

# EM CASE OF THE WEEK.

BROWARD HEALTH MEDICAL CENTER  
DEPARTMENT OF EMERGENCY MEDICINE



Care Warriors

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An 18-month-old male presents with a burn of the left oral commissure after chewing through an electrical cord. Loss of consciousness is suspected. The commissure is not bleeding, and no burns of the feet or buttocks are apparent. The child has normal EKG results and immunizations have been confirmed as up to date. The patient is drinking liquids well. Which of the following medications is most appropriate?



- Oral augmentin for 14 days
- Topical bacitracin to the commissure until the eschar is replaced by epithelium
- Topical silver sulfadiazine cream until the wound heals
- Tetanus toxoid and topical bacitracin

**Question summarized from**

Dulebohn, S., MD. (2019). Welcome to StatPearls. Retrieved December 10, 2020, from <https://www.statpearls.com/quiz/askquestion/?ResultID=205088>

*EM Case of the Week is a weekly "pop quiz" for ED staff.*

The goal is to educate all ED personnel by sharing common pearls and pitfalls involving the care of ED patients. We intend on providing better patient care through better education for our nurses and staff.

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**The correct answer is B.** Topical bacitracin to the commissure until the eschar is replaced by epithelium.

Electrical exposure can result in three mechanisms of injury: direct injury from electrical current, thermal injury from electrical energy conversion, and mechanical trauma during or after the incident. Thermal injuries, often the most evident of injuries, may be able to be treated conservatively depending on severity. Broad-spectrum antibiotic use for mild cutaneous injuries has been highly debated but current literature indicates that they have not been clinically useful after routine burns.

### Discussion

Direct injury from electrical current is most evident in the cardiac and nervous tissues. EKG abnormalities seen after electrical exposure include AV block, bundle branch block, atrial fibrillation, and QT prolongation, ventricular tachycardia, and ventricular fibrillation. Nervous tissues, followed by vascular tissues and blood, have the least resistance to electricity and can be injured even when the overlying cutaneous tissue is intact and undamaged. This decreased resistance can result in temporary or permanent paresthesias and numbness. Vascular vulnerability can lead to coagulation necrosis and thrombosis and limb ischemia. The electrical energy affects muscle tissue as well and may cause contraction and tetany, which leads to many of the mechanical injuries discussed later. Visceral injury has been described after electric shock, especially when the pathway travels through the thorax. Bowel perforation, pancreatic and renal injuries, retinal detachment, and inner ear dysfunction have all been discussed in the literature<sup>1</sup>. Injury at the oral commissure is seen in pediatric burns with subsequent airway obstruction and severe bleeding due to damage to the labial artery<sup>2</sup>.

As stated above, thermal injury is the most common presenting symptom after electrical exposure with the extent of thermal injury depending on low-voltage or high-voltage exposure. Low-voltage exposures usually result in superficial burns at the entry and exit sites while high-voltage exposures may create burns that require skin grafting, debridement, and sometimes amputation<sup>3</sup>.

Mechanical injury can occur due to tetany and muscle contractions or due to trauma during/after exposure. Thoracic tetany can cause paralysis of the respiratory muscles and subsequent respiratory failure. Shoulder dislocations are also commonly reported after electrical exposure. The muscle contraction may lead to rhabdomyolysis and muscle necrosis which can end in compartment syndrome and/or acute kidney injury. Because of the risk of falls during/after electrical exposure, patients must be examined head-to-toe and they require C-spine stabilization as vertebral fractures, basilar skull fractures, and extremity fracture have all been well-documented after electrical exposure.

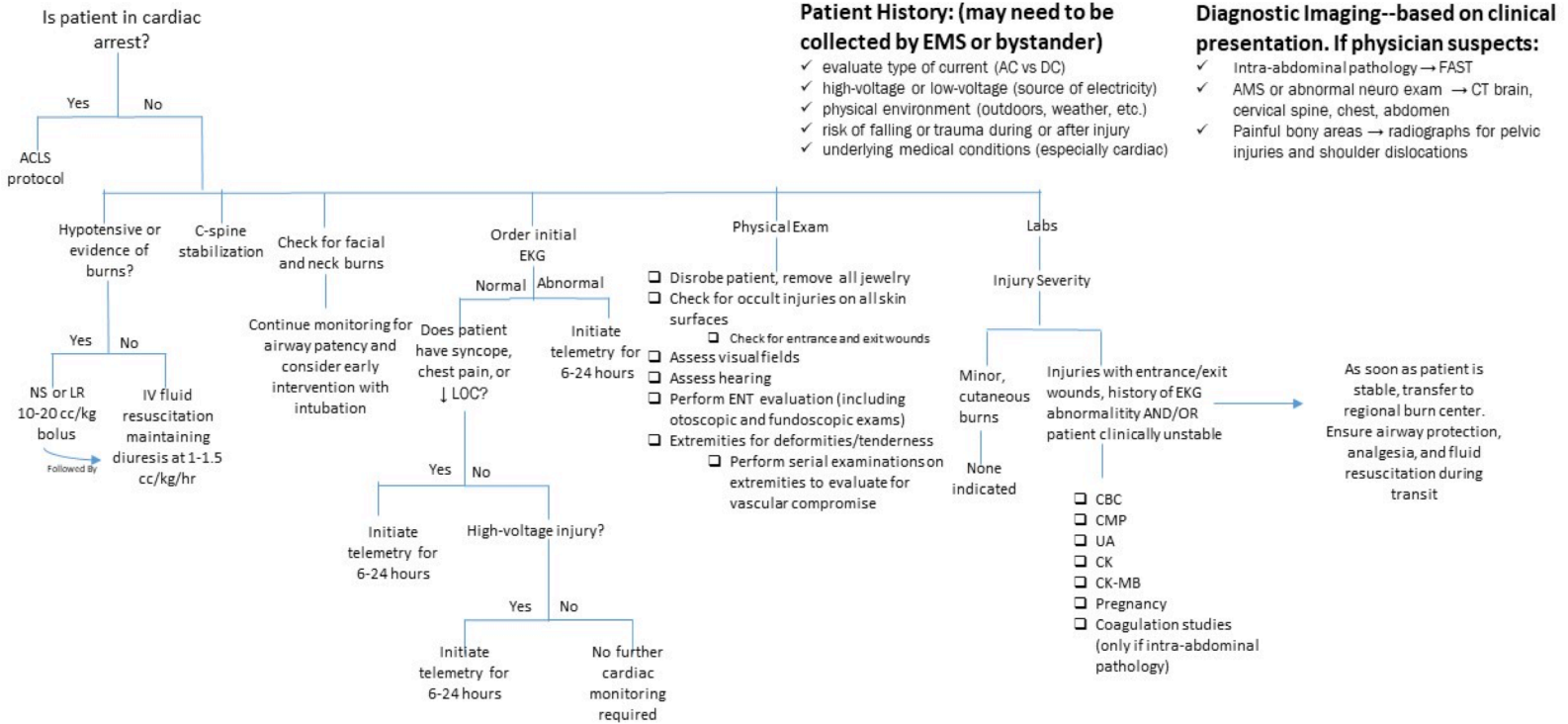
### Treatment

Initial treatment of electrical burns should follow a systematic approach as many injuries may be occult and thorough examination and testing is required to ensure proper assessment of patient condition. Figure 1 provides an algorithm for initial management of patients with electrical burns. Patients may present in cardiac arrest due to arrhythmias, thrombosis, blood loss, or a wide variety of other pathologies. These patients should be managed according to ACLS protocol. Once the patient has been appropriately resuscitated via ACLS protocol, a series of clinical history questions, physical exam maneuvers, and diagnostic imaging modalities should occur<sup>1,3</sup>.

Every electrical burn patient should receive an initial EKG, C-spine stabilization, and fluid resuscitation upon ED arrival. Many of these patients present with altered mental status and proper precautions should be taken to rule out fatal arrhythmias and traumatic injuries.

For a list of educational lectures, grand rounds, workshops, and didactics please visit [BrowardER.com](http://BrowardER.com) and **click** on the **"Conference"** link.

*All are welcome to attend!*



**Patient History: (may need to be collected by EMS or bystander)**

- ✓ evaluate type of current (AC vs DC)
- ✓ high-voltage or low-voltage (source of electricity)
- ✓ physical environment (outdoors, weather, etc.)
- ✓ risk of falling or trauma during or after injury
- ✓ underlying medical conditions (especially cardiac)

**Diagnostic Imaging--based on clinical presentation. If physician suspects:**

- ✓ Intra-abdominal pathology → FAST
- ✓ AMS or abnormal neuro exam → CT brain, cervical spine, chest, abdomen
- ✓ Painful bony areas → radiographs for pelvic injuries and shoulder dislocations

As soon as patient is stable, transfer to regional burn center. Ensure airway protection, analgesia, and fluid resuscitation during transit

**Discussion contd.**

A thorough clinical history can give more information about the voltage type and likely extent and location of injuries. Fluid resuscitation is paramount to avoid burn-related dehydration and as well as to prevent kidney injury in the case of rhabdomyolysis. The airway must be closely monitored, especially if the patient has oral, facial, or neck burns. The patient should receive a thorough and complete physical exam in order to identify occult injuries, entry and exit wounds, and any neurological deficits. Upon stabilization, all patients with anything more than minor cutaneous burns should be transferred to a regional burn center for further management.

**Take home points**

- All patients presenting with electrical injuries should receive a baseline EKG.
- Deeper injuries may present under seemingly unaffected skin and therefore full evaluation is required regardless of initial appearance.
- All patients with electrical injuries should have C-spine immobilization and an extensive trauma evaluation.
- Visceral injuries such as bowel perforation and vascular injuries that can result in thrombosis need to be excluded prior to discharge.
- All patients with anything more than mild electrical burns should be transported to regional burn centers once stable.

**ABOUT THE AUTHOR**

Month's case was written by I Fields. Rachel is a 4<sup>th</sup> year al student from FIU HWCOM. d her emergency medicine on at BHMC in December Rachel plans on pursuing a in Internal Medicine after



**REFERENCES**

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