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Original Research Article

Chest wall reconstruction using Latismus Dorsi Flap: our experience

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ABSTRACT

Background: Covering a big chest wall defect is the main clinical issue in cancer resection whether it is due to locally advanced breast cancer or any other carcinomas extending to chest wall or injuries leading to chest wall defect. The main aim of the study was to discuss the role of latissmus dorsi flap in chest wall reconstruction.
Methods: Study reviewed 15 patients with chest wall defect within a period of two years January 2015 - December 2016, who underwent chest wall reconstruction after tumor resection or burns.
Results: Among 15 patients, 12 patients were having locally advanced breast tumors, only one patient with recurrent desmoids tumor of abdominal tumor of abdominal wall extending to chest wall and 2 cases were of electrical burn injuries. The age range varied from 40-60 years. Among these patients 13 were females and 2 were males. The defect size varied from 12x15 cm to 26 x 20 cm. There were no major complications except for partial graft loss in two patients.
Conclusions: Lattissmus Dorsi flap is safe and very good flap for chest wall reconstruction.

Keywords: Chest wall, Latissimus Dorsi Flap, Reconstruction

INTRODUCTION

Surgical ablation of locally advanced breast cancer often results in huge defects and covering these large chest wall defects is the main clinical issue. Over the last four decades a variety of surgical techniques have been implemented which include skin grafts, local skin or fasciocutaneous flaps and myocutaneous flaps (such as pectoralis major, rectus abdominis, lattissmus dorsi and external oblique flaps).[1,2]

Generally, flaps are advantageous over the skin grafts in terms of aesthetics and durability especially when adjuvant radiotherapy is indicated.[2-5]

The technique of using Latissmus Dorsi myocutaneous flap (LDMF) for closure of defects in oncologic breast surgery was first described by Tansini.[6] In the present study LDMF was used for covering chest wall defects in fifteen patients over a period of two years. The purpose of this study was to detail our experience of using this flap for chest wall reconstruction with a specific focus on outcomes, advantages, disadvantages, and proper patient selection.

METHODS

The study was conducted in Department of Surgery at a tertiary care teaching hospital in Punjab, India catering to a semi-urban and rural (agricultural based) population between Jan 2015 to Dec 2016.

Inclusion criteria

A total of 15 consecutive patients with large chest wall defects due to any cause (locally advanced breast cancer

or fungating breast cancer, post electric burns and desmoids tumor) were included in the study.

Exclusion criteria

Breast mound reconstructions that used flaps and/or implants were excluded.

Surgical technique

Muscle anatomy

The Latissimus Dorsi is the broadest of the back muscles and accordingly has multiple origins, most importantly the spinous processes of T7 to T12, the thoracolumbar fascia, and the posterior third of the iliac crest. There are also muscular slips that arise from the lowest four ribs, external oblique, and the scapula. Super medially, it is somewhat covered by trapezius, but otherwise is the most superficial muscle in the back lying directly on the paraspinous muscles medially and serratus anterior more laterally. The large flat belly of the muscle is thinner inferiorly and gains some thickness as it converges into a single broad tendon that wraps laterally around teres major forming the posterior axillary fold to insert medially into the intertubercular groove of the humerus. When harvested completely, the muscle flap can measure up to 20 × 35 cm, with a skin paddle as large as 12 × 20 cm.[6]

Vascular anatomy

The latissimus is a type V muscle, and its vascular anatomy is almost a mirror image of the pectoralis flap. The dominant pedicle is the thoracodorsal artery, a terminal branch of the subscapular artery that itself arises from the third portion of the axillary artery. Anatomic variations of the subscapular axis are well described and not uncommon, and in ~2 to 5% of cases, the thoracodorsal artery itself arises from the axillary artery directly. In the majority of cases, before the thoracodorsal artery enters the latissimus, it gives rise to several 1- to 2-mm branches that supply serratus anterior, which can be used to elevate a chimeric flap for broader coverage. After entering the underside of the muscle, the main pedicle divides into two main branches: an upper horizontal branch that travels medially along the superior border of the muscle, and a descending oblique branch that runs inferiorly, parallel to the anterior border of the muscle ~2.5 cm from the edge. The bifurcation is predictably found ~4 cm distal to the inferior scapular border and 2.5 cm medial to the lateral free margin of the muscle. This consistent vascular anatomy allows for a partial latissimus to be harvested when this might be sufficient, minimizing donor morbidity.[7,8]

Secondary pedicles arise dorsally and mostly perfuse the distal part of the muscle. They are typically found ~5 to 10 cm lateral to the spinous processes and are arranged in a medial row (branches of the lumbar arteries) and a lateral row (branches of the intercostal arteries). The largest and most constant of these are the branches of the 8th to 11th intercostal arteries, however they are typically not useful for large anterior chest wall reconstructions due to their location and short pedicle length. These branches can be used, however, when the latissimus has been previously transected in a standard non-muscle-sparing thoracotomy incision, as the distal portion of the muscle can still be mobilized to provide coverage of limited posterior defects.

Harvest technique

McCraw has detailed the transfer technique of this flap.[9] The inferior tip of the scapula, the superior and lateral borders of the muscle, the spine, and the iliac crest should be marked preoperatively. Optimal positioning for latissimus dorsi (LD) flap harvesting is typically the lateral decubitus position, with the arm prepped and the shoulder flexed to 90 degrees. This corresponds with the preferred positioning for a standard thoracotomy allowing posterolateral and intrathoracic reconstructions to be completed without the need for patient repositioning after flap harvest. For more anterior defects, the latissimus is harvested in this position, and the donor site can be closed prior to repositioning the patient and in setting the flap anteriorly. The axis and length of the thoracodorsal pedicle afford this flap an excellent arc of rotation, and virtually any part the ipsilateral chest wall can be reached.[10-12] The Latissimus Dorsi flap can be harvested as a muscle flap, a myocutaneous flap, or a perforator flap.

Clinical reviews in tabulated form were performed to obtain data on sex, age, diagnosis, oncological status, adjuvant therapy, location and size of the defects, and complications. Individual patient outcomes in all 15 cases were compared.

RESULTS

Out of fifteen patients included in the study conducted; 13 were females and 2 were males. The age range varied between 40- 60 years.

Figure 1: (A) Preoperative picture of patient with locally advanced carcinoma breast; (B) Post-operative picture after chest wall reconstruction using LD Myo-cutaneous flap.

Table 1: Latissmus Dorsi Flap for chest wall reconstruction- clinical profiles.

Patient no.	Age (years)	Defect size (cm2)	Operation method	Pathology	Start of adjuvant therapy	Side
1	50	20X15	LD Myocutaneous	LABC	POD20	Right
2	40	12X12	LD+SSG	LABC	POD20	Right
3	55	26X18	LD+SSG	LABC	POD21	Right
4	55	25X15	LD+SSG	LABC	POD18	Right
5	60	22X12	LD+SSG	LABC	POD19	Right
6	55	20X16	LD+SSG	LABC	POD15	Right
7	58	26X18	LD+SSG	LABC	POD20	Right
8	60	25X20	LD+SSG	LABC	POD21	Right
9	60	21X20	LD+SSG	Desmoid tumor	POD20	Left
10	48	18X17	LD+SSG	LABC	POD19	Right
11	45	19X19	LD+SSG	LABC	POD18	Left
12	47	15X11	LD Myocutaneous	Electric burn	-	Right
13	56	21X20	LD+SSG	LABC	POD18	Right
14	60	18X17	LD+SSG	Electric burn	-	Right
15	52	21X19	LD+SSG	LABC	POD19	Right

Table 2: Latissmus Dorsi Flap for chest wall reconstruction- complications and follow up.

Patient no.	Complication	Hospital stay (days)	Follow up
1	Graft take 50%	20	6 months
2	-	15	1 year
3	-	18	1 year
4	-	15	15 months
5	-	16	18 months
6	-	14	15 months
7	-	11	12 months
8	-	15	6 months
9	-	16	18 months
10	Seroma at donor site	20	12 months
11	-	18	10 months
12	-	16	8 months
13	-	15	6 months
14	-	14	4 months
15	-	20	2 months

Etiologically majority of the patients (12/15) had either locally advanced breast cancer or fungating breast cancer and all were females followed by 2 patients who had chest wall defect post electrical burns (both males) and 1 female suffering from recurrent desmoids tumor of abdominal wall extending up to chest wall (Figure 1, 2 and 3).

In thirteen patients (86.66%) study used LDMF with SSG; while in two patients (13.33%) study used Latissmus Dorsi myocutaneous flap (where the defect size was small) (Table 1).

In the present study, the defect size ranged between 26x20 cm to 12x15 cm. There were no major complications except for partial graft loss in only two patients which was healed after few dressings. Mean hospital stay in the present was calculated to be 12 days. All the patients included in the present study were followed up from 6 months to 2 years depending upon the individual case scenario (Table 2).

Figure 2: (A) Preoperative picture of patient with recurrent desmoids tumor of abdominal wall extending to chest; (B) Intra operative picture showing chest wall reconstruction using LD Muscle; (C) Intra operative picture showing muscle covered with SSG; (D) Late post-operative picture showing well settled flap and graft.

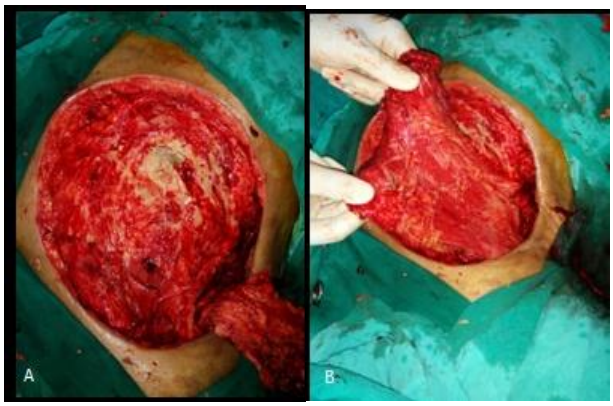

Figure 3: (A) Intra operative picture showing chest wall defect; (B) Intra operative picture showing technique of muscle transfer to chest wall.

DISCUSSION

Reconstruction of chest wall defects is a clinically challenging scenario, which is characterized by reconstruction, restoration and function. The choice of reconstructive technique often requires the plastic surgeon to analyze not only the anatomical as well as functional morbidity related to the defect. Important factors for consideration are coverage with healthy tissue for early wound healing and to cover vital structures.[13,14]

In contrast to the dramatic evolution in the field of breast reconstruction, less attention has been paid by surgeons at large regarding the reconstruction of the large chest wall defects following so called "toilet mastectomy", wherein the stress of the operating surgeon is towards the aim of ablating the breast and skin tissues and minimizing oncologic recurrence in locally advanced breast cancers.[15,16] Many flaps have been documented in literature with an eventual goal to provide early wound healing such as fasciocutaneous flaps, muscle flaps (Pedicled or Free).

The choice of reconstruction depends on the location and size of defects, availability of local and pedicled options and general conditions of patient.

The usage of LDMF was documented in detail by Oliver to cover the damage caused by radiation on chest wall.[17,18] Advantage of LDMF over other pedicled flaps is its long vascular pedicle which helps it to reach upto sternum and cover large chest wall defects. Also, it has good rotation arch and can be designed in different forms and sizes according to defect type.[10]

Because of good skin coverage and adequate oncological margins, postoperative radiotherapy can be started after 3 weeks which results in good locoregional control.

In this series, we had no major complications except for partial graft loss in two patients. In contrast the series of Abdalla et al, have reported a very high skin flap necrosis in upto 12% of patients and wound infection in 4%. Kachoo et al, in their series of patients had done pedicled myocutaneous flap to cover chest wall defect in 75 % of cases with minor post-operative complications like seroma formation.

Arnold and Pairolero are credited with the largest single-institution series of chest wall reconstructions, reviewing their personal experiences with 500 chest wall reconstructions performed in an 18-year period at the Mayo Clinic. Four hundred seven patients underwent a total of 611 muscle flaps: 355 pectoralis majors, 141 Latissimus Dorsi, and 115 other flaps including rectus abdominis, serratus anterior, and external oblique flaps. The patients' ages ranged from 1 day to 85 years, and their defects were a result of chest wall resections, infected median sternotomies, radiation-induced necrosis, or a combination. 83% of patients had excellent results with a healed, asymptomatic chest wall at the time of last follow-up (average follow-up 57 months). Their experience underscores the feasibility, efficacy, and safety of performing muscle flap reconstructions in patients who typically have significant comorbidities,

severe pathology, or critical illness as major obstacles to success.[20]

Several other large series reiterate these results. Chang et al reviewed their 10-year experience of chest wall reconstructions at memorial Sloan-Kettering Cancer Center, which included 113 patients who underwent a total of 157 musculocutaneous or muscle flap reconstructions for chest wall defects. The most common diagnoses in this group were breast cancer and sarcoma, and the majority of patients (106 of 113) underwent only 1 operation. Only 11% of patients required free tissue transfer, and 85% of cases were completed with only one muscle flap harvested. Only 4% of patients had a partial flap loss, otherwise 84% of patients achieved a stable, healed chest wound without any complication.[21]

CONCLUSION

Thus, it is concluded that LDF should be utilized more often as it is a robust, reliable flap having consistent vascular anatomy and has verstality to cover small or large defects. It is technically straight forward procedure with minimal complications.

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