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An Exciting Journey in SubLiminal Laser Treatment Therapy for DME

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DME is one of the most common causes of sight-threatening retinopathy for people with diabetes, which currently affects more than 30 million people worldwide.[1] As the prevalence of diabetes and vision diseases related to diabetes continues to rise, so does the burden it creates on health care systems.

Treatment options for DME vary as we continue to learn more about its pathogenesis and molecular pathways. These new insights have led to innovative clinical trials where we've learned a significant amount about different treatment protocols. Results offered from the Early Treatment Diabetic Retinopathy Study (ETDRS) research group led to laser photocoagulation becoming the initial mainstay treatment for DME.[2] Since then, the industry has introduced corticosteroids, anti-VEGF therapy injections, laser therapies, and several combinations thereof to treat DME. While all these are important tools when developing an appropriate treatment response, laser therapy is becoming increasingly relevant, including SubLiminal laser therapy (Quantel Medical).

SubLiminal laser therapy is a modern subthreshold laser that employs a customizable pattern grid selection and delivers treatment through a succession of short, microsecond-long pulses of laser instead of the usual "continuous" beam of conventional laser. This allows for cooling of the retinal pigment epithelium (RPE) between pulses, preventing a critical amount of heat from accumulating in the tissue and the consequential RPE and retinal scarring which we know to be unnecessary to attain a therapeutic response[3] and to limit the possibilities for future retreatments. Repeatability and safety are the two leading advantages of treating DME with subthreshold SubLiminal laser therapy versus conventional laser.

SubLiminal laser therapy also provides an option for making physicians less dependent on intravitreal therapy. SubLiminal laser therapy is a strong option for patients with a mild to moderate exudative/inflammatory edema, saving injections and associated risks and costs, as well as decreasing the number of visits.[4] Concerning the application technique, the learning curve is relatively flat compared to conventional macular laser. Particular considerations involve the treatment of large areas to stimulate a significant response from the targeted RPE cells. To treat these areas densely and avoid leaving "blank spaces," the goal is to recruit every cell in the treatment area to "work for you." It is important to note that insufficient spots have been identified as the number one cause for treatment failure.[5]

When treating DME with SubLiminal laser therapy the OCT thickness map should guide your treatment area. The power to use in each patient should be individually titrated for efficacy and safety purposes. We titrate at one-third of the minimum energy to cause a barely visible burn in the peripheral healthy macula. The rest of the parameters can be universalized (spot size 160 µm, 5% duty cycle). Also, we like to avoid transfoveal treatment. The fovea represents a small area, so leaving it out of the treatment plan will not affect your outcomes and will add an extra safety step especially when you begin delivering these treatments. Evaluate your results using OCT (pay attention to the thickness map) as well as autofluorescence to check for any disturbance of the RPE indicating too much power was employed ("suprathreshold" treatment).

RATIONALE OF SUBLIMINAL LASER TREATMENT FOR DME

Steroids are the most powerful tool available for local treatment of DME, but they also cost the most both in terms of raw costs and intraocular complications. Anti-VEGF is less powerful than steroids and at a lesser cost comes with fewer intraocular complications including a very mild (but nevertheless present) risk of endophthalmitis. Continuous-wave (conventional) laser photocoagulation while way more affordable (and weaker) than the aforementioned alternatives comes with potentially dangerous side effects including epiretinal fibrosis, choroidal neovascularization, and enlargement of laser scars which as mentioned will limit your chances of retreatment.[6] Subthreshold lasers offer a safer, more efficient treatment profile than continuous-wave laser photocoagulation while remaining in the lower-cost scale. The question then becomes, regardless of its cost why would we choose SubLiminal laser therapy, which offers less "antiedema" power over intravitreal treatment options? The answer is that DME manifests itself in many different degrees, and a significant number of our patients present with mild to moderate edema with potential for deterioration. SubLiminal laser therapy might be all you need to treat DME safely, effectively, and efficiently in these cases, both to achieve improvement and to prevent them from advancing to more severe phases. When considering SubLiminal laser therapy, good patient selection is key. Inflammatory/exudative edema without relevant ischemia is a strong patient selection target. Predominantly ischemic edema will not respond well to the stimulation targeted by SubLiminal laser therapy. The following are the scenarios most likely to benefit from SubLiminal laser treatment in DME.

CLINICALLY SIGNIFICANT EXTRAFOVEAL EDEMA

The edema, in these cases, is distant enough from the fovea to keep the central vision safe. The benefit of using SubLiminal laser therapy in cases like this is the durability and repeatability of the laser treatment since there is no damage to the RPE as well as to prevent further central threatening deterioration (Figure 1).

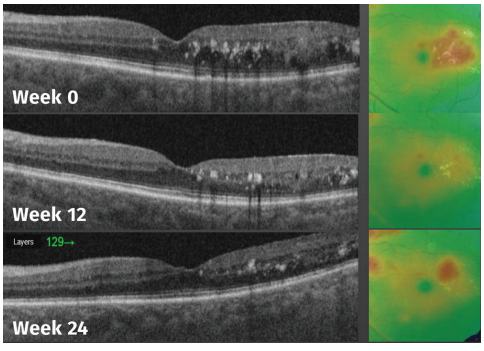

Figure 1. Clinically significant extrafoveal edema (weeks 0, 12, 24).

COMBINATION TREATMENT IN THICKER FOVEAE/DECREASED VISUAL ACUITY

Combination therapy is an interesting scenario for SubLiminal laser therapy. When the fovea is deeply involved and the vision is damaged, you do not want to lose time. My recommended course of therapy is to "dry" the fovea as quickly as possible. This involves using intravitreal therapy as first-line treatment and once the fovea has been restored then you can move forward with SubLiminal laser therapy as a consolidation therapy. It is difficult to know how many injections the patient may need; every case must be assessed individually (Figure 2).

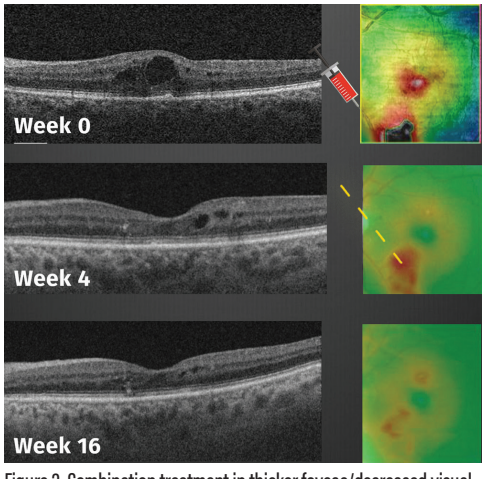

Figure 2. Combination treatment in thicker foveae/decreased visual acuity: weeks 0 (injection day), 4 (laser day), and 16.

FOVEA-INVOLVING MILD EDEMA

Patients with a fovea-involving mild edema are my favorite for SubLiminal laser because it offers a game-changing alternative. These patients are at risk. The vision is still good at this point and the use of anti-VEGF won't be too cost-effective (not to mention that an endophthalmitis in a 20/20 eye, although rare, is a disaster). Using conventional laser so close to the fovea is unadvisable, but SubLiminal laser can work very close to the fovea. SubLiminal laser makes a significant difference in the growing severity of the edema and potentially reduces the need for future intravitreal injections. We conducted a short case study series (publication pending) of patients with fovea involved and good vision with successful results both in terms of effectiveness and safety. From week 1 to 12, the central retinal thickness decreased an average of 16 µm (P = .001), and from week 1 to the end of follow-up we saw an average decrease of 22 µm (P = .0003). OCT showed the edema had completely resolved in 30% of the cases after the first SubLiminal laser therapy treatment and significantly improved for 50% of the cases. At the end of the follow-up, a total of 56% of cases were resolved. Not one of the treated patients experienced deterioration requiring intravitreal treatment (Figure 3). This must be compared to the DRCR protocol V results,[7] where 34% of the patients with foveal edema and good vision who were in the observation arm eventually deteriorated and required intravitreal therapy.

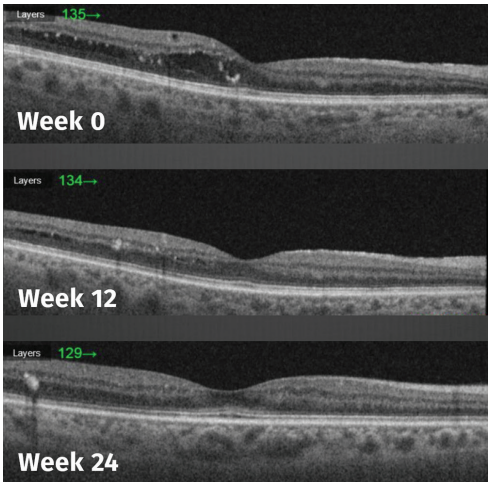

Figure 3. Fovea-involving mild edema with good vision (weeks 0, 12, 24).

CONCLUSION

I have been using the Easyret 577-nm SubLiminal laser (Quantel Medical) for nearly 3 years, and it has been an exciting journey. SubLiminal laser therapy is an advanced technology and therapeutic tool to treat DME patients and decrease the burden of monthly visits and costly injections. In my experience, the more I utilize SubLiminal laser therapy for DME, the more encouraging the outcomes are. DME is a complex disease that requires careful examination, monitoring, and treatment to gain a good response. SubLiminal, as with any subthreshold laser therapy, is more surgical than medical retina therapy, so your personal experience is vital, and you must face the learning curve. It is key to understand the laser parameters and adhere to the treatment guidelines. I can assure you, it is a voyage worth the cost. ■

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