The influence of intravitreally injected silicone oil on electrophysiological potentials of the eye

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Abstract. In a prospective study the effect of silicone oil injected in the vitreous cavity was monitored electrophysiologically in six patients who were treated for retinal detachment. Electroretinograms (ERG) and electrooculograms (EOG) were recorded before, shortly after, and up to four months following the removal of the oil. An evident increase of the standing potential could be observed in all eyes after removal of the silicone oil. In some patients the ERG amplitudes increased also. No fast oscillations and virtually no slow oscillations could be recorded in the EOG. Follow-up studies did not show a significant recovery of the bioelectric activity. Intravitreal silicone oil appears to cause an insulation effect which interferes with the propagation of electrical potentials. The result of the present study do not provide information concerning possible retinotoxic effects of silicone oil.

Introduction
Silicone oil injected into the vitreous cavity reduces the amplitudes of the electrophysiological potentials of the eye. A toxic side effect of silicone oil impairing the neuroretina has been assumed responsible for the reduction of ERG and EOG amplitudes (Lee et al., 1969; Mukai et al., 1972, 1975). Esser, Foerster and Laqua (1982) and Momirov, van Lith and Živojinović (1983) proposed an insulation effect of silicone oil to impede the distribution of the electrical potentials of the eye causing reduced electrophysiological amplitudes.

Methods
Six patients were examined before, shortly after (less than 24 h), and up to four months following the removal of silicone oil from the vitreous cavity. Scotopic ERGs were elicited following 5 min of dark adaptation by rectangular light stimuli of 10 msec duration and 65 cd/m² light intensity. 10 ERGs were averaged. Photopic ERGs and off-responses were elicited after 3 min of light adaptation to 65 cd/m² by rectangular light (65 cd/m² intensity) and dark stimuli of 0.3 sec each. One hundred responses were averaged.
Thirty minutes of dark adaptation preceded the recording of the slow oscillation in the EOG. The intensity of the rectangular light stimulus was 850 cd/m². Following the recording of the slow oscillation five fast oscillations were elicited by rectangular light (850 cd/m² intensity) and dark stimuli of 1.1 min each and averaged.

Figure 1—4. Electrophysiological recordings of a patient with intraocular silicone oil implant. Tracings: 1st tr. = reference eye, 2nd tr. = recording before removal of silicone oil, 3rd tr. = recording 24 h after removal of silicone oil, 4th tr. = follow-up recording 4 months later, 5th tr. = light stimulus, 6th tr. = calibration. (1) Scotopic ERG. Cal. = 100 µV, 0.03 sec. (2) Photopic ERG. Cal. = 100 µV, 0.06 sec. (3) Slow EOG oscillation. Cal. = 850 µV, 1.6 min. (4) Fast EOG oscillation. Cal. = 850 µV, 0.22 min.