Journal of Surgery
Wingkar C, et al. J Surg 10: 11388
www.doi.org/10.29011/2575-9760.11388
www.gavinpublishers.com
Original Research Article

Surgical Reconstruction of Defects Following Oncological Resections by Pedicled Flaps at Tertiary Care Centre

Chinmay Wingkar[1], Sunil V. Jagtap[2*], Manuja Pimplodkar[3], Shubham S Jagtap[4], Neha N. Ghadge[2]

[1]Department of Plastic Surgery, KVV,Krishna Institute of Medical Sciences, karad, India

[2]Department of Pathology, KVV,Krishna Institute of Medical Sciences, karad, India

[3]Department of Gereral Surgery ,KVV, Krishna Institute of Medical Sciences, Karad, India

[4]Department of Medicine ,KVV, Krishna Institute of Medical Sciences, Karad, India

***Corresponding author:** Sunil Vitthalrao Jagtap, Department of Pathology, KVV,Krishna Institute of Medical Sciences , karad, India

Citation: Wingkar C, Jagtap SV, Pimplodkar M, Jagtap SS, Ghadge NN (2025) Surgical Reconstruction of Defects Following Oncological Resections by Pedicled Flaps at Tertiary Care Centre. J Surg 10: 11388 DOI: 10.29011/2575-9760.011388

Received Date: 14 July 2025; **Accepted Date:** 18 July 2025; **Published Date:** 21 July 2025

Abstract

Background: Pedicled flaps are used in cancer reconstruction, to rebuild tissue after tumor removal. Regional (or pedicled) flaps are harvested from the same anatomical region but not directly adjacent. A single pedicled advancement skin flap is a flap that is mobilized by undermining and advancement into a defect without altering the plane of the pedicle.

Methods and materials: This article is based on a observational ,analytical study carried in the Department of Plastic Surgery, Krishna Institute of Medical Sciences, Karad, between September 2015 to March 2020,which was focused on the role of plastic surgeon in onco reconstructive surgeries. This study only comprises of the pedicled flaps performed by plastic surgeons in cancer reconstruction and not the ones done by oncosurgeons. Study includes cases of head and neck, thorax, musculoskeletal and soft tissue, gynaecological malignancies in which pedicle flaps were done for reconstruction. The duration of the study was 54 months. Total number of pedicle flaps done were 54 .Various pedicled flaps were studied. The age of study subjects was from 18 years to 65 years. Donor site and graft site complications were studied. The 2 flaps had partial flap necrosis and re-surgery was needed.

Conclusion: Plastic surgery is an important component of cancer reconstruction in complex surgeries, anatomically difficult and unfamiliar areas of tumors and flaps and in cases with flap failures or re-surgeries. The pedicled flap surgery typically has a shorter operative time, associated with lower hospital costs, are considered reliable in both academic and community settings compared to free flap surgery. Pedicled flap reconstruction still plays an essential role in cancer reconstruction surgery as an alternative to free grafts.

Keywords: Cancer Reconstruction; Free Flap; Head and Neck Cancer; Pedicled Flap; Pedicled Latissimus Dorsi Flap

Introduction

Cancer reconstruction is an important and complex surgical procedure which needs good surgical skills and a proper knowledge of anatomy, physiology, plastic surgery and oncology. Plastic surgery plays an important role in complete care of cancer patients. They use various techniques, including flap surgeries, microsurgery, and skin grafting, to repair tissue lost due to cancer [1,2]. The main role of a plastic surgeon is to provide a better resection and reconstruction as to offer the patient a better opportunity for cure with the help of other surgeons and specialists and to improve the patients' quality of life [3]. Pedicled flaps build tissue after tumor removal. The process consists of moving tissue i.e. skin, fat, muscle from one area while keeping it attached to its original blood supply, then placing it in the area where reconstruction is required.. A pedicle is a stem or stalk of tissue

that connects parts of the body to each other. Pedicled flaps play a major role in cancer reconstructive surgeries. And the type of graft depends on the malignancy, medical history of the patient, site of tumor. It is very important that the onco-surgeon and plastic surgeon have good coordination to have a better surgical outcome in cancer reconstructive surgeries. Pedicled flap reconstruction may be safer and more useful than free tissue transfer in patients with problems, including systemic complications and graft bed vascularization [4]**.** Flap selection is a complex process, with Free Flap and Pedicled flap having both their respective pros and cons. More importantly, patients pre-operative conditions, the nature of the disease, and the available resources are significant factors to consider when choosing the appropriate reconstructive technique.

Materials and Methods

This is a observational, analytical study done at Tertiary Care Centre. In Hospital of Krishna Institute of Medical Sciences, Karad. Duration of this study is 54 months, from September 2015 to March 2020. Aims And Objectives-Pedicled flaps play a major role in cancer reconstructive surgeries. This study highlights the role of plastic surgeons in cancer reconstruction by identifying the anatomical features of tissue defects requiring reconstruction. The study consists of assessment of various pedicled flaps used in different malignancies for their indications and complications. This study includes flaps done only by the Department of Plastic surgery. Flaps done by onco-surgeons were not included. Patients were explained about the reconstructive options, hospital stay and post-operative complications. The study included a detailed assessment complications and outcome of different pedicled flaps depending on the malignancy, general condition of the patient, co-morbidities and site and size of the tumor.

Results and Observations

In this study, a total of 54 patients were studied. All these patients were operated by Plastic Surgeon between September 2015 to March 2020 at Tertiary Care Centre Hospital ,Krishna Institute of Medical Sciences, Karad. All patients with neoplasm who underwent reconstructive surgery with pedicled flaps were included in the study. Out of 54 pedicled flaps reconstruction cases 35 were males and 19 were females.

Age Distribution: Maximum number of cases were in the age group 50 to 60 years. The youngest case was a 22 years female and the oldest patient was a 72 years male**.**

Pedicled Flaps Site Wise Distribution: Most commonly used locoregional flap was Pectoralis Major Myocutaneous Flap (9 cases,16.6%) followed by Pedicled ALT Flap (5 cases,9.2%) , Fasciocutaneous flaps(4 cases,7.4%) Nasolabial flap (3cases,5.5%),Scalp transposition flap(3cases,5.5%)etc.

Location of Primary Tumor: In this study, the commonest location of primary tumour was in head and neck region followed by lower limb (Table 1,Figures 1-4).

Pedicled Flaps Complications: Partial flap was reported in one case of reverse sural flap and one case of perforator flap both in cases of lower limb defects. They were treated with debridement and skin grafts. There was no complete flap loss in any case.

Donor Site Complications: There were minor graft losses at donor site in 2 cases.They were treated conservatively.

Region of reconstructions (Total no of cases)	Pedicled Flap Types	No of cases as per reconstruction procedures	Average post cancer surgical defect size in cm	Percentage of total no of patients
Head and Neck (29)	Pectroralis major flap myocutaneous flap	9	11x8	16.66
	Pectoralis major muscle flap	3	Lateral half of tongue or floor of mouth	5.55
	Deltopectoral flap	1	4x3	1.85
	Standard forehead flap	2	6x5	3.7
	Median Forehead flap	3	3x3	5.55
	Mustarde flap	3	Lower eyelid>50% or cheek defect4x3	5.55
	Nasolabial flap	3	7x4	5.55
	Gilles Fan Flap	2	Lip defect >50%	3.7
	Scalp transposition flap	3	10x9	5.55

Upper limb(5)	Pedicled Radial forearm flap	2	4x4	3.7
	Abdominal flap	2	10x5	3.7
	Pectoralis major myocutaneous flap	1	9x5	1.85
Trunk (5)				
	Transverse back flap	1	15x12	1.85
	Pedicled ALT flap	1	15x10	1.85
	Latissimus dorsi Flap	2	17x11	3.7
	Pectoralis major myocutaneous flap	1	10x7	1.85
Gynaecological (1)				
	Singapore flap	1	10x5	1.85
Lower limb(14)				
	Pedicled ALT flap	5	10x6	9.2
	Fasciocutaneous flaps	4	8x6	7.4
	Reverse Sural Flap	3	9x5	5.55
	Propellar flap	2	10x7	3.7

Table 1: Various reconstruction of defects following oncological resections by pedicled flaps technics.

Figure 1: A-case of squamous cell carcinoma of Upper lip showing ulcero-proliferative tumor B-Defect after surgical excision of tumor.C,D-Reconstruction complete after Gilles Fan Flap.

Figure 2: A-case of squamous cell carcinoma over medial malleolus showing ulcero-infiltrative growth. B-Post resection defect. C -BSA flap planned skin marking .D-Post operative day 10 E-Final inset done after 3 weeks

Figure 3: A,B-an operated case of thigh sarcoma with scar. C-After wide local excision and pedicled ALT flap. D-After completion of radiation.

Figure 4: A.a case of squamous cell carcinoma over left iliac region showing ulcero-infiltrative and proliferative growth.B-Post resection defect.C-Flap inset at post operative day [5].

Discussion

Surgical resection is the principal treatment for malignant tumors that often outcome in large full-thickness defects. Flaps and grafts are commonly used to repair defects.5. Reconstruction depends on the size of the defect and the different techniques aim to achieve good aesthetic quality and acceptable sequalae at the donor site. After oncological resection,reconstruction of defects often requires various flaps, including random, pedicled and free flaps. It is determined by surgeons based on the defect size, complexity, and technical expertise,facilities available ,cost etc. [6].The technic of free flaps reconstruction surgeries requires longer operating time,advanced instruments and technical expertise, higher anaesthetic risk in patients with multiple comorbid conditions, intense postoperative monitoring and increased cost These are important factors to consider when planning free flaps or pedicled flaps. Reconstructive surgery are significantly increased along with the trend of using either free microvascular or pedicle flaps following ablative surgery [7]. The first pedicled flap was described by Susruta in 800 BC and consisted of a forehead flap [8]. The landmark innovation in reconstructive surgery by McGregor in1963 being the first ever reliable transposition flap [9]. McGregor's temporalis muscle flap was significant because it demonstrated the reliable application of transposition flaps. In onco-reconstruction, locoregional flaps are an important tool in the hands of Plastic surgeon. Many onco-surgeons are trained in locoregional flaps, therefore plastic surgeons are not required in every case**.** Nowadays, microvascular free flaps done by plastic surgeons in the mainstay of onco-reconstruction in most centre in India.The flaps' benefits are the preservation of vascular supply and the redistribution of tension lines around the defect [10]. Free flaps require the expertise of microvascular surgery and longer operative times, but they showmore versatility and robustness than PF for some defects [11]. Granzow JW et al,observed that pedicled flaps are accessible to both academic and community surgeons and considered more reliable in specific settings but are not suitable for every defect [12]. Pedicle flaps may have limitations in reconstructing very large defects. The choice between pedicled and free flaps depends on the size, location, and nature of the defect, as well as the patient's overall health and available resources. The various technics for reconstructive surgery in oncological defect are available in pedicled flaps, such as the Pectoralis Major Myocutaneous flap (PMMC), delto-pectoral flap (DP flap), and forehead flap, and their many modifications [13,14].

Head and Neck

Although free flap reconstruction is undoubtedly the first choice of reconstruction .The Pectoralis Major Myocutaneous Flap (PMMF) ,became the flap of choice for head and neck reconstruction in many centers and was extensively studied.PMMC flap remains an important tool in head and neck reconstruction. Because of its versatility, it has become workhorse in head and neck reconstruction [15]. For reconstruction of head and neck defects,Mahieu R et al. in their study of 93 patients, found that pedicled flaps achieved results equivalent to those of free flaps [16]. A combined PMMC and DP flap for reconstruction were used by Pradhan et al. and noted without any loss of flap. Pradhan et al.

in their study of 29 patients used combined PMMC and DP flap for reconstruction without any loss of flap [17]. It was done as first choice of flap in some cases whereas in some cases it was done after failure of a free flap. It remains the commonest performed pedicled flap in head and neck malignancy [18]. The subclavian artery's preoperative angiography is not a standard procedure in the surgical planning of pedicled flap procedures in the head and neck area [19]. Pectoralis major muscle flap was used in 2 cases of carcinoma of tongue wherein hemiglossectomy was done. In one case of carcinoma of floor of mouth, pectoralis major muscle flap was done (Table 1,Figure 1). Reconstruction of eyelids can be challenging after tumour excisions. In 3 cases Mustarde flap was done for lower eyelid defects. Out of these 3 cases, 2 patients had total postresection lower eyelid loss and one had more than 50% loss. All 3 patients had no flap complications. M A Callahan et al published a series of 55 cases of mustarde flaps with no complications [20]. In 2 cases of more than 50% loss of lower lip post tumor resection, Gilles fan flap was done. Other flaps done by us were standard forehead flaps, median forehead flaps, scalp transposition flaps and deltopectoral flaps. To restore the function and aesthetic outcome is critically important. It has good cosmetic outcome with minimal patient morbidity. Pedicled flap is a versatile flap with good cosmetic outcome with minimal patient morbidity.The reconstruction of the lower eyelid and cheek defects is a challenging task for Plastic Surgeons.

The flap survival rate was 96% for the PMMC flap [21].

In Upper Limb

Pectoralis major myocutaneous flap has been used for coverage of defects in upper arm too. In one case of SCC over shoulder region, PMMC flap was used to cover the defect. In 2 cases of SCC in lower forearm, abdominal flap was used to cover exposed tendons, vessels and nerves. In 2 cases pedicled radial forearm flap was done.

In Lower Limb

Pedicled ALT (anterior lateral thigh) flap transfer represents a reliable option for soft tissue coverage. In the hands of experienced microsurgeons, this flap is a safe and swift option [22]. Pedicled ALT flap was done in 5 cases for reconstruction (Figure 2). Majority of these cases were soft tissue sarcomas.In 2 out of 5 cases, it was not islanded completely. In 2 cases of malignancy at lower thigh, fasciocutaneous flaps were done (Table 1, Figure 2,3). Anterolateral thigh flap was first described by Song in 1984 ,along with the anteromedial and posterior thigh flap [23]. and later popularized by Koshima et al. Fasciocutaneous flaps were done for postresection defects in leg [24].Another common flap done was reverse sural flap. Fasciocutaneous and muscular flaps are some options for coverage, such as the reverse-flow fasciocutaneous sural flap [25]. It was the choice of reconstruction for 2 cases in squamous cell carcinoma over medial malleolus (Figure 2). In one case reverse sural flap was done for reconstruction of defect over tendoachilles. Juan et al. in 2017 published their article of reverse sural flap for reconstruction of the mid and hind foot following melanoma excision. Out of the 4 patients in their case series, all flaps survived without any complications [26]. In ankle melanoma wide excision surgery to remove the tumor with reconstruction on the part of the heel by local flaps with sural graft with split-thickness skin grafting is required [27].In such malignancies tumor recurrence has to be looked properly at site which requires regular follow up.

In Trunk (Chest, Abdomen and Back)

In 2 cases, we did reconstruction by pedicled latissimus dorsi flap. Both these cases had postresection defect over scapular region fore which ipsilateral latissimus dorsi flap was done. One female had squamous cell carcinoma at posterior superior iliac spine. For her the postresection reconstruction was done by pedicled ALT flap (Figure 3). In one case the defect over sacral region was reconstructed by transverse back flap. One case had chest wall tumor on left side, the defect of which was closed by PMMC flap from opposite side**.** Bakri et al. published an article in 2011 describing latissimus dorsi, pectoralis major and rectus abdominis muscle flaps as the workhorse for chest wall reconstruction

Gynecological Malignancy

The Singapore flap, a pedicled fasciocutaneous flap from the thigh, can be used for vaginal reconstruction. It's particularly useful in low-resource settings due to its ease of dissection and minimal need for additional supplies, We performed one case of vaginal reconstruction. It was a cae of squamous cell carcinama of lateral wall of vagina. Singapore flap was taken from right side. The flap involves raising a section of tissue, including skin and underlying tissue, from the thigh and moving it to the vaginal area. (Table 1, Figure 3). The flap is known for its reliability, safety, and relative ease of dissection. 29 Regarding post-operative complications, donor and recipient sites morbidity, as well as the impact of PF reconstruction techniques on patients' quality of life to be considered in the future management plans. Plastic surgery is an important component of cancer reconstruction in complex surgeries, anatomically difficult and unfamiliar areas of tumors and in cases with flap failures or re-surgeries. Pedicled flap reconstruction still plays an essential role in cancer reconstruction surgery as an alternative to free grafts. PF is associated with minor complications which can be managed very easily.

Conclusions

Plastic surgeons and Onco-surgeons have a good knowledge about pedicled flaps and play an important role as far as onco surgical

reconstruction is concerned. They have an important role to play in complex cases like difficult anatomical locations, second flap surgery after a flap failure or after any flap complications. Hence, plastic surgeons are crucial in any cancer reconstruction surgeries according to our study conducted in western India. The pedicled flap surgery typically has a shorter operative time, associated with lower hospital costs, are considered reliable in both academic and community settings compared to free flap surgery.

References

1. Stiles ZE, Lohman RF, Mann GN (2022) Plastic Surgery Reconstruction of Sarcoma Resection Defects: Form and Function. Surg Clin North Am 102: 583-599.
2. Simunovic F, Eisenhardt SU, Penna V, Thiele JR, Stark GB (2016) Holger Bannasch,Microsurgical reconstruction of oncological scalp defects in the elderly,Journal of Plastic, Reconstructive & Aesthetic Surgery.2016,69: 912-919.
3. Hasen KV, Few JW, Fine NA (2022) Plastic surgery: a component in the comprehensive care of cancer patients. Oncology 16: 1685-1698.
4. Chang BA, Asarkar AA, Horwich PM, Nathan CAO, Hayden RE (2022) Regional pedicled flap salvage options for large head and neck defects: The old, the new, and the forgotten. Laryngoscope Investig Otolaryngol 8: 63-75.
5. Schultz TA, Cunningham K, Bailey JS (2014) Basic flap design. Oral Maxillofac Surg Clin North Am 26: 277-303.
6. Sivakumar M, Mohapatra DP (2020) A review of flaps and their uses in reconstructivesurgery. J Anat Soc India 69: 103-109.
7. Katna R, Girkar F, Tarafdar D, Bhosale B, Singh S, et al. (2021) Mumbai Oncology Group - Head and Neck. Pedicled Flap vs. Free Flap Reconstruction in Head and Neck Cancers: Clinical Outcome Analysis from a Single Surgical Team. Indian J Surg Oncol 12: 472-476.
8. Robertson MS, Robinson JM (1986) Pectoralis major muscle flap in head and neck reconstruction. Arch Otolaryngol Head Neck Surg 112: 297-301.
9. McGregor IA (1963) The temporal flap in intra-oral cancer: its use in repairing the postexcisional defect. Br J Plast Surg 16: 318-335.
10. Patel SB, Buttars BR, Roy DB (2022) Mustardé flap for primary nasal sidewall defect post-Mohs micrographic surgery.JAAD Case Reports 23: 151-154.
11. Kozin ED, Sethi RK, Herr M, Shrime MG, Rocco JW, et al. (2016) Comparison ofperioperative outcomes between the supraclavicular Artery Island flap and Fasciocutaneous free flap. Otolaryngol Head Neck Surg 154: 66-72.
12. Granzow JW, Suliman A, Roostaeian J, Perry A, Boyd JB (2013) Supraclavicular artery island flap (SCAIF) vs free fasciocutaneous flaps for head and neck reconstruction. Otolaryngol Head Neck Surg 148: 941-948.
13. Sivakumar M, Mohapatra DP (2020) A review of flaps and their uses in reconstructive surgery. J Anat Soc India 69: 103-109.
14. Tripathi M, Parshad S, Karwasra RK, Singh V (2015) Pectoralis major myocutaneous flap in head and neck reconstruction: An experience in 100 consecutive cases. Natl J Maxillofac Surg 6: 37-41.
15. Chepeha DB, Annich G, Pynnonen MA, Beck J, Wolf GT, et al. (2004) Pectoralis major myocutaneous flap vs revascularized free tissue transfer: complications, gastrostomy tube dependence, and hospitalization. Arch Otolaryngology Head Neck Surg 130: 181-186.
16. Mahieu R, Colletti G, Bonomo P, Parrinello G, Iavarone A, et al. (2016) Head and neck reconstruction with pedicled flaps in the free flap era. Acta Otorhinolaryngol Ital 36: 459-468.
17. Pradhan P, Preetam C, Sarkar S, Samal DK, Parida PK (2022) Combined Use of Pectoralis Major Myocutaneous Flap and Deltopectoral Flap for the Reconstruction of Advanced Oral Cancers: Our Experience in 29 Cases. J Maxillofac Oral Surg 21: 312-319.
18. McCrory AL, Magnuson JS (2002) Free tissue transfer versus pedicled flap in head and neck reconstruction. Laryngoscope 112: 2161-2165.
19. Sievert M, Koch M, Mantsopoulos K, Traxdorf M, Mueller SK, et al. (2020) Failure of pedicled flap reconstruction in the head and neck area: A case report of a bilateral subclavian artery stenosis. International Journal of Surgery Case Reports 76: 381-385.
20. Callahan MA, Callahan A (1980) Mustardé flap lower lid reconstruction after malignancy.Ophthalmology 87: 279-286.
21. Yamashita Y, Ozeki S, Hashimoto K, Miwa K, Yamamoto N, et al. (2013) Clinical evaluation of pedicled flap for oral cancer reconstruction. Journal of Japanese Society of Oral Oncology 25: 142-150.
22. Vater AM, Lamby P, Moncher J, Schmidt K, Jordan M, et al. (2024) Pedicled ALT-flap for soft tissue reconstruction in the trochanteric area. Technol Health Care 32: 3505-3512.
23. Song YG, Chen GZ, Song YL (1984) The free thigh flap: a new free flap concept based on the septocutaneous artery. Br J Plast Surg 37: 149-152.
24. Koshima I, Fukuda H, Utonomiya R (1989) The anterolateral thigh flap: variations in its vascular pedicle. Br J Plast Surg 42: 260-263.
25. Clivatti GM, Nascimento BBD, Ribeiro RDA, Milcheski DA, Ayres AM, et al. (2022) Reverse Sural Flap For Lower Limb Reconstruction. Acta Ortop Bras 30: e248774.
26. Larrañaga JJ, Picco PI, Yanzon A, Figari M (2013) Reconstruction of hind and mid-foot defects after melanoma resection using the reverse sural flap: a case series. Surg J (N Y) 3: e124-e127.
27. Jagtap SV, Khoja S ,Billawaria S, Richard CTS, Jagtap SS (2021) Acral nodular melanoma presenting with rapid progression. Journal of Cutaneous and Aesthetic Surgery 14: 426-432.
28. Bakri K, Mardini S, Evans KK, Carlsen BT, Arnold PG (2011) Workhorse flaps in chest wall reconstruction: the pectoralis major, latissimus dorsi, and rectus abdominis flaps. Semin Plast Surg 25: 43-54.
29. Crum M, Miller C, Micallef C, Delaney R, Hope E (2024) Bilateral Singapore fasciocutaneous flap after anterior vulvectomy and distal urethrectomy for localized recurrent vulvar carcinoma. Gynecol Oncol Rep 53: 101373.