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Clinical Record

# Unilateral facial nerve paralysis after electrocution injury

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**Abstract**

We present a case of acute, unilateral facial nerve paralysis in a patient who had received a low voltage electrical current. This is an extremely rare cause of this neurological condition. The patient regained complete neurological function approximately three months after the incident. Unilateral facial nerve paralysis most commonly occurs due to infection or blunt or penetrating trauma; it has not been previously reported as a result of low voltage electrical injury.

**Key words: Electric Injuries; Facial Paralysis**

## Introduction

Electrical shocks commonly cause immediate damage to the heart, nervous system and musculoskeletal system.[1] Neurological complications secondary to electrical injury can manifest either early or late and can affect the central or peripheral nervous systems.[2,3]

We describe the development of an immediate onset, right-sided facial palsy in a patient who had been exposed to an electrical current. Unilateral facial nerve paralysis as a result of low voltage electrical injury (through a domestic source) has not been reported in the literature before. However, two cases of lightning-induced unilateral facial nerve paralysis and one of high voltage electricity induced bilateral facial nerve paralysis have been reported.[4,5]

## Case report

A 71-year-old, right-handed man sustained an electrical burn to his left index finger from a 240 V source at home. While cleaning his tank, he became trapped in a narrow space between the metallic tank and the ceiling and accidentally touched an electric cable, being in contact with it for nearly three minutes. He did not lose consciousness. He had no hearing loss, hyperacusis, ophthalmological problems, or abnormality of taste or lacrimation.

On examination, the patient had a deep, third degree burn over the terminal phalanx of the left index finger, where the tissues were completely charred. The exit wound was in the right parotid region, where he had developed a tense, tender swelling and a lower motor neuron type, grade four House–Brackmann facial nerve paralysis (Figure 1). The patient had some sensory loss over the right parotid area and had a streak of redness extending from the right parotid region towards the chin (Figure 2). The remainder of the ear, nose and throat examination was normal. His electrocardiogram was normal, and routine blood tests, including creatinine kinase concentration, were within normal limits.

The patient was catheterised and maintained a good urine output, with no evidence of myoglobinuria. He developed no evidence of compartment syndrome in the left upper limb. An ultrasound scan showed a normal appearance of the right parotid, with no haematoma or collection. The patient was started on a reducing dose of oral steroids.

Reassessment on the following day showed slight improvement of the parotid swelling, with no further deterioration of the facial palsy. Electroneurography showed a 58 per cent degeneration of the right facial nerve when compared with the left (Figure 3). The patient underwent terminalisation of his left index finger and was discharged with instructions on eye care and a seven-day course of steroids, to be followed up in the ENT clinic.

At follow up one week following the injury, the parotid swelling had resolved considerably, with some improvement of the facial palsy (grade two to three), although the sensory deficit was still present.

At final follow up three months following the injury, the patient was fully recovered, with no residual weakness or sensory loss.

## Discussion

Exposure to electrical current via industrial or residential accidents or lightning strikes is a serious and growing concern in today's medical community.[6] Electrical accidents can be divided into those involving low voltage (less than 1000 V) and high voltage (greater than 1000 V).[7] Electrical injuries commonly cause widespread acute and delayed tissue damage.[8]

Cardiac arrhythmias and respiratory arrest are the most life-threatening complications in the acute phase, followed by neurological sequelae, which can present early or late in the course of recovery and include both the central and peripheral nervous systems.[4]

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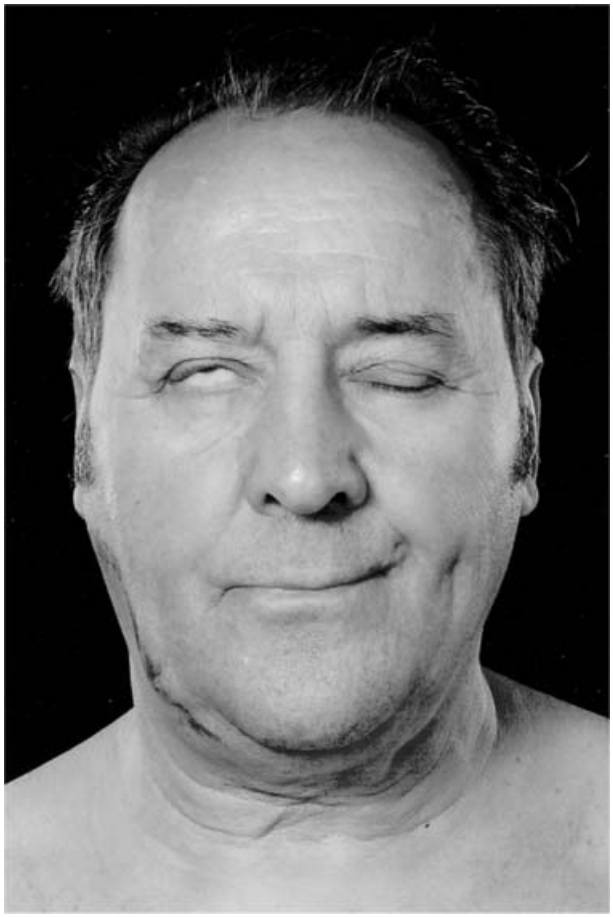

FIG. 1
Grade IV House–Brackmann facial nerve paralysis.

Delayed complications, days to years later, include cholelithiasis, cataracts, and nervous system conditions such as amyotrophic lateral sclerosis, memory loss, behavioural changes, spinal paralysis and peripheral neuropathy.[1,4,9,10]

FIG. 2
Exit wound over the right parotid, with a streak of redness extending towards the chin.

The neuropathy of electrical and lightning injuries was described 60 years ago. Findings in the central nervous system include petechial haemorrhages and chromatolysis of the pyramidal cells, the Purkinje cells of the cerebellum and the anterior horn cells. A striking abnormality of peripheral nerves is a localised ballooning of myelin sheaths.[3,11]

In addition to sustaining damage from the primary effects of electrical injuries, patients are vulnerable to secondary injury from direct physical trauma. Many of the abnormalities seen in a patient suffering from an electric shock resemble those occurring in patients suffering from lightning injuries. There are, however, some differences. Injury from electrical accidents is more likely to cause severe burns, rhabdomyolysis, muscle necrosis, deep tissue damage and gangrene. As a result, such patients are more likely to suffer from renal failure and need surgical amputation of limbs. The reason for these more severe burns and tissue necrosis in electrical accidents relates to the longer duration of exposure to alternating current, compared with the brief exposure to direct current involved in lightning injuries.[3,12,13]

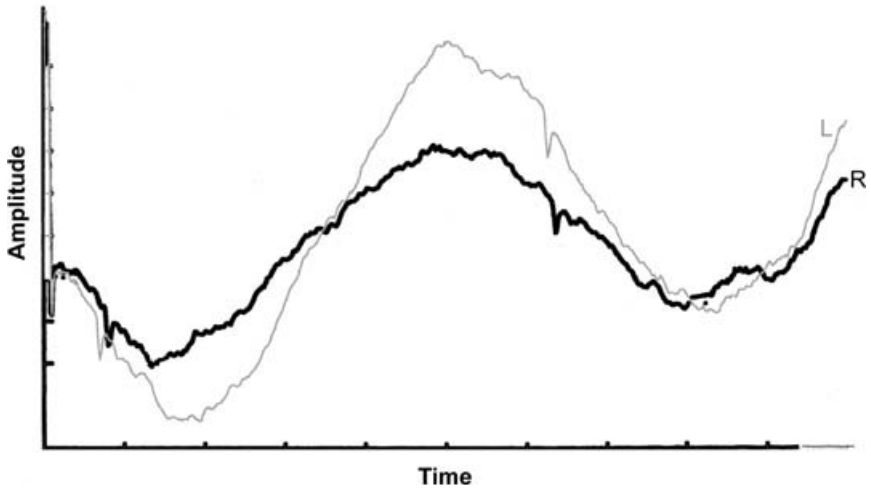


FIG. 3
Electroneurography. L = left; R = right

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- **Exposure to electrical current via industrial or residential accidents or lightning strikes is a serious and growing concern**
- **This paper presents a case of facial nerve paralysis following exposure to low voltage electrical current**
- **The possible ways in which electrical injury can cause facial nerve paralysis are discussed**

The neurological and vascular sequelae are the major contributors to the high morbidity of electrical injury.[14] The extent of neurological injury and the probability of recovery are related to the duration of exposure to electrical energy. The energy transmitted follows the path of least resistance.[15] The effect of electricity on the body is determined by seven factors: type of current, amount of current, pathway of current, duration of current, area of contact, resistance of the body and voltage.[7]

Unilateral facial nerve paralysis has many causes. Bell's palsy, which is idiopathic, is the most common type, followed by traumatic, infectious, familial and other rare causes such as Moebius syndrome and Melkerson–Rosenthal syndrome.[16] Early detection, evaluation and intervention are important for optimal functional recovery after facial nerve injury.[17]

The mechanism of injury sustained by the patient described above is interesting and unusual, the current being delivered to the left index finger and exiting from the right parotid region, with resultant swelling and right-sided, lower motor neuron type facial nerve paralysis. The outcome following neurological dysfunction is unpredictable, but most patients can be expected to spontaneously recover over a period ranging from weeks to months following the incident.[4]

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Dr W Farhan takes responsibility for the integrity of the content of the paper.
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