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RESEARCH ARTICLE

SALVAGING SEVERELY CRUSHED UPPER LIMB WITH BRACHIORADIALIS AND LATISSIMUS DORSI MUSCLE FLAPS: A CASE REPORT

***[1]Dr. Kaushik Paul, [2]Dr. Saurabh Sharma and [3]Dr. Deepashree Paul**

[1]MS (General Surgery), MCh (Plastic Surgery), DNB (Plastic Surgery) Consultant Plastic Surgeon, Apollo Gleneagles Hospital, Kolkata
[2]MS, MCh-PDT (Plastic Surgery) R. G Kar Medical College, Kolkata
[3]MDS (PGT) Gurunanak Institute of Dental Sciences and Research, Kolkata

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ABSTRACT

Introduction: Trauma that affects the elbow region may result in significant soft tissue defect with exposure of the antecubital neurovascular and other vital structures. In this case study role of brachioradialis and latissimus dorsi muscles in reconstruction of complex upper limb defect is evaluated.

Case Study: A fifty year old patient presented with severe crush injury to right upper limb which was salvaged with three staged surgical procedures. Brachioradialis and latissimus dorsi muscle flaps and split skin grafting were used for this complex reconstruction of upper limb

Conclusion: The brachioradialis muscle flap is reliable option for coverage of the anterior defects of the elbow. It has a good blood supply and there is minimal functional morbidity when it is used.
The latissimus dorsi muscle flap is one of the most reliable and versatile flaps used in reconstructive surgery. Pedicled Latissimus dorsi muscle with split thickness skin graft is the primary choice for reconstruction of large complex arm and elbow defects.

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INTRODUCTION

Severe trauma that involves large part of the upper limb may result in significant soft tissue defect with exposure of the antecubital neurovascular structures and the underlying muscles. Soft tissue defects of the cubital fossa present a unique problem, because of their critical locationnot so much for their size (Ahmet Karacalar, 2004). The brachioradialis muscle flap is reliable, easy to harvest and provides single staged stable coverage to the antecubital fossa. For the reasons mentioned above, this flap is very useful choice for adding well-vascularized soft tissue over the deep structures. Vascularity of the upper limb should be assessed pre- or intraoperatively (Shen, 2008). Latissimus dorsi flap was introduced by Tansini in 1906. Because of its large vessel diameter, a long reliable pedicle, its size, and versatility, it is considered as an extraordinary flap in the reconstructive surgery for many years. The pedicled latissimus dorsi flap is very effective in reconstructing elbow and arm defects following trauma.

Corresponding author: Dr. Kaushik Paul,
MS (General Surgery), MCh (Plastic Surgery), DNB (Plastic Surgery) Consultant Plastic Surgeon, Apollo Gleneagles Hospital, Kolkata

Case Report

A fifty year old female patient presented in the emergency department with severe crush injury to left upper limb following road traffic accident. After initial evaluation and hemodynamic stabilization of the patient, she was taken to Operation Theater for wound exploration and necessary debridement. In the first stage only fracture stabilization and debridement were performed. The patient was taken to the operation theater for second look operation. Flexor groups of forearm muscles were largely found to be necrotic which were subsequently removed which ultimately resulted in the exposure of brachial artery. To cover the exposed vessels in elbow region brachioradialis muscle flap was elevated. Relook surgery was done three days after second operation. Necrosis appeared in some muscles in the medial aspect of the arm which seemed to be normal in earlier operations. The necrotic muscles were removed which resulted in exposure of median and ulnar nerves. To cover the defect over medial aspect of arm latissimus dorsi muscle flap was planned. The operation was performed in lateral position. Planning in reverse was performed. The flap was elevated keeping the thoracodorsal

blood vessels intact. Wound over back region was closed in two lawyers keeping a negative pressure suction drain in situ. The muscle placed over defect in arm and elbow regions. The position of the patient changed to supine position. Split thickness skin graft harvested from anterior and medial aspect of right thigh.

Fig. 1. Crushed right upper limb- preoperative

Fig. 2. After first debridement, external fixator in situ

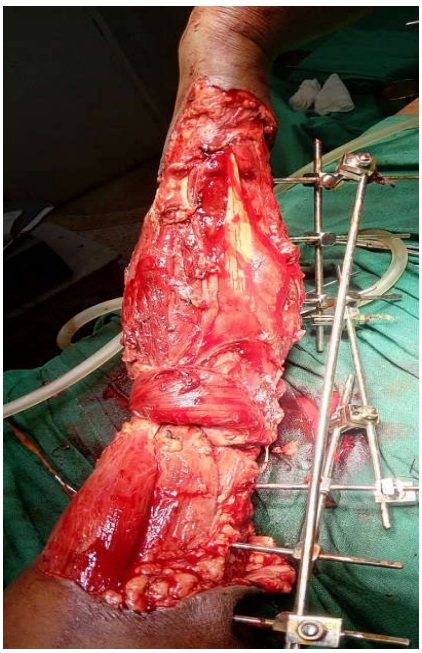

Fig. 3. Brachioradialis muscle flap used to cover exposed brachial artery

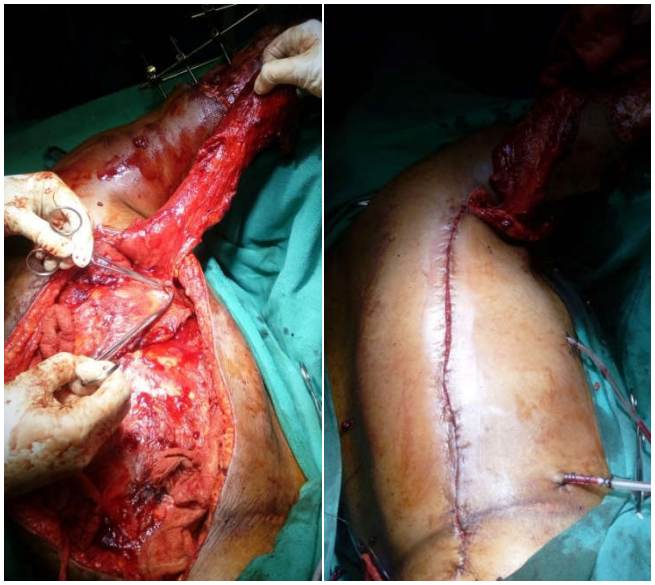

Fig. 4. **Fig. 5.**

Fig. 4. Latissimus dorsi muscle flap elevated
Fig. 5. Closure of the wound in the back region

Fig. 6. **Fig. 7.**

Fig. 6. Split skin grafting to cover raw area over arm region
Fig. 7. Split skin graft to cover raw area over right upper limb

Fig. 8. Well healed wound in right upper limb

The raw area in right upper limb covered with split skin graft. The dressings in right upper limb changed at regular intervals. The wound healed completely in one month time. External

fixator was removed seventy-five days after the incident. Physiotherapy started and continued for three more months. Due to extensive loss of muscles both in arm and forearm the function of the limb became somehow limited. But with the help of motivation from the patient side and expert assistance from the physiotherapist the patient regained significant hand function. The skin graft donor side in right in the right thigh healed with hypertrophic scar formation which was treated with pressure garment and local application of steroids.

DISCUSSION

Perforator flaps raised according to the principle of perforasome (Chaput, 2014), may not be possible always because of massive injury to surrounding skin. The brachioradialis muscle can provide adequate surface area for coverage the deep antecubital neurovascular structures. Its harvesting causes minimal functional morbidity (McGeorge, 1991). Ger reported use of brachioradialis muscle flap after performing an end-to-end anastomosis of the brachial artery.
Lendrum presented a patient with a compound comminuted fracture dislocation of the left elbow and with an ulcer above the olecranon. A brachioradialis muscle flap and split thickness skin graft was used to cover the defect. Triceps tendon or ligaments of the elbow joint can also be reconstructed with brachioradialis tendon if necessar. In this patient the brachioradialis muscle flap was used to cover deep antecubital defect. The nerve supply of the muscle was preserved to avoid its atrophy and keep it bulky enough for deep defects. Latissimus dorsi is located suitably for reconstruction of defects around the arm and elbow regions. It arises from the inferior angle of scapula, lower four ribs, thoracolumbar fascia and posterior lip of iliac crest. Chang et al. used latissimus dorsi flap in upper extremity for coverage of large wounds with and exposed bone, joint and neurovascular structures (Chang, 1994). Stern and Carey (Stern, 1988) and Minami et al. (1990) advocated detaching both the origin and the insertion of the muscle in an attempt to increase the mobility of the flap. It may sometimes lead to complete loss of the flap due to kinking or twisting of the pedicle at the time of transfer.

Split thickness skin graft in conjunction with latissimus muscle flaps for soft tissue coverage decreases donor site morbidity. It also provides cosmetically superior coverage (Minami, 1990). Stevenson et al. (Stern, 1982), attained good functional and cosmetic results within a pedicled flap and a split thickness skin graftin a 12 years old trauma victim. The pedicled latissimus dorsi flap can be successfully used for soft tissue coverage of complex upper extremity wounds following trauma, tumor ablation, infection or burns and sometimes in combination with a functional muscle transfer (Stern, 1982; Abu Jamra, 1981; Silverton, 1978; Landra, 1979; MacKinnon, 1983). In this patient to avoid traction on the pedicle latissimus dorsi tendon was left intact. When the muscle with skin graft is used the muscle contours well as it atrophies and produces excellent aesthetic result particularly when unmeshed or minimally meshed graft gives is used. Reduced morbidity at the muscle donor site is another advantage. As debridement was needed to remove fair amount dead muscles, latissimus dorsi muscle provided good vascularized cover to the exposed neurovascular pedicle as well as replacing the muscle loss (Koumbourlis, 2002). Although free tissue transfer is an option for reconstruction; the success of this modality is doubtful in the presence of vascular injury and at the same time it is more complex and time consuming procedure (Erol Kesiktas, 2005; MacKinnon, 1983).

Conclusion

The brachioradialis flap is reliable, easy to harvest and itprovides stable coverage to the antecubital fossa. It is rich in blood supply, can be done in one stage and gives a good protecting layer for the underneath deep structures as well as obliterates the dead space. Also it allows early mobilization of elbow joint. Pedicled latissimus dorsimuscle flap with a split thickness skin graft are the primary choice for reconstruction of complex defects of arm and elbow regions. The procedure is reliable, safe and it produces an excellent functional and cosmetic results.

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