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## Deep gluteal grounding pad burn after abdominal aortic aneurysm repair

*Although skin burns at the site of grounding pad are a known risk of surgery, their exact incidence is unknown. We first report the case of a patient who presented a deep gluteal burn at the site of the grounding pad after an abdominal aortic aneurysm repair, the etiology and the challenging treatment required to overcome this complication.*

KEY WORDS: Grounding pad, Skin burn

## Introduction

Since Bovie's development and commercialization of an electrosurgical unit in 1926<sup>1</sup>, procedures involving the application of electric current to the human body begun to be more and more frequent, safe and effective. Skin burns at the site of grounding pad are a known risk of surgical intervention requiring diathermic coagulation. They are more frequently described after procedures in which long activation time or high current are needed such as tumor ablations<sup>2</sup> or arthroscopy<sup>3</sup>. Even if modern devices clearly demonstrated the safety of electrosurgery, we believe that the awareness of this poten-

tial risk is necessary to minimize eventual injuries, which may represent an important cause of morbidity and sometimes mortality.

We first report the case of a patient who presented a deep gluteal burn at the site of the grounding pad after an abdominal aortic aneurysm repair, the etiology and the challenging treatment required to overcome this complication.

## Case Report

A 48-year old white man, was admitted at our Institution as an emergency for a sudden appearance of severe pain in the lower abdomen and back due to an impending rupture of an abdominal aortic aneurysm. Past medical history was remarkable for obstructive sleep apnea syndrome treated with noninvasive ventilation and morbid obesity (Body Mass Index = 38). Preoperative laboratory tests were within the normal range except for a slightly hyperglycemia (6.9 mmol/L). A preoperative CT-scan demonstrated the presence of an infrarenal abdominal aortic aneurysm 8 cm in diameter also involving the left

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iliac artery. No thrombus deposition was present. Endovascular treatment was excluded for patient' age and the high-risk of type II endoleak. Therefore, an endoaneurysmectomy with an aorto-bi-iliac graft (Dacron 14/7 mm) was performed. Postoperative control CW Doppler showed an optimal direct pulsatile flux on the posterior tibial and pedal arteries but after 24-hour the absence of a direct pulsatile tibial and pedal flux was noted. A CT-angiography demonstrated the occlusion of the iliac branch of the prostheses. The left internal iliac artery maintained the perfusion of the left limb. Although the limb was warm with a good venous refill, a complete sensitive and motor paralysis of the left lower limb was noted. A first-second degree burn over his left buttock was noted (Fig. 1A). Intravenous systemic anticoagulation was immediately started. An emergent crossover femoro-femoral bypass graft (Dacron 7 mm) was constructed to re-vascularize the left limb. A postoperative electromyography demonstrated the absence of the sensitive and motor action potentials at the level of the sural nerve with

acute neurogenic damage compatible with a plexus lesion on the left side. For the first three days the burn was conservatively treated because it was considered superficial. However, a tense swelling of the upper portion of the lower limb and a significant increase of myoglobin (7372 ng/mL) was noted requiring an aggressive alkaline fluid hydration. Furthermore, a super-infection by multi-resistant *Klebsiella Pneumoniae* and *Acinetobacter Baumannii* overcome thus precipitating local conditions (Fig. 1B). Specific antibiotics were started and multiple aggressive surgical debridements were performed (Fig. 1C). Vacuum-Assisted Closure therapy was then applied to facilitate wound closure and to prevent systemic contamination<sup>4</sup>. To reduce the diameter of tissue loss a rotation flap vascularized by lumbar perforators was performed<sup>5</sup>. Definitive closure of the wound was obtained after 2 months with a split-thickness skin graft to cover the residual area (Fig. 1D). The patient is alive without sign or symptom of vascular prosthesis infection and the cosmetic result is good. Laboratory tests are within the normal range at 6-month follow-up.

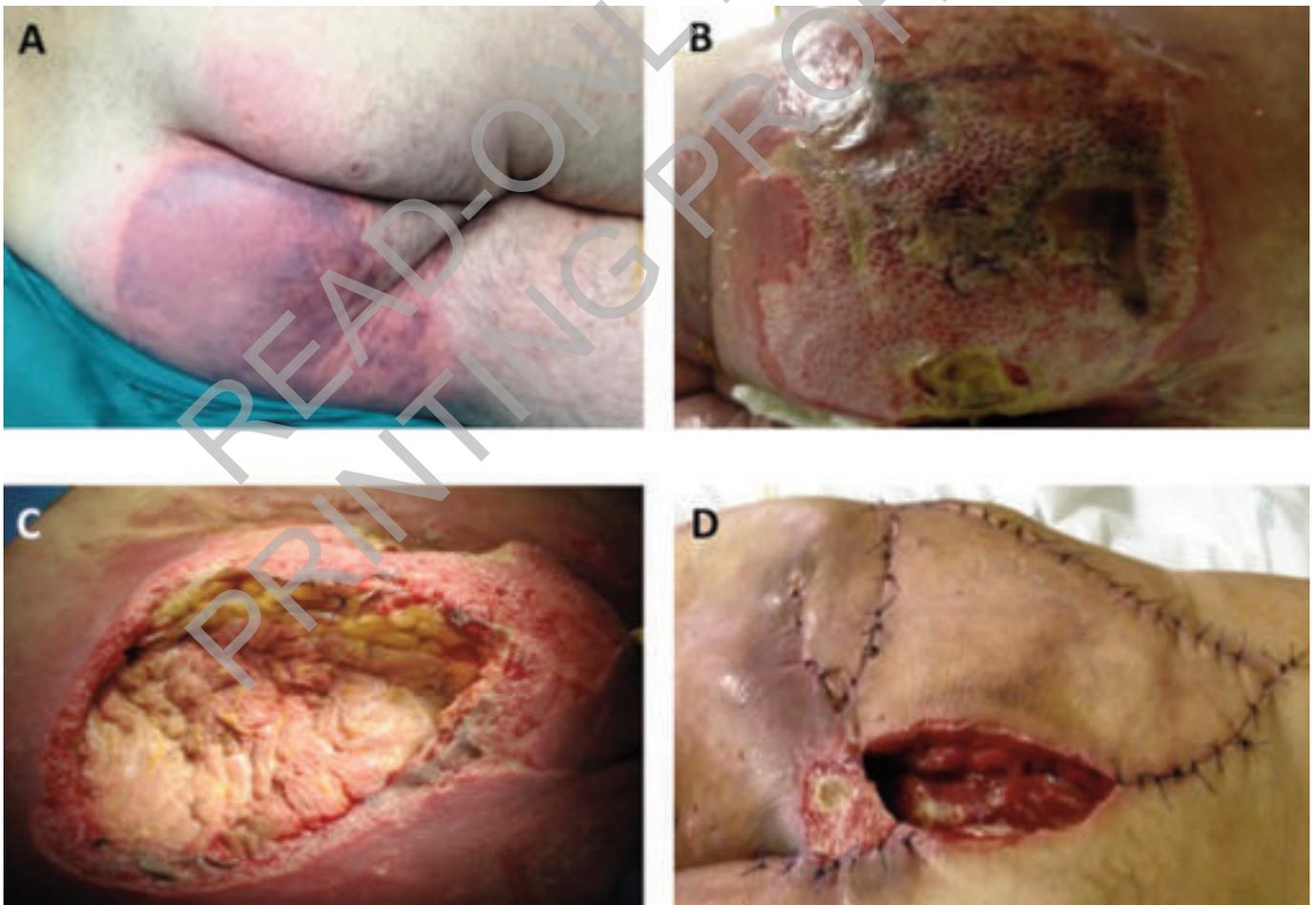


Fig. 1: (A) a first-second degree burn over the left buttock. (B) local condition at day 3. (C) the depth of the burn is evident. (D) the residual area before a split-thickness skin graft.

## Discussion

Skin burns following electrocautery are rare complications. The exact incidence is unknown and it is probably underestimated. At present, with the use of modern devices, these complications became more rare but they are still sporadically reported in literature <sup>2,3,6</sup>.

A grounding pad is applied on patient's skin to return the electric current back to the generator. Grounding pads are usually positioned over dry, shaven and well-vascularized surfaces in order to maximize the contact area of the return electrode and reduce the heat of the underlying tissues <sup>7</sup>.

To our knowledge we first report the case of a patient who presented a deep gluteal burn at the site of the grounding pad after an abdominal aortic aneurysm repair. This catastrophic complication jeopardized his life because of a superimposed systemic multi-resistant bacterial infection with a considerable risk of vascular prosthesis colonization. We hypothesized that the ineffectiveness of the return electrode was due to presence of a morbid obesity. It is well known that fat is less efficacious in removing the heat because of its low-conductive capacity and its scarce vascularization when compared to muscles. However, we can not exclude the concomitant possibility that the gluteal skin got soaked while preparing the operatory field or during the operation enlarging the "ground" through a pathway external to the return pad. The conversion of the electricity into heat at the level of the grounding pad does not explain the radicular paralysis of the sural nerve but the electricity runs through tissues with low resistance such as nerves, vessels and muscles <sup>8</sup>. This occurrence may justify the sensitive and motor paralysis of the sural nerve. Multiple experimental methods to reduce skin heating, including increasing the surface area of the grounding pads, increasing the number of pads, and using sequential activation of the pads, have been reported with good results <sup>9</sup>. However, in our case the entire sequence of precaution methods used in the operative theatre to avert the sequelae of these events, failed but no specific alarm sounded. Therefore, the patient underwent multiple debridements, prolonged antibiotic therapy and a long hospitalization.

In conclusion, burns following surgery are only the "tip of the iceberg" and underlying deep tissue damage may be extensive. Serious medico-legal, economic and psychological implications follow these injuries. In our opin-

ion the surgical staff should be aware of the possibility of this event in order to reduce life-threatening complications and an aggressive treatment should be immediately started.

## Riassunto

Nonostante le ustioni a livello della piastra dell'elettrobisturi siano una nota, possibile, complicanza della chirurgia moderna, la loro reale incidenza resta ignota. Gli Autori presentano per primi un caso di ustione profonda a livello gluteo in un paziente sottoposto a chirurgia dell'aorta addominale per aneurisma. Particolare interesse rivestono l'eziologia, la presentazione clinica e il complesso trattamento multidisciplinare.

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