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CUTTING-EDGE ADVANCEMENTS

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Laser therapy a novel approach to DME, CSR

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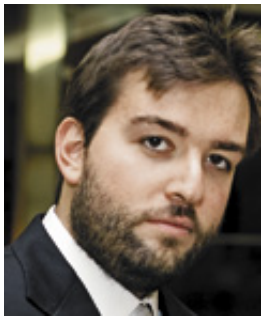
Take-home

An ophthalmologist with a practice in Brazil explains how using photothermal stimulation with an algorithm is an effective treatment for his patients with diabetic macular edema and central serous chorioretinopathy.



Dr. LavinskyBy Daniel Lavinsky, MD, Special to *Ophthalmology Times*

Porto Alegre, Brazil—A novel approach to laser therapy of the macula allows for precise control of low-level laser dosages at short durations. The technique works by first titrating to a barely visible level, and then by allowing clinicians to select the percentage of energy delivered to the eye below that level—enabling less-damaging laser treatments.

Use of such photothermal stimulation with an algorithm (PASCAL Streamline Laser System with Endpoint Management, Topcon Medical Laser Systems) has proven to be extremely effective in treating patients with diabetic macular edema (DME) and central serous chorioretinopathy (CSR). The endpoint software uses a computational algorithm to determine laser parameters for retinal heating and maximize the margins between visible and subvisible endpoints, while providing linear control over a non-linear process.

My colleagues and I have treated about 58 patients with DME and CSR using the laser therapy and algorithm. In our practice in Porto Alegre, Brazil, there is a high population of patients with DME. However, our insurance companies do not cover the expense of ranibizumab (Lucentis, Genentech), and many patients cannot afford anti-vascular endothelial growth factor (VEGF) treatments. Therefore, we tend to treat with laser often.

We also believe in combining either photothermal stimulation or photocoagulation with anti-VEGF therapy. In patients with DME, preliminary data show a decrease in central macular thickness, and most importantly, an increase in letters in vision in patients who have undergone photothermal stimulation.

CSR is a disease that can be very difficult to treat. Usually, acute CSR will resolve itself. If it

does not resolve in 4 to 6 months, however, it is considered to be chronic with limited treatment options. Some clinicians use photodynamic therapy with verteporfin (Visudyne, Valeant Ophthalmics), which—along with being expensive—has many side effects. Photothermal stimulation with algorithm has proven to be an effective treatment for patients with CSR.

Treatment protocol

When treating patients with CSR, first differentiate between acute and chronic CSR. I treat with laser therapy 3 to 4 months after symptoms appear and use optical coherence tomography (OCT) to confirm the presence of fluid. If symptoms have existed for more than 4 months, I move directly to photothermal stimulation.

Areas of leakage or areas of retinal fluid are treated with an almost confluent grid of 200 µm burns per spot and endpoint setting of 30% energy from titration burn. The titration burn at 100% energy is extremely important if it is necessary for surgeons to titrate outside the central area; it is enough to create the first barely visible burn at 3 seconds and then it will be used to reduce the energy. From there, I change the energy to my desired level.

When treating patients with DME, the process is more complicated, because the disease is more chronic. I prefer to use combination therapy with anti-VEGF treatment.

If a patient has very light DME to very light edema, I use only a laser with algorithm at 30%. If a patient has a denser edema and thicker retina, I use anti-VEGF and then combine the endpoint software with 30% photothermal stimulation. This way, I can decrease the number of treatments and the number of injections.

If a patient has moderate or mild DME, I start with laser and do not use injections. If the patient has severe edema, I start with injections, followed by photothermal stimulation. My goal is to decrease the number of injections.

DME patient case

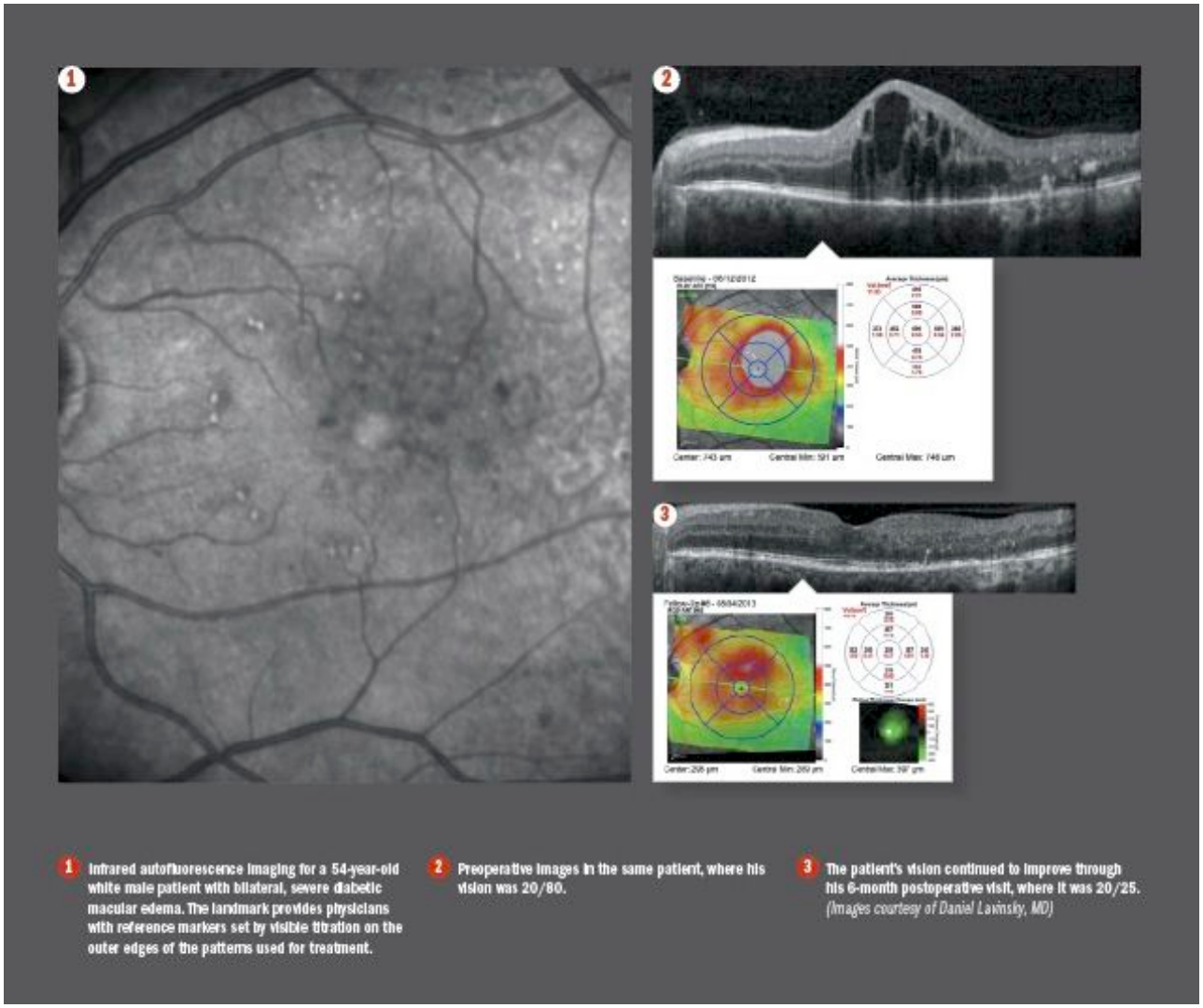
A 54-year-old white male had been suffering from bilateral, severe DME for 15 years. He could not afford anti-VEGF treatments, because his insurance did not cover the cost.

He was treated first with conventional photocoagulation with no success. We then treated using photothermal stimulation and the algorithm with landmarks turned "on"—landmarks provide reference markers set by visible titration on the outer edges of the patterns used for treatment—and 760 burn spots.

The landmarks caused damage to the retinal pigment epithelium (RPE), and after 1 to 2 months we were able to see in vivo that the laser burn restored, so there was a healing process for photocoagulation. Even with the landmarks—which are photocoagulation burns—they will heal. We will only see the spots in infrared autofluorescence imaging, because of the RPE proliferation of the damage that we caused.

The patient's vision continued to improve through his 6-month postoperative visit to 20/25. The landmarks are important for physicians who want to determine if a patient was treated with laser, and the burns do not affect results.

CSR case studies



1 Infrared autofluorescence imaging for a 54-year-old white male patient with bilateral, severe diabetic macular edema. The landmark provides physicians with reference markers set by visible titration on the outer edges of the patterns used for treatment.

2 Preoperative images in the same patient, where his vision was 20/80.

3 The patient's vision continued to improve through his 6-month postoperative visit, where it was 20/25. *(Images courtesy of Daniel Lavinsky, MD)*

A 64-year-old white male had experienced decreasing vision for 8 months. His chronic CSR was diagnosed with 20/60 visual acuity and a point of leakage very close to fovea revealing a retinal detachment.

The patient was treated using photothermal stimulation with algorithm. We used a 200-µm spot size and 110 mW of power for a 100% (titration) burn, which served as a landmark. Using the landmarks in the patient's retinas, we knew that we treated from the landmark to the fovea almost confluent using 0.25 spacing.

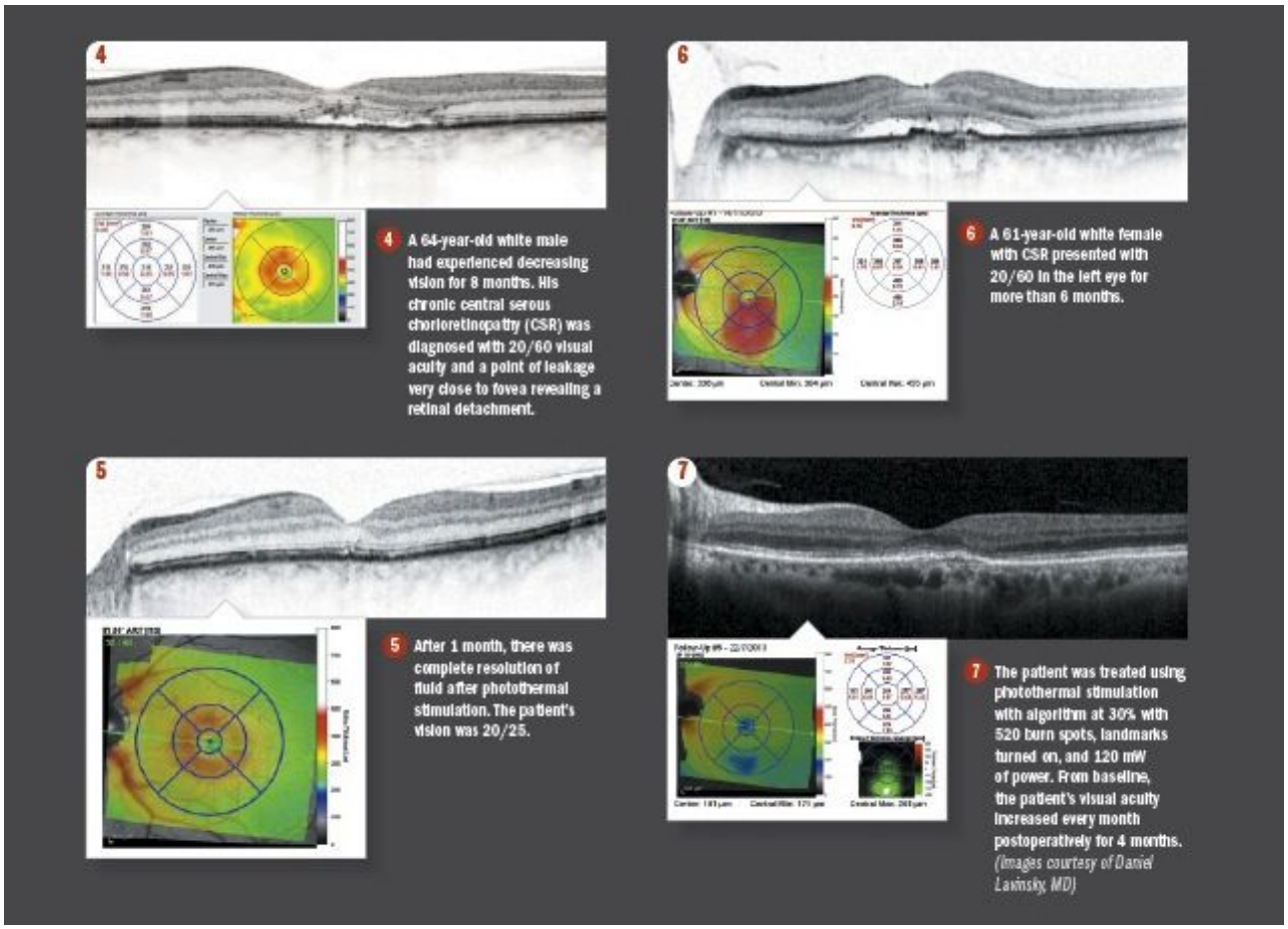
We then treated with photothermal stimulation with algorithm at a 30% setting, and landmarks set "on" with 538 burns because of the patient's chronic case. We used autofluorescence as a method of imaging to show lipofuscin of the RPE, so if we damaged the RPE cell, the barely visible burns will let us see hyper-autofluorescence burns. We could not see any hypo- or hyperautofluorescent burns when using 30% photothermal stimulation with algorithm.

After 1 month, there was complete resolution of fluid after photothermal stimulation.

In another case, a 61-year-old white female presented with 20/60 in the left eye for more than 6 months. She reported a very strange symptom of seeing "butterflies," caused by fluid in her eye. She had chronic CSR.

The patient was treated using photothermal stimulation with algorithm at 30% with 520 burn spots, landmarks turned on, and 120 mW of power. From baseline, the patient's visual acuity increased every month postoperatively for 4 months. The patient's CSR completely resolved. She

ended up with 20/20 and reported never seeing the butterflies again.



Conclusion

In the clinic, photothermal stimulation with an algorithm is a fast, accurate therapy for patients with CSR and DME. The key tangible benefit of utilizing software for advanced algorithms during laser treatment is the ability to titrate for visible burn and decrease the energy endpoint to a subvisible level.

Eye-care specialists can now treat based on the endpoint of a treatment and create a burn pattern that is visible on angiography, OCT, or completely subvisible by any clinical imaging modality with photothermal stimulation capability.

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