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RESEARCH ARTICLE

BILATERAL SHOULDER DISARTICULATION FOLLOWING HIGH VOLTAGE ELECTRIFICATION: CASE REPORT

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Abstract

The high voltage electrical burn is a rare but very serious incident involving the vital and functional prognosis. It generally occurs in young active subjects and in professional environments, especially in the context of work accidents. Tissue damage is immediately disastrous and requires multidisciplinary management. The recourse to amputation or bilateral disarticulation leads to a serious disability with a heavy socio-professional and psychological repercussion, hence the interest of prevention and awareness. We report the case of a 35 years old patient who suffered a high voltage electrification of both upper limbs during a false manipulation of high voltage cables.

Introduction:-

High-voltage electrical burns are serious burns but are generally rare in Morocco. They cause very significant tissue and bone damage and generally involve male electrical workers. Conservative treatment is sometimes ineffective and amputations are unavoidable. We report the case of a young patient with high-voltage electrification of both upper extremities during false manipulation of electrical conduction cables, in whom the course was marked by aggravation requiring bilateral disarticulation of the shoulders.

Patient and Observation:-

Patient presentation:

A young man of thirty-five years old, electrical technician by profession, admitted to the emergency department of the Mohamed VI University Hospital of Marrakech in February 2021 after four days, following an electrical burn of two upper limbs going up to the axillary region during a false manipulation of high voltage electrical cables.

Diagnostic approach:

The examination on admission showed a conscious patient, well oriented in time and space, febrile at 39°C, pale, anicteric, the cardiac sounds were normal as well as the neurological examination.

Examination of both upper extremities objective a circumferential third-degree burn extended to the axillary root with total charring and extensive ischemia on an estimated 20% burned skin surface (Figure 1).

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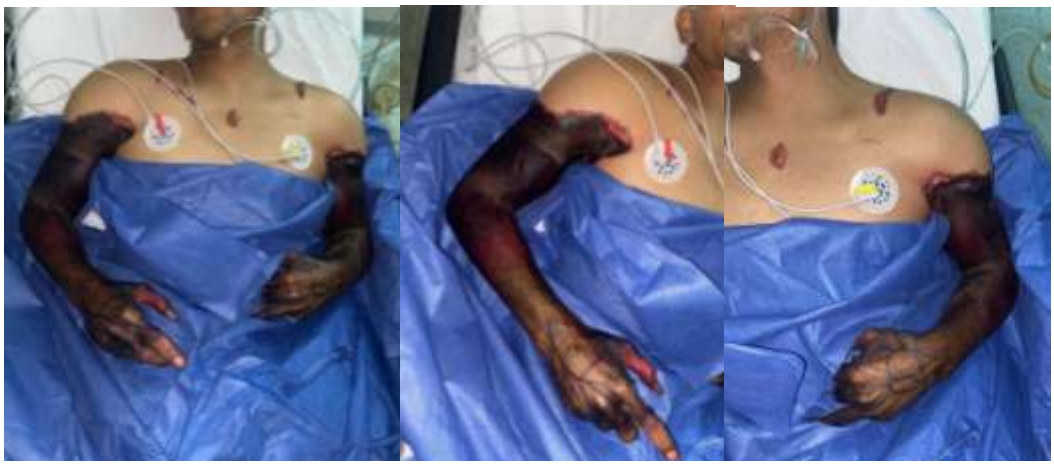

Figure 1:- Initial appearance of the burn.

The biological workup revealed rhabdomyolysis with creatine kinase : 1000 IU/L, kalemia: 4.6 mmol/l, urea: 0.9 g/l, creatinine: 12 mg/l, hemoglobin: 8.9 g/dl, hematocrit: 30%, normal troponin level, and an electrocardiogram without abnormalities.

Therapeutic Intervention:

The patient was appropriately resuscitated with hydrolytic correction and level 2 analgesia. After information and consent of the patient and his family, the patient was taken to the operating room by the plastic and burn surgery team in collaboration with the trauma team; under general anesthesia, a shoulder disarticulation was performed (Figure 2). The postoperative course was uneventful.

(a) (b)

Figure 2:- Immediate postoperative appearance after bilateral disarticulation of both upper limbs. a)- left side, b)- right side.

Follow-up and Results:

Postoperatively, the patient was admitted to the burn unit and continued to receive broad-spectrum antibiotic therapy, necessary blood transfusions, and nutritional supplementation rich in amino acids, protein, and calories. He received daily stump dressing changes with removal of the Redon drains on the second day (Figure 3).

Figure 3:- Clinical aspect of amputation stumps at D15 postoperatively.

Informed consent:
The patient was informed about this article, the nature of the study, its purpose, its duration, and why his or her case was unique. He voluntarily gave his informed consent to allow the authors to use his photos for this case report.

Discussion:-

Electricity, although an important commodity, remains a serious cause of burns in our society. Low voltage (<1000V) and high voltage (>1000V) electrical burns are caused by the conduction of electrical current through the body. [1][2]

Electrical burns are generally rare and constitute about 5-8% of all burns admitted to the Plastic Surgery and Burns Department of Arrazi Hospital, Mohammed VI University Hospital Center, Marrakech, Morocco. They occur mainly in young active males and in the context of work accidents, but the occurrence of burns during a false handling of cables due to ignorance of the danger remains frequent in our context.

The lack of knowledge of the danger of electric current leads to serious consequences in young people wanting to handle electric cables, especially when they are of high voltage. [3] The severity of the tissue-bone damage makes the management of this type of burns very difficult and depends on the different parameters that characterize the contact with the conductor : intensitý, voltage, resistance to the passage of the current when it is continuous or impedance in alternating current, frequency of the current, time and surface of contact. [4][5]

Direct tissue damage is mainly secondary to the heat generated in the tissue , which depends on the intensitý of the current (I) measured in Amperes, its voltage (U) expressed in Volts, the resistance (R) measured in Ohms, the exposure time (t) measuredin seconds, the contact surface, and the heat produced (E) expressed in joules. Thus, high voltage injuries are frequently deep and extensive. Ohm's law (U = RI) and Joule's law (E = RI2t) thus make it possible to evaluate the heat release responsible for the thermal trauma [2][6][7].

The resistance of fabrics depends essentially on their water content. Therefore, the more hydrated the tissue, the lower its electrical resistance. The following tissues are classified in decreasing order of resistance: bone, fat, tendons, skin, muscles, vessels and nerves. This explains why the preferential path of the current inside the body follows the vascular and nerve axes responsible for the rapidly progressive ischemia phenomena for 4 to 5 days, but also why the lesions are deep because these axes are located in contact with the bones [7][6].

The management of this type of burn begins at the scene of the accident and ends in hospital. The stabilization of the patient on the hemodynamic and respiratory level, the correction of possible hydroelectrical disorders, but also the surgical treatment which relies first of all in emergency on the incisions of musculoaponeurotic discharge. Repeated trimming reduces the risk of superinfection and limits the general and functional consequences of rhabdomyolysis [1][3][8].

Amputation is generally done after a decision by a multidisciplinary medical staff and after agreement from the patient or his family. It must be as conservative as possible to allow the least disabling fitting possible. It allows for a reduction in the length and cost of hospitalization [8].

Conclusion:-

High voltage electrical burns often have devastating consequences. The extent of the damage is unpredictable and progressive. The total disability involves the functional prognosis, the psycho-socio-professional repercussion and the high cost of the care of these patients, hence the major interest of prevention and awareness.

Conflicts of Interest:
The authors declare no conflicts of interest.

Author contributions:
All authors contributed to the conduct of this work. They also declare that they have read and approved the final version of the manuscript.

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