

Reconstruction of Large Post-traumatic Defect over Upper Chest with Open Clavicle Fracture by Latissimus Dorsi Muscle Flap

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ABSTRACT

Tumor resection and trauma are the most common chest wall defects that require reconstruction. All these patients need careful preoperative evaluation and good surgical techniques. The defect's location, size and nature determine the selection of reconstruction. Water and air-tight closure of the chest cavity and adequate stability with acceptable cosmetic appearance are the reconstruction goals. Large defect over the upper chest is difficult to manage, especially in the case of an open fracture. Different flaps are available to cover upper chest wall defects like Pectoralis Major flap, Latissimus Dorsi (LD) Flap, Trapezius flap and Free flap. Here we present the case of a large traumatic defect of size 20 × 15 cm over the upper chest, covering clavicular region and anterior shoulder. The patient had open clavicle fracture and Pneumothorax secondary to rib fracture for which ICD is placed. Post debridement, clavicle is fixed with External fixator and defect of upper chest is reconstructed with LD muscle flap and Skin grafting to cover the fractured segments of rib and major vascular structures.

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INTRODUCTION

Problems in chest wall reconstruction depends on the physiological deficit and anatomical defect. It can be inferred that certain physiological deficit can arise from an anatomical defect. Management of complex chest wall defects has changed with recent surgical advancements. The introduction of muscle and myocutaneous flap helps in the closure of extensive resection or traumatic defect of chest wall. One of the challenging problems is the reconstruction of soft tissue defects of the upper chest wall, neck and shoulder area. Previously, it required several stages for reconstruction. Few flaps are available like

Pectoralis Major flap, Trapezius flap, TDAP flap, TFL flap and Free flaps. However, the use of Latissimus dorsi (LD) flap for covering large soft tissue defects provides adequate, well-vascularized and healthy tissue which minimizes the risk of wound healing problems and deep-seated infection.

CASE REPORT

A 28-year-old male patient with a history of fall into a papad-making machine has presented with wounds over the upper chest, clavicular region and anterior shoulder region with open displaced fracture of clavicle. There were multiple rib (2,3,4) fractures with pneumothorax which was treated conservatively with ICD by cardiothoracic surgeon. Subsequently, the patient was evaluated, hemodynamically stabilized and was taken up for debridement. There was volume loss of medial portion of pectoralis major with injury along the vascular pedicle region, deltoid attachments were damaged partially, and sternocleidomastoid attachment medial part of clavicle was displaced, resulting in a defect 20 × 15 cm which exposed

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fractured segment rib, and part of major vessels. So, the defect was reconstructed with LD muscle flap with skin grafting along with external fixation of clavicle fracture done by an orthopedic surgeon. The donor site was then closed primarily with a drain. The ICD was then removed on POD 3 after repeating chest x-ray and CT thorax. The primary dressing was done on the 5th day. The graft uptake was 100% and the flap was found healthy. Then the donor site drain was removed. Post-operatively, the seroma developed at the donor site was treated conservatively. Further management of the clavicle fracture was followed as per orthopaedician conservatively, as the patient didn't have gross functional deficit. The flap got settled well and the wound was healed completely by the end of 2 weeks.

DISCUSSION

Three tenets of surgical resection should be maintained in treating patients requiring chest wall resection. First, all devitalized tissue should be removed. Second, prevent physiologic flail by restoring the rigid chest wall. Third, it is essential to seal



Figure 1: Post traumatic defect of the upper chest wall.

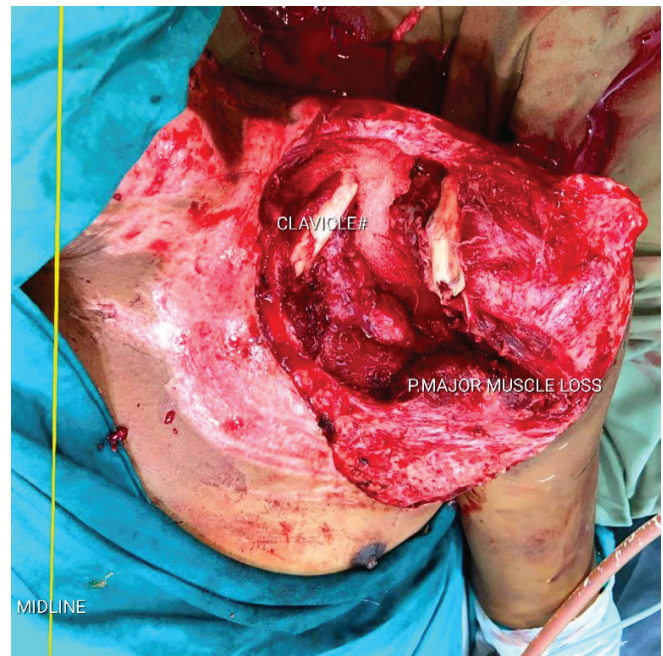


Figure 2: After debridement.

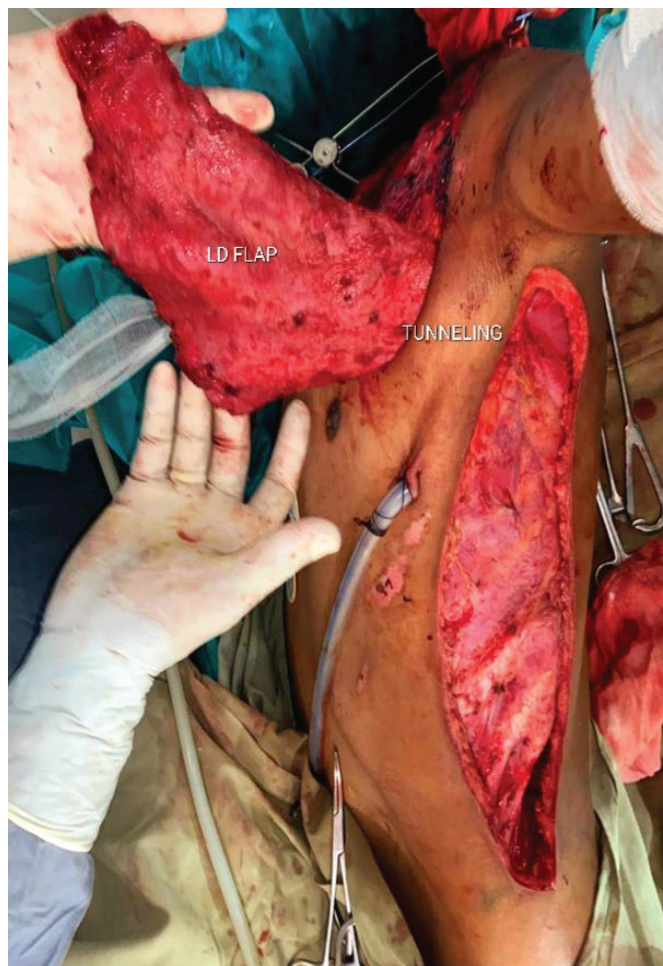


Figure 3: Harvested & tunneled LD flap.

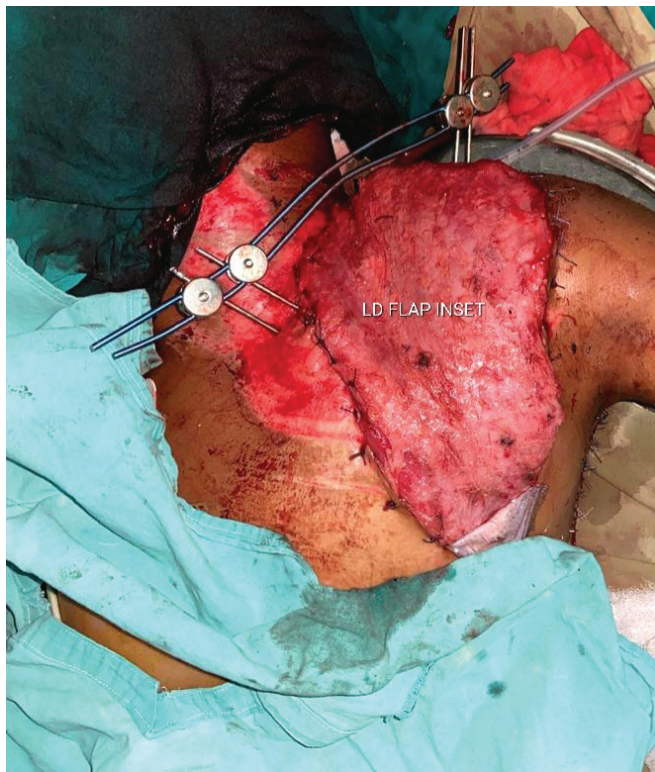


Figure 4: Latissimus Dorsi Flap inset.

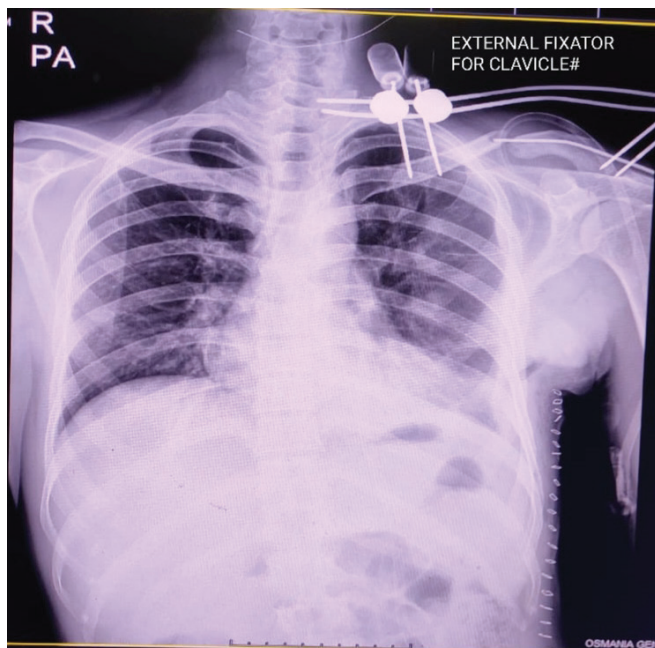


Figure 5: Exfix for clavicle and LD flap inset over the defect.

the pleural space, protect the viscera and great vessels, and prevent infection by healthy soft-tissue coverage.

Superficial defects are closed easily with skin grafts or local flap, whereas full thickness defects over the chest are more challenging and may require both the thoracic and plastic surgeons for management.



Figure 6: SSG over the muscle flap.



Figure 7: POD 25 with well settled flap and graft.

The indications for soft tissue reconstruction over the chest wall defect with pedicled muscle flap or free flap is to provide vascularized tissue cover which will control the infection, reduce the dead space, and provide coverage to synthetic mesh used.

The muscle and musculocutaneous flaps are one of the mainstay reconstruction methods in chest

wall defects. Many local muscle flap will provide vascularized coverage to thoracic trunk defects (e.g., Latissimus dorsi, Pectoralis major, Trapezius, or Deltoid muscles).

The pectoralis major muscle or musculocutaneous flap is less effective in covering large defects in upper chest and shoulder region as muscle is located in the same anatomical region and is inserted in the humerus. In our case there is partial loss of pectoralis major and doubtful injury to the vascular pedicle site that makes pectoralis major muscle flap impossible to be used in the present case. An omental flap can lead to complications like intra-abdominal injuries and hernia while harvesting and transposing in the subcutaneous tunnel.

The LD muscle and musculocutaneous flaps are excellent options for the reconstruction of large chest-wall and shoulder defects. For defects around shoulder and clavicle region, LD flap is the first-choice flap of reconstruction. LD flap have been used for coverage of large chest wall, arm and shoulder defects like radiation-induced and traumatic wounds.

Extremely detailed studies of the consistent neurovascular anatomy of the LD muscle have now increased the design possibilities of flaps based on this muscle. Armed with this anatomic knowledge, a long vascular pedicle, free of muscle bulk and easily capable of reaching shoulder and upper chest wall defects can be created. The location of thoracodorsal artery (blood supply to latissimus dorsi muscle) within the axilla, will safeguard it from surgical trauma and radiation effects.

The two impressive advantages of the flap are its large size, good arc of rotation, reach, ease of harvest and speed with which it can be mobilized. The muscle is large, has excellent bulk, and is located within reach of both anterior and posterior sectors of chest wall. The muscle has good tone when its nerve is spared.

Healing has been uneventful in patients with LD flap, no revisions have been necessary, and restoration of shoulder upper chest wall contour has been satisfactory.

Hence larger defects of upper chest wall and shoulder defect can be easily reconstructed with LD flap in single setting, without notable complications.

CONCLUSION

Upper chest wall defects are more challenging. Three important steps in upper chest wall defect reconstruction are removing all devitalized tissue, restoration of the rigid chest wall to prevent physiologic flail, and to seal the pleural space with healthy soft-tissue coverage.

LD Flap is an excellent option for upper chest wall defects especially near the shoulder and clavicular region. The advantages of the LD flap are its large size, good arc of rotation, reach, ease of harvest, and the speed with which it can be mobilized.

REFERENCES

1. Kamal A. Mansour, MD, Vinod H. Thourani, MD, Albert Losken, MD, James G. Reeves, BS, Joseph I. Miller, Jr, MD, Grant W. Carlson, MD, and Glyn E. Jones, MD Chest Wall Resections and Reconstruction: A 25-Year Experience *Ann Thorac Surg* 2002;73:1720-6
2. Mimis Cohen, MD, FACS, Sai S. Ramasastry, MD, FRCS, Chicago, Illinois Reconstruction of Complex Chest Wall Defects *The American journal of surgery* 1996;172:35-40
3. Ghazi Althubaiti, M.D. Charles E. Butler, M.D. Abdominal Wall and Chest Wall Reconstruction. *Plast. Reconstr. Surg* 133: 688e, 2014.
4. M. F. LAI, B. C. MILROY and D. G. PENNINGTON shoulder defect cover with functional restoration using Lattissimusdorsi myocutaneous flap: a case report. *British Journal of Plastic Surgery* (1982) 35, 140—143
5. Benjamin E. Cohen, M.D. Shoulder Defect Correction with the Island LatissimusDorsi Flap , *Plastic and Reconstructive Surgery*, 01 Nov 1984, 74(5):650-656
6. Moelleken BR, Mathes SA, Chang N. Latissimus dorsi muscle-musculocutaneous flap in chest-wall reconstruction. *Surg Clin North Am.* 1989 Oct;69(5):977-90
7. Abu Jamra FN, Akel SR, Shamma AR. Repair of major defect of the upper extremity with a latissimus dorsi myocutaneous flap: a case report. *Br J Plast Surg.* 1981 Apr;34(2):121-3.
8. David T. Netscher, M.D. Michael A. Baumholtz, M.D Chest Reconstruction: I. Anterior and Anterolateral Chest Wall and Wounds Affecting Respiratory Function, *Plastic and Reconstructive Surgery.* 2009;124(5):240e-252e