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CASE REPORT
ΕΝΔΙΑΦΕΡΟΥΣΑ ΠΕΡΙΠΤΩΣΗ

Clinical outcomes of latissimus dorsi flap reconstruction in malignancy cases
A case series

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ΑΡΧΕΙΑ ΕΛΛΗΝΙΚΗΣ ΙΑΤΡΙΚΗΣ 2026, 43(Συμπλ 1):148–154

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Κλινικά αποτελέσματα της ανακατασκευής του κρημνού του πλατέος ραχιαίου σε περιπτώσεις κακοήθειας: Μια σειρά περιπτώσεων

Περίληψη στο τέλος του άρθρου

The three cases include a 15-year-old girl, a 37-year-old woman and a 60-year-old woman with tumors located in the auricle, breast, and deltoid, respectively. All patients underwent total resection of the tumor, followed by reconstruction with a latissimus dorsi (LD) flap. The first case was diagnosed with pleomorphic rhabdomyosarcoma (T2bN1M0) with a past medical history of chemoradiation, the second case was diagnosed with invasive ductal carcinoma of the breast (T2N0M0), and the third case was diagnosed with dermatofibrosarcoma protuberance (G1T4N1M0). All patients had adequate flap perfusion, complete wound healing, and no complications (i.e., necrosis or infection) observed within five days after surgery. In conclusion, LD flap can be presented as a safe and effective method for reconstruction of large, post-resection tumor defects from different anatomical sites. Its rich vascularity, adaptability to irradiated tissue, and overall good biomechanical properties and esthetic results position the LD flap as the ideal choice in oncoplastic surgery.

Key words

Latissimus dorsi
Neoplasms
Oncoplastic surgery
Quality of life
Reconstructive surgical procedures
Surgical flaps

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Cancer continues to be one of the most complex and difficult public health issues worldwide as a result of its high rates of occurrence, mortality, along with long-term influence in patients' quality life.[1] Despite advancements in diagnosis and treatment, many patients continue to face issues, particularly patients with late-stage or metastatic disease who often times only have palliation for options.[2,3] With this in mind, the goals of cancer therapy are ultimately achieving a "disease-free state", reducing recurrence, and improving overall quality-of-life, with a combined individualized treatment plan.[2] One of the most important factors for successful cancer therapy is how well any curative treatment (surgical, chemotherapeutic and radiotherapeutic) can preserve anatomical form and physiological function of the diseased tissue.[4–6] Any surgical anatomical alteration by removal of tumor could also couple with organ dysfunction or esthetic concerns; which in turn could have psychological and life-satisfaction implications on the patient.[4–6] Therefore, the oncoplastic reconstructive approach is a critical part of modern cancer care, integrating removal of disease with the preservation or restoration of optimal shape, size and function.[5,7]

Oncoplastic reconstruction is a specialty within reconstructive surgery whose goal is to replace the anatomical shape and functional integrity of tissues removed for tumor resection, while also considering esthetics and function.[5,7] The latissimus dorsi (LD) flap has developed into one of the more modern approaches of reconstruction and carries several advantages, such as excellent perfusion, consistent vascular anatomy, and the esthetics of fat grafting from an often unnoticed donor site.[8–12] The primary rationale for the LD flap is its reliable perfusion from the thoracodorsal artery, which is important for optimal healing and restoration of functional and esthetic results, particularly in tissues that have fibrosis from radiotherapy or vascular compromise.[8–10] The use of LD flap in clinical reports has demonstrated success rates greater than 90% for head and neck, breast and extremity reconstruction with low complication rates.[9–14]

However, studies have also reported aspects related to the LD flap, such as prolonged operative time, and decreased strength of the back muscles, and esthetic outcomes were influenced by the size of the defect and the method used for the anastomosis.[15–19] Overall, there is poor comparative evidence for the LD flap compared with other reconstructive techniques to various tumor sites which leads reasoning about its adaptability and variability within a multidisciplinary oncoplastic setting, which is the impetus for completing this study.[15,16,19]

The main goal of this case series is to assess the clinical outcomes of reconstruction using the LD flap for patients with various malignancies in terms of types of malignancies and locations following wide tumor resection. Additionally, we hope to show that LD flap reconstruction provides optimal functional and esthetic outcomes with low complication rates, even in patients with prior radiation therapy. In addition, this case series is meant to serve as a basis for advancing clinical guidelines in oncoplastic reconstruction, as well as to promote improved quality of life and rehabilitation outcomes in cancer patients with multimodal therapies.

CASE PRESENTATION

Case 1

A 15-year-old female presented to a tertiary hospital with a progressively enlarging mass on the right auricular region for the past three years, without any associated pain. The patient had a previous history of tumor excision measuring approximately one cm at the same site in a secondary hospital and had undergone six cycles of chemotherapy followed by thirty sessions of radiotherapy. Physical examination revealed a hard, solid mass with an irregular surface, measuring 13×6×6 cm, fixed to the surrounding tissue, extending from the right temporal to the neck region. No enlargement of the axillary, infraclavicular, or supraclavicular lymph nodes was detected. Vital signs and systemic examinations were within normal limits.

Magnetic resonance imaging (MRI) of the brain showed a recurrent soft tissue mass in the right parotid area measuring 13.9×10×11.5 cm, producing an extension into the masticator space, infiltrating the right superficial masseter muscle, and compressing the right maxillary artery (fig. 1A). The chest X-ray showed within normal limits and no evidence of pulmonary metastasis (fig. 1B), and the panoramic radiograph showed no evidence of any bone metastasis (fig. 1C). Clinically, a large ulcerative mass was noted in the right parotid and temporal regions (fig. 1D).

The patient had a biological surgical approach to excise the tumor widely. Rehabilitation was done with a LD flap (fig. 1E). The patient did well post-operatively, with good flap coverage, complete healing, and a closed wound (fig. 1F). Histopathology confirmed the diagnosis of pleomorphic-type rhabdomyosarcoma (T2bN1M0). Overall, the postoperative process was not complicated, with the flap well-vascularized and no signs of infection or necrosis of tissue.

Case 2

A 37-year-old woman presented with a left breast mass for three months, with no pain or nipple discharge. She had a history of oral hormonal contraceptive use and began menstruating at 13 years of age. Examination demonstrated a firm, mobile breast mass, 3 cm in diameter, with no nipple retraction or peaud'orange, and no palpable enlarged axillary lymph nodes on either side.

Breast ultrasound showed a heterogeneous solid mass measuring 2.3×1.99 cm with partially indistinct borders at the 11–12 o'clock position and no enlargement of lymph nodes. The structures of the nipple were normal (fig. 2A). Chest X-ray findings were unremarkable with no indications of metastasis (fig. 2B). Pre-operative marks were made for the mastectomy incision on the anterior chest wall (fig. 2C) and for the LD flap donor site on her back (fig. 2D).

The patient then received a modified radical mastectomy with immediate reconstruction using a LD flap. On postoperative assessment, the wound was closed appropriately with good tissue perfusion (fig. 2E). Fine needle aspiration biopsy (FNAB) determined the diagnosis of inflammatory-type invasive ductal carcinoma classified as breast imaging-reporting and data system (BI-RADS) 4B, with clinical stage of T2N0M0. Five days postoperatively, the patient demonstrated adequate healing of the wound, with no signs of infection or necrosis.

Case 3

A 60-year-old woman presented to the clinic with a palpable firmness in the right upper arm (deltoid area) for about 15 years with pain. She had previously had surgery twice for a similar tumor in 2004 and 2009; however, the tumor returned after about nine years. On examination, there was a hard, fixed solid mass measuring 10×8 cm with ulceration of the overlying skin. No enlargement of the axillary lymph nodes was noted bilaterally.

MRI indicated a heterogeneous solid mass with irregular but relatively well-defined margins, with necrotic areas, in the proximal soft tissue of the right humerus, involving the deltoid and triceps muscles (fig. 3A). After wide excision of the tumor, a large soft tissue defect was noted which was reconstructed with a LD flap (fig. 3B). The postoperative exam demonstrated a well-adhered flap, with adequate drain placement (fig. 3C).

Biopsy and immunohistochemical findings demonstrated spindle cells with Verocay bodies, along with positive staining for CD43, consistent with dermatofibrosarcoma protuberans (DFSP) classified as G1T4N1M0. The patient had a good postoperative

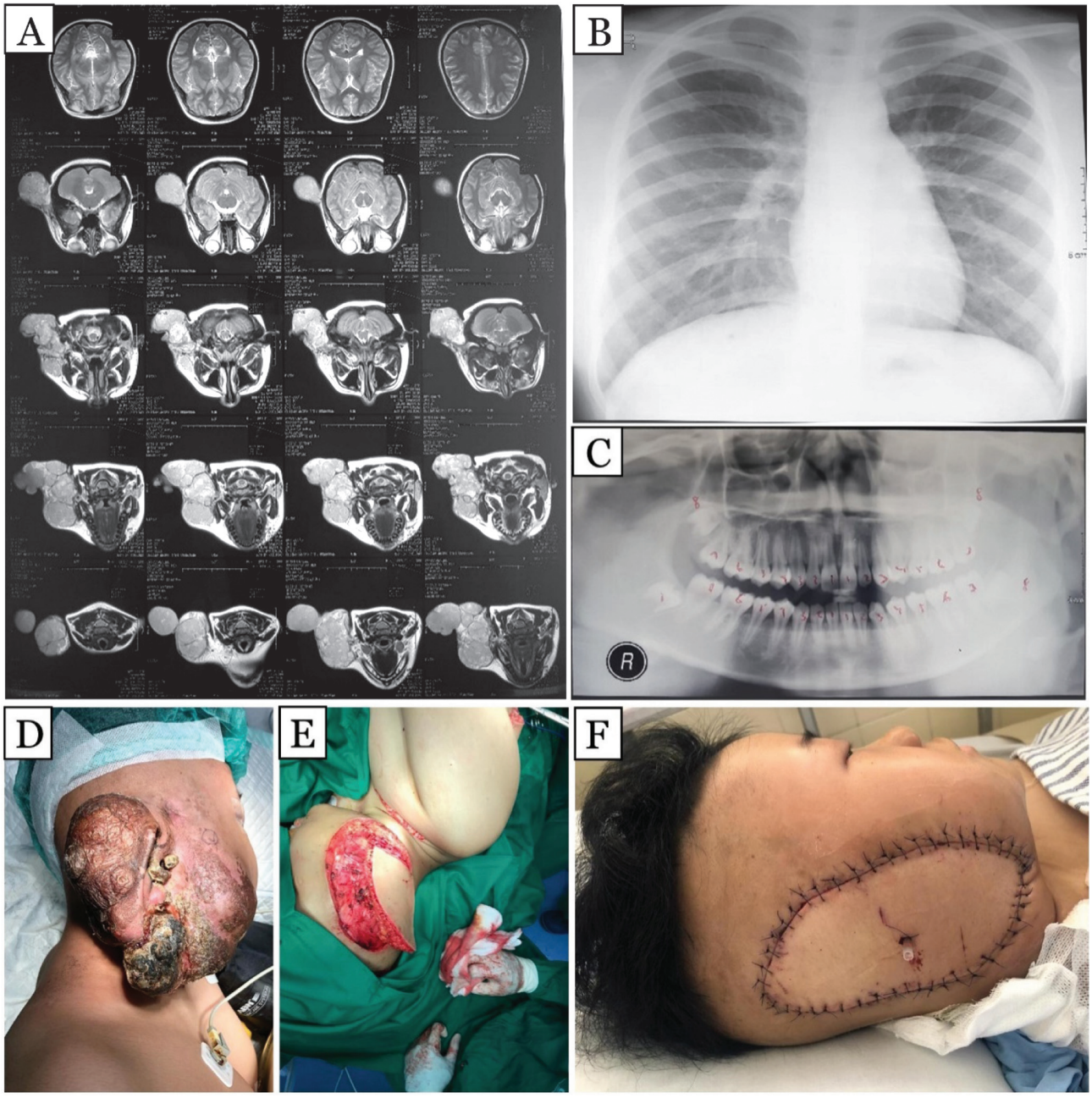

Figure 1. *Patient 1.* Radiological findings and surgical reconstruction of parotid region malignancy. **(A)** Brain magnetic resonance imaging (MRI) showing a mass at the right parotid region extending into the masticator space and infiltrating the right superficial masseter muscle, compressing the right maxillary artery. **(B)** Normal chest radiograph findings. **(C)** Panoramic radiograph showing no evidence of metastatic lesions. **(D)** Preoperative view showing an ulcerated tumor over the right parotid and temporal region. **(E)** Intraoperative view demonstrating tumor resection and harvesting of the latissimus dorsi flap. **(F)** Immediate postoperative result showing flap inset and closure.

course, with appropriate vascularization of the flap, and no evidence of infection or necrosis of the tissues.

COMMENTS

In the three cases described, all patients presented with malignant tumors in various locations (head and neck, breast, and upper arm) and obtained satisfactory reconstructive results using the LD flap following wide tumor resection. No postoperative complications (e.g., infection, tissue necrosis, or flap failure) were identified in the five-day follow-up. The results indicate that the LD flap can be a safe and effective reconstructive option for a variety of malignancies requiring coverage of a large defect

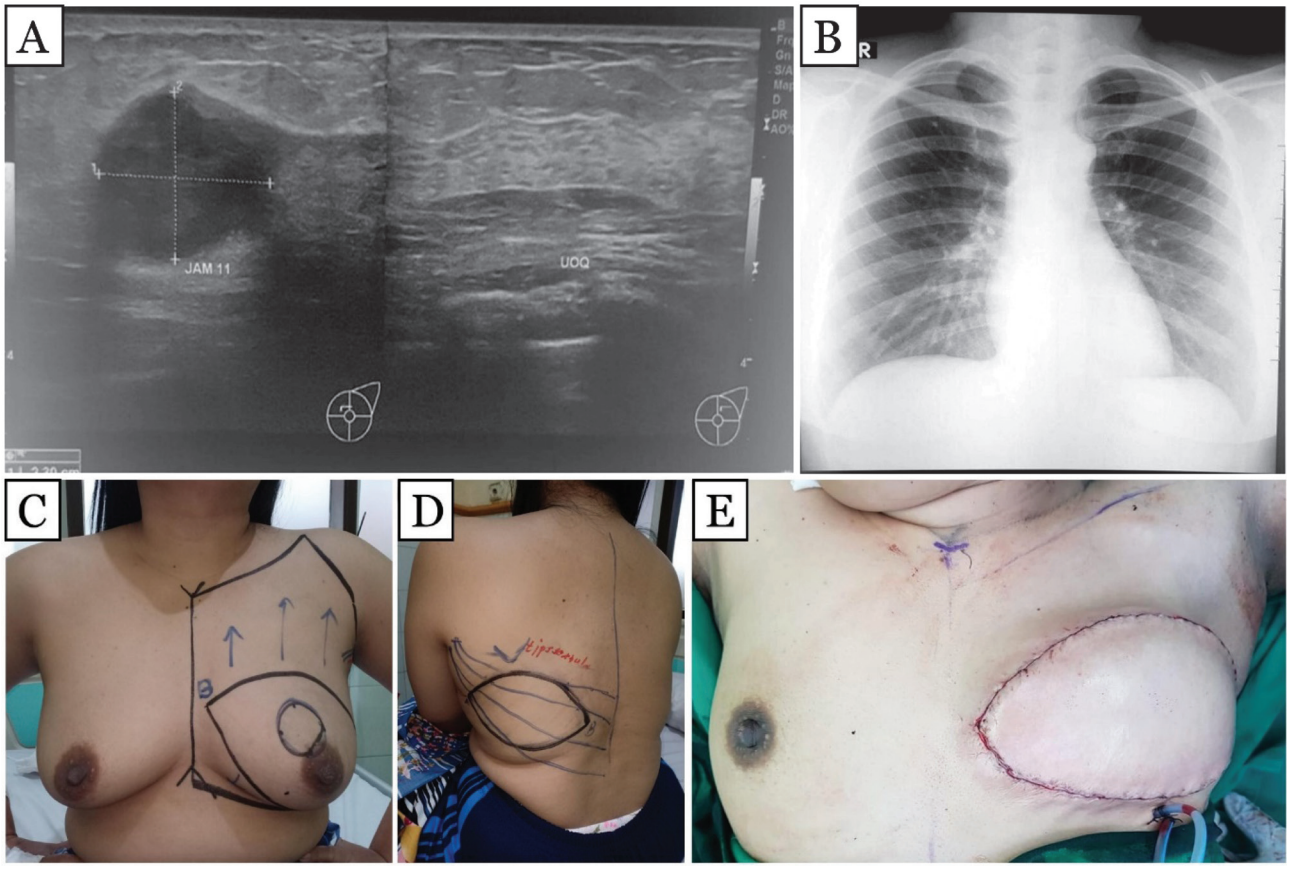

Figure 2. *Patient 2.* Radiological findings and surgical reconstruction of left breast malignancy. **(A)** Breast ultrasonography showed a heterogeneous solid mass in the left breast measuring 2.3×1.99 cm with partially unclear margins at the 11–12 o'clock position, normal nipple architecture, and no sign of lymph node enlargement. **(B)** Chest radiograph showed normal features. **(C)** Preoperative marking of the mastectomy and flap donor area showing the incision design on the anterior chest wall. **(D)** Preoperative marking of the corresponding latissimus dorsi flap on the back. **(E)** Immediate postoperative appearance following flap transfer and wound closure.

Figure 3. *Patient 3.* Latissimus dorsi flap reconstruction following wide excision of upper back malignancy. **(A)** Preoperative view showing a large ulcerated tumor on the upper back with preoperative flap markings. **(B)** Intraoperative view after wide tumor excision and flap elevation demonstrating adequate defect coverage. **(C)** Immediate postoperative appearance showing flap inset and closure with drain placement.

with a good vascular supply. This finding corroborated the literature, which has suggested benefits of the LD flap due to its good perfusion, reproducible vascular anatomy, and hidden donor site, giving an esthetic and functional benefit to oncologic reconstruction.[20] In a similar fashion, others have suggested that the LD flap used to reconstruct head and neck defects and breast defects has well-vascularized flaps that covered defects and proximity to areas that may

have had radiation or surgery.[21] The success of the LD flap may be partially due to the proximity of the vascularity of the flap to an area that had demonstrated vascular stability, as well as tolerated the surrounding tissue that may have required radiation or had nearby surgical intervention.[9,10] Specialty microsurgical techniques and flap design enhance the procedure's outcome and success.[15,16,19] Therefore, LD flap provides a reliable and versatile option for reconstruction after tumor resection in multiple areas of anatomy including the head and neck, breast, and extremities.[9–13,22]

In the three case studies presented, there were two different clinical scenarios. One case comprised patients with a prior history of radiotherapy (rhabdomyosarcoma), and the other comprised patients without radiotherapy (breast carcinoma and DFSP). The findings showed that LD flap provided the best tissue perfusion and healing in both clinical scenarios. Patients with a history of radiotherapy sustained fibrosis and vascular damage from radiation to the recipient tissue; however, the LD flap had good viability on the affected area with no vascular-related adverse events. These findings are consistent with previous literature suggesting muscle flaps, with a rich vascular supply, such as LD flaps are more tolerable to irradiated tissues compared to thin skin flaps.[23] Other studies have described a success rate higher than 90% for flaps in patients post-irradiation when coupled with careful vessel selection for anastomosis.[24] This can be directly explained by the rich vascular supply from the thoracodorsal artery, which guarantees blood supply and vascularity in compromised recipient tissue, as well as results are markedly improved by the good health status of the patient and good condition of the LD flap with no contraindications to its usage.[8–10] Thus, in patients with or without prior history of irradiation, LD flap proved to be successful, reliable, and reproducible across the three cases presented.[8–12]

Theoretically, the rationale behind reconstruction with the LD flap lies in the principles of neovascularization, autogenous blood supply, and high-perfusion tissue transfer.[8] The muscle flap introduces a fresh and sufficient blood supply from the donor site to the tumor resection cavity, which is often poorly perfused due to wide excision or secondary vascular impairment induced by irradiation.[9,10] Neovascularization refers to the connection of new microvessels formed from the elevated flap with recipient capillaries to support delivery of oxygen, increase tissue metabolism and augment local regeneration.[10] The secondary vascular entity expands the notion of sustaining tissue perfusion, preventing local ischemia, and allowing for epithelial wound healing in the microvascular reconstruction paradigm.[15,16] The thoracodorsal artery is the primary blood supply of this flap with a large enough size as the capital pedicle of a myocutaneous flap with predictable vasculature to guarantee consistent perfusion even in fibrotic tissue.[9,10] Biomechanically, the flap is comprised of long, pliable yet strong muscle fibres that allow it to span large defects in a highly mobile area such as the shoulder and chest wall, while retaining tissue compliance and anatomical position.[12,17,18,25,26] In addition, increased muscle perfusion facilitates immune regulation at the wound site while optimizing wound metabolism through increased oxygen delivery and facilitation of leukocytes migration and clearing ischemic metabolites.[17,27] In summary, the ideas of hemodynamic, microcirculatory and viscoelastic are consistent with the function of LD flap as a reconstructive option for structural support, regenerative biological effect, and cosmetic superiority regardless of the cancer type.[5,7,8]

This study provides several noteworthy clinical implications. First, the LD flap has demonstrated good outcomes in multiple tumor sites (head and neck, breast, and upper extremity) with excellent vascular success and low complications. Second, the flap can be used in patients after previous radiotherapy, as the strong blood supply from the thoracodorsal artery may reduce the risk of tissue necrosis in fibrotic tissue. Third, the LD flap provides a functional option in institutions with limited microsurgical and access to microsurgical anastomosis as a pedicled flap while delivering a satisfactory functional and esthetic result. Fourth, the successful flap emphasizes the importance of reconstructive plans to be conceived soon after the tumor has been resected to ensure overall preservation of underlying anatomical structure and function. Fifth, the outcomes in this study could be a starting point for a longitudinal study to address the long-term effects of the LD flap on quality of life, musculoskeletal function, and local tumor control.

This study has several limitations. First, the limited population size (three patients) limits potential generalizability of findings. Second, not having a control group prevents objective comparisons of a LD flap to other reconstructive options. Third, the short observation period reported (five days post-operative) is not enough time to assess long-term outcomes, such as flap muscle strength, biomechanical function, or local tumor control. Fourth, subjective measures such as satisfaction with the esthetic of reconstruction and effects on patient quality of life were not evaluated as outcomes.

In conclusion, the LD flap was shown to be an effective, safe, and versatile reconstructive option for large defect management after tumor resection in various anatomi-

cal sites, including the head and neck, breast, and upper extremities. The LD flap had a high rate of vascularization, excellent wound healing, and no major complications, even in patients with previous radiotherapy. LD flaps possess superior perfusion, resistance to irradiated tissue, and anatomical flexibility as a viable reconstructive option in a broad range of oncoplastic states. These results emphasize the significance of a multi-disciplinary approach between oncologic and reconstructive surgeons for informed and meaningful therapy planning, leading to optimal functional and esthetic outcomes in their shared patients after oncologic surgery.

ΠΕΡΙΛΗΨΗ

Κλινικά αποτελέσματα της ανακατασκευής του κρημνού του πλατέος ραχιαίου σε περιπτώσεις κακοήθειας: Μια σειρά περιπτώσεων

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Περιγράφονται τρεις περιπτώσεις, ένα 15χρονο κορίτσι, μια 37χρονη γυναίκα και μια 60χρονη γυναίκα, με όγκους που εντοπίζονταν στο πτερύγιο του ωτός, στον μαστό και στον δελτοειδή, αντίστοιχα. Όλοι οι ασθενείς υποβλήθηκαν σε ολική εκτομή του όγκου ακολουθούμενη από ανακατασκευή με κρημνό πλατέος ραχιαίου (LD). Η πρώτη περίπτωση διαγνώστηκε με πλειομορφικό ραβδομυοσάρκωμα (T2bN1M0) με προηγούμενο ιατρικό ιστορικό χημειοακτινοθεραπείας, η δεύτερη περίπτωση διαγνώστηκε με διηθητικό πορογενές καρκίνωμα του μαστού (T2N0M0) και η τρίτη περίπτωση διαγνώστηκε με προβάλλον δερματοϊνοσάρκωμα (G1T4N1M0). Όλοι οι ασθενείς είχαν επαρκή αιμάτωση κρημνού, πλήρη επούλωση τραύματος και δεν παρατηρήθηκαν επιπλοκές (δηλαδή, νέκρωση ή λοίμωξη) εντός 5 ημερών μετά την επέμβαση. Συμπερασματικά, ο κρημνός LD μπορεί να παρουσιαστεί ως μια ασφαλής και αποτελεσματική μέθοδος για την ανακατασκευή μεγάλων, μετά την εκτομή, ελλειμμάτων όγκου από διαφορετικές ανατομικές θέσεις. Η πλούσια αγγείωσή του, η προσαρμοστικότητά του στον ακτινοβολημένο ιστό και οι συνολικά καλές βιομηχανικές ιδιότητες, καθώς και τα αισθητικά αποτελέσματα καθιστούν τον κρημνό LD ως την ιδανική επιλογή στην Ογκοπλαστική Χειρουργική.

Λέξεις ευρετηρίου: Επανορθωτικές χειρουργικές επεμβάσεις, Νεοπλάσματα, Ογκοπλαστική Χειρουργική, Πλατύς ραχιαίος, Ποιότητα ζωής, Χειρουργικοί κρημνοί

References

1. ARRUEBO M, VILABOA N, SÁEZ-GUTIERREZ B, LAMBEA J, TRES A, VALLADARES M ET AL. Assessment of the evolution of cancer treatment therapies. *Cancers (Basel)* 2011, 3:3279–3330
2. BAUSEWEIN C, SIMON ST, PRALONG A, RADBRUCH L, NAUCK F, VOLTZ R. Palliative care of adult patients with cancer. *Dtsch Arztebl Int* 2015, 112:863–870
3. SANTOSO DSB, SANTOSO B, KRISTYANA S, CANDRADIKUSUMA D, NATASIA SMD, EVATTA A. Exploring a rare oncologic complication: Alveolar rhabdomyosarcoma in HIV patient. *Deka in Medicine* 2024, 1:e277
4. VILLARET AB, CAPPIELLO J, PIAZZA C, PEDRUZZI B, NICOLAI P. Quality of life in patients treated for cancer of the oral cavity requiring reconstruction: A prospective study. *Acta Otorhinolaryngol Ital* 2008, 28:120–125
5. DAIGELER A, HARATI K, KAPALSCHINSKI N, GOERTZ O, HIRSCH T, LEHNHARDT M ET AL. Plastic surgery for the oncological patient. *Front Surg* 2014, 1:42
6. VAMADEVA SV, CURNIER A. The role of plastic surgery in reconstruction after oncological surgery. *Br J Hosp Med (Lond)* 2016, 77:328–333
7. HANASONO MM. Reconstructive surgery for head and neck cancer patients. *Adv Med* 2014, 2014:795483
8. SOOD R, EASOW JM, KONOPKA G, PANTHAKI ZJ. Latissimus dorsi flap in breast reconstruction: Recent innovations in the workhorse flap. *Cancer Control* 2018, 25:1073274817744638
9. ZHU G, LI C, CHEN J, CAI Y, LI L, WANG Z. Modified free latissimus dorsi musculocutaneous flap in the reconstruction of extensive postoncologic defects in the head and neck region. *J Craniofac Surg* 2015, 26:572–576
10. WILKMAN T, SUOMINEN S, BACK L, VUOLA J, LASSUS P. The pedicled latissimus dorsi flap in head and neck reconstruction: An old method revisited. *J Reconstr Microsurg* 2014, 30:163–170
11. WINTERS ZE, HAVILAND J, BALTA V, BENSON J, REECE-SMITH A, BETAMBEAU N ET AL. Integration of patient-reported outcome

measures with key clinical outcomes after immediate latissimus dorsi breast reconstruction and adjuvant treatment. *Br J Surg* 2013, 100:240–251
12. ZHU L, MOHAN AT, VIJAYASEKARAN A, HOU C, SUR YJ, MORSY M ET AL. Maximizing the volume of latissimus dorsi flap in autologous breast reconstruction with simultaneous multisite fat grafting. *Aesthet Surg J* 2016, 36:169–178
13. DURAN-MORENO J, KONTOGEORGAKOS V, KOUMARIANOU A. Soft tissue sarcomas of the upper extremities: Maximizing treatment opportunities and outcomes. *Oncol Lett* 2019, 18:2179–2191
14. FANG F, MOMOH AO. Pedicled latissimus dorsi flap breast reconstruction after mastectomy. In: Sabel MS, Mulholland MW (eds) *Operative techniques in breast, endocrine, and oncologic surgery*. Wolters Kluwer/Lippincott Williams & Wilkins, Philadelphia, 2015
15. BAILEY SH, ONI G, GUEVARA R, WONG C, SAINT-CYR M. Latissimus dorsi donor-site morbidity: The combination of quilting and fibrin sealant reduce length of drain placement and seroma rate. *Ann Plast Surg* 2012, 68:555–558
16. SAJID MS, BETAL D, AKHTER N, RAPISARDA IF, BONOMI R. Prevention of postoperative seroma-related morbidity by quilting of latissimus dorsi flap donor site: A systematic review. *Clin Breast Cancer* 2011, 11:357–363
17. BLACKBURN NE, McVEIGH JG, McCAUGHAN EM, KENNEDY RD, McINTOSH SA, WILSON IM. The musculoskeletal consequences of latissmus dorsi breast reconstruction in women following mastectomy for breast cancer. *PLoS One* 2018, 13:e0202859
18. LUTRINGER J, FLIPO B, CARLES M, GAL J, CHIGNON-SICARD B. Functional impairment and its impact on sporting activities after latissimus dorsi flap breast reconstruction. *Ann Chir Plast Esthet* 2012, 57:567–574
19. WINTERS ZE, AFZAL M, BALTA V, FREEMAN J, LLEWELLYN-BENNETT R, RAYTER Z ET AL. Patient-reported outcomes and their predictors at 2- and 3-year follow-up after immediate latissimus dorsi breast reconstruction and adjuvant treatment. *Br J Surg* 2016, 103:524–536
20. NYEKHA V, KUNDAN M, BELSARIYA V, VK S, AGARWAL A. Immediate latissimus dorsi flap reconstruction: Assessing aesthetic outcomes following mastectomy in breast cancer patients. *Cureus* 2024, 16:e64874
21. THARIAT J, CARSUZAA F, BEDDOK A, DENEUVE S, MARCY PY, MERLOTTI A ET AL. Reconstructive flap surgery in head and neck cancer patients: An interdisciplinary view of the challenges encountered by radiation oncologists in postoperative radiotherapy. *Front Oncol* 2024, 14:1379861
22. KAUR N, GUPTA A, SAINI S. Breast reconstruction in low resource settings: Autologous latissimus dorsi flap provides a viable option. *Indian J Cancer* 2015, 52:291–295
23. HAN SJ, KIM J, KIM S, HA Y. Case report: Vertical muscle-sparing latissimus dorsi flap in the reconstruction of chronic radiation-induced chest wall ulcers after breast cancer surgery: A case series. *Front Surg* 2024, 11:1397233
24. WANG W, ONG A, VINCENT AG, SHOKRI T, SCOTT B, DUCIC Y. Flap failure and salvage in head and neck reconstruction. *Semin Plast Surg* 2020, 34:314–320
25. PURUSHOTHAM AD, UPPONI S, KLEVESATH MB, BOBROW L, MILLAR K, MYLES JP ET AL. Morbidity after sentinel lymph node biopsy in primary breast cancer: Results from a randomized controlled trial. *J Clin Oncol* 2005, 23:4312–4321
26. GIORDANO S, KÄÄRIÄINEN K, ALAVAIKKO J, KAISTILA T, KUOKKANEN H. Latissimus dorsi free flap harvesting may affect the shoulder joint in long run. *Scand J Surg* 2011, 100:202–207
27. SZYCHTA P, BUTTERWORTH M, DIXON M, KULKARNI D, STEWART K, RAINE C. Breast reconstruction with the denervated latissimus dorsi musculocutaneous flap. *Breast* 2013, 22:667–672

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