

Case report

Unexpected guest: Atrial fibrillation due to electrical shock

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ABSTRACT

Cardiac arrhythmias due to electrical injuries are rare among emergency service admittances. A 35 year-old female patient was admitted to emergency service with palpitation after electrical injury as a result of contact with a domestic low-voltage source. Electrocardiography (ECG) showed atrial fibrillation with rapid ventricular response. Transthoracic echocardiography findings were normal. Atrial fibrillation spontaneously converted to normal sinus rhythm after rate limiting treatment with beta-blocker. The patient was discharged without any complication on the third day of hospitalization. Although cardiac arrhythmias rarely occur after electrical injury, cardiac monitoring is recommended for all patients with documented rhythm disorder, loss of consciousness, or abnormal ECG at admission.

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Introduction

In parallel with the technological tools which acquire more space in our lives, the electrical injury cases have increased. The actual incidence of electrical injuries is unknown.¹ Soft tissue burns, cardiac arrhythmias, neurological damage and even death may occur in patients who are exposed to electrical injury.^{2,3} Cardiac monitoring and medical therapy are recommended for patients with documented rhythm disorder, loss of consciousness, or abnormal ECG at admission.⁴ Herein, we present a rare case of electrical injury as a result of contact with a low-voltage domestic source presented with atrial fibrillation.

Case report

A 35-year-old female patient without known cardiac disease was admitted to emergency service with complaint of palpitation after electrical injury that occurred as a result of contact with a low-voltage domestic source. On physical examination, radial pulses were irregular and rapid, blood pressure was 125/80 mm Hg. There were skin-burn injuries on the extensor side of the middle phalanx of the left hand indicating the entrance of electric current and on the extensor side of

the right arm showing the exit. The neurologic, respiratory and gastrointestinal system examinations were normal. The cardiac rhythm was monitored and atrial fibrillation with rapid ventricular response (160 beats/min) was seen on an electrocardiogram (Fig. 1). In laboratory analysis; white blood cell count (WBC): 14.200 (4.600–10.200 K/ μ L), hemoglobin: 11.9 (12.2–18.1 g/dL), creatine-kinase (CK): 386 (40–165 U/L), CK-MB: 12.3 (0.6–6.3 ng/mL) and lactate dehydrogenase (LDH): 309 (125–243 U/L) were detected. Troponin I and other biochemical and hematological parameters were in normal range. Transthoracic echocardiography findings were normal. Intravenously, 5 mg of metoprolol was administered for ventricular rate control. Enoxaparin 8000 IU/0.8 mL was given subcutaneously (sc) at admission for preventing thromboembolic complications. The patient was transferred to the coronary intensive care unit for hemodynamic and rhythm monitorization. In adding to burn dressings, daily sc 2×8000 IU/0.8 mL of enoxaparin, and oral 2×50 mg of metoprolol were started. On the first day of hospitalization, the rhythm was spontaneously returned to sinus rhythm (Fig. 2). The abnormal laboratory parameters were improved at follow-up and the patient was discharged on the third day of admission without any complication.

Discussion

The exact mechanism of electric shock-induced arrhythmias is not clear. The heart is one of the most susceptible organs to electrical injury. Electrical shock may cause direct myocardial necrosis or cardiac arrhythmias. Asystole and ventricular fibrillation are the most serious arrhythmic complications of electrical injury.² Increased cardiac sodium/potassium pump activities and an increase of serum potassium concentration may trigger arrhythmias after electrical injury.⁵ The most

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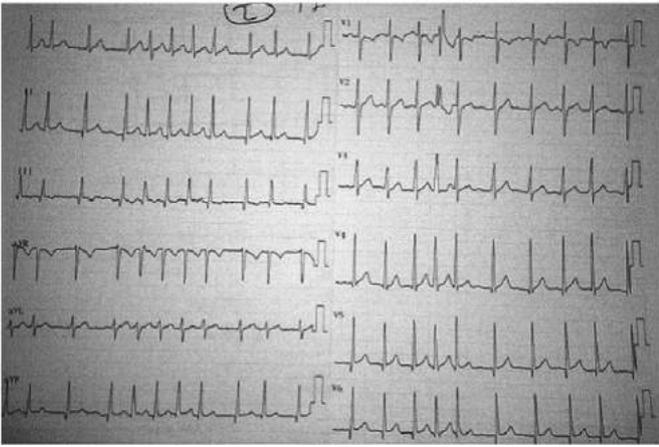


Fig. 1. Initial electrocardiogram showed atrial fibrillation with rapid ventricular response.

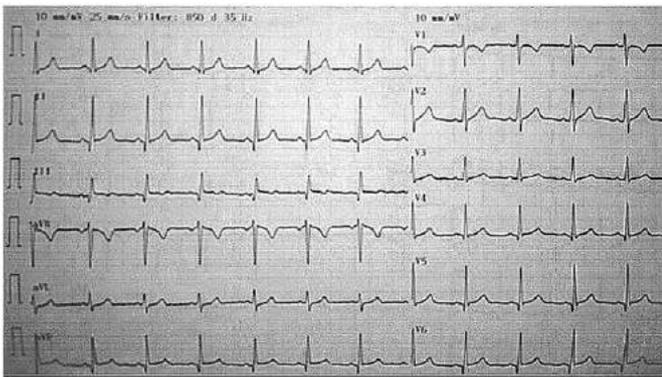


Fig. 2. The rhythm was returned to sinus after medical therapy.

common electrocardiographic changes resulting from electric shock are sinus tachycardia and nonspecific ST-segment deviations and T-wave changes. Atrial fibrillation, atrial and ventricular premature contractions, bundle branch blocks, QT interval prolongation and ventricular fibrillation are less frequently seen. In addition, other cardiac effects such as transient hypertension, myocardial infarction, left ventricular dysfunction and cardiac rupture can be seen.^{6,7} In a study by Arrowsmith et al., the frequency of cardiac complications was reported as 3% among 145 persons exposed to electric shock. Atrial fibrillation was detected in only one person who returned to normal sinus rhythm after intravenous digoxin administration.⁸ In another study conducted with 182 patients with electrical shock exposure, Butler et al. reported sinus tachycardia in 7 patients, ventricular premature contractions in 5 patients and atrial fibrillation in 2 patients. They reported that cardioversion was required in one of two patients with atrial fibrillation.⁹ Uzkeser et al.¹⁰ reported a case of atrial fibrillation after electrical shock exposure and the patient's rhythm had returned to sinus rhythm by medical therapy on the second

day. Gözlükaya et al.¹¹ reported a case with atrial fibrillation developed after electrical shock who returned to sinus rhythm 20 min after intravenous diltiazem administration. Our case was similar with other cases in the literature in terms of diagnosis, treatment and disease course. The patient was treated with intravenous metoprolol at admission and rapid ventricular rate was diminished, then oral metoprolol was continued in the intensive care unit. On the first day, the rhythm was returned to normal sinus rhythm spontaneously. Arrowsmith et al.⁸ reported that all patients with dysrhythmias resolved within 48 h of admission either spontaneously or with pharmacologic treatment.

Although the cardiac effects due to electrical shock are rare, it is important to close follow-up for cardiac arrhythmias. Cardiac arrhythmias due to electrical injuries are usually observed during or immediately after the event.¹² Cardiac monitoring is recommended if there is loss of consciousness or documented rhythm disturbance and in cases with abnormal ECG at the time of admission.⁴ The monitoring period in studies are usually 24 h.^{4,8} Unless there is a loss of consciousness and the 12-lead ECG is normal, it is unlikely that the patient will go on to develop cardiac problems, and it is not necessary to monitor the patient for 24 h.^{4,8}

In conclusion, electrical shock occurs in an unexpected time and atrial fibrillation is an uncomfortable cardiac problem that may occur after electrical shock. With a correct treatment and follow-up strategy, atrial fibrillation should be converted to sinus rhythm in patients without structural heart disease. Additionally, it is important to monitor patients who have documented rhythm disorder, loss of consciousness, or abnormal ECG after electrical shock at the time of admission.

Conflict of interest

The authors declare no conflict of interest.

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