



## CASE REPORT

# Reconstruction of maxillary palatal defects after partial maxillectomy using a pedicled buccal fat pad and a nasolabial flap

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## Abstract

The novelty of this procedure is the reconstruction of a maxillary palatal defect with two pedicled flaps: a pedicled buccal fat pad and a nasolabial flap. This use of combination flaps makes the surgery simple, short, and useful for a wide defect. The novelty of this procedure is the reconstruction of a maxillary palatal defect with two pedicled flaps: a pedicled buccal fat pad and a nasolabial flap. This use of combination flaps makes the surgery simple, short, and useful for a wide defect.

## KEYWORDS

buccal fat pad, maxillary cancer, nasolabial flap, reconstruction

## 1 | INTRODUCTION

Three cases with maxillary palatal defects of different sizes after partial maxillectomy were reconstructed with pedicled buccal fat pads and nasolabial flaps. This approach overcame problems of osteotomy with a pedicled buccal fat pad alone, and simplified surgical procedures and reduced the operative time.

Maxillary palatal defects due to tumor resection require immediate reconstruction because they may create many morphological and functional disorders. Reconstruction of these defects with tissues is often performed with recovery of function with an obturator because there is no appropriate surrounding tissue and reconstruction with a free flap needs an enlarged operative field.<sup>1</sup>

Egyedi<sup>2</sup> reported good outcomes of skin implantation using a pedicled buccal fat pad (pBFP) and thick skin tissues

in patients with oroantral and oronasal communications. The reconstruction method with a pBFP is effective for maxillary palatal defects.<sup>3</sup> Most published studies have reported a high success rate due to the rich vascularity of a pBFP, low donor-site morbidity and the simple surgical procedure for grafting.<sup>3</sup> Also, the transplanted pBFP changes to fibrous connective tissues and can fully support the load of a prosthesis device.<sup>4-6</sup> However, there is a limitation on the coverage range of defects.<sup>7</sup>

Use of a nasolabial flap (NF) is one of the oldest techniques for replacement of orofacial soft tissue defects.<sup>8</sup> It has advantages of the donor site being in the same operating field, reliable and rich vascularity, versatility in design, proximity to the defect, and ease of flap elevation.<sup>9</sup> This method is indicated for small- or medium-sized defects due to the limitation of length and width.<sup>10</sup>

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Here, we report three cases in which we used a pBFP in combination with a NF to facilitate recovery of function for large defects that could not be fully covered by transplantation with a pBFP alone.

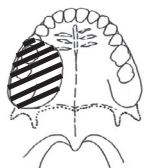
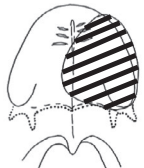

## 2 | CASE REPORTS

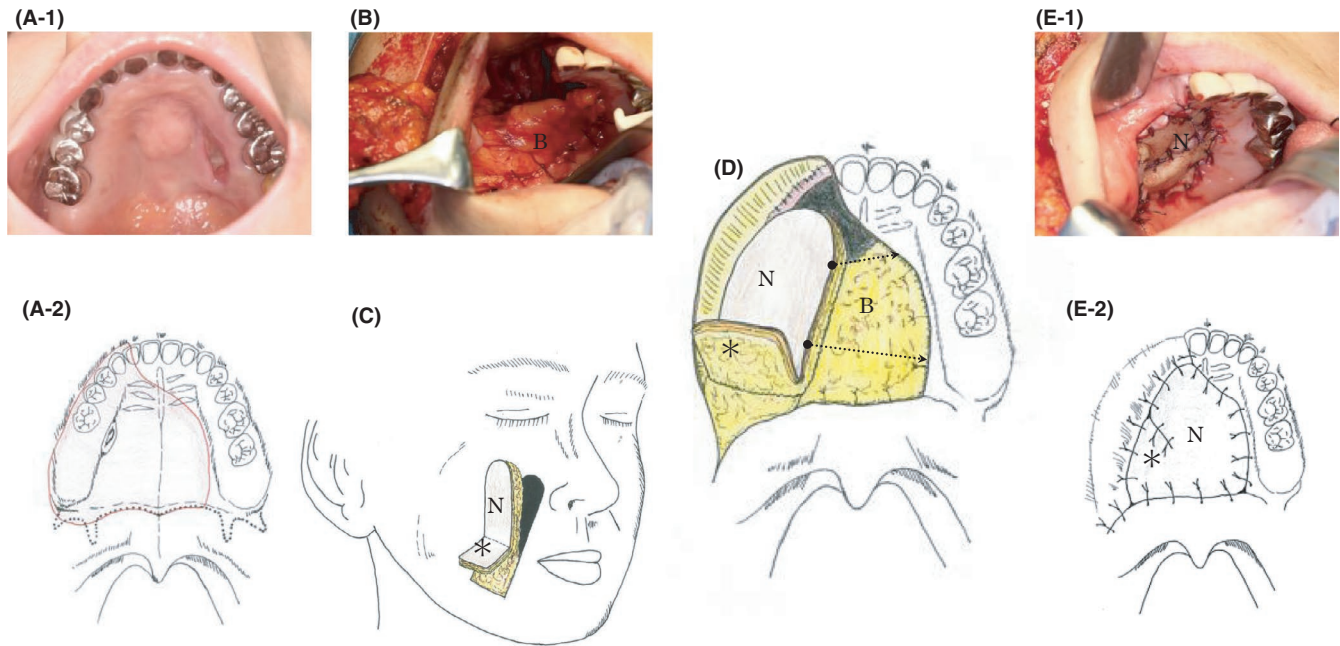
The three patients (1 male and 2 females) underwent reconstruction of oroantral and oronasal communications using a NF and pBFP after partial maxillectomy from January 2016 to September 2017 in the Department of Oral and Maxillofacial Surgery at Kameda General Hospital. The primary disease was squamous cell carcinoma (SCC) in two patients and mucoepidermoid carcinoma (MC) in one. No cervical lymph node metastasis or distant metastasis was observed in all cases. All patients had oroantral and/or oronasal communications after resection (Table 1). No necrosis, infection, or severe scar contracture in grafts was found in any patients. The wound stabilized, ingestion was started and rehabilitation was performed with appropriate denture within 10 days after surgery in all patients. The postoperative oronasal communication (8×5 mm in size) in the posterior midline end was found in Case 3, which was largest defect after partial maxillectomy, one month after surgery. No preoperative or postoperative radiation therapy was given in all cases.

## 2.1 | Surgical technique and procedure

After partial maxillectomy (Figure 1 A-1, 2), oroantral and oronasal communications due to maxillary palatal defects were closed using a pBFP and NF. First, an extensive incision was made from the efferent retromolar mucosa toward the anterior border of the mandibular ramus to establish a good surgical field. The buccinator and zygomaticus major muscles were cut, and the dissection was carefully performed to create sufficient openings for pulling out the capsule overlying the fat pad atraumatically. Then, the pBFP was fixed with absorbable sutures on the marginal palatal mucosa covering the posterior defect to form the maxillary sinus floor and bilateral nasal cavity floor (Figure 1B). Subsequently, a bell-shaped flap was marked on the nasofacial groove on the same side of the defect (Figure 1C). The base of the flap was placed a little above the level of the oral commissure. The NF was kept above the mimetic muscle and the skin of the base part of the flap was separated as a pedicled partial thickness graft (Figure 1D). The modified NF was then transferred intraorally through a transbuccal tunnel. The flap covered the remaining anterior defects and was sutured on the buccal mucosa. The pBFP and NF were fixed with absorbable suture to prevent dead space. Lastly, the part of the pedicled partial thickness graft of the NF was folded toward the exposed pBFP and sutured to cover all the defect completely (Figures 1E-1,2).

TABLE 1 Summary of patient characteristics

Item	Case		
Case Number	1	2	3
Sex	M	F	F
Age	80	87	65
Diagnosis	Right maxillary gingival carcinoma T2N0M0	Left maxillary gingival carcinoma T3N0M0	Right maxillary mucoepidermoid carcinoma T4aN0M0
Resection area			
Defect size (cm)	4.2 × 3.9	5.2 × 4.8	6.3 × 6.8
Oroantral communication size (cm)	Rt: 2.2 × 1.8	Lt: 3.0 × 1.8	RT: 2.8 × 2.0 LT: 2.1 × 1.0
Oronasal communication size (cm)	–	Lt: 1.3 × 1.0	4.5 × 1.2
PNS after resection	Yes	Yes	No
Operation time (min)	141	111	224
Bleeding (ml)	100	70	480
Start of postoperative ingestion (days)	7	5	10
Outcome	Good	Good	Partial dehiscence



**FIGURE 1** Preoperative and intraoperative intraoral photographs, Surgical outline (Case 3). (A-1) Intraoral photograph after biopsy (mirror image), showing diffuse swelling in the left palatal mucosa. (A-2) Primary tumor and resected margin. (B) After transplantation with a pBFP. B: Buccal fat pad. (C) Design of the nasolabial flap. Skin on the peripheral side in the nasolabial fold flap was not completely removed and was folded (asterisk). N: Nasolabial flap. (D) Oroantral and oronasal communications were closed with a pBFP and NF. The pBFP was sutured to cover the soft palate to the midline palate, and the NF was sutured with mucosa in the unaffected side (arrowhead). Folded skin was used for filling of the mucosal defect and completely closed with buccal mucosa. (E-1, 2) Transplantation with a nasolabial fold flap, which was fixed and sutured to cover the pBFP

Case 1 was an 80-year-old male patient who visited our department with a chief complaint of discomfort due to an ulcerated lesion in the right maxillary gingiva. The patient had a history of hypertension, diabetes, arrhythmia, and chronic renal failure. An anesthesiologist diagnosed the case as American Society of Anesthesiologists physical status (ASA-PS) class 3. The lesion was determined to be maxillary gingival carcinoma (SCC, moderately differentiated type) based on clinical, radiographic examination, and histopathological findings. The region to be resected was from the right maxillary tuberosity to the upper right 4 and the subject underwent partial maxillectomy under general anesthesia. After resection, a defect of  $4.2 \times 3.4$  cm in size (oroantral communication:  $2.2 \times 1.8$  cm) was detected and closed with a pBFP and NF. The wound was stabilized after suture removal at 7 days after surgery. Then, the patient started ingestion, and an appropriate partial denture was provided.

Case 2 was an 86-year-old female patient who visited our department with a chief complaint of pain due to an ulcerated lesion in the left maxillary gingiva. The patient had a history of mandibular gingival cancer, hypertension, and chronic renal failure. An anesthesiologist diagnosed the case as ASA-PS class 3. The lesion was determined to be maxillary gingival carcinoma (SCC, well-differentiated type) based on clinical, radiographic examination, and histopathological

findings. The region to be resected was from the left maxillary tuberosity to the left maxillary canine and the area over the maxillary midline. The patient underwent partial maxillectomy under general anesthesia. After resection, a defect of  $5.2 \times 4.8$  cm in size (oroantral communication:  $3.0 \times 1.8$  cm, oronasal communication:  $1.3 \times 1.0$  cm) was detected and closed using a pBFP and NF. The wound was stabilized 5 days after surgery. Then, the patient started ingestion, and an appropriate partial denture was provided.

Case 3 was a 65-year-old female patient who visited our department with a chief complaint of diffuse swelling and discomfort in the right palatal mucosa. The patient had a history of arrhythmia, chronic renal failure, and anemia. An anesthesiologist diagnosed the case as ASA-PS class 3. The lesion was determined to be a malignant salivary gland tumor (low-grade mucoepidermoid carcinoma) based on clinical, radiographic examination, and histopathological findings. The regions to be resected were the upper right 2 in the anterior area, the right sphenoid bone and the posterior nasal spine (PNS) in the posterior area, and lower parts of the lateral nasal wall and vomer bone in the superior area (Figure 1A-2). After resection, there were maxillopalatal defects of  $6.3 \times 6.8$  cm (oroantral communications:  $2.8 \times 2.0$  cm on the right side,  $2.1 \times 1.0$  cm on the left side,  $4.5 \times 1.2$  cm in the bilateral oronasal communications). The oroantral and

oronasal communications were closed by a pBFP and NF. The wound was stabilized after suture removal 10 days after surgery. Then, the patient started ingestion, and an appropriate partial denture was provided.

The wound was found to be dehiscent toward the posterior flap end approximately one month after surgery (Figure 2A). Consequently, an oronasal communication was closed with a mucoperiosteal flap under local anesthesia (Figure 2B).

### 3 | DISCUSSION

The objective of closure of oroantral and/or oronasal communications after partial maxillectomy is functional recovery of articulation, mastication and swallowing, and recovery of the physiological functions of the maxillary sinus and nasal cavity. The approaches include reconstruction with an obturator, pedicled flap and free flap.

Small defects of less than a half of the maxillary alveolus and hard palate can be recovered functionally and

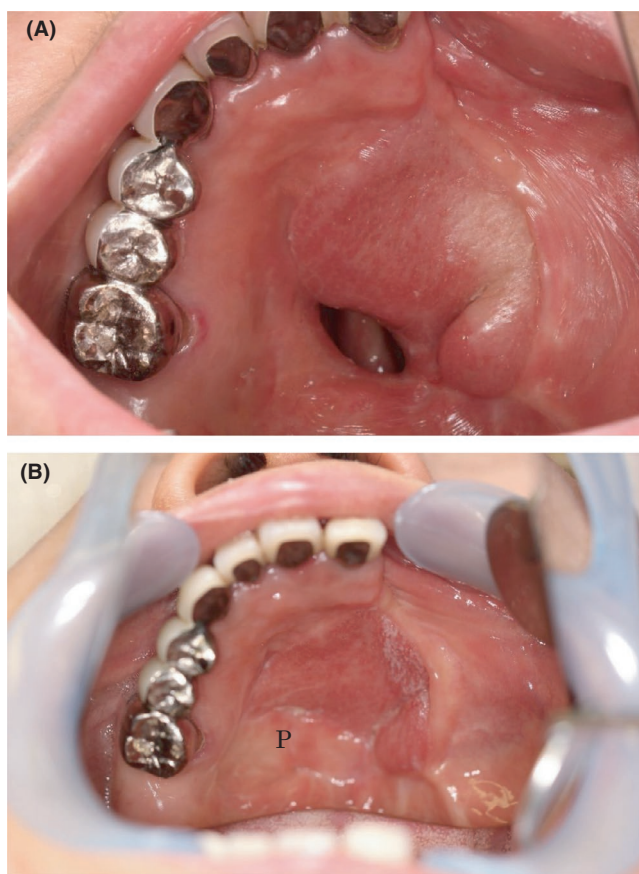
cosmetically with dentures.<sup>7</sup> Filling with flaps into a defect is necessary to support long-term stability of velopharyngeal insufficiency and can also improve QoL. A study of the relationship of mastication capacity, defect size and form and remaining teeth in patients with a dental obturator showed that mastication capacity was higher in patients with a dentate than in those with an edentulous jaw, and also higher in patients with maxillary defects not exceeding the midline.<sup>1</sup> An obturator for the reconstruction of a defect is the traditional approach to rehabilitation and is still widely practiced. However, this requires patients to keep visiting hospital for adjustment of occlusion and/or fitting. It is often difficult for elderly patients to tolerate continuous adjustment, and an ill-fitting obturator might require changes to the dietary pattern or make it difficult to eat, which may lead to decreased QoL.

In recent years, reconstruction of maxillary palatal defects has progressed, and vascularized bone grafts and occlusal reconstruction with dental implants have become good treatment options.<sup>11</sup> However, the surgical procedure is complicated and more invasive than soft tissue reconstruction only. Moreover, aging of society has progressed worldwide, especially in developed countries, and thus, the number of elderly patients has increased.<sup>12</sup> Both age and systemic diseases are risks for surgery, and thus, some patients cannot undergo a vascularized bone or soft tissue graft. Also, the cost for complex surgery including dental implant placement may be a burden for patients. Therefore, simple and short surgery is a particularly good option for elderly patients to shorten the hospital stay and reduce postoperative complications.

The method described in this case series is indicated for patients with a maxillary palatal defect who require short-term surgery based on their general condition, such as age and underlying disease, of ASA-PS class 3.

A pBFP is widely used for reconstruction of defects after maxillary tumor resection, closure of oroantral and/or oronasal communications, and reconstruction of the facial bucca for esthetic reasons.<sup>13</sup> It has the following advantages: (1) easy-to-use graft sampling, (2) abundant blood flow, and (3) great plasticity and a deformable structure without disruption by pressure and extension.<sup>14</sup> Moreover, a pBFP does not disappear, even in elderly patients, and is unlikely to shrink, even if body fat in other regions disappears due to malnutrition.<sup>15</sup> Transplantation with a pBFP is indicated for a small-to-moderate maxillary palatal defect, which is up to 4 cm in diameter.<sup>2</sup> Therefore, there is problem of limited coverage of the defect<sup>16</sup> and a high possibility of wound dehiscence if the defect is over 4 cm long.<sup>17</sup>

A NF is a common name for local flaps formed in the border of the nasolabial fold, an esthetic unit, and is used for primary reconstruction of the nasal wing and bridge, and other neighboring areas because of its good color and texture.



**FIGURE 2** Postoperative intraoral photograph (Case 3) at 1 month after surgery. (A) An oronasal communication was found at the border of the midline transplanted area and soft palate (mirror image). (B) The oronasal communication was closed with the mucosal and periosteal flap in the unaffected palate (mirror image). P: Palatal rotation flap

<sup>18</sup> The advantages of the NF are as follows: (1) easy-to-use flap sampling, (2) collection from neighboring areas flanked by the oral cavity, (3) good blood circulation, (4) free to move, and (5) almost inconspicuous scars at sampling points matching the nasolabial fold.<sup>19</sup> On the other hand, the disadvantages are that it is not suitable for reconstruction for wide defects due to the limited collection site and that scars on the wound remain after surgery, resulting in esthetic problems (Figure 3). The NF receives nutrition from the vascular networks anastomosing the facial and canthus arteries. These vessels can be elevated in an axial pattern flap; however, for a rotation flap such as that used in this procedure, these vessels are often elevated as a random pattern flap in the fat middle layer. A random pattern flap can be elevated as an elongated flap up to approximately 8 cm with a 1:4 of the ratio of pedicle to length.<sup>20</sup> Therefore, the length of the flap can be extended somewhat; however, it is still unlikely to be applicable to a wide defect.

Our procedure combining a pBFP and NF for reconstruction of maxillary defects has the following advantages: (1) simple surgical procedures and reduced operative time, (2) no descent of flaps after surgery, and (3) stable denture fabrication earlier after surgery, and (4) favorable design for wide defects. Since our combination flap was covered with the skin of the NF and a partial pedicled rotated skin graft over the pBFP, there is no need to wait for epithelialization in adipose tissue and achievement of early wound stabilization compared with a pBFP alone. Moreover, closure of oroantral and oronasal communications associated with a maxillary defect after partial maxillectomy has different characteristics compared to reconstruction of a skin defect on the body surface because of less anchorage to the transplanted floor. Either a pBFP or NF can receive

vascular flow from the base of the pedicled flap, and vascularization will start on the edge of the flaps, which are sutured on the muscle tissues of the soft palate or buccal and thin palatal mucosa. Double transplantation with a pBFP and NF overlapped with each other with a thick adipose surface can achieve wide vascularization in the overlapped area. This can produce a more stable and thicker reconstruction due to adipose scaffolds, compared to a single pedicle flap.

Regarding the defect size, we performed double transplantation with a pBFP and NF and achieved reconstruction against the maxillary palatal defect over the midline. Since our procedure combining a pBFP and NF used two pedicled flaps, the flaps were stretched in different directions to cover a wide defect with overlap. Therefore, this method is indicated for wider reconstruction than each single pedicled flap alone. The simplified surgical procedure using double transplantation with a pBFP and NF for reconstruction of wide partial maxillectomy defects achieved stable results. The postoperative facial features are shown in Figure 3. All patients had some postoperative scarring, but all were satisfied with the results.

Attention should be paid to reconstruction of resected maxillary areas over the midline, including the posterior nasal spine (PNS). The muscular system forming the soft palate consists of the tensor veli palatini, levator veli palatini, uvulae, grossopalatine, and palatopharyngeus muscles. These muscle tissues are attached with the palatal aponeurosis and PNS in the soft palate. Most of the muscle tissues are attached with the midline soft palate; consequently, it is assumed that traction force on the posterior soft palate becomes stronger when the soft palate is elevated by the swallowing reflex after PNS-included resection. Therefore, in case 3, we conclude that a nasal fistula gradually developed at the posterior end of the grafted region due to the start of ingestion. In such resection over the midline maxillary bone including the PNS, it is necessary to avoid traction of the soft palate toward the throat.

Maxillary reconstruction is difficult to standardize due to difference in the experience of the surgeon, the age and medical history of the patient, the expectations of the patient, the number of teeth remaining, and the cost for the treatment. There are several options available, but no articles reporting on wide closure of maxillary palatal defects using a pBFP and NF were identified. In our experience, this may be a useful option for patients who need simple and relatively quick maxillary reconstruction.

## ACKNOWLEDGEMENTS

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## CONFLICT OF INTEREST

None of the authors have a conflict of interest to disclose.



**FIGURE 3** Postoperative facial photograph (Case 1) at 6 months after surgery. NF was performed from the left nasolabial fold. Some postoperative scarring was observed, but the patient was able to be a complete denture and was satisfied esthetically

## AUTHOR CONTRIBUTIONS

SN: served as the main author and contributed to data acquisition and manuscript preparation. HM: contributed to data acquisition and manuscript writing. SW, HT: contributed to patient care. MT: edited manuscript. All authors approved the final version to be published.

## ETHICAL STATEMENT

Since there is no information that can identify individuals in this paper, approval by the committee is unnecessary.

## DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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## REFERENCES

- Koyama S, Sasaki K, Inai T, Watanabe M. Effects of defect configuration, size, and remaining teeth on masticatory function in post-maxillectomy patients. *J Oral Rehabil*. 2005;32:635-641.
- Egyedi P. Utilization of the buccal fat pad for closure of oro-antral and/or oro-nasal communications. *J Maxillofac Surg*. 1977;5:241-244.
- Singh J, Prasad K, Lalitha RM, Ranganath K. Buccal pad of fat and its applications in oral and maxillofacial surgery: a review of published literature. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*. 2010;110:698-705.
- Tideman H, Bosanquest A. Use of the buccal fat pad as a pedicled graft. *J Oral Maxillofac Surg*. 1986;44:435-450.
- Fujimura N, Nagura H, Enomoto S. Grafting of the buccal fat pad into palatal defects. *J Craniomaxillofac Surg*. 1990;18:219-222.
- Kugimoto T, Komura K, Tanaka T, Tomioka H, Shimamoto H, Harada H. Reconstruction of maxillopalatal defects after partial maxillectomy using a pedicled buccal fat pad covered with a polyglycolic acid sheet and fibrin glue. (in Japanese). *Jpn J Oral Maxillofac Surg*. 2014;60:527-531.
- Kim MK, Han W, Kim SG. The use of the buccal fat pad flap for oral reconstruction. *Maxillofac Plast Reconstr Surg*. 2017;39:5. <https://doi.org/10.1186/s40902-017-0105-5>
- Gewirtz HS, Eilber FR, Zarem HA. Use of the nasolabial flap for reconstruction of the floor of the mouth. *Am J Surg*. 1978;136:508-511.
- Sandeep BP, Durairaj D, Suresh K, Karthikeyan D, Pradeep D. Comparison of extended nasolabial flap versus buccal fat pad graft in the surgical management of oral submucous fibrosis: a prospective pilot study. *J Maxillofac Oral Surg*. 2017;16:312-321.
- Kallappa S, Shah N. Outcome of Nasolabial Flap in the Reconstruction of Head and Neck Defects. *Indian J Surg Oncol*. 2019;10:77-581.
- Andrades P, Militsakh O, Hasasono MM. Current strategies in reconstruction of maxillectomy defect. *Arch Otolaryngol Head Neck Surg*. 2011;137:806-812.
- Kanasi E, Ayilavarapu S, Jones J. The aging population: demographics and the biology of aging. *Periodontol 2000*. 2016;72(1):13-18.
- Alexander DR. The use of buccal fat pad for reconstruction of oral defects: review of the literature and report of 15 cases. *J Oral Maxillofac Surg*. 2000;58:158-163.
- Gaughran GRL. Fasciae of the masticatory space. *Anat Rec*. 1957;129:383-400.
- Stuzin JM. The anatomy and clinical applications of the buccal fat pad. *Plast Reconstr Surg*. 1990;85:29-37.
- Singh J, Prasad K, Lalitha RM, Ranganath K. Buccal pad of fat its application in oral and maxillofacial surgery: a review of published literature 2004 to 2009. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*. 2010;110:698-705.
- Rapidis AD, Alexandridis CA, Eleftheriadis E, Angelopoulos AP. The use of the buccal fat pad for reconstruction of oral defects: review of the literature and report of 15 cases. *J Oral Maxillofac Surg*. 2000;58:158-163.
- Cormack GC, Lamberty BGH. *The Arterial Anatomy of Skin Flaps*, 2nd edn. London: Churchill Livingstone; 1994:327-329.
- Tan NC, Hsieh CH, Riva FMG, Jeng SF. The nasolabial flap as a one stage procedure for reconstruction of intermediate to large lip defects with functional and aesthetic assessments. *J Plast Reconstr Aesthet Surg*. 2013;66:352-357.
- Spear SL, Kroll SS, Romm S. A new twist to the nasolabial flap for reconstruction of lateral alar defects. *Plast Reconstr Surg*. 1987;79:915-920.

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