Cukurova Medical Journal
ÇUKUROVA ÜNİVERSİTESİ TIP FAKÜLTESİ DERGİSİ

Cukurova Med J 2016;41(3):472-478
DOI: 10.17826/cukmedj.237485

ARAŞTIRMA/RESEARCH

Reconstruction of neck defects by pre-expanded occipito-cervico-dorsal island flaps

Boyun defektlerinin preekspanse oksipito-serviko-dorsal ada flepleri ile onarımı

Cengiz Eser[1], Anıl Arif Olguner[1], Serkan Sabancıoğularından[1], Eyüphan Gencel[1]

[1]Çukurova University Medical Faculty Department of Plastic Reconstructive and Aesthetic Surgery, Adana/Turkey

Cukurova Medical Journal 2016;41(3):472-478.

Abstract

Purpose: Neck defects usually occur after burn contracture release and benign or malignant neck tumor excisions. Frequently used neck skin reconstruction methods are skin grafting, Z-Plasties, skin pedicled or perforator flaps, and free flaps. Pre-expanded perforator skin flaps are useful options for skin defect reconstructions. Pre-expansion of the skin flap provides more tissue for the reconstruction and donor area closure. Additionally, defect reconstructions used by adjacent skin maintain a good tissue colour and texture match with the defect.

Material and Methods: In this study, 8 patients (neck burn contracture release (n=7) and congenital giant hairy nevus excision (n=1)) whose neck defects were reconstructed with 11 pre-expanded occipito-cervico-dorsal perforator island flaps were evaluated. The maximum and minimum flap sizes were 9x23 cm and 5x13 cm respectively. Mean age of the patients was 15.8 and mean expansion time was 11.5 weeks.

Results: Mean follow-up time was 27.8 months. We encountered an expander exposition in one case and 50% flap necrosis in another case. Aesthetic and functional improvement was observed in all patients.

Conclusion: The pre-expanded occipito-cervico-dorsal perforator island flap is useful in moderate sized lateral neck defects. The aforementioned flap provides good tissue compliance and colour with neck and minimal donor area morbidity. It is a new useful reconstructive method in patients with lateral neck defects, who have a healthy cervico-dorsal skin and do not have useful ventral skin.

Key words: Neck defect; expansion; pre-expanded; flap; perforator; occipito-cervico-dorsal

Öz

Amaç: Boyun cildi defektleri genellikle kontraktür sebestleştirilmesi veya malign/benign tümör eksizyonu sonrası meydana gelir. Sık kullanılan boyun cilt rekonstrüksiyon yöntemleri Z-plastiler, cilt pediküllü veya perforatör flepler ve serbest fleplerdir. Bunlara ek olarak son zamanlarda pre-ekspanse perforator cilt flepleri cilt defekt rekonstrüksiyonlarında sıkça kullanılmaktadır. Cilt fleplerinin ekspansiyonu rekonstrüksiyon ve donor alan onarımı için daha fazla doku sağlar. Ayrıca defektlerin yakın doku ile rekonstrüksiyonu, renk ve yapı uyumu açısından iyi sonuçlar verir.

Gereç ve Yöntem: Bu çalışmada 7'si boyun kontraktür açılması sonrası ve 1'i konjenital dev kıllı nevus eksizyonu olmak üzere boyunda cilt defekti olan 8 hasta değerlendirildi. Tüm defektlere toplam 11 adet preekspanse oksipito-serviko-dorsal ada flebi ile onarım uygulandı. En geniş flep boyutu 9x23 cm iken en küçük flep boyutu 5x13 cm idi. Ortalama hasta yaşı 15.8 idi ve ortalama ekspansiyon zamanı 11.5 hafta idi.

Bulgular: Hastalar ortalama 27,8 ay takip edildi. bir hastada doku genişletici ekspozisyonu oluşurken başka bir hastada %50 flep nekrozu görüldü. Tüm hastalarda estetik ve fonksiyonel sonuçlar kabul edilebilir seviyelerdeydi.

Sonuç: Preekspanse oksipito-serviko-dorsal flep, orta büyüklükteki boyun defektlerinde kullanılabilecek uygun bir rekonstrüksiyon seçeneğidir. Tanımlanan flep, özellikle ön servikal ve torakal cildi uygun olmayan ve dorsal serviko-dorsal cildi sağlam olan hastalarda uygulanabilecek yeni bir rekonstrüktif metod olarak sunulmuştur.

Anahtar kelimeler: Boyun defekti; ekspansiyon; pre-ekspanse; flep; perforatör; oksipito-serviko-dorsal

Yazışma Adresi/Address for Correspondence: Dr. Cengiz Eser, Çukurova University Medical Faculty Department of Plastic Reconstructive and Aesthetic Surgery, E-mail: cengizeser01@gmail.com
Geliş tarihi/Received: 07.01.2016 Kabul tarihi/Accepted: 07.02.2016

INTRODUCTION

Contractures and benign/malignant tumors of the neck affect patients in aesthetic and functional aspects. Neck defects especially occur after burn contracture releases and tumoral excisions[1]. Many different surgeries have been described for the repair of neck defects. Most commonly used techniques are full/split thickness skin grafting, Z-Plasties, local flaps and free flaps[2,3]. Recently, perforator flaps and their combinations have been frequently used for reconstruction of large skin-soft tissue defects. Larger defects can also be repaired with pre-expanded free or pedicled flaps[4,5].

In accordance with the principle of the adjacent tissue repair[6]; pre-expanded flaps which are harvested from occipito-cervico-dorsal (OCD) perforators may be utilized in neck defect repair. Preparation of the flap by pre-expansion makes it advantageous to use in contour deformities such as in head and neck defects, because thinner and larger flaps can be prepared trough pre-expansion.

In this preliminary study, for the reconstruction of the neck region, pre-expanded OCD flaps and our outcomes are presented.

MATERIAL AND METHODS

Study included eight patients (six men and two women) with cervical defect(s) were treated with pre-expanded OCD perforator island flaps from May of 2010 until March of 2014. Institutional review board approval was obtained for the study. Totally 11 flaps were used in 8 patients. Mean age of the patients was 15.8 (between 7 and 30). Seven of the patients were operated due to neck burn contracture release and one of the patients was operated due to congenital giant cell hairy nevus (CGHN) excision (Figure 1 and 2).

Preoperative evaluation

Initially, cervical defect sizes that will occur after burn contracture release or CGHN excision were estimated. The OCD perforators, which were located on healthy side of the posterior aspect of shoulder were detected by 8 MHz Handheld Doppler. One of the OCD perforators, which is the most audible and located on optimal pivot point for future flap was marked. Perforator markings were determined unilateral or bilateral depending on the cervical defect side and healthy donor area

Figure 1. Fourteen years old male who has a burn scar on his left neck (upper left and middle). After 300 cc expansion (upper right). After pre-expanded occipito-cervico-dorsal flap transposition (lower left and right)

Expander implantation

In first operative session a tissue expander was implanted above the muscular fascia in close proximity to the preoperatively marked OCD perforator. Pocket incisions were made at the future flap's lateral margin. Care was taken not to expose the marked perforator during the preparation of the pocket.

Figure 2. Ten years old male who has a giant cell hairy nevus on his right neck (upper left). After 400 cc expansion (upper middle and right). Perioperative view of patient. Note that the dotted circle shows one of the occipito-cervico-dorsal perforator (lower left). Ten days after the flap transposition. Note that 50% of distal flap necrosis (lower midle). Twentyfour months after the second operative session. Note that distal half of the flap reconstructed with full-thickness skin grafting (lower right).

Possible rotation arch was set at the perforator exit point after the expansion. Standard, external port, smooth tissue expanders (Mentor, Santa Barbara, CA, USA) with differing volumes were used in all of the patients (Table 1).

Flap harvesting

Second operative session was initiated after gaining adequate skin-soft tissue over the expander. Neck defects occured after contracture release or CGHN excision. Marked perforator, which was determined in first session was redetermined by handheld Doppler for an accurate pedicle location. Flap borders were marked and incised in shape of an ellipse so the pivot point would be at the medial edge of the flap's long axis in the dorsal shoulder.

During expander and port removal, marginal flap incisions were performed. Harvested flaps were transposed to defect in an island fashion. During flap harvesting, previously determined perforator was not quite skeletonized from subcutaneous tissue in order to prevent kinking. The flap was rotated with 1 cm surrounding soft tissue around the marked perforator (Figure 3).

RESULTS

The maximum and minimum flap sizes were 9x23 cm and 5x13 cm respectively. Mean expansion time was 15.1 weeks. However, immediate postoperative hyperemia was observed in all flaps, we observed 50% distal partial necrosis in one flap. Two of the 11 expanded flaps were tapered and expanders were exposed (18.2%). We provided good results with prompt plastic surgery interventions in those cases. We have not observed hematoma or infection. The follow-up period was 27.8 months. Flap adaptations were good in all cases in long-term. All patients satisfied with the operation..

Table 1. Patients and characteristics

No	Age/ sex	Cause of defect	Defect size (cm)	Expander type / size (cc)	Expansion time (wks)	Flap size	Complication	Follow-up (mo)	Right/Left/ Bilateral flap
1	7/m	Burn	8x10 8x9	SE/75 SE/75	9	8x13/R 8x10/L	No	18	Bilateral
2	12/m	Burn	5x14	SE/150	10	5x13	Exposition of expander	26	Right
3	14/m	Burn	10x15	SE/250	14	10x17	No	48	Left
4	21/m	Burn	8x14/R 7x15/L	SR/400 SR/400	12	8x15/R 8x15/L	No	36	Bilateral
5	30/f	Burn	7x11	SE/250	12	7x14	No	26	Left
6	24/m	Burn	8x12/R 7x12/L	SE/250 SE/250	11	8x15/R 7x13/L	No	18	Bilateral
7	10/m	Congenital giant hairy nevus	9x22	SR/ 400	16	9x23	Partial necrosis (%50)	38	Right
8	8/f	Burn	7x12	SR/100	8	7x15	No	12	Right

m:Male, f: Female, SE: Smooth elliptical, SR: Smooth round, R: Right, L: Left

Nevertheless, in one flap (patient 2) we observed a rotational arch difficulty and changed the pivot point to anterior neck in a free style fashion (Figure 4). In this patient, flap was rotated to the defect onto an anterior perforator. Donor areas were closed primarily (Figure 5,6 and 7).

Suction drains were held in place for one day postoperatively. Patients were evaluated in terms of flap suitability, aesthetic achievements, donor area scarring, and complications.

DISCUSSION

Neck lesions usually disturb the patient in aesthetic and functional aspects. Hypertrophic scars and keloids of the neck occur especially after burns. These lesions can lead to head and neck function

restrictions such as; decreased neck rotation, cervical intervertebral joint and spine problems, oral competence and speech difficulties etc[7,8]. Neck scars may also cause social withdrawal symptoms. Another visual problematic lesion in the neck is GCHN. GCHN also has a premalignant potential and it should be removed[9].

Larger defects require larger flaps for reconstruction. Perforator flaps and free flaps are utilized more frequently in large skin-soft tissue defects. Since a long time, plastic surgeons have also been using tissue expansion methods to overcome this problem. Because of a good colour and texture match, pre-expanded local skin flaps would be advantageous especially in head and neck reconstruction[11,12]. Pre-expanded deltopectoral flap, subclavicular and supraclavicular flaps are able to obtain contour and colour match to the neck[13-15]. Major disadvantage of these flaps is the morbidity of the donor site that always leads to a hypertrophic scar. In this context, flaps which are harvested from undamaged posterior shoulder can be a useful alternative for lateral neck defect repairs. Ogawa et al.[16] showed that; there are some skin areas which are perfused by certain perforators in dorsum. Occipital artery perforators nourish the skin island between C1-C4 vertebrae; transverse cervical artery perforators nourish the skin island between C2-Th3 vertebrae; circumflex scapular artery perforators nourish the skin island between C7-Th7 vertebrae; and intercostal artery perforators nourish the skin island between C1-C4 vertebrae. These skin islands are linked between each other by choke arterioles.

The OCD perforator network is suitable for local flap harvesting from the superior-dorsal torso. The pedicle of OCD flap comes from occipital artery and transverse cervical artery. Hyasoku and Gao used the above-mentioned flap for the first time as a super-thin flap for repair of neck scar contracture in 1994[17,18]. It is useful in contour deformity repair of head and neck through thin and large sized preparation from adjacent tissue. Additionally, this flap can be shaped according to the defect, and designed safely in a much larger size by distal microvascular augmentation. As Tsai[19] and Saint-Cyr et al.[20] revealed, pre-expanded perforator free flaps are reliable options for larger reconstructions. We increased the surface area of flap by pre-expansion method as they mentioned. Pre-expansion provided us not only defect reconstruction but also donor area closure by the flap. Expansion of flaps also maintained subcutaneous tissue thinning, good tissue compliance and contour harmony with neck in long term. In addition, we avoided free flap complications and single surgery time by using this method.

In the present study, the reason of using perforator flaps as an island shape was quite in order to release the rotational arch of perforator pedicle. The island maneuver also provided flap rotation flexibility. We observed in this preliminary study that the pre-expanded OCD perforator island flaps could be viable up to laryngeal tubercle. We did not observe any flap necrosis up to 10x17 cm size which was used in a 14-years-old patient. We may suggest that it is a reliable flap in moderate sized lateral neck defects and has a perfect tissue match with the neck. Non of the patients complained from donor area scars because scars are hidden in the back.

Ashab et al.[21] observed two prosthesis exposure in 36 (5.6%) face and neck burn scar reconstructions. We observed expander exposition in two of eleven flaps (18.2%). Our high complication rate may be due to difficulty of dorsal skin expansion. Additionally, we observed 50% flap necrosis in one of eleven cases. However the pre-expansion method is a kind of delay procedure and increases flap viability, main reason of necrosis may be very large flap design.

Main disadvantage of the presented method is that it is an at least two-staged procedure, but longer single surgical procedures such as free flap surgery may have additional perioperative and postoperative risks. Pain during expansion period is another drawback of this procedure. We inflated the expanders by establishing cooperation with the patients in an average 11.5 weeks. Using this procedure may cause beard lack in males, so this flap should be performed carefully in reconstruction of male cheeks.

In conclusion, the pre-expanded OCD perforator island flap is a useful alternative procedure in moderate sized lateral neck defects. The aforementioned flap provides good tissue compliance and color with neck and minimal donor area morbidity. Therefore it is a new useful reconstructive method in patients with lateral neck defects who have a healthy cervico-dorsal skin.

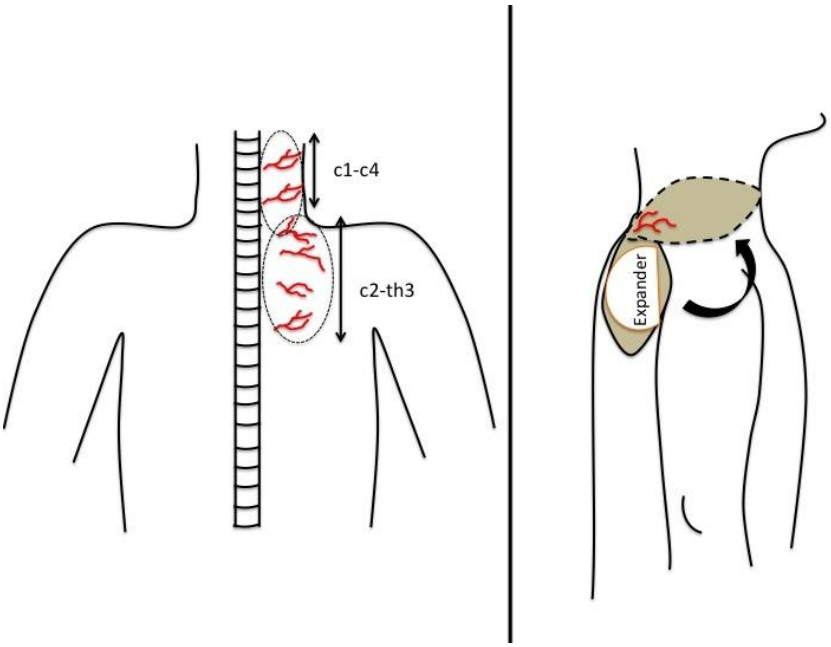

Figure 3. The territory of the occipital artery located between the c1 and c4 vertebra (left). The territory of the transverse cervical artery located between the second cervical vertebra and the third thoracic vertebra (left). It is thought that the area is bounded to the territory of the occipital artery, circumflex scapular artery, and dorsal intercostal perforator artery. So a pre-expanded occipito-cervico-dorsal skin flap can be harvested from back of the shoulder and can be rotated to the neck (right).

Figure 4. Twelve years old male who has a burn scar on his neck (upper left and middle). Exposure of the expander after 150 cc expansion (upper right). Perioperative view of same patient in the second session. Note that the flap designed in anterior pedicled free style manner because of tissue insufficiency for neck reconstruction (lower left). One week after the second operative session (lower middle and right).

Figure 5. Twentyone years old male who has a burn scar on his neck (upper left). After 400 cc expansion of right and left expanders (upper right). Postoperative 12 months view (lower left and right).

Figure 6. Seven years old male who has a burn scar on his neck after 100 cc expansion of both expanders (upper left and right). One year after second surgery (lower left and right).

Figure 7. Eight years old male who has a burn scar on his right neck and after 150 cc of expansion (upper left). Three years after second surgery. (upper right, lower left and right). Note that donor scar hidden in dorsum

REFERENCES

1. Grishkevich VM. Unilateral cervical burn scar deformity elimination with contralateral cervicothoracic flap a new approach. J Burn Care Res. 2012 ;33:26-31.
2. Matsumine H, Sakurai H, Nakajima Y, Kubo K, Higuchi R, Nozaki M. Use of a bipedicled thin groin flap in reconstruction of postburn anterior neck contracture. Plast Reconstr Surg. 2008;122:782–5.
3. Nath S, Erzingatsian K, Simonde S. Management of postburn contracture of the neck. Burns. 1994;20:438–41.
4. Xiaobo Y, Yanyong Z, Haiyue J, Hongxing Z, Bo P, Lei L . Aesthetic and functional restoration of anterior neck scar contracture using bipedicled expanded forehead flap. Burns. 2011;37:1444-8.
5. Acartürk TO. Aesthetic reconstruction of the postburn neck contracture with a preexpanded anterolateral thigh free flap. J Craniofac Surg. 2014;25:23-6.
6. Kulahci Y, Sever C, Uygur F, Oksuz S, Sahin C, Duman H. Preexpanded pedicled thoracodorsal artery perforator flap for postburn axillary contracture reconstruction. Microsurgery. 2011;31:26–31.
7. Grishkevich VM, Grishkevich M. Postburn neck lateral contracture: anatomy and treatment. a new approach. J Burn Care Res. 2015;36:e294-9.
8. Grishkevich VM, Grishkevich M, Menzul V. Postburn neck anterior contracture treatment in children with scar-fascial local trapezoid flaps: a new approach. J Burn Care Res. 2015;36:e112-9.
9. Oksüz S, Ulkür E, Tuncer S, Sever C, Karagöz H. Elbow reconstruction with a pedicled thoracodorsal artery perforator flap after excision of an upper-extremity giant hairy nevus. J Plast Reconstr Aesthet Surg. 2013;66:566-9.
10. Hocaoğlu E, Aydin H. Preexpanded perforator flaps of the dorsolateral trunk in pediatric patients. Plast Reconstr Surg. 2013;131:1077-86.
11. Margulis A, Adler N, Eyal G. Expanded deep inferior epigastric artery perforator flap for reconstruction of the posterior neck and the upper back in a child with giant congenital melanocytic nevus. J Plast Reconstr Aesthet Surg. 2010;63:703–5.
12. Zang M, Zhu S, Song B, et al. Reconstruction of extensive upper extremity defects using pre-expanded oblique perforator-based paraumbilical flaps. Burns. 2012;38:917–23.
13. Song B, Zhao J, Guo S, Yi C, Liu C, He L, Li Y, Shao J, Zhang X. Repair of facial scars by the free expanded deltopectoral flap. Plast Reconstr Surg. 2013;131:200-8.
14. Xie F, Wang J, Li Q, Zhou S, Zan T, Gu B, et al. Resurfacing large skin defects of the face and neck with expanded subclavicular flaps pedicled by the thoracic branch of the supraclavicular artery. Burns. 2012;38:924–30.
15. Vinh VQ, Ogawa R, Van Anh T, Hyakusoku H. Reconstruction of neck scar contractures using supraclavicular flaps: retrospective study of 30 cases. Plast Reconstr Surg. 2007;119:130–5.
16. Ogawa R, Hyakusoku H, Murakami M, Gao JH. Clinical and basic research on occipito-cervico-dorsal flaps: including a study of the anatomical territories

of dorsal trunk vessels. Plast Reconstr Surg. 2004;113:1923-33.
17. Hyakusoku H, Gao JH. The "super-thin" flap. Br J Plast Surg. 1994;47:457-64.
18. Hyakusoku H, Pennington DG, Gao JH. Microvascular augmentation of the super-thin occipitocervico- dorsal flap. Br J Plast Surg. 1994;47:465-9.
19. Tsai FC. A new method: perforator-based tissue expansion for a preexpanded free cutaneous perforator flap. Burns. 2003;29:845–8.
20. Saint-Cyr M, Schaverien M, Rohrich RJ. Preexpanded second intercostal space internal mammary artery pedicle perforator flap: case report and anatomical study. Plast Reconstr Surg. 2009;123:1659–64.
21. Ashab Yamin MR, Mozafari N, Mozafari M, Razi Z. Reconstructive surgery of extensive face and neck burn scars using tissue expanders. World J Plast Surg 2015;4:40-9.