MODULE 9.7
Laser Photocoagulation

Until the introduction of anti–vascular endothelial growth factor (anti-VEGF) agents, laser photocoagulation had been the primary treatment for diabetic macular edema (DME).[1,2] This method involves the application of small (50- to 100-µm) laser burns directly to leaking microaneurysms (MAs; focal) and scattered through regions of diffuse retinal thickening (grid). The precise mechanism of action of this technique is not completely understood, but it may involve direct closure of MAs (thermal effects), reduced retinal oxygen demand due to targeted destruction of the outer retina, and/or a resultant increased oxygen delivery to the retina caused by laser-induced damage to the retinal pigment epithelium.

The Early Treatment of Diabetic Retinopathy Study (ETDRS) defined the term clinically significant macular edema (CSME).[3] The ETDRS demonstrated that focal laser treatment of CSME decreased the risk of vision loss by approximately 50%, increased the chances of visual improvement, decreased the frequency of persistent diabetic macular edema (DME), and caused only minor visual field losses. The clinical utility of focal laser was confirmed when the Diabetic Retinopathy Clinical Research Network (DRCR.net) released 2- and 3-year results of a large trial comparing intravitreal triamcinolone acetonide, 1 mg and 4 mg, and focal laser photocoagulation.[3] After 2 years, treatment with laser was associated with more favorable visual acuity (VA) outcomes and fewer adverse events than treatment with either dose of triamcinolone acetonide. Laser treatment provided visual stabilization and slight improvements in VA. Short-duration pattern-scanning laser macular photocoagulation has also been shown to have similar effectiveness in the treatment of CSME.[4]

Some studies suggest that the combination of anti-VEGF agents and delayed laser therapy may provide advantages in visual outcomes for patients with DME. You'll learn more about these in Module 10.

Conventional laser treatment (eg, with an ophthalmoscopically visible end point) is a known cause of anatomical and functional chorioretinal damage.[6] Some of the complications associated with conventional laser treatment include:

- Decreased:
  - VA
  - Visual field
  - Night Vision
  - Contrast sensitivity
- Pain
- Choroidal neovascularization
- Hemorrhage
- Epiretinal fibrosis
- Serous detachment of the peripheral retina

Laser technologies are evolving, and the new instruments are being designed to cause less damage to the retina (Table 1). Micropulse laser (MPL) produces multiple short bursts of laser that cause less thermal diffusion and more targeted damage to the retinal pigment epithelium (RPE), with less adjacent injury to the photoreceptors and choriocapillaris.[1] MPLs produce "subthreshold" retinal photocoagulation that is biomicroscopically invisible at the time of treatment. This technique may reduce some of the potential complications that can be observed with conventional laser systems, such as paracentral scotoma and scar enlargement. Although MPL technology may provide advantages over previous laser technology, it is yet to be established as a definite improvement. Although the preliminary results look promising, MPLs have yet to be widely adopted into clinical practice for the treatment of DME.

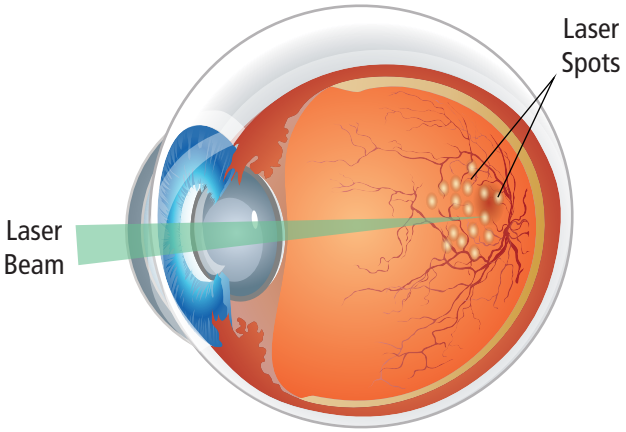
Table 1: Evolution of Laser Therapy

Traditional PRP	Current PRP
• Argon green 514 nm • 200-500 µm • 100 msec • 1200-1500 burns • Repeat sessions • 57%-77% show some regression of neovascularization in 6 months	• Neodymium YAG 532 nm • PASCAL • 20-30 msec • Increase number of spots required to achieve neovascular regression at the rat of traditional approach • Burns smaller size

Laser Therapy

During laser therapy, areas of leakage in the retina are exposed to small laser burns that decrease the quantity of fluid and slow down leakage.

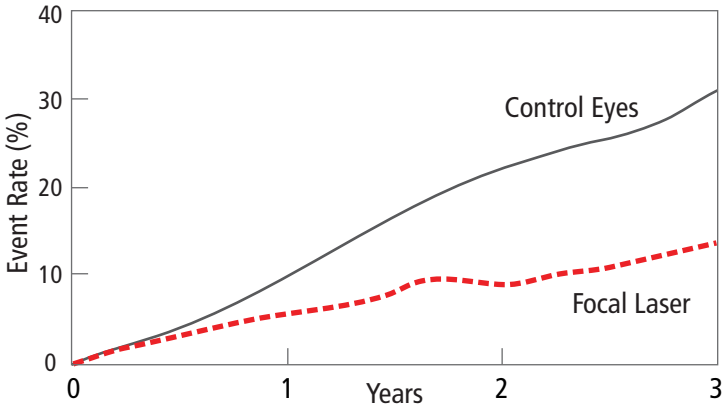
Laser therapy has been, until recently, the standard treatment for DME. It stabilizes vision and can prevent vision loss caused by DME, but rarely improves visual acuity.



Focal laser photocoagulation

Photocoagulation for diabetic macular edema. Early Treatment Diabetic Retinopathy Study report number 1

The published results of the effect of focal/grid laser therapy on moderate vision loss due to DME is usually overstated as a 50% reduction in vision loss. This 50% is actually a relative risk reduction. The actual results at 3 years were 3 lines of vision loss for 24% of the control group and 12% for the laser-treated group. Therefore, the absolute risk reduction is only 12%.



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References

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