

ORIGINAL STUDY

**ANTERO-LATERAL THIGH FLAP IN RECONSTRUCTION OF
COMPLEX FACIAL DEFECTS RESULTED AFTER TUMOR
RESECTIONS**

Carmen Gheorghita¹, Dragos Zamfirescu², Ioan Lascar²

¹County Emergency Hospital Brăila, Romania

² Clinical Emergency Hospital Bucharest, Romania

carmendoccp@yahoo.com

ABSTRACT

Reconstruction of large and complex defects of the face due to tumor resection is challenging for plastic surgeons. Free flaps allow one-stage reconstruction for cancer defects, and this is the main reason that the most complicated technique has become very used in head and neck surgery. In the last few years, antero-lateral thigh flap has become an important flap for face reconstruction, despite the difficulty of its dissection. 4 patients with cancer of the face have been operated on with this technique. The patients ages range from 54 to 59 years and all were men. After tumor ablation and neck dissection made by a maxillo-facial surgeon, the antero-lateral thigh flap has been raised by plastic surgeons and transferred into the defects, where the microvascular anastomoses has been done. The donor site has closed primarily. All 4 free flaps had survived without major complications. No patient required surgical revision. The follow-up period was 3 years – 3 months. No recurrence was noted. There was no donor site morbidity. Antero-lateral thigh free flap has become very popular in reconstruction of very large and complex defects of the face after cancer ablation. Despite his difficulty in dissection and variability of the vascular anatomy, this flap has very good results in face reconstruction and the donor site morbidity is very low.

KEYWORDS: *free flap, antero-lateral thigh flap, face reconstruction.*

1. Introduction

Extensive defects at face level which result after tumor resections represent a difficult problem for the plastic surgeon, especially if he tries to cover the defect in a single operator time and if he wants the resection to be made in healthy tissue in order to avoid local recurrence [1,2]. Facial tumor ablation may have unsatisfied functional and esthetic consequences without reconstructive microsurgery

which can make a functional and esthetic reconstruction with superior results even in the moment of resection [3-5].

Antero-lateral thigh flap was firstly described in 1983 by Baekin, followed shortly afterwards by Song et al. in 1984. This flap has several advantages, but still it is not widely used due to the different anatomic ways, thus localization of the perforators being hardly estimated before operation. There are studies which prove the utility of color Doppler ultrasound which can accurately establish localization

of the perforators, thus influencing the planning of the antero-lateral thigh flap. Flap sizes vary from 11/5 to 26/8 cm. If a bigger flap is taken, the donor site must be grafted. The flap can be taken as sensitive flap on the lateral femoral cutaneous nerve. Vascularisation of the flap is ensured by the descendent branch of the lateral circumflex femoral artery, with a diameter between 1,5 and 2,5 mm and a length of approximately 7 cm. The venous drainage is ensured by the two comittant veins which have a diameter slightly larger than the artery's [6-10].

2. Material and Methods

In the last three years, at the Plastic Surgery and Reconstructive Microsurgery Clinic, Emergency Clinical Hospital Bucharest, there have been operated on 4 patients with face post-excisional defects to whom there has been applied defect reconstruction with antero-lateral thigh flap with muscular component (segment of vast lateral muscle). The ages of the patients vary between 54 and 59 and all are men. The histopathological examination of these patients showed the presence of the spino-cellular carcinoma. Surgical interventions were performed by a team composed of an maxillofacial surgeon who made tumor resections and cervical neck dissection, and plastic surgeons who made flap dissection and its transfer to the defect level.

Time of the surgical intervention lasted between 8 and 12 hours. Localization of the donor site of the flap at a distance from the cephalic extremity permitted two teams working simultaneously, fact that shortened a lot the intervention time.

Pattern of the antero-lateral thigh flap and surgical technique.

To some patients, the tegument and the subcutaneous cellular tissue of the antero-lateral thigh area is thin and pliable, this area having the

possibility to be a donor area for a large, pliable, thin and sensitive fascio-cutaneous flap (if the defect needs such reconstructions). The cutaneous island can reach 25/8 cm and it can be closed by direct suture. The flap has a large vascular pedicle but there is a quite big anatomic variability. Most of the flaps need dissection of the musculocutaneous perforators, these being variably supplied by septocutaneous perforators. It is a flap difficult to dissect, thus it is not advisable for the surgeons with less experience to lift such flaps [11].

Vascular anatomy.

The pattern of the antero-lateral thigh flap is placed on the septum between the vast lateral muscle and the right femoral muscle.

Arterial vascularization is given by the descendent branch of the lateral circumflex femoral artery which has its origin in the deep femoral artery, has a tract at intramuscular septum level, between right femoral muscle and vast lateral muscle and ends in the lateral vast muscle close to the knee-joint. Cutaneous branches vascularize the skin situated superficially from the vast lateral muscle [12].

The lateral circumflex femoral artery (LCFA) gives an ascendent and a descendent branch, the latter ensuring the perforators for the antero-lateral thigh flap. This descendent branch had deep tract in the space between the right femoral muscle and the lateral vast muscle, often deep in the septum space and occasionally found inside the right femoral muscle. This septal plan can be used to identify the arteries and the vascularization of the flap if the septum is joined by at least a septocutaneous perforator artery and a comittant vein [13].

As no septocutaneous perforator is present, the superior part of the septal plan which intersects the tensor fasciae latae muscle can be used to identify the lateral circumflex femoral arteries and the descendent branch. In 80% of the cases, the descendent branch delivers musculocutaneous perforators in the flap. If

the artery is situated in the inferior part of the right femoral muscle, the dissection is difficult.

The pedicle can be of 7-8 cm long and the vascular diameter varies between 1,5-2 mm. Usually, the artery has 2 comittant veins with a diameter larger than the artery. The flap can be enervated by main branches of the lateral femoral cutaneous nerve (L2-3). This branch enters the flap in the upper part and it can be dissected proximally to gain length. It has tract along the flap axis, from the antero-superior iliac spine (SIAS) to the lateral edge of the knee [14].

Flap dissection.

It is down the axis of the septum between the right femoral muscle and the lateral vast muscle with a line that connects SIAS and the external edge of the knee. This line is divided in 3 in order to lift the flap. The proximal junction of 1/3 with the medium one of 1/3 is usually the place for perforator which passes through the tensor fasciae latae muscle (TFL). This point is marked in order to be included in the flap. The perforator of the TFL can be a saving pedicle if the distal perforators are poor qualitative or are sectioned during dissection. The medium junction of 1/3 with the distal one of 1/3 is marked and included in the flap (1/3 medium of the septum). Usually, this area includes all perforators and must be included in the flap. The flap can be shortened after lifting, under direct vision of the perforators. The anterior flap is dissected firstly, notifying any existent perforators at the level of the right femoral muscle. The arteries that approach the septum or are nearby it are kept until after lifting the posterior flap, when the vascular pedicle of the flap is clearly established [15].

The posterior flap can be raised towards the septum, usually with no interferences from the main perforator arteries at the lateral vast muscle level. The septum is identified and any septal perforator is noted. If there can be seen 1-2 perforators of good quality in the septum, there shall be continued the lifting of the anterior flap until the septum is isolated

on both sides. If vascularization is entirely septal, the descendent branch of the ACFL is discovered at the basis of the septum, between the right femoral muscle and the lateral vast muscle and it is proximally dissected. ACFL and the veins can be isolated as proximal pedicle.

If no septal artery is identified, the perforators through the right femoral muscle must be dissected through the muscle till the descendent branch level of the ACFL. The arteries are afterwards isolated until the origin of the ACFL and the comittant veins and thus the flap is ready to be transferred [16].

The ascending branch is ligated and the flap is isolated on the lateral circumflex femoral arteries. It is advisable to be included a small fragment of fascia around the perforators in order to avoid their lesion.

The closing of the donor area can be made by direct suture with. If the defect is large, a skin graft is applied at the donor site [17].

3. Cases presentation

Case 1

Patient, male, age 55, smoker, hospitalized with the diagnosis: tumor at the left upper jaw, beginning for approximately 8 months, invading the left upper dental arcade, invading the inferior wall of the orbit, the posterior nasal septum and the palatine arch.

Intraoperatorily, there has been performed a left lateral cervical neck dissection, left upper jaw tumor resection, posterior 1/3 excision of the nasal septum and of the inferior wall of the orbit. The antero-lateral thigh flap with muscular segment from the vast lateral was used for closing the defect and reconstruction of the jugal and palatine lining. The fascia was anchored at the residual periosteum of the orbit. The descending branch of the lateral circumflex femoral artery was anastomosed at the facial artery and the venous anastomosis was performed with the external jugular vein (termino-lateral) (figures 1-8).

Figure 1. Preoperative aspect



Figure 2. Imagistic aspect

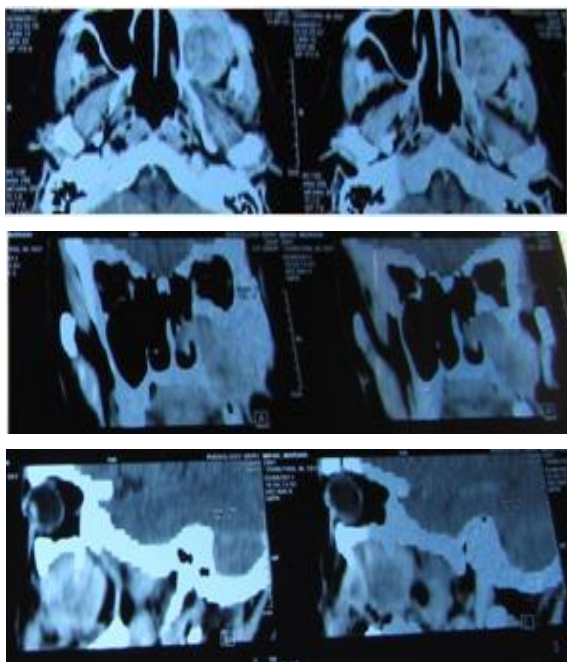


Figure 3. Intraoperative aspect



Figure 4. Flap dissection



Figure 5. Flap aspect

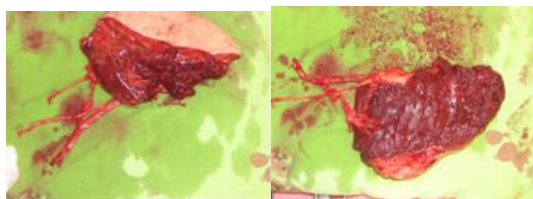


Figure 6. Final intraoperative aspect



Figure 7. Postoperative aspect



Figure 8. Postoperative aspect



Case 2

Patient, male, aged 59, smoker, hospitalized with diagnosis of: tumor at left jugal mucosa with jaw invasion, beginning for approximately 3 months, with invasion at the level of parotid and lateral pterigoidian muscles.

Intraoperatorily, there has been performed: right latero-cervical ganglion removal, mandible access osteotomy, superficial lobe parotidectomy, right hemi-maxillectomy.

The defect reconstruction has been made with LAT+vast lateral muscular segment, with anastomosis at the facial artery and external jugular vein, innervated flap by connection to the inferior and middle branch of the facial nerve. Tegument island has been used for reconstruction of the jugal mucosa and the flap fascia was anchored to the infra-orbital periosteum, the inferior branch of the mandible and pre-auricular. The mandible was reconstructed by osteosynthesis with plate and screws.

Case 3

Patient, male, aged 61, non-smoker, hospitalized with diagnosis of lingual tumor with recent history, with invasion on sublingual salivary gland, invasion at mandible level, oral floor, and bilateral cervical adenopathy.

Intraoperatorily, there has been performed: bilateral cervical ganglion removal, total resection of the tongue, oral floor, supra-hyoidian musculature, mandible access osteotomy.

The defect reconstruction has been made with LAT+vast lateral muscular segment, with micro-vascular anastomosis at the facial artery and external jugular vein level, respectively the thyroid-lingual-facial venous trunk, flap innervations being made by motor branch neuroraphy with left hypogloss nerve and sensitive branch with the left lingual nerve. The mandible was reconstructed by osteosynthesis with plate and screws (figures 9-16).

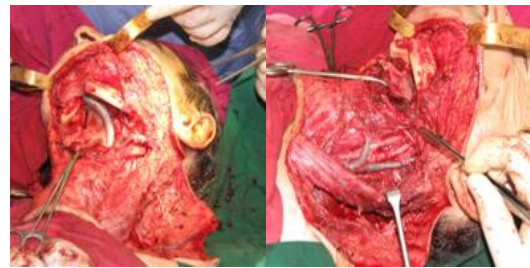
Figure 9. Preoperative aspect**Figure 10. Intraoperative view****Figure 11. Tumor aspect****Figure 12. The raised flap****Figure 13. Intraoperative view**

Figure 14. Intraoperative view**Figure 15. Final intraoperative aspect****Figure 16. Final postoperative aspect****Case 4**

Patient, male, aged 58, hospitalized with diagnosis of ulcerated pelvilingual tumor, infiltrative, with recent history, with invasion at the level of mandible..

Intraoperatorily, there has been performed: radical cervical ganglion removal, sub-total resection of the tongue, oral floor, segmental mandible arch resection, mandible osteosynthesis with plate and screws.

The defect was covered with LAT+vast lateral segment anastomosed with facial artery and vein, respectively the thyroid-lingual-facial venous trunk,

flap innervations being made by motor branch neuroraphy with hipoglos nerve and sensitive branch with lingual nerve.

4. Results

All 4 flaps survived with no major additional complications. One patient presented an area of dehiscence at the trance level of intraoral suture which did not need supplementary surgical interventions, the area healing spontaneously. One patient developed a hematoma at the receptor area after 7 post-operative days which was evacuated by puncture. The patients with pelvi-lingual tumors needed pre-operative tracheostomies and were post-operative fed by nasogastric probe, respectively by gastrostomy tube. One patient followed a pre-operative radiotherapy and the latero-cervical dissection was very difficult, but he did not present post-operative complications.

Microvascular artery anastomoses were performed in all cases by termino-terminal vascular suture between the lateral circumflex femoral artery and the facial artery. In the case of the venous anastomoses, the chosen vascular pedicles were: external jugular vein (3 cases - termino-lateral anastomosis), facial vein – 2 cases, lingual vein – 1 case, thyroid-lingual-facial venous trunk – 2 cases (2 veins were anastomosed for each artery).

The aesthetic post-operative aspect was good, no patient asked for flap revision aesthetically. There were presented no complications at the donor area level. One patient presented tumor relapse after 2 years from the free transfer, at the cheek area, he has been operated again, with tumor removal and local flaps for cover.

5. Discussions

Extensive facial defects represent a difficult problem for a plastic surgeon due to affection of

complex and different structures: nasal pyramid, orbit, oral cavity, tongue, jaw, mandible, oral/nasal lining. Reconstruction of these defects imply restoration of the medio-facial volume, reconstruction of the oral or/and nasal mucosa, reconstruction of the tongue, bone reconstruction (jaw, mandible), dentition rehabilitation [2,16].

There have been used different flaps in reconstruction of these defects: fibular flap for mandible reconstruction, right abdominal muscle flap, musculocutaneous latissimus dorsi flap, antebrachial radial flap, etc. Osteo-cutaneous flaps are extremely important in bone reconstruction, but the skin island is usually small and it is not enough for reconstruction of large face defects. The right muscular abdominal flap is usually used for filling some deep defects at the face level [17].

The antero-lateral thigh flap represents a very good choice for reconstruction of the complex defects at the face level. The flap can replace large volumes of tissues and the skin island is large and can be used both for tegument reconstruction and for oral mucosa reconstruction.

Morbidity of the donor area is minimum, thus, the direct suture being possible in all cases if the tegument island does not exceed 8 cm in width.

The vascular pedicle is usually long and does not present any atheromas, the length of the pedicle can reach considerable dimensions (7-12 cm) by proximal dissection, thus being an adequate pedicle for anastomoses in cervical region. The vascular diameter of 2-2,5 mm is joined by 2 comittant veins with the diameter of 1,8-3 mm.

The drawing of the flap can consist of two tegument islands: one for reconstruction of the mucosa and one for covering the skin, and a segment of vast lateral muscle which ensures closing of the dead spaces, determining an acceptable volume at the zygomatic region, ensures the acceptable support of the orbital content by fascia fixation on the orbital

periosteum. This flap can be reinnervated, which is very important in intra-oral reconstruction, by including the lateral cutaneous femoral nerve in the flap.

Post-operative radiotherapy does not represent a contraindication and does not determine a negative effect on the flap both for a long time and for a short time follow-up.

6. Conclusions

The anterolateral thigh flap ensures an acceptable post-operative result, both from the functional and aesthetic point of view, in case of its use in covering the complex post-ablational defects at the face level. Lately, using the radial antebrachial flap in defect reconstruction at face level (especially in intra-oral reconstruction) diminished as frequency in favour of using the anterolateral thigh flap. The advantages of the flap are:

At dimensions that do not exceed 8 cm in width, the donor area can close primarily, damage being minimum at the level of the donor area;

The anterolateral thigh flap is a thin, pliable flap that determines a good cervical contour if it is used in reconstruction of the cervical region.

The flap can be thinned having indication in intra-oral reconstruction in this case;

It can be associated with other neighbouring flaps: the lateral vast or the distant one – the fibular osteocutaneous flap for satisfying the reconstructive necessities of the area;

The color and the texture are acceptable;

Two operatory teams can work simultaneously, the flap collection can be done in the same time with the ablative surgery, thus, intervention time can be shortened;

It is a flap of large dimensions, the tegument island can reach dimensions of 18/25 cm, ½ of the lateral thigh can be included in this flap.

Volume, shape and size of the flap can be adjusted depending on the defect;

If it is lifted as fasciocutaneous flap, it does not include muscles, that is why the morbidity of the donor area is minimum.

It has the same range of success as the classical free flaps even if it is a flap based on the perforator arteries and the dissection is more difficult.

References

- 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.
- Tsukino A, Kurachi K, Inamiya T, Tanigaki T.**, Preoperative color Doppler assesment in planning of anterolateral thigh flap. *Plast Reconstr Surg* 2004,113 (1): 241-6.
- Yang JY, Tsai FC, Chana JS, Chuang SS, Chang SJ, Huang WC.**, Use of free thin anterolateral thigh flap combined with cervicoplasty for reconstruction of postburn anterior cervical contractures. *Plast Reconstr Surg* 2002, 110 (1):39-46.
- Begue T, Masquelet AC, Nordin JJ.**, Anatomical Basis of the anterolateral thigh flap. *Surg Radiol Anat* 12:311,1990
- Fu-Chan Wei, Jain Vivek, Celik Naci, Chen Hung-Chi, Chuang David, Chwei Chin, Lin Chih-Hung**, Have we found an ideal soft-tissue flap? An experience with 672 Anterolateral thigh free flap. *Plast Reconstr Surg* 2002,109(7): 2219-26.
- Kimata J, Uchiyama K, Ebihara S, Yoshimusi T, Asai M, Saikawa M, Hayashi R, Jitsuiki J, Majima K, Ohiyama W, Haneda T, Nakatsuka T, Harii K.**, Versatility of the free anterolateral thigh flap for reconstruction of head and neck defects *Plast reconstr Surg* 1997,123(12).
- Celik Naci, Wei Fu-Chan, Liu Chih-Hung, Chen Ming Huei, Chen Hung-Chi, Jeng Seng-Feng, Kuo Jur-Ren**, Technique and strategy in Anterolateral perforator flap surgery, based on an analysis of 15 complete and partial failures in 439 cases: *Plast Reconstr Surg* 2002,109(7), 2211-16.
- Miller MJ, Reece GP, Marchi M, Baldwin BJ.**, Lateral thigh free flap in head and neck reconstruction. *Plast Reconstr Surg* 1995, 96:334-340.
- Truelson JM, Leach JL.**, Lateral thigh flap in reconstruction of the head and neck. *Otolaryngol Head and Neck Surg.* 1998: 118, 203-210.
- Demirkan F, Chen HC, Wei FC, Chen HH, Yung SG, Han SP, Liar CT.**, The versatile anterolateral thigh flap: a musculocutaneous flap is disguise in head and neck reconstruction. *Br J Plast Surg* 2000, 53:30.
- Kimata J, Uchiyama K, Ebihara S, Nakatsuka T, Harii K.**, Anatomic variation and technical problems of the anterolateral thigh flap : a report of 74 cases. *Plast reconstr Surg* 1998,102:1517.
- Kimata J, Uchiyama K, Ebihara S, Sakuraba M, Iida H, Nakatsuka T, harii K.**, Anterolateral thigh flap donor site complications and morbidity. *Plast Reconstr Surg* 106:584, 2000
- Koshima I, Fukuda H, Utunomiya R, Soeda S.**, The anterolateral thigh flap variations in its vascular pedicle. *Br J Plast Surg* 1989,42: 260.
- Koshima I, Yamamoto H, Hosoda M, Moriguchi T, Nagayama H, Orita J.**, Free combined composite flaps using the lateral circumflex femoral system for repair of massive defects of the head and neck regions: an introduction to the chimeric flap principle. *Plast Reconstr Surg* 1993,92:411.
- Koshima I.**, Free anterolateral thigh flap for reconstruction of the head and neck defects following cancer ablation, *Plast reconstr Surg* 2000,105, 2358.
- Luo S, Raffaul W, Luo J, Luo L, Gao J, Chen L, Egloff DV.**, Anterolateral thigh flap A review of 168 cases. *Microsurgery* 1999,19:232.
- Yamada N, Kakibuchi M, Kitayoshi H, Matsuda K, Yano K, Hasokawa K.**, A new way of elevating the anterolateral thigh flap. *Plast Reconstr Surg* 2001,108: 1677.