It's always a hit with the kids, although to be honest, it's probably not the most COVID-friendly concept right now. But hopefully the pandemic will be in better control next time we visit. ■

YOSHIHIRO YONEKAWA, MD

- Adult and Pediatric Retina Surgeon, Wills Eye Hospital/Mid Atlantic Retina, Philadelphia
- Assistant Professor of Ophthalmology, Sidney Kimmel Medical College, Thomas Jefferson University, Philadelphia
- yyonekawa@midatlanticretina.com; Twitter @YoshiYonekawaMD
- Financial disclosure: Consultant (Alcon, Alimera, Allergan, Genentech)



OCULUS HD Disposable LenZ –
For single-use on the ZEISS RESIGHT®



- **Perfect view in every case**
  Single-use means no scratches or opacities
- **Always sterile**
  Minimizes risk of infection and cross-contamination
- **Always available on the spot**
  Increase your O.R. capacity utilization

www.oculussurgical.com +49 641 2005-298
Follow us! 855-SDI-BIOM (Toll Free, US Only)

OCULUS® SURGICAL

Stable and Reliable Laser Delivery for Optimal Treatment Outcomes

- **NEW** Low Power Mode
- 22 Preprogammed Scan Patterns
- Auto Forward Function
- SOLIC Optical Design

YLC-500 Vixi Yellow Scan Laser

The YLC-500 Vixi is a **577nm** yellow scan laser photocoagulator using the innovative OPSL (optically pumped semiconductor laser) method to achieve stable and reliable laser delivery for optimal treatment outcomes.

Now available with NEW **Low Power Mode** (LPM), a form of laser treatment that delivers reduced power to the retina for minimally invasive photocoagulation and a therapeutic effect.

LEARN MORE: info@nidek.com · usa.nidek.com

CALL US TODAY!
1-877-200-9892

Eye & Health Care
NIDEK INC.

Caution: U.S. Federal Law restricts this device to sale, distribution, and use by or on the order of a physician or other licensed eye care practitioner. Specifications may vary depending on circumstances in each country. Specifications and design are subject to change without notice.

December 22, 2020
2020-0019