Electric shock induced Purtscher-like retinopathy

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The most common ocular manifestation following electric shock injury is the development of cataract. Retinal manifestations can vary from development of macular holes to retinal detachments. Purtscher-like retinopathy following electrical injury has not been reported till date. We hereby present a case of a 19-year-old electrician who presented with grossly reduced vision in the right eye of 2 months following an electric shock. The fundus of the right eye showed macular ischemic degeneration, occluded vessels, cotton-wool spots, and hemorrhages. Optical coherence tomography angiography revealed presence of capillary drop-out in the para-foveal region, which was more pronounced in the deep capillary plexus. Electric shock injury can lead to a clinical picture simulating Purtscher's retinopathy. The electrical injury leads to a more extensive damage to the deep capillary plexus as compared with the superficial plexus.

Key words: Electric shock, electrical injury, optical coherence tomography angiography Purtscher retinopathy, Purtscher-like retinopathy

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Purtscher's retinopathy, initially described by Otmar Purtscher,[1] is classically described as a chorioretinopathy secondary to nonocular compression trauma, associated with a constellation of retinal findings including cotton-wool spots, retinal hemorrhages, optic disc edema, and Purtscher flecken. When these typical retinal findings occur in the complete absence of trauma, the term Purtscher-like retinopathy is used.

Purtscher and Purtscher-like retinopathy have been estimated to have a combined incidence of 0.24 persons per million per year and are bilateral in 60% cases.[2]

Case Report

A 19-year-old male patient, an electrician by occupation, presented to us with complaints of pain in the left eye associated with a mildly diminished vision since the past 2 days following

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ocular injury with a ball. He also gave a history of grossly diminished vision in the right eye since the past 2 months following an electric shock; the point of contact was the right thumb. The approximate voltage of the current was 440 volts. There was an associated history of fall following the electric shock which was from a height of about 10 feet and was not associated with any bony injury. His general physical evaluation revealed presence of a healed burn on the dorsum of the right thumb extending to the lateral aspect of the index finger [Fig. 1].

Ocular examination revealed a visual acuity of 20/400 (OD) and 20/30 (OS). On anterior segment examination of the left eye, a note was made of 1+ cells and flare in the anterior chamber with 0.8 mm of hyphema. A relative afferent pupillary defect was noted in the right eye. The remainder of the anterior segment was normal in both eyes with a clear lens.

Fundus examination of the right eye [Fig. 2] showed presence of a clear media with multiple cotton-wool spots in the nasal half of the macular region. There were multiple areas of retinal whitening with associated areas of perivascular clearing noted in the nasal macula depicting the classical Purtscher flecken. A note was also made of the solitary flame-shaped hemorrhage and a sclerosed vessel in the area of the papillomacular bundle. The peripheral fundus was within normal limits. The fundus evaluation of the left eye was normal.

An optical coherence tomography (OCT) evaluation of the right eye showed disorganization of the inner retinal layers nasal to the fovea with atrophy of the ganglion cell layer. The outer retina also shows a discontinuity in the ellipsoid zone in the same area [Fig. 3]. OCT-angiography (OCT-A) analysis (6 × 6 mm) showed presence of multiple areas of capillary drop-out in the nasal macula which were more pronounced in the deep capillary plexus as compared to the superficial capillary plexus [Fig. 4]. To confirm the findings of the OCT-A, a fluorescein angiogram (FFA) was carried out, which revealed an area of capillary nonperfusion supero-nasal to the fovea. A note was also made of sluggish perfusion in the area of the papillomacular bundle with perfusion being complete at around 65 s following dye injection [Fig. 5]. OCT evaluation and FFA of the left eye was essentially normal.

Figure 1: Right hand of the patient shows evidence of a burn wound on the dorsum of the thumb extending to the lateral aspect of the index finger

A diagnosis electric shock induced Purtscher-like retinopathy in the right eye with a contusion injury in the left eye was reached. The patient was started on topical steroids and mydriatics in the left eye, while he was explained about the poor visual prognosis in the right eye.

At 2 months of follow-up, the visual acuity in the right eye was stable at 20/400, while it improved to 20/20 in the left eye. The iritis in the left eye had resolved while fundus examination of the right eye revealed diminished number of cotton-wool spots with a temporal pallor of the optic nerve head.

Discussion

Purtscher's retinopathy is a manifestation of acute occlusive micro-vasculopathy associated with trauma, which may be in the form of a cranial injury or thoracic compression. In the presence of a nontraumatic etiology, it is designated as Purtscher-like retinopathy. Miguel *et al.* carried out a systematic review of Purtscher's and Purtscher-like retinopathy in 2013[3] and noted trauma (33.8%) to the most common cause of this clinical picture. Acute pancreatitis was the commonest cause of Purtscher-like retinopathy. An extensive literature search failed to reveal any case of Purtscher-like retinopathy following an electrical injury.

The diagnosis of Purtscher and Purtscher-like retinopathy is mainly clinical, with the presence of any three of the following features.[3]

1. Purtscher flecken
2. Retinal hemorrhages, low-to-moderate in number (1–10)
3. Cotton-wool spots (typically restricted to the posterior pole)
4. Probable or plausible explanatory etiology
5. Complementary investigation compatible with diagnosis.

In our case we were able to clinch the diagnosis due to the presence of Purtscher flecken, cotton-wool spots restricted to the posterior pole, and a solitary retinal hemorrhage.

Few reports are noted in the literature, which depict the OCT-A findings of Purtscher's retinopathy. Kumar and Tomar[4] have documented a case of 17-year-old male who presented with Purtscher's retinopathy, and with OCT-A noted a capillary drop-out in the macular area involving both the superficial and the deep plexus. Similar findings were also noted by Hamoudi *et al.*[5] and Gil *et al.*[6] in their case studies. Multimodal imaging in a 65-year-old male patient of Purtscher retinopathy by Xiao *et al.*[7]

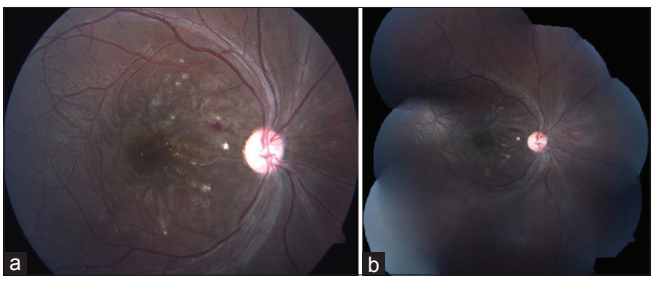

Figure 2: (a) The fundus photograph of the right eye shows presence of multiple cotton-wool spots in the nasal half of the macula. A note can be made of a solitary retinal hemorrhage in the area of the papillomacular bundle with an associated sclerosed retinal vessel. Multiple areas of retinal whitening with perivascular clearing can be made out which are consistent with Purtscher flecken. (b) There is no evidence of any peripheral retinal changes

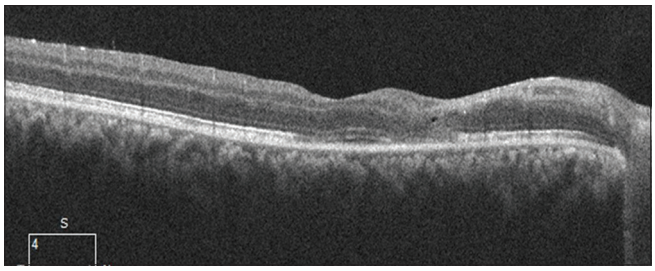

Figure 3: OCT macula of the right eye shows evidence of disorganization of the outer retinal layers with a focal loss of the ellipsoid zone nasal to the foveal dip. Retinal thinning nasal to the fovea in the area of the papillomacular bundle is noted

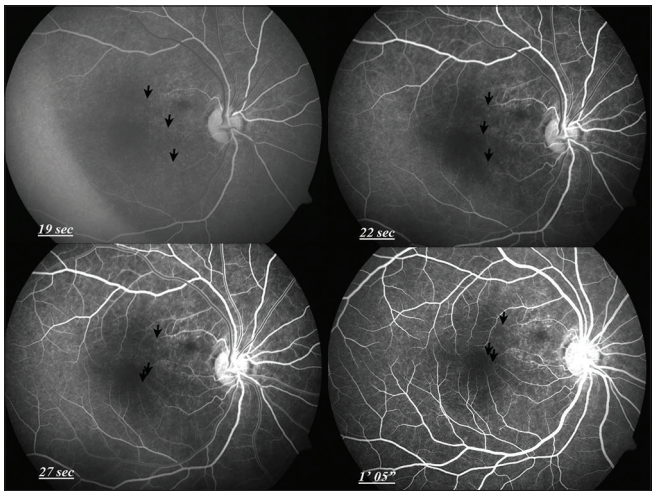

Figure 5: FFA shows presence of a sluggish circulation in the nasal macular area with a slow filling of the retinal arteries in this region. It takes around 65 s for the artery to be completely filled and reach the border of the foveal avascular zone (FAZ). The A-V transit time was prolonged. A note is also made of a region of hypofluorescence supero-nasal to the FAZ indicative of a capillary nonperfusion area. The blocked fluorescence due to the retinal hemorrhage can also be noted. The arrows show the passage and flow of dye toward the FAZ

also revealed flow voids in the superficial and deep plexuses and a discontinuity in the ellipsoid zone. An interesting finding was noted by Tokimitsu *et al.*[8] in their report of a 42-year-old Japanese male patient who suffered a femoral fracture. They noted capillary drop-out only in the deep capillary plexus with no changes in the superficial plexus. Similarly, in our case, we also noted areas of capillary nonperfusion in the nasal macula which were more prominent in the deep capillary plexus as compared to the superficial capillary plexus. The area of nonperfusion was more clearly demarcated on the OCT-A as compared with the FFA. However, the OCT-A findings depicting the features of Purtscher-like retinopathy caused by an electrical injury in the index case are seen in the chronic or resolving stage. The findings in the acute stage are not known.

Vascular effects of electric shock are well documented in the literature and can be attributed to both thermal and nonthermal effects of the electrical current.[9] Ascaso *et al.* have documented two cases of retinal vein occlusion following electrical trauma.[10] Hence, we ascertain that the microvascular occlusion was caused by the electrical current flowing through retinal tissue.

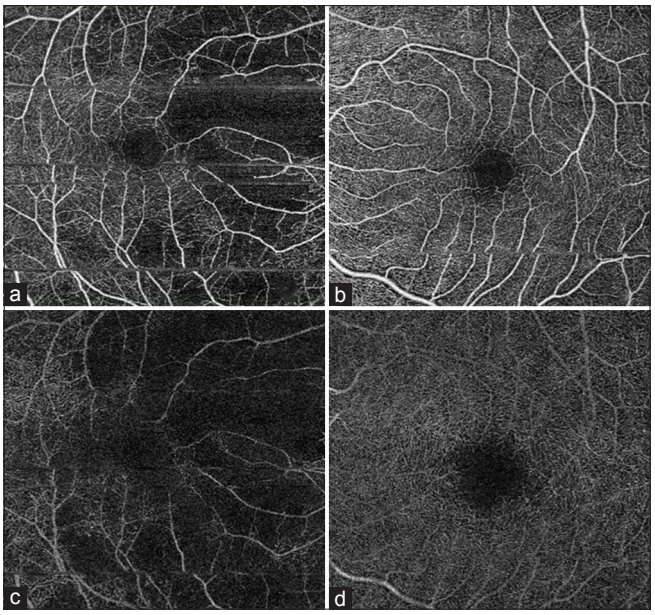

Figure 4: OCT-A denotes presence of flow void in both the superficial (a) and deep capillary (c) plexuses of the right eye as compared to that of the left eye (b and d)

We hypothesize that the electrical current is transmitted to the optic nerve from the point of contact via the neurons. The neural tissue being a good conductor of electricity is spared from the thermal damage. The current then disperses along the sclera, retinal pigment epithelium (RPE)–Bruch's complex, and the neural retina. Increased resistance at the level of RPE–Bruch's complex may be responsible for thermal damage, which preferentially involves the deep capillary plexus due to its proximity. The current dissipates quickly as it moves away from the optic nerve head; hence the damage is confined to the posterior pole with relative sparing of the peripheral retina.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Electric shock injury may manifest in the form of Purtscher-like retinopathy. OCT-A is better than FFA in delineating the extent of injury due to its better depth resolution. Outcomes for patients presenting with Purtscher-like retinopathy remain guarded particularly if the papillomacular bundle is involved. Further case studies may throw more light on this causal association and the preferential damage of the deep plexus.

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Conflicts of interest

There are no conflicts of interest.

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