

ISR Journal of Medical Case Reports (ISRJMCR)

Homepage: https://isrpublisher.com/isrjmcr/

Volume 1, Issue 1, May, 2025

ISSN: XXXX-XXXX (Online)



# A 5-Year Retrospective Study on Electrical Burns in the Reconstructive and Aesthetic Surgery Department of Marrakech

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**Article History** 

Received: 01-05-2025 Accepted: 12-05-2025 Published: 17-05-2025



Abstract: Case Report Electrical burns, albeit rare, constitute a massive concern in reconstructive and aesthetic surgery judging by their overall negative outcomes. Our objective is to present the different aspects of electrical burns of the patients who were taken charge of in the department of aesthetic and reconstructive surgery in the Mohammed VI University Hospital of Morocco in a 5 years' time. We conducted a retrospective study between August 2019 and August 2024, regarding 37 total cases of electrical burns, tracking all the main components of the acute phase (Epidemiological, Clinical, and Therapeutic Parameters).

Keywords: Electrical Burn, Emergency, Amputation.

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### **INTRODUCTION**

Electrical Burns are the Consequence of Electrical Current's Passage Across the Body, which should all be considered polytraumas until proven otherwise, thus an extreme emergency involving intensive care doctors; emergency department doctors; anesthesiologists, critical care doctors, and plastic surgeons.

Although less frequent than their thermal counterparts (9,5% of total burns), they are characterized by an Iceberg effect where the visible lesions can hide much more severe tissue damage, and consequently shouldn't be underestimated, both in terms of morbidity and long-term sequelae [1].

The objective of this study is to give an

overview of the different statistics of electrical burns in our context, and consequently to know whether there are things that need further optimization in the treatment pillars.

#### METHODS

It is a retrospective study on a 5 year period between August 2019 and August 2024, regarding a total of 37 cases of electrical burns.

All victims of electrical burns in this period were hospitalized and included in this study, we excluded the patient who had burns from electrical flashes as these were considered a thermal burn variant.

#### RESULTS

Most patient included in our study

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were males 32 (86%), with an average age of 19.6 years (We also noted the highest patient count in the category of 5 years to 12 years

old) with age borders of 3 years old and 58 years old (Figure No.1).



Figure No. 1: Age and Gender Findings

Over 90% of our patients had a relatively short pre-admission period with 31 of them showing up before the 6-hour mark



Figure No. 2: Admission Delay Findings

Of the total 37 patients, 23 (62%) had low voltage burns while 14 (38%) had high voltage burns. Most incident occurred in children while playing (24 cases), followed by domestic accidents (7 cases) and working accidents (6 cases) (Figure No. 3). and 19 of them before the 3-hour mark (Figure No. 2).



Figure No. 3: Type of Electrical Burn

The total burnt surface area (TBSA) amongst our patients was widely variable ranging from 1% to 63%, with an average value of 13.2% (Figure No. 4 and 5).



**Figure No. 4: TBSA Findings** 



Figure No. 5: Examples of TBSA from different magnitudes amongst our patients, on the left a low voltage burn in a 13-year-old boy and on the right a high voltage burn in a 17-year-old boy

35% of our patients had associated physical trauma along with the electrical burn, mainly due to ejection or a fall due to losing balance after the burn (Figure No. 6, 7, and 8).



Figure No. 6: Physical Trauma Association Findings



Figure No. 7: Humeral fracture of the lower extremity associated with fractures of nasal bones and maxillary sinuses in a 7-year-old boy after ejection secondary to a high voltage electrical burn



Figure No. 8: Femoral Shaft fracture in a 21-year-old man after a 10m fall secondary to a pole electrocution

All our patients underwent bloodwork at admission, 24 (65%) of them had abnormal biological parameters, consisting mostly of elevated Troponin, Lactates, and Creatine-Kinase (Figure No. 9).



**Figure No. 9: Bloodwork Findings** 

All our patients also underwent an EKG, which was normal in 31 of them (84%), and showed abnormalities in the other 16%, mostly consisting of arrhythmias (Figure No. 10).



Figure No. 10: EKG Findings

Surgical treatment was required in 28 patients (76%) while 9 patients didn't undergo surgery, the surgical procedure was skin graft in 24 patients, Aponeurotomy in 14 patients, and amputation (Figure No. 11).

15 patients (63%) of the patients that needed a skin graft underwent it once, whilst 7 (29%) required two procedures of skin graft, some even needed more than two skin grafts 2 (8%) (Figure No. 13).

Of the patients that needed to undergo amputation, 8 (73%) had minor amputations (Below wrist and ankle) while 3 (27%) had major amputations (Above wrist and ankle).



**Figure No. 11: Surgery Rate Findings** 



Figure No. 12: Examples of cases of surgical procedures in our patients, respectively for skin graft (Upper), Aponeurotomy (Middle), and Amputation (Bottom)



Figure No. 13: Number of Skin Grafting Procedures needed

Prognosis wise, 24 (65%) of our patients had a good acute phase evolution: 21 patients (60%) required an ICU admission, and 2 patients died (6.1% Mean Mortality Rate). Of the 24 patients with good acute phase evolution, only 3 patients (8%) had no sequelae in their evolution (Figure No. 14).



Figure No. 14: Prognosis Findings

The types of sequelae that were found in most of our patients were an unsightly scar in 34 patients (92%), a physical range of motion limitation in 15 patients 40.5%, an alteration of sensibility in 12 patients (32%), and an amputated body part in 11 patients (30%) (Figure No. 15).



Figure No. 15: Sequelae Findings

The mean hospital stay in our patients was 18.1 Days, we noted that this value was widely variable based on the type of electrical burns, with an average stay of 6.8 Days for low voltage burns and 48 Days for high voltage burns.

#### DISCUSSION

It is practically constant that electrical burns are much more predominant in the male population and the relatively young population, our study joins the literature in that regard, like a Turkish study of 2016 that found a mean age of 26.4 years and a male predominance of 89.4% [2].

The literature also objectives a small pre-admission delay, such as 85.9% in less than 4h in a German study of 2018. And similarly, a mean TBSA of 18.7%, like the number we found [3].

However, we noticed that most studies find that working accidents are the main electrical burn circumstance [3]. It is supposed that the reason might be due to a less optimal kid supervision and house management after having kids in our context, explaining the high rate of that population getting electrical burns.

The rate of low voltage burns versus high voltage burns in the literature was also widely variable. For example, a Portuguese study of 2017 found than high voltage burns were more frequent than low voltage burns at 44,4% vs 55,6%, different from our study [4].

The value of the biological dosage of CK (Creatine-Kinase) resides mostly in the prediction of the outcome, as it has been shown that higher values of CK generally translated later to a longer hospital stay, higher rates of surgical procedures like skin grafting or amputation, and even higher morbidity and mortality in some cases [5].

The surgical procedures rates were similar, like a recent Albanian study of 2024 where around 48.14% had escharotomy and aponeurotomy, 25.9% had Skin Grafts, and 14.81% were amputated. A mean mortality rate of 11% was also observed, slightly higher than the one we found [6].

Pathological scarring such as cheloid is common in the electrical burned area, as well as numbness and persistent sensations. Amputations still remain however the main obstacle as it generally has a direct effect on the daily basis of life, that even an appropriate prosthesis can't revert, let alone all the psychological damage and self-image issues that sprout from these complications [7]. These sequelae were all omnipresent in our study.

# CONCLUSION

Electrical burns tend to be underestimated as they are generally less frequent, but that shouldn't change the fact that they need to get high attention for proper sensibilizing, as they can devastate someone's life in the blink of an instant if not directly end their life.

We hope that this modest work will boost the likelihood of more resources being put in to provide protection for both electricians and manual workers as well as children in the age of discovery.

**Conflits of Interest:** Authors declare not having a link of interest regarding this work.

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