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High-voltage electrical burn leading to upper limb amputation: A comprehensive nursing care perspective

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Abstract
Electrical burns, particularly from high-voltage exposure, are severe injuries that can lead to extensive tissue destruction, amputations, and systemic complications. This case report presents a 38-year-old male with a history of alcohol consumption who sustained high-voltage electrical burns to the right upper limb, requiring an above-elbow amputation. On admission, he exhibited deep tissue necrosis, bleeding, swelling, hypovolemic shock, and risk of cardiac arrhythmias. Nursing diagnoses included impaired skin integrity, acute pain, risk for infection, deficient fluid volume, impaired physical mobility, anxiety, and ineffective coping. Comprehensive nursing interventions covering emergency resuscitation, wound care, pain management, monitoring, psychological support, and rehabilitation were implemented to stabilize the patient and prevent complications. This case underscores the pivotal role of nurses in life-saving management, recovery, and long-term rehabilitation of patients with severe electrical burn injuries. Early intervention and holistic nursing care are essential for optimal outcomes and improved quality of life.

Keywords: Electrical burns, high-voltage injury, nursing care, amputation, wound management, rehabilitation, shock, psychological support

Introduction
Electrical burns are among the most severe and life-threatening injuries, often resulting in extensive tissue damage, amputations, and systemic complications. High-voltage burns in particular can lead to cardiac arrhythmias, renal failure, and sepsis. Early and effective management, with active nursing care, plays a vital role in the patient's survival and recovery.

Case Presentation
A 38-year-old male with a history of alcohol intoxication was admitted to the emergency department after accidental contact with a high-voltage electric source. He presented with extensive burns on the right upper limb with deep tissue destruction. On admission, he was restless, pale, and disoriented. Examination revealed blackened and charred tissues extending up to the mid-arm. Due to irreversible damage, an above-elbow amputation was performed.
The amputation site was swollen, with bleeding and exposed tissues. The patient reported severe pain, but sensation was absent in the deeply charred areas. He showed signs of hypovolemic shock, including hypotension, tachycardia, shallow respiration, and cold extremities. Entry and exit wounds from the current were identified. There was high concern for systemic complications including arrhythmias, renal impairment, and infection.
He presented with:

Local Findings
- Extensive burns with charring of right upper limb
- Open wound with exposed tissues
- Swelling and bleeding at the amputation site

Systemic Findings
- Restlessness, pallor, and disorientation
- Hypotension, tachycardia, rapid shallow respiration

- Cold, clammy extremities indicating hypovolemic shock
- Risk of arrhythmias and renal complications due to electrical current

Intervention: Above-elbow amputation performed due to irreversible tissue damage.

Diagnosis

High-voltage electrical burn injury to the right upper limb with traumatic above-elbow amputation, complicated by hypovolemic shock and risk of systemic complications (sepsis, cardiac arrhythmias, renal dysfunction).

Management

1. **Emergency Resuscitation:** Stabilization of airway, breathing, and circulation (ABC); oxygen support; IV fluid resuscitation; blood transfusion if required.
2. **Wound and Surgical Care:** Bleeding control, sterile dressings, surgical debridement, and further wound management.
3. **Supportive Measures:** Continuous ECG monitoring, pain management, antibiotics, and tetanus prophylaxis.
4. **Long-Term Care:** Nutritional support, physiotherapy, psychological counseling, and rehabilitation with prosthesis.

Nursing Diagnosis

1. Impaired skin integrity related to electrical burns and surgical amputation.
2. Acute pain related to burn injury and surgical intervention.
3. Risk for infection related to open wound and tissue necrosis.
4. Deficient fluid volume related to blood loss and shock.
5. Impaired physical mobility related to amputation.
6. Anxiety and disturbed body image related to trauma and sudden disability.
7. Risk for cardiac dysfunction related to electrical injury.
8. Ineffective coping related to alcohol dependence and stress.

Nursing Care Plan

Nursing Diagnosis	Goals/Outcomes	Nursing Interventions	Evaluation
Impaired skin integrity	Patient's wound will remain free from infection and show signs of healing within 7-10 days	• Maintain aseptic dressing • Monitor wound for redness, pus, odor • Assist in surgical debridement • Educate patient/family on wound care	Wound shows granulation tissue, no signs of infection
Acute pain	Patient will report reduced pain within 1 hour of intervention	• Administer prescribed analgesics • Position patient comfortably • Apply cold/pressure as advised	Patient reports pain relief; vital signs stable
Risk for infection	Patient will remain free from infection during hospital stay	• Administer antibiotics as prescribed • Maintain strict hand hygiene • Monitor vital signs and wound appearance	No fever; wound shows normal healing
Deficient fluid volume	Patient will maintain stable BP and adequate urine output	• Monitor vital signs frequently • Administer IV fluids as prescribed • Record intake/output	Vital signs stable; urine output adequate
Impaired physical mobility	Patient will achieve maximum functional independence	• Assist with limb exercises • Teach use of assistive devices • Encourage physiotherapy	Patient demonstrates safe mobility and follows exercise regimen
Anxiety & disturbed body image	Patient will verbalize feelings and show positive coping	• Provide emotional support • Encourage expression of feelings • Include family in care planning	Patient expresses feelings; demonstrates coping strategies
Risk for cardiac dysfunction	Patient will maintain stable cardiac rhythm	• Continuous ECG monitoring • Report abnormal rhythms immediately • Ensure electrolyte balance	No arrhythmias detected; ECG normal
Ineffective coping	Patient will adopt positive coping mechanisms	• Counseling for alcohol dependence • Encourage support group participation • Teach stress-relief techniques	Patient engages in counseling and demonstrates improved coping

Role of Nurse

The nurse plays a crucial role in the holistic care of patients with electrical burns:

1. **Initial Emergency Care**

- Ensure airway patency and administer oxygen.
- Assist in IV access and start fluid resuscitation.
- Monitor vital signs and watch for signs of shock.
- Provide emotional reassurance to the patient and family.

2. **Wound and Post-Surgical Care**

- Maintain strict aseptic technique during dressing changes.
- Monitor wound for signs of infection (redness, pus, fever).

- Assist in bleeding control and pain management.
- Support the surgical team during debridement or amputation procedures.

3. Monitoring and Documentation

- Record intake and output to assess fluid balance.
- Monitor ECG for arrhythmias and report abnormalities.
- Document wound condition, pain levels, and progress daily.

4. Supportive & Psychological Care

- Provide adequate nutrition support to enhance wound healing.
- Offer counseling and emotional support to cope with trauma and disability.
- Educate the patient and family on wound care and infection prevention.
- Address alcohol dependence by guiding toward de-addiction support services.

5. Rehabilitation Role

- Encourage physiotherapy and exercises for mobility.
- Educate about prosthesis use and care.
- Help in reintegration to daily life and provide long-term follow-up guidance.

Discussion

Electrical burn injuries can extend beyond visible damage, often involving muscles, nerves, and vessels. In this case, high-voltage current caused extensive destruction leading to amputation, with systemic risks of shock, infection, and cardiac complications. Nursing care is vital at every stage—emergency stabilization, wound management, infection prevention, psychological support, and rehabilitation. A nurse's role not only improves survival but also enhances the patient's quality of life after such devastating injuries.

Conclusion

This case emphasizes the importance of prompt medical and nursing intervention in managing high-voltage electrical burn injuries. Comprehensive nursing care, including emergency management, wound care, monitoring, psychological support, and rehabilitation, is essential for improving patient outcomes and helping the individual adapt to life after amputation.

Conflict of Interest

The author declares no conflicts of interest in the preparation and publication of this case report.

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