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# KOL KNOCKOUT™ RETINA EDITION:

## EXPERTS GO TOE TO TOE ON MEDICAL AND SURGICAL TREATMENT APPROACHES

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## Content Source

This continuing medical education (CME) activity captures content from three live-virtual symposia.

## Activity Description

This supplement summarizes three live-virtual symposia hosted by Sunil K. Srivastava, MD. The game show-style quiz competition with real-time audience voting featured retina-focused case studies and discussions regarding patient care and surgical approaches among key opinion leaders/contestants.

## Target Audience

This certified CME activity is designed for retina specialists.

## Learning Objectives

Upon completion of this activity, the participant should be able to:

- **Recognize** the barriers to early diagnosis and intervention for patients with retinal disease
- **Evaluate** key data from clinical studies to determine the medical and surgical treatment approaches that would be most effective in managing disease presentation in real-world settings
- **Describe** the role of visualization in common vitreoretinal surgical procedure
- **Formulate** troubleshooting guides to mitigate the effect of unexpected intraoperative vitreous behavior
- **Develop** algorithms to identify and surgically treat patients who may benefit from cutting-edge durable therapies for the treatment of diabetic eye diseases and neovascular age-related macular degeneration

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# PRETEST QUESTIONS

Please complete prior to accessing the material and submit with Posttest/Activity Evaluation/Satisfaction Measures for credit.

**1. Please rate your confidence in your ability to improve outcomes for patients with retinal disease (based on a scale of 1 to 5, with 1 being not at all confident and 5 being extremely confident).**

a. 1
b. 2
c. 3
d. 4
e. 5

**2. A 16-year-old patient presents to your office with a 5-week history of progressive vision loss in her left eye. On exam, she is noted to have disc edema, and peripapillary, subretinal, and intraretinal fluid with a macular star in her left eye. Which of the following serologies would be important to obtain in this patient?**

a. *Bartonella* testing
b. PT/PTT testing
c. INR testing
d. CBC/CMP testing

**3. A 54-year-old woman with a history or proliferative diabetic retinopathy (PDR) OU following panretinal photocoagulation (PRP) OU presents with a nonclearing vitreous hemorrhage (NCVH) for 4 months in the setting of her PDR. She also has a significant cataract in the eye with vitreous hemorrhage. All of the following are reasonable options for this patient EXCEPT?**

a. Pars plana vitrectomy (PPV) for NCVH with cataract extraction at a later date
b. PPV + cataract/extraction combo case
c. In-office fill in PRP
d. Cataract extraction first followed by PPV for NCVH after the cornea clears

**4. A 25-year-old man presents to your office after a history of assault with a subluxed lens. His IOP is 65 mm Hg. On slit lamp exam you notice his lens abutting his cornea with significant corneal edema. What is the ideal timing of his surgery?**

a. Urgent surgery needed
b. Surgery within 3 to 4 weeks
c. Surgery within 3 to 4 months
d. Nonsurgical management

**5. All of the following are important in the management of a patient after a dropped lens, EXCEPT?**

a. Maintaining clarity of the cornea
b. Urgent peripheral retinal exam
c. B scan prior to surgery, if necessary
d. No suture to anterior segment wounds

**6. A patient presents to your office for examination after a dropped lens. On B-scan ultrasonography, he has evidence of nonappositional choroidals. What is the likely reason for this?**

a. Anterior segment wound leak with low IOP
b. Anterior chamber hyphema with high IOP
c. Pupillary block from retained lens fragment
d. Pupillary block from vitreous

KOL KNOCKOUT™

# KOL KNOCKOUT™ RETINA EDITION: EXPERTS GO TOE TO TOE ON MEDICAL AND SURGICAL TREATMENT APPROACHES

*As the US population ages, an increasing number of people will develop sight-threatening age-related retinal diseases, including those stemming from systemic diseases such as diabetes. Common treatments for retinal vascular diseases include anti-VEGF therapy, laser photocoagulation, and intraocular steroids. In patients with advanced disease, prompt surgical intervention may be necessary to save sight. We've seen practice patterns evolve as advancements in vitreoretinal surgical technology and medical retina treatments improve surgical efficiency and treatment outcomes. To treat the full spectrum of patients in the real world, retina specialists must not only be up-to-date with the clinical evidence surrounding medical therapies but also best practices for performing vitreoretinal surgical procedures. Captured from a series of three live-virtual "knockout rounds," our distinguished panel of retina specialists discuss their rationale for diagnosing and managing complex surgical and medical retina cases.*

**—Sunil K. Srivastava, MD, Program Chair**

## ROUND 1 | CASE 6: THE DISAPPEARING MASS

**Dr. Srivastava:** A 65-year-old woman had vit-buckle surgery in her right eye 18 months ago and was then referred for a second opinion on a possible tumor with an exudative retinal detachment (RD) in her left eye. She previously had a retinal tear in the same eye, which was treated with laser 1 year ago (Figure 1A) and started showing new symptoms 1 week ago. The referring vitreoretinal surgeon noted a black-brown mass and fluid on the widefield fundus photo (Figure 1B) but couldn't see it on exam. Dr. Talcott, what would you do in this scenario?

**Katherine E. Talcott, MD:** We need more information. There's certainly a pigmented area with fluid around it inferiorly. I'm not seeing exudation or hemorrhage. I'd conduct a B-scan to look for thickness and elevation, and a fluorescein angiogram (FA). There may or may not be an elevation superotemporally.

**Dr. Srivastava:** We have a B-scan and FAs (Figure 1C-E). Dr. Vakharia, are you now more or less concerned about a tumor?

**Priya Sharma Vakharia, MD:** I don't see a discrete choroidal mass. I'm also less concerned about an inflammatory cause because I don't see vascular leakage on the FA. There's an RD on the B-scan. It looks like exudative RD, but that area doesn't light up on the FA. Why did the patient have a prior vitrectomy in the right eye?

**Dr. Srivastava:** It was for a rhegmatogenous RD.

**Jeremy D. Wolfe, MD, MS:** We're all concerned that this pigmented lesion is a melanoma, because subretinal fluid (SRF) associated with a choroidal nevus is a risk factor for malignant transformation.[1] The segmental panretinal photocoagulation (PRP) in the left eye looks odd.

**Dr. Srivastava:** I'd agree. Would you want to perform any other tests?

**Dr. Vakharia:** I'd get an indocyanine green angiogram.

**Dr. Wolfe:** I'd want fundus autofluorescence.

**Dr. Talcott:** Agreed.

**Dr. Srivastava:** We don't have those images but Figure 1F and 1G show a regular color fundus photo and FA of the same area using a 30° to 50° camera. There's definitely fluid here, but no mass. Now what would you do?

**Dr. Wolfe:** I'd examine the patient carefully. I would have the patient lean back to see if the fluid shifts to try to differentiate between a rhegmatogenous and exudative RD. The FAs don't

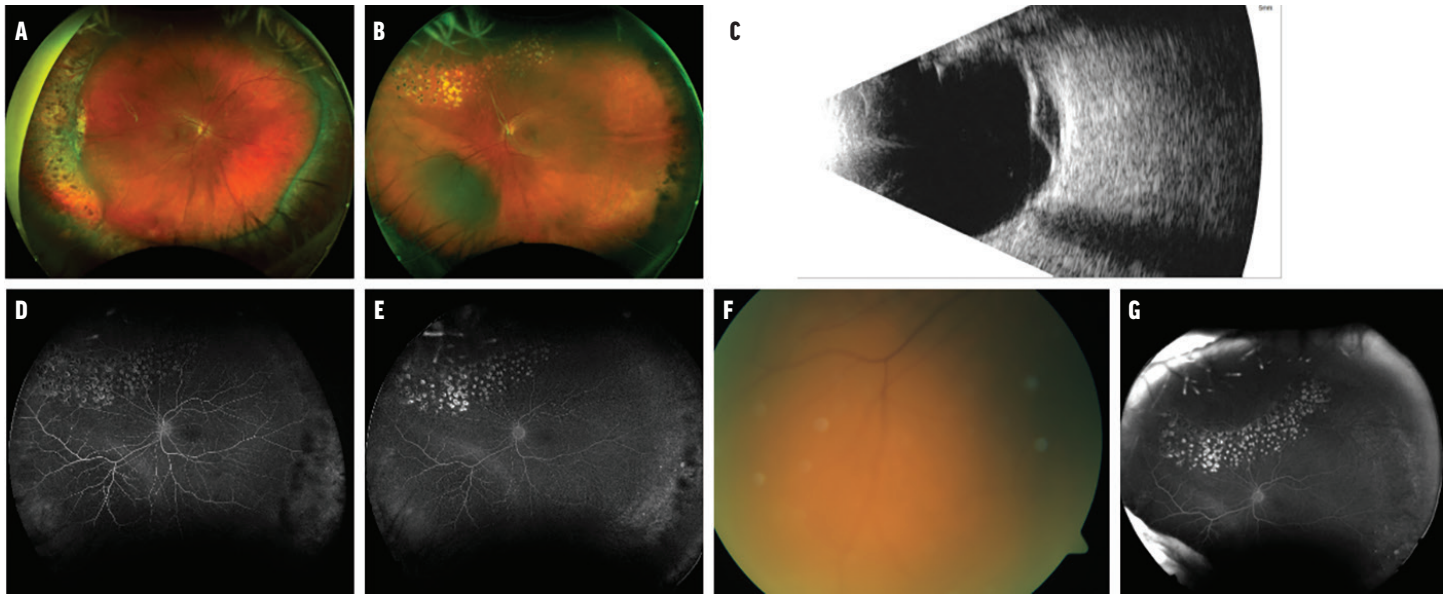


Figure 1. (A,B) Widefield color fundus photographs, (C) B-scan ultrasonogram, (D,E) fluorescein angiograms and (F,G) color fundus photograph of a pigmented mass with SRF.

indicate an exudative process, but I don't see a break either. The large patch of laser superonasally could suggest preexisting peripheral pathology.

**Dr. Srivastava:** While examining the patient, I performed a scleral depression and suspected guttering around that area. We then performed a vitrectomy on this eye. What looked like a mass on the widefield image was, in fact, an old retinal break and guttering. We performed an air-fluid exchange around it.

In this case, an artifact on the widefield image prompted us to take the patient to the OR. It's a good lesson that images can sometimes be deceiving and that, sometimes, it's best to simply examine the patient.

**Dr. Vakharia:** It's possible that the widefield image was showing the vortex vein. Dr. Carol L. Shields will often advise you to push on the eye if you see similar masses in any of the quadrants. If it disappears, it could be a dilated vortex vein. It's an easy test to do in clinic.

**Dr. Srivastava:** Great point. If you're looking into the eye and seeing nothing, manipulating the eye to induce dynamic changes can help reconcile the image and exam. Here, I depressed the superior nasal area, which allowed me to see the guttering.

## ROUND 2 | CASE 1: OBSERVATION VERSUS ANTI-VEGF IN DIABETIC EYE DISEASE

**Dr. Srivastava:** Our next case is a 55-year-old woman who presents with blurred vision. To discuss this case, we are joined by Yasha S. Modi, MD, and Christina Y. Weng, MD, MBA.

The patient has had type 2 diabetes for 15 years and is on oral hyperglycemic agents. She has no ocular history and her VA is 20/30 in both eyes. The OCT shows intraretinal fluid (IRF) in both eyes and SRF in the left (Figure 2A,B). There are also small hyperreflective spots in both eyes. We can see leakage and microaneurysms in the late FA images (Figure 2C,D).

**Dr. Modi:** How does the periphery look?

**Dr. Srivastava:** The periphery looks great. I'd say this patient has moderate to severe nonproliferative diabetic retinopathy (NPDR). This case started in 2018 when the results of the Protocol V trial were not yet published. Dr. Weng, what would you've done in 2018?

**Dr. Weng:** There's a lot of IRF and even some SRF in the left eye that could indicate very severe disease. I would've initiated anti-VEGF treatment for both eyes, even considering the results of the Protocol V trial. Based on the FA findings, anti-VEGF may provide other benefits in addition to resolving the diabetic macular edema (DME).

**Dr. Modi:** With 20/30 or 20/32 VA, this patient would not have been enrolled in Protocol V, which only enrolled patients with a VA of 20/25 or better.[2] Having said that, in 2018, I would've also initiated anti-VEGF therapy. However, we may be missing the forest for the trees. What's her HbA1c? Does she have diabetic nephropathy?

**Dr. Srivastava:** HbA1c was 9.5%. No diabetic nephropathy yet.

**Dr. Modi:** Does she have paresthesias in her hands? I ask this in clinic to understand the extent of microvascular disease in these patients. I'm less concerned about her vision and more so about her poor glycemic control and extent of DR, which is causing severe microvascular issues.

**Dr. Vakharia:** I would have also treated this patient initially with anti-VEGF. I would consider intravitreal corticosteroids in

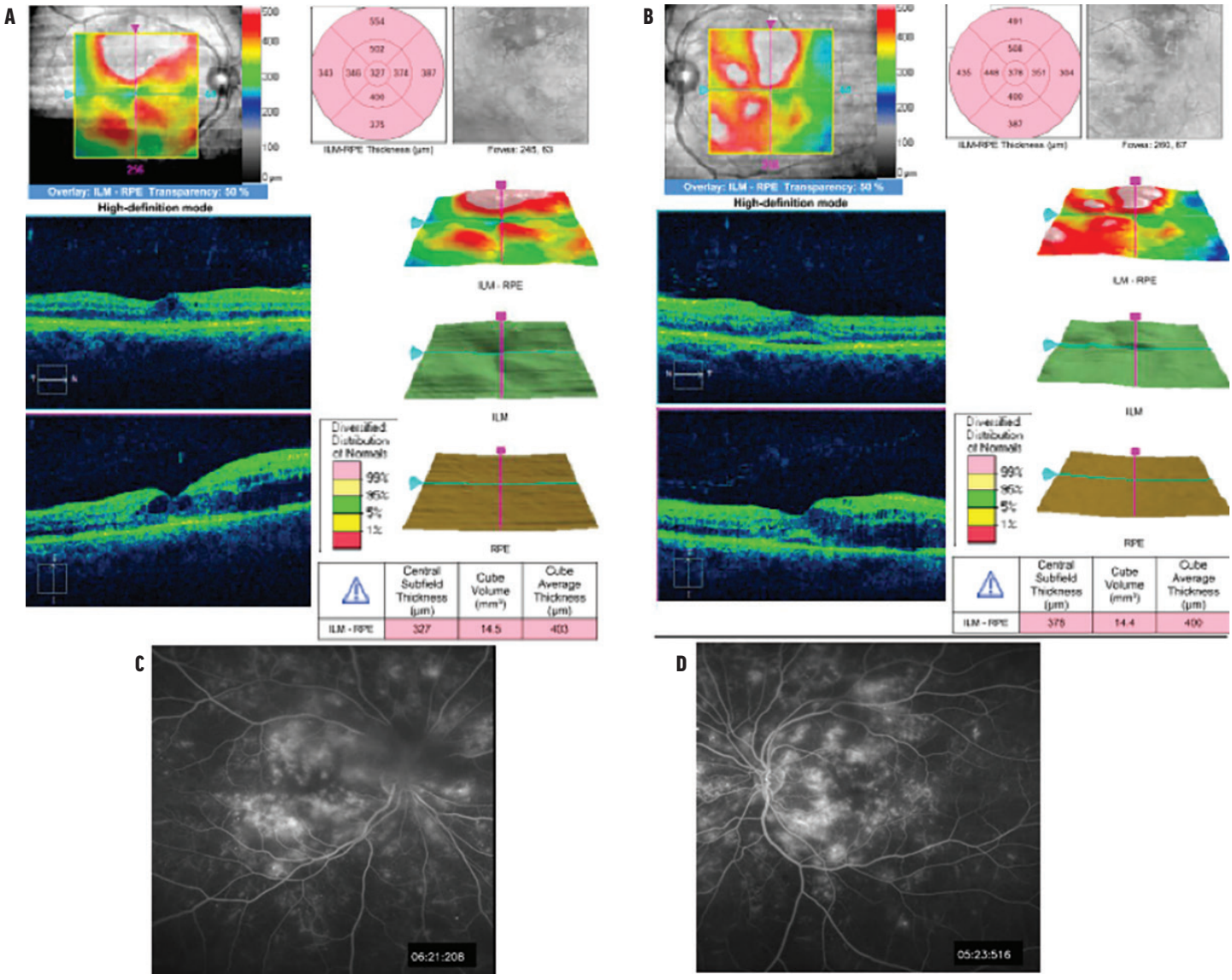


Figure 2. (A,B) Presenting OCT and (C,D) late FAs of both eyes in a patient with NPDR.

conjunction because they dry the retina well. Although she's currently phakic, she's likely to require cataract surgery soon because of her age.

**Dr. Srivastava:** The patient received bevacizumab injections in both eyes and 5 to 6 weeks later her VA was 20/20. Over the next year, she received five injections bilaterally. By 2019, her vision was 20/25 and her OCT images looked worse than at baseline and at the previous injection given 2 months ago (Figure 3); however, she was not symptomatic and was happy with her vision. The results of Protocol V were published in 2019. Dr. Vakharia, how would you have treated this patient in 2019?

**Dr. Vakharia:** Because the patient has a VA of 20/25 and is happy, I would've observed her.

**Dr. Modi:** I'd say that Protocol V is still not applicable here because she's been treated. The disease has also changed over the past year. In patients with DR, it's always good to reassess how the disease progresses every year, especially if it is poorly controlled. It's reasonable to consider observation alone but that's still almost seven visits per year.

**Dr. Srivastava:** How would you then apply Protocol V to patients who began anti-VEGF treatment prior to 2019?

**Dr. Modi:** For those patients, it's reasonable to continue treating them, and potentially extending them, with the goal of halting treatment and observing them closely. Of course, be prepared for worsening of DR and consider repeat ultrawide-field FA 6 months later to ensure that they don't require PRP for occult proliferative

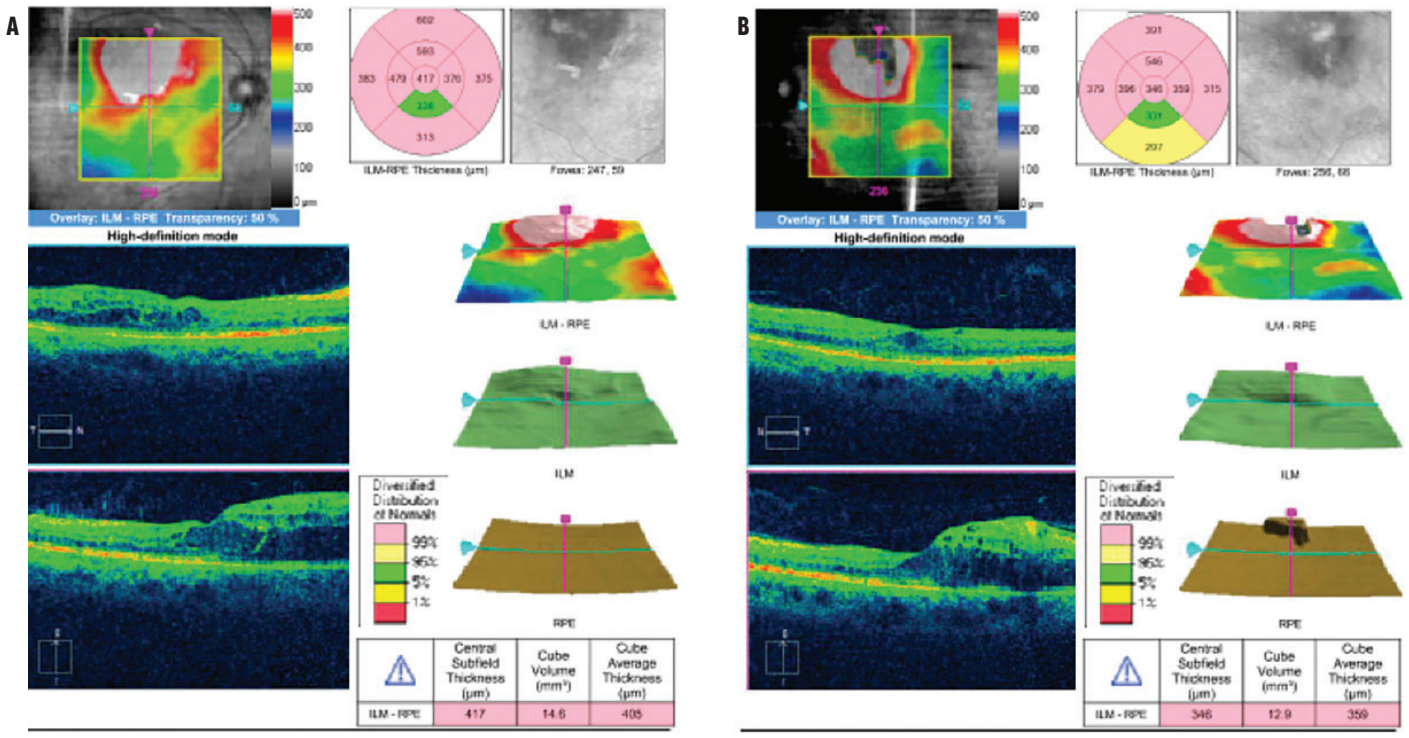


Figure 3: Follow-up OCT images of the (A) right and (B) left eyes of a patient with NPDR after six bevacizumab injections over 1 year.

diabetic retinopathy (PDR). Notably, patients treated with anti-VEGF will have resolved dot blot hemorrhages and exudates, but the nonperfusion will remain. Thus, they may manifest "featureless" DR that doesn't correspond to a classical clinical staging assessment per the Diabetic Retinopathy Severity Scale.

**Dr. Srivastava:** Dr. Weng, would Protocol V have influenced your decision-making at the time even if the previous injection was 2 months prior?

**Dr. Weng:** For a patient with this amount of fluid, I would continue treatment. Her VA is 20/25 in both eyes, and while she may not notice any visual changes, she also may not know how much better her vision could be with treatment.

**Dr. Modi:** I agree that the images show severe disease with a lot of extrafoveal DME, which is very concerning. However, are we treating based on OCT findings or treating an asymptomatic patient? I'd prefer she see her endocrinologist to control her diabetes. I would continue to observe her and have her return in 7 to 8 weeks to consider restarting anti-VEGF therapy.

**Dr. Weng:** We currently only have 2 years of vision data from Protocol V. I'm concerned that this amount of fluid could potentially lead to neuronal damage down the line.

**Dr. Srivastava:** At the time, Protocol V did influence my treatment of this patient. Over the next 3 years, I administered one injection in both eyes per year. Here are the late FAs taken in 2022 (Figure 4A,B). The last injection was 3 months prior.

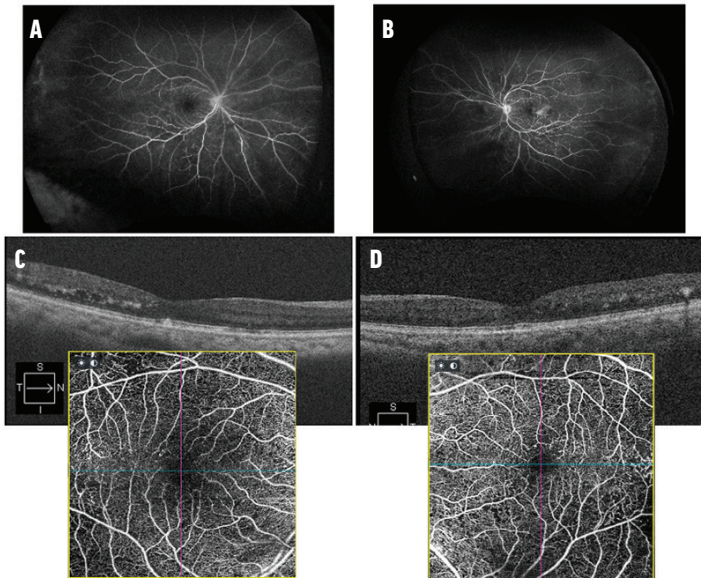


Figure 4. (A,B) Late FA and (C,D) OCTA images of a patient with NPDR who was treated for 3 years based on trial data from the Protocol V.

**Dr. Modi:** This is the confusing thing about diabetic eye disease. Some patients have good perfusion and terrible DME, while others have nonperfusion and absolutely no DME.

**Dr. Srivastava:** OCT-angiography (OCTA) was performed in September 2022 (Figure 4C,D); both eyes were 20/25. Dr. Weng, do you use OCTA for patients like this?

**Dr. Weng:** No, not on a regular basis. It's great for tracking the size of the foveal avascular zone and ischemic changes, but I don't use it regularly to guide DME treatment.

## ROUND 3 | CASE 1: RECURRENT RD

**Dr. Srivastava:** A 66-year-old woman presents for a second opinion of fluid under the retina. To discuss this case, we are joined by Ajay E. Kuriyan, MD, MS, and Jayanth Sridhar, MD.

The patient has a longstanding history of rheumatoid arthritis on tofacitinib. She also has an ocular history of uveitis and was treated 20 years ago for Fuchs' corneal endothelial dystrophy. She's had seven RD surgeries in the left eye and detached four times. Two years ago, she had an RD in the left eye that redetached at 1, 2, and 4 months. The eye then had silicone oil, which was removed, and another vitrectomy was performed. She's had a scleral buckle as well. She's now been told that she has recurrent fluid in the left eye and could either have another surgery or leave it be. Her vision is counting fingers in that eye and IOP is 17 mm Hg. She also has endothelial pigment, neovascularisation of the iris (NVI), and oil droplets on the IOL, all in the left eye. Figure 5A shows the dilated widefield fundus image of the right eye. Dr. Modi, anything worth noting here?

**Dr. Modi:** There's good laser around a horseshoe tear. I'd like to know if the anterior margins are lasered. You can see horseshoe tears superior nasally and inferior temporally. There may even be an unlasered tear temporally.

**Dr. Srivastava:** Excellent. Figure 5B shows a widefield image of the left eye. It's difficult to see, so I'll highlight heavy lasering of the posterior retinotomy and a subretinal band. There's more laser superiorly. Figure 5C and D show the OCT images of the left eye. Dr. Kuriyan, your thoughts on these images?

**Dr. Kuriyan:** The patient has significant SRF and some cystoid macular edema. The retina appears to be attached superiorly in the left eye. I'd check whether there's an extension of fluid from the periphery as well. With her history, I'm most concerned about a recurrent RD, but given the superior attachment, I'm also concerned about inflammation.

**Dr. Srivastava:** How would you manage a patient like this?

**Dr. Sridhar:** The most important thing is to discuss the goal of another intervention. Her vision is counting fingers. Significant improvement is unlikely. I would ask if the fluid was picked up on a follow-up exam or if she noticed a change in vision, to get an indication of acuity versus chronicity. While the IOP is normal, she has NVI. One of our goals could be preventing neovascular glaucoma,

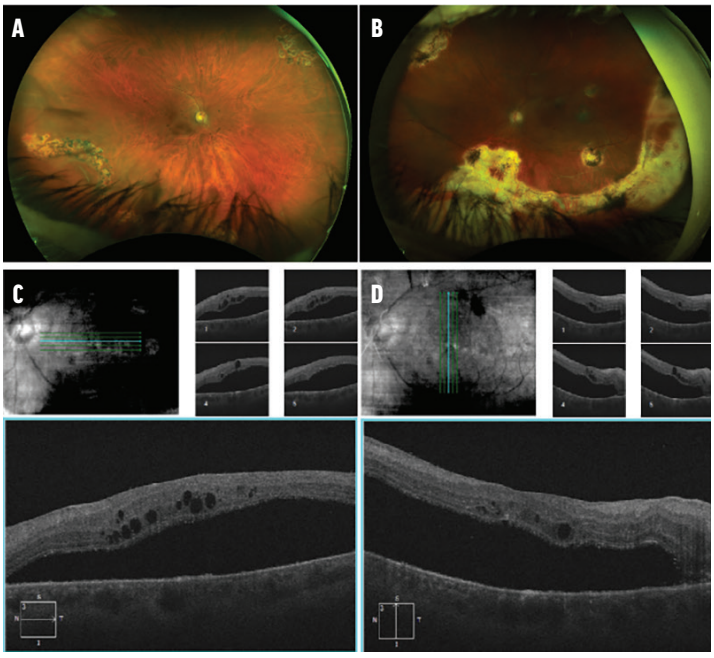


Figure 5. (A,B) Widefield fundus and (C,D) OCT images of a patient who has experienced seven retinal redetachments in the left eye.

phthisis bulbi, and pain, in which case, despite the number of surgeries, it is reasonable to intervene.

Next, I would attempt to understand, either preoperatively or intraoperatively, why she detached again. Was this proliferative vitreoretinopathy (PVR) pulling the retina or based on that fluid, is there is a micro break, perhaps inferiorly along the edge of the heavy laser that could be tracking above? Some patients need chronic oil if the break isn't found to prevent the eye from becoming phthisical. I question whether she actually had a buckle. It is hard to tell from the images. A buckle may not necessarily help in this case, but there's a low threshold for intervention.

**Dr. Srivastava:** To answer your question, the patient did notice a change in her vision, but it was slow and gradual, not acute.

**Dr. Modi:** Dr. Sridhar made excellent points. You can see disruption of the retinal layers on OCT. The retina is remarkably thick. If there was an exudative cause, we'd typically see retinal pigment epithelium undulations and a thicker choroid, neither of which are seen here, which makes me think it's a rhegmatogenous RD.

Looking at the fundus image, a buckle may not be relevant because the eye already has an extensive retinectomy posteriorly and superiorly. I'd conduct a thorough exam to see if there's any tangential traction.

I don't see epiretinal membranes (ERMs) in the macula, but it's worth scanning different areas on the OCT to see the configuration of the RD, especially shallow ones. There doesn't appear to be any oil in the left eye, as there's no reflectivity in the near-infrared image. Given that it's the first time I'm seeing this patient and we haven't fully established the goals of care, surgery could

be diagnostic. Are we seeing a foreshortened retina due to intrinsic stiffness of the retina or a preretinal/subretinal PVR?

**Dr. Kuriyan:** This detachment is likely related to PVR or a missed break. If the patient is motivated to undergo more surgery, I think there's a good reason to operate. I'd use perfluoro-N-octane (PFO) to identify whether there is PVR that's causing this detachment. We see a subretinal band inferiorly, but it's not necessarily a problem here. Deformation of the edge of the PFO bubble can help detect intrinsic foreshortening that isn't picked up by ERM staining. That would help with the decision to extend the retinectomy. While we're in the OR, we can do a much better depressed exam, look for breaks that might be around the edge, and bolster up those areas if we don't see foreshortening.

**Dr. Srivastava:** I did go to the OR based on the history of uveitis, so we all agree. I always worry about exudative detachment, so I obtained FAs, which showed persistent SRF, leakage, and subretinal bands in the left eye. I prescribed preoperative prednisone, which made things worse.

In the OR, we first removed the emulsified oil and performed a capsulectomy to improve our view. Once in the vitreous, we added triamcinolone.[3] I performed a depression but didn't see a break. We also didn't see a buckle. At this point in the surgery, what would you do?

**Dr. Sridhar:** It depends on why the RD occurred. You couldn't find a peripheral break but if you follow the fluid to the edge of that retinectomy inferiorly, maybe there is a break positioned posteriorly. In this case, a buckle would not make much of a difference. The anterior retina looked attached, so I do not suspect anterior guttering due to a donut RD. If I cannot identify a break, I like the PFO test. If you want to test for intrinsic contraction, use PFO and see if it flattens. It doesn't seem contracted, but you could do diathermy, reopen that edge, reflatten the laser, and put oil in. If you are using oil, the buckle is likely not additive.

**Dr. Modi:** Sometimes, even when you're looking intraoperatively, it's hard to see why the retina redetached. In almost all redetachment cases, I use Brilliant Blue G ophthalmic solution to stain the internal limiting membrane and remove it across the macula. It's worth doing this because with recurrent RDs, the posterior hyaloid may be down. You used triamcinolone but, often, removing the layer below the hyaloid is more confirmatory, especially with redetachments. I'd also place a buckle relatively posteriorly, 5 mm back from the muscles, to save more retina. I wouldn't perform the retinectomy.

**Dr. Kuriyan:** I'd use PFO here. If it looks like I'm going to complete that inferior retinectomy, I don't see much use for a buckle there. If I don't see intrinsic fibrosis there and I don't do the retinectomy, I would place a buckle to support the peripheral retina because it is not being removed.

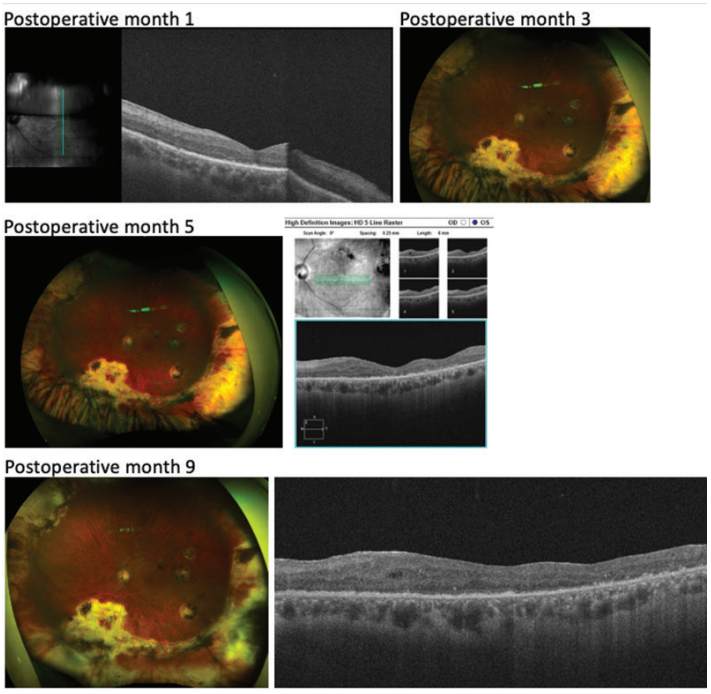


Figure 6. Postoperative follow-up of a patient who underwent treatment for recurrent RD.

**Dr. Srivastava:** I ended up using PFO and placing a buckle because foreshortening does occur in these scenarios. I couldn't see any flaring. I saw loculated fluid anteriorly, which I believe is from a foreshortened retina, so the buckle did help. I then performed a retinotomy, as high up as I could on the buckle. I then put in gas and drained the fluid. Any tips at this point?

**Dr. Sridhar:** I would do it the same way—keep the new break more peripheral and make a retinotomy on the buckle so it is supported. I would then perform a fluid-air exchange at the edges and laser. Finally, I would take down the PFO, rinse if needed, and place the silicone oil.

**Dr. Modi:** Would you perform laser 360° laser retinopexy on the buckle at this point if you couldn't find a break? I would in these situations. A recent study showed that the outcomes are paradoxically worse when laser is used,[4] but I'd argue that this represents a selection bias; 360° laser is done in cases where we're less confident in identifying all of the pathology. Thus, these cases are inherently more likely to fail.

**Dr. Kuriyan:** I would've also done 360° laser because I would've retinectomized those areas more. They weren't flat with the PFO. The scleral buckle performs a similar function to the retinectomy.

**Dr. Srivastava:** At postoperative month 3, you can see the buckle and attached retina (Figure 6). The area of PVR and subretinal band have not moved. By month 12, she's doing well with 20/125 VA and IOP of 14 mm Hg. She's using her peripheral vision but it's certainly not her primary vision.

My take-home lesson in these cases is, as Dr. Modi noted, that

surgery can be a diagnostic tool. There are a variety of ways to fix the problem, but don't forget to protect the right eye and place laser around the untreated tear. Any last thoughts?

**Dr. Sridhar:** To Dr. Kuriyan's point of an intrinsic contracture, laser can also be used diagnostically. It proved that the peripheral retina was flat. If that laser did not take, for example, inferonasally, you may have had a chronically detached retina on the buckle. In that case, you're better off cutting it out, given the NVI.

**Dr. Srivastava:** I completely agree.

## ROUND 3 | CASE 2: JUST A CASE OF NEURORETINITIS?

**Dr. Srivastava:** A 16-year-old patient presents with a 5-week history of progressive vision loss in her left eye and is asymptomatic in her right eye. She was seen by a local retina doctor and found to have disc edema, peripapillary fluid, SRF, and IRF, with a macular star in her left eye. She was started on oral prednisone 20 mg, and she noticed a mild improvement in her vision. She has no ocular history, past medical history of depression on fluoxetine, and family history of diabetes and hypertension. She owns cats, is not sexually active, and doesn't use drugs. She has had some headaches and cat scratches.

The patient's VA is 20/20 in her right eye, 20/80 in her left eye. No anterior chamber cells. Everything is quiet. The fundus photo of her right eye shows some disc edema nasally, with some intraretinal hemorrhage on the superior arcade (Figure 7A). Anything else stand out?

**Dr. Sridhar:** There's no significant vitritis or vitreous debris. The retina looks fairly preserved.

**Dr. Modi:** The vessels on the superior arcade are engorged, especially the veins. I'm a little concerned about this, given that this is the asymptomatic eye.

**Dr. Srivastava:** Correct. We agree that this is likely a bilateral case. The left eye has disc edema, cotton wool spots, hemorrhages, and that macular star (Figure 7B).

**Dr. Modi:** The macular star typically forms 10 to 14 days after disc edema develops, making this a chronic finding. I'm now more concerned about the right eye, given the disc edema. This may be bilateral neuroretinitis. Three-quarters of patients with neuroretinitis will improve without intervention; however, some of them don't.

**Dr. Srivastava:** You can see fluid under the retina and exudates on the OCT of the right eye (Figure 7C).

**Dr. Modi:** It's starting to develop a star, which gives us an idea of timing. The left eye has extensive exudation extending from the outer plexiform layer to the outer nuclear layer with SRF and fibrinous material underneath the retina (Figure 7D).

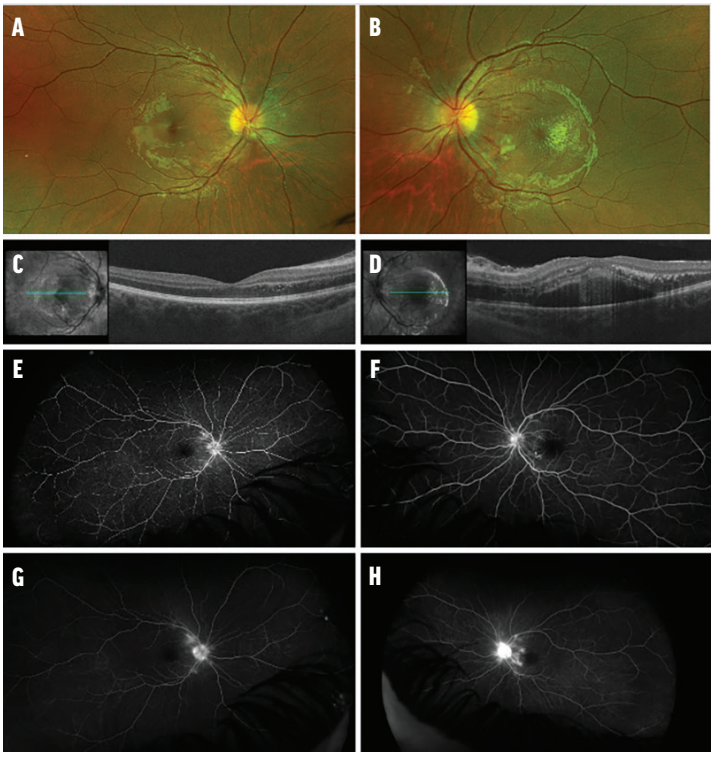


**Figure 7. (A,B) Fundus photos, (C,D) OCT images, and (E-H) FAs of the left and right eyes in a patient with neuroretinitis. *Courtesy of Careen Lowder, MD, PhD.***

**Dr. Srivastava:** The FA of the right eye highlights the nerve and artery (Figure 7E,G). The FA of the left eye looks similar, but we don't see as many prominent leakage spots until the later phase image (Figure 7F,H). The disc is leaking, and both arteries and veins are involved.

We initiated labs upon presentation. The chest x-ray and tests for rheumatoid factor, antinuclear antibody, fluorescent treponemal antibody absorption test, *Toxoplasma*, *Toxocara*, Lyme, *Bartonella*, tuberculosis, lysozyme, uric acid, and erythrocyte sedimentation rate were normal/negative. The platelet count was elevated at 583,000/µL.

**Dr. Modi:** Any rashes, besides the cat scratches?

**Dr. Srivastava:** None. What else do you consider when you see a case like this?

**Dr. Sridhar:** This looks a lot like *Bartonella*, so it's helpful to know that it's negative. However, if your index of suspicion is high enough, labs don't necessarily completely rule it out. Cuts through the nerve would allow us to see if there were inflammatory deposits on the nerve head, either in *Bartonella* or other inflammatory conditions. This could be idiopathic neuroretinitis; however, it is rarely bilateral. Idiopathic retinitis, vasculitis, aneurysms, and neuroretinitis (IRVAN) is another possibility. It doesn't tend to have peripheral findings, so it's helpful to see that there aren't aneurysmal changes peripherally. There are interesting changes around the nerve in the left eye, but it's hard to discern whether

they are aneurysmal or inflammatory. In leukemia, it'd be odd to have leukemic infiltration concentrated just around the nerve and we don't typically see macular stars, but I would always rule out neoplastic causes in a younger patient.

**Dr. Modi:** What's the blood pressure?

**Dr. Srivastava:** Great question. The fundus photos did show copper wiring of an inferior vessel. We sent her to get more tests and the workup came back negative. While she was undergoing ocular imaging, she developed chest pain. Her blood pressure was 202/137 mm Hg. She was immediately sent to the emergency department, where it became 240/130 mm Hg with a heart rate of 50 beats/minute. Dr. Kuriyan, what's your thought process now?

**Dr. Kuriyan:** This is hypertensive retinopathy. She needs a systemic workup. I'd get renal imaging to see if there's anything else at play and look for hormonal imbalances from, for example, a pheochromocytoma.

**Dr. Srivastava:** She was admitted to the hospital and started on a nicardipine drip. Her head CT was normal, and the renal ultrasound showed a large round, left adrenal mass, ie, a pheochromocytoma. She also had elevated catecholamines. The biopsy confirmed the diagnosis of hypertensive emergency due to pheochromocytoma. She underwent a robotic laparoscopic transabdominal adrenalectomy, and over time, her VA improved to 20/25 in the left eye with almost complete resolution of nerve edema, SRF, and IRF. This is a great case of neuroretinitis signaling a systemic problem.

**Dr. Modi:** It's interesting that there was no choroidal hypoperfusion and pinpoint areas of leakage in the FA, which is typical of a hypertensive emergency. Considering that the view to the back of the eye was clear, it was reasonable to consider noninflammatory disease. Additionally, we think of the urine beta-2-microglobulin test as being specific for tubulointerstitial nephritis and uveitis (TINU) syndrome, but its only indicative of tubular disease. It's important to realize that it can be a nonspecific finding. In the absence of other clinical findings, ordering this test at random may end up giving you a false positive.

**Dr. Srivastava:** This case was labeled an emergency, but it only became so toward the end. She would've had urgency for a while; based on those vessel changes, maybe a couple weeks. Dr. Kuriyan, what would you test to get an idea of her visual potential?

**Dr. Kuriyan:** Chronicity is a very important factor in determining long-term outcomes for these patients. As Dr. Modi mentioned, this patient had good choroidal flow, which is also a positive indicator. Worse vision at presentation is also associated with worse final vision.

**Dr. Srivastava:** With some of these complicated cases, you just have to let it play out.

## ROUND 3 | CASE 3: COMBINATION OR STAGED SURGERY?

**Dr. Srivastava:** We now go back to a surgical case. A 54-year-old woman presents with decreased vision in her left eye, and has a history of PDR and DME in both eyes. She's had multiple PRP sessions and between nine and 12 bevacizumab injections, administered every 4 to 8 weeks, for recurrent vitreous hemorrhage (VH)/DME. The fundus view is limited by her cataract. She has a history of hypertension and diastolic heart failure. Her VA is 20/80 in the right eye and counting fingers in the left. There is no NVI on exam, but she does have significant cataracts in both eyes, with the left eye being worse than the right.

She has been my patient for the past 2 years. About a year ago, she had laser and her VA was around 20/60. There was minimal DME with a tractional component. The neovascularization of the disc looked inactive (Figure 8A).

**Dr. Kuriyan:** When was the last laser session?

**Dr. Srivastava:** Around 2 to 3 months prior to this image.

**Dr. Kuriyan:** There is a lot of fibrosis over the nerve. If the neovascularization were indeed inactive, observation is perfectly reasonable. An FA would be helpful. If there were any hidden NVD or neovascularization elsewhere, we could certainly do more laser fill-ins. Anytime we do more laser or administer anti-VEGF in these eyes, we must consider further crunch of the fibrosis. Based on its location and how it looks, I'm not worried about it. From a PDR standpoint, because she'd been quiescent for a year, I'm happy to keep monitoring her. I'd consider anti-VEGF therapy to resolve the DME.

**Dr. Srivastava:** Great points. Dr. Sridhar, let's say she's now bled a couple of times, and I'm fairly certain it's from the nerve. What would you do in this scenario?

**Dr. Sridhar:** You can only treat what you can see. I'm an advocate for maximum laser treatments. The widefield image shows cortical spokes superotemporally, but it may not be possible to laser that section. If she keeps bleeding, we have two options. The first option is to administer anti-VEGF therapy following the PANORAMA or Protocol W dosing regimens.[5,6] Typically, we would inject every 3 to 4 months, but because there's no defined endpoint to this treatment, if she rebleeds in the future after we stop therapy, we would have to reevaluate treatment. The second option is to optimize the view. Could she get cataract surgery between injections to improve her view? Would that help with fill-in laser? It depends on whether she's medically optimized and how well she tolerates laser. Based on her history, I'd inject if I couldn't get more laser in, schedule her for cataract surgery, and then finish with laser afterward. If she keeps bleeding while on anti-VEGF therapy or is dependent on therapy to prevent bleeding, I'd consider a future vitrectomy to lift that traction.

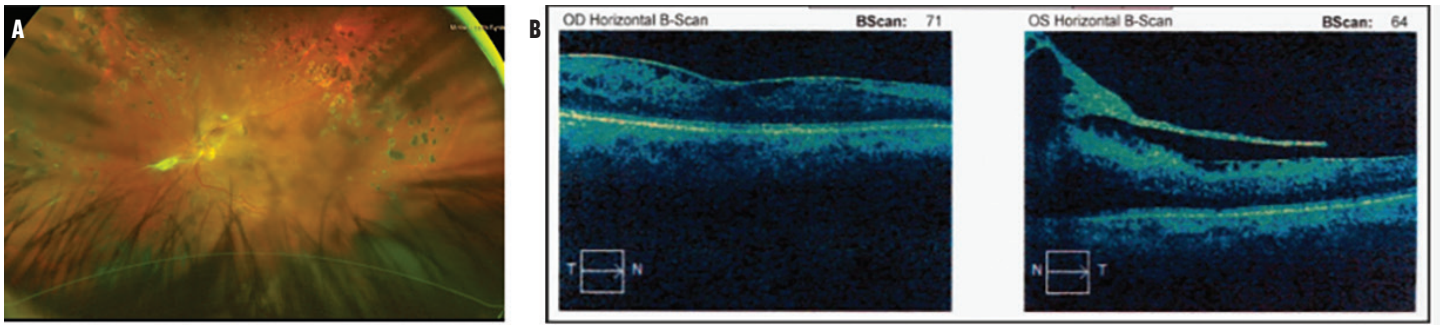


Figure 8. (A) Fundus photo and (B) OCT images of a patient with PDR.

**Dr. Srivastava:** Excellent. Dr. Modi, here's the OCT pre-VH (Figure 8B). Does this give you an indication of whether surgery is needed?

**Dr. Modi:** Many retina specialists push for early surgery. In this instance, especially in combination with cataract surgery, you can clear the view and remove the posterior hyaloid. However, you must feel confident in removing the posterior hyaloid. A B-scan can be useful to preoperatively assess the difficulty of the case, ie, understand where the hyaloid is up and where it's not. If the hyaloid is down throughout, it'll be a tough case. In this eye, we can see prepapillary traction, which signals a lot of peripheral separation, so it's reasonable to perform surgery.

What's more concerning is the heart failure at 54 years of age. If this patient doesn't make big changes, ocular problems are the least of her worries. A retrospective study over 10 years showed that the long-term, all-cause mortality rate of diabetic patients requiring vitrectomies for tractional RD (TRD) was 48.7%.[7] Patients presenting with counting fingers or worse vision in one or both eyes had a 52.0% mortality rate, with a mean survival after diagnosis of 2.6 years.[7] This patient should be referred to cardiology and nephrology. Regardless of the intervention, ongoing follow-up is the most important thing.

**Dr. Srivastava:** I like the holistic approach. The VH in the left eye did not clear. We'd already tried anti-VEGF, so we went to the OR. Dr. Kuriyan, ideally, should this patient have combination surgery, or should it be spaced out?

**Dr. Kuriyan:** If I have a difficult time visualizing and there's a significant amount of anterior VH, I'd prefer combination surgery with a cataract surgeon performing the cataract surgery followed by me performing the vitrectomy. If I have a reasonably good view and there is no significant anterior VH, I'd perform the vitrectomy first and schedule cataract extraction for a later date because if we end up needing a tamponade or oil and the lens is even slightly unstable, it can potentially move forward.

**Dr. Sridhar:** I agree with Dr. Kuriyan. The combination surgery may not be ideal in patients with renal failure because it can lead to severe inflammation, transvitreal fibrinoid syndrome, and other issues.[8,9] Otherwise, there are several advantages to combination surgery. I open the posterior capsule to more quickly clear shake-out VH. The combination surgery provides a great peripheral view, which also helps clear out the blood. It saves the patient additional surgery and only adds about 15 to 20 minutes to the case. We do these combos frequently in our practice. These patients are very happy because they get rapid visual rehabilitation, which they need to take care of their diabetes, inject insulin, and other daily activities.

**Dr. Modi:** We all have slightly different approaches. I would stage the surgeries in case of postoperative corneal edema obscuring the view. To Dr. Kuriyan's point, unless there's a perfect capsulorrhexis, the tamponade may lead to anterior prolapse of the optic. You could get optic capture on the iris.

**Dr. Sridhar:** Combination surgeries are more common in Europe, either out of necessity or practice patterns, but these patients do just fine. In the United States, we're averse to this, mostly because of practice dynamics. If there's a concern about optic prolapse, use a three-piece IOL with a bigger optic in the bag. Ideally, a combination surgery is best for these patients, unless the cataract is dense enough to damage the cornea during extraction. Conversely, if it were an early cataract and the patient was 45 years old, Dr. Kuriyan's approach is perfectly reasonable. However, this patient has a significant cataract that is impacting her vision and our ability to examine the retina and operate. There is no reason, in my opinion, to shy away from a combined surgery for fear of the IOL shifting.

**Dr. Srivastava:** The combo packs that we have now are very good, with that added bit of efficiency. Dr. Kuriyan, with your staged approach, do you warn the cataract surgeon about anything before he or she operates?

**Dr. Kuriyan:** If there's a significant VH, the patient will have an impaired red reflex. Dr. Modi's point about an opaque cornea is also key.

**Dr. Srivastava:** We did perform combination surgery. I place a single trocar for posterior decompression when I do combo cases. In my experience, patients who receive multiple intravitreal injections are at greater risk for weakened zonules, so I was on the

lookout for this. Sure enough, as soon as we started sculpting, we saw the bag coming up. Despite this, we extracted most of the lens. At this point, would you leave them aphakic or insert a secondary IOL? There's no sulcus support.

**Dr. Sridhar:** It's too early to decide. I would remove the rest of the bag, given that it won't be needed for a sulcus lens, so that there's no scaffold for inflammation or synechiae. I'd then proceed with the vitrectomy. If everything went well, I'd consider placing an IOL. If not, no harm in leaving them aphakic. You can always add the IOL in later.

**Dr. Srivastava:** How do you then decide where to place your trocars and cannulas?

**Dr. Modi:** I'd perform a regular vitrectomy. I wouldn't compromise trocar placement for any other procedures. My priority is ensuring I have excellent posterior hyaloid removal without a break. I also agree with Dr. Sridhar about removing the entire bag.

**Dr. Kuriyan:** I agree 100%. I would set up everything the same. If I did a fixated IOL, it would be trocar-assisted so that I wouldn't have to worry about performing a peritomy.

**Dr. Srivastava:** We prepped the eye for a sutured IOL and proceeded with the vitrectomy. We went through the posterior capsule and saw that the peripheral hyaloid was up. With this nasal fibrotic plaque, what should our goals be? I've separated everything around it.

**Dr. Kuriyan:** I would release anything that's easy and not struggle with the rest in the nasal retina. You don't want to risk a break in something that's not visually significant.

**Dr. Modi:** I agree. You can use retinal striae as a surrogate to discern where the traction originates. Often, the nasal plaque doesn't matter. If you see retinal striae through the macula, especially the fovea, be more aggressive in removing the large plaques that contribute to their presence.

**Dr. Sridhar:** You may have a plane between the nerve and fibrotic plaque, and cleaving that band alone would be enough. There is no need to trim completely. I would restain at this point to make sure there isn't another attached sheet.

**Dr. Srivastava:** We continued to segment and cut the macular tractional membrane with dual port cutters, which are very efficient and safe. Since the vitrectomy went well, we decided to place a sutured IOL. By postoperative months 1 and 3, the macula looked good, and her VA was 20/60 and improving.

Let's now consider the right eye. The VA is 20/70 and there is some fibrosis. I've previously tried more laser. How would you handle this eye based on the outcomes of the left?

**Dr. Sridhar:** We don't know exactly why her zonules were compromised. It may be the injections, but it could also be trauma. I'd ensure she didn't have phacodonesis. Even so, I'd split the surgeries and have retina on standby.

**Dr. Kuriyan:** I agree. There's no harm in staging. She has one good eye. We can wait and see how it goes.

**Dr. Modi:** To Dr. Sridhar's point about fibrin, what's your postoperative antiinflammatory control for a patient like this?

**Dr. Srivastava:** I prescribe a heavy course of topical steroids. I don't use oral steroids. Some surgeons will advocate for intravitreal steroids, which is also fine. The only one you can use in the OR is triamcinolone. I don't use dexamethasone implants because of the sutured IOL. I sometimes use sub-Tenon's steroids.

**Dr. Sridhar:** I would also use topical steroids. I'll administer an intravitreal anti-VEGF and triamcinolone steroid injection at the end. Sub-Tenon steroids do not work immediately, so a heavy course of topical steroids is needed for the first 7 to 14 days.

## ROUND 3 | CASE 4A: SUBLUXED LENS

**Dr. Srivastava:** Now, we'll discuss a series of three lens cases. A 25-year-old man was assaulted and developed multiple facial and orbital fractures. An ophthalmology exam 4 days later showed a mild subluxed lens and subretinal hemorrhage. He was prescribed artificial tears. Three days later, he comes in with severe pain and his IOP is 65 mm Hg. What do we think is going on?

**Dr. Modi:** There are two possibilities—either the lens is loose and causing a pupillary block, or it moved forward and caused secondary angle closure (either by physically obstructing the angle with the lens in the anterior chamber or by a posterior pushing mechanism bringing the peripheral iris against the cornea). Either could be diagnosed by slit lamp exam.

**Dr. Srivastava:** Based on how the patient presents in Figure 9, what's the management plan?

**Dr. Sridhar:** It looks like the lens is abutting the cornea. Without immediate intervention, this cornea will fail. We'll also need to reduce the IOP with glaucoma medication, perhaps acetazolamide or mannitol. There are two ways to manage the subluxed lens. In office, maybe while waiting for surgery, you could dilate the eye, lay the patient supine, "flick" the lens back behind the pupil, and use pilocarpine to constrict the pupil. This prevents the lens from moving forward again. The surgical option will likely need retina on board because the entire lens complex has subluxed anteriorly, which means the vitreous isn't far behind.

**Dr. Kuriyan:** I'd also treat the IOP either with topical or oral acetazolamide. I wouldn't wait longer than a day to treat the

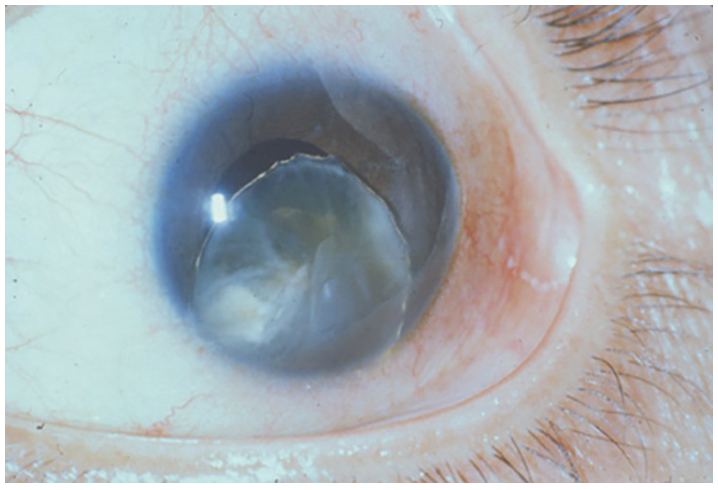

Figure 9. Subluxed lens abutting the cornea following facial and orbital fractures.

lens, primarily because corneal edema could develop and further obscure our view.

**Dr. Srivastava:** We dilated the eye, the lens went back, and the IOP decreased to somewhere in the 40s and 50s. Dr. Modi, why do you think the IOP remained elevated?

**Dr. Modi:** The anterior hyaloid may have been broken and come forward. Another option could be vitreous prolapse into the anterior chamber, which can be harder to discern.

**Dr. Srivastava:** It was indeed the vitreous. We performed a 23-G vitrectomy and released the anterior vitreous plug. Any tips on removing the lens at this point?

**Dr. Sridhar:** I would cut as much of the lens as possible. If I don't get good engagement, I knock the lens back further, give myself more room, then clear out the vitreous before working on the rest. The hyaloid is down posteriorly. You don't need to lift it before taking the lens. In fact, the hyaloid is protecting the lens from hitting the retina. Since this is a soft lens, it wouldn't cause too much Commotio retinae if it hit the macula. If I find myself constantly catching the vitreous, then I'll lift the hyaloid and continue cutting.

A peripheral exam is very important to detect other issues like dialysis, which you found and treated in this case, because that will change your management plan. Finally, I wouldn't insert an IOL given the high preoperative IOP.

**Dr. Modi:** Dialysis is also a good reason to hold off on the secondary IOL. I always like to have the posterior hyaloid up and have performed a good vitrectomy before fragmenting the lens. Given the high vacuum, even a short moment of inadvertent vitreous aspiration may be enough to cause a peripheral break.

**Dr. Kuriyan:** If the lens is fairly anterior, I clear the vitreous behind it. I don't induce a PVD to prevent the lens bouncing back and forth, which is less of a concern with a soft lens. I usually lollipop the lens, ie, insert the light pipe in the middle and cut around it. Lowering the cut rate, especially for a dense lens, is key for efficient removal, particularly if you don't use the fragmatome.

## ROUND 3 | CASE 4B: DEALING WITH A DROPPED LENS

**Dr. Srivastava:** This second lens case started with a call from the anterior surgeon that they'd dropped the lens. How quickly do you respond in these situations?

**Dr. Sridhar:** We would pick it up the same day at our hospital. Dr. Modi published a great paper looking at delayed versus early removal of lens fragments and found no difference in visual acuity outcomes.[10] Regardless of when the surgery is done, it's important to stabilize the anterior chamber, close the wounds, and perform a good anterior vitrectomy. In these stressful situations, most often, surgeons forget to close the main and paracentesis wounds, which could result in iris or vitreous coming out of the wounds.

**Dr. Srivastava:** What do you say if the anterior surgeon asks whether they can place an IOL?

**Dr. Modi:** A sulcus IOL is the preferred strategy, but if they feel they've removed enough of the anterior vitreous, an anterior chamber IOL (ACIOL) is also a good option. I defer to the surgeon's expertise and ask that he or she try to be as gentle as possible.

**Dr. Kuriyan:** If I'm in the OR when this issue arises, I'll also do a same-day procedure. From the patient's perspective, it's less stressful to have the situation resolved on the same day.

**Dr. Srivastava:** We performed the vitrectomy 1 week later and placed a sulcus IOL. It was a grade 3 to 4+ nuclear sclerotic cataract. How do you decide whether to use the fragmatome or not?

**Dr. Kuriyan:** I always start with the 23-G cutter on a low-cut rate. Sometimes, the lens is easily removed. I have a very low threshold to switch to the fragmatome. If it looks like it'll be difficult, I use the fragmatome.

**Dr. Sridhar:** I agree with Dr. Kuriyan. You do not want to get stuck in "cutter limbo." The fragmatome is controlled and safe but you have to understand the fluidics. I also start with the 23-G cutter because there's a better chance of taking the lens out with the cutter alone and you're less likely to outrun the infusion because the fragmatome is typically 19-G versus a 23-, 25-, or 27-G infusion.

**Dr. Srivastava:** We used a 23-G fragmatome, but the 19-G can do the same. They're both powerful, open ports. We were discussing the hyaloid in the previous case. I tend to lift it early on in these dropped lens cases.

**Dr. Modi:** I do as well. To Dr. Kuriyan's point in the previous case, I do the equivalent of a vertical chop, especially with dense lenses. I'll verticalize the lens, break it in half, and then quadrants. In this way, it won't cause Commotio retinae or iatrogenically cause a peripheral tear by having the posterior hyaloid up.

## ROUND 3 | CASE 4C: AN INTRAOPERATIVE SURPRISE

**Dr. Srivastava:** Our last case here is similar in that it was another dropped lens but the anterior segment surgeon had performed a vitrectomy and already placed an ACIOL, and was asking for the lens fragments to be taken out next week. Dr. Kuriyan, what do you do when you follow-up with these patients?

**Dr. Kuriyan:** I'd ensure the cornea stayed as clear as possible, which may mean additional topical steroids. I'd also monitor the IOP and perform a good peripheral retinal exam on postoperative day 1. Anterior vitrectomy cut rates are a little slower than what we're used to, and it's less commonly done by anterior segment surgeons, so there may be more vitreous traction. The patient might need a B-scan if he or she has an edematous cornea to ensure it looks good.

**Dr. Sridhar:** I agree 100%. Check the eyes yourself because things can change very rapidly after an anterior vitrectomy. Whether you see them intraoperatively or postoperatively, pay attention to the axial length or other ocular abnormalities. There's a reason the lens dropped in this eye. I've been in situations where I've quickly checked the IOL calculations, realized that I was dealing with a nanophthalmic eye, and changed the positioning of my ports accordingly. It's important to look at the patient's history and ask questions to avoid these surprises.

**Dr. Srivastava:** In this case, we were in for a surprise. The anterior segment surgeon watched the patient postoperatively and IOP was 6 to 8 mm Hg. In the OR, I reviewed the notes and saw that the patient had complained of pain 2 days prior to surgery. My first clue that something was amiss was that we weren't certain we could see the infusion line. When we inserted a trocar and saw a choroidal drain, we knew there was a choroidal or suprachoroidal hemorrhage. A better examination of the patient before surgery would've helped us be better prepared but wouldn't have changed the timing of surgery. Dr. Modi, what would you do at this point?

**Dr. Modi:** I'd get an intraoperative B-scan. If you can't see, you can't proceed. We're seeing a white reflex even though there's no endophthalmitis or anything in the anterior chamber. We can't see behind the retained lens fragment and have no idea about the location of the tissue planes.

**Dr. Srivastava:** All fair points. I could see part of the retina, so I partially drained the suprachoroidal hemorrhage, 3 mm back. I then repositioned the infusion line to help with the drainage. Why do you think this person developed a suprachoroidal hemorrhage?

**Dr. Modi:** Maybe the wounds weren't closed.

**Dr. Srivastava:** Correct. I stitched them up, obtained a better view to the back, and removed the dropped lens with a 23-G cutter. Dr. Kuriyan, now that you can see the suprachoroidal hemorrhage, what are your management goals?

**Dr. Kuriyan:** I'd want to get in and out as soon as you achieve your goals. Inducing the PVD is part of that. I'd also do a thorough depressed exam to look for RD, to make sure I didn't miss anything. If you're having a difficult time viewing the back, place the infusion line in the anterior chamber with your trocar so that you aren't worried about its visibility and can obtain good infusion.

**Dr. Srivastava:** I could see that the choroidal hemorrhage could be drained further. Should I have pressed on?

**Dr. Sridhar:** No. It'll improve once you reverse the underlying cause and it's not appositional. Sometimes we make the mistake of wanting things to look perfect. If there's a good peripheral iridotomy for the ACIOL, you could consider putting expansile gas in the back. It's not necessary here because you don't have any breaks. The goal is to maintain IOP while the choroid settles back. You don't want postoperative hypotony.

**Dr. Srivastava:** What pressure do you operate on for a normal vitrectomy, say an ERM? How would that change in this case?

**Dr. Modi:** It'd be 25 mm Hg for an ERM.

**Dr. Sridhar:** It's also 25 mm Hg for me and in cases like this, I will go up to 35 mm Hg, if needed, but I typically stay in the 25 to 30 mm Hg range.

**Dr. Kuriyan:** I'd use 25 mm Hg as well. In this case, I'd monitor the situation. If these choroidal hemorrhages get larger, I'd have a very low threshold to increase my pressure to 30 to 35 mm Hg baseline. If this was an old bleed that happened on the day of the initial cataract surgery and it remains stable without fluctuation and good drainage during the current surgery, I'd keep it at 25 mm Hg.

**Dr. Srivastava:** Settings will vary between machines so 25 mm Hg on one machine may be different to 25 mm Hg on another. Some machines have pressure control and posterior fluidics. You have to understand your machine and what the numbers mean. Dr. Modi, if you were using a machine with which you were unfamiliar, how do you determine what the right pressure should be?

**Dr. Modi:** Look at what's going on in the eye. It's a balance between infusion and fluid coming out of the eye. Look for surrogate clues that your infusion is keeping pace with your vitrector. Keep the eye stable in the setting of a choroidal hemorrhage by titrating the pressure upward.

**Dr. Srivastava:** Dr. Sridhar, have your infusion and vacuum settings changed with the new cutters?

**Dr. Sridhar:** No. Sometimes, when you start the vitrectomy, the eye tends to collapse. The first thing to check is if the infusion is in the eye and if there is vitreous clogging it. Sometimes, you do outrun the infusion and some of that is the fellow-in-training cutting in balanced salt solution (BSS) and not the vitreous. If that happens, I'll increase the IOP to prevent the eye from collapsing with each movement.

**Dr. Srivastava:** Dr. Kuriyan, are there certain cases where you will inherently reduce IOP?

**Dr. Kuriyan:** I'll do that with diabetic cases, especially big TRDs. You might have to increase the IOP to control hemorrhages, but usually the vasculature is so compromised that even a period of higher-than-usual pressure can knock out the perfusion. You can sometimes see these changes during surgery, which are a reminder to lower the pressure, if possible.

I also look out for a "disc at risk," which has been described in the cataract literature more often than the vitrectomy literature, but we also have pressure fluctuations. In terms of titrating the pressure upward, Dr. Sridhar made great points about shaving in BSS versus vitreous.

**Dr. Srivastava:** These have been great cases. It's been a lot of fun and we've all certainly learned a lot. Thank you for participating in this program. ■

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# *KOL KNOCKOUT*™ RETINA EDITION: EXPERTS GO TOE TO TOE ON MEDICAL AND SURGICAL TREATMENT APPROACHES

Release Date: February 2023
Expiration Date: February 2024

## INSTRUCTIONS FOR CREDIT

To receive credit, you must complete the attached **Pretest/Posttest/Activity Evaluation/Satisfaction Measures Form** and mail or fax to Evolve Medical Education LLC, 353 West Lancaster Avenue, Second Floor, Wayne, PA 19087; Fax: (215) 933-3950. To answer these questions online and receive real-time results, please go to https://evolvemeded.com/course/2235-supp. If you experience problems with the online test, email us at info@evolvemeded.com. *NOTE: Certificates are issued electronically.*

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## DEMOGRAPHIC INFORMATION

Profession
___ MD/DO
___ OD
___ NP
___ Nurse/APN
___ PA
___ Other

Years in Practice
___ >20
___ 11-20
___ 6-10
___ 1-5
___ <1

Patients Seen Per Week (with the disease targeted in this educational activity)
___ 0
___ 1-15
___ 16-30
___ 31-50
____ >50

Region
___ Midwest
___ Northeast
___ Northwest
___ Southeast
___ Southwest

## LEARNING OBJECTIVES

| Did the program meet the following educational objectives? | Agree | Neutral | Disagree |
|---|---|---|---|
| **Recognize** the barriers to early diagnosis and intervention for patients with retinal disease | _____ | _____ | _____ |
| **Evaluate** key data from clinical studies to determine the medical and surgical treatment approaches that would be most effective in managing disease presentation in real-world settings | _____ | _____ | _____ |
| **Describe** the role of visualization in common vitreoretinal surgical procedure | _____ | _____ | _____ |
| **Formulate** troubleshooting guides to mitigate the effect of unexpected intraoperative vitreous behavior | _____ | _____ | _____ |
| **Develop** algorithms to identify and surgically treat patients who may benefit from cutting-edge durable therapies for the treatment of diabetic eye diseases and neovascular age-related macular degeneration | _____ | _____ | _____ |

# POSTTEST QUESTIONS

Please complete at the conclusion of the program.

**1. Based on this activity, please rate your confidence in your ability to improve outcomes for patients with retinal disease (based on a scale of 1 to 5, with 1 being not at all confident and 5 being extremely confident).**

a. 1
b. 2
c. 3
d. 4
e. 5

**2. A 16-year-old patient presents to your office with a 5-week history of progressive vision loss in her left eye. On exam, she is noted to have disc edema, and peripapillary, subretinal, and intraretinal fluid with a macular star in her left eye. Which of the following serologies would be important to obtain in this patient?**

a. *Bartonella* testing
b. PT/PTT testing
c. INR testing
d. CBC/CMP testing

**3. A 54-year-old woman with a history or proliferative diabetic retinopathy (PDR) OU following panretinal photocoagulation (PRP) OU presents with a nonclearing vitreous hemorrhage (NCVH) for 4 months in the setting of her PDR. She also has a significant cataract in the eye with vitreous hemorrhage. All of the following are reasonable options for this patient EXCEPT?**

a. Pars plana vitrectomy (PPV) for NCVH with cataract extraction at a later date
b. PPV + cataract/extraction combo case
c. In-office fill in PRP
d. Cataract extraction first followed by PPV for NCVH after the cornea clears

**4. A 25-year-old man presents to your office after a history of assault with a subluxed lens. His IOP is 65 mm Hg. On slit lamp exam you notice his lens abutting his cornea with significant corneal edema. What is the ideal timing of his surgery?**

a. Urgent surgery needed
b. Surgery within 3 to 4 weeks
c. Surgery within 3 to 4 months
d. Nonsurgical management

**5. All of the following are important in the management of a patient after a dropped lens, EXCEPT?**

a. Maintaining clarity of the cornea
b. Urgent peripheral retinal exam
c. B scan prior to surgery, if necessary
d. No suture to anterior segment wounds

**6. A patient presents to your office for examination after a dropped lens. On B-scan ultrasonography, he has evidence of nonappositional choroidals. What is the likely reason for this?**

a. Anterior segment wound leak with low IOP
b. Anterior chamber hyphema with high IOP
c. Pupillary block from retained lens fragment
d. Pupillary block from vitreous

# ACTIVITY EVALUATION

Your responses to the questions below will help us evaluate this activity. They will provide us with evidence that improvements were made in patient care as a result of this activity.

Rate your knowledge/skill level prior to participating in this course: 5 = High, 1 = Low____

Rate your knowledge/skill level after participating in this course: 5 = High, 1 = Low____

This activity improved my competence in managing patients with this disease/condition/symptom. ____ Yes ____No

Probability of changing practice behavior based on this activity: ____High ____ Low ____No change needed

If you plan to change your practice behavior, what type of changes do you plan to implement? (check all that apply)

Change in pharmaceutical therapy ____
Change in nonpharmaceutical therapy ____
Change in diagnostic testing ____
Choice of treatment/management approach ____
Change in current practice for referral ____
Change in differential diagnosis ____
My practice has been reinforced ____
I do not plan to implement any new changes in practice ____

Please identify any barriers to change (check all that apply):

____ Cost
____ Lack of consensus or professional guidelines
____ Lack of administrative support
____Lack of experience
____ Lack of time to assess/counsel patients
____ Lack of opportunity (patients)
____ Reimbursement/insurance issues
____ Lack of resources (equipment)
____ Patient compliance issues
____ No barriers
____ Other. Please specify: _____

| | | |
|---|---|---|
| The design of the program was effective for the content conveyed | ___ Yes | ___ No |
| The content supported the identified learning objectives | ___ Yes | ___ No |
| The content was free of commercial bias | ___ Yes | ___ No |
| The content was relative to your practice | ___ Yes | ___ No |
| The faculty was effective | ___ Yes | ___ No |
| You were satisfied overall with the activity | ___ Yes | ___ No |
| You would you recommend this program to your colleagues | ___ Yes | ___ No |

Please check the Core Competencies (as defined by the Accreditation Council for Graduate Medical Education) that were enhanced through your participation in this activity:

____ Patient Care
____ Practice-Based Learning and Improvement
____ Professionalism
____ Medical Knowledge
____ Interpersonal and Communication Skills
____ System-Based Practice

Additional comments:

_____

This information will help evaluate this activity. May we contact you by email in 3 months to inquire if you have made these changes?
If so, please provide your email address below.

_____

_____