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ORIGINAL ARTICLE FACE AND NECK SURGERY

Buccal Fat Pad: An Effective Option for Facial Reconstruction and Aesthetic Augmentation

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Abstract

Introduction Autogenous grafting with lipoaspirate and dermo-fat grafting are popular techniques employed by plastic surgeons for correcting small volume facial defects and contour deformities. These techniques however present certain disadvantages. In this article, we present the use of the buccal fat pad graft as an alternative method of correcting such facial deformities.

Patients and Methods Free buccal fat pad grafting was carried out in 15 patients in our institution. All were harvested using an intraoral approach. The buccal fat pad graft was used to correct periorbital contour depressions, nasal tip deformities, as a camouflage graft over exposed silicon nasal implants and as a filler in the depression deformity after mass excision.

Results All 15 patients demonstrated good contour deformity correction without a significant graft resorption up to 3 years of follow-up. There were no donor site complications. The amount used ranged from 1 to 5 cc in volume as a spacer or barrier for the moderate-sized volume defect or depression, even though more than 5 cc of fat graft could be harvested if required.

Conclusion In conclusion, the buccal fat pad graft represents an easy, expedient and exceptional tool for the correction of contour deformities, volume replacement or for aesthetic augmentation.

Level of Evidence IV This journal requires that authors assign a level of evidence to each article. For a full description of these Evidence-Based Medicine ratings, please refer to the Table of Contents or the online Instructions to Authors www.springer.com/00266.

Keywords Buccal fat pad · Aesthetic · Reconstructive · Fat graft

Introduction

Mild facial contour irregularities can result from a variety of causes. Trauma and inflammatory lesions on the face commonly lead to fat necrosis and soft tissue volume loss. Similarly, uses of various implants in aesthetic procedures commonly lead to thinning of overlying skin and ultimately exposure of implants by pressure necrosis. Both biologic and synthetic materials have been used for soft tissue volume replacement in the facial area. Synthetic fillers are readily available, "off-the-shelf" filler materials which require little expertise for use. However, they are expensive and frequently necessitate repeated or top-up procedures. Recently, fat grafting has become a popular method of soft tissue volume replacement in the facial region; however, the delicate fat globules are sensitive to trauma and therefore take of the fat grafted in this manner is usually reduced necessitating frequent repeated harvest and grafting procedures. Dermal and dermo-adipose grafts have also been used in the past; however, it requires a donor site which is somewhat away from the operating area and the procedure usually leaves a scar on the donor area. Here we present our experience with the buccal pad of fat as a free

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graft for soft tissue volume replacement in various areas of the face. We would also like to explore the use of buccal fat free grafts as camouflage material to address complications after synthetic implant insertion.

Relevant Anatomy

The buccal pad of fat shares the buccal space with the parotid duct, salivary glands, facial artery and vein, lymphatic channels and buccal artery as well as branches of the facial and mandibular nerves. It is an encapsulated lobulated mass with a body and four processes with an average volume of 9.6 ml (range 8.33–11.9 ml) [1, 2].

The body is divided into 3 lobes—anterior, intermediate and posterior, and is situated deep along the posterior maxilla and upper fibres of the buccinator. The buccal fat pad has three extensions, namely pterygopalatine, buccal and temporal [3]. The pterygoid extension lies posteriorly and stays in the pterygomandibular space and packs the mandibular neurovascular bundle and lingual nerve. The temporal extension is made up of a superficial and deep lobe (Fig. 1). The superficial extension lies between the deep temporal fascia, temporalis muscle and tendon, whereas the deep part lies behind the lateral orbital wall and frontal process of the zygoma. The facial vessels mark the anterior extent of the buccal pad of fat. Also in the same plane are the buccal branches of the facial nerve along with the parotid duct which lie on the lateral surface of the buccal fat pad [2, 3].

As the buccal fat is generally located deep to the skin, it can be harvested without any obvious changes to the donor sites such as depression or contour deformities. The buccal fat is also easily approached, intraorally utilizing a simple incision on the buccal mucosa and splitting the buccinator muscle.

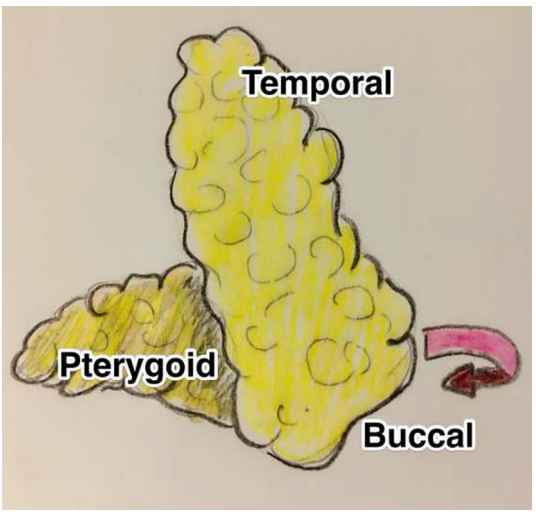

Fig. 1 Anatomy of buccal fat pad showing temporal, pterygoid and buccal extensions

Possible functions of the buccal fat pad include prevention of negative pressure while sucking in newborns, enhancement of intermuscular motion and protection of neurovascular bundles. Physiologically, it is a specialized type of fat termed as *syssacosis.* It is a unique type of fat similar to periorbital fat which has been found to be resistant to lipolysis and persists during times of severe emaciation [3].

Materials and Methods

Free buccal fat pad grafting was carried out in 15 patients in our institution (Table 1). Ages of patients ranged from 23 to 67 years with an average age of 38. Indications for use of buccal fat grafts were for correction of contour irregularities, volume replacement or as a space-occupying barrier.

Surgical Technique

Harvest of the buccal fat pad can be performed under general or local anaesthesia. With cheek retractors placed on the cheek, the area of fat harvest is visualized. Local anaesthesia with vasoconstrictor is injected into the area of harvest. The incision is placed below the parotid duct opening on the cheek mucosa opposite the lower dental rows with the mouth wide open. The buccinator is then split open with artery forceps by blunt dissection to expose the buccal pad of fat. The buccal fat usually extrudes if the splitting of the buccinator is done in the right direction. The direction of splitting should be changed and accompanied by an external cheek compression if it fails to extrude. The fat is delivered and the amount required resected out. When harvesting the buccal fat, fat lobules should be handled gently to prevent tear or rupture, which may accelerate absorption or lead to loss in elasticity at the recipient site. When a free graft is required, the fat is resected and the remainder cauterized and returned into the cheek. The incision is closed with an absorbable suture.

Results

Case 1

The patient is a 25-year-old woman who developed a foreign body granuloma in her nasal tip after nasal tip augmentation via filler injection (Figs. 2, 3). Removal of the nasal tip foreign body granuloma resulted in a nasal tip contour depression and potential dead space for

Table 1 List of patients with contour depressions and thinned skin corrected by buccal fat grafting

Age	Sex	Condition	Purpose of buccal fat graft (volume)	Outcome	Period of follow-up in case records
25	F	Nasal tip foreign body granuloma (Case 1)	Space-occupying barrier (1 cc)	Return to normal skin quality. No recurrence	1 year
32	F	Right lower lid venous malformation (Case 2)	Space-occupying barrier (3 cc)	No contour depression No ectropion	3 years
52	F	Left periorbital neurofibroma (Case 3)	Correction of depression deformity (5 cc)	No contour depression or resorption	10 months
41	F	Thinned columella after silicone implant (Case 4)	Volume reinforcement (1 cc)	No recurrence	2.5 year
27	F	Thinned dorsum of nose after silicone implant (Case 5)	Volume reinforcement (2 cc)	No recurrence	2 years
26	M	Nasal tip plasty with cartilage work (Case 6)	Camouflage cushion (3 cc)	Natural appearance	7 months
33	F	Thinned nasal mucosa after silicone implant	Space-occupying barrier	No recurrence	5 months
23	F	Thinned nasal tip after silicone implant	Volume reinforcement (3 cc)	No recurrence	11 months
25	F	Thinned nasal tip after silicone implant (Case 7)	Volume reinforcement (2 cc)	No recurrence	1 year
44	M	Asymmetric nasal tip (Case 8)	Correction of asymmetry (2 cc)	Natural appearance	7 months
50	F	Thinned columella after silicone implant	Volume reinforcement	No recurrence	2.5 years
67	F	Sunken upper lid (Case 9)	Volume replacement (4 cc)	Mild correction	2 years
48	M	Depression glabellar scar	Volume replacement	Natural appearance	11 months
35	F	Lipoma, forehead	Volume replacement (3 cc)	Natural appearance	1.5 year
40	F	Lipoma, forehead	Volume replacement	Natural appearance	2 years

haematoma formation (Fig. 4). A 1-cc buccal fat pad graft was harvested intraorally from her left cheek (Figs. 5, 6), and the graft was inset into her nasal tip via the same right nostril marginal incision (Fig. 6). This served to obliterate the nasal tip dead space, as well as correct the potential contour deformity that would have resulted. On serial follow-up 3 months post-operatively, her nasal tip redness has resolved, with no graft exposure and a return to near-normal skin quality (Figs. 7, 8). One year after the operation, the colour turned to normal, but she refused further photography.

Case 2

The second patient (Figs. 9, 10) is a 32-year-old woman with a right lower eyelid venous malformation. She underwent excision of this lesion (Fig. 11), which might cause right lower lid depression or ectropion. A 3 cc buccal fat pad graft was harvested and inset to her right lower lid region (Fig. 12) to fill the space after resection of the lesion. She was seen 3 years after the procedure with good contour correction, no ectropion and no significant loss of graft volume (Figs. 13, 14).

Case 3

The patient is a 52-year-old woman with periorbital depression post-resection of neurofibroma (Fig. 15). Five cc of buccal fat pad was inserted to the area to correct the contour deformity. At 10-month follow-up, there was a significant improvement and minimal graft loss (Fig. 16).

Case 4

A 41-year-old woman with thinned columella post-rhinoplasty with implant (Fig. 17) was grafted with 1 cc of buccal fat graft as a volume reinforcement graft. Post-operative examination 2.5 years later shows an improvement in the volume and appearance of the columella (Fig. 18).

Case 5

A 27-year-old woman with thinned nasal dorsum and extrusion of implant post-dorsal augmentation with solid silicone implant (Fig. 19) was grafted with 2 cc of buccal fat graft post-removal of implant. Two years post-buccal

Fig. 2 Frontal view of nasal tip showing foreign body granuloma post-filler injection

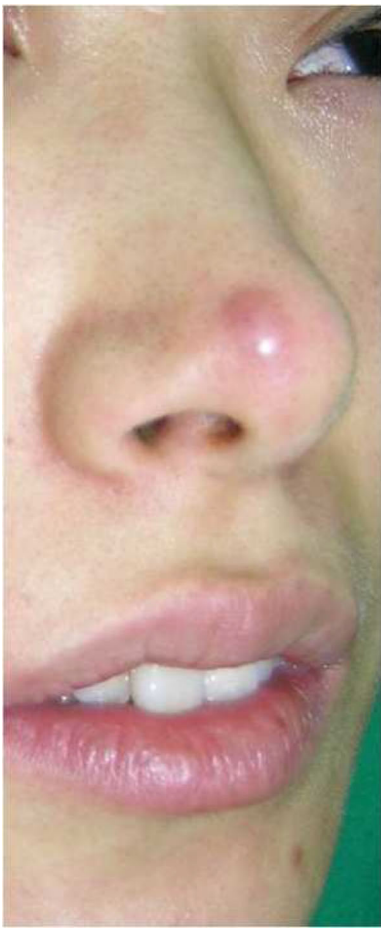

Fig. 3 Right oblique view of nasal tip showing foreign body granuloma post-filler injection

fat grafting shows an improvement in skin condition and contour of nasal dorsum (Fig. 20).

Case 6

A 26-year-old male who underwent nasal tip plasty with cartilage grafting was grafted with 3 cc of buccal fat graft to camouflage the cartilage grafts at the nasal tip. Follow-up after 7 months shows minimal loss of graft (Figs. 21, 22, 23, 24, 25).

Case 7

The patient is a 25-year-old female with thinned nasal tip and contour deformity post-removal of silicone implant (Fig. 26). Two cc of buccal fat graft was inserted into the defect at the nasal tip. One year later, there is an improvement in contour and appearance of the nasal tip (Fig. 27).

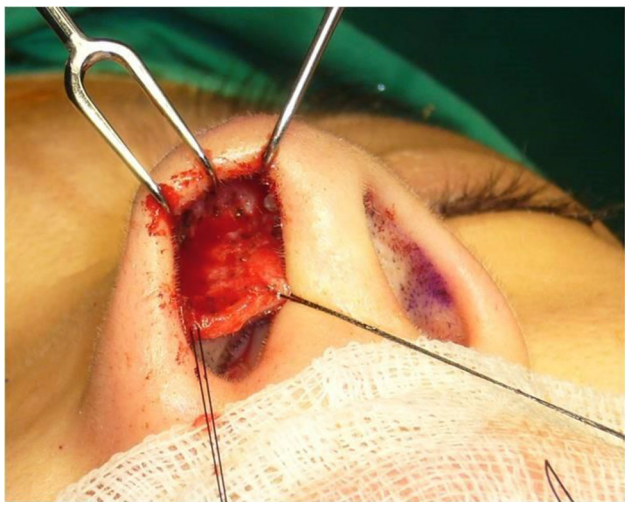

Fig. 4 Right alar rim incision to remove foreign body granuloma

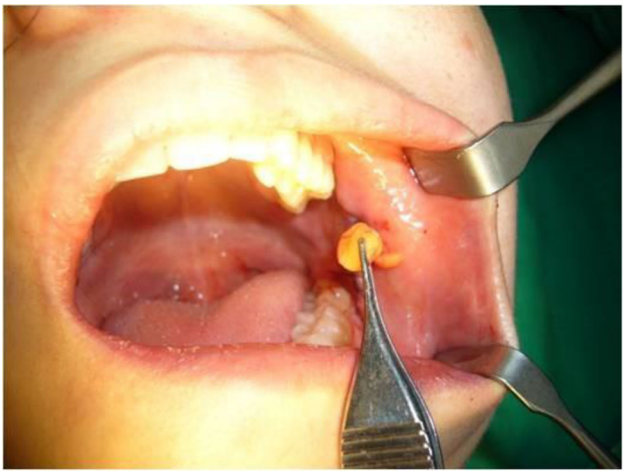

Fig. 5 Buccal fat graft harvested from left cheek

Fig. 6 Buccal fat graft inserted in the potential space post-removal of silicone granuloma

Fig. 7 Frontal view of nasal tip showing improved appearance and reduced inflammation 3 months post-operatively

Case 8

The patient is a 44-year-old male presented with asymmetric nasal tip (Fig. 28). Two cc of buccal fat graft was inserted to correct the asymmetry. On follow-up, 7 months later there is symmetry of the nasal tip with minimal resorption of the buccal fat graft (Fig. 29).

Case 9

The patient is a 67-year-old female with sunken upper eyelids post-blepharoplasty which was done elsewhere (Fig. 30). Four cc of buccal fat was grafted into each eyelid. On follow-up 2 years later, there is mild correction of her sunken eyelids (Fig. 31).

Discussion

The use of autologous fat grafts to correct contour deformities and improve skin appearance is not a novel one. One of the earliest uses of fat in the literature was for correction of contour deformities [4] as well as for improvement in scar quality [5]. This early en-bloc transfer of fat had good immediate effects but fell out of favour due to its poor long-term results [6]. The interest in fat grafting was rekindled by the advent of liposuction in the 1980s and systematization of fat grafting techniques in the 1990s [6].

Although liposuction and lipografting have become a popular method of transferring autologous fat grafts for augmentation and contour correction, the technique is not without its inherent disadvantages. Firstly, special equipment in the form of cannulas, syringes and liposuction machines is required. Secondly, a distant site from the fat grafting site may need to be prepared for harvesting the fat grafts. Thirdly, the procurement of fat grafts depends on the amount of available fat in the donor area which may be reduced in thin/athletic individuals. In these thin or athletic individuals, a good volume of buccal fat can still be found [7, 8]. Finally, even though the entry site for the liposuction cannulas is usually placed at hidden sites, they still do leave scars which may be disturbing to some patients for a short period of time. We chose to use the buccal fat graft for the simple reason that the donor area and any trace of scars are well hidden on the inner aspect of the cheek. The

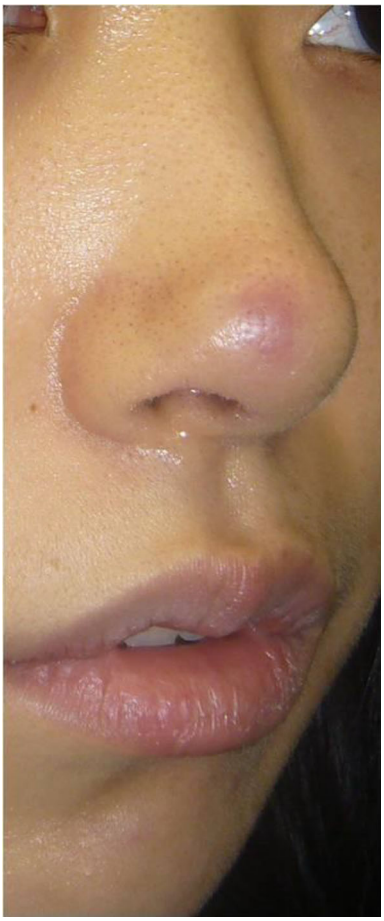

Fig. 8 Right oblique view of nasal tip 3 months post-buccal fat grafting with improved skin appearance and resolved inflammation

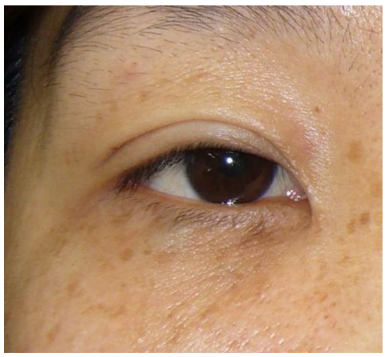

Fig. 9 Frontal view of lower eyelid venous malformation

Practice Advisory on Liposuction even lists fat embolism, thromboembolism and lidocaine toxicity among its lists of severe complications from liposuction [9].

Dermo-fat grafts are also good options for augmentation of volume defects; however, the procurement of these grafts is labour intensive with the need for a second operation site for harvest of graft. Dermo-fat grafts are also prone to shrinkage after transfer [10].

Fig. 10 Venous malformation of lower eyelid seen with lower eyelid retracted

Fig. 11 Intraoperative view of venous malformation resection showing potential space

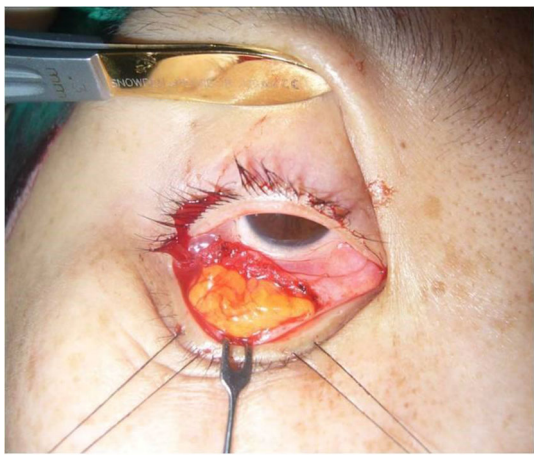

Fig. 12 Intraoperative view post-resection of venous malformation and insertion of buccal fat graft

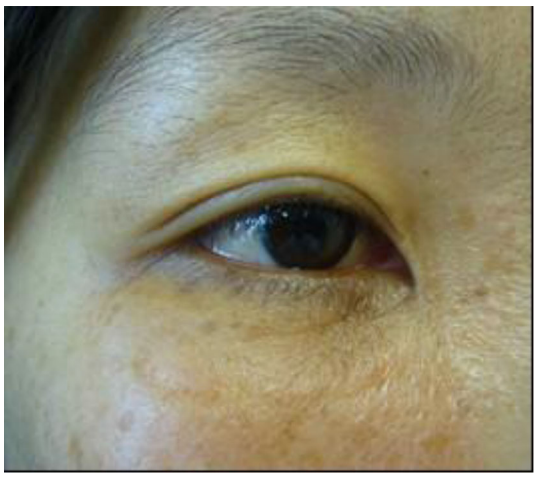

Fig. 13 Result 3 years post-resection of venous malformation showing good contour with no graft volume loss

Fig. 14 Results post-buccal fat graft with eyelid retracted

Fig. 15 Periorbital depression post-excision of neurofibroma

Fig. 16 Seven months post-buccal fat graft insertion shows improved periorbital contour

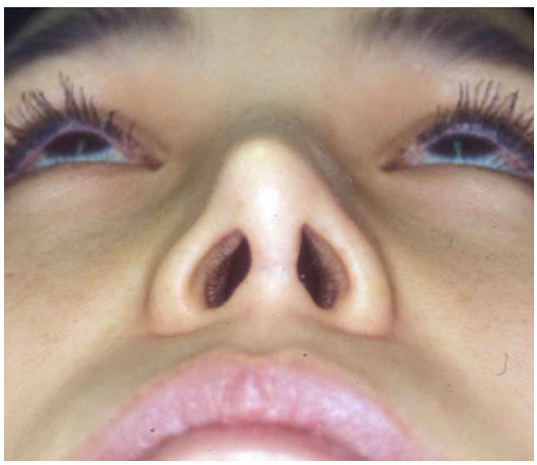

Fig. 17 Thinned columella post-solid silicone implant insertion

Buccal fat has been used extensively as a pedicled flap to treat oro-antral fistulas as well as post-excisional surgical defects around the oral cavity [11–13]. However, there is limited literature on the surgical use of free buccal fat grafts as a reconstructive tool or tool for augmentation [14, 15].

In the experience of the senior author, JT Kim, clinical applications of buccal pad of fat are for correction of small to moderate amounts of soft tissue volume loss. Chakrabarthi et al. [16] similarly found that a buccal fat flap could be used to cover small to moderate defects of about 4 cm in

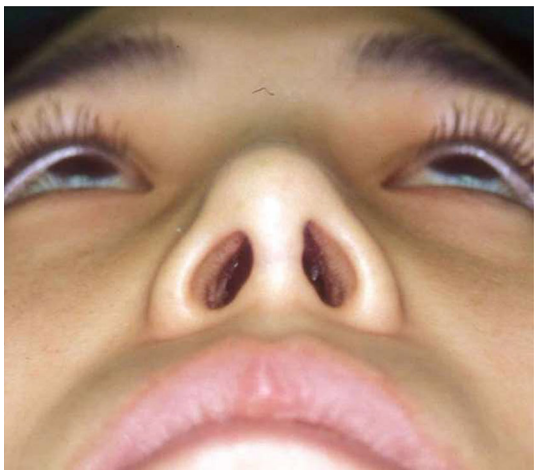

Fig. 18 Improvement in shape and volume of columella post-buccal fat graft insertion

Fig. 19 Thinned skin over nasal dorsum post-solid silicone implant insertion

diameter in their series of 29 cases. Shrivastava et al. [17] mention that any stretching of the buccal fat graft to cover defects larger than 4 cm may lead to dehiscence from impairment in the vascularity of the flap. However, lesions as large as 6 cm in diameter have been successfully covered so long as the bed of the defect is well vascularized.

The buccal fat graft can also be used as a camouflage graft over a nasal implant post-rhinoplasty and as volume

Fig. 20 Improvement in quality of skin and contour post-grafting with buccal fat graft

replacement in secondary rhinoplasty post-foreign body removal. The idea of using a fat graft to camouflage over implants has been used previously in aesthetic breast augmentation with implants [18, 19]. In breast augmentation, fat grafting was used to camouflage the breast implants under thin skin or when the implant was placed in a subglandular pocket in thin individuals. Similarly, buccal fat grafts were successfully used as a spacer or barrier in the thinned skin after silicone implant for augmentation rhinoplasty as well in our series of cases. The senior author has also used pedicled buccal fat grafts to prevent against Frey's syndrome post-parotidectomy [20].

The results from our group of 15 patients suggest that the buccal fat graft is an effective option for filling various small to moderate contour defects post-resection in the head and neck area. It was also successfully used to treat complications from the use of solid silicone implants for nasal augmentation. We found that the buccal fat graft not only served as an effective barrier and prevented extrusion of the implant, but also served as a volumizer to augment the thinned-out skin from the use of these implants. In addition, we also found a reduction in inflammation on the skin, especially where nasal implants were, and an improvement in the appearance of the skin.

Fig. 21 Buccal fat graft used as camouflage graft post-nasal tip plasty—frontal view

Fig. 22 Buccal fat graft used as camouflage graft post-nasal tip plasty—right oblique view

Huang SH et al. found in their animal study that fat grafting reduced levels of neuronal nitric oxide synthase, inducible nitric oxide synthase, COX2 as well as interleukin-1 beta and tumour necrosis factor beta on burnt skin compared to non-grafted rats [21]. This probably explains the reduction in inflammation post-grafting for our patient (Case 1). In the case of an exposed implant on the nasal dorsum, the skin healed well with minimal scarring and with improved colour and texture of skin (Case 5). Although we could not quantitatively prove it in this study, we theorize that it could be due to the stem cell effect from the buccal fat graft.

Farré-Guasch et al. in their in vitro study showed that stem cells were found in the stromal vascular fraction around buccal fat pad fat cells as well as from the dedifferentiated fat cells (DFAT) obtained from buccal fat pad fat cells themselves. They also found these stem cells to be similar to abdomen-derived fat stem cells [22]. Subsequently, whole fat grafts have been found to contain twice the quantity of stem cells compared to lipoaspirated fat [23]. This was further explained by the fact that stem cells were mainly located around the large vessels surrounding the fat cells. Therefore, a piece-meal transfer of fat like buccal fat could be more advantageous compared to lipoaspirated fat. Other in vitro

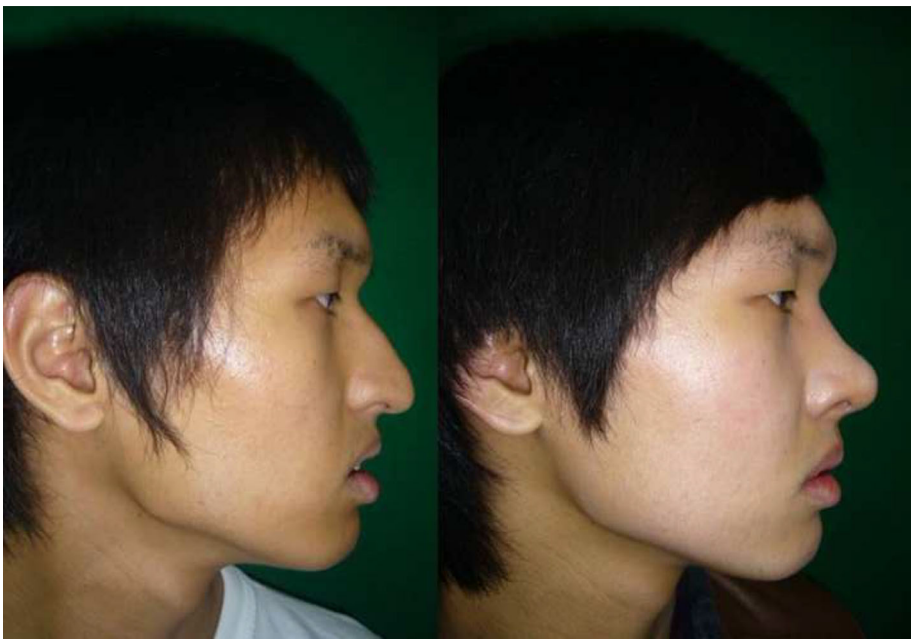

Fig. 23 Buccal fat graft used as camouflage graft post-nasal tip plasty—right lateral view

Fig. 24 Buccal fat graft used as camouflage graft post-nasal tip plasty—left oblique view

studies have also demonstrated that buccal fat pad-derived stem cells expressed CD34 markers which have been shown to stimulate neovascularization as well as facilitate healing of scarred and injured tissue [24, 25]. Further comparative in vitro studies may be needed to compare the yield of stem cells from both buccal fat pad and lipoaspirated fat.

The senior author did not have any difficulty or complications from the harvest of buccal fat as the amount harvested was relatively small ($\sim$1–5 cc). Nonetheless, disadvantages of use include the possibility of injury to the parotid duct and buccal branch of the facial nerve. If bleeding is not secured, it could result in haematoma and ecchymosis over the cheek [26]. The senior author utilizes a delicate approach coupled with a detailed knowledge of the buccal fat pad anatomy for a successful harvest of this delicate tissue.

Fig. 25 Buccal fat graft used as camouflage graft post-nasal tip plasty—left lateral view

Fig. 26 Thinned nasal tip post-augmentation with silicone implant

Fig. 27 Improved contour 3 months later and volume post-buccal fat graft insertion as camouflage graft

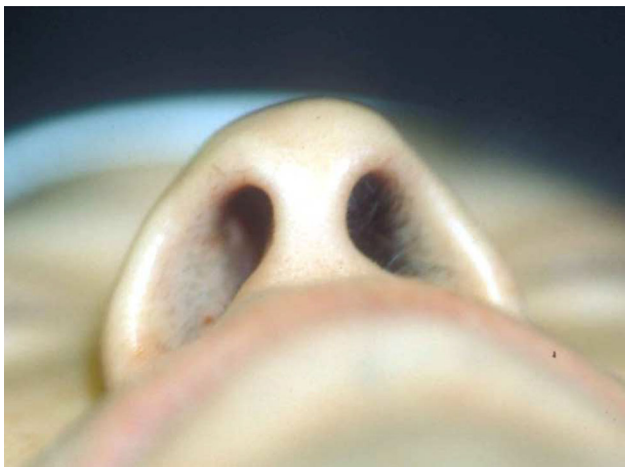

Fig. 28 Asymmetric nasal tip

Fig. 29 Improvement in asymmetry with buccal fat graft

Fig. 30 Sunken upper eyelid post-blepharoplasty

Fig. 31 Minimal improvement in contour post-correction with buccal fat grafts

Conclusion

The buccal fat pad serves as an excellent option as a graft for soft tissue replacement in the facial region, especially in periorbital and nasal areas. The ease of harvest and proximity to operating area make it a good choice as a source of volume replacement. Complications can be prevented by accurate knowledge of the vascular anatomy around the buccal fat pad.

Compliance with Ethical Standards

Conflict of interest The authors declare that they have no conflicts of interest to disclose.

References

1. Yousuf S, Tubbs RS, Wartmann CT, Kapos T, Cohen-Gadol AA, Loukas M (2010) A review of the gross anatomy, functions, pathology, and clinical uses of the buccal fat pad. Surg Radiol Anat 32(5):427–436
2. Loukas M, Kapos T, Louis RG Jr, Wartman C, Jones A, Hallner B (2006) Gross anatomical, CT and MRI analyses of the buccal fat pad with special emphasis on volumetric variations. Surg Radiol Anat 28(3):254–260
3. Zhang HM, Yan YP, Qi KM, Wang JQ, Liu ZF (2002) Anatomical structure of the buccal fat pad and its clinical adaptations. Plast Reconstr Surg 109(7):2509–2518 **(discussion 2519–2520)**
4. Czerny V (1895) Drei plastische operationen. III. Plasticher Ersatz der Brustdruse durch ein Lipom. Arch F Klin Chir 50:544–550
5. Neuber G (1893) Uber die Wiederanheilung vollstandig vom Korper getrennter, die ganze Fettschicht enthaltender Hautstucke. Zbl f Chi 30:16–17
6. Mazzola RF, Mazzola IC (2015) History of fat grafting: from ram fat to stem cells. Clin Plast Surg 42(2):147–153
7. Tideman H, Bosanquet A, Scott J (1986) Use of the buccal fat pad as a pedicled graft. J Oral Maxillofac Surg 44(6):435–440
8. Stuzin JM, Wagstrom L, Kawamoto HK, Baker TJ, Wolfe SA (1990) The anatomy and clinical applications of the buccal fat pad. Plast Reconstr Surg 85(1):29–37
9. Iverson RE, Lynch DJ, American Society of Plastic Surgeons Committee on Patient Safety (2004) Patient advisory on Liposuction. Plast Reconstr Surg 113(5):1478–1490
10. Hintschich C (2017) [Dermofat grafting]. Ophthalmologe 114(8): 755–758
11. Toshihiro Y, Nariai Y, Takamura Y, Yoshimura H, Tobita T, Yoshino A, Tatsumi H, Tsunematsu K, Ohba S, Kondo S, Yanai C, Ishibashi H, Sekine J (2013) Applicability of buccal fat pad grafting for oral reconstruction. Int J Oral Maxillofac Surg 42(5):604–610
12. Jung BK, Song SY, Kim SH, Kim YS, Lee WJ, Hong JW, Roh TS, Lew DH (2015) Lateral oropharyngeal wall coverage with buccinator myomucosal and buccal fat pad flaps. Arch Plast Surg 42(4):453–460
13. Rattan V, Rai S, Vaiphei K (2008) Use of buccal pad of fat to prevent heterotopic bone formation after excision of myositis ossificans of medial pterygoid muscle. J Oral Maxillofac Surg 66(7):1518–1522
14. Kim JT, Ho SY, Hwang JH, Sung KY (2014) Efficacy of the buccal fat pad graft in facial reconstruction and aesthetic augmentation. Plast Reconstr Surg 133(1):83e–85e
15. Kablan F (2015) The use of buccal fat pad free graft in regenerative treatment of peri-implantitis: a new and predictable technique. Ann Maxillofac Surg 5(2):p179–p184
16. Chakrabarthi J, Tekriwal R, Ganguli A, Gosh S, Mishra PK (2009) Pedicled buccal fat pad flap for intraoral malignant defects: a series of 29 cases. Indian J Plast Surg 42(1):p36–p42
17. Shrivastava G, Padhiary S, Pathak H, Panda S, Lenka S (2013) Buccal fat pad to repair intraoral defects. Int J Sci Res Publ 3(2):p1–p4
18. Auclair E (2009) Benefit of complementary lipofilling in aesthetic breast augmentation with implant. Ann Chir Plast Esthet 54(5):491–495
19. Auclair E, Anavekar N (2013) Composite breast augmentation: soft tissue planning using implant and fat. Plast Reconstr Surg 132(3):558–568
20. Kim JT, Naidu S, Kim YH (2010) The buccal fat: a convenient and effective autologous option to prevent frey syndrome and for facial contouring following parotidectomy. Plast Reconstr Surg 125(6):1706–1709
21. Huang SH, Wu SH, Chang KP, Cheng KI, Lee SS, Kwan AL, Yeh JL, Tsai HP, Lin SD, Lai CS (2014) Autologous fat grafting

alleviates burn-induced neuropathic pain in rats. Plast Reconstr Surg 133(6):1396–1405
22. Farré-Guasch E, Martí-Pagè C, Hernádez-Alfaro F, Klein-Nulend J, Casals N (2010) Buccal fat pad, an oral access source of human adipose stem cells with potential for osteochondral tissue engineering: an in vitro study. Tissue Eng Part C Methods 16(5):1083–1094
23. Yoshimura K, Sato K, Aoi N, Kurita M, Hirobi T, Harii K (2008) Cell-assisted lipotransfer for cosmetic breast augmentation: supportive use of adipose-derived stem/stromal cells. Aesthet Plast Surg 32:48–55
24. Planat-Benard V, Silvestre JS, Cousin B, André M, Nibbelink M, Tamarat Clergue M, Manneville C, Saillan-Barreau C, Duriez M, Tedgui A, Levy B, Pénicaud L, Casteilla L (2004) Plasticity of human adipose lineage cells toward endothelial cells: physiological and therapeutic perspectives. Circulation 109(5):656–663
25. Madonna R, De Caterina R (2007) In vitro neovasculogenic potential of resident adipose tissue precursors. Am J Physiol Cell Physiol 295(5):C1271–C1280
26. Matarasso A (2006) Managing the buccal fat pad. Aesthet Surg J 26(3):330–336