An Emerging Option to Treat DME

Two case studies using micropulse laser therapy.

AARON APPIAH, MD

Conservative estimates predict that 366 million people worldwide will have diabetes by 2030.[1] Diabetic retinopathy affects a third of these people, making it likely to be the principle cause of vision impairment in many countries in the not-to-distant future.[2]

The Early Treatment Diabetic Retinopathy Study (ETDRS) set focal and/or grid laser photocoagulation as the standard of care for patients with declining visual acuity due to diabetic macular edema,[3] the leading cause of visual impairment in people with diabetes.[4]

The development of pharmaceutical treatments directed toward VEGF have resulted in a number of new trials, and the reconsideration of the overall treatment algorithm to include a goal of improved visual acuity, rather than just stable visual acuity.[5]

As a result of these trials, most of my colleagues and I have begun using anti-VEGF with or without steroids as a primary treatment for DME. However, successful treatment requires frequent and continuous injections, a fact that is increasingly frustrating to physicians and patients alike.

To combat this, I have begun using micropulse laser therapy (MPLT) to treat my patients who cannot achieve a sustained resolution of DME with anti-VEGF injections.

CASE STUDY I

My first example of successful use of MPLT is with a 63-year-old white male with very aggressive refractive DME (**Figure 1**). I had administered multiple injections of bevacizumab (Avastin, Genentech, South San Francisco, CA) and triamcinolone (Triesence, Alcon, Forth Worth, TX)) and one injection of dexamethasone (Ozurdex OS, Allergan, Irvine, CA), with very little response.

I often use the two first-mentioned drugs together to address both the vascular and inflammatory aspects of DME, garnering a quicker response time. However, this patient responded only minimally, and within two to three weeks, the edema would recur.

Aaron P. Appiah, MD, practices with Capital Eye Consultants in Tallahassee, FL. Dr. Appiah reports no financial interest in any products mentioned in this article. He can be reached via e-mail at juvajor@aol.com.

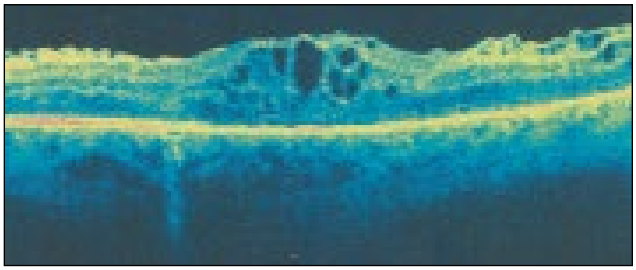

Figure 1. This 63-year-old man had very aggressive refractory DME that would not respond to anti-VEGF or steroid.

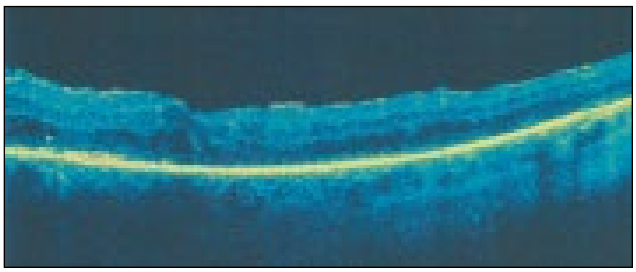

Figure 2. After treatment with MPLT, the same patient from Figure 1 showed dramatic improvement, with central retinal thickness decreasing from 438 µm to 270 µm.

I decided to perform laser photocoagulation with the Iridex IQ 532 (Iridex, Mountain View, CA) in micropulse emission mode. My laser settings were 550 mW of power, 200 msec, 5% duty cycle, and 100-µm spot size with heavy confluence around the macular area. At baseline, the patient had central retinal thickness of 438 µm as seen on OCT and visual acuity of 20/200.

Three months post-MPLT the patient had central retinal thickness of 270 µm and visual acuity of 20/60, a dramatic improvement (**Figure 2**).

CASE STUDY II

My second example is an 80-year-old woman with DME in both eyes (**Figure 3, Page 55**). Again, I had previously administered multiple injections of intravitreal bevacizumab and triamcinolone. However, the DME had not responded

CONTINUED ON PAGE 55

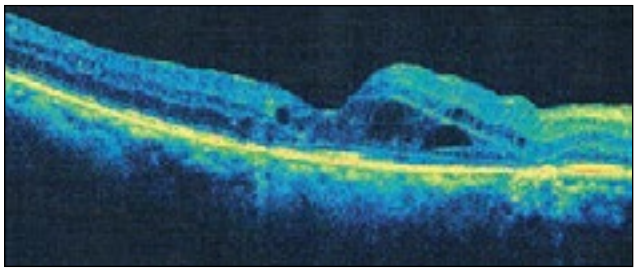

Figure 3. This 80-year-old woman had refractory DME that did not respond to anti-VEGF or steroid. Central retinal thickness was 403 µm.

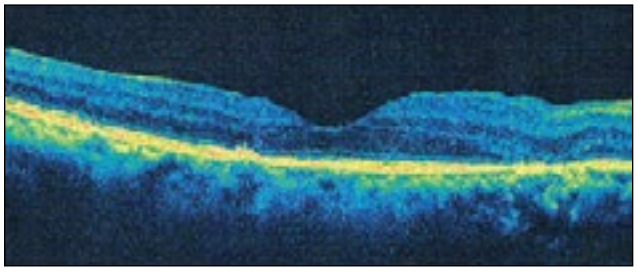

Figure 4. Three weeks post-treatment, the patient from Figure 3 had central retinal thickness decrease to 159 µm, and visual acuity improved to 20/50 from 20/60.

CONTINUED FROM PAGE 26

to the anti-VEGF therapy, and her central retinal thickness was 403 µm, with visual acuity of 20/60.

I performed MPLT with 500 mW of power, 200 msec, with a 5% duty cycle. I applied repetitive micropulses in a dense treatment pattern over the edematous area as shown by OCT. Three weeks post-treatment (**Figure 4**), the central retinal thickness had reduced to 159 µm, and visual acuity had improved to 20/50.

UNDERSTANDING MPLT

Micropulse laser is a delivery modality that "chops" a continuous-wave (CW) laser emission into tiny trains of repetitive microsecond pulses, each followed by brief rest periods. This allows the user to control the laser effects more precisely on the target tissues.

The micropulses limit the laser-induced heat from spreading to adjacent tissues, while intervals between pulses allow cooling to occur. This delivery approach reduces or eliminates tissue damage, so there is no visible burn by which to judge your treatment effect.

Initially, I created a threshold burn with the laser in CW emission mode and then switched to micropulse mode, quadrupling the power necessary to achieve the threshold burn. I have since realized that almost all of my patients can be treated using 500 to 600 mW of power at 200 msec and a 5% duty cycle.

Melanin in the choroid and hemoglobin in the blood cells absorb the laser pulses. A blond fundus has little melanin in the choroid, so it requires greater power to obtain the same treatment effect as a darkly pigmented choroid, which has greater absorption. In patients with a dark choroid, I use 500 mW of power; in patients with little pigment in the choroid, I increase the power to the 600-mW range.

Because no grayish burn occurs, physicians may wonder if they have treated the area. However, three to six weeks later, a nice result is visible without damage to the retina.

ADAPTING MY TREATMENT PARADIGM

The majority of patients will respond to anti-VEGF injections to some degree, but many will not achieve complete resolution, or their edema will resolve and then recur within three to four weeks, requiring another injection.

This is where MPLT can be a vital treatment option. In patients presenting with diffuse DME impacting the central fovea and central retinal thickness in the range of 350 µm or greater, I first perform an intravitreal injection of anti-VEGF and a steroid to reduce the swelling, and then I perform MPLT.

In my experience, MPLT seems to have longer-lasting efficacy if the central retinal thickness is first reduced below 350 µm with anti-VEGF treatment. In patients who present with focal edema and central retinal thickness of 350 µm or less, MPLT can be the initial treatment. Patients will respond well.

Patients may exhibit a response to MPLT as quickly as three weeks post-treatment. Patients with less fluid and swelling respond the quickest. However, the treatment continues to have effect for up to three months, so I wait at least that long before I determine if I need to retreat.

SUMMARY

Micropulse laser has truly revolutionized my practice, not just with DME, but also with any vascular pathology. I can safely treat right through the fovea and get a response without damaging the retina. In fact, I have actually seen retinal sensitivity improve post-treatment. The repetitive nature of anti-VEGF treatment results in significant cost and inconvenience to the patient. That ultimately compelled me to adopt MPLT.

In my opinion, MPLT is far superior to CW laser treatments, and I see much better responses in my patients. They are happier because they feel no discomfort from the treatment, there see no resulting blind spots around the fovea, and they do not have to repeat treatment so frequently. RP

REFERENCES

1. Wild S, Roglic G, Green A, Sicree R, King H. Global prevalence of diabetes: estimates for the year 2000 and projections for 2030. Diabetes Care. 2004;27:1047-1053.
2. Ding J, Wong TY. Current epidemiology of diabetic retinopathy and diabetic macular edema. Curr Diab Rep. 2012;12:346-354.
3. American Academy of Ophthalmology Retina Panel. Preferred practice pattern guidelines: Diabetic retinopathy. American Academy of Ophthalmology; San Francisco, CA, 2010.
4. Aroca PR, Salvat M, Fernandez J, Mendez I. Risk factors for diffuse and focal macular edema. J Diabetes Compl. 2004;18:211-215.
5. Bandello F, Cunha-Vaz J, Chong NV, et al. New approaches for the treatment of diabetic macular oedema. Eye. 2012;26:485-622.5.