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SHORT COMMUNICATION

Case report

Electric cataract: a case report and review of the literature

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ABSTRACT: A case of electrically induced cataract in both eyes in a 12-year-old boy, after a high-voltage electric shock, is reported. He sustained skin burns on the neck, chest, abdomen, and inner left arm. The cataract developed first in the left eye and later on in the right eye. The child regained normal vision in both eyes after cataract extraction and aphakic correction with spectacles. The need for awareness of the possibility of this complication and screening of all cases of electrical injuries is stressed. The majority of cases respond well to surgery, but final visual acuity will depend on the other ocular damage due to electrical current. The clinical features and pathogenesis of this condition are briefly reviewed. (Eur J Ophthalmol 1999, 9: 134-8)

KEY WORDS: Electrical injury, Cataract

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INTRODUCTION

Lenticular opacities occurring after electrical injury due to lightning or contact with a high-voltage conductor are infrequent, and are often associated with no other observable ocular damage. The first description of electric cataract caused by lightning was given by Saint-Yves (1). A cataract produced by artificially generated electrical current was reported by Desbrieres and Bargy (2). Subsequently cataract formation after electrical injury was reported from different parts of the world (3-17).

During an electric shock, the current flows through the body between two contact points. The clinical picture of electrical injury is influenced by numerous factors including voltage, tissue sensitivity, type of current (direct or alternating), length of contact, place and area of contact and route travelled within the body (11). The present report concerns a rare case of bilateral cataract due to high-voltage electrocution in a child, who regained normal vision after surgery in both eyes. A brief review of the literature on the clinical features and pathogenesis of this condition is given.

Case Report

A 12-year-old boy was referred to the eye clinic by the plastic surgeon, with a history of loss of vision in the left eye after an electric shock. Two weeks earlier he had climbed a pylon while playing with fellow children in a paddy field, and his head had come into direct contact with a high-voltage (11000 volts) power line. He was unconscious for a short period and sustained skin burns on the neck, chest, abdomen and inner side of the left arm (Fig. 1). After resuscitation from shock in a nearby government hospital, he was referred to the plastic surgeon at the general hospital attached to the University Medical College for treatment of burns. There was a large area of deep burn in the vertex of the scalp. The underlying skull bone was charred and necrosed, and sequestrectomy and skin grafting were done (Fig. 2).

The patient complained of some loss of vision in the left eye soon after recovering from the electric shock. Examination of the left eye showed vision of counting fingers at 3 meters. Eyelids, conjunctiva, cornea, anterior chamber, iris and pupil were normal. An im-

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mature cataract was seen (Fig. 3). Ocular movements were normal. Intraocular pressure was 16 mm Hg. Examination of the right eye showed normal visual acuity (6/6). Eyelids, conjunctiva, cornea, anterior chamber, iris, pupil, lens, and ocular movements were normal. Intraocular pressure was 18 mm Hg.

Ophthalmoscopic examination after dilating the pupils with 1% tropicamide eye drops showed a dull red reflex in the left eye due to cataract; the optic disc was normal. The optic disc and macula were normal in the right eye. Slit-lamp biomicroscopy showed anterior subcapsular diffuse opacity with opacification of the nucleus and cortex in the left eye. In the right eye there was an anterior subcapsular ring-like opacity in the periphery with irregular margins, and the rest of the lens was clear.

The condition of both eyes (immature cataract in the left eye and early cataract changes in the right eye secondary to electrical injury) was explained to the parents, and cataract operation in the left eye was recommended.

After complete healing of the burns on the body and scalp, a standard microsurgical procedure of manual extracapsular cataract extraction was performed under general anesthesia in the left eye (six weeks after the electrical injury). No intraocular lens was implanted as the child's parents could not afford it. Postoperatively, the boy was treated with gentamicin, betamethasone and homatropine eye drops in the left eye. The postoperative period was uneventful. Fundus examination was normal. Vision improved to 6/6 with aphakic correction (+10.00D sph, + 0.75 D cyl 180°), and the glasses were prescribed six weeks after the cataract surgery.

During the postoperative follow-up, the patient complained of rapid loss of vision in the right eye (vision deteriorated to 6/60 in three months after the electrical injury). Cataract changes in the nucleus and cortex of the lens of the right eye progressed rapidly. The cataract became mature in five months after the electrical injury (Fig. 4). A standard microsurgical procedure of manual extracapsular cataract extraction was done in the right eye under general anesthesia. No intraocular lens was implanted. Postoperatively, the boy was treated with the same eye drops as the left eye. The postoperative period was uneventful. Vision improved to 6/6 with aphakic correction (+10.00 D sph, +0.50 D cyl 180°), and the glasses were pre-

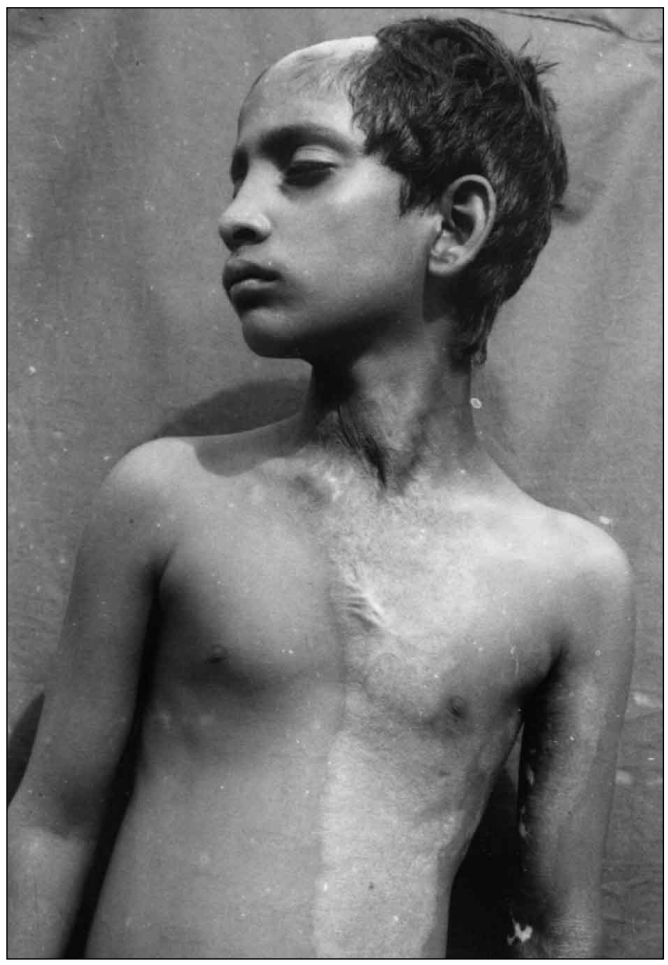

Fig. 1 - *Large areas of healed skin burns on the neck, chest, abdomen and inner side of left arm after electrical injury.*

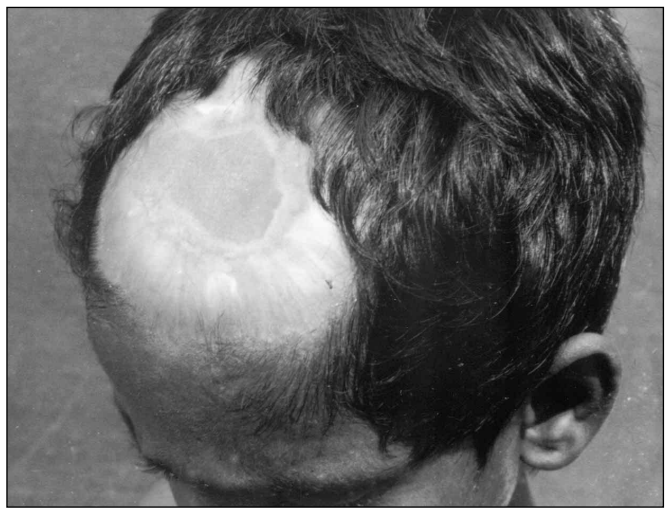

Fig. 2 - *Large area of skin grafting done for electrical burn of the scalp.*

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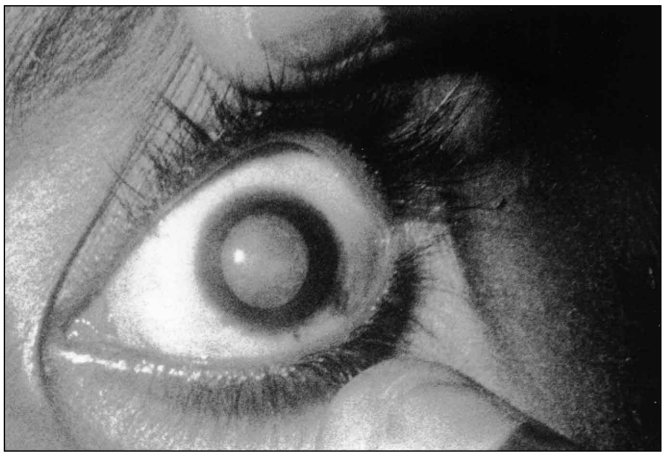

Fig. 3 - *Immature cataract in left eye two weeks after the electrical injury.*

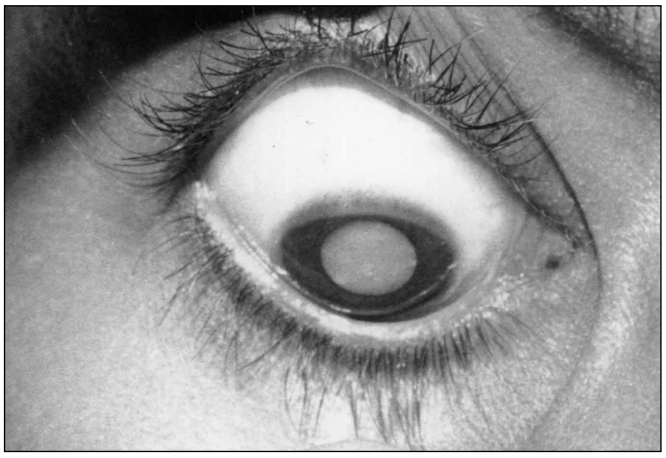

Fig. 4 - *Mature cataract in right eye five months after the electrical injury.*

scribed six weeks after the second operation. Near-vision glasses (an addition of +3.50 to the distance vision power in both eyes) were also prescribed.

The patient was seen once every three months for one year. At the last examination the anterior segment and fundus were normal in both eyes, and vision was 6/6 in both eyes with aphakic glasses.

DISCUSSION

The incidence of cataract reported in patients with electrical injuries varies widely-from 0.7% to 8% (8, 11-13, 15). This is probably due to differences in the voltage and duration of action of the current, the distance of the area of contact from the eye, its extent on the surface, and the direction taken by the current in the body (3, 11). The strength of electrical current causing cataract formation has been reported to vary from 220 volts (4) to 80,000 volts (18). For unknown reason, electroconvulsive therapy does not cause cataract (19, 20).

Since electrical injuries are usually life-threatening, the eyes are often not examined until days to weeks after the accident. The cataract may develop immediately after injury, or be delayed by a few days; the average latency varies from 1 to 18 months (3), although, a latent period of 11 years has also been reported (8). Usually the cataract changes are bilateral in lightning injury, but unilateral in electrical injury. However, when the point of contact is on one side and the lens changes are bilateral, the cataract initially forms in the eye on the affected side (closest to the contact point) and later on in the contralateral eye (3). The interval between cataracts occurring in the two eyes can vary between three weeks and two years (21).

In the present case the lens might have become cataractous immediately after the electrical injury in the left eye – the side of contact – resulting in gross loss of vision which the patient noted after recovering from the electric shock. In the right eye, early anterior subcapsular lenticular opacities were detectable with slit-lamp biomicroscopy at the first examination two weeks after the electrical injury.

In the majority of cases, the current passes through the head in the vicinity of the eye and a contact electrical burn develops (3). In the present case, the current passed through the head and the child developed electrical burns on the vertex region of his scalp, on the neck, chest and abdomen and inner side of the left arm. The skull bone was necrosed completely and sloughed out exposing the dura mater. Such findings have been reported in 2% of cases of burns due to electricity (12).

The earliest changes seen in the lens after electrical injury are a collection of multiple fine vacuoles beneath the anterior subcapsule, usually in the mid-periphery of the lens, requiring dilatation of the pupil for visualization. These collections are always present in the anterior subcapsular area, and show no apparent relationship to lens fiber configuration. Over intervals varying from weeks to months, these vacuoles are replaced with flake-like opacities which coalasce and

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migrate into the line of vision (9, 22). In general, industrial electrical accidents affect the anterior subcapsular cortex, while lightning injuries involve both anterior and posterior subcapsular areas (6). Saffle et al (13), however, reported a 40% incidence of posterior subcapsular cataracts in their review of industrial electrical accidents. Clinically, there is a general tendency towards progression but occasionally the cataracts remain stationary for as long as two years (3). However, in 77% (13) to 82% (9) of the cases, the cataract progressed to maturity and surgery was required. In the present case, the cataract in the right eye progressed to maturity in five months after the electrical injury. Rarely, the cataract may become complicated by secondary glaucoma in the intumescent stage (23).

The exact pathogenesis of electric cataract is controversial and several theories have been put forward (3). Decreased permeability of the lens capsule, or a direct coagulative effect on the proteins of the lens cells, or powerful contraction of the ciliary muscle causing a concussion type of cataract due to mechanical damage, or nutritional disturbance of the lens due to iritis and impaired circulation, or ultraviolet and infrared irradiation could be causative factors for electric cataract.

Treatment of the electric cataract is similar to any other cataract, i.e. exracapsular extraction with posterior chamber intraocular lens implantation. The final visual acuity in these cases will depend on the damage to other ocular structures. In the present case, no intraocular lenses were implanted as the child's parents could not afford them. However, the child was rehabilitated with aphakic glasses and, as expected, a good visual outcome was achieved after surgery as there was no other ocular damage in either eye.

Whenever a case of electrical injury is referred for ophthalmic evaluation, a detailed ocular examination must be made to check for any complications. Close follow-up of these patients is mandatory since they may develop cataract changes at a later date.

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