Evaluation of Visual Function in a Case of Traumatic Leukoma and Cataract* **

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Summary. Eight psychophysical tests were used to evaluate visual function in a patient with dense opacities of the cornea and lens. Hue discrimination, dark adaptation and increment thresholds yielded quantitative data on the extent of cone and rod function. After removal of the cataractous lens, visual field size could be determined by kinetic perimetry. With eye pursuit movement, profile and flicker perimetry, some information was also obtained on foveal performance and meridional distribution of visual sensitivity. These measurements were compared with results obtained after implantation of a keratoprosthesis. They show that psychophysical procedures can be useful in establishing the postoperative prognosis in patients with opaque optic media. Such tests, therefore, should be combined with objective methods of examination.

Introduction

In patients with severely scarred corneas the final decision to proceed with transplant surgery is based on the state of a candidate's light sense. Traditionally, eyes with obscured fundi and no measurable visual acuity are examined by one or several of the following tests: (a) light perception; (b) color perception; (c) spatial projection in response to direct or transcleral illumination and fixation reflex; (d) perception of entoptic phenomena induced by light, pressure, electricity or x-rays; (e) infrared pupillometry and contralateral pupil reflex; (f) electroretinography; (g) recording of the visually evoked cortical potential and (h) ultrasonography.

Unfortunately, little specific information can be derived from the results of such an examination. In order to demonstrate that more
refined data on sensory function may be obtained, psychophysical methods were used to test the vision of a patient with dense opacities of the cornea and lens. Although there have been several reports on the significance of the electroretinogram (ERG) and visually evoked cortical potential (VECP) in cases of cataract, leukemia and vitreous hemorrhages (Straub, 1961; Burian and Burns, 1966; Jayle, Tassy and Graveline, 1968; Jayle and Tassy, 1970; Fricker, 1971), only a few authors have studied visual performance after these ocular changes with subjective procedures (Harrington, 1964; Duke-Elder, 1969; Goldmann and Lotmar, 1970; Green, 1970). The main reasons for this hesitation are the alleged inability of such patients to maintain proper fixation, their blurred vision and the problem of comparing the results with normal standards.

Case History

The patient was a 45-year-old man who had suffered severe burns in a propane gas explosion. Vision remained good for about 2 weeks after the accident when Pseudomonas keratitis and increased intraocular pressure were noticed in both eyes. Shortly thereafter the left globe ruptured, causing extrusion of cornea and lens and total loss of vision. A small perforation in the right eye apparently healed. However, the cornea became increasingly opaque and vascularized until only light perception remained.

One year after the accident the patient was examined at the Cornea Service of the Massachusetts Eye and Ear Infirmary. In the right eye lids, tear meniscus and conjunctiva were normal. The cornea was densely scarred and totally opaque with superficial and deep vascularization. Corneal scarring prohibited ophthalmological examination of the anterior chamber and the posterior structures. The left eye was phthisical and enophthalmic.

Light and color were perceived only by the right eye. With transcleral illumination, the light source was correctly projected in all four quadrants. The patient reported entoptic vascular patterns, but failed to see pressure phosphenes. The b-wave of the electroretinogram after dark adaption measured about two-thirds of the normal amplitude. ERG-responses could be recorded up to a flash rate of 35 Hz, a value about 15 Hz lower than the normal ERG-CFF. Ultrasonography showed an average sized globe with the lens in normal position and no cataract spikes. The vitreous was acoustically clear, and there was no indication of retinal detachment. Gross ocular motility was not impaired.

A penetrating keratoplasty of 7 mm in diameter was performed and, unexpectedly, a mature cataract was found. It was extracted four days after corneal transplant surgery. Initial progress was good and the patient reported seeing colors, diffuse shapes and details as small as the dial on his electric shaver. However, thirteen days after transplantation the new cornea became tilted, inflamed and subsequently cloudy. After a month it was opacified and neovascularized to such an extent that vision was again limited to light perception. Other symptoms included photophobia and secondary glaucoma.

Six months later, when the patient was reexamined at the Massachusetts Eye and Ear Infirmary, his cornea looked as opaque as before the transplant (Fig. 1).

1 These notes are excerpts taken from the VA-record No. 002-16-01 and the MEEI-Cornea Service record No. 3676.