Interesting Case Series

Electrical Burn of the Upper Extremity

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DESCRIPTION

A 29-year-old man presented with an electrical burn to his dominant hand, shown in the figure above, caused by grabbing an exposed high voltage wire. Physical examination demonstrated a lack of fingertip sensation and decreased range of motion in the index through small fingers.

NEXT

QUESTIONS

1. **What is the appropriate initial management of electrical injuries?**
2. **How is compartment syndrome assessed in the presence of an electrical burn of the hand?**
3. **Describe the initial surgical management of electrical burns to the upper extremity.**

DISCUSSION

Initial management is directed toward the preservation of life. Cardiac arrhythmias are common and cardiopulmonary resuscitation must be applied. Electrical injury causes damage in following 3 ways: by generation of heat, interference with electrical activity of the heart and nervous system, and by endothelial damage with progressive tissue necrosis. As a rule, tissue destruction is always more extensive than initially apparent.

Once the patient is stabilized, the extent and depth of the burn is assessed. Initial laboratory studies should include routine electrolyte, arterial blood gas, urine, and creatine kinase level analysis. A 12-lead electrocardiograpic diagnosis and cardiac enzyme levels should be obtained to assess for cardiac arrhythmias and direct cardiac injury.

A common complication is myoglobinuria and hemoglobinuria, which can lead to acute renal failure if not recognized and managed in a timely manner. Aggressive crystalloid resuscitation is essential for protection of the kidneys. Urinary output should be maintained at 2 mL/kg/h or 100 mL/h in an adult.

Alkalinization of the urine may provide benefit by enhancing the clearance of myoglobin from the renal tubules. Serial creatine kinase measurements should be monitored to assess the progression of disease and adequacy of treatment. Initially, to obtain maximal penetration of the burn eschar, the hand is dressed with mafenide cream (Sulfamylon cream) until surgical debridement can be performed.

Fasciotomies and escharotomies should be performed within 6 to 8 hours of injury if compartment syndrome is suspected. Clinical signs such as edema, pain with passive motion, and subjective firmness of the compartments are adequate indicators of the need for compartment release. It is essential that all compartments of the hand and potentially the forearm, both dorsal and volar, as well as all digits, Guyon's canal, and the carpal tunnels are released. Serial debridements should then be performed in preparation for definitive reconstruction.

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