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# Burns in the Operating Room: A Case Report of an Electrosurgery Plate Hand Burn

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**Abstract** **Case Report**

Although electro-surgery is one of the most important tools in modern surgery, its use is not without risks. Burns caused by electro cautery plates are one of these dreaded accidents that remain rare but serious. The occurrence of such an accident in a surgical context is difficult for the patient as well as for the medical team. In this case report, we describe a burn of the hand of a patient admitted to the neurosurgery operating room due to a defective plate and we discuss the means of prevention of these incidents to improve the safety of patients in the operating room.

**Keywords:** Electro-surgery - Complications - Burn - Prevention.



## INTRODUCTION

Electro-surgery is a technique that has been used for several years in the operating room; it is currently very popular and synonymous of modern surgery. In electro-surgery, the electric current is produced by a generator and reaches the patient's body through an active electrode that acts on the target tissues and exits through a neutral electrode. When this electric current meets the human tissue, it turns into heat and determines the therapeutic effects, sectioning or coagulation.

However, even with long experience with electro-surgery and technological progress, its use is not without risks and complications are always observed. These main complications are electromagnetic interference with monitoring devices, with pacemakers and especially burns. In this case report, we describe a burn on the hand of a patient admitted to the neurosurgery operating room due to a defective plate and we discuss the means of prevention of these incidents to improve the safety of our patients in the operating room.

## CLINICAL CASE

Mrs A.F, 55 years old, with no notable medical history and never operated, was admitted to the neurosurgery operating room that day for the treatment of a herniated L3-L4 disc discovered 3 weeks ago following disabling lumbo-sciatica that was resistant to medical treatment. After monitoring, conditioning and general anesthesia, the patient was put in the pectoral position on the operating table and the dispersive plate was placed under the middle of the right arm by the surgeon required by the knee-elbow position.

After the surgeons had identified the site, they proceed to the surgical incision followed by a coagulation section of the subcutaneous and muscular planes using a mono-polar electro-cautery. It was at this point that we observed smoke and a smell of fire coming from the plate placed under the right arm. The surgeon was stopped. Clinical examination revealed a third degree burn measuring 5 cm by 2 cm on the outer edge of the right hand (Figure 1).

The plate and its application site, the generator and the scalpel were changed before allowing the surgeon to continue the operation which was completed without further incident. The hand of our patient was immediately dressed with Sulfadiazine and a plastic surgeon was called to evaluate the burn after waking up. The burn progressed well under directed healing.

**Figure 1: Burn of the outer edge of the right hand with an electro-surgery plate**

## DISCUSSION

Electrosurgery is a very useful and effective technology, but it has a high risk for the patient and can cause injury or death. These include burns, electrification, smoke inhalation, short circuits, fires, etc. These complications still account for a significant portion of the morbidity associated with surgery [1]. In the United States, burns in the operating room are the fifth most common cause of medicolegal issues.

Their incidence remains underestimated and only isolated cases or short series are available in the literature. The mechanisms of these burns are diverse, involving the three triggers known as the "fire triangle" in a closed space. These are the heat source (in this case the electric scalpel), the fuel and an oxidizer, most often oxygen, all of which are present in the operating rooms [2].

Electro-surgery require an electric generator that transforms mains current (240V, 50Hz) into high frequency current (> 100,000Hz), conducted by a cable and a handle to an electrode. When activated, it generates at the point of tissue contact a high concentration of energy on a small contact surface and a coagulation or sectioning effect of the tissue [3].

In monopolar mode, the current circuit is long and passes from the active electrode to a neutral electrode placed at a distance. The neutral electrode, applied to a large skin surface, dissipates the heat produced and cancels out the thermal effect and its consequences on the skin. In bipolar mode, the current flows between the arms of the pincer on a short circuit and generates a local electrosurgical effect.

The burns by electro-cautery plate are thus related to the defect of application of the plate on a broad surface of the skin or its maladjustment at the time of the mobilization of the patient, of presence of inflammable product on a not dried plate, a defective plate or of excess of energy delivered by the generator.

Clinically, the extent and severity of the burns are variable. They depend on the amount of thermal energy produced on the plate. It is defined by Joule's thermal law ($Q= I. R^2. t$), which is a function of the current intensity (I), the impedance (R) and the duration of the current application (t) [4]. The burns reported are usually deep, with charred skin, as found in our patient. They reflect the intensity of the current delivered, the often-long duration of application in a patient under anesthesia and the silent nature of the burn during the procedure [5].

In our case, the burn was due to the defective plate and its application surface which was inadequate to its size. It only covered a part of the arm resulting in a concentration of heat at this point as well as to the presence of serum on the posing arms, which had moistened the patient's skin and conduct courant to the burned area. Our patient benefited immediately from a Sulfadiazine bandage and she progressed well under directed healing. She also benefited from psychological support.

Prevention remains the most effective way to combat these accidents, and the following specific measures should always be applied:

- Training in electrical hazards and use of the electrosurgical device for all team members.
- The neutral electrode should be placed as close as possible to the area to be operated on in order to minimize the path of the current through the patient's body.
- Never stick the plate on a bony prominence, scar tissue, wet or inflammatory skin.
- Coagulation episodes should be intermittent and brief.
- Newer devices that have a plate alarm system that detects a defective or improperly connected plate, incorrect power delivery, improper foot pedal activation, incorrect plate application should be used.
- Ensure proper operation of the generator, check the integrity of accessories (electrical wires, neutral electrodes, foot pedals, etc.) [6].

The occurrence of an adverse event during the use of an electro-surgery device must lead us to inform the patient about the nature of the damage and ensure the necessary care as well as keep the incriminated material, including disposable material, and alert in the first place the biomedical manager, the pharmacist and / or the correspondent of material vigilance [7].

## CONCLUSION

Patient safety in the operating room is a major concern for the health care teams above all their universal motto is "primum non nocere". We alert through this clinical case on the seriousness of one of the main accidents related to electro-surgery that is the burn. Prevention remains the best way to fight against these accidents.

**Conflicts of interest**

The authors declare no conflicts of interest.

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