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Case Report

Delayed bowel perforation in electrocution: An unpredictable foe

Divakar Goyal^a, Ajay Dhiman^a, Nilesh Jagne^a, Amulya Rattan^{b,*}

^a Senior Resident, MCh Trauma Surgery & Critical Care, AIIMS Rishikesh, India 249203

^b Assistant Professor, Trauma Surgery & Critical Care, AIIMS Rishikesh, India 249203

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ABSTRACT

Electrocution injuries, particularly high voltage, are uncommon, but can be devastating. Thermal burns, arrhythmias and myonecrosis are commonly known and monitored complications of electrical injuries. Direct thermal trauma to internal viscera is also known and almost all internal organs have been reported to be affected, bowel being the most common. However, bowel perforation occurring in a delayed fashion is one rare, dreaded and erratic complication of electrocution, making it a dangerous pitfall if missed. Alimentary tract perforations can present on a delayed basis in high voltage electrocution injuries; advise for clinical follow up must incorporate this possibility at the time of discharge. Presentation of delayed visceral injuries is subtle & atypical, and post burn immunosuppression may play a part for such presentation. We suggest that all victims of high voltage electrocution with abdominal wall burns receive diagnostic laparoscopy and/or CECT abdomen as part of workup of their injuries. Any non-enhancing segment of bowel on CECT, however small, should be prudently evaluated with laparoscopy.

Introduction

Electrocution injuries are uncommon, but can be devastating, particularly when high (>1000 V) voltage. [1,2] Low voltage (<1000 V) electrical injuries can inflict significant injury too, albeit uncommonly. [3] Thermal burns, arrhythmias and myonecrosis are commonly known and monitored complications of electrical injuries. [2] Direct thermal trauma to internal viscera is also known and almost all internal organs have been reported to be affected, bowel being the most common. [4–6] However, bowel perforation occurring in a delayed fashion is one rare, dreaded and erratic complication of electrocution, making it a dangerous pitfall if missed. [1] We report our experience of a similar case, where concomitant jejunal and sigmoid perforation occurred on day 6 of electrocution. The perforation was detected & treated well in time as the patient was still in the hospital at the time of perforation, being admitted in view of planned soft tissue coverage for post burn raw area. However, this could be detrimental had the patient been discharged, especially in our setup where neither follow-up nor access to tertiary care is robust.

Case report

A 25-year, differently-abled boy (?birth apshyxia) was admitted after h/o accidental electrocution, with charred left upper hand and exit wounds over left groin and foot. (TBSA 11%) Injury-arrival interval was 3 h, primary survey was normal and FAST was negative. Patient had overt compartment syndrome of left upper limb due to circumferential & constricting eschar (Fig. 1) for which he

* Corresponding author at: Department of Trauma Surgery, AIIMS, Rishikesh, India.
E-mail address: amulya.rattan@gmail.com (A. Rattan).

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Fig. 1. Circumferential & constricting eschar leading to compartment syndrome post electrocution.



Fig. 2. Perforation (3*2 inches) in mid-jejunum, presenting on day 6 of admission.

was taken to OR for urgent escharotomy. Myonecrosis in affected upper extremity was profound, but amputation consent wasn't given by family in index surgery. He was found to be Hepatitis B positive; there was history of blood transfusion in remote past. Patient underwent amputation on post-op day 2 with family's consent. Patient was kept admitted for regular debridement and dressings of left groin exit wound. He was accepting orally well, bowel-bladder habits were normal, there was no peritonitis or fever; abdominal imaging was therefore not done. On day 6 of hospital admission, he developed sudden abdominal distension, multiple episodes of bilious vomiting and pain abdomen; there was no peritonitis. Sonography of abdomen showed free fluid in abdomen. A CT abdomen was deferred as patient started pouring out faecal matter from left groin wound for which he was taken for exploratory laparotomy. A 3*2 cm mid-jejunal (Fig. 2) and 1*1 sigmoid colon perforation were found for which jejunal resection anastomosis and descending end colostomy were done. There was neither charring of the gut viscera nor signs of intestinal ischemia. Further postoperative recovery was uneventful. Patient underwent regular dressings of the laparostomy wound, which was grafted after 3 weeks. The exit wound in left groin gradually resulted in exposure of femoral artery. Pedicled right anterolateral thigh flap was done for vessel coverage. He had a left femoral artery blow out on day 35 of admission, which was managed with ligation of artery by team present bedside. The left lower limb was pulseless but continued to be well perfused, with no distal neurological deficit, normal saturation and good distal runoff in CT angiography. He was discharged to home care after 45 days of admission.

Discussion

Visceral injury as a direct consequence of electrocution is known since 1927 [1]. Mechanisms leading to visceral injury from

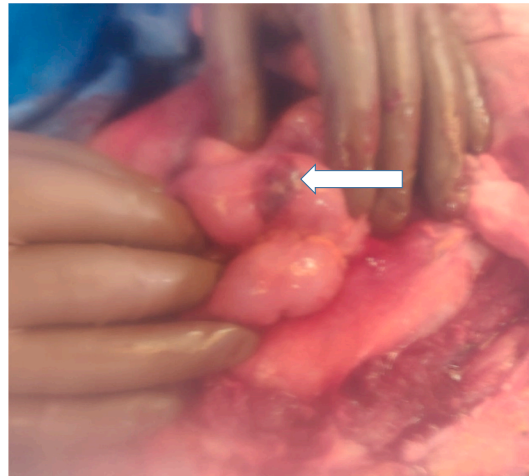


Fig. 3. Non-viable but intact segment of jejunum, secondary to thermal damage. Patient had large area abdominal wall burn from high-voltage electrocution.

The suboptimal resolution is due to photograph being taken from a cell phone wrapped in plastic sheet, as a part of COVID OR protocol.

electrocution are both thermal and non-thermal damage. Heating of tissue in accordance with Joule's law and denaturation of cellular macromolecules are thermal mechanisms mediating injury, whereas electro conformational denaturation is a non-thermal mechanism inflicting tissue damage. [6] In our patient, perforations seem to have occurred as a manifestation of irreversible local damage to bowel at the time of electrocution, underneath the site of exit wound. The damage was, it seems, not severe enough to lead to perforation acutely.

Bowel perforation is often associated with high voltage electric injury, and overlying abdominal wall involvement is common, as in our patient. [3,6] However, severity of cutaneous lesions can't be used to predict internal organ damage. Visceral damage, in-fact, may be inversely related to skin lesions, as low resistance in skin would lead to less cutaneous burns but more transmission of current to internal organs. [1,6]

There is a great variation in presentation of delayed complications of alimentary tract post electrocution. Whereas some authors mention day 18–21 as the most common window for such occurrences, [7,8] reports of perforations occurring in second week of injury are also there. [1,3,9] The unpredictable temporal association of delayed bowel perforation in electrocution is perhaps a marker of incompletely understood mechanisms underlying this perilous event.

Presentations of such delayed complications are subtle, atypical and therefore can lead to increased morbidity and mortality [7] In our case, the patient had frank perforations of small and large bowel, but without peritonitis; such presentations have been observed by other authors too. [7,9] Post burn immuno-suppression may be one plausible explanation for the lack of peritoneal features in frank bowel perforation post electrocution, which usually occurs in association with overlying abdominal wall burns. [10]

There is no consensus definition of "delayed bowel perforation" post electrocution, in contrast to other injuries (viz "late neurological injuries"). [1] *We propose that any intraperitoneal bowel perforation occurring after 48 h of injury be labelled as delayed perforation*, as most intra-peritoneal perforations would present clinically by 48 h of occurrence.

Subsequently, we treated a patient with large area abdominal wall burn (high voltage electrocution); building on previous experience, we took the patient for abdomen exploration. To our surprise, we found a non-viable (but intact!) segment of jejunum, which would have presented as a frank perforation on delayed basis. (Fig. 3) CT was not done in this case, as patient was taken up for laparotomy. ***The intraoperative picture (Fig. 3) would very well explain delayed occurrence of bowel perforations in electrocution patients.*** It's difficult to comment whether these perforations, if small enough, might get sealed off and evade detection clinically. In retrospect, we wonder whether getting a CECT abdomen would have helped in our index case, owing to intact wall of damaged bowel.

We suggest that all victims of high voltage electrocution with abdominal wall burns receive diagnostic laparoscopy and/or CECT abdomen as part of workup of their injuries. Any non-enhancing segment of bowel on CECT, howsoever small, should be prudently evaluated with laparoscopy.

Summary

We hereby report a case of delayed perforations of small and large bowel in a patient of high voltage electrocution injury. The perforation occurred on a delayed basis, and most probably occurred as a manifestation of irreversible damage without structural disintegration at the time of electrocution, as proved by intraoperative photograph from an unrelated, subsequent case.

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