

A Successful Case of Abdominal and Bilateral upper Limb Electrical Burns

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Abstract: This article summarises the clinical data of a patient admitted to the Department of Trauma Surgery of our hospital on 13 December 2024. We summarised and analysed the patient's clinical diagnosis and surgical treatment experience. The patient was in critical condition at the time of admission, and through multidisciplinary treatments, the patient's wound was significantly improved, his vital signs became stable, his digestive function recovered well after intestinal resection and anastomosis, and the electroburn wound was grafted and gradually healed. Through this case, we have come to the conclusion that abdominal and limb electrical burns are severely injured, have a high disability rate and many complications, so it is important to carry out multidisciplinary comprehensive treatment.

1. Case data

Electrical burns are severe burns that often injure deep tissues and organs. They can cause high amputation rate, disability rate and mortality rate. This patient, A 45-year-old man, At 15:00 on 13 December, while working at the construction site, he was accidentally burned by 380-volt industrial electricity on his upper limbs, abdomen and right foot. Abdominal wall ruptured, both hands charred, accompanied by severe pain in the limbs. A colleague at work called an ambulance and took him to our hospital. The emergency department administers rapid fluids and indwelling urinary catheters to drain about 200 ml of brown urine. At admission: 36.3°C, pulse: 84 BPM, breath: 18 BPM, blood pressure: 160 / 103mmHg. The abdomen was flat, and the abdominal muscles were tense, with no gastrointestinal pattern and peristalsis wave seen. Lower abdominal tenderness, with rebound pain. Liver and spleen were not palpable. The mobile turbidity were negative and the bowel sounds were diminished. The lower abdomen was about 7×20cm of electric burn wound, the peripheral skin was leathery. Some tissue was carbonized, subcutaneous fat was exposed, the base was exposed, and the intestine was gray-white, inelastic, no blood, and no peristalsis. The middle, ring and small fingers of the right hand were gray-white, partial wound was carbonized and adjacent tissue was swollen. The right radial artery beats normally and the right thumb was be requested. The left hand was completely carbonized and the phalanges were detached. The left forearm was pale or brownish yellow, and the eschar showed leather-like changes, with shallow vein thrombosis and obvious swelling. The swelling of the left upper arm was obvious, the annular wound was 5cm on the left elbow joint, about 4cm wide. The epidermis is sloughed off, and the base is reddish and white. Some tissue carbonized, and the pain decreased. The left armpit and the left upper arm have a 3×15cm wound. The epidermis is

sloughed off, the base is reddish and white, some tissue is carbonized, and pain is decreased. The eschar of the wound of the right foot was about 2cm in diameter. Emergency routine blood examination showed 13.110 ± 9 / L, neutrophils 48%, hemoglobin 151g / L. Creatine kinase isoenzyme 407U / L (risk), creatine kinase > 1500U / L, lactate dehydrogenase 1748U / L, urea nitrogen 8.1 mmol/L, creatinine 126 μ mol / L, uric acid 471 μ mol / L, glucose 9.26 mmol/L, glutamic acid dehydrogenase 23.94U/L, alanine aminotransferase 148U / L, aspartate aminotransferase 266U / L. Emergency examination of abdominal CT showed: local defect of the left lower abdominal wall with abdominal wall hernia, intestinal expansion of the lower abdominal intestine, intestinal wall swelling with multiple small air and fluid leveling, soft tissue injury of the abdominal wall and subcutaneous emphysema. See Figure 1

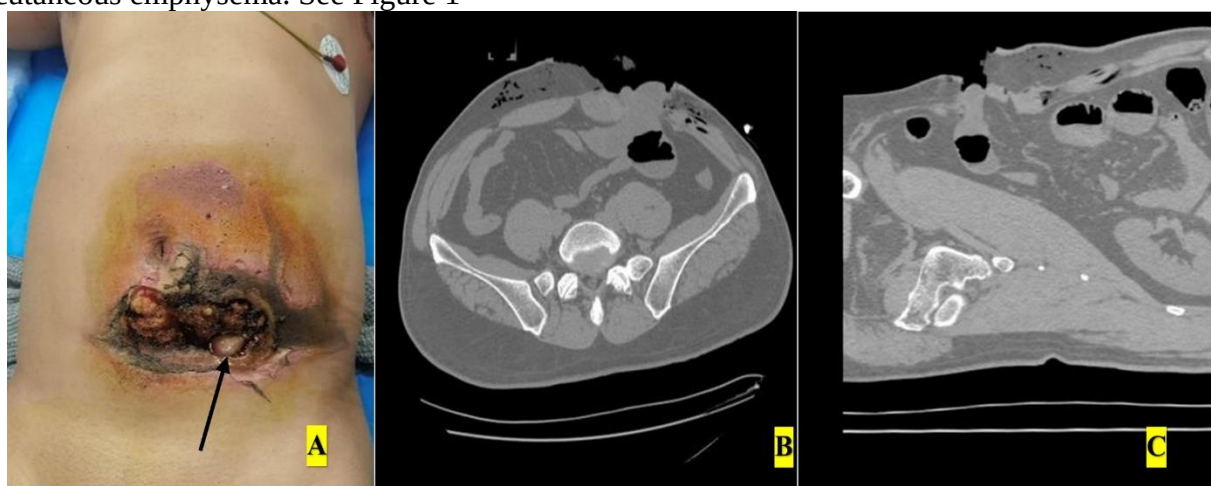


Figure 1 A shows that the abdominal wound of the patient showed leather-like marginal skin, some tissues were carbonized, subcutaneous fat was exposed, the base was exposed, and the intestine (arrow) was gray, inelastic, no blood transport, and no peristalsis. B.C: abdominal CT showed a local defect of the left lower abdominal wall with abdominal wall hernia, intestinal distension of the lower abdomen, intestinal wall swelling with multiple small air and fluid leveling, soft tissue damage of the abdominal wall, and subcutaneous emphysema.

2. Treatment process

2.1 General treatment

After admission, a central venous access was established, 2000ml of supplementary crystalloid was given for fluid resuscitation, and imipenem cilastatin was given as intravenous infusion, and sodium bicarbonate 12.5g was given to alkalinize urine. Vital signs were monitored closely.

2.2 The course of treatment

After preoperative preparation, Exploratory laparotomy was performed and there was no effusion or intestinal contents in the abdominal cavity. See Figure 2. The middle part of the small intestine is significantly dilated, and the dilated intestinal tube is about 60 cm long. The small intestine is greyish-white and spotty-like. And in the abdominal wall defect a 2cm diameter small intestinal rupture can be seen, The necrotic segment of the intestinal tube is scattered in 3 places, about 2cm in diameter, and the size of the necrotic foci of the black-grey intestinal wall. At the same time, thrombosis in the capillaries of the intestinal wall can be seen, without peristalsis, and it is inelastic to the touch. Necrotic small bowel resection and intestinal anastomosis were performed. The wound of the

abdominal wall electrical burn defect was debrided and sutured to close the abdominal cavity. For abdominal wall tissue defects, VSD sealed negative pressure drainage was given to close the wound. The left upper limb was amputated distally from the shoulder joint. Open amputation was performed on the 3rd, 4th, and 5th metacarpals of the right hand. After surgery, he was transferred to ICU for intensive care and received organ function support therapy, including anti-infection, nutritional support, Continuous renal replacement therapy (CRRT), Maintain the balance of water, electrolytes and internal environment.

2.3 Flap repair surgery

After 23 days of admission, the right inguinal pedicle flap repair was performed, along with residual abdominal wound stamp skin grafting and debridement and suture of the left axillary wound. Two weeks after the repair of the right groin flap, the intermittent flap block training was started. After 1 hour, the flap still had no ischemia and reached the condition. Therefore, the pedicle flap of the right hand was given 44 days after admission. After pedicle surgery, the right hand flap had a localized infection of the flap edge, but the blood flow of the flap was not affected, and debridement and dressing change were continued. The patient was admitted to the right hand wound for 75 days, and he was cured and discharged. During this process, the left shoulder, right sole and abdominal wall wound were healed successively. See Figure 2

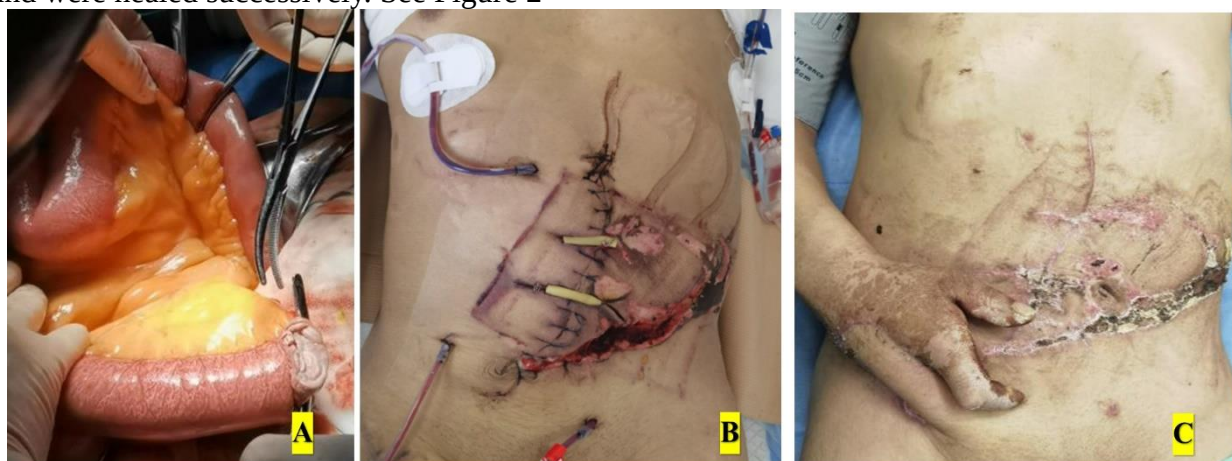


Figure 2 A shows that during the exploratory laparotomy, the damaged small intestine was patch pattern change, dilated, without peristalsis, inelastic to the touch. small bowel resection and intestinal anastomosis were performed. B: the abdominal cavity was closed after exploratory laparotomy. C shows good blood flow of the flap after repair of the pedicle flap in the right hand.

3. Discussion

Electric burn is a special injury, accounting for the second burn cause of various[1], including electric shock, arc or electric spark burns and lightning injury three types. Electric burn can cause human blood vessels, nerves, muscle, skin and bone tissue damage, systemic internal organs pathological changes, the injured parts to the upper limb accounted for the first [2]. Electrical damage is divided into low-voltage damage (<1000V) and high-voltage damage (> 1000V) damage. Among the patients treated in emergency treatment, the proportion of low-voltage electric injuries accounted for the majority [3]. In this case, the soft tissue of the abdomen, right hand, left upper limb and right foot were extensively necrotic, and the whole thickness defect of the abdominal wall, small intestine exposure and necrosis, with serious local damage. The right hand repair was performed with a Tubular flap [4] supplied by the right inferior abdominal artery. In the treatment of this patient, early closure

of the wound was a key factor in the treatment of abdominal injuries, Especially during the treatment of abdominal injuries, emergency laparotomy is performed according to abdominal surgical principles. Accurately identify the boundary region of the necrotic bowel and excised the necrotic bowel during surgery. [5] When sealing the abdominal cavity, attention is paid to the closed suture of the peritoneal layer, and the residual abdominal wall surface tissue defects is attracted by VSD sealing negative pressure, which avoids the infection of the wound and also creates conditions for the later skin graft [6].Continuous renal replacement therapy (CRRT) treatment in the early postoperative period plays a positive role in protecting renal function and promoting the discharge of necrotic tissue metabolites [7].

4. Conclusion

However, there are also some deficiencies in the treatment process of this patient, such as the left upper limb amputation is too active, A low-level amputation can be performed first, and some inter-compartmental ecological tissues can be preserved. and secondary debridement amputation can be performed after the demarcation is clear. The right hand flap wound developed an infection during the treatment, increasing the hospital stay.

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