Visual defects in the uninjured eye of patients with unilateral eye injury

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Abstract. We have examined the electroretinographic responses, the psychophysically determined course of dark adaptation and/or the scotopic and photopic (static) perimetric profile of the uninjured eyes of 11 patients with unilateral intraocular foreign bodies. Most of the patients showed subnormal ERG amplitudes over a range of light intensities, and subnormal light sensitivity in isolated retinal areas. The data suggest that eyes not directly injured by a unilateral traumatic ocular episode may show visual defects.

Introduction

Intraocular foreign bodies (IOFB) have highly variable effects on the physiology and responsiveness of the injured eye. In addition to the damage incurred by the ocular media during penetration through the eye globe the foreign body may cause secondary complications. These complications may result in widespread impairment of the retina and other ocular tissue (Duke-Elder & Perkins, 1966). Electrophysiological and psychophysical tests on the injured eye may reveal reduced sensitivity and/or abnormal transmission of electrical signals within the retina or along central visual pathways (Karpe, 1948).

Disturbances in the contralateral eye as a result of unilateral eye injury are a rare complication (0.02% of patients with penetrating ocular wounds in the most recent report (Niiranen, 1978)). It was, therefore, surprising to find in a retrospective survey that about 70% of patients with unilateral intraocular foreign bodies (N = 85) showed during routine clinical examination, abnormal electrophysiological responses from the uninjured eye. The abnormal responses resembled cases of Riggs-type congenital nyctalopia. In corroboration, patients often complained of difficulty with night vision and in the few cases tested psychophysically, dark adaptation was found to be deficient (Auerbach, 1977). Recent publications support the findings of abnormal electroretinograms evoked from the uninjured eyes of patients with unilateral IOFBs (Abraham, 1977; Knighton and Lewis, 1979).

To further investigate the effect of unilateral eye injury on the fellow eye, we re-examined some of these patients in detail by electrophysiological and...
psychophysical techniques. The results suggest that patients with unilateral eye trauma may show elevated ERG and psychophysically determined thresholds in the eye not affected directly by the injury.

Subjects and methods

Subjects

Of a total of 85 patients suffering from unilateral IOFBs examined in our laboratory between 1961 and 1978, 20 were invited to participate in the experiment. All subjects were selected by their apparent normal health prior to and post injury and by our judgement of their readiness and ability to cooperate. Of these 20 patients, only 11 responded positively and are the subjects of the present report.

It should be emphasized that in general we have not examined the ophthalmological or physiological status of the injured eye. Details of the accident and the description of the injured eye immediately following the trauma were scanty and in many cases deemed unreliable. We therefore do not report on the present state of the uninjured eye nor do we attempt to correlate the present status of the injured and uninjured eyes. We report only results from the uninjured eyes which appeared normal ophthalmologically during a recent examination and were reported to have been unharmed by the traumatic episode (see clinical data in Table 1).

ERG

The electroretinographic procedure has been described in detail elsewhere (Nawratzki, Auerbach & Rowe, 1966). Briefly, following 30 minutes in darkness, patients (1–8 in Table 1) were fitted with contact lens electrode while in a reclining position. A photostimulator, Grass PS22, was used at highest intensity (116) to deliver 'white' test flashes of 10 usec duration. The light source was positioned at a distance of 20 cm from the subject’s face. The intensity of the light stimuli was controlled over a range of at least 5 log units in steps of .1—.5 log units by interposing ‘neutral’ density filters into the light beam. The ERG responses of each eye evoked by the test flashes were recorded separately while the fellow eye was covered by a black eye patch. ERG responses were amplified, monitored on an oscilloscope and photographed for later analysis. Response amplitude was defined as the distance from the trough of the a-wave to the peak of the b-wave. Threshold was taken to be that light intensity, expressed as a density of the neutral filter, which evoked a 50 uv response.

Dark adaptation

For eight subjects (1–8 in Table 1) threshold changes during 40 min of dark adaptation were measured. The apparatus and procedure of measurement have been previously described (Auerbach & Kripke, 1974; Auerbach, Godel & Rowe, 1969). Patients were seated in a light-proof chamber, positioned on a chinrest.