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Case report

Electroretinograms before and after extraction of large intraocular iron foreign body

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ABSTRACT

Purpose: We present our findings in a case with an intraocular foreign body in which the electroretinographic (ERG) findings were useful.

Observations: A 37-year-old man was injured by an iron fragment that penetrated into his left eye through the cornea. His visual acuity was counting fingers, and a traumatic cataract prevented an examination of the fundus. B-mode ultrasonography showed a stick-like foreign body of approximately 14 mm in length in the eye. Preoperative ERGs with a contact lens electrode showed reduced responses with many blinking artifacts. Lensectomy and pars plana vitrectomy were performed and a fragment of a wire brush was seen embedded in the superior nasal retina which was removed. The decimal visual acuity improved to 1.2 two weeks later. The postoperative ERG performed with a skin electrode showed reduced responses in the injured eye.

Conclusions and importance: We recommend that the physiology of the retina be assessed by recording ERGs with a skin-type electrode as soon as possible after a traumatic injury to the eye.

1. Case report

A 37-year-old man visited our hospital because his left eye was hit by an iron fragment while he was cleaning the floor with a wire brush. His best-corrected visual acuity (BCVA) was counting fingers, and the intraocular pressure was 11 mmHg in the injured eye. There was a self-sealed perforating wound near the center of the cornea, and a traumatic cataract prevented an examination of the fundus (Fig. 1). B-mode ultrasonography and computed tomography of the brain showed a stick-like foreign body at the posterior pole of the eye (Fig. 1). Preoperative combined rod and cone electroretinograms (ERGs) were picked-up with a contact lens electrode (EW-102, Mayo, Aichi, Japan). The ERGs were elicited by a stimulator (LS200, Mayo, Aichi, Japan) and a recorder (LE3000, TOMEY CORPORATION, Aichi, Japan) after 30 min of dark adaptation. The ERGs from the left eye were markedly reduced. However, the ERG recordings were not reliable because the patient could not tolerate the contact lens electrode leading to many blinking artifacts (Fig. 2).

The patient was immediately treated with intravenous antibiotics, and lensectomy and pars plana vitrectomy (PPV) were performed 3 days later when a surgeon could first operate with some confidence. After the removal of the opacified lens and vitreous hemorrhage, a fragment of the wire brush of approximately 14 mm length was seen embedded in the superior nasal retina. The wire fragment was removed through the corneoscleral wound **(Video)**. The decimal BCVA improved to 1.2 two weeks later, but perimetry showed a visual field defect corresponding to the site of the injured retina (Fig. 1).

Supplementary video related to this article can be found at https://doi.org/10.1016/j.ajoc.2019.100463

ERGs were recorded using the RETeval® system (LKC Technologies, Inc., USA) with skin electrodes which became available 15 weeks after the injury. The reduction of the ERGs was more prominent in the left eye. In addition, the implicit times of the single flash and flicker ERGs were delayed in the left eye relative to the right. These findings indicated a dysfunction of the retina of the traumatized eye. (Fig. 2).

2. Discussion

It has been reported that the time of PPV was not significantly correlated with the BCVA outcome,[1] but the delayed removal of a

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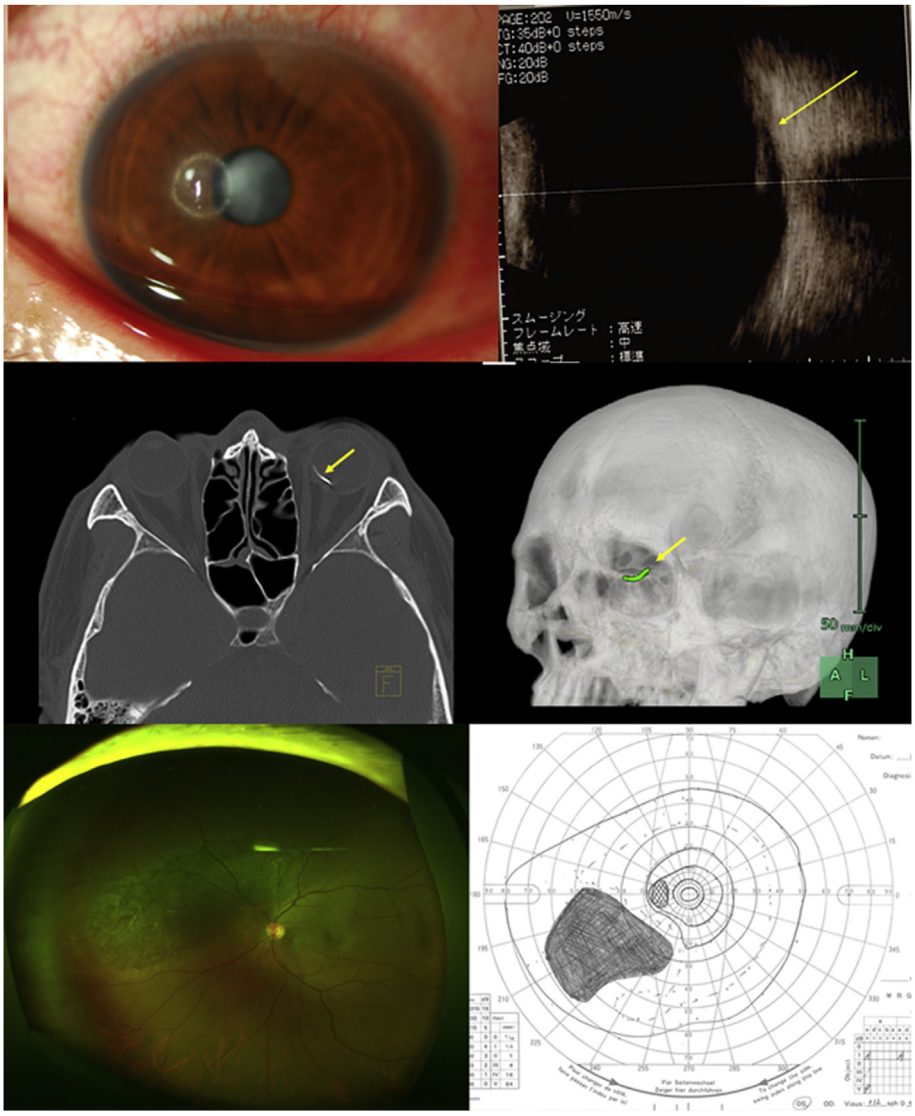

Fig. 1. Ophthalmological findings before and after surgery of a patient with an intraocular iron foreign body. Top left: Slit-lamp photograph of the left eye showing a self-sealed perforating wound near the center of the cornea and traumatic cataract. Top right: B-mode ultrasound sonography of the left eye showing a stick-like foreign body (arrow) at the posterior pole of the eye.
Middle left and right: Computer tomographic image of the skull showing a high-intensity stick-like foreign body (arrow) of about 15 mm in length at the posterior pole of the eye.
Bottom left: Fundus photograph of left eye after vitrectomy and removal of the foreign body showing an atrophic retinal lesion located superior and nasal to the optic disc.
Bottom right: Perimetric visual field of the left eye after surgery showing an islandic
visual field deficit corresponding to the atrophic retinal lesion.

foreign body can cause endophthalmitis. In our patient, the iron foreign body was removed 3 days after the accident and resulted in an improvement of the BCVA and a preservation of the central visual field. This was partly due to the removal of the media opacity.

Unfortunately, the skin-type electrodes for ERG recordings were not available before the surgery, nevertheless the postoperative recordings provided important information by comparing responses between affected and healthy eyes. Earlier studies have shown that both the scotopic and photopic ERGs became larger but then decreased at later times.[2] The rods were more affected than cones, and the ERGs were the negative-type.[2] The findings in our case were in good agreement with these earlier findings. The visual fields continued to be partially defective corresponding to the area of the retina damaged by the foreign body. However, the ERG findings suggested a diffuse retinal dysfunction that would not have been detected if only the BCVA and visual fields had been examined.

3. Conclusions

The physiological evaluations of the eye by ERGs recorded by skin electrodes was helpful in demonstrating a subclinical impairment of the injured eye.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ajoc.2019.100463.

Patient consent

Written consent to publish this case has not been obtained. This report does not contain any personal identifying information.

Acknowledgements and disclosures

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Conflicts of interest

No authors have no financial disclosures.

Authorship declaration

TK cared the patient, worked up, treated, and collected data. IK and

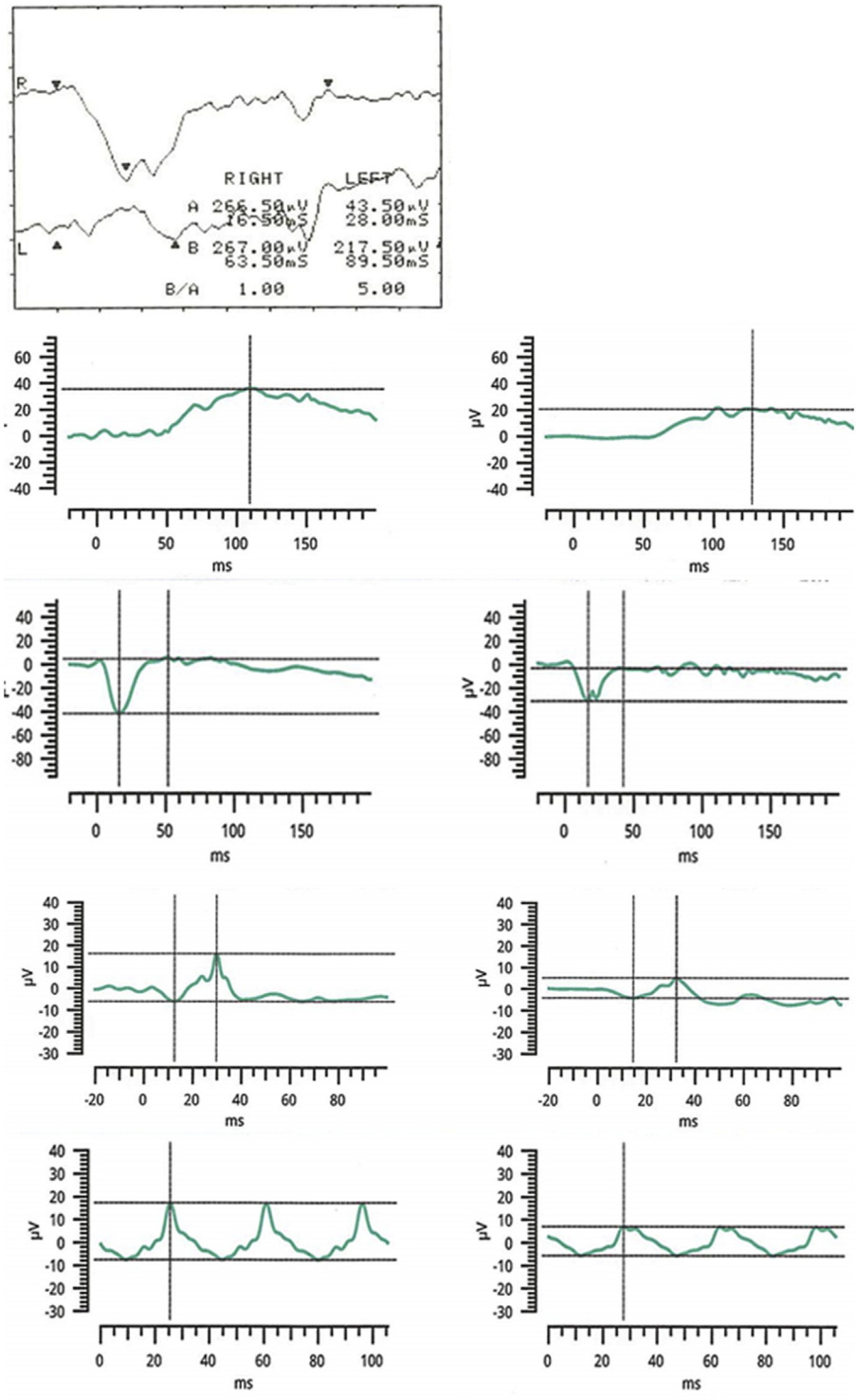

Fig. 2. Electroretinography (ERG) before and after surgery. Top left: Preoperative combined rod and cone ERG shows noise level response from the left eye and reduced response from the right eye. The noisy recordings are because the electrode was unstable due to blinking. Second to Fifth rows: Postoperative ERGs recorded using skin electrode. Each row shows rod, combined rod and cone, cone, and flicker ERG. The combined a-, and b-waves of the scotopic and photopic ERGs of the left eye are reduced. The b-wave is more severely reduced, so the shape of the ERG is the negative type ERG. The implicit times of the combined rod and cone and flicker responses were delayed in the left eye relative to the right. The arrows indicate stimulus timing.

SM analyzed the ophthalmological findings and gave critical suggestions. KS performed operation and prepared manuscript. All authors agree to be accountable for all aspects of work. The subject gave verbal informed consent and patient anonymity is preserved. All authors attest that they meet the current ICMJE criteria for Authorship.

Other acknowledgments

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