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Case Report

A Case of Button Battery Ingestion Mimicking Inferior Myocardial Ischemia and Atypical Chest Pain

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Abstract

With the increasing use of electronic toys, the number of cases involving battery ingestion has risen significantly in recent years. This case report presents a child who attended the emergency department with sudden chest pain and crying episodes. The electrocardiogram (ECG) revealed signs of myocardial ischemia in inferior leads, despite completely normal cardiac function. A chest X-ray detected a button battery lodged in the esophagus.

A 4-year-old boy presented to the emergency department with sudden, intense chest pain and crying while playing with his toys. An electrocardiogram showed prolonged corrected QT interval (cQT 0.56), marked ST depression, and negative T waves in leads DII, DIII and aVF. Echocardiography (ECHO) revealed normal cardiac function. Cardiac enzyme and biochemical tests returned normal results (troponin-I ≤ 3.2 ng/L, CK-MB 29.8 U/L). A disc-shaped battery was detected on chest radiography, and electrocardiographic findings completely normalized after the battery was removed endoscopically.

In the literature, rare adult cases of multiple cylindrical battery ingestion have been reported with ECG findings that mimic myocardial ischemia or infarction. Our case is notable as it presents a single disc battery lodged in the esophagus of a pediatric patient that mimicked an inferior myocardial infarction.

Keywords: Arrhythmias, cardiac, chest pain, foreign bodies, myocardial ischemia

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Chest pain is a common symptom in pediatric practice, although it is usually attributed to non-cardiac causes. Foreign body aspiration is a rare cause of chest pain. With the increased use of electronic toys, the number of batteries has also risen among ingested foreign bodies.[1] The esophagus is the most frequently affected organ; however, vascular injuries are the most dangerous and often fatal.[2] In a comprehensive meta-analysis by Varga and colleagues, the complication rate for battery ingestion was found to be 0.2%, and the mortality rate 0.04%.[2] The most common complications include esophageal injury, perforation, tracheoesophageal fistula formation, stricture with obstruction, vascular injury, necrosis, bilateral vocal cord paralysis, bronchopneumonia, and spondylitis.[2] Ingestion of small cylindrical batteries (such as AA and AAA batteries) is rare and generally considered less risky than disc battery ingestion.[1,3] Among children under six, ingestion of disc batteries with a diameter of ≥2 cm poses a high risk of complication 12%. These 2 cm batteries have a shelf life of up to 10 years and retain about half of their charge even when not in use.[4,5] One of the rare

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complications following battery ingestion is cardiac arrhythmia. In the literature, four case reports involving adults documented this complication, and the ingested batteries were cylindrical.[6-9] Our case represents the first report of a pediatric patient with disc battery ingestion mimicking an inferior myocardial infarction.

Case Report

A 4-year-old male patient, followed by a child psychiatrist for atypical autism, presented to the pediatric emergency clinic with severe chest pain. The chest pain was intense and persistent, and the patient pointed to the anterior chest wall and epigastric area. He had no prior history of cardiac medication use, nor was there any family history of heart disease. He exhibited no shortness of breath, nausea, or vomiting. The patient's history revealed that he had undergone bronchoscopy at age 2 in our clinic for foreign body aspiration, during which a peanut fragment was removed. Physical examination revealed no pathological findings, and a detailed cardiac examination due to chest pain was unremarkable, with no murmur detected. After establishing intravenous access and administering oxygen, cardiac enzyme and biochemical tests were ordered.

On the electrocardiogram (ECG), prolonged corrected QT interval (cQT), ST depression, and negative T waves were observed in leads DII, DIII and aVF, findings consistent with inferior cardiac ischemia (Fig. 1). The pediatric cardiology department was consulted, and cardiac enzyme levels were assessed showing troponin-I at ≤3.2 ng/L (normal range: 0-34.2) and CK-MB at 29.8 U/L (normal range <24.0), which was mildly elevated. Echocardiography (ECHO) was also normal. A chest X-ray revealed a foreign object, identified as a disc battery, in the distal esophagus, leading to a consultation with our department (Fig. 2). The abnormal ECG findings were thought to be related to the active battery. Emergency endoscopy was performed, and the disc battery was removed from the lower esophagus with forceps. A stage 2b burn was observed at the site where the battery had lodged.

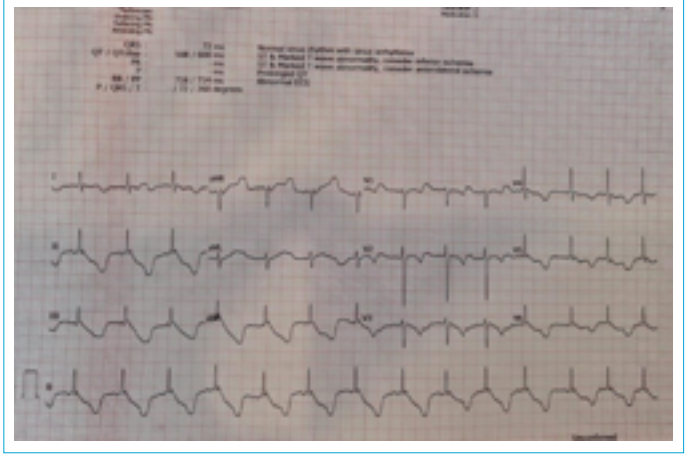

Figure 1. Electrocardiogram (ECG) obtained in the pediatric emergency department.

Prolonged corrected QT interval (cQT), ST-segment depression, and negative T waves were observed in leads DII, DIII and aVF findings consistent with inferior myocardial ischemia.

During surgery, the abnormal T-wave patterns on cardiac monitoring resolved immediately after battery removal. A follow-up ECG taken in the ward showed no ST depression in leads DII, DIII, and aVF, and the cQT interval had normalized (Fig. 3). The patient was fed through a nasogastric tube postoperatively, and a follow-up endoscopy on postoperative day 5 showed the mucosal injury had regressed to stage 2a. An esophagogram performed after discharge showed no esophageal stricture. The patient, weighing 19 kg (75th-90th percentile), displayed no swallowing difficulties or weight loss.

Discussion

In the literature, battery ingestion has been associated with numerous complications; however, this is the first reported case in pediatric patients where ECG findings mimicking myocardial infarction accompanied chest pain. This case contributes uniquely to the literature due to the patient's young age, prior history of foreign body aspiration, the presence of a disc battery lodged in the esophagus, and

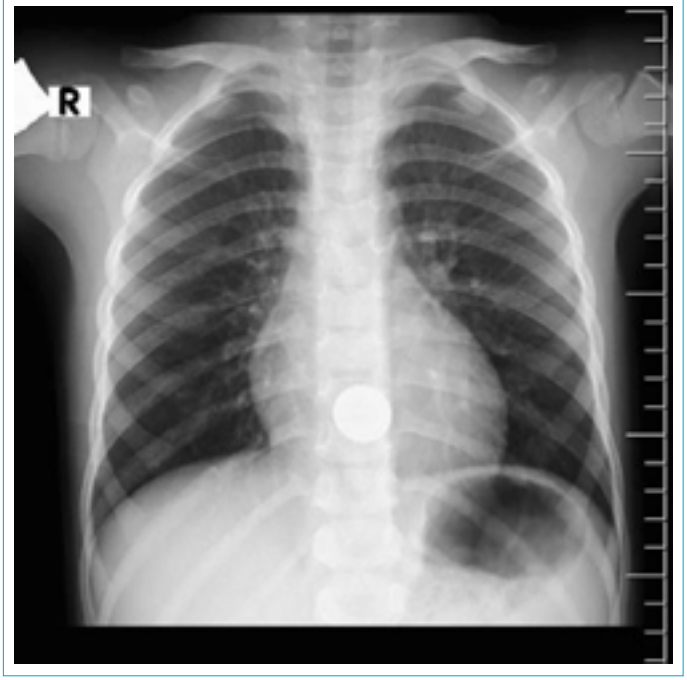

Figure 2. Chest X-ray.

The chest X-ray revealed a disc battery lodged in the distal esophagus.

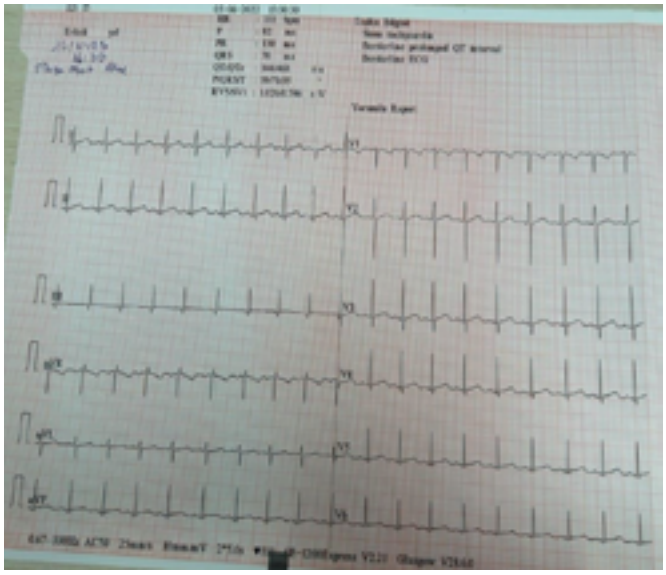

Figure 3. Postoperative electrocardiogram (ECG).

No ST-segment depression was observed in leads DII, DIII, and aVF, and the corrected QT interval (cQT) had normalized.

transient ECG findings suggestive of myocardial ischemia. Previous studies reporting cardiac-related complications primarily involved adult patients, with multiple cylindrical, rather than disc, batteries lodged in the stomach.[6-8] Alexander J. Ordoobadi et al.[6] and Chang H et al.[7] observed ST segment elevation in inferior leads on ECG, while Moritz Till Huttelmaier et al.[8] found ST elevation in leads I and aVR. In contrast, our case presented with ST depression. In each of the three studies,[6-8] the ingested cylindrical batteries were located in the stomach, with multiple batteries present. In our case however, the battery was positioned at the lower end of the esophagus. Previous adult studies suggested that such changes were observed only when the battery was located close to the heart's lower regions (specifically II, III and aVF leads reflecting inferior cardiac areas). We also believe that the proximity of the battery in the lower esophagus to the heart contributed to the ECG changes observed in our case.

While the mechanism behind ST segment changes caused by batteries has not been fully explained, it is believed to result from the electrical current generated by the batteries.[6] Moritz Till Huttelmaier et al.[8] proposed two hypotheses to explain the occurrence of ECG changes: Cardiac motion within the disturbance field generated by the battery causes electrical changes at a heart rate time scale above the high-pass filter threshold; and the electrotonic potential of the battery affects the membrane currents of cardiac myocytes, producing repolarization abnormalities without generating an action potential. According to Huttelmaier's hypothesis, gastric mucosa bridges the battery's anode and cathode, allowing current flow. Additionally, larger batteries (e.g., cylindrical) tend to produce higher frequencies of these effects than smaller designs, such as button batteries [8]. While detailed data on this topic are lacking, our case does not align with this hypothesis, as it involved a disc battery in the esophagus. While ST-segment depression is often observed in the context of cardiac ischemia, prolonged QT intervals are not commonly seen in battery ingestion cases, as they indicate an increased risk of sudden cardiac death due to ventricular arrhythmias. Aside from genetic long QT syndromes, prolonged QT intervals may also occur due to drugs that disrupt ventricular repolarization. Given that repolarization abnormalities, as seen in battery ingestion cases, resolve immediately after battery removal, a causal relationship between battery removal and ECG abnormalities was proposed.[8] In our case, the prolonged QT interval normalized immediately after battery removal. Additional pediatric cases are needed to better understand the relationship between battery ingestion and transient ECG abnormalities, particularly QT interval changes.

Conclusion

Prolonged cQT intervals and ST depression are rare but clinically significant complications of battery ingestion when the battery is lodged in the esophagus. In patients who are unable to communicate ingestion events (such as those with intellectual disabilities or under psychiatric follow-up), the possibility of battery ingestion should be considered if atypical chest pain is accompanied by abnormal ECG findings.

On such cases, both clinical symptoms and ECG abnormalities may resolve completely following timely battery removal.

Disclosures

Conflict of Interest: The authors declare no conflict of interest.

Informed Consent: Informed consent was obtained

Ethics Committee Approval: The study was approved by the Baskent University Institutional Review Board and Ethics Committee and supported by Baskent University Research Fund. (date: 25/12/2024, number: 24/288)

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