IRIDEX

Successful Treatment of Microaneurysms Associated with DME Using a 577-nm Laser

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The treatment of diabetic macular edema (DME) has evolved over time with medical and surgical interventions increasingly being considered and employed, in addition to traditional retinal laser photocoagulation.

We had been treating DME for years with an argon green wavelength laser. In some of the offices where I treated patients, I also had access to a multicolor laser (green, yellow, and red wavelengths) and observed that with the yellow wavelength, treatment of individual microaneurysms was technically less difficult and could often be accomplished with less energy than was customary with the green wavelength. With specific difficult cases, I would have patients travel to one of these offices to be treated with the yellow solid state laser, but this was not practical for all circumstances.

The theoretical advantage of a yellow wavelength, with excellent absorption by hemoglobin and very low absorption by the xanthophylls in the fovea, had been known for years, but a portable laser for use in satellite locations was previously not available. When a portable 577-nm laser became available, it was tested then acquired for my practice. With the power output capabilities of the IRIDEX laser, we have been able to use it for all retinal photocoagulation procedures, including peripheral ablative treatments.

The following case is a good example of what I find to be a particular advantage of the 577-nm yellow wavelength—its precision in effectively treating microaneurysms with little to no alteration of the retinal pigment epithelium (RPE) underneath. Particularly as treatment approaches the fovea, it is desirable to confine the laser-induced photothermal effect to as small an area as possible in order to limit the collateral damage and spare as much of the function of the adjacent neurosensory retina.

History and examination

A 64-year old white female was referred to our office with diagnosed diabetic retinopathy. Best corrected visual acuity was 20/60 in the right eye, and no light perception in the left eye, due to an unsuccessful retinal detachment surgery at an outside institution.

A fundus exam confirmed the presence of clinically significant macular edema in the right eye, with a focal area of swelling with several microaneurysms and a ring of fatty yellow deposits around them that is characteristic of significant leakage. Diagnostic evaluation with optical coherence tomography (OCT) (Figs 1, 2) and fluorescein angiography confirmed that microaneurysms were the primary etiology of the edema and that significant tractional or diffuse permeability components were not apparent.

Treatment

The patient was taken to the laser suite, where individual microaneurysms were photocoagulated with the IRIDEX IQ 577™ laser, using the angiogram as a guide to their location. Using a 50-µm spot size, a microaneurysm that was distant from the fovea was treated initially to determine whether the initial power of 120 mW was adequate. In this case, the ocular media were relatively transparent, and the response was a little stronger than desired, so the power was lowered to 100 mW for the remainder of the applications. A total of 13 laser applications were performed, using the parameters described in Table 1.

Result

When the patient returned for follow-up three months after treatment, the edema had resolved (Figs 3, 4) and the vision improved to 20/30, with minimal visible laser application alterations at the level of the RPE. Furthermore, this patient did not complain of “blind spots” due to small scotomas that are quite common from patients who have been treated with other laser wavelengths near the center of the macula.

We will continue to follow this patient every 4 months to monitor her diabetic retinopathy.

TABLE 1: TREATMENT PARAMETERS

IRIDEX IQ 577 for Microaneurysms in DME

Wavelength:	577 nm
Emission Mode:	Continuous-wave
Slit lamp adapter spot size:	50 µm
Spot size on retina:	50 µm
Power:	100 mW
Exposure duration:	50 ms
Total spot delivery:	1-3 applications per microaneurysm
Endpoint:	Blanching of microaneurysm

Discussion and treatment pearls

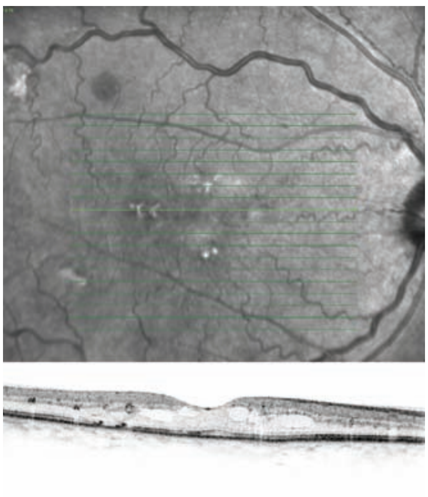
As with any laser, the power needed with the 577-nm yellow laser is patient variable. It is in part dependent on fundus pigmentation, quality of the ocular media and how edematous the retina is.

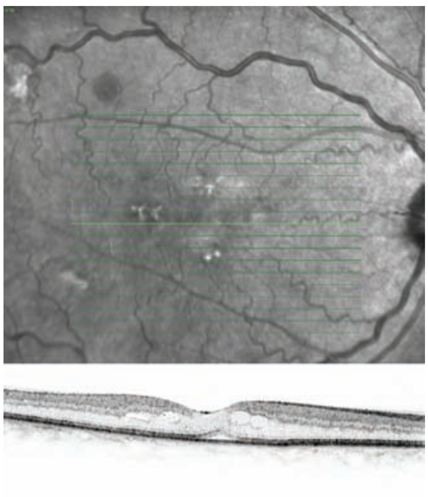
Using a 50-µm spot size, I always begin with 120 mW and will decrease it to 100 mW as in this case, or even less, if the blanching effect in the initial peripheral applications is stronger than anticipated. In the occasional case with extensive edema and media opacification, I may increase the power in increments to 200 mW and occasionally higher. For similar situations, this is usually less power than I would have used with a 532-nm green laser. With the 532-nm green wavelength, I would start with a larger 75-µm spot size at 200 mW power, and would very commonly have to go quite a bit higher in power to achieve the desired clinical endpoint.

With the yellow wavelength and improved absorption, I have been able to utilize a smaller spot size with a reduced power and still obtain blanching of the microaneurysm, with less visible blanching of the underlying RPE or edema of the surrounding retina. With this smaller and precisely focused laser beam, treatment is less difficult and often takes less time. If the patient is good at maintaining fixation, I can often treat the microaneurysm with just a single application; others may require two or more applications.

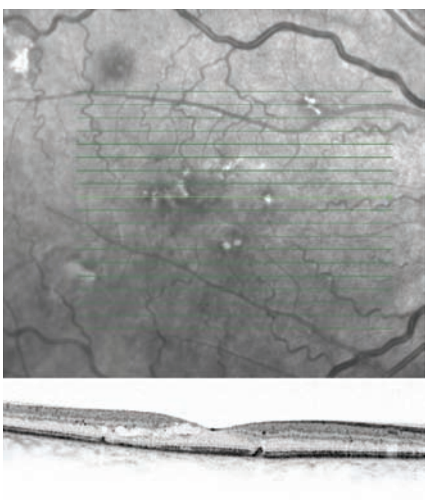
I am currently using the IRIDEX IQ 577 yellow laser in its continuous-wave (CW) emission mode only, but this laser can also be operated in MicroPulse™ emission for subthreshold applications with no visible endpoint. Preliminary results with this laser in MicroPulse mode are encouraging, and it is not surprising that biological effects could be elicited with subthreshold treatments avoiding the well known collateral effects of conventional laser photocoagulation. I look forward to further published data on appropriate parameters for MicroPulse in macular treatments.

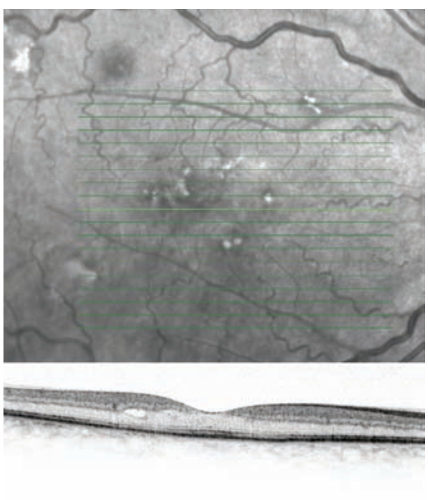
In the case described here, the edema was almost purely the result of leaking microaneurysms. In cases that appear to have a more mixed etiology, perhaps complicated by components of diffuse capillary "oozing" or vitreous traction, I consider treating the microaneurysms with the laser initially, but would bring the patient back sooner, at two months, to determine the effectiveness of the laser and to what extent treatment with other modalities, such as vascular endothelial grown factors, inhibitors, steroids, or surgery, might be indicated.





Figures 1 and 2. Pre-treatment. OCT confirms the presence of microaneurysms.





Figures 3 and 4. Two months post-treatment, the edema had resolved with minimal visible laser application alterations at the level of the RPE.