Reconstruction of a Severe Chest Electrical Burn Injury, Case Report

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Abstract
The aim of this case is to show the usefulness of early debridement and resurfacing of burn injuries in difficult areas like the chest wall. The successful techniques using a Lattisimus dorsi myocutaneous flap in the management of this case represents a good reconstructive method to be applied.

Keywords
Chest Injury; Electrical Burn; Reconstruction

Introduction
Electrical burns since its inception in 1849 represent big challenge in all aspects of its management from the initial presentation in emergency room until the follow up visits (Edlich, 2010, http://emedicine.medscape.com/article/1277496-overview). All health professionals involved in burn care must appreciate the physiologic and pathologic effects and management of electric current injury (Edlich, 2010, http://emedicine.medscape.com/article/1277496-overview), in some cases clinical evaluation of electrical injury is difficult because of the significant discrepancy between the appearance of skin burns and the severe necrosis of the tissue beneath the skin, and its treatment is very challenging because of devastation of vast tissues and structures in this type of patient (Li et al., 2007).

Chest wall and mediastinum burns maybe life threatening, they interfere with respiratory mechanism and may also contaminate with exposed vital structures (Netscher and Baumholtz, 2009). High-voltage electrical burns on the chest may cause lung infarction because of the direct effect of the electrical current and vascular embolism (Li et al., 2007), it may also adversely affect the heart conduction system, especially in older victims. Injuries to extremities usually require surgical intervention to prevent loss of the limb (Keane Law Firm, 2010).

Consideration is given to flap choice to restore function, resolve infection and maintain stable aesthetics (Netscher and Baumholtz, 2009).

In this case report we report an exceptional case of an extensive electrical current burn causing severe chest wall destruction exposing the sternum and result in left lower limb burn.

The main aim of this article is to confirm the usefulness of both flaps and grafts and its possible complications.

Case report
A 27 yrs old man suffered from electrical current burns admitted to our casualty with second to third degree burns in the chest wall and right lower limb, Total body surface area was 22% (Figure 1; Figure 2).

On local examination the patient has a big wound over the chest, 3rd degree burn at the lower third of the sternum 15x10 cm, dry, white edges and there is extensive tissue destruction in the lower sternum, there was a 2nd degree superficial burn in the right lower limb up to the mid thigh with rest of the examinations were normal (Figure 1; Figure 2). The
patient resuscitated, general investigations were normal and wound debridement was done.

After stabilization of the patient condition, at the fourth day the open wound were covered with split thickness skin graft harvested from left thigh, chest wall was resected with wide margin of normal tissue and right latissmus dorsi musculocutaneous flap was used for reconstruction (Figure 4; Figure 5).

At the second day the patient developed mild right hemoepumothorax treated by insertion of chest tube when the patient returned to surgical unit the wound was infected therefore was debridement done with removal of all necrotic tissue and all infected ribs (Figure 3).

Postoperatively, the flap course went fine but part of skin graft lost with necrosis of the lower edge of skin flap, infection recurre and suitable antibiotic was given according to culture and sensitivity and the patient improved quickly (Figure 6).
Now the infection is controlled and the patient is waiting for a small skin graft, his right leg burn was healed and is moving without difficulty.

**Discussion**

Reconstruction of chest wall after electrical current burns has posed extremely difficult issues for plastic surgery surgeons, now a day with the use of skin grafts and pedicle flaps technique, one stage reconstruction of these difficult wound has become possible (Edlich, 2010, http://emedicine.medscape.com/article/1277496-overview).

The recent development of muscle and musculocutaneous flaps open new era in chest wall reconstructive surgeries (Harashina et al., 1983).

Reconstruction after large chest wall burns must ensure not only anatomical coverage but a normal respiratory function, especially in the case of associated ventilatory disturbance because flail chest wall segment causes hypventilation and increase in respiratory work (Jose et al., 2008).

In this kind of cases the option for soft tissue reconstruction is determined according to extent of soft tissue involvement, in our case extensive burn injury and debridement result in large defect which needed full thickness flap and skin graft.

The most commonly used muscle in this kind of surgeries is latissimus dorsi muscle followed by serratus anterior muscle as the second choice then pectoralis major muscle, omentum is the fourth and rectus abdominis muscle is the last option.

Latissimus dorsi muscle is a versatile and reliable muscle for chest wall reconstruction, it has a study vascular pedicle and can be elevated and rotated through a generous arc to reach the entire ipsilateral chest as will as the midline and contra lateral axillary fold, the serratus artery branch to latissimus dorsi muscle also has been proven to be an adequate vascular supply to the latissimus dorsi muscle when ligation of thoracodorsal artery has occurred (Edlich, 2010, http://emedicine.medscape.com/article/1277496-overview).

When latissimus dorsi muscle is used minimal function impairment is appreciated, only forceful backward extension and adduction of the arm are noted as mildly to moderately compromise.

The primary complication encountered with chest wall reconstruction is associated with infection whether from initial wound contamination and inadequate debridement or secondary infection (Edlich, 2010, http://emedicine.medscape.com/article/1277496-overview).

Poor planning when harvesting the pedicle flap and careless sacrificing of essential arterial perforators may result in muscle flap necrosis an skin peddle epidermolysis, close system drains also are essential for both donor and recipient sites, infections is controlled with wide debridement and irrigation and coverage with well perfused viable tissue.

Removal of skeletal element can alter pulmonary function leading to respiratory compromise.

Muscle flap harvest rarely leaves the patient with debilitating functional impairment but extensive resection after multiple operations lead to poor cosmetic outcome.

Keloid scars and contraction can be a complication in small portion of patient, harvesting muscles closely associated to the thoracic cage may result of pneumothorax (Edlich, 2010, http://emedicine.medscape.com/article/1277496-overview).

We should put in mind all this mentioned complication when dealing with this kind of surgeries to be avoided and minimized.

Advances in research and micro vascular techniques will continuously add to the armamentarium of plastic surgeon in the reconstruction of the chest (Edlich, 2010, http://emedicine.medscape.com/article/1277496-overview).

**Results**

In this type of injury infection can result from initial wound contamination, inadequate debridement or secondary infection.

Early fluid resuscitation, antimicrobials, early excision,
and grafting have improved survival in the early postburn period; however, a significant incidence of pneumonia-related sepsis occurs after burn injury.

Developments in anesthesia, antibiotics, hematology, and wound healing brought about routine use of flaps with good postoperative results. Improvements in surgical technique and advances in microsurgery also resulted in more complex flaps, resulting in composite and compound pedicled and muscle flaps (Edlich, 2010, http://emedicine.medscape.com/article/1277496-overview).

Where necessary, skeletal integrity must be restored generally with prosthetic material then covered with well vascularized soft tissue, buttress visceral repair and fill dead space, soft-tissue deficiency must occasionally be augmented with large distant micro vascular flaps.

**Conclusion**

Flap reconstruction has reduced both morbidity and mortality and restore respiratory function in both physiological and pathological aspect.

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