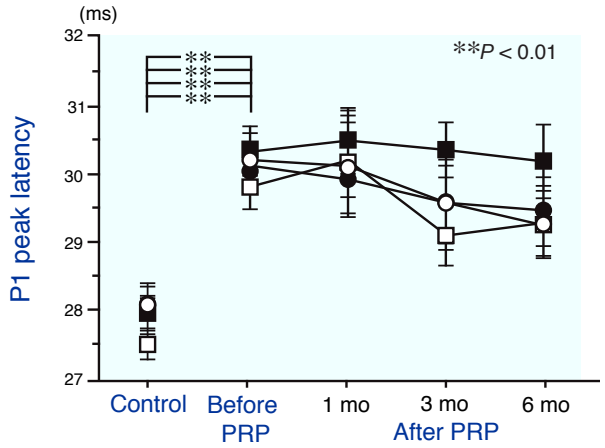


Fig. 4. Changes in the P1 peak latencies of the mfERG obtained from 4 mfERG areas in 14 diabetic eyes before and after PRP. The diabetic eyes were derived from 9 patients with preproliferative or early proliferative diabetic retinopathy showing no clinically significant macular edema in this series. All values were expressed as mean ± SEM. Each bar indicates SEM. ** indicates $P < 0.01$ by Mann-Whitney's U test. PRP, panretinal photocoagulation; mo, month(s). Control: 15 normal control eyes of 14 healthy volunteers.

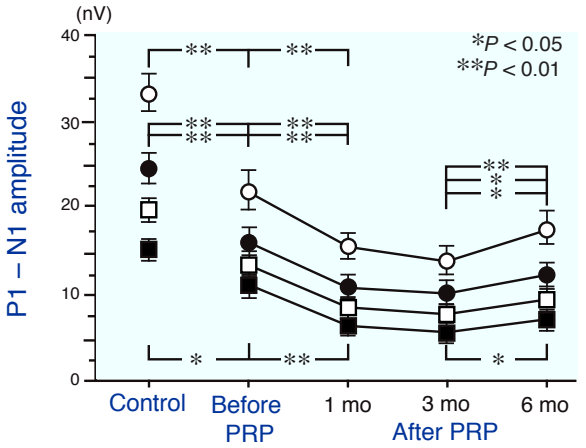
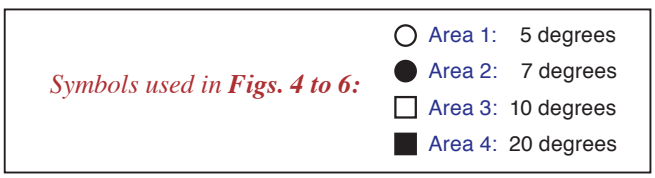


Fig. 5. Changes in the P1 – N1 amplitudes of the mfERG obtained from 4 mfERG areas in 14 diabetic eyes before and after PRP. All values were expressed as mean ± SEM. Each bar indicates SEM. * indicates $P < 0.05$, and ** indicates $P < 0.01$ by Mann-Whitney's U test. PRP, panretinal photocoagulation; mo, month(s). Control: 15 normal control eyes of 14 healthy volunteers.



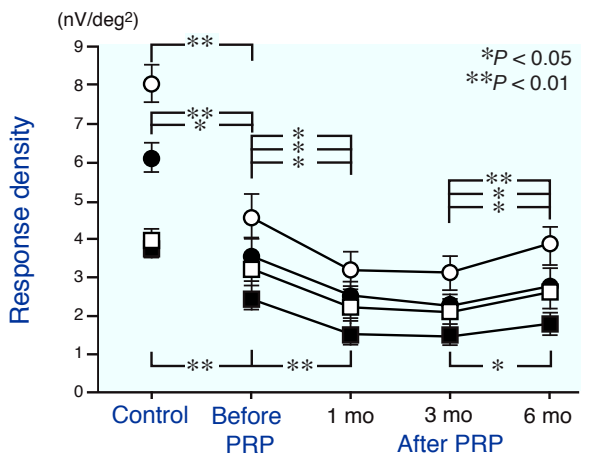


Fig. 6. Changes in the mean response density levels of the mfERG obtained from 4 mfERG areas in 14 diabetic eyes before and after PRP. All values were expressed as mean ± SEM. Each bar indicates SEM. * indicates $P < 0.05$, and ** indicates $P < 0.01$ by Mann-Whitney's U test. PRP, panretinal photocoagulation; mo, month(s). Control: 15 normal control eyes of 14 healthy volunteers.

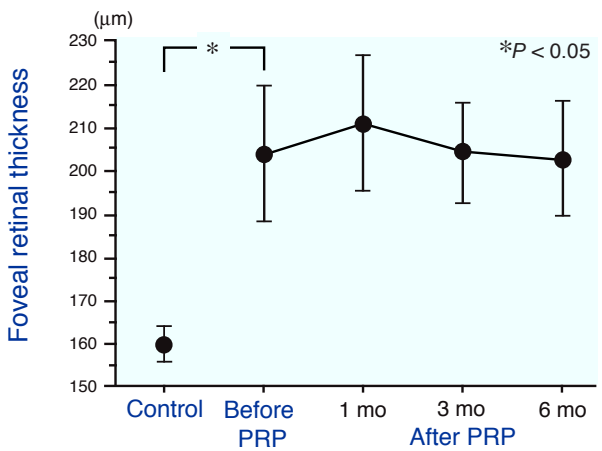


Fig. 7. Changes in the mean foveal retinal thickness within 5 degrees on OCT in 14 diabetic eyes before and after PRP. All values were expressed as mean ± SEM. Each bar indicates SEM. * indicates $P < 0.05$ by Mann-Whitney's U test. PRP, panretinal photocoagulation; mo, month(s). Control: 16 normal control eyes of 12 healthy volunteers.

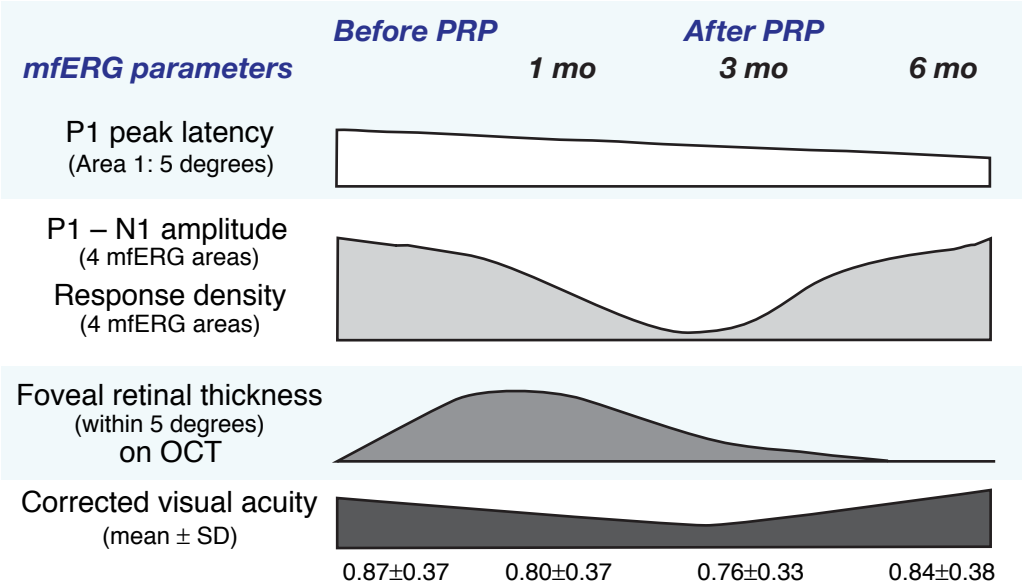


Fig. 8. Summarized data obtained in the present study before and after PRP in 14 diabetic eyes. In the mfERG parameters, the P1 peak latency from the area 1 (within a central radius of 5 degrees), the P1 – N1 amplitudes and the mean response density levels from the 4 mfERG areas are presented at 1, 3 and 6 months after PRP following each data before PRP in addition to the mean foveal retinal thickness within 5 degrees on OCT. The mean corrected visual acuity in the 14 diabetic eyes is also presented throughout the course. PRP, panretinal photocoagulation; mo, months(s).

same tendency as in the P1 – N1 amplitudes, as shown in Fig. 6. That is, the mean response density levels from the 4 areas were remarkably decreased in the 14 diabetic eyes before PRP as compared with those in the 15 control eyes at the 1% or 5% level, followed by a maximum decrease in the parameter at 3 months after PRP. However, remarkable recoveries were detected in the mean response density levels from the 4 areas at 6 months after PRP at the 1% or 5% level.

The mean foveal retinal thickness within 5 degrees on OCT was significantly increased in the 14 diabetic eyes before PRP as compared with the thickness in the 16 control eyes of the 12 healthy volunteers at the 5% level. Most remarkably, a transient increase in the thickness was detected in the diabetic eyes at 1 month after PRP, followed by a tendency for recovery at 3 to 6 months after PRP (Fig. 7).

Discussion

As summarized in Fig. 8, in the mfERG parameters, the P1 peak latency from the area 1 (within a central radius of 5 degrees) was markedly prolonged in the 14 diabetic eyes before PRP as compared with that in the 15 control eyes, but a tendency for recovery was detected throughout the course after the procedure (Fig. 4).

The P1 – N1 amplitudes and the mean response density levels from the 4 mfERG areas were remarkably decreased in the diabetic eyes before PRP as compared with those in the control eyes, followed by a maximum decrease in both parameters at 3 months after PRP. However, remarkable recoveries were detected in both decreased parameters from the 4 areas at 6 months after PRP (Figs. 5, 6 and 8).

The mean foveal retinal thickness within 5 degrees on OCT was remarkably increased in the diabetic eyes before PRP as compared with the

thickness in the 16 control eyes. Most remarkably, a transient increase in the thickness was detected in the diabetic eyes at 1 month after PRP, followed by a tendency of recovery at 3 to 6 months after the procedure (Figs. 7 and 8).

This time, statistical analysis was not undertaken on the correlation between the corrected visual acuity and each data from the mfERG or OCT examinations before and after PRP in each diabetic eye due to the relatively small number of samples. However, as demonstrated in Fig. 8, it is of note that the mean corrected visual acuity before PRP in the 14 diabetic eyes showed a gradual decrease at 1 month, followed by a maximum decrease at 3 months and a tendency of gradual recovery at 6 months after the procedure in each mean corrected visual acuity in those eyes, as in the changes in the P1 – N1 amplitudes and the mean response density levels of the mfERG obtained from the 4 mfERG areas in the 14 diabetic eyes before and after PRP.

The OCT findings showed no coincidental changes between mean foveal retinal thickness and mean corrected visual acuity in the 14 diabetic eyes throughout the course after PRP. However, tendency of recovery in mean foveal retinal thickness at 3 to 6 months after PRP may reflect a reversible foveal function resulting in a gradual recovery of the mean corrected visual acuity at 6 months after the procedure in diabetic eyes (Fig. 8), although we need to do further investigation on this point in more subject patients.

The mfERG derived from the fundus area, especially within 5 degrees of the central portion (Area 1) is supposed to reflect a cone-dominated response, which originates predominantly in the outer 70% of the retina, as in the full-field flash ERG (Hood et al., 1997; Palmowski et al., 1997; Fortune et al., 1999).

Optical coherence tomography provides noninvasively a cross- sectional tomographic image of the retina as described above and is more sensitive to small changes in retinal thickness than slit-lamp biomicroscopy (Hee et al., 1995, 1998; Kang et al., 2004).

Thus, the results obtained in the present survey indicate that the mfERG and OCT examinations are useful for assessment of macular function before and after PRP in diabetic retinopathy, especially within 5 degrees of central portion, and that the effects of PRP on the macular function in this entity seem to be reversible at the foveal region, although we need a further investigation in relation to the outcome of visual acuity.

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