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Use of Customized Thickness Anterolateral Thigh Flap in Head and Neck Reconstruction

Baş Boyun Rekonstrüksiyonunda Defekte Uygun Kalınlıkta Anterolateral Uyluk Flebi Kullanımı

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Öz

Giriş ve Amaç: Bu çalışmada doku defektin kalınlığına göre farklı cerrahi planlarda eleve edilen anterolateral uyluk flebi (ALT) ile rekonstrüksiyon deneyimlerimizin paylaşılması amaçlanmıştır.
Gereç ve Yöntemler: Mart 2017'den Aralık 2020'ye kadar subfasyal, süper ince, suprafasyal, kimerik ve kompozit flepler dahil olmak üzere farklı ALT flebi cerrahi planları ile baş ve boyun defektlerinin rekonstrüksiyonu yapılan 25 hastada 26 flep içeren retrospektif bir çalışma yapıldı. Flep elevasyon planları, operasyon sırasında cetvel kullanılarak belirlenen defektin kalınlığına göre seçildi. Flep kalınlıkları, komplikasyonlar ve revizyon oranları değerlendirildi.
Bulgular: Süper ince fleplerden biri total nekroz oldu; başka flep kaybı olmadı. Postoperatif dönemde üç hasta öldü. Uygun flep elevasyon planı seçilmesine rağmen, 26 flepten 4'ünde revizyon cerrahisi yapıldı. Süper ince ALT flebi ile dudak rekonstrüksiyonu yapılan hastalardan birind postoperatif 6. ayda bulky bir görünüm mevcuttu ve subfasyal ALT flebi uygulanan 3 hastaya inceltme ameliyatı yapıldı.
Sonuç: ALT flep, baş boyun bölgesindeki defektin kalınlığına göre farklı planlarda eleve edilebilen güvenilir bir fleptir. Uygun kalınlıktaki ALT flep, revizyon ameliyatları olmadan tek aşamada rekonstrüksiyon sağlar ve optimal estetik sonuçlar alınabilir.

Anahtar kelimeler: Anterolateral uyluk flebi, Baş boyun rekonstrüksiyonu, Serbest flep.

Abstract

Objective: This study demonstrates different techniques of anterolateral thigh flap (ALT) with the appropriate surgical planes according to the thickness of the defect, which have not been previously found in the literature, with our reconstruction experiences.
Materials and Methods: A retrospective study was performed including 26 flaps in 25 patients who underwent reconstruction of head and neck defects with different surgical planes of ALT flap including subfascial, superthin, suprafascial, chimeric and composite flaps from March 2017 through December 2020. Flap planes were chosen according to the thickness of the defect, determined during surgery by using caliper. We evaluated the characteristics, flap thicknesses, complications and need of revision surgery in postoperative period.

Results: One of the superthin flaps was totally lost; there was not any other flap loss. Three patients died in postoperative period. Although appropriate plane of the flaps was chosen, 4 of all 26 flaps needed revision surgery. One of the patients who was performed lip reconstruction with superthin ALT flap had bulky appearance needed liposuction in postoperative 6 months and 3 patients who received subfascial ALT flaps were performed debulking surgeries.
Conclusion: ALT flap is a versatile, reliable flap which can be harvested in different planes according to the thickness of the defect in head and neck region. The ALT flap with convenient thickness provides definitive reconstruction in a single stage without revision surgeries and the most optimal aesthetic results can be obtained.

Keywords: Anterolateral thigh flap, Free flaps, Head and neck reconstruction.

1. Introduction

The anterolateral thigh flap (ALT) was first described by Song et al in 1984, and has gained popularity among surgeons[1]. The adaptability for many clinical conditions, including versatility in design, low donor site morbidity, not sacrificing any major vascular structure, ability to 2-team approach without re-positioning and consistent vascular anatomy makes this flap favored[2-9].

Head and neck region reconstruction is difficult due to limitation in local flaps, especially after damaged tissue due to radiotherapy for cancer treatment[10]. But also this region provides multiple recipient vessels, which is an advantage for free tissue transfers[2]. The volume of the ALT flap can be customized by choosing different surgical planes, and the pedicle can be positioned in the appropriate length and location, which makes it a suitable choice in head and neck defects[9,11]. Also, head and neck defect reconstruction demand a precise analyze since the defect is in a more visible area and any ill-formed tissue or bulky appearance may result in the necessity of repetitive surgeries such as liposuction or z-plasty. The majority of surgeons prefer the most common subfascial plane; however, the aforementioned reasons lead surgeons to study the variations of this flap. Fascia only flap, suprafascial plane or thinned flaps are some of the different techniques which have been performed to advance the outcomes [12-18].

In this study, we aimed to discuss different techniques of ALT flaps in head and neck defects and our planning technique for choosing the appropriate plan according to the thickness of the defects.

Methods

A retrospective study of 26 ALT flaps in 25 patients who underwent reconstruction of head and neck defects with ALT flaps was performed from March 2017 through December 2020. Due to the retrospective nature of this study, it was granted an exemption in writing by the University of Manisa Celal Bayar University Institutional Review Board. This research was conducted per the Declaration of Helsinki guidelines. All the patients have provided written informed consent for the surgery and photographs. The etiologies of defects were cancer ablation (20 patients), post-burn or post-radiotherapy scar contracture (3 patients) and trauma (3 patients), respectively. Defect sizes were ranged from 5x4cm to 20x14cm. Nine flaps were superthin, 9 were suprafascial, 6 were subfascial, one flap was chimeric, and one flap was consistent of different fascial planes while the remainder of patients received subfascial flaps. The thicknesses of the defects were measured with a caliper and noted. After the first incision on thigh, subfascial, suprafascial and superthin plane thicknesses were measured with a caliper through the same access (Figure 1). The closer flap plane was chosen depending on the thickness of the defect.

Figure 1. Measurement of flap by using caliper (peroperative image)

2.Materials and Methods

2.1.Surgical technique

Preoperative markings of ALT perforators were made based on the anatomical landmarks described by Wei et al2. Suprafascial flaps were harvested by elevating just above the deep fascia[2,19]. To maintain a super thin flap, a sharp incision to the level of superficial scarpal fascia, which is found between subdermal smaller fat tissue and deeper septate fatty lobules, was made and dissection continued with cautery up to 2 cm to the perforator. After this point, pedicle was followed using forceps and scissors with meticulous dissection under 2,5x magnification loop. In all patients, type 1 and type 2 perforators were found according to the perforator types described by Kimura et al[18]. If a type 3 perforator is encountered, it is skipped through the other perforators until type 1 or 2 pedicle is reached. Deep fascia was incised at the point of entering the muscle, and pedicle was dissected until the desired length is achieved.

If a superthin ALT was being harvested for lip reconstruction, a split from deep fascia was dissected as needed to make a static sling for lip. Chimeric flap

was designed according to the needs of a defect involving maxillary sinus; including a mass from vastus lateralis muscle based on an independent pedicle from the lateral circumflex femoral system. One patient, who had a full thickness malar defect due to malignancy, was operated with a composite flap consisted of different fascial layers. The flap was customized to obtain an easily formed flap with a similar thickness of the non-operated side. 5 cm of this flap was harvested in subfascial plane and 14 cm of the flap was elevated in suprafascial plane. The flap was shaped by folding it on itself. To facilitate the rotation of the flap and reduce the tension during folding, a 1 cm segment was de-epithelized in horizontal plane. Suprafascial plane was used to reconstruct the oral mucosa and subfascial plane for the outer part of cheek. Thus, both the oral mucosa and the skin were reconstructed in one session without the need for grafts. One artery and one vein were used as recipient vessels. First arterial anastomosis was performed. Then, the optimal caliber vein with a better blood flow in flap was explored. Temporal superficial artery and vein were used for scalp reconstruction and facial artery and vein were used for face and neck reconstruction. Intraoperative insufficient venous circulation occurred in 3 patients and external jugular vein was used as the second vein.

3. Results and Discussion

3.1.Results

The patient group was composed of 21 male and 4 female patients. The mean age of the patients was 57.08 (range, 17 to 80 years). Twenty-six flaps were included in the study; 9 flaps were superthin (34.6.%) (Figure-2, 3), 9 were suprafascial (34.6.%) (Figure-4, 5), 1 were chimeric (3.8%) and 1 was composite (3.8%), consistent of different fascial planes while the remainder of patients received subfascial flaps (n=6, 23.07%).

Figure 2. Preoperative image of a case with a malignant tumor in left preauricular region

Figure 3. Postoperative image of the patient in

The thickness of superthin flaps ranged between 3 mm to 9 mm (mean 6.55mm) whereas the thickness of suprafascial flaps was between 10mm to 22mm (mean 15.8mm) and subfascial flaps was between 15mm to 25mm (mean 22mm). There were two venous problems due to hematoma in concomitant neck dissection surgery, and one patient demonstrated arterial insufficiency in early postoperative period. Explorations were performed in all patients, while the flaps with hematoma totally recovered after drainage and hemostasis, the one with arterial insufficiency, which was a superthin flap, was totally lost due to the insufficient recipient artery. 3 patients with large width of flaps (12x10cm, 21x14cm, 20x13cm) required a skin graft for donor site reconstruction, others were closed primarily. The follow-up time varied from 6 to 45 months (mean 20.5 months, the flap which was totally lost was excluded). 3 patients died in postoperative period. One patient, who received a composite flap died because of cardiac problems in postoperative 27th day. Two of the patients were lost due to recurrence and metastasis of tumor on postoperative 10th and 11th months (Table 1).

Fascia graft was used as a static sling in 5 patients who underwent lip reconstruction with superthin ALT flap. Although appropriate plane of the flaps was chosen, one patient who underwent lip reconstruction with a superthin ALT flap had bulky appearance postoperatively and needed liposuction in postoperative 6 months. 3 of the patients who were reconstructed with a subfascial ALT flap had a bulky appearance and debulking operations were performed postoperatively.

Figure 4. Preoperative image of a case with a post burn contracture of neck

Figure 5. Postoperative image of the patient in Figure 4, after reconstruction with suprafascial ALT flap

One patient had a minimally bulky appearance however revision was not requested by the patient and did not cause loss of function and re-operation was not deemed necessary. Comissuroplasty was performed on the 6th postoperative month in a patient who underwent lip reconstruction with a suprafascial ALT flap. In the late period, all other patients who were reconstructed with superthin or suprafascial flaps, the thicknesses were compatible with surrounding tissue.

3.2.Discussion

The ALT flap thickness can be adjusted for defect; suprafascial ALT, superthin ALT, using only adipofascial tissue of flap and defatting are commonly studied modifications in literature[2,5,7,14,15,20,21]. There are several studies defining techniques for performing trimming and thinning the ALT flap when there is an excessive deep layer fat inconvenient with the surrounding skin of the defect [14,21].

A thin ALT flap can be obtained by meticulous dissection by peeling off the fat lobules after harvesting the flap above or beneath the fascial plane[6,18]. However, simultaneously thinning the flap requires experience, has a risk of injuring the perforator during trimming and also may be time consuming[14-16,22]. As a result of prolonged time of surgery and time spent under microscope, the surgeon may become exhausted during the most crucial part of surgery. Moreover, thinning may impair blood circulation and increase the rate of complications[15,18,23,24]. The failure rate after thinning the flap varies from %6.9 to %75, which indicates thinning is not a very optimal modification on flap[6,14,15]. The literature from Eastern population tend to have less complication after thinning procedure than Western population, owing to Western population is likely to have more subcutaneous fat in thigh region, requiring more aggressive fat dissection[6,15,23]. If the ALT flap is elevated according to the appropriate thickness of the fascia plane, extensive fat dissection and relevant impaired blood circulation can be avoided. In the present study, by choosing the ALT flap plane compatible with the defect thickness, complication rate of %3.8 was acceptable compared to those studies with thinned flaps.

Buccal mucosa repair is crucial for successful repair of perioral and malar region. In one patient with a full-thickness defect involving the oral mucosa, an ALT flap consisting of two different fascia layers were harvested as a single chunk. The part of the flap to be folded in for the buccal mucosa was designed in the suprafascial plane, and the bulkier part to form the cheek was designed in the subfascial plane. We suggest that this technique provides an advantage by eliminating the need for grafts and avoiding the risks of lysis or graft failure. Besides, customizing the thickness according to the region of the defect prevented a dysfunctional bulky mass in oral cavity. Customizing the flap thickness according to the need of the region to be reconstructed is essential since bulky flaps may cause aesthetically unwanted appearance, especially in a visible area like head and neck and may limit the function of mobile areas such as oral cavity and neck[14,22] Besides, it is crucial that the flap thickness is compatible with the surrounding tissue so as not to be clogged, which may lead impaired circulation. Especially in overweight or obese populations and females, increased thickness of subcutaneous layer of thigh limits the use of a fibro-fatty and bulky ALT flap and makes repetitive surgeries mandatory[14,16,25]. Measuring the cavity of the defect with a caliber and then choosing a fascial plane through the same incision according to the desired thickness while starting the ALT flap

Table 1. Data of the patients

G	Age	Etiology	Localization	Flap size (cm)	Type of flap	FT (mm)	Complication	Revision surgery	FU (month)
M	57	Ca	LL	6x5	SPT	3	N	None	6
M	68	Ca	LL	6x6	SPT	8	MB	Liposuction	18
F	40	Contracture	Neck	12x8	SPT	8	N	None	12
M	44	Ca	LL	5x4	SPT	7	H	None	6
M	62	Ca	LL	6x3	SPT	5	N	None	6
M	56	Ca	Tongue	8x6	SPT	9	N	None	14
M	76	Ca	Left cheek	10x9	SPT	9	N	None	12
M	62	Ca	LL	7x4	SPT	6	N	None	11 (ex)
M	31	Trauma	Mentum and LL	11x9	SPT	4	Necrosis	-	-
M	31	Trauma	Mentum and LL	11x9	SPF	14	N	Comissuroplasty	10
F	52	Ca	LL	6x5	SPF	10	N	None	9
M	66	Ca	Neck	12x10	SPF	15	N	None	20
M	17	Contracture	Neck	20x13	SPF	20	N	None	23
M	80	Ca	Parotid Gland	8x5	SPF	22	H	None	19
M	68	Ca	Scalp	12x8	SPF	15	N	None	17
M	54	Ca	Left Cheek	5x5	SPF	18	N	None	14
M	67	Ca	Left postauricular	12x10	SPF	15	N	None	34
M	66	Ca	LL	11x7	SPF	14	N	None	1 (ex)
M	52	Ca	Mentum and FM	21x14	SF	24	N	None	12(ex)
M	43	Contracture	Neck	18x9	SF	20	MB	None	40
F	50	Ca	Scalp	16x10	SF	20	B	Debulking	30
M	40	Ca	Scalp	9x6	SF	28	B	Debulking	38
M	41	Ca	Right Cheek	8x6	SF	25	B	Debulking	45
M	76	Ca	Left Temporal	12x8	SF	15	N	None	6

F	80	Ca	Right Cheek	19x10	CO	-	N	None	18
M	79	Ca	Left Cheek +Nasal Dorsum	10x6	CH	-	N	None	11

G, Gender; M, Male; F, Female FT, Flap Thickness; FU, Follow-up; Ca, Carcinoma; LL, Lower Lip; FM, Floor of the Mouth; SPT, Superthin; SPF, Suprafascial; SF, Subfascial; CO, Composite; CH, Chimeric; B, Bulky; MB, Minimal Bulky, H, Haematoma; Ex, Exitus; N, None

harvesting will reduce the need for revision surgery. Marucci et al reported that in 60 patients who underwent extremity reconstruction with subfascial and suprafascial ALT flaps, 21 patients (%35) needed debulking surgeries[13]. Even secondary surgeries may not result in %100 satisfactory outcomes. Huang et al performed recontouring via liposuction and reported over %85 improved results[26]. In our study, we considered the patient's dissatisfaction with the bulky appearance of flap or functional loss as an indication for revision surgery and %84 of patients (n=21) did not need debulking procedures. One patient who was performed lip reconstruction with superthin ALT flap needed liposuction in postoperative 6 months and 3 out of 6 patients with subfascial flaps needed debulking procedures.

4. Cocnlusion

We suggest that ALT flap is a safe, reliable flap in soft tissue reconstruction in head and neck region and it can be harvested in the appropriate plan according to the thickness of the defect. One can measure the flap thicknesses in the beginning of the flap elevation and choose the flap to serve the best fit the defect. Appropriate thickness of flap provides appealing results without bulkiness and also contributes to the recovery of the function of the head and neck region. Moreover, using the ALT flap with convenient thickness provides definitive reconstruction with appealing aesthetic results in a single stage without revision surgeries; consequently, repetitive hospitalizations and costs decrease as well.

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No potential conflicts of interest relevant to this article were reported.

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