

Clinical Analysis of the Use of Latissimus Dorsi Flap in Repairing Defects after Oncological Surgery

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Abstract:

Background: Cancer resections often lead to significant defects, necessitating reconstructive surgery for functional and aesthetic restoration. The Latissimus Dorsi (LD) flap is a versatile, robust musculocutaneous flap widely used in reconstructive surgery due to its ample size, consistent vascularity, and adaptability to various defect types. The study aims to evaluate the role of the latissimus dorsi flap in the reconstruction of various defects following cancer resections.

Methods: This prospective study involved 45 patients undergoing LD flap reconstruction post-cancer resection at 'PMCH' during 'February 2019 to June 2019'. The study evaluated the flap's effectiveness in covering defects in the chest wall, breast, arm, axilla, shoulder, head, and neck. Flap dimensions, surgical techniques, and patient outcomes were analyzed.

Results: The patient cohort comprised 36 females and 9 males, with an age range of 23 to 82 years. The majority (42 out of 45) of reconstructions used myocutaneous flaps. Breast reconstructions were the most common (25 cases), followed by chest wall and axilla. Complications included complete flap loss (4%), partial flap necrosis (16%), seroma formation (11%), and shoulder dysfunction (4%). These results demonstrate the LD flap's versatility and applicability across various reconstruction sites.

Conclusion: The LD flap is a reliable and effective option for reconstructive surgery post-cancer resection, offering versatility across different anatomical locations. While the procedure is generally safe, attention to potential complications and patient-specific factors is crucial for optimal outcomes.

Recommendation: Future research should focus on long-term functional and aesthetic results, as well as patient satisfaction, to further refine the use of LD flaps in reconstructive surgery.

Keywords: Latissimus Dorsi Flap, Reconstructive Surgery, Cancer Resections, Musculocutaneous Flap.

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Introduction

Cancer resections are critical in managing and eradicating malignancies but often result in significant defects in various anatomical regions. These defects, particularly in areas such as the arm, axilla, shoulder, chest wall, breast, head, neck, and scalp, pose aesthetic concerns and can impact functional outcomes and quality of life [1]. Therefore, reconstructive surgery post-cancer resection is an essential aspect of comprehensive cancer care.

The latissimus dorsi flap, a versatile and robust musculocutaneous flap, has emerged as a crucial component in reconstructive surgery [2]. Its ample size, consistent vascularity, and relative ease of harvest make it a preferred choice for reconstructing extensive and complex defects

following oncological surgeries. The flap's ability to be tailored to various shapes and sizes and its potential to be combined with other reconstructive techniques enhance its applicability across a wide range of defect types [3].

This study aims to evaluate the role of the latissimus dorsi flap in the reconstruction of various defects following cancer resections. By analyzing a series of cases where this flap has been employed, the study aims to understand its effectiveness, versatility, and outcomes in reconstructive surgery. This evaluation seeks to contribute valuable insights into the optimization of reconstructive strategies in post-oncological surgery, ultimately aiming to improve functional

and aesthetic outcomes and enhance the quality of life for patients.

Methodology

Study Design: A prospective study. The study focused on evaluating the effectiveness of the latissimus dorsi flap in reconstructing defects following various cancer resections.

Study Setting: Patients were identified and treated at the 'PMCH', during the study period 'February 2019 to June 2019'.

Participants: There were 45 patients with various types of cancer. Under general anesthesia, all patients had surgery, with the majority of the procedures being reconstructions.

Inclusion and Exclusion Criteria: All defects after cancer resections of the chest wall, breast, arm, axilla, shoulder, head, and neck were included in the inclusion criteria. A history of prior posterolateral thoracotomy involving the division of the latissimus muscle served as an exclusion criterion.

Data Collection and Analysis: Data was gathered about patient outcomes, flap size, and surgical method. The feasibility, functional results, and aesthetic consequences of the flap were the main areas of analysis.

Procedure: A pedicled flap of the latissimus dorsi (LD) was extracted. Marking the flap margins required defining the anterior muscle boundary and the apex of the scapula. The serratus branch was preserved since the flap's axis was designated posterior to the latissimus dorsi muscle's anterior edge. Because of the concentration of perforating arteries on the front edge of the muscle, this defect was the basis for determining the size of the skin island.

Different flap designs, such as the normal and expanded latissimus dorsi flaps, were used. For volume enhancement, procedures like the fleur-de-

lis incision and the harvesting of scapular fat fascia were used. The study also looked at several skin island orientations for the best results in terms of coverage and appearance.

Patient Positioning: In order to protect the brachial plexus and ulnar nerve, patients were placed in a lateral decubitus position throughout the flap harvest procedure. For both the flap harvest and the transfer to the chest wall or upper arm, this location offered the best access.

Surgical Technique: To maintain muscle function and ensure hemostasis, a careful dissection method was used. The flap was carefully inserted and arranged before being tunnelled to the problem spot. Depending on the defect and flap size, different skin closure procedures were employed, and drains were utilized as needed.

Bias: A uniform surgical technique for every patient and clearly stated inclusion/exclusion criteria were two steps taken to reduce bias.

Variables: Patient demographics, the kind and location of the malignancy, the size and position of the defect, the dimensions of the flap, and the surgical results were among the variables.

Statistical Analysis: The data was analysed using statistical techniques, with an emphasis on patient satisfaction, complications, and the flap success rate.

Ethical Considerations: After fully detailing the surgical procedures to each patient and their attendants, informed permission was acquired. The study complied with institutional protocols and ethical standards, maintaining patient confidentiality.

Result

In the current study comprising 45 patients, the effectiveness and outcomes of using the Latissimus Dorsi (LD) flap for reconstructive surgery following cancer resections were evaluated.

Table 1: The table provides an overview of the patient demographics, types of flaps used, and reconstruction sites

Parameter	Value
Total Patients	45
Demographics	
Female Patients	36
Male Patients	9
Average Age (years)	52
Youngest Age (years)	23
Oldest Age (years)	82
Type of flaps	
Myocutaneous Flaps	42
Muscle-only Flaps	3
Reconstruction sites	
Breast Reconstructions	25
Chest Wall Reconstructions	7

Axilla Reconstructions	7
Back Reconstructions	4
Shoulder Reconstructions	2

Of the 45 patients included in the study, 36 were female and 9 were male, reflecting a gender distribution consistent with the typical candidates for such reconstructive procedures. The age range of the patients varied considerably, with the youngest being 23 years old and the oldest at 82 years. The average age across all patients was 52 years.

In terms of the types of flaps used, the majority of the cases, 42 in total, involved myocutaneous flaps. This predominance underscores the versatility and reliability of these flaps in reconstructive surgery. However, in 3 cases, only the muscle part of the flap was utilized due to complications with the skin paddle during dissection. In these instances, skin grafting was necessary to cover the resultant defects.

The distribution of reconstruction sites across the 45 patients was as follows: breast reconstructions accounted for over half of the cases (25 cases, or 56%), followed by chest wall and axilla reconstructions, each comprising 16% with 7 cases. Back reconstructions were performed in 4 cases (9%), and shoulder reconstructions in 2 cases (4%). This distribution highlights the flap's applicability in various anatomical locations, especially in breast reconstruction.

Regarding the size of the flaps used, the largest measured 32 x 22 cm, while the smallest was 12 x 9 cm. This range demonstrates the adaptability of the LD flap to various defect sizes. In 4 cases, direct closure of the donor site was possible, indicating smaller flap sizes (ranging from 12 x 9 cm to 12 x 12 cm). However, in the majority of cases, 41 in total, the donor sites required grafting, primarily using thick split-thickness skin grafts harvested from the thigh.

Postoperative complications were documented to assess the procedure's safety and efficacy. Complete flap loss occurred in 2 cases (4%), while partial flap necrosis was observed in 7 cases (16%). Seroma formation under the flap was noted in 5 cases (11%), and at the donor site in 1 case (25% of direct closure cases). Additionally, partial graft loss at the donor site was seen in 5 cases (12% of grafted cases), with infections occurring in 4 cases (9% of grafted cases). Shoulder dysfunction was reported in 2 cases (4%).

This comprehensive analysis of 45 patients offers a broader perspective on the use of the Latissimus Dorsi flap in reconstructive surgery post-cancer resections, highlighting its versatility, the range of

applicable sites, and potential complications associated with the procedure.

Discussion

The study involving 45 patients who underwent reconstructive surgery using the Latissimus Dorsi (LD) flap following cancer resections provides critical insights into the utilization, flexibility, and potential challenges of this surgical technique.

A notable aspect of the study is the predominance of female patients (36 out of 45), which reflects the common application of the LD flap in breast reconstruction. This is in line with the global surgical trends and emphasizes the flap's significance in post-mastectomy reconstructions. The patient age range varied widely from 23 to 82 years, demonstrating the flap's suitability across different age groups.

The majority of the flaps used were myocutaneous (42 out of 45 cases), underlining the preference for this type due to its robustness and reliability. The most common reconstruction sites were the breast (25 cases), followed by the chest wall and axilla, indicating the diverse applications of the LD flap in various body regions.

Complication rates in this study included complete flap loss in 4% of cases, partial flap necrosis in 16%, and seroma formation in 11%. These figures are comparable to those reported in other similar studies, suggesting a consistent risk profile across different patient populations and surgical settings. The successful employment of muscle-only flaps in a few cases, where the skin paddle was compromised, suggests that this approach can be a viable alternative, though it often requires additional skin grafting.

A previous study by [4], reviewed 60 latissimus dorsi flaps and reported no flap loss, highlighting the flap's versatility for defects like breast and chest wall reconstructions, and covering areas like the abdomen, axilla, and upper extremity. [5] discussed complications related to LD flap use in head and neck surgery, noting potential issues like brachial plexus compression. Studies by [6] reported low complication rates, with seroma being the most common issue. [7] presented a technique for autologous breast reconstruction using the LD flap, with high patient satisfaction despite some complications like seroma and necrosis. [8] analyzed shoulder function post

LD flap surgery, finding no significant loss in shoulder power. [9] also noted cosmetic and

functional issues at the donor site, with most patients being satisfied with the overall outcome.

Overall, the LD flap is a reliable and versatile option for reconstructive surgery, with manageable complications and high patient satisfaction. Our study supports the flap's efficacy, mirroring findings from previous research, but also underscores the need for careful surgical planning to minimize risks like seroma formation, partial graft loss, and shoulder dysfunction.

Conclusion

In conclusion, the Latissimus Dorsi flap remains a vital resource in reconstructive surgery, especially following cancer resections. While generally safe and effective, the procedure requires careful consideration of potential complications and patient-specific factors to optimize outcomes. Future research could further investigate long-term functional and aesthetic results, as well as patient satisfaction, to enhance the application of LD flaps in reconstructive surgeries.

Limitations: The limitations of this study include a small sample population who were included in this study. The findings of this study cannot be generalized for a larger sample population. Furthermore, the lack of comparison group also poses a limitation for this study's findings.

Recommendation: Future research should focus on long-term functional and aesthetic results, as well as patient satisfaction, to further refine the use of LD flaps in reconstructive surgery.

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List of abbreviations:

LD - Latissimus Dorsi

TRAM - Transverse Rectus Abdominis Myocutaneous

DIEP - Deep Inferior Epigastric Perforator

SSG - Split Skin Graft

GA - General Anesthesia

LDF - Latissimus Dorsi Flap

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References

1. Orcutt ST, Anaya DA. Liver resection and surgical strategies for management of primary liver cancer. *Cancer Control*. 2018 Jan 11;25(1):1073274817744621.
2. Bakri K, Mardini S, Evans KK, Carlsen BT, Arnold PG. Workhorse flaps in chest wall reconstruction: the pectoralis major, latissimus dorsi, and rectus abdominis flaps. *In Seminars in plastic surgery 2011 Feb (Vol. 25, No. 01, pp. 043-054)*. © Thieme Medical Publishers.
3. Maciel-Miranda A, Morris SF, Hallock GG. Local flaps, including pedicled perforator flaps: anatomy, technique, and applications. *Plastic and reconstructive surgery*. 2013 Jun 1; 131(6):896e-911e.
4. Bostwick J, Vasconez LO, Jurkiewicz MJ. Breast reconstruction after a radical mastectomy. *Plast Reconstr Surg*. 1978;61: 682.
5. Freedlander E. Brachial plexus cord compression by the tendon of a pedicled latissimus dorsi flap. *Br J Plast Surg*. 1986; 39:514
6. Menke H, Erkens M, Olbrisch RR. Evolving concepts in breast reconstruction with latissimus dorsi flaps: results and follow-up of 121 consecutive patients. *Ann Plast Surg*. 2001; 47:107.
7. Delay E, Jorquera F, Lucas R. Sensitivity of breasts reconstructed with the auto logous latissimus dorsi flap. *Plast Reconstr Surg*. 2000; 106:302–309
8. Glassey N, Perks GB, McCulley SJ. A prospective assessment of shoulder morbidity and recovery time scales following latissimus dorsi breast reconstruction. *Plast Reconstr Surg*. 2008;122(5):1334-1340.
9. Russell RC, Pribaz J, Zook EG et al. Functional evaluation of latissimus dorsi donor site. *Plast Reconstr Surg*. 1986; 78:336.