

Case Report

Use of pectoralis major myocutaneous flap cover in a case of electric burn

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ABSTRACT

Reconstructive flap surgery is commonly done in patients that have tissue loss from trauma or burns. It involves transporting live healthy tissue from one part of the body to the area with tissue loss or loss of skeletal support. Myocutaneous flaps are often used when the area to be covered needs more bulk and increased blood supply. Since its development in 1947 for repairing cardiothoracic tissue defects, the pectoralis major myocutaneous flap has been widely utilized in head and neck reconstructive procedures. This flap offers a one-stage reconstruction and provides a large cutaneous space that can be navigated to fix defects involving two epithelial surfaces. Though done as salvage flap nowadays after failure of a free vascularized flap, PMMC flaps are continually performed in developing countries with limited medical sources. Primarily implemented to repair head and neck defects, the PMMC flap can be executed at other sites as well. In this case report, we present the application of PMMC flap to cover exposed acromion in high voltage electrical burn patient.

Keywords: Pectoralis major myocutaneous flap, Electric burn, Shoulder joint, Acromion

INTRODUCTION

Electrical burns occur when electricity comes in contact with the body. These burns are due to accidental contact with exposed parts of high or low voltage electrical appliances, wiring, or lightning strikes.¹ Electric injuries often bring about rapid deterioration consequently leading to high morbidity and mortality rates, while some electrocutions are instantly fatal. The depth of the burn is directly proportional to temperature and time of exposure.^{1,2} Localized electric burns produce massive tissue damage and coagulative necrosis.² Electroporation affecting cell membrane resting potential may ensue in larger cells, such as nerve or muscle cells. Burns are the most severe at the site of entry and exit of the current. The point of contact can be determined by the entrance site. When electricity travelling in the body encounters

resistance, heat is generated based on the level of current (squared), tissue resistance, and duration of exposure.³ High resistance of bone in the passage of current results in periosteal necrosis and melting of calcium phosphate matrix. If the muscles are severely injured, the individual becomes at risk for rhabdomyolysis and acute compartment syndrome.⁴ Depending on the extent of the burn injury, the surgeon must contemplate the need of wound excision, biological wound closure, or definitive wound closure. Although progression of microvascular free tissue transplantation (free flaps) has become the golden standard in reconstructive flap surgery, pectoralis major myocutaneous (PMMC) still remains highly effective.⁵ PMMC flaps are considered in patients with failure of or are considered poor candidates for a free vascularized flap. The underlying fourth or fifth ribs and overlying skin may be included in the PMMC flap along with the pectoralis major.⁵ The PMMC flap offers

advantages such as abundant soft tissue volume, relative versatility, easy harvest, large skin paddle, and short operating time.⁶ To reduce complications such as deformity of the thoracic wall and function impairment of the neck and shoulder, modifications have been undertaken. For example, transecting horizontally along the pectoralis major muscular fiber axis at the level of pectoral branch and including the internal thoracic artery (third intercostal perforating branch) in the skin paddle caudally-medially to the nipple has been done to avoid impediments faced post-operatively.⁵ Though rare, isolated deep burns of the shoulder region may present as a problem due to the difficulties faced for coverage, especially when they are accompanied by exposure of the underlying bone. As a result of prolonged exposure to heat, the patient suffered a deep burn that damaged shoulder joint and accompanying muscles.⁷ Exposed acromion was present along with surrounding friable granulation tissue and eschar, further complicating the possibility of full coverage with local tissue.

CASE REPORT

A 37 year old male arrived in the outpatient department due to a severe electrical burn injury over the left shoulder. During his shift at the factory fifteen days ago, a high-voltage electric wire fell onto his left shoulder. The burn was determined to be grade IV and measured 5X5 cm. On further inspection, the acromion was visible along with surrounding tissue hyperaemia. No active discharge or bleeding were present. The patient was stable, having a GCS of 15/15, heart rate of 78 bpm, and blood pressure of 110/70 mmHg. Systemic examination was remarkable. ECG and lab work were all within normal range. The patient received one blood transfusion the day before surgery was scheduled. Under aseptic conditions, the exposed and necrosed part of the acromion was nibbled. It was decided that primary skin closure was not possible due to the wide defect of the skin. Thus, the surgical team opted for a flap reconstruction. Normally, a pedicled latissimus dorsi flap would be considered. However, due to the disrupted muscle, it was not possible. Hence, a PMMC flap chosen for the optimal method to cover the exposed bone and injury. Tracing was done from the exposed acromion to the xiphisternum. Another surface marking was done from the midpoint of the left clavicle to vertically intersect the first line. Following the path of the pectoral branch of the thoracoacromial artery on the pectoralis major muscle, the skin paddle was positioned and outlined. During elevation of the flap, care was taken to involve as many myocutaneous perforators that provide blood supply to the skin paddle. From the lateral edge of the paddle to the anterior axillary line, an incision was made. The pedicle was identified on the deep surface of the superior part of muscle. By dissecting along the lateral border of the pectoralis major with electrocautery, the dissection plane between the pectoralis minor and major muscles and the vascular pedicle was discovered. Once this intermuscular plane had been identified, the pectoralis major and its

vascular pedicle were freed by stripping the pectoralis minor toward the clavicle with a finger. To free it from the humerus, the pectoralis muscle was divided laterally to the pedicle. A wide subcutaneous tunnel was developed, and the flap was transported from the chest to the shoulder girdle. The flap covered the entire defect and was sutured. Chest wall was closed by undermining the surrounding skin along with a closed suction drain for the prevention of hematoma occurrence. No complications occurred during the procedure.



Figure 1: Harvested part of PMMC flap.



Figure 2: Patient's shoulder post-operative second day.



Figure 3: Patient's shoulder three months post-operative.

Post-operative recovery was uneventful, and the patient was discharged in stable condition after five days. The skin staples were removed on his subsequent outpatient department visit. On inspection, the donor and recipient site appeared to be healing well and patient had no further complaints.

DISCUSSION

Patients who have experienced electrical injuries can endure a wide variety of complications depending on the voltage and extent of exposure to the current. In this case, the patient suffered a burn on the left shoulder that resulted in necrosis of the skin, muscle and underlying bone leading to an ulcer formation with no signs of infection. As it was grade IV burn, it was necessary to cover the open defect and remove all the necrosed tissue and bone to prevent any future infection. The choice of flap was based on the anatomical proximity of the pectoralis major muscle along with the consideration of the size of the defect. One stage reconstruction of the defect was planned by the utilization of the pectoralis major since it was in close proximity to the defect and provided a large cutaneous island that can cover the defect entirely. Additionally, the pectoralis major muscle has a robust blood supply; it is supplied by the thoracoacromial artery, a branch of the second part of the axillary artery.⁸ The reconstruction of the wound provided a satisfactory outcome with no complications and the cosmetic outcome of the procedure was excellent. The PMMC flap is commonly used to cover debrided sternotomy wounds but this case focuses on the use of this flap to cover a shoulder injury wound after acromion osteotomy instead of use of the conventional latissimus dorsi flap.⁹

CONCLUSION

The PMMC flap has been performed over forty years of surgical history for reconstruction in closure of variety of defects. In the case of high risk patients and surgical candidates with vessel-depleted tissues or poor free tissue, the pectoralis major myocutaneous flap is essential. The PMMC flap is cost-effective and has less complication in comparison to other myocutaneous flaps. These reasons may hold beneficial in developing countries and in salvage procedures for free flap failures. We report a unique case of a shoulder burn injury having undergone reconstructive flap surgery with a PMMC flap instead of a conventional latissimus dorsi flap. The PMMC flap provided successful closure with

no complications, along with a pleasing cosmetic outcome. Hence, we can consider this flap and method for anterior shoulder injury reconstruction in future cases.

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