could go unnoticed since the mfVEP might not have a detectable amplitude in either case. However, since the latency changes frequently occur at the perimeter of the field deficit, and if we posit that in the presence of normal amplitudes they may represent the earliest detectable damage, changes in latency could signal the subtlest progression or recovery of disease.

As with all theory and conjecture, validation or rejection by experimentation is required. Semela *et al.*'s findings invite several interesting questions on the significance and relevance of latency shifts in compressive neuropathies. It is easy to hypothesise about them, but only further experimentation will provide real answers.

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Combined triamcinolone acetonide injection and grid laser photocoagulation

Combined triamcinolone acetonide injection and grid laser photocoagulation: a promising treatment for diffuse diabetic macular oedema?

Tomohiro Iida

Diabetic macular oedema is a major cause of visual loss in patients with diabetes. The Early Treatment of Diabetic Retinopathy Study showed that focal laser photocoagulation reduced moderate visual loss in eyes with clinically significant macular oedema.^{1–3} The efficacy of grid photocoagulation for treatment of diffuse diabetic macular oedema was reported in the 1980s.^{4–6} Those studies reported resolution of macular oedema and stabilisation or improvement of visual acuity (VA). Eyes treated with conventional grid photocoagulation for diffuse macular oedema, however, developed progressively expanding laser scars that resulted in decreased vision,⁷ subretinal

fibrosis⁸ and visual field loss.^{6–9} Lee and Olk¹⁰ reported that VA improved in 14.5% and was unchanged in 60.9% of eyes with diffuse macular oedema treated with grid laser photocoagulation. However, the VA decreased by three lines or more in 24.6% of eyes. The limited efficacy of grid laser photocoagulation for treatment of diffuse macular oedema prompted interest in modified methods of grid photocoagulation and other treatments such as steroid injections and pars plana vitrectomy.

In eyes with diffuse diabetic macular oedema, retinal opacification, macular swelling and fluid accumulation prevent the transmission of laser energy to the outer retina and the retinal pigment

epithelium. Conventional grid laser photocoagulation, in which grey–white spots are applied around the fovea, causes intense retinal damage in the macular area. Innovations in photocoagulation technology have focused on improved laser instruments and laser techniques. Laser damage can be decreased by reducing the duration of laser exposure and by using subvisible clinical endpoint laser photocoagulation.^{11–13} Luttrull *et al.*¹³ studied the visual and clinical outcomes of subthreshold diode micropulse laser photocoagulation in eyes with diabetic macular oedema. This method minimised retinal and choroidal damage and had a beneficial effect on VA and resolution of macular oedema.

Intravitreal injection of triamcinolone acetonide has been reported to improve VA and to reduce the macular thickness in eyes with diffuse diabetic macular oedema.^{14–18} However, the beneficial effect on vision and macular thickness does not persist in long term. Massin *et al.*¹⁸ reported the results of a prospective controlled study of intravitreal triamcinolone acetonide, which showed that one intravitreal injection of triamcinolone acetonide reduced the macular thickening due to refractory diffuse diabetic macular oedema in the short term. All eyes that were injected with triamcinolone acetonide had a dramatic

anatomical improvement of the macular oedema compared with control eyes. However, the difference between the central macular thickness of the treated and control eyes was no longer significant at 24 weeks after treatment because of the recurrence of macular oedema in the treated eyes. Similar recurrences of macular oedema have also been reported.^{15-17, 19} The recurrence of macular oedema is related to the disappearance of triamcinolone acetonide from the vitreous. Beer *et al*²⁰ calculated that measurable concentrations of triamcinolone acetonide would be expected to last for no more than 3 months in non-vitreotomised eyes after a 4 mg intravitreal injection. Recurrence of macular oedema can be treated with repeat intravitreal injections.^{17, 21} However, Chan *et al*²² reported that a repeat 4 mg intravitreal injection of triamcinolone acetonide might not be as effective as the initial injections, even in patients who initially responded well to the treatment. In this chronic disease, the need to repeat intravitreal injection may also increase the risk of complications such as raised intraocular pressure, cataract development and endophthalmitis.

Triamcinolone acetonide delivered through the posterior sub-Tenon has also been used to treat diabetic macular oedema.^{23, 24} The advantages of a sub-Tenon injection include a lower risk of complications. Although sub-Tenon injections were reported to effectively reduce macular oedema, the efficacy was likely to be temporary.

In this issue of the journal, Shimura *et al*²⁵ (see page 449) prospectively evaluated the efficacy of a sub-Tenon injection of triamcinolone acetonide before application of grid laser photocoagulation in eyes with diffuse diabetic macular oedema. In this study, to reduce intrinsic damage from visible endpoint laser photocoagulation applied to an oedematous retina, the investigators proposed triamcinolone acetonide-assisted grid photocoagulation. The authors describe an interesting and well-conducted study that showed that patients previously treated with triamcinolone acetonide require less laser power and have fewer adverse clinical side effects from grid laser photocoagulation than patients treated with laser alone. Triamcinolone acetonide-assisted grid photocoagulation maintained the improvement in macular thickness and VA for up to 24 weeks without recurrence of the macular oedema.

Recently, Kang *et al*²⁶ also studied the clinical outcomes of macular grid laser photocoagulation performed 3 weeks after an intravitreal injection of triamcinolone acetonide for diffuse diabetic macular oedema. This combination therapy seemed to improve the VA and to

reduce the central macular thickness at 3 and 6 months after treatment compared with an intravitreal injection only. Although further study is required to determine the long-term effectiveness, these results indicate that combination therapy of a triamcinolone acetonide injection and grid laser photocoagulation maintains improved VA, reduces the risk of recurrent macular oedema, and prevents retinal damage in eyes with diffuse diabetic macular oedema.

After an intravitreal or a sub-Tenon injection of triamcinolone acetonide, the decreased foveal thickness and restoration of retinal transparency facilitate adequate laser application to the outer retina and the retinal pigment epithelium. The presence of triamcinolone acetonide also might suppress the photocoagulation-induced inflammation. Tunc *et al*²⁷ reported that a sub-Tenon injection of triamcinolone combined with focal laser photocoagulation on the same day improved early (18 weeks) visual outcomes of diffuse diabetic macular oedema, compared with macular focal and grid laser treatment. Combined triamcinolone injection and macular laser photocoagulation might be a promising therapy for diffuse diabetic macular oedema and other retinal vascular diseases.

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