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Electrical Burns: Epidemiological, Clinical, and Therapeutic Aspects – A Study of 20 Cases

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Abstract **Case Report**

Electrical burns are among the most severe and complex injuries, often resulting in significant morbidity and mortality. This study aims to analyze the epidemiological, clinical, and therapeutic aspects of electrical burns through a retrospective review of 20 cases treated at the Plastic Surgery and Burns Unit of Marrakech University Hospital between January 2020 and April 2022. The findings highlight the predominance of work-related accidents, the severity of tissue damage, and the challenges in management, including high rates of amputations and disabling sequelae. Prevention through stringent safety measures and public education is emphasized as the cornerstone of reducing the incidence and impact of electrical burns.

Keywords: Electrical Burns, High Voltage, Epidemiology, Clinical Management, Prevention, Sequelae.

INTRODUCTION

Electrical burns are severe injuries caused by the passage of electric current through the body, leading to tissue destruction and systemic complications. These burns are classified into flash burns (caused by electrical arcs without direct contact) and true electrical burns (resulting from direct contact with an electrical source). High-voltage injuries (>1000 V) are particularly devastating, often causing extensive tissue necrosis, vascular damage, and long-term disabilities. Despite advances in burn care, the management of electrical burns remains challenging due to their unpredictable progression and high rates of complications. This study analyzes the epidemiological, clinical, and therapeutic aspects of electrical burns through a retrospective review of 20 cases treated at the Plastic Surgery and Burns Unit of Marrakech University Hospital.

PATIENTS AND METHODS

This retrospective study was conducted at the Plastic Surgery and Burns Unit of Marrakech University Hospital. Medical records of patients admitted for electrical burns between January 2020 and April 2022 were reviewed. Data collected included demographic information, circumstances of injury, clinical presentation, treatment modalities, and outcomes.

Inclusion Criteria:

- Patients with electrical burns requiring hospitalization for more than three days.
- Availability of complete medical records, including paraclinical data.

Exclusion Criteria:

- Outpatients with minor burns not requiring hospitalization.
- Incomplete medical records.

Classification of Electrical Burns:

- **Low voltage (<1000 V)**: Typically associated with household accidents.
- **High voltage (>1000 V)**: Often related to occupational or industrial accidents.

Data Analysis

Descriptive statistics were used to analyze demographic and clinical data. Continuous variables were expressed as means and ranges, while categorical variables were presented as percentages.

RESULTS

Demographic Data:

- **Age**: The mean age of patients was 20.21 years (range: 4–58 years).
- **Gender**: A male predominance was observed (85% male, 15% female).

Circumstances of Injury (Fig. 1):

- **High-voltage accidents**: 50% of cases involved contact with high-voltage sources (e.g., children playing near power lines or adults stealing cables).
- **Work-related accidents**: 40% of cases occurred in occupational settings, primarily among electricians and construction workers.
- **Domestic accidents**: 10% of cases were related to household electrical appliances.

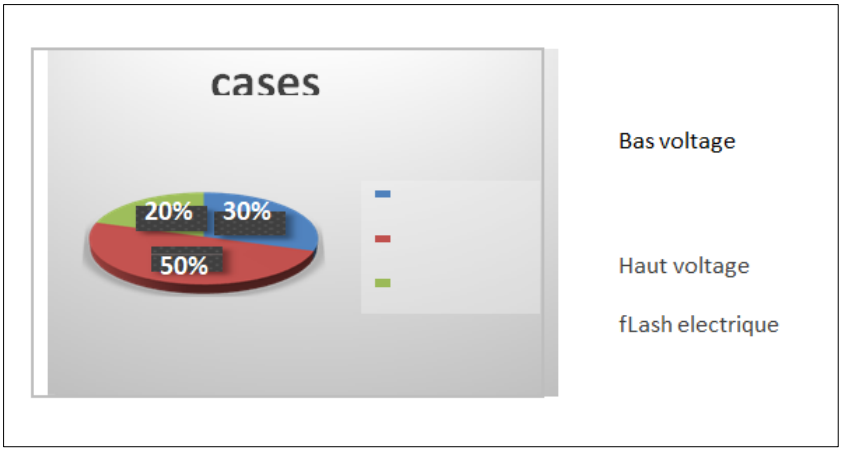

Fig. 1: circumstances of injury

Time to Consultation (Fig. 2):

- **Acute phase**: 95% of patients sought medical attention within 24 hours of injury.
- **Sequelae phase**: 5% of patients presented weeks or months after the injury with complications such as contractures or infections.

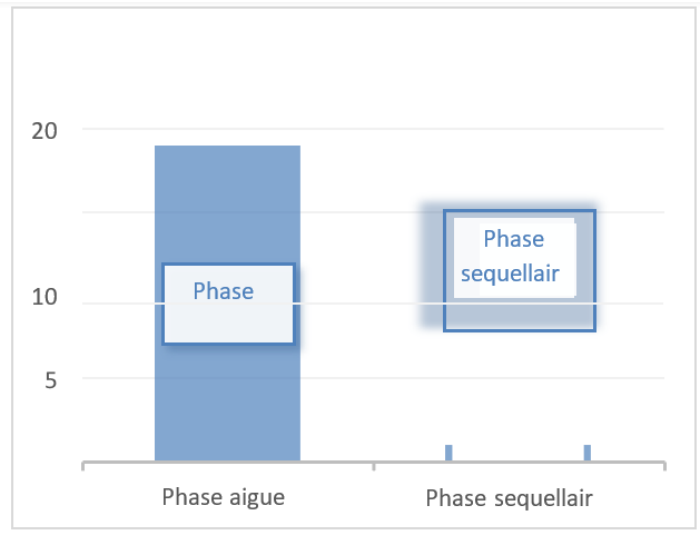

Fig. 2: Time to consultation

Burn Characteristics:

- **Surface area**: 80% of patients had burns involving >10% of total body surface area (TBSA).
- **Depth**:
  - Third-degree burns: 65% (13 cases).
  - Second-degree burns: 35% (7 cases).

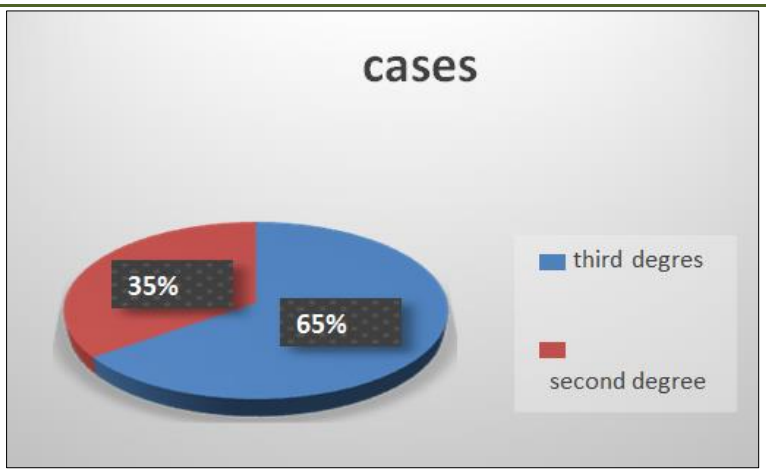

Fig. 3: Burn depth

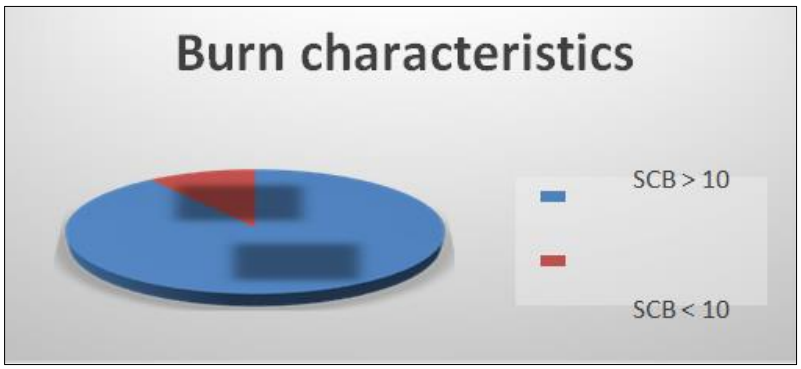

Fig. 4: Acute phase

Associated Injuries:

- **Polytrauma**: 3 cases.
- **Tendon injuries**: 2 cases.
- **Joint dislocation**: 1 case.
- **Multi-organ failure**: 1 case.

Paraclinical Findings:

- **ECG**: No significant cardiac abnormalities were detected.
- **Laboratory tests**: Elevated CPK and myoglobin levels were observed in 70% of cases, indicating muscle damage.
- **Imaging**: MRI was performed in 5 cases to assess deep tissue involvement.

Therapeutic Interventions:

- **Fasciotomy**: Performed in 8 cases to prevent compartment syndrome.
- **Skin grafting**: Required in 11 cases for extensive third-degree burns.
- **Amputation**: Bilateral shoulder disarticulation was performed in 1 case due to irreversible tissue damage.

DISCUSSION

Pathophysiology of Electrical Burns

Electrical burns result from the conversion of electrical energy into thermal energy, causing tissue necrosis. The extent of injury depends on factors such as voltage, current intensity, tissue resistance, and duration of contact. High-voltage injuries are particularly destructive, often leading to deep tissue necrosis, vascular thrombosis, and nerve damage. The Joule effect ($J = R \times I^2 \times T$) explains the relationship between heat generation and tissue resistance, with low-resistance tissues (e.g., nerves, blood vessels) being more susceptible to damage.

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Clinical Challenges:

- **Delayed presentation**: Some patients present late with complications such as infections or contractures, complicating management.
- **Systemic effects**: Electrical burns can cause cardiac arrhythmias, renal failure, and metabolic disturbances, requiring multidisciplinary care.
- **Psychological impact**: Patients often experience post-traumatic stress disorder (PTSD), depression, and anxiety, necessitating long-term psychiatric support.

Therapeutic Strategies:

- **Early intervention**: Fasciotomy and debridement are crucial to prevent compartment syndrome and sepsis. Early excision of necrotic tissue reduces the risk of infection and improves outcomes.
- **Reconstructive surgery**: Skin grafting and flap reconstruction are often required for extensive burns. Advanced techniques such as microsurgery and tissue engineering are increasingly used for complex cases.
- **Rehabilitation**: Physical and occupational therapy are essential to restore function and prevent disabilities. Customized prosthetics and assistive devices play a key role in improving quality of life.

Prevention:

- **Public education**: Raising awareness about electrical safety, especially among children and non-professionals, is critical. Schools, communities, and media campaigns can play a significant role in disseminating safety information.
- **Safety regulations**: Enforcing strict safety standards in workplaces and households, such as the use of residual current devices (RCDs) and proper insulation, can prevent accidents.
- **Legislation**: Implementing laws to prevent unauthorized access to high-voltage equipment and penalizing negligence can reduce the incidence of electrical burns.

Future Directions:

- **Research**: Further studies are needed to explore the role of advanced imaging (e.g., MRI, CT angiography) in early diagnosis and treatment planning.
- **Technology**: The development of smart sensors and wearable devices to detect electrical hazards in real-time could revolutionize prevention efforts.
- **Global collaboration**: Sharing best practices and data across countries can help establish standardized guidelines for the management of electrical burns.

CONCLUSION

Electrical burns are severe injuries with significant morbidity and mortality. Early recognition, prompt intervention, and comprehensive rehabilitation are essential to improve outcomes. However, prevention remains the most effective strategy. Public education, stringent safety measures, and robust legislation are critical to reducing the incidence and impact of electrical burns.

Case N1: Aponevrotomie

Case N2: Skin graft

Case N3: Bilateral shoulder disarticulation

REFERENCE

- Andrew L.J., Cooper M.A.: "Lighting injuries: electrical, medical and legal aspects", 47-70, Boca-Raton Fla: CRC Press, 1992.
- Artz C.P., Moncrief J.A.: "Treatment of burns", WB. Saunders, Philadelphia, London, Toronto, 1969.
- Atlanta M.E, El Ekiabi, Al
- Batiste 0., Girer A., Foray J., Marsigny B.: Les accidents de fulguration en haute montagne. Chirurgie, 116: 60- 4, 1990.
- Batley S.L.: Electrical injuries. AORM J., 49: 773, 1989.
- Benhamla A., Bouayed-Agha R.: Les brûlures électriques: considérations étiologiques, anatomo-pathologiques et thérapeutiques. Chirurgie, 101: 864- 70, 1975
- Davidson T.I., Brown L.C.: Self-inflicted burns - a 5 years' retrospective study. Burns, 11: 157-60, 1985.
- Echinard C.H., Latarjet J.: "Les brûlures", Abrégés Masson ed., 1993.
- Fingerhut A., Brocard M., Ronat R.: Clinodactylie par brûlure électrique: quelques réflections à propos de deux cas. Sem. Hôp. Paris, 29-30: 1983.
- Folliot D.: Les accidents d'origine électrique, leur prévention. Collection monographie de médicine de travail, 4: 1982.
- Gastinne H., Mathe D., Gay R.: Electrisation, données actuelles et conduite à tenir. Revue du Praticien, 33: 229-33, 1983.
- Gourbière E., Lambrozo J., Folliot D., Gary C.: Complications et séquelles des accidents dûs à la foudre. Réan. Soins Intens. Méd. Urg., Il: 138-61, 1995.
- Gourbière E.: Le coup de foudre. Le généraliste, 1665: fév. 1996.
- Grube B.J., Heimbach D.M., Engrav L.H. *et al.,* : Neurologie consequences of electrical burns. J. Trauma, 30: 254-8, 1990.
- Haberal M., Oner Z. *et al.,* : Severe electrical injury. Burns, 15: 60, 1989.
- Rouge D., Laffitte F., Laguerre J., Conil J.W., Chavoin J.B.C., Arbus L., Costagliola M. Le flash électrique, mécanisme et prévention: à propos de 21 cas. Ann. Médit. Burns Club, 3: 252-5, 1990.
- Zelt R., Daniel R.K., Ballard P.A. *et al.,* : High voltage electrical injury: chronic wound evolution. Plast. Reconstr. Surg., 82: 1027, 1988.