

Reconstruction of through-and- through cheek defect following carcinoma surgery-for mucosal lining and cover both by Free Anterolateral Thigh (ALT) Flap

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Abstract

Free flaps are common option for soft tissue reconstruction and improvements of the surgical technique have progressively concerned the function and appearance of the recipient and donor sites. The anterolateral (ALT) thigh free flap possesses many of the important properties that make this flap ideal for reconstruction of through-and-through cheek defect following carcinoma surgery for mucosal lining and cover both. Thus, the aim of the study was to evaluate indications, advantages, disadvantages, and complications of the usage of free ALT flap in through-and-through cheek defect reconstruction.

Material and Methods: Totally, 26 patients affected by oral squamous cell cancer cases were taken in study. The study populations consisted of North Indian were cases collected between December 2015 to September 2017 according to criteria described earlier through the outpatient and indoor patient surgery department clinics (LLR Hospital, Kanpur, India) and Cancer clinics (J.K.Cancer Institute Kanpur, India). Written informed consent had been signed by all patients prior to surgery.

During follow-up, patients were periodically assessed for the functional and aesthetic outcome of both recipient and donor site.

Results: Our study suggest that ALT free flap is workhorse for reconstruction of through-and-through cheek defect with 92.30% flap survival rate possesses good functional and aesthetic outcome of recipient site with minimal donor site morbidity.

Conclusion: Although various free flaps have been described but ALT free flap has become the flap of choice for reconstruction of through-and-through cheek defect following carcinoma surgery for mucosal lining and skin cover both.

Key words: Anterolateral thigh (ALT) free flap, through-and-through cheek defect, oral squamous cell cancer, Indian population

Introduction

Buccal squamous cell carcinoma (SCC) is a common malignant tumour among oral cancers; it poses significant threat to patients' life and severely affects their quality of life. ^[1] Complete and extensive resection is the traditional treatment strategy. Microvascular free flap have been in

clinical use for nearly three decades becoming gold standard in oral and oropharyngeal reconstruction. Although variety of flaps are available, the anterolateral thigh flap is a typical perforator flap based on the musculocutaneous and septocutaneous perforators of descending branch of the lateral circumflex femoral artery has gained increasing popularity since first being described by **Song et al.** in 1984.^[2] An increasing number of advantages have been identified for the use of ALT flaps in the reconstruction of head and neck soft tissue defects.^[3] The advantages of ALT flap are availability of different tissues with large amounts of skin, low donor site morbidity, adequate length of vascular pedicle, adaptability as a sensate or flow through flap, composite flap, thinning flap.^[4, 5] The aim of present study is to describe ALT free flap in reconstruction of through-and-through cheek defect following carcinoma surgery for mucosal lining and cover both.

Material and Methods: Totally, 26 patients (22 Males, 4 Females; age range: 31-65 mean: 42.65) affected by oral squamous cell cancer cases were taken in study. The study populations consisted of North Indian were cases collected between December 2015 to September 2017 according to criteria described earlier through the outpatient and indoor patient surgery department clinics (LLR Hospital, Kanpur, India) and Cancer clinics (J.K.Cancer Institute Kanpur, India). Written informed consent had been signed by all patients prior to surgery. In the pre-operative setting colour Doppler ultrasonography, to map points where perforators seemed to penetrate the fascia lata in the region between the proximal and medial third of the antero- lateral region of thigh. ALL reconstructions were performed in the primary stage after tumour resectioning, by two surgical team and all patients were followed-up. The flap parameters were measured and recorded before harvesting, including pedicle length

and harvested skin area. During ALT flap dissection, the lateral femoral cutaneous nerve, the motor branches to rectus femoralis muscle and vastus lateralis muscle were respected in all cases. The donor site was closed primarily in all cases except in two case repaired with full thickness skin graft by taking extra skin from corner of flap after trimming.

Flap Anatomy and Dissection: A line drawn from the ASIS (Anterior Superior Iliac Spine) to the lateral edge of patella and centred over the perforators locate the central axis of flap.



Figure 1: Preoperative photograph showing skin paddle design

Dissection proceeds from a medial to lateral direction in a sub fascial plane until reaching the perforators that may be septocutaneous or musculocutaneous. The septocutaneous perforator always lies superficially on the vastus lateralis muscle and crosses into the intermuscular septum of the rectus femoris and vastus lateralis muscle proximally. The musculocutaneous perforator always emerges from the vastus lateralis muscle either two or three at a time. Usually, the most proximal one is dissected on account of the relatively larger diameter of perforator. The vascular pedicle must then be carefully dissected from the motor branches of the femoral nerve innervated to vastus lateralis muscle that should be well preserved until it emerges from the lateral circumflex femoral vessels. The

lateral femoral cutaneous nerve is also preserved where possible.



Figure 2: After harvesting ALT flap preserving nerve to vastus lateralis muscle



Figure 3: ALT flap with vascular pedicle

During follow-up, patients were periodically assessed for the functional and aesthetic outcome of both recipient and donor site.

Results

The study includes 26 patients, 22 male, 4 female ranging ages from 30 to 65 year with mean of 42.65 who had through-and-through cheek defect following malignant tumour resections of buccal mucosa and had been reconstructed by free ALT flap. The flap characteristics data are shown in [Table 1].

The average size of mucosal defect, width was 4-5 cm while length was 4.5-6 cm. The average size of skin defect, width was 4.5-6.5 cm while length was 6-8 cm. The flap perforator was musculocutaneous in 84.62% cases and 15.38% have septocutaneous perforator and originated from the descending branch of lateral circumflex femoral artery in all cases. In the all cases pedicle was composed of one artery and two veins. The mean total harvest time of flap was 72.30 min with range 60-85 minute. The flaps ranged in size from 12-16 cm in length, and from 5-8 cm in width. The overall flap survival rate was 92.30% while there was complete necrosis of two ALT flaps (7.70%) and was managed by replacement of the flap by pedicled pectoralis major flap. The donor site was primarily closed in 24 cases (92.34%) while 2 cases (7.70%) needed full thickness skin grafting done by trimming of extra skin from corner of flap.

Table 1:

Flap characteristics of patients	Values
Number of flaps [n%]	26 (100)
Flap size (range, in cm)	
Length	12-16
Width	5-8
Mucosal defect (range, in cm)	
Length	4.5-6
Width	4-5
Skin defect (range, in cm)	
Length	6-8
Width	4.5-6.5
Type of perforators	
Musculocutaneous	22 (84.62%)
Septocutaneous	4 (15.38%)
Origin of perforator [n (%)]	
Descending branch	26 (100)
Transverse branch	0 (0)

LCFA	0 (0)
Flap survival [n (%)]	
Total survival	24 (92.30 %)
Partial necrosis	0 (0)
Complete necrosis	2 (7.70 %)
Donor site closure	
Primary closure	24 (92.30%)
Full thickness skin graft	2 (7.70%)

There was no postoperative dog ear formation, wound infection in the donor site. There was bulkiness of flap in 2 (7.70%) cases and local abscess and hemorrhage was not recorded in the recipient site. Duration of hospital stay was 12-14 days. Postoperative complication data are shown in [Table 2] and follow-up data are shown in [Table-3].

Table 2:

Post-operative complication	Data
Donor site [n (%)]	
Dog Ear	0 (0)
Wound infection	0 (0)
Recipient site [n (%)]	
Total flap necrosis	2 (7.70%)
Local abscess	0 (0)
Hemorrhage	0 (0)
Bulkiness of flap	2 (7.70)
Duration of hospital stay (days)	12-14 days

Table 3:

Donor site: functional outcome [n (%)]	Values
Gait alteration	0 (0)
Sensory disturbance	0 (0)
Cold intolerance	0 (0)
Donor site: aesthetic outcome [n(%)]	
Hypertrophic scarring	0 (0)
Hypo pigmentation/ Hyper pigmentation	0 (0)

Keloid formation	0 (0)
Contour defect	0 (0)
Widening of scar	9 (37.5)
Recipient site: functional outcome [n (%)]	Values
Speech problem	6 (25)
Oral incompetence	6 (25)
Swallowing problems	0 (0)

During follow-up in 25% cases speech problem and oral incompetence was recorded in the recipient site with widening of scar was present in 37.5% of cases in the donor site.



Figure 4: Follow-up of recipient site showing good color and texture match.



Figure 5: Follow-up of donor site showing with good aesthetic and functional outcome.

Discussion

Radical tumor ablation of carcinoma buccal mucosa produced large through-and-through cheek defect. As evident from this study, ALT free flap is becoming useful option for the reconstructions of these defects for mucosal

lining and cover both with good functional and aesthetic outcome of both the recipient and the donor site.

The flap harvest is convenient because it does not require patient repositioning and can be performed simultaneously using a two team approach. The donor site can be concealed easily, as it can be closed primarily and does not violate a functional motor unit and thus result in minimal morbidity. Song *et al.* in 1984, was the first to describe the ALT flap as a fasciocutaneous flap. The detailed anatomy of this flap was further presented from cadaver dissection or clinical experience, and it was found that the blood supply of the ALT flap was based on the septocutaneous or musculocutaneous perforators, or both.^[6]

Kimata et al.^[7] reported that the septocutaneous perforators were evident in 26.3% and musculocutaneous perforators in 73.7% of the 38 clinical cases. **Shieh et al.**^[8] found that the perforator was musculocutaneous one in 83.8% of cases and septocutaneous one 16.2% of cases of the 37 clinical cases. **Wolff and Grundmann**^[9] found that 90% of the flaps had musculocutaneous perforators, and 10% of the flaps had septocutaneous perforators. **Shimizu et al.**^[10] described 41 cadaver studies. Of them, the cutaneous blood supply musculocutaneous perforators were found in 51%, and septocutaneous perforators in 49%. In our study 84.62% of the flaps had musculocutaneous perforators, and 15.38% of the flaps had septocutaneous perforators.

Yildirim et al.^[11] found that the perforator origin was from the descending branch of lateral circumflex femoral artery in 92.9%, and from the transverse branch in 7.1% of 28 clinical cases. Another study on 16 cases reported that the perforator originated from the descending branch in 15 cases (93.75%), and from the transverse branch of lateral circumflex femoral in one case (6.25%). If this anatomic variation is known by the surgeon, we believe

that flap elevation should possess no difficulty. One should first find the perforator and then follow it in a retrograde manner.^[12] In our study, we found that the perforator origin was from the descending branch of lateral circumflex femoral artery in all our 26 cases.

According to **Lueg**^[13] the mean total harvest time of the flap was 50 min (range, 41-75 min). In our study, it was the period ranging from 60 to 85 min (mean 72.30 min).

The important advantage of the ALT flap is the relatively low donor site morbidity that accompanies even a substantial flap harvest. The donor site can be closed primarily if the width of the flap does not exceed about 8 cm, but wider flaps needing a split-thickness skin graft for closure of the donor site.^[14] In our study, the donor site of was primarily closed in 92.30% of the cases while 7.70% of the cases needed skin grafting, done by trimming of extra skin from corner of flap and applied as full thickness skin grafting. Postoperative complications data were divided into recipient-site complications and donor-site complications. The recipient-site complications include total flap necrosis in two cases, which was managed by replacement of the flap by pedicle pectorals major flap. No postoperative hemorrhage or local abscess was recorded. The duration of hospital stay ranged from 12 to 14 days. The donor-site complications include neither wound infection nor dog ear formation in any case.

Protection of nerve to vastus lateralis muscle is important to preserve maximal quadriceps function during harvesting of ALT flap to decrease the donor-site morbidity.

During follow-up in **25%** cases speech problem and oral incompetence was recorded in the recipient site with widening of scar was present in **37.5%** of cases in the donor site.

In addition, in our study, no significant functional deficits were noted either by the patient or examining physician

(no gait alteration, no sensory disturbance, and no cold intolerance) with regard to aesthetic deficits. There was widening of scar line at donor site was present in 37.5% of cases without recording any hypopigmentation or hyperpigmentation, keloid formation, or contour defect at the donor site of the flap.

Conclusion

Not only does the ALT free flap provide a plenty of soft tissue for reconstruction, but it also provides a plethora of options for reconstruction. It can be thinned if a thin flap is required, can be used as a sensate or flow through flap, and if bulk is needed it can be harvested with a piece of the vastus lateralis muscle render the ALT one of the most versatile flap for soft tissue defect reconstructions.

The ALT flap was a reliable method for through-and-through cheek defect reconstructions with a high success rate and good functional and aesthetic outcome of both recipient and donor site.

5. References

[1]. Fang QG, Shi S, Li ZN, et al. Squamous cell carcinoma of the buccal mucosa: analysis of clinical presentation, outcome and prognostic factors. *Mol Clin Oncol* 2013; 1:531–4.

[2]. Song Y G, Chen G Z, Song Y L. The free thigh flap: a new free flap concept based on the septocutaneous artery. *Br J Plast Surg*. 1984; 37:149–159.

[3]. Wei F C, Jain V, Celik N, Chen H C, Chuang D C, Lin C H. Have we found an ideal soft-tissue flap? An experience with 672 antero-lateral thigh flaps. *Plast Reconstr Surg*. 2002;109:2219–2226.

[4]. Nakayama B, Hyodo I, Hasegawa Y, et al. Role of the anterolateral thigh flap in head and neck reconstruction: advantages of moderate skin and subcutaneous thickness. *J Reconstr Microsurg*. 2002; 18:141–146.

[5]. Celik N, Wei F C, Lin C H, et al. Technique and strategy in anterolateral thigh perforator flap surgery,

based on an analysis of 15 complete and partial failures in 439 cases. *Plast Reconstr Surg*. 2002;109:2211–2216.

[6]. Xu D, Zhong S, Kong J. Applied anatomy of the anterolateral femoral flap. *J Plast Reconstr Surg* 1988; 82 :305.

[7]. Kimata Y, Uchiyama K, Ebihara S. Versatility of the free anterolateral thigh flap for reconstruction of head and neck defects. *Arch Otolaryngol Head Neck Surg* 1997; 123:1325.

[8]. Shieh SJ, Chiu HY, Yu JC. Utilizing free anterolateral thigh flap for reconstruction of head and neck defects following cancer ablation. In *Proceedings of the 14th Congress of the International Microsurgical Society*; 1998; Corfu, Greece.

[9]. Zhou G, Qiao Q, Chen GY. Clinical experience and surgical anatomy of 32 free anterolateral thigh flap transplantations. *Br J Plast Surg* 1991; 44:91-96.

[10]. Shimizu T, Fisher DR, Carmichael SW. An anatomic comparison of septocutaneous free flaps from the thigh region. *Ann Plast Surg* 1997; 38:604

[11]. Yildirim S, Avcı G, Aköz T. Soft-tissue reconstruction using a free anterolateral thigh flap: experience with 28 patients. *Ann Plast Surg* 2003; 51 :37-44.

[12]. TA Amer. The versatile free anterolateral thigh flap for soft tissue reconstruction: a plethora of options. *Kasr El Aini J Surg* 2008; 9

[13]. Lueg EA. Comparing microvascular outcomes at a large integrated health maintenance organization with flagship centers in the United States. *Arch Otolaryngol Head Neck Surg* 2004; 130 :779-785.

[14]. Kimata Y, Uchiyama K, Ebihara S, Sakuraba M, Iida H, Nakatsuka T, et al. Anterolateral thigh flap donor-site complications and morbidity. *Plast Reconstr Surg* 2000; 106 :584.