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Case Report

Transient Symptomatic Sinus Bradycardia Following Low-Voltage Exposure from a Mobile Phone Charger Connector: A Case Report

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Abstract

Background: Electrical injuries can be life-threatening, ranging from mild skin burns to serious organ damage. Low-voltage electric shocks (<1000V) are more common than high-voltage electric shocks. Phone chargers have been used quite frequently in recent years, especially at night, to charge portable phones. Cases of burns due to phone chargers have been reported.

Case Presentation: In this case report, a 30-year-old woman developed chest pain and symptomatic bradycardia after exposure to low-voltage electricity (5 V, 3 A) from the connector of a phone charger.

Conclusion: This case describes transient symptomatic sinus bradycardia temporally associated with contact with a mobile phone charger connector. However, causality cannot be established based on a single case. In symptomatic patients after such exposure, ECG assessment and short-term emergency department monitoring may be considered.

Keywords: Electrical Injury, Phone Charger, Symptomatic Bradycardia

1. Background

Electrical injuries may cause life-threatening conditions ranging from mild skin burns to severe organ damage.[1] In recent years, electrical injuries have increased due to increased access to electricity and the development of technology.[2] Low-voltage electric shock (<1000 V) is more common than high-voltage electric shock.[3] Today, most of the people who are exposed to low-voltage electric shock apply to emergency services.[2]

Phone chargers are widely used in daily life to charge portable electronic devices. Product safety reports and institutional safety warnings suggest that low-quality, damaged, or non-compliant chargers may be associated with electric shock and fire hazards.[4,5] Burn cases related to phone chargers have been reported.[6-8]

In this case report, a 30-year-old woman who developed chest pain and symptomatic bradycardia after exposure to low-voltage (5 V, 3 A) electricity from the connector of a phone charger is discussed

2. Case Presentation

A 30-year-old woman presented to the emergency department after an electric shock caused by touching the connector of a charger cable plugged into a 220-V outlet. The charger output was reported/labelled as 5 V and 3 A; however, the actual current passing through the patient's body could not be determined. According to the patient's statement, the contact was brief and involved the connector tip. The patient did not report having wet hands at the time of contact. Information regarding whether the charger was original, low-quality, non-compliant, or damaged was not available. After the contact, she felt pain radiating from her left hand toward her chest, which lasted approximately thirty minutes. Afterwards, she experienced near-syncope/blackouts and palpitations. There was no active chest pain during the examination, but she reported tingling in her left arm. There was no known disease or regular medication in the patient's medical history. No previous history of arrhythmia, syncope, or known baseline bradycardia was reported. She was not a trained athlete and did not report regular intensive endurance exercise. Vital signs were blood pressure 108/72 mmHg, oxygen saturation 99% in room air, temperature 36.4 °C, respiratory rate 17 breaths per minute, and pulse rate 40 beats per minute. The bradycardia was considered clinically symptomatic because the patient presented with recent near-syncope/blackouts, palpitations, and chest discomfort in temporal association

with documented sinus bradycardia on admission. However, she was hemodynamically stable, with no hypotension, altered mental status, signs of shock, or clinical evidence of poor peripheral perfusion. Physical examination revealed no lesions on the fingers of the left hand that were in contact with electricity, and neurovascular examination was normal. The cardiovascular examination revealed no abnormal heart sound or murmur. Other system examinations revealed no significant pathology. The patient denied alcohol or substance use. There was no reported family history of sudden cardiac death or clinically significant arrhythmia. Electrolyte levels were within normal limits. Thyroid function tests were not performed because there was no clinical suspicion of thyroid dysfunction during the emergency department evaluation. Pregnancy was excluded by history and/or testing.

While the patient was monitored in the emergency department observation/resuscitation area, ECG was performed, biochemical tests, cardiac biomarkers, and hemogram tests were obtained, and hydration with saline was started. The initial ECG showed sinus bradycardia, and the heart rate was 46 bpm. The rhythm was sinus, with P waves preceding each QRS complex. No atrioventricular block, bundle branch block, clinically significant conduction delay, acute ST-segment elevation or depression, or ischemic ST-T change was observed. The PR interval, QRS duration, and QT/QTc interval were within normal limits according to the ECG assessment. In the control ECG taken ten minutes later, the heart rate was 51 bpm with persistent sinus rhythm and no newly developed conduction abnormality or ischemic change. The last control ECG taken two hours later showed sinus rhythm and a heart rate of 61 bpm, with normalization of the heart rate and no clinically significant ST-T abnormality, conduction delay, or malignant arrhythmia (Figure 1). Complete blood count, renal and liver function tests, and other basic laboratory parameters were within normal limits. However, a borderline troponin elevation was observed initially: troponin was 0.20 ng/ml according to the institutional reference range of 0–0.16 ng/ml. CK-MB was 77 IU/L, and LDH was 460 U/L. Repeat troponin testing at three hours was <0.10 ng/ml, showing no dynamic rise and falling below the institutional threshold. Total CK and urinalysis were within normal limits. Myoglobin was not assessed because it is not routinely performed in our emergency department for clinically stable patients without evidence of muscle injury, rhabdomyolysis, or renal involvement.

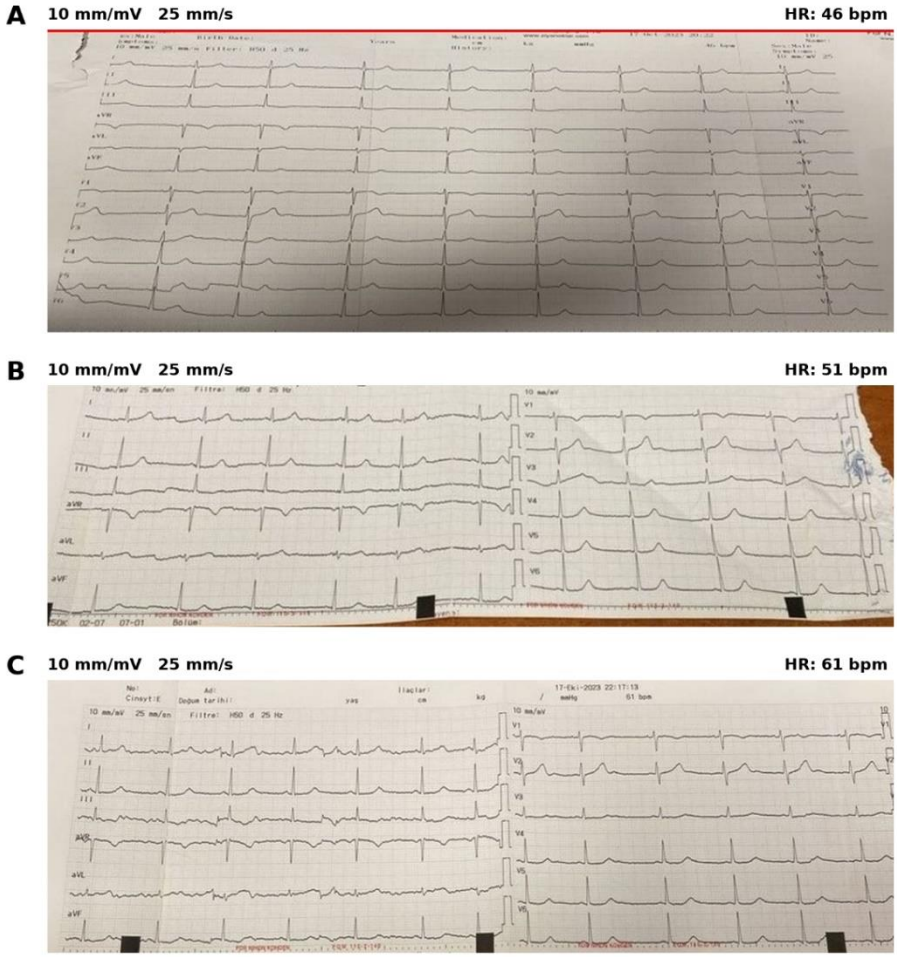

Figure 1. ???????????

The patient had no active complaints during follow-up; her vital signs remained within normal ranges, and no clinically significant additional arrhythmia was detected during emergency department monitoring. After six hours of observation, she was discharged with recommendations.

3. Discussion

One of the most common outcomes of electrical injuries is cardiac arrhythmias. Although delayed arrhythmias have been reported, arrhythmia develops in a short period of time after electrical injury.[9] Sinus tachycardia or bradycardia, atrial fibrillation, ventricular tachycardia, and bundle branch block are the most common types of arrhythmias.[9,10] In a study by Pilecky et al. including 480 cases of electric shock, sinus bradycardia was detected in approximately 10.4% of the patients at the time of admission.[10] Of 182 (37.9%) patients who underwent ECG monitoring in the emergency department, only two patients had potentially serious arrhythmias (paroxysmal atrial fibrillation in one patient and supraventricular tachycardia in the other).[10]

In order to provide the energy level required by portable electronic devices, chargers convert the electricity received from the socket to the voltage and current level at which the device can be charged in a safe and healthy way by means of an adapter. Due to the increasing number and variety of portable electronic devices in recent years, chargers are used in almost every home every day. In general, the energy in the connectors of chargers may seem harmless because it has a lower-voltage and current level than the electricity in the socket. However, there are publications showing that chargers can cause serious problems. Mostly skin burns and lesions have been described.[6-8] It has been reported in the literature that low-voltage electrical injuries may lead to arrhythmias.[10] However, the term "low-voltage" refers to <1000 volts of electricity and generally refers to electrical injuries of 100-120 volts, which are common in domestic use.

In this case report, a patient who experienced low-voltage (5 V, 3 A) electrical injury after contact with the connector of a cellphone charger presented with chest pain, and sinus bradycardia was detected. ECG monitoring was performed in the emergency department, and no arrhythmia developed and the patient was discharged.

Previous charger-related case reports have predominantly described cutaneous or thermal injuries, including burns, tissue defects, or very-low-voltage skin injuries associated with mobile phone chargers.[6-8] In contrast, reports of arrhythmia after low-voltage electrical injury generally involve household or mains-voltage exposures and describe rhythm disturbances such as atrial fibrillation or other ECG abnormalities.[9,10] The present case differs from these reports because the patient presented with transient symptomatic sinus bradycardia after reported contact with a mobile phone charger connector, without visible burn injury, persistent myocardial injury, malignant arrhythmia, or renal involvement. Therefore, the novelty of this case is not that it proves a direct causal effect of charger connector contact on sinus bradycardia, but that it highlights an uncommon clinical presentation and supports symptom- and ECG-guided evaluation after such exposures.

Although the onset of symptoms and sinus bradycardia occurred shortly after contact with the mobile phone charger connector, a definite causal relationship cannot be established based on a single case. Alternative explanations, including a vasovagal reaction, anxiety- or pain-related autonomic response, presyncope, baseline sinus bradycardia, or measurement variability, should also be considered. In the present case, no previous history of bradyarrhythmia was reported. The initial bradycardia improved during observation without specific antiarrhythmic treatment, and no clinically significant arrhythmia was detected during emergency department monitoring. Therefore, this case should be interpreted as a temporal association between charger connector contact and symptomatic sinus bradycardia rather than definitive evidence of direct causation.

Although CK-MB and LDH were mildly elevated, total CK, renal function tests, and urinalysis were within normal limits, and there was no clinical evidence of rhabdomyolysis or acute kidney injury. Therefore, these mild biomarker abnormalities were interpreted cautiously and were not considered clinically significant in the absence of a dynamic troponin rise, persistent symptoms, ECG deterioration, or renal involvement.

Although there is no universally established standard for monitoring duration after low-voltage electrical injury, Ahmed et al. reported that low-risk patients with normal ECG findings may be discharged after brief clinical assessment.[11] In this case, six-hour monitoring was preferred because the patient had near-syncope/blackouts, chest discomfort, palpitations, and sinus bradycardia at admission. She was discharged after symptom resolution, improvement on serial ECGs, absence of dynamic troponin rise, and no clinically significant additional arrhythmia during monitoring.

6. Conclusion

Sinus bradycardia is one of the types of arrhythmia seen after electrical injury, and most cases are asymptomatic and clinically resolve spontaneously. In the present case, transient symptomatic sinus bradycardia was observed after contact with a mobile phone charger connector. However, a definitive causal relationship between charger connector contact and sinus bradycardia cannot be established based on a single case. The patient improved during emergency department observation without specific antiarrhythmic treatment, no clinically significant

additional arrhythmia was detected, and she was discharged uneventfully. Chargers can cause serious fires and other safety concerns. However, the potential cardiac effects of very-low-voltage charger connector contact remain unclear; therefore, further case reports or observational data are needed to better clarify this relationship.

Research Highlights

What Is Already Known?

Low-voltage electrical injuries are common in daily life and are usually associated with minor cutaneous findings. Cardiac complications are uncommon and most frequently include transient arrhythmias, such as sinus tachycardia or nonspecific ECG changes. Symptomatic sinus bradycardia after exposure to a mobile phone charger has rarely been reported in the literature.

What Does This Study Add?

This case report describes a young female patient who developed symptomatic sinus bradycardia and chest pain following a low-voltage electric shock from a phone charger connector. The report highlights that even seemingly harmless household electrical exposures may result in clinically significant cardiac conduction abnormalities, requiring emergency department evaluation and cardiac monitoring.

Author Contributions

Authors contributed equally to this work.

Conflict of Interest Disclosures

All authors declared that they have no conflict of interest.

Ethical Approval

All authors declared that human rights were respected according to Declaration of Helsinki.

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