MCBU SBED
MANİSA CELAL BAYAR ÜNİVERSİTESİ SAĞLIK BİLİMLERİ ENSTİTÜSÜ DERGİSİ
MANISA CELAL BAYAR UNIVERSITY JOURNAL OF INSTITUTE OF HEALTH SCIENCE
ISSN: 2147-9607

ARAŞTIRMA MAKALESİ
RESEARCH ARTİCLE
CBU-SBED, 2019, 6(1):47-51

The Use of Axial Based Superficial Temporal Artery Frontal Branch Island Flap in Reconstruction of Full Thickness Extensive Lateral Canthus and Eyelid Defects

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Gönderim Tarihi / Received:06.12.2018
Kabul Tarihi / Accepted:28.03.2019

Öz

Amaç: Lateral kantus da dahil olmak üzere tam kat ve geniş göz kapağı defekti rekonstrüksiyonu, karmaşık ve kompleks yapının bir sonucu olarak zordur. Bu bölge defektlerini kapatmak, başarılı fonksiyonel ve estetik sonuçlar elde etmek için iyi vaskülarize cilt ve yumuşak doku önemli bir rol oynamaktadır.

Hasta ve yöntem: Çalışmaya Manisa Celal Bayar Üniversitesi Tıp Fakültesi Hastanesi'nde Mayıs 2014-Aralık 2015 tarihleri arasında aksiyel süperfisyal temporal arter frontal dal ada flebi ile rekonstrüksiyon yapılan tam kalınlıkta göz kapağı ve lateral kantus defekti olan hastalar dahil edildi.

Bulgular: Bu teknikle sekiz hasta ameliyat edildi. Beş tanesi kadındı. Ortalama yaş 66,1 ve ortalama takip süresi 11,8 ay idi. Dört hastada bazal hücreli karsinom, iki hastada skuamöz hücreli karsinom, bir hastada trikoblastik karsinom tespit edildi. Bir hastanın defekti ise travmaya sekonder idi. Bu teknikle toplam beş alt kapak total tam kat defekti, iki lateral kantus defekti ve bir total tam kat üst kapak defekti rekonstrükte edildi. Üç hastada flep donör alanı kısmi kalınlıkta deri grefti ile onarıldı. Bir hasta ameliyattan 6 ay sonra lateral kantal fissurun genişletilmesi için lateral kantoplastiye ihtiyaç duydu. Bir hasta ise ameliyattan 6 ay sonra hafif ektropiyona sekonder lateral kantopeksiye gereksinim duydu.

Sonuç: Yüzeysel temporal arterin terminal frontal dalı bazlı ada flebi, palpebral konjonktiva rekonstrüksiyonu için mukoza grefti ve tars rekonstrüksiyonu için kıkırdak grefti gerekmeksizin kabul edilebilir estetik ve fonksiyonel onarım için güvenilir ve değerli bir seçenektir.

Anahtar Kelimeler: Göz Kapağı, Lateral Kantus, Rekonstrüksiyon, Yüzeyel Temporal Arter, Ada Flebi.

Abstract

Objective: Full-thickness and extensive eyelid defect reconstruction including lateral canthus is complex and difficult as a result of complex structure of the area. To close defects in this region with good texture and to obtain successful functional and aesthetic results, good vascularized skin and soft tissue play an important role.

Patient and methods: Patients with extensive full thickness eyelid and lateral canthus defects reconstructed with axial superficial temporal artery frontal branch island flap in Manisa Celal Bayar University Faculty of Medicine Hospital between May 2014 and December 2015 were included in the study.

Results: A total of eight patients were operated with this technique. Five of them were female. Mean age was 66.1 and mean follow-up period was 11.8 months. Four patients had basal cell carcinoma, two had squamous cell carcinoma and one had trichoblastic carcinoma. One patients' defect was secondary to trauma. Five total lower lid defects, two lateral canthus defects and one total upper lid defect were reconstructed with this technique. Flapdonor area of the three patients were reconstructed with split thickness skin graft. One patient needed lateral canthoplasty for lateral fissur widening 6 month after surgery and one patient needed lateral canthopexy secondary to mild ectropion 6 month after surgery.

Conclusion: Island flap based on terminal frontal branch of the superficial temporal artery ensures a reliable and valuable option with acceptable aesthetic and functional coverage without need of cartilage graft for tarsus and mucosa graft for palpebral conjunctiva reconstruction.

Keywords: Eyelid, Lateral Canthus, Reconstruction, Superficial Temporal Artery, Island Flap.

1. Introduction

Lower and upper eyelid defects are occurred due to skin tumors, trauma, congenital deformities or burns. It is not possible to close the defects primarly, if the defect is more than one-fourth of the eyelid width [1]. We need more complex reconstruction techniques to close wide full-layer defects. The goals of repairing eyelid are both aesthetic and functional outcomes. In reconstruction of the eyelid, anatomical structures of the eyelid are very important because each of these structures have different function. Complication rates will be low after surgery, if the anatomical structures are reconstructed well. Dysfunction of the eyelids may cause corneal ulcers and blindness, if it is not repaired [2]. Because of its complex anatomy, eyelid reconstruction is challenging. There are too many techniques described for lower and upper eyelid reconstruction in the literature. These are Tenzel advancement flap, Cutler-Beard bridge flap, Hughes tarsoconjonctival flap, Mustarde cheek flap, lateral eyelid rotational flap, bilobed flap, forehead rotation flap, vascularized propellary flap, frontalis turn-over flap and retroauriculary flap [3-6]. None of these techniques suggest both the reconstruction of lower and upper eyelid defects, including the lateral canthus. The use of axial based superficial temporal artery island flap was reported by Monks [7] and termed as island flap by Eser [8]. Modifications of the flap based on frontal branch of the superficial temporal artery were defined and used for eyelid and lateral canthus reconstruction [9, 10]. In this study we present our experiences about the reconstruction of wide full layer upper and lower eyelid and lateral canthus defects by using axial based superficial temporal artery frontal branch island flap without creating secondary donor morbidity.

2. Patients and Methods

Patients with extensive full thickness eyelid and lateral canthus defects reconstructed with axial based superficial temporal artery frontal branch island flap between May 2014 and December 2015 were included in the study. Clinicopathological characteristics of the patients and follow-up data were evaluated.

3. Surgical Technique

All patients were operated under general anesthesia. All procedures were performed by the same surgeon. Skin projection of frontal branch of superficial temporal artery was marked by using doppler ultrasonography (USG). Size of the defect was measured and the flap was designed. The flap was elevated over the periosteum from distally to proximally. The pedicle of the flap was elevated with the overlying skin. A tunnel was designed from proximal end of the pedicle of the flap to lateral end of the defect. The tunnel width was two times greater than the pedicle width. In addition, the tunnel was designed 3 mm above the original lateral canthal tendon point. The skin over the pedicle was deepithelized. The flap was passed through the tunnel and inset. The pedicle was fixed to periosteum of the lateral orbit to avoid sagging of the flap and as a result, to prevent from ectropion. Galea of the flap, same size as the conjunctival defect was elevated from flap and sutured to remaining conjunctiva. Frontal muscle and connective tisue was sutured to remnant orbicularis oculi muscle and finally flap skin was sutured to skin.

4. Results

Totally eight patients were treated with this technique. Five of the patients were female and three were male. The age of the patients ranged between 33 and 88 (mean: 66.1). Basal cell carcinoma (BCC) in 4 patients, Squamous cell carcinoma in situ (SCC) in two patients, Trichoblastic carcinoma (TCC) in one patient and trauma in one patient were found in the etiology. Total lower lid was reconstructed in 5 patients, lateral canthus in 2 patients and total upper lid in one patient. The duration of follow-up ranged between 6 and 22 months (mean: 11.8 months). Postoperative lateral canthopexy was performed inone patient 6 months after the surgery as a result of ectropion and lateral canthoplasy was performed in another patient 6 month after the surgery as a result of limited lateral vision to expand the lateral fissure (Table 1).

5. Case Reports

Case 1: A 59 year-old man was operated for recurrent BCC at lateral cantus.of right orbit. The diagnose was changed to TCC after histopathological evaluation. Full thickness defect reconstruction of lateral canthus was performed with axial based superficial temporal artery frontal branch island flap. The donor side closed primarily. Lateral canthoplasty was peformed as a result of lateral vision impairment six months after surgery (Figure 1).

Case 2: A 68 year-old woman was operated for BCC located at left lateral canthus. Full thickness defect of lateral canthus was reconstructed with defined modified flap. Primary closure was performed for flap donor area. No recurrence was seen 22 months after surgery and there was not needed a revision surgery (Figure 2).

Case 3: A 33 year-old man had right periorbital soft tissue injury as a result of motorcyle accident. A week after primary closure of injury, left upper eyelid necrosis was debrided and full thickness total eyelid defect was reconstructed with the defined modified flap. STSG was used to close flap donor area defect. There was no revision needed 18 months after defect reconstruction and there was no vision impairment (Figure 3).

Case 4: A 75 year-old woman was operated for left lower lid BCC. Total lower eyelid full thickness defect was reconstructed with defined modification. Flap donor side was closed primarily. There was no recurrence of tumor and no need of revision surgery 10 months after reconstruction (Figure 4).

Table 1: Clinicopathological evaluation of the patients.

Case	Sex	Age	Etiology	Localization	Donor Area Closure	Follow up	Complication	Revision
1	F	78	BCC	Total lower lid	Primary closure	20 months	None	None
2	F	68	BCC	Lateral canthus	Primary closure	22 months	None	None
3	M	33	Trauma	Total upper lid	STSG	18 months	None	None
4	F	75	BCC	Total lower lid	Primary closure	10 months	None	None
5	M	50	SCC	Total lower lid	Primary closure	8 months	None	None
6	M	59	TBC	Lateral canthus	Primary closure	7 months	Lateral vision impairment	Lateral canthoplasty
7	F	88	SCC	Total lower lid	STSG	7 months	Mild ectropion	Lateral canthopexy
8	F	78	BCC	Total lower lid	STSG	3 months	None	None

Table 1: Patients' data and clinical outcomes of technique. **F:** Female, **M:** male, **BCC:** Basal cell carcinoma, **SCC:** Squamous cell carcinoma, **TBC:** Trichoblastic carcinoma, **STSG:** Split thickness skin graft.

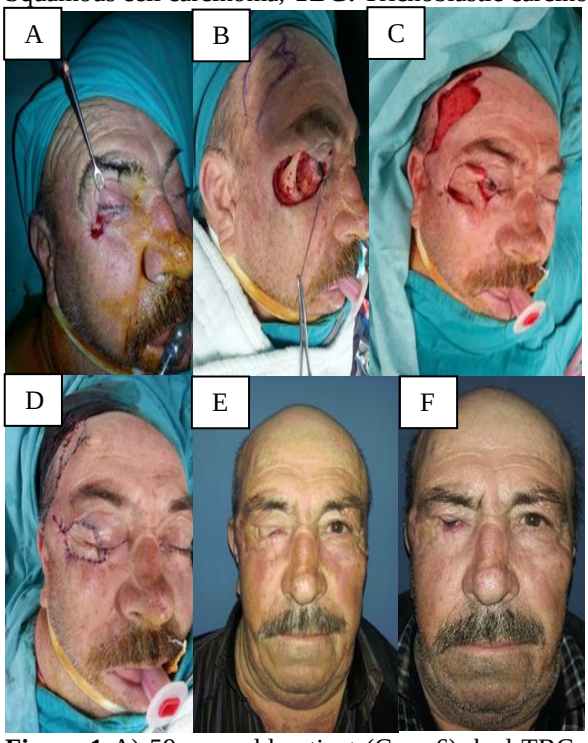

Figure 1:A) 59 year-old patient (Case 6), had TBC on his right lateral canthus. B) After the excision, a wide defect is shown C) Flap elevation. D) Flap inset to the defect E) View of the patient 6 months after surgery with lateral vision impairment. F) View of the patient 1 month after lateral canthoplasty surgery.

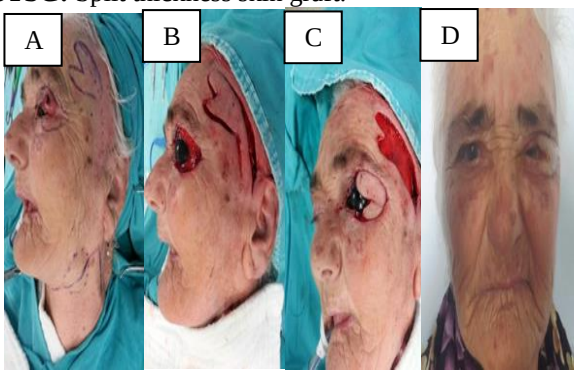

Figure 2: A) 68 year-old patient (Case 2), had BCC on her lateral canthal region. B) Wide defect and flap elevation are shown. C) Flap inset by tunneling from the lateral side of the defect D) Postoperative view 22 months after surgery.

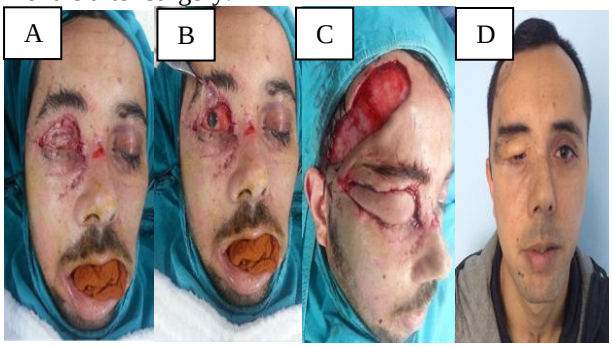

Figure 3: A) 33 year-old patient had defect on his right upper lid as a result of trauma (Case 3). B) Only palpebral conjunctiva was remained as a graft. C) Flap elevation and inset to the defect. D) View of the patient 18 months after surgery.

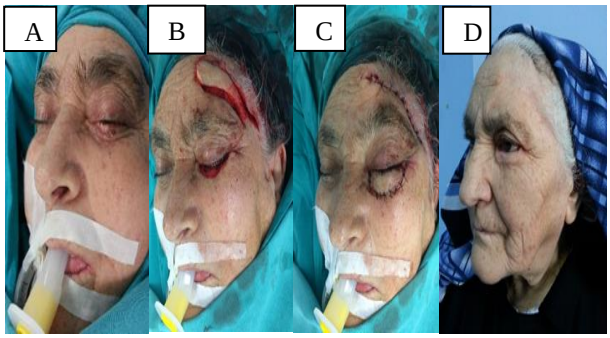

Figure 4: A) 75 year-old patient (Case 4), had BCC on her lower lid. B) view of the defect after excision. C) intraoperative view of the patient after reconstruction. D) Postoperative view 10 months after surgery. Flap donor scar is minimal.

6. Discussion

Eyelids have two important units. Upper and lower eyelids have both anterior and posterior lamellar layer. Skin and orbicularis oculi muscle form the anterior lamella, conjunctiva and tarsal plate form the posterior lamella of the eyelids [11]. Wide and full thickness defect of lateral canthal region, upper and lower eyelid are challenging and needs more complex surgical procedures. Plastic surgeon must protect the function of the eyelid and consider the cosmetic concerns of the patient. The ideal results of reconstruction in eyelid surgery should be a movable eyelid, perfect corneal protection, good aesthetic quality, and acceptable sequelae at the donor site [9]. There are too many techniques for eyelid reconstruction in the literature. Tenzel first described semicircular flap in 1975 for small or mid-size lower lid defects [12]. The Mustarde rotational cheek flap and switch flap are used widely for full thickness lower eyelid defects [13, 14]. Mcnutt et al. used rotational flap without posterior lamella repair [15].

They believe that ectropion develops because of insufficient tissue mobilization, not for lack of posterior lamella reconstruction. These techniques needs posterior lamella recontstruction and serve for only lower lid reconstruction. Good alternatives to Mustarde flap are Cutler-Beard bridge flap and Hughes tarsoconjontival flap [16, 17]. The main disadvantage of these flaps is the need of stage. Functional reconstruction techniques are used for eyelid reconstruction. Homolateral forehead flap is used for bipalpebral reconstruction but it is a four-step procedure [18]. Since the superficial temporal artery island flap was defined, it was used for different purposes and eyelid reconstruction is one of them. Vasculary structures are very important for plan of the flap, that will be used to reconstruct, depends on the vascularity. The terminal branches of superficial temporal artery are frontal and parietal branches. Frontal branch divides into anterofrontal, centrofrontal and posterofrontal branches. Temporal branch of the facial nerve courses parallel or inferior to the frontal branch of the superficial temporal artery [2].

Monks was used this flap for eyelid reconstruction in 1898 [7]. Eser was the first surgeon used island flap term for this flap [8]. This flap is also called 'tulip flap', because of its long name [9]. They reported good aesthetic results. Tulip flap has good color match and texture for eyelid reconstruction. It is dissected easily and rotation arc is wide. The pedicle of the flap is safe if the plan of the technique is performed carefully. Generally donor site is closed primarily. Only using this flap, both upper and lower eyelid reconstruction or lateral canthus defect reconstruction can be performed. As this flap has three layer, galeal layer may serve as conjunctiva, frontal muscle may serve as orbicularis muscle. As a result we did not need a secondary donor area for cartilage or mucosa graft for posterior lamella reconstruction. Care must be taken for the tunnel. The tunnel for the inset of the flap must be wide, because narrow tunnels may cause veneous insufficiancy of the flap. One of the disadvantege of this flap is the risk of frontal branch of facial nerve injury. Meticilous dissection is needed to decrease this complication. The other disadvantage of this flap is bulkiness. At late period of surgery, there may be need thinning for good cosmetic results. Ectropion is one of the complication and may need to be corrected by lateral canthoplasy.

7. Conclusion

Tulip flap has many advantages when we compare with the other type of flaps. It has a reliable blood supply, easy dissection, good aesthetic results and minimal donor site morbidity. This flap is good choice for wide upper and lower eyelid defects included lateral canthal region without a secondary donor area morbidity.

8. References

1. Shi, Y, Zhou, X, Yu, J, Liu, H, Reconstruction of Full-Thickness Eyelid Defects Following Malignant Tumor Excision: The Retroauricular Flap and Palatal Mucosal Graft. J Craniofac Surg 2016, 27(3):612-614.
2. Dhar, S.I, Kopp, R, Tatum, S.A, Advances in eyelid reconstruction. Curr Opin Otolaryngol Head Neck Surg 2016, 24(4):352-358.
3. Lassus, P, Lindford, A.J, Free temporal artery posterior auricular skin (TAPAS) flap: A new option in facial and intra-oral reconstruction. Microsurgery 2017, 37(6):525-530.
4. Meena, M, Triple-Flaps for lateral canthus reconstruction: A novel technique. Oman journal of ophthalmology 2012, 5(3):181-183.
5. Pushker, N, Batra, J, Meel, R, Bajaj, M.S, Chawla, B, Ghose, S, Lateral eyelid rotation flap: a novel technique for reconstruction of full thickness eyelid defect. Int Ophthalmol 2015, 35(6):793-799.
6. Yazici, B, Cetinkaya, A, Cakirli, E, Bilobed flap in the reconstruction of inferior and/or lateral periorbital defects. Ophthalmic Plast Reconstr Surg 2013, 29(3):208-214.
7. Monks, G.H, The restoration of a lower eyelid by a new method. Boston Med Surg 1898, 139.
8. Eser, J.F.S, Island flaps. N Y Med J 1917, 106.
9. Cologlu, H, Kocer, U, Oruc, M, Sahin, B, Ozdemir, R, Axial bilobed superficial temporal artery island flap (tulip flap): reconstruction of combined defects of the lateral canthus including the lower and upper eyelids. Plastic and reconstructive surgery 2007, 119(7):2080-2087.
10. Elbanoby, T.M, Elbatawy, A, Aly, G.M, Ayad, W, Helmy, Y, Helmy, E, Sholkamy, K, Dahshan, H, Al-Hady, A, Bifurcated Superficial Temporal Artery Island Flap for the

Reconstruction of a Periorbital Burn: An Innovation. Plast Reconstr Surg Glob Open 2016, 4(6):e748.
11. Chang, E.I, Esmaeli, B, Butler C.E, Eyelid Reconstruction. Plastic and reconstructive surgery 2017, 140(5):724e-735e.
12. Tenzel, R.R, Reconstruction of the central one half of an eyelid. Archives of Ophthalmology 1975, 93(2):125-126.
13. Callahan, M.A, Callahan, A, Mustarde flap lower lid reconstruction after malignancy. Ophthalmology 1980, 87(4):279-286.
14. Uemura, T, Yanai, T, Yasuta, M, Kawano, H, Ishihara, Y, Kikuchi, M, Switch Flap for Upper Eyelid Reconstruction-How Soon Should the Flap Be Divided? Plast Reconstr Surg Glob Open 2016, 4(4):e695.
15. McNutt, S.A, Weber, A.C, Costin, B.R, Mehta, M.P, Lewis, C.D, Perry, J.D, Rotational Flap Repair of Full Thickness Eyelid Defects without a Posterior Lamellar Graft or Flap. Orbit 2015, 34(5):268-273.
16. Cutler, N.L, Beard, C, A method for partial and total upper lid reconstruction. Am J Ophthalmol 1955, 39(1):1-7.
17. Rohrich, R.J, Zbar, R.I, The evolution of the Hughes tarsoconjunctival flap for the lower eyelid reconstruction. Plastic and reconstructive surgery 1999, 104(2):518-522; quiz 523; discussion 524-516.
18. Bertrand, B, Colson, T.R, Jr, Baptista, C, Georgiou, C, Philandrianos, C, Degardin, N, Bardot, J, Casanova, D, Total Upper and Lower Eyelid Reconstruction: A Rare Procedure--A Report of Two Cases. Plastic and reconstructive surgery 2015, 136(4):855-859.