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Case Report

Experience of successful treatment and recovery of a patient with severe high voltage electric burns complicated with unilateral electric cataract

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Abstract

Electrical burns are a special type of burn in which a certain amount of current passes through the human body and causes different degrees of tissue injury, organ dysfunction, or sudden death. Compared with other burn patients, the amputation rate of electric burns is higher and often leads to various complications. In this study, a case of severe electric burn complicated with unilateral electric cataract was reported, which recovered well after 173 days of operation and symptomatic support.

Keywords: Electric burns, Injury, Amputation, Cataract

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Introduction

Electrical burns are the third most common cause of burns after burns and flame burns. It is relatively rare but potentially devastating multiple system injuries with high incidence rate and mortality(1-2). Research shows that the proportion of electric burns in burns is 3%~5% in developed countries and 27% in developing countries(3). Electric burns are traditionally divided into low-voltage electric burns(<1000V) and high-voltage electric burns (≥1000V). The impact of current will have serious consequences, leading to disability and death. The final result depends on the power supply voltage, the resistance of the victim, the type of power supply, its path through the body, and contact time(1). Compared with other types of trauma, high-voltage electric burns presents some quite unique problems. It is progressive to tissue injury. It often seriously destroys deep tissues, involving muscles, nerves, blood vessels, and even bones. It is necessary to pay close attention to and be aware of all possible manifestations and consequences. Several studies have shown that electric burns often requires multiple debridements and skin grafting to repair the wound, often need to prolong the initial treatment and amputation height more frequently, and the amputation rate of electric burns is much higher than that of other burn patients(4-6).

In addition, electrical burns can cause various complications due to their complexity, and the incidence rate varies. Ocular complications caused by high voltage electrical burns are rare. A cataract is a destructive and long-term electrical burns complication, which usually occurs on both sides, and there are a few reports of unilateral cataracts (7).

This study reported a case of severe electrical burn complicated with unilateral electrical cataract. After 173 days of operation and symptomatic support, the postoperative vision and wound recovered well.

Case

A 47-year-old male was accidentally hit by high-voltage electricity and immediately fell into a coma. About 1 minute later, he woke up by himself. The patient spread multiple electric burns along with the current. About 4 hours later, he was sent to our hospital for treatment. The emergency department received burn and plastic surgery as "electric burns". The preliminary evaluation showed that he had 10% of the total body surface area (TBSA) severe burns (The specific depth and distribution of wounds were shown in Table 1). Relevant examinations and tests were actively improved after admission (The specific results were shown in Table 2). Laboratory and physical examination, chest film, and head CT scan did not show any signs of the nervous system, respiratory system, and cardiovascular abnormalities. According to the patient's critical situation, the doctor operated on the patient in stages. The doctor performed "decompression fasciotomy of the right upper limb" on the day of admission, and then performed multiple debridements, negative pressure suction, skin grafting, skin flap transplantation, and bridging of arteriovenous transplantation. Symptomatic treatments such as anti-infection, myocardial nutrition, and rehydration were performed after operation.

Table 1. Specific depth and distribution of wounds

Location	TBSA	Depth
Face and neck	6%	ShallowⅡ°-DeepⅡ°
Right armpit	1%	ShallowⅡ°-DeepⅡ°
Right elbow	1%	DeepⅡ°-Ⅲ°
Right wrist, right palm	1%	DeepⅢ°-Ⅲ°
Anterolateral right calf	1%	ShallowⅡ°-DeepⅡ°

Table 2. Relevant physical examination and laboratory examination results of patients

Laboratory parameters	Determined values	abnormal	Normal reference value
WBC, x 10^9/L	23.45	↑↑	3.50-9.50
RBC, x 10^{12}/L	3.96	↓	4.30-5.80
Neutrophils, %	0.93	↑	0.40-0.75
Lymphocytes, %	0.02	↓	0.20-0.50
Eosinophils, %	0.00	↓	0.004-0.08
ALT, U/L	98.00	↑	9.00-50.00
AST, U/L	608.00	↑↑↑	15.00-40.00
CK, U/L	40220.00	↑↑↑	38.00-174.00
CK-MB, U/L	704.00	↑↑↑	0.00-24.00
LD, U/L	1405.00	↑↑↑	140.00-271.00
α-HBDH, U/L	561.00	↑↑	90.00-180.00
Blood sugar, mmol/L	9.34	↑	3.90-6.10
Myoglobin, ng/ml	>3000.00	↑↑↑	28.00-72.00

During this period, due to repeated expansion, multiple ruptures and bleeding of the brachial artery, serious destruction of the elbow joint, and no function, the right upper arm amputation was performed. Symptomatic supportive treatments such as anti-infection, rehydration, and improvement of microcirculation were given after operation. The dressing in the operation area was changed in time to keep it clean and dry.

About 130 days after admission, the patient stated that the vision was blurred. Ocular B-ultrasound showed that the vitreous body in the right eye was turbid, which was diagnosed as traumatic cataract. The ophthalmology department performed phacoemulsification and intraocular lens (IOL) implantation in the right eye and gave local anti-inflammatory treatment after the operation.

The wound recovered and the condition gradually improved. Finally, the total duration of 173 days of surgery and symptomatic support treatment, wound recovery, no major complications, the patient improved and was discharged from the hospital. The doctor instructed him to inject some water into the head expander regularly, and strengthen nutrition and functional exercise at the same time.

Discussion

Compared with traditional burns, the severity of high-voltage electric burns and the incidence of complications is increased. At the same time, it is usually related to a long hospital stay, multiple surgical interventions are required, and the rehabilitation is potentially worse(8). In addition, more serious deep tissue injury and higher amputation rate than other burn types require multiple and long-term multidisciplinary and rehabilitation treatment, which is expensive and labor loss. All these have brought a heavy socio-economic burden to the patients themselves, their families, and society.

In the previous literature, many literatures and cases reported the surgical treatment of high-voltage electric burns, but it is still very challenging in reality. Studies have shown that the surgical treatment of high-voltage electric burns is characterized by repeated debridement and necrosis. However, amputation of necrotic limbs must be considered when wound infection is likely to aggravate sepsis complications(9). In this case report, the patient received professional and good first aid and staging treatment, including incision decompression, debridement, skin flap transplantation repair, arteriovenous graft bridging, and other operations. However, during the treatment and recovery period, the patient's brachial artery ruptured and bled for many times, the blood circulation of the collateral branches at the fingertip was poor, there was no

main artery in the right forearm, and the elbow joint was seriously damaged. After retaining the affected limb, it may be repeatedly infected or even myelitis. Finally, with comprehensive consideration by the doctor and the patient's requirements, the patient's right upper arm was amputated. This is because electrical burns can lead to thrombosis of arteries and veins, weakening of arteries, and sometimes rupture of arteries without any warning signs which makes it more difficult to cure(6).

In addition, it is worth noting that in this case report, the patient felt blurred vision about two months after admission due to high-voltage electric burns, and was diagnosed as electric cataract. After cataract phacoemulsification and IOL implantation, the postoperative visual acuity recovered well. Because electric injuries are usually urgent and life-threatening, the eyes are usually examined after the patient's condition is stable. Most patients with electric burns do not have visual discomfort in the early stage, but with the development of cataracts, their visual acuity decreases a few months after injury, and the latent period of cataracts after electric trauma varies from immediately after injury to several years(10-11).

Therefore, in the early recovery period of electric burns, an eye examination should be carried out regularly to find eye complications in time and improve the social function and quality of life of patients.

Conclusion

The prominent feature of electric burns is that the skin wound is small, but the deep tissue injury under the skin is very extensive. It needs multiple intervention operations. At the same time, we should attach great importance to observing all potential risks and making the best treatment decision in time. In addition, because electric burns may affect any structure of the eyes and lead to serious sequelae, it is necessary to screen various possible eye complications in time and follow up for a long time. Finally, we are committed to reducing the economic burden and improving the quality of life after injury to the greatest extent.

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Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this article.

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