

**How to Cite:**

Mohanty, R. R., Mishra, R., Nayak, B. . . , & Nayak, B. B. (2022). Versatility of antero-lateral thigh free flap in reconstruction of defects in different parts of our body- our experience. *International Journal of Health Sciences*, 6(S7), 1743–1758.  
<https://doi.org/10.53730/ijhs.v6nS7.11658>

## **Versatility of antero-lateral thigh free flap in reconstruction of defects in different parts of our body- our experience**

**Rasmi Ranjan Mohanty**

Assistant Professor Department Of Plastic Surgery Mkcg Medical College & Hospital, Brahmapur  
Email: [kingrasmi.r@gmail.com](mailto:kingrasmi.r@gmail.com)

**Rojalin Mishra**

Senior Resident Department Of Plastic & Reconstructive Surgery Scb Medical College & Hospital, Cuttack  
Corresponding author email: [rosalinmishra8@gmail.com](mailto:rosalinmishra8@gmail.com)

**Bishnupada Nayak**

Senior Consultant Department Of Plastic Surgery Scb Medical College & Hospital, Cuttack  
Email: [bishnupada.nayak1@gmail.com](mailto:bishnupada.nayak1@gmail.com)

**Bibhuti Bhusan Nayak**

Professor & Hod Department Of Plastic & Reconstructive Surgery Scb Medical College & Hospital, Cuttack  
Email: [bibhutinayak50@gmail.com](mailto:bibhutinayak50@gmail.com)

**Abstract**--Introduction Extensive soft tissue defects pose a great deal of challenge to the reconstructive surgeon. The aim of this study is to analyse the outcome of free anterolateral thigh (ALT) flaps for soft tissue reconstruction of defects following tumor excision, trauma and postburn. Methods : A retrospective review of 19 patients undergoing ALT Flaps for various reasons from Dec 2018 to Jan 2021 was performed to determine perioperative factors, demographic profile, complications and outcomes. Results : The mean age the study population was 47.2 years. The male to female ratio was 2.16:1 (68.5 % male, 31.5% females). The etiology of soft tissue defect was post- tumor resection – 47.36%, trauma- 36.8%, post burn reconstruction- 10.5% . The defect sites were most commonly leg-31.5%, upper extremity- 26.3%, buccal mucosa- 15.7%, scalp-10.5%, tongue- 10.5%, breast- 5.2%. Flaps were harvested from right thigh in 52% of cases and left thigh in

58% of the cases. Donor site was closed primarily in 11 cases (57.8%), SSG coverage was done for 8 cases (42.8%). The minimum operating time was 205 minutes and maximum was 435 minutes, with an average time of .....The minimum hospital stay post op was 12 days, maximum being 45 days. Post operative complications were seen in 36.8% of the cases. In two cases, revised arterial anastomosis was done while one case required only venous revision anastomosis. Partial flap necrosis occurred in 3 cases (15.7%), complete necrosis in 1 case (5.2%), donor site morbidity was seen in 3 cases (15.7%). In the post-operative period hematoma and infection occurred in 3 cases. The patients were followed up for a period of 4 months with follow up visits at 2<sup>nd</sup> week, 1 months and 4 months post discharge. Conclusion : ALT Flap in experienced hands provide reliable coverage of large soft tissue defects with excellent esthetic and functional outcomes with minimal donor site morbidity.

**Keywords**---ALT Flap, soft tissue defects, reconstruction.

## **Introduction**

Microsurgical free-tissue transfer has revolutionised reconstructive surgery which enables surgeons more freedom to perform radical tumor resections and single-stage reconstruction techniques for the majority of defects.<sup>1-4</sup> Patients with locally advanced or recurrent disease, ablative surgery in whom can cause severe impairments for the patient are now considered candidates for surgical treatment.<sup>2,4</sup> The ALT flap first described in 1984, due to its versatility in size, low donor site morbidity, large tissue yield and abundant vascularity gained popularity for soft tissue reconstruction. It can be used for reconstruction of defects in extremities, trunk and head and neck.<sup>5,6</sup> Koshima et al were the first to describe the use of ALT flap to reconstruct head & neck defects.

In 1984, Song et al described the ALT flap, supplied by septocutaneous vessels of lateral circumflex femoral artery.<sup>7</sup> This was later demonstrated only to be true only in 15% of cases, while a musculocutaneous perforator supplying 85% of the cases.<sup>8,9</sup> Developments in retrograde dissection techniques and intramuscular perforator laid the foundations for harvesting muscle-sparing ALT flaps.<sup>10,11</sup>

Over the last three microsurgical reconstruction have evolved significantly with focus on functional and aesthetic results and reducing donor site morbidity. The anterolateral thigh flap (ALT) is a fasciocutaneous flap based on the musculocutaneous or septocutaneous perforators of the descending branch of the lateral circumflex femoral artery.<sup>12</sup> Major indications of free flap include – coverage following tumor excision or trauma. ALT has become the workhorse over the years for skin, soft tissue defects replacing many other flaps.<sup>13,14,15,16</sup>

Similarly, scalp being an aesthetic & functional body unit protecting the cranium, extensive soft tissue defects of scalp present a reconstructive challenge.

Use of local or regional flaps has always been the 1<sup>st</sup> choice for scalp reconstruction with tissue expanders being employed for larger defects.<sup>17,18</sup>

### **Anatomy**

ALT flap is supplied by the descending branch of lateral circumflex femoral artery, the largest branch of the profunda femoris artery. Its artery associated with two venae comitantes traverses obliquely with the nerve to vastus lateralis within the groove formed between the rectus femoris & vastus lateralis.<sup>19,20</sup> The lateral cutaneous nerve of the thigh can also be included for a sensory flap.

The ALT flap can be harvested with skin & subcutaneous fat when a thin flap is desirable at the suprafascial level.<sup>19,20,21,22</sup> At the subfascial level- fascia lata is included for additional bulk, useful for repair of dural or tendon defects or creation of a sling support for the oral commissure. A musculo-cutaneous flap can be harvested by including part of the vastus lateralis muscle.<sup>3,12,27,28</sup>

### **Surgical techniques for harvesting the ALT flap:**

A line was drawn between the anterior superior iliac spine and the superolateral border of the patella and midpoint was marked. Doppler probe was used pre- and intra-operatively to identify a cutaneous perforator, located within 3 cm of the midpoint.<sup>16,23</sup> A proximal and/or distal additional perforators may be present. Skin paddle width was taken according to the size of the defect. The medial side of the skin paddle was incised, with a proximal extension towards the anterior superior iliac spine. The incision was taken down then the fascia was incised after identifying the rectus femoris muscle by its bipennate morphology. The rectus femoris was then retracted medially to expose the descending branch of the lateral circumflex femoral artery in the base of the intermuscular septum. The course of the cutaneous perforator was assessed, and additional perforators if any, were identified. The nerve to the vastus lateralis was identified. This was accomplished by meticulous dissection with fine scissors, bipolar cautery and small vessel ligation clips. When all perforators were identified, the skin was laterally incised. Working from inferior to superior, the fascia (and skin paddle) was dissected off the underlying vastus lateralis until the most inferior

perforator was reached. This perforator was then released from surrounding muscle, again using meticulous dissection and ligaclips. In case of usage of a single perforator, some amount of muscle should be left adherent to it, for easy identification of the twisting of the pedicle. The remaining perforators were released in the same manner. Bleeding at the cut skin edges of the flap indicates adequate perfusion by the perforators. The descending branch of the lateral circumflex femoral artery and vein were then dissected superiorly to their branches to the rectus femoris, which should be preserved. The pedicle was then divided. It is often used for coverage after release of contracture. Suction drainage was placed. The skin is closed in two layers

### **Material & methods:**

A retrospective analysis of 19 patients who underwent ALT Flap due to various reasons was done in the department of plastic and reconstructive surgery, SCB Medical College & Hospital, Cuttack from Dec 2018-Jan 2021. Patient variables included age, sex, cause and location of the defect for which the ALT Flap was used and complications following the ALT Flap cover.

SI No.	AGE	SEX	LOCATION	CAUSE	COMPLICATIONS/ OUTCOMES
1	45	M	Hand	Trauma	Seroma
2	52	M	Scalp	Post-tumor excision	
3	24	M	Leg	Trauma	
4	46	M	Scalp	Post burn	Mild skin dehiscence
5	43	F	Hand	Trauma	
6	53	M	Tongue	Post-tumorexcision	hematoma
7	29	F	Buccal mucosa	Post-tumor excision	
8	38	M	Hand	Trauma	Venous insufficiency
9	42	M	Leg	Trauma	Wound dehiscence
10	63	M	Tongue	Post tumor excision	

11	48	F	Buccal mucosa	Post tumor excision	
12	51	M	Leg	Post tumor excision	infection
13	37	F	Leg	Trauma	
14	47	M	Hand	Trauma	Arterial insufficiency
15	51	F	Leg	Trauma	
16	64	M	Buccal Mucosa	Post tumor excision	
17	49	F	Breast	Post tumor resection	
18	52	M	Leg	Post tumor excision	Aretrial insufficiency
19	63	M	Upper arm,che	Post burn contractu axilla,chest	

## Results

The mean age the study population was 47.2 years. The male to female ratio was 2.16:1 (

68.5 % male, 31.5% females). The etiology of soft tissue defect was post- tumor resection –47.36%, truaam-36.8%, post burn reconstruction- 10.5% . The defect sites were most commonly leg-31.5%, upper extremity- 26.3%, buccal mucosa-15.7%, scalp-10.5%, tongue- 10.5%,breast- 5.2%.Flaps were harvested from right thigh in 52% of cases and left thigh in

58% of the cases. Donor site was closed primarily in 11 cases (57.8%), SSG coverage was done for 8 cases ( 42.8%). The minimum operating time was 205 minutes and maximum was435 minutes, with an average time of .....

The minimum hospital stay post op was 12 days , maximum being 45 days. Post operative complications were seen in 36.8% of the cases. In two cases, revised arterial anastomosis was done while one case required only venous revision anastomosis. Partial flap necrosis occurred in 3 cases(15.7%), complete necrosis in 1 case (5.2%), donor site morbidity was seen in 3 cases(15.7%). In the post-operative period hematoma and infection occurred in 3 cases. The patients were followed up for a period of 4 months with follow up visits at 2<sup>nd</sup> week, 1 months and 4 months post discharge .

## **Discussion**

Reconstruction of soft tissue defects following trauma and various other causes like posttumor surgery etc present a great challenge to the reconstructive surgeon . Salvage, functional recovery and aesthetic appearance can be optimised if the primary reconstruction can be performed appropriately.12,24,25

In general, we favour performing the ALT flap as a myo-cutaneous flap primarily in situations where defect were significant in three dimensions. The inclusion of muscle helps obliterate dead space with little associated donor site morbidity. Leg and ankle demand a thinner and more flexible reconstruction than proximal part of leg. We have also experience in supra thin ALT flap for post traumatic lower third leg defect.

The LD flap is often the flap of choice for large scalp defects due to large surface area and reliable pedicle anatomy and length.26-27. However LD flap, removes a bulk of muscle and thus is associated with long term morbidity secondary to shoulder stiffness limiting daily activities.

To overcome the drawbacks of LD Flap, ALT Flap has emerged as an LD alternative for scalp reconstruction. 28,29. The advantage of ALT Flap allows a two surgeon team to work simultaneously, decreasing operating time.30,31. Technically better harvest techniques can provide a long pedicle in most of the cases. Postoperative radiation can be given ALT flap and is more resistant to shearing forces than a skin graft over a muscle and offers an ideal

surface to monitor tumor recurrence. Radical tumor ablation in the head and neck region can significantly impair function and aesthetics and usually requires complex reconstruction, so we have found that ALT Flap possesses many qualities that make a flap ideal for head and neck reconstruction, like good match for recipient site tissue characteristics, the option for sensory innervation and flexibility in design, flexibility of tissue volume .

Buccal defects resulting from cancer ablation can be divided into partial and full thickness. The ALT flap can be safely thinned intraoperatively, making it appropriate for partial- thickness cheek defects reconstruction .32. even though the radial forearm flap is also appropriate for such situations, the ALT flap leaves a less conspicuous donor site with less morbidity. Full-thickness cheek defects involving the oral lining, buccal fat, masseter and facial skin present more challenging reconstruction, particularly if the oral commissure is involved. Reconstruction of such defects with the radial forearm flap results improper

esthetic and deficient functional outcomes. Thus when the oral commissure is involved, the folded ALT flap is our preferred option.

We have also used two ALT Flaps for tongue reconstruction following oral malignancy. ALT Flap is the 1<sup>st</sup> choice for such cases as it provides more bulk and easier insetability.

### **Conclusion**

Despite being some variations in its vascular pedicle, the ALT flap offers advantages: easy and rapid harvestment; long and large vascular pedicle; a reliable cutaneous skin paddle, and bulk adjustment by trimming the flap, suitable for use in the forearm and thenar eminence; are keys to the successful transfer of the flap for immediate reconstruction of upper extremity defects. As in most other soft tissue defects that have been reported in the literature recently, with its evident functional and aesthetic advantages, the ALT flap can be considered an excellent alternative for most soft tissue defects.

Though numerous other locoregional, free flaps have been described, most are inferior than the ALT flap for head and neck reconstruction, because they variably fail to offer a sufficient number of these advantages. The diversity that the ALT flap offers allows its use for most indications in head and neck reconstruction, including those of the intraoral, tongue, buccal, midface, and scalp regions. Resultant donor-site morbidity is low and hidden when compared with other available flaps.

Thus ALT flap reconstructions can be performed suits the diverse tissue requirements and in selected patients, ALT flaps can provide good surgical and functional results.

### **References**

1. Demirhan F, Chen HC, Wei FC, et al. The versatile anterolateral thigh flap: a musculocutaneous flap in disguise in head and neck reconstruction. *Br J Plast Surg* 2000;53:30–36
2. Jeng SF, Kuo YR, Wei FC, Su CY, Chien CY. Reconstruction of extensive composite mandibular defects with large lip involvement by using double free flaps and fascia lata grafts for oral sphincters. *Plast Reconstr Surg* 2005;115:1830–1836
3. Wei FC, Jain V, Celik N, Chen HC, Chuang DC, Lin CH. Have we found an ideal soft-tissue flap? An experience with 672 anterolateral thigh flaps. *Plast Reconstr Surg* 2002;109: 2219–2226
4. Wei FC, Celik N, Chen HC, Cheng MH, Huang WC. Combined anterolateral thigh flap and vascularized fibula osteoseptocutaneous flap in reconstruction of extensive composite mandibular defects. *Plast Reconstr Surg* 2002;109: 45–52
5. Elliott RM, Weinstein GS, Low DW, Wu LC. Reconstruction of complex total parotidectomy defects using the free anterolateral thigh flap: a classification system and algorithm. *Ann Plast Surg* 2011;66(5):429–437
6. Yu P, Sanger JR, Matloub HS, Gosain A, Larson D. Anterolateral thigh

- fasciocutaneous island flaps in perineoscrotal reconstruction. *Plast Reconstr Surg* 2002;109(2):610–616, discussion 617–618
7. Song YG, Chen GZ, Song YL. The free thigh flap: a new free flap concept based on the septocutaneous artery. *Br J Plast Surg* 1984;37:149–159
  8. Ao M, Uno K, Maeta M, Nakagawa F, Saito R, Nagase Y. De-epithelialised anterior (anterolateral and anteromedial) thigh flaps for dead space filling and contour correction in head and neck reconstruction. *Br J Plast Surg* 1999;52:261–267
  9. Xu DC, Zhong SZ, Kong JM, et al. Applied anatomy of the anterolateral femoral flap. *Plast Reconstr Surg* 1988;82:305–310
  10. Mardini S, Tsai FC, Wei FC. The thigh as a model for free style free flaps. *Clin Plast Surg* 2003;30:473–480
  11. Wei FC, Silverman RT, Hsu WM. Retrograde dissection of the vascular pedicle in toe harvest. *Plast Reconstr Surg* 1995;96:1211–1214
  12. Song YG, Chen GZ, Song YL. The free thigh flap: a new free flap concept based on the septocutaneous artery. *Br J Plast Surg*. 1984 Apr;37(2):149–59. DOI: 10.1016/0007-1226(84)90002-X
  13. Yang JY, Tsai FC, Chana JS, Chuang SS, Chang SY, Huang WC. Use of free thin anterolateral thigh flaps combined with cervicoplasty for reconstruction of postburn anterior cervical contractures. *Plast Reconstr Surg*. 2002 Jul;110(1):39–46. DOI: 10.1097/00006534-200207000-00009
  14. Chen HC, Tang YB. Anterolateral thigh flap: an ideal soft tissue flap. *Clin Plast Surg*. 2003 Jul;30(3):383–401. DOI: 10.1016/S0094-1298(03)00040-3
  15. Rajacic N, Gang RK, Krishnan J, Lal Bang R. Thin anterolateral thigh free flap. *Ann Plast Surg*. 2002 Mar;48(3):252–7. DOI: 10.1097/00000637-200203000-00004
  16. Wei FC, Jain V, Celik N, Chen HC, Chuang DC, Lin CH. Have we found an ideal soft-tissue flap? An experience with 672 anterolateral thigh flaps. *Plast Reconstr Surg*. 2002 Jun;109(7):2219–26; discussion 2227–30. DOI: 10.1097/00006534-200206000-00007
  17. Zayakova Y, Stanev A, Mihailov H, et al. Application of local axial flaps to scalp reconstruction. *Arch Plast Surg* 2013;40:564–569
  18. Hierner R, van Loon J, Goffin J, et al. Free latissimus dorsi flap transfer for subtotal scalp and cranium defect reconstruction: report of 7 cases. *Microsurgery* 2007;27:425–428
  19. Kuo YR, Seng-Feng J, Kuo FM, Liu YT, Lai PW. Versatility of the free anterolateral thigh flap for reconstruction of soft tissue defects: review of 140 cases. *Ann Plast Surg* 2002;48: 161–166
  20. Zhou G, Qiao Q, Chen GY, Ling YC, Swift R. Clinical experience and surgical anatomy of 32 free anterolateral thigh flap transplantations. *Br J Plast Surg* 1991;44:91–96
  21. Chen HC, Tang YB. Anterolateral thigh flap: an ideal soft tissue flap. *Clin Plast Surg* 2003;30:383–401
  22. Shieh SJ, Chiu HY, Yu JC, Pan SC, Tsai ST, Shen CL. Free anterolateral thigh flap for reconstruction of head and neck defects following cancer ablation. *Plast Reconstr Surg* 2000;105:2349–2357
  23. Ensaf F, Babl M, Conz C, Fichtl B, Herzog G, Spies M. Doppler Sonografie und



- Farbdopplersonografie zur präoperativen Perforatordarstellung beim anterolateralen Oberschenkellappen [Doppler sonography and colour Doppler sonography in the preoperative assessment of anterolateral thigh flap perforators]. *Handchir Mikrochir Plast Chir.* 2011 Apr;43(2):71-5. DOI: 10.1055/s-0030-1255071
24. Wei FC, Celik N, Jeng SF. Application of “simplified nomenclature for compound flaps” to the anterolateral thigh flap. *Plast Reconstr Surg.* 2005 Apr;115(4):1051-5; discussion 1056-7. DOI: 10.1097/01.PRS.0000156296.74066.80
  25. Langer S, Steinsträsser L, Lehnhardt M, Strack N, Steinau HU, Daigeler A, Homann HH. Der freie ALT-Oberschenkellappen in der traumatologischen und onkologischen Defektdeckung [Anterolateral thigh flaps for reconstruction of traumatological and oncological defects]. *Unfallchirurg.* 2008 May;111(5):323-30. DOI: 10.1007/s00113-007-1355-y
  26. Jia-Ao Y, Hong-Jing L, Zheng-Hua J, et al. Reconstruction of a large pediatric scalp defect with skull exposure by a free anterolateral thigh flap. *Plast Reconstr Surg* 2012;129:178e–180e
  27. O’Connell DA, Teng MS, Mendez E, et al. Microvascular free tissue transfer in the reconstruction of scalp and lateral temporal bone defects. *Craniofac Trauma Reconstr* 2011;4:179–188
  28. Fischer JP, Sieber B, Nelson JA, et al. A 15-year experience of complex scalp reconstruction using free tissue transfer-analysis of risk factors for complications. *Reconstr Microsurg* 2013;29:89–97
  29. Ozkan O, Coskunfirat OK, Ozgentas HE, et al. Rationale for reconstruction of large scalp defects using the anterolateral thigh flap: structural and aesthetic outcomes. *J Reconstr Microsurg* 2005;21:539–545
  30. Joo YH, Cho KJ, Park JO, et al. Usefulness of the anterolateral thigh flap with vascularized fascia lata for reconstruction of orbital floor and nasal surface after total maxillectomy. *Laryngoscope* 2013;123:2125–2130
  31. Hanasono MM, Sacks JM, Goel N, et al. The anterolateral thigh free flap for skullbase reconstruction. *Otolaryngol Head Neck Surg* 2009;140:855–860
  32. Kimura N, Satoh K. Consideration of a thin flap as an entity and clinical applications of the thin anterolateral thigh flap. *Plast Reconstr Surg* 1996;97:985–992

Sl No.	AGE	SEX	LOCATION	CAUSE	COMPLICATIONS/ OUTCOMES
1	45	M	Hand	Trauma	Seroma
2	52	M	Scalp	Post-tumor excision	
3	24	M	Leg	Trauma	
4	46	M	Scalp	Post burn	Mild skin dehiscence
5	43	F	Hand	Trauma	
6	53	M	Tongue	Post-tumor excision	hematoma
7	29	F	Buccal mucosa	Post-tumor excision	
8	38	M	Hand	Trauma	Venous insufficiency
9	42	M	Leg	Trauma	Wound dehiscence
10	63	M	Tongue	Post tumor excision	
11	48	F	Buccal mucosa	Post tumor excision	
12	51	M	Leg	Post tumor excision	infection

13	37	F	Leg	Trauma	
14	47	M	Hand	Trauma	Arterial insufficiency
15	51	F	Leg	Trauma	
16	64	M	Buccal Mucosa	Post tumor excision	
17	49	F	Breast	Post tumor resection	
18	52	M	Leg	Post tumor excision	Arterial insufficiency
19	63	M	Upper arm, chest	Post burn contracture axilla,chest	



Fig 1: Post traumatic leg defect reconstructed with free ALT Flap and follow up picture after 1 month.



Fig 2 : Post tumor excision – reconstruction of scalp defect with ALT free flap



Fig 3 : post burn contracture- excision and reconstruction by ALT Flap.



Fig 4 : post mastectomy- ALT Flap reconstruction

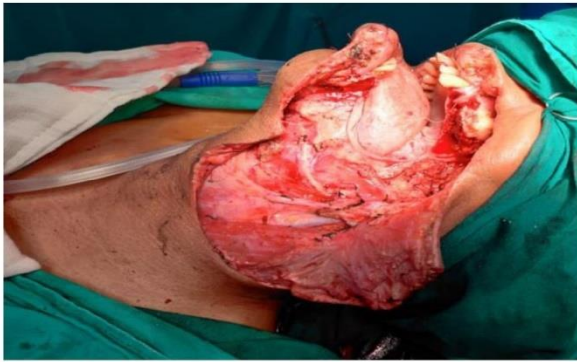


fig 5: post buccal mucosa carcinoma resection defect reconstructed by ALT Flap



Fig 6 : post traumatic upper limb defect- reconstruction with ALT free flap ; follow up after 2 months.