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USING PHOTODYNAMIC THERAPY IN 2019:

Current Concepts for Real-World Use

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CONTENT SOURCE

This continuing medical education (CME) activity captures content from a virtual round table discussion that occurred on March 28, 2019.

ACTIVITY DESCRIPTION

Verteporfin for photodynamic therapy (PDT) has been approved for decades as a treatment for retinal disorders. Eye care professionals need to understand all the real-world clinical scenarios in which the use of PDT alone or in combination with anti-vascular endothelial growth factor (VEGF) therapy can be a more efficacious treatment option than anti-VEGF monotherapy.

TARGET AUDIENCE

This certified CME activity is designed for retina specialists and ophthalmologists involved in the management of retinal diseases.

LEARNING OBJECTIVES

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

- **Summarize** the clinical benefits of PDT in patients with retinal disorders
- **Design** a treatment regimen based on a personalized medicine approach for patients who do not respond adequately to anti-VEGF injections
- **Identify** methods for effective PDT delivery in clinic settings, including dosing, infusion periods, and determination of treatment size
- **Differentiate** the benefits of half fluence PDT and full fluence PDT on a real-world population

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1. PLEASE RATE YOUR CONFIDENCE ON YOUR ABILITY TO APPLY UPDATES IN USING PHOTODYNAMIC THERAPY (PDT) IN THE CLINIC. (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. PLEASE RATE HOW OFTEN YOU INTEND TO APPLY ADVANCES IN USING PDT IN THE CLINIC. (BASED ON A SCALE OF 1 TO 5, WITH 1 BEING NEVER AND 5 BEING ALWAYS.)

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

3 PDT SHOULD BE CONSIDERED IN PATIENTS WITH THE FOLLOWING CONDITIONS *EXCEPT*:

a. Polypoidal choroidal vasculopathy
b. Myopic choroidal neovascularization
c. Dome-shaped macula
d. Central serous chorioretinopathy (CSR)

4. ACCORDING TO THE EVIDENCE, IN WHICH CLINICAL SITUATION WOULD FULL-FLUENCE PDT BE APPROPRIATE?

a. Full-fluence PDT is never appropriate due to the potential adverse events.
b. Full-fluence PDT is appropriate in all clinical scenarios because it's more effective than half fluence.
c. For patients with central serous chorioretinopathy.
d. For patients with polypoidal choroidal vasculopathy who did not respond to anti-VEGF treatment.

5. THE PANELISTS ADVISE OPTIMIZING THE PDT WORKFLOW MAY BEST BE ACCOMPLISHED WHEN _____.

a. There is a PDT laser in at least one office location
b. There is a dedicated PDT expert in your practice, such as a nurse or technician
c. Patients needing PDT are scheduled on the different days
d. Angiogram and PDT occur on separate days of the month

6. THE FOOD AND DRUG ADMINISTRATION RECOMMENDS PATIENTS AVOID THE SUN FOLLOWING PDT TREATMENT FOR _____.

a. 2 days
b. 3 days
c. 4 days
d. 5 days

7. ACUTE VISION LOSS CAN OCCUR AFTER PDT. WHAT PERCENTAGE OF PATIENTS HAVE ACUTE VISION LOSS FOLLOWING PDT ACCORDING TO THE VERTEPORFIN IN PHOTODYNAMIC THERAPY STUDY GROUP?

a. 5%
b. 4%
c. 2%
d. 1%

8. WHEN DIAGNOSING A PATIENT FOR CSR, CLINICIANS SHOULD ASSESS FOR ALL THE FOLLOWING RISK FACTORS *EXCEPT*:

a. Caffeine use
b. Steroid use, both by the patient and in the home
c. Hypotension
d. Excessive stress/Type A personality

9. AN ELECTRICIAN WITH RECURRENT CSR PRESENTS IN YOUR OFFICE. HE HAS A HISTORY OF TOPICAL STEROID USE, GYNECOMASTIA, AND HYPERTENSION. HE IS VERY CONCERNED ABOUT HIS ABILITY TO WORK BECAUSE THE CSR IS LOCATED IN HIS DOMINATE EYE WITH BETTER VISION. WHAT IS AN ACCEPTABLE EVIDENCE-BASED COURSE OF ACTION TO FIRST TAKE WHEN TREATING THIS PATIENT?

a. Recommend half-fluence PDT immediately
b. Take him off steroids, reemphasize the need to control his hypertension
c. Prescribe spironolactone
d. Recommend half-fluence with anti-VEGF

10. AN APPROPRIATE TIME FOR REEVALUATION AFTER PDT IS _____.

a. 3 months
b. 2 years
c. 2 to 4 weeks
d. 4 to 6 weeks

Using Photodynamic Therapy in 2019:
Current Concepts for Real-World Use

Verteporfin photodynamic therapy (PDT) has been approved for decades as a treatment for retinal disorders such as predominantly classic subfoveal choroidal neovascularization due to age-related macular degeneration (AMD), pathologic myopia, or presumed ocular histoplasmosis. Over the past few years, its use and role in ophthalmic care has evolved to include central serous chorioretinopathy, polypoidal choroidal vasculopathy, and peripapillary choroidal neovascularization. Although PDT may not be a treatment clinicians use daily, it is a valuable tool to have in their armamentarium. The following CME-approved activity gathers thought leaders to discuss its real-world utility, clinical benefits, and pearls for use.

—Rishi P. Singh, MD, Moderator

REAL-WORLD USES OF PHOTODYNAMIC THERAPY

Q | RISHI P. SINGH, MD: PDT is a selective vasoocclusive treatment targeting choroidal vascular abnormalities. Although it has utility in other medical specialties, it was originally developed for use in ophthalmology to treat neovascular age-related macular degeneration (AMD).[1,2] Over the years, its usage has evolved to treat a range of other chorioretinal conditions such as choroidal hemangioma,[3] central serous chorioretinopathy (CSR),[4,5] polypoidal choroidal vasculopathy (PCV),[6,7] and peripapillary choroidal neovascularization (CNV).[8] There are many variables that impact the effectiveness of PDT, including verteporfin dosing, fluence dosing, infusion periods, and the accurate determination of lesion size.[9-13] What role does PDT have in your practice today?

DAVID S. DYER, MD, FACS: PDT doesn't have a large role in my practice, but it is important to have at your disposal. I use it in patients with CSR and PCV, and as a rescue therapy for lesions that aren't fully responding to anti–VEGF treatment.[14] It can also be used in combination with anti-VEGF.

The EVEREST study showed that PDT alone or in combination with ranibizumab can achieve a complete regression of polyps in patients with symptomatic macular PCV compared with ranibizumab alone.[6,7,15,16] The PLANET study compared intravitreal aflibercept monotherapy with or without rescue PDT and found a 10.8 letter gain after 3 months, with polyp closure rates of 38.9%. Further, 81.7% of eyes had no active polyps.[17,18]

Several studies have shown that the use of PDT in juxtafoveal and extrafoveal CNV can achieve long-term stabilization and an improvement of visual acuity.[19,20] Han et al evaluated the use of anti-VEGF and PDT for juxtafoveal and extrafoveal CNV and found that combination therapy preserves good visual function and is well suited for some cases of nonfoveal CNV.[21]

I'll also use PDT for either choroidal or capillary hemangioma. These aren't common issues, but they do come up. I typically don't use PDT for myopic CNV because I feel the risk for developing atrophy is too significant,[22] and I've had success with anti-VEGF therapy in these patients. That being said, I would consider PDT in a myopic patient if they were unresponsive to anti-VEGF therapy and there was not a subfoveal or juxtafoveal lesion. I'll also consider PDT in patients on anti-VEGF therapy who have had a recent stroke, just to get them through that 90-day window before we can resume anti-VEGF treatments.[23]

VIVEK CHATURVEDI, MD: On the whole, 75% of my PDT use is for chronic CSR and 25% is for polypoidal AMD or refractory, wet AMD. I do not use PDT for patients with myopic CNV. For patients with wet AMD, I recommend walking them through how the medication works and how it's different from the monotherapy they've been receiving.

AMANI FAWZI, MD: The bulk of my PDT patients have CSR and polypoidal lesions. I also use it in hemorrhagic lesions and peripheral lesions that are causing substantial exudate. I've also had success with it for proliferative tumors that are causing a lot of exudate that's tracking through the macula, as well as in patients with von Hippel–Lindau peripheral lesions.[24] If those lesions become too large and they are too peripheral to laser completely with thermal laser, then PDT is an option. Finally, I also use PDT in patients with a dome-shaped macula. Those eyes sometimes have chronic subretinal fluid that doesn't respond to other treatment. Data have shown that myopic eyes associated with a dome-shaped macula and foveal serous retinal detachment may be responsive to PDT.[25,26]

OPTIMIZING THE PDT WORKFLOW

Q | DR. SINGH: The PDT workflow can be somewhat complicated due to the number of steps necessary. The typical workflow is as follows: A technician or nurse preps the patient with an IV, performs the IV fluorescein angiography (IVFA)/indocyanine green (ICG), maintains the IV's patency, mixes the drug, and supervises the infusion. The clinician sees the patient after the infusion, reviews the angiogram, and places the laser. The technician or nurse then removes the IV and reviews the postoperative instructions with the patient. How do you optimize the workflow and scheduling for maximum efficiency?

CASE 1: CHRONIC CENTRAL SEROUS RETINOPATHY Presented by Dr. Chaturvedi

A 55-year-old man with chronic CSR came to me on a referral (Figure 1). His scans showed a small amount of subretinal fluid, and we decided to observe. He was very concerned about his ability to work because his right eye was his dominant and better eye.

He was taking dextroamphetamine-amphetamine for adult attention-deficit/hyperactivity disorder. During his next visit, we found increased fluid. He was asymptomatic but his vision dropped to 20/30. After discussing it with some of my partners, we decided to take him off dextroamphetamine-amphetamine, feeling that there could be mineralocorticoid effect in its use. His fluid resolved (Figure 2) a couple of months later.

Four or 5 months later, however, his fluid returned. He was, again, asymptomatic but with 20/30 vision. This pattern continued the following year: the fluid resolved and then returned. At this point we recommended that he start rifampin,[1] but he elected not to because of its contraindication with alcohol.

We then recommended reduced-fluence PDT, which he also declined out of worry about the potential side effects and abrupt vision loss. This fluid continued to worsen (Figure 3), and we decided to start him on oral eplerenone to reduce the fluid, which the literature supports.[2-4] We know that spironolactone works better for fluid reduction, but the risk profile is higher, especially in males with decreased libido and gynecomastia.[5] Spironolactone is associated with dose-dependent sexual side effects. Both eplerenone and spironolactone increase potassium concentrations, although the effect with spironolactone appears to be greater than with eplerenone.[6]

His angiogram showed multiple areas of RPE staining and small areas of leakage. The ICG showed diffuse congestion, diffuse leakage, and diffuse dilation throughout the posterior pole with multiple hot spots (Figure 4). We decided to increase the eplerenone dosage from 50 mg to 100 mg, and he continued to have persistent fluid. He's still asymptomatic, with 20/30 vision. Seven months later, he still has persistent fluid, and we're beginning to see some RPE changes; we decided to stop oral eplerenone. I'm pushing PDT strongly at this point, but he is still concerned about abrupt vision loss.

On his next follow-up appointment, we see that his visual acuity (VA) has dropped to 20/60 and he is symptomatic. We continue to monitor him for another year and see no changes in the FA or ICG. He finally agrees to low-fluence PDT. My strategy was to develop a treatment based on what I saw on the angiogram, which showed most of the leakage superior to the macula, and the ICG, which showed leakage all around the fovea. I did a continuous set of four different targeted areas just superior to the fovea in a box pattern over the course of the 83 seconds. Four months after PDT, his VA was 20/80, but his fluid was gone (Figure 5). Figure 5 shows substantial loss of the outer retina as well as irregularities to the EZ junction.

How would you treat this patient?

Dr. Fawzi: I would have pushed for the PDT about a year earlier and explained that we could treat all the areas outside the fovea in stages and then reassess to see if he needs more. Unfortunately, when the fluid sits for a long time, the photoreceptors suffer. I would have tried to treat the superior areas and stay outside the fovea to see what happens.

Dr. Dyer: I agree. I would have done multiple treatments around the fovea since it's his best eye and since he's hesitant

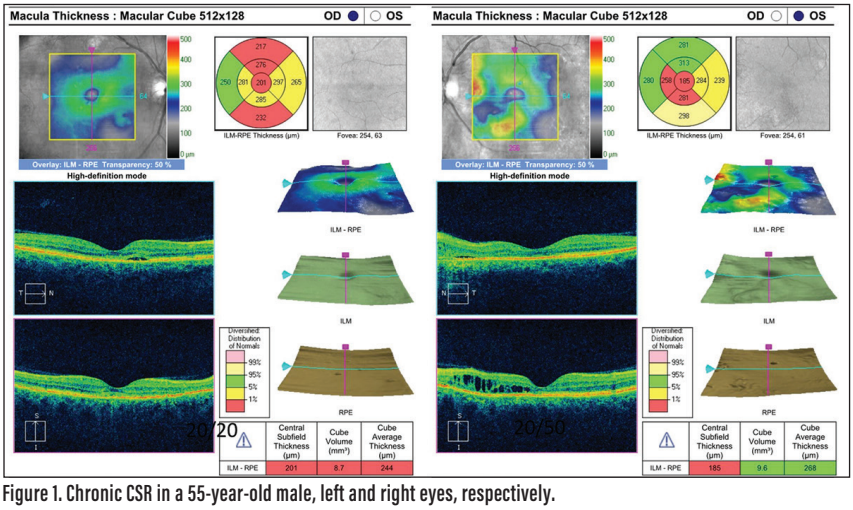

Figure 1. Chronic CSR in a 55-year-old male, left and right eyes, respectively.

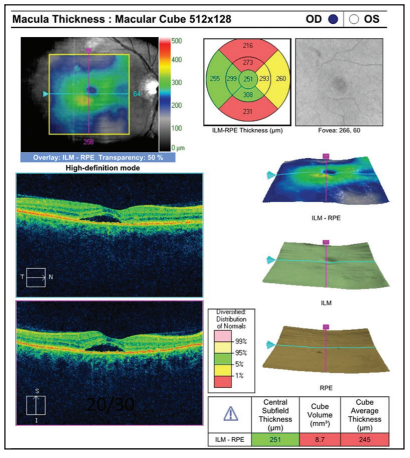

Figure 2. Fluid resolution after discontinued Adderall use.

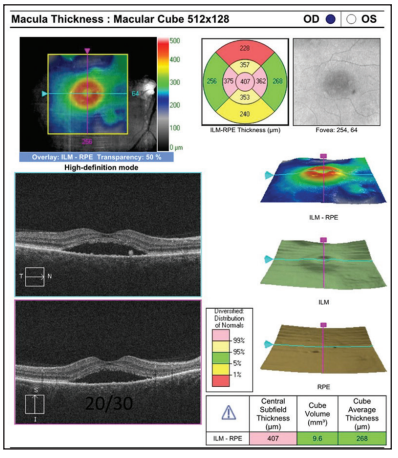

Figure 3. Increased fluid in after eplerenone 50 mg.

CASE 1 (*Continued*)

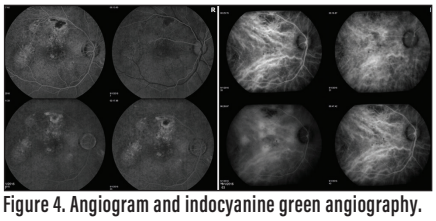

Figure 4. Angiogram and indocyanine green angiography.

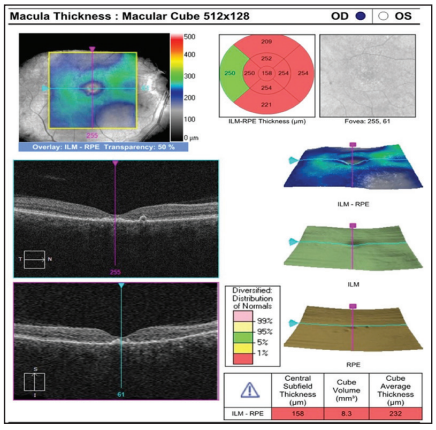

Figure 5. After PDT treatment.

about treating the fovea directly. His vision loss is probably because he just waited too long before having treatment. I've tried multiple medications, including the three that you mention here, and no one has responded.

Dr. Fawzi: I think the only medication that works is withdrawing the steroids if they're on any. We haven't had a good experience with any rifampin or eplerenone either.

Dr. Chaturvedi: I completely agree. I have not had much success with systemic medications.

Dr. Singh: Let's talk a little bit about the diagnostic dilemma here with this case. What do you ask about when you're interviewing patients with chronic CSR?

Dr. Chaturvedi: I try to assess what, if anything, they are encountering or interacting with that could potentially exasperate their symptoms. I always ask the patient about steroid use, not just about the steroids they are using but if anyone in the home I using steroid cream or if they have any children with a steroid inhaler. Although the link between steroids and CSR is poorly understood, a number of cases have reported CSR development or worsening in conjunction with topical, oral, or inhaled steroids.[7-9]

I also talk to them about their personality, especially if there is no steroid use, and how endogenous cortisol levels may impact their disease.[10,11] Type A personality and stress are known risk factors for CSR.12 Most people do carry some degree of stress in their life, and it's difficult to reduce it unless you feel like your stress level is exceeding what your typical stress level is. I don't dive into that too deeply anymore, although I used to.

Dr. Singh: I have three or four patients with CSR that is exacerbated by caffeine.[13] I have one patient in particular who can drink green tea but can't drink coffee. I've also had some patients with the same experience eating chocolate. I now ask my patients how much caffeine they consume, and some people have responded by simply cutting back. Although the link between CSR and caffeine abuse has not been well reported in the literature, clinicians are starting to make this connection.[14]

Dr. Fawzi: I also talk to them about hypertension because that's the other strong association with CSR.[11] If they have hypertension, I encourage them to control it. Sometimes, that enough to reduce the fluid.

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DR. DYER: Because we don't use it on a daily basis, we bring the patient back once we identify the need for PDT. It's scheduled within a week to 10 days. We can do the PDT in any office, but we do have a room in our main location that's set up for PDT specifically. We try to centralize PDT unless it's a long drive for the patient. I use half fluence for almost every indication, and base the lesion size on the angiogram.

DR. SINGH: Something I've done to streamline the process is not removing the IV if I'm doing a same-day angiogram. That way, I can use the same IV for the PDT.

DR. FAWZI: We do PDT once a month in my practice, and we schedule all the patients on the same day to maximize efficiency. We have a nurse that comes on that day specifically for the PDT, and gets every patient prepped individually.

DR. CHATURVEDI: We have one laser for our 11 offices, and arrangements are made to bring the laser to an office if we have a patient who is a candidate for PDT. Most of the offices have one PDT-dedicated nurse because it's a complex set up. PDT's require preapproval from insurance, so we end up scheduling patients within 2 or 3 weeks of identifying that they need the treatment.

CASE 2: POLYPOIDAL LESIONS Presented by Dr. Fawzi

A 58-year-old Hispanic woman came in for examination of a macular lesion. She was 20/80 in her left eye, and she did not use steroids or have relevant medical history. Her baseline OCT had subretinal fluid with debris in it (Figure 1). The shape of the debris looked like CSR, but there's also a shallow lying pigment epithelium detachment with material in it that was suspicious for a polypoidal-type lesion. We did an ICG, which showed polyps on the outside, plaque in the middle, low-lying PED, and features of CSR. Figure 2 illustrates the autofluorescence dripping pattern, which is indicative of a pachychoroid spectrum. There's thick choroid, neo blood vessels, and a long-standing history of CSR that comes and goes.

This case is from 2016, and at that point I had had some anecdotal success for polypoidal with aflibercept, which was later borne out later with the PLANET trial.[1] I started with aflibercept to see how she would respond. Would anyone have gone straight to PDT or combination therapy? How would you treat this patient?

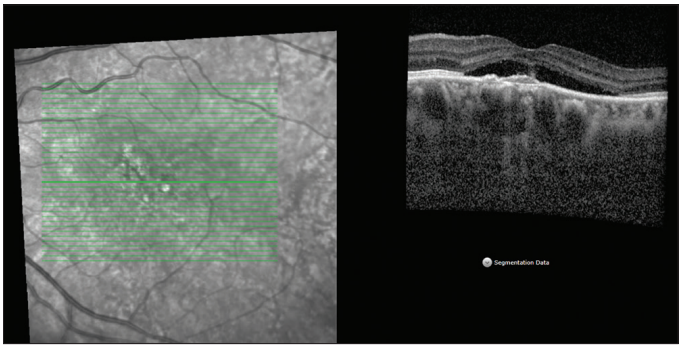

Figure 1. Baseline OCT in a 58-year-old hispanic female with macular lesion.

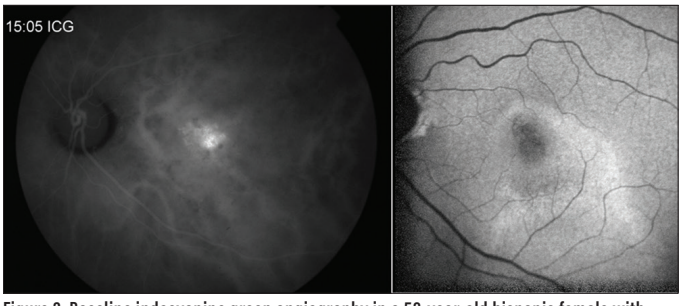

Figure 2. Baseline indocyanine green angiography in a 58-year-old hispanic female with macular lesion.

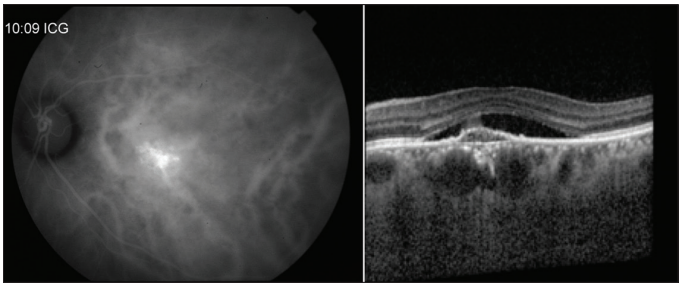

Figure 3. Macular lesion after aflibercept treatment.

Dr. Singh: You're pointing out the big difference between the PLANET study and the EVEREST trial. Whereas PLANET study showed that aflibercept monotherapy was sufficient for treatment of polypoidal, EVEREST did not.[1,2,3,4] I agree with starting with aflibercept in this case; I would have started with aflibercept as well. But PDT could have a role in reducing the frequency of treatments for the patient in trying to resolve subretinal fluid faster.

Dr. Fawzi: We started with aflibercept, and a year later she was 20/40; a lot of the fluid was gone. I extend the treatment interval over the next year and it fails; fluid comes and goes despite therapy every 4 weeks. The fluid is not responding to aflibercept (Figure 3). I then decide to add PDT to the treatment.

Dr. Singh: Where was your lesion treatment in this case?

Dr. Fawzi: It was subfoveal. The ICG showed that we shrunk slightly the branching vascular network, but the polyps are exactly the same size (Figure 3).

Dr. Singh: Did you use full fluence or partial fluence in this case?

Dr. Fawzi: We used full fluence because of how poorly she was responding to treatment.

Dr. Dyer: I would have started with monotherapy as well, but treated the patient with partial fluence PDT to see how she responded. I don't think it's wrong to select full fluence, however.

Dr. Fawzi: We did the PDT guided by ICG so that we captured the polyps and the branching vascular network (Figure 3). We did pure PDT only, and did not include anti-VEGF therapy. Four months post therapy she was dry, with no extra anti-VEGF needed (Figure 4). There's some outer retinal changes and her vision is 20/80, but the PED and polyps shrunk. We are waiting to see if we can recover some of her vision.

Dr. Singh: When you manage these patients, are you constantly screening them with OCT and ICG? I often wonder in many of these patients if there's a CNV component.

Dr. Fawzi: You should be suspicious of CNV if the patient has large choroidal vessels abutting the RPE (so called pachy-vessels), combined with a shallow irregular PED (so called double-layer sign), as this case showed.. OCT angiography (Figure 5) is my

CASE 2 (*Continued*)

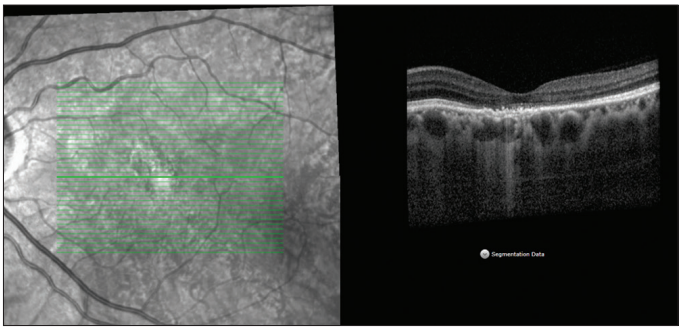

Figure 4. Four months after full-fluence PDT.

go-to screening method because it helps differentiate a CSR pigment epithelial detachment that has no vessels in it versus a neovascular PED that has neo vessels. If the OCT angiography doesn't reveal much, my next step is ICG to look for polypoidal.

1. Lee WK, Iida T, Ogura Y, et al. Efficacy and Safety of intravitreal aflibercept for polypoidal choroidal vasculopathy in the PLANET study: A randomized clinical trial. *JAMA Ophthalmol.* 2018;136(7):786-793.
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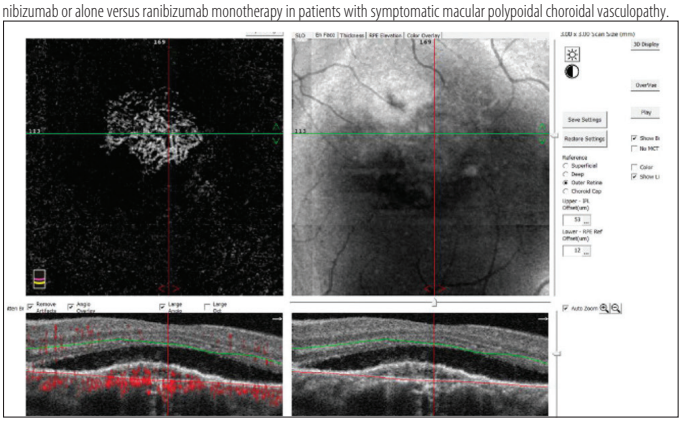

Figure 5. OCT angiography shows branching vascular network but not the polyps.

Retina. 2012;32(8):1453-1464.
3. Tan CS, Ngo WK, Chen JP, et al. EVEREST study report 2: imaging and grading protocol, and baseline characteristics of a randomised controlled trial of polypoidal choroidal vasculopathy. *Br J Ophthalmol*. 2015;99(5):624-628.
4. Tan CS, Ngo WK, Lim LW, et al. EVEREST study report 3: diagnostic challenges of polypoidal choroidal vasculopathy. Lessons learnt from screening failures in the EVEREST study. *Graefes Arch Clin Exp Ophthalmol.* 2016;254(10):1923-1930.

DETERMINING DOSING AND LESION SIZE

Q | **DR. SINGH:** Dr. Dyer, you mentioned that most of your patients get partial fluence. Is that correct? How do you determine lesion size?

DR. DYER: I do use half fluence; I only use full fluence if the half wasn't adequate. The standard PDT regimen includes IV verteporfin at 6 mg/m^2 for 10 minutes. Five minutes later, the patient receives a diode laser at a wavelength of 689 nm and energy of 50 mJ/cm^2 over 83 seconds to the target lesion.[27] Half fluence is 25 mJ/cm^2 over 83 seconds. Both full and half fluence have been shown to be effective,[12,28-31] but full-fluence PDT is the only treatment modality that will achieve 70% to 80% closure rates for polyps.[6,7] However, half fluence has significantly fewer adverse events than full fluence, including atrophic changes, choroidal ischemia, retinal pigment epithelium (RPE) atrophy, or secondary choroidal neovascularization.[32-34] Further, some studies have shown that standard-dose PDT may be associated with choriocapillaris hypoperfusion, which could result in decreased vision.[35]

I base the size of the lesion off FA, ICG, or color fundus photography. FA is the most commonly used tool to identify PDT candidates,[9,36] but ICG is recommended in patients with PCV, especially if they are of African or Asian desent.[36] In general, the calculation is 1,000 µm plus the lesion. If I have a CSR patient and the leakage is not subfoveal, I'll try to get the spot size in an area so that I don't have to treat the fovea. Studies have shown that among patients with myopic CNV, those treated with foveal-sparing PDT had significantly better visual acuity compared with those treated with foveal-involving PDT.[37] Sometimes I'll make two different treatments. The drug lasts long enough for you to treat one area and then treat a second area. I'll do that if it's an oblong-shaped area that needs to be treated without having to treat the fovea.

DR. FAWZI: For CSR patients, we usually use the fluorescein and half fluence. For PCV, it's a little harder to decide; If anti-VEGF therapy failed, sometimes we go full fluence. We use ICG for our polyps to determine the lesion size so we can see the entire area of the polypoidal. Most of the time you can't determine where the polyps are on the fluorescein angiography alone. We know that anti-VEGF therapy will address the branching vascular network, so we're most interested in targeting the polyps. I agree that you should avoid the fovea if you can.

DR. CHATURVEDI: I use partial or half fluence PDT on all patients, including polypoidal. I am not comfortable using full fluence. The difficulty with many of the chronic central serous patients is they often have multifocal areas of leakage on ICG and on angiography. I like to do a contiguous set of spots over the course of the 83 seconds to ensure I'm covering the area that's creating the persistent subretinal fluid. For the lesion size, I also target 1,000 µm larger than the area in question I want to treat.

POST PDT BEST PRACTICES

Q | **DR. SINGH:** What do you tell your patients about after care and procedure-related effects?

CASE 3: CENTRAL SEROUS CHORIORETINOPATHY Presented by Dr. Dyer

A patient presents with recurrent CSR and 20/100 vision. I was the third retina specialist to treat him. His right eye had what looked like burnt out CSR and 20/400 vision. The left eye fluctuated between 20/60 and 20/100. He's still working full time and needed his vision to continue to work. Before I saw him, he received focal laser treatment to some individual leaking areas and an intravitreal injection of steroids, which did not help. The angiogram shows a modeled RPE and some late leakage temporal to the fovea (Figure 1). As you can see on the late phase, there's a couple focal areas of leakage. I offered this patient PDT because this was his only good-seeing eye, I didn't want to treat the fovea. Figure 2 illustrates the treatment pattern. I was able to incorporate all of the leaking areas and to keep away from the fovea.

Over the course of 2 to 3 months, he had a nice response. However, his vision only went from 20/100 to 20/80. His post-PDT OCT showed reduced subretinal fluid and some cystoid changes, which is unusual. Four months posttreatment, there was little to no leakage, and the OCT's flattened out nicely (Figure 3). This vision didn't improve on the Snellen chart, but the patient described better contrast and improved color vision. He is a court stenographer, and he reported that he was able to read and type better than before treatment. It's been almost a year now, and he's still doing very well. I'm sure at some point we'll need to treat him again, but for now, everything's stable.

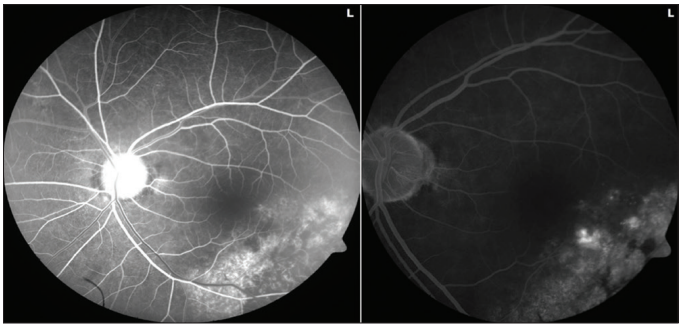

Figure 1. Angiogram of a patient with recurrent CSR.

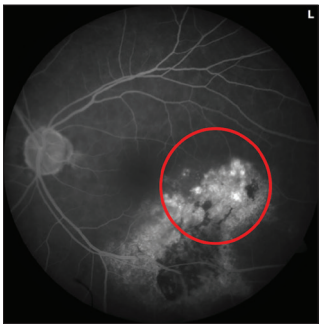

Figure 2. PDT treatment pattern.

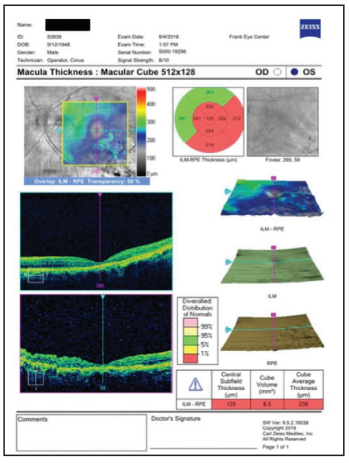

Figure 3. Four months after PDT.

Dr. Fawzi: One thing to note about this case is the cystoid edema, which is a marker of sick RPE. Patients who get cystoid intraretinal fluid are more likely to have sort of burned out RPE, which is not a positive prognostic sign.

Dr. Singh: What is your retreatment criteria?

Dr. Dyer: In my experience, you need more than one. The question is, what is interval? The interval should be customized to that particular patient. Some patients need treatment on a regular basis, but others can go 2 to 3 years between treatments. This is reflective of the variability in their disease. That said, almost everyone I treat has needed at least another two or three treatments.

Dr. Singh: How do you manage bilateral treatment, and what are the logistics?

Dr. Dyer: Although the literature indicates it is possible to treat both eyes at once,[1] I treat them on separate days. It's too risky to do both eyes, especially if it's a subfoveal treatment. If for some reason you had a negative result, and you had some foveal infarct in both eyes, it would be terrible. I always treat one eye at a time, and bring them back for the second eye a few weeks later.

Dr. Chaturvedi: I also do separate days, and I give it a good 6 to 8 weeks prior to treating the fellow eye.

Dr. Fawzi: I would only consider same-day bilateral treatment if I was treating extra foveally in both eyes.

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DR. CHATURVEDI: The first thing I always tell them is that they'll need to avoid direct sunlight or high-light environments for about 5 days.[38] I advise them to stay indoors as much as possible, and to wear a jacket and a wide-brimmed hat and sunglasses when they leave the appointment after the PDT. They also need to be particularly careful around the infusion site. Sunscreen will not protect them from a severe reaction from the photosensitization to the skin. In terms of the injection itself, I explain they may have some lower back pain during the procedure. I also explain the potential risks of having significant vision loss,[39] which is minimized since I only give my patients reduced fluence.

DR. FAWZI: We know that 4% of patients will lose vision,[40] so I tell my patients to call or come in immediately if their vision changes dramatically for the worse. Assuming everything is going to plan, I see patients about a month post-PDT and monitor them for additional needs for treatment.

"There's a definite role for PDT, and every practice should have at least one laser. We see a lot of patients with CSR and refractory AMD who can benefit from PDT."

—Vivek Chaturvedi, MD

DR. DYER: I have my patients stay inside for 2 days, which has not presented any problems. The Food and Drug Administration advises us to be cautious, and 5 days likely makes sense for sunnier parts of the country, but I don't think it's necessary everywhere. We do have patients come to the appointment covered up to make sure their organs are not exposed and ask them to wear hats when they leave. As for the possibility of vision loss, we impress upon patients that they are to call us immediately if they notice any negative changes in vision. Finally, I also remind them to tell a hospital or treating physician that they've had PDT if an emergency medical situation were to occur.

DETERMINING RETREATMENT INTERVALS

Q | **DR. SINGH:** The traditional treatment interval has been 3 months follow-up from PDT in the AMD era.[41] Does that hold true now, or are you following patients more closely?

DR. DYER: Data support the safety of 2-month PDT retreatment intervals. An early study showed retreatment at 2- to 4-week intervals was well-tolerated, even with double the standard light dose.[42] The more recent Visudyne Early Retreatment trial randomly assigned 323 patients to verteporfin PDT as needed, at either 6-week or 3-month intervals,[43] and illustrated similar safety and efficacy between the two treatment arms.

I follow up with my CSR patients 6 weeks post PDT. If it's an AMD patient who is unresponsive to anti-VEGF therapy, I do a combination treatment and follow up with them 4 to 6 weeks later to assess the efficacy. I also follow up within 4 to 6 weeks for patients with polypoidal lesions; I want to see how much they've improved. If you need to retreat a patient a number of times, you might find that some CSR patients can go 6 months between treatments. Once they've had a couple treatments, I extend the interval to 3 months. But for the first few treatments, I see them back within 4 to 6 weeks.

DR. SINGH: The interval has changed a lot in the optical coherence tomography (OCT) era. OCT has allowed us to follow patients much closer. The 3-month interval is based on our ability to redo FAs.

DR. FAWZI: The OCT really informs you of what's going on. From that, you can tell if the fluid is going away or if the lesions are shrinking. I have my patients return within a month and repeat the OCT. That level of follow up is reassuring to the patient as well.

DR. CHATURVEDI: I usually see wet AMD or chronic CSR patients about 4 to 6 weeks after initial treatment. We most likely are not going to be retreating CSR patients at that point, but I still like to see how they are responding. I see my AMD patients at this interval as well, because there's a possibility we need to be combining anti-VEGF medications.

WHERE PDT STANDS IN 2019

Q | **DR. SINGH:** What do clinicians need to know about using PDT in 2019?

DR. CHATURVEDI: There's a definite role for PDT, and every practice should have at least one laser. We see a lot of patients with CSR and refractory AMD who can benefit from PDT. It's also important to have specific staff trained as PDT experts because its use can be infrequent. Finally, I recommend using ICG more often in diagnosing CSR because we are missing some patients with polypoidal lesions.

DR. FAWZI: PDT is used in practice more than people realize. It provides an extra benefit to those patients who we can't extend when we're treating with anti-VEGF therapy or who have CSR that's not responding treatment. There aren't alternatives in CSR treatment at this point, and until we have something better, PDT is a great option for those high-strung, high-energy patients who are very nervous. It gives them an excellent outcome.

I also agree that it is critical to have a PDT expert in every practice who is responsible for the authorization, scheduling, and infusion. Infusion leaks can be terrible for patients. We've had bad experiences with that, so it's very important that the infusion is put in the right place and handled appropriately so you don't get that leak.

DR. DYER: PDT is an important tool, and the best treatment option for CSR. It's also an important treatment option for

polypoidal patients. It's a viable, supplemental treatment or combination treatment in patients with unresponsive AMD patients. I also echo the recommendation of having PDT expert, preferably a nurse, who understands the laser, can correctly mix the infusion, and who can get good IV started. It makes it a safer, more efficient process. ■

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USING PHOTODYNAMIC THERAPY IN 2019:
Current Concepts for Real-World Use

Release Date: May 15, 2019
Expiration Date: May 15, 2020

INSTRUCTIONS FOR CME CREDIT

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Name _____ ❑ MD/DO participant ❑ OD ❑ non-MD participant

Phone (required) _____ ❑ Email (required) _____

Address _____

City _____ State _____ Zip _____

License Number _____

OE Tracker Number _____

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
___ 1-5
___ 6-10
___ 11-15
___ 15-20
___ >20

Region
___ Northeast
___ Northwest
___ Midwest
___ Southeast
___ Southwest

Setting
___ Solo Practice
___ Community Hospital
___ Government or VA
___ Group Practice
___ Other
___ I do not actively practice

Models of Care
___ Fee for Service
___ ACO
___ Patient-Centered Medical Home
___ Capitation
___ Bundled Payments
___ Other

LEARNING OBJECTIVES

DID THE PROGRAM MEET THE FOLLOWING EDUCATIONAL OBJECTIVES?	AGREE	NEUTRAL	DISAGREE
Summarize the clinical benefits of PDTin patients with retinal disorders	_____	_____	_____
Design a treatment regimen based on a personalized medicine approach for patients who do not respond adequately to anti-VEGF injections	_____	_____	_____
Identify methods for effective PDT delivery in clinic settings, including dosing, infusion periods, and determination of treatment size	_____	_____	_____
Differentiate the benefits of half fluence PDT and full fluence PDT on a real-world population	_____	_____	_____

POSTTEST QUESTIONS

1. **PLEASE RATE YOUR CONFIDENCE ON YOUR ABILITY TO APPLY UPDATES IN USING PHOTODYNAMIC THERAPY (PDT) IN THE CLINIC BASED ON THIS ACTIVITY. (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. **PLEASE RATE HOW OFTEN YOU INTEND TO APPLY ADVANCES IN USING PDT IN THE CLINIC. (BASED ON A SCALE OF 1 TO 5, WITH 1 BEING NEVER AND 5 BEING ALWAYS.)**
   a. 1
   b. 2
   c. 3
   d. 4
   e. 5

3. **PDT SHOULD BE CONSIDERED IN PATIENTS WITH THE FOLLOWING CONDITIONS *EXCEPT*:**
   a. Polypoidal choroidal vasculopathy
   b. Myopic choroidal neovascularization
   c. Dome-shaped macula
   d. Central serous chorioretinopathy

4. **ACCORDING TO THE EVIDENCE, IN WHICH CLINICAL SITUATION WOULD FULL-FLUENCE PDT BE APPROPRIATE?**
   a. Full-fluence PDT is never appropriate due to the potential adverse events.
   b. Full-fluence PDT is appropriate in all clinical scenarios because it's more effective than half fluence.
   c. For patients with central serous chorioretinopathy.
   d. For patients with polypoidal choroidal vasculopathy who did not respond to anti-VEGF treatment.

5. **THE PANELISTS ADVISE OPTIMIZING THE PDT WORKFLOW MAY BEST BE ACCOMPLISHED WHEN _____.**
   a. There is a PDT laser in at least one office location
   b. There is a dedicated PDT expert in your practice, such as a nurse or technician
   c. Patients needing PDT are scheduled on the different days
   d. Angiogram and PDT occur on separate days of the month

6. **THE FOOD AND DRUG ADMINISTRATION RECOMMENDS PATIENTS AVOID THE SUN FOLLOWING PDT TREATMENT FOR _____.**
   a. 2 days
   b. 3 days
   c. 4 days
   d. 5 days

7. **ACUTE VISION LOSS CAN OCCUR AFTER PDT. WHAT PERCENTAGE OF PATIENTS HAVE ACUTE VISION LOSS FOLLOWING PDT ACCORDING TO THE VERTEPORFIN IN PHOTODYNAMIC THERAPY STUDY GROUP?**
   a. 5%
   b. 4%
   c. 2%
   d. 1%

8. **WHEN DIAGNOSING A PATIENT FOR CSR, CLINICIANS SHOULD ASSESS FOR ALL THE FOLLOWING RISK FACTORS *EXCEPT*:**
   a. Caffeine use
   b. Steroid use, both by the patient and in the home
   c. Hypotension
   d. Excessive stress/Type A personality

9. **AN ELECTRICIAN WITH RECURRENT CSR PRESENTS IN YOUR OFFICE. HE HAS A HISTORY OF TOPICAL STEROID USE, GYNECOMASTIA, AND HYPERTENSION. HE IS VERY CONCERNED ABOUT HIS ABILITY TO WORK BECAUSE THE CSR IS LOCATED IN HIS DOMINATE EYE WITH BETTER VISION. WHAT IS AN ACCEPTABLE EVIDENCE-BASED COURSE OF ACTION TO FIRST TAKE WHEN TREATING THIS PATIENT?**
   a. Recommend half-fluence PDT immediately
   b. Take him off steroids, reemphasize the need to control his hypertension
   c. Prescribe spironolactone
   d. Recommend half-fluence with anti-VEGF

10. **AN APPROPRIATE TIME FOR REEVALUATION AFTER PDT IS _____.**
    a. 3 months
    b. 2 years
    c. 2 to 4 weeks
    d. 4 to 6 weeks

ACTIVITY EVALUATION

Your responses to the questions below will help us evaluate this continuing medical education (CME) activity. They will provide us with evidence that improvements were made in patient care as a result of this activity as required by the Accreditation Council for Continuing Medical Education (ACCME).

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

I plan to make changes to my practice based on this activity. _____ Yes _____ No

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

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:

_____

_____ I certify that I have participated in this entire activity.

This information will help evaluate this CME activity; may we contact you by email in 3 months to see if you have made this change? If so, please provide your email address below.

_____


RT
Retina Today


evolve
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