



## Reconstruction of intraoral defects with superior labial artery musculo-mucosal flap: a preliminary clinical study

### Süperiyör labial arter muskulo-mukozal flep ile ağız içi defektlerinin rekonstrüksiyonu: Ön klinik çalışma

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**Objectives:** In this article, we present the use of the superior labial artery musculo-mucosal (SLAMM) flap for intraoral reconstruction.

**Patients and Methods:** The study included five patients (2 females, 3 males; mean age 36 years; range 11 to 56 years) who consulted at our clinic between October 2008 and January 2010. Five oral defects were reconstructed with the SLAMM flap. Three patients underwent reconstruction with SLAMM flap following oncologic resection. The other two patients had traumatic defects in the oral cavity which necessitated flap application. First, the distal end of the flap was incised and the superior labial artery was identified after dissection. After ligation of the artery, the mucosa, submucosa and the cuff of orbicularis oris muscle were elevated. The dissection was extended laterally and anteriorly, depending on the necessary flap size.

**Results:** None of the patients had partial or total flap necrosis. During the follow-up period, contracture developed in only one patient. Successful reconstruction was observed in all patients.

**Conclusion:** The superior labial artery musculo-mucosal flap is a simple and feasible technique which can be used for reconstruction of intraoral defects.

**Key Words:** Intraoral defect; musculo-mucosal flap; superior labial artery.

**Amaç:** Bu makalede, ağız içi rekonstrüksiyonu için süperiyör labial arter muskulo-mukozal (SLAMM) flep kullanımı sunuldu.

**Hastalar ve Yöntemler:** Ekim 2008 ve Ocak 2010 tarihleri arasında kliniğimizde konsültasyonu yapılan beş hasta (2 kadın, 3 erkek; ort. yaş 36 yıl; dağılım 11-56 yıl) çalışmaya dahil edildi. Beş ağız içi defekti SLAMM flep ile yeniden yapılandırıldı. Onkolojik rezeksiyonu takiben üç hastaya SLAMM flep onarımı uygulandı. Diğer iki hastada ağız içinde flep uygulamasını gerektiren travmatik defektler bulunmaktaydı. Öncelikle, flep distal ucu insize edildi ve diseksiyon sonrasında süperiyör labial arter belirlendi. Arterin bağlanmasından sonra, mukosa, submukoza ve kısmi orbikularis oris kası kaldırıldı. Diseksiyon, flep büyüklük ihtiyacına göre, lateral ve anteriyora doğru genişletildi.

**Bulgular:** Hiçbir hastada kısmi ya da tam flep nekrozu gözlenmedi. Takip süresince yalnızca bir hastada kontraktür gelişti. Tüm hastalarda başarılı rekonstrüksiyonun sağlandığı gözlemlendi.

**Sonuç:** Süperiyör labial arter muskulo-mukozal flep, intraoral defektlerin rekonstrüksiyonunda, kolay ve uygun bir tekniktir.

**Anahtar Sözcükler:** Ağız içi defekti; muskulo-mukozal flep; süperiyör labial arter.

Reconstruction of the mouth floor defects is a challenging problem. There are many anatomical and physiological properties to consider during the reconstruction procedure. Tongue mobility is an important factor that affects speech intelligibility and swallowing. The choice of reconstruction method must provide enough cushioning for dental prostheses. Although many methods are reported in literature for the reconstruction of mouth floor defects, there is no consensus among authors. Free skin grafts, local flaps, free flaps have been all used.<sup>[1-18]</sup> The main factor for choosing the right reconstruction method is the size of the defect.

After Bozola et al.<sup>[1]</sup> described buccal artery based musculo-mucosal flap with good surgical results, the facial artery and its branches attracted attention. Anatomical studies and the literature have reported that a facial artery musculo-mucosal (FAMM) flap can be used to reconstruct not only the floor of mouth defect, but also defects of the oral region, palate and the nasal septum. Recent studies have reported that the superior labial artery based musculo-mucosal flaps can be used to reconstruct the oral commissure and lower lip.<sup>[2-4]</sup>

In this article, the superior labial artery musculo-mucosal flap was used to reconstruct intraoral defects in five patients.

## PATIENTS AND METHODS

Between October 2008 and January 2010, we used the superior labial artery musculo-mucosal (SLAMM) flap for mouth floor defects in five patients (3 males, 2 females, mean age 36 years; range 11 to 56 years). The etiology of defects were trauma for two patients and tumor resection for three patients. (Table 1).

### Surgical anatomy

While the arterial anatomy of the perioral region is highly variable, the superior labial artery is a constant branch of the facial artery that separates from the facial artery 16 mm behind the lip

commissure.<sup>[5]</sup> The superior labial artery courses between the submucosa and orbicularis oris muscle and can be easily palpated at the inner and lower portion of the upper lip. The superior labial artery is 45.4 mm long and lies approximately 10 mm deep to the inferior border of the upper lip.<sup>[13]</sup> Generally, the superior labial artery has anastomoses with the contralateral superior labial artery at the level of philtrum. The concomitant vein is not always found, but there is a rich submucosal venous plexus.

### Surgical technique

Preoperatively, the course of the superior labial artery was defined through the use of hand doppler and the flap was designed with respect to the position of the artery. The artery was in the middle of the flap. The distal end of the flap was the mucosal area at the level of ipsilateral philtral column, while the proximal part was planned according to the size of the defect. In four of the cases, the pedicle was dissected up to the oral commissure. In one of the patients, the pedicle was dissected up to mandibula corpus, along the facial artery, while the inferior labial artery was cut and ligated. All of the flaps had antegrade flow. After surgical planning, the distal end of the flap was incised and the superior labial artery was ligated. The mucosa, submucosa and the cuff of orbicularis oris muscle were elevated and dissected to avoid any arterial injury. To increase the mobility of the flap, the inferior labial artery was ligated at the oral commissure level. The average width of the flap and the average length of the pedicle were 20 mm and 50 mm respectively. The donor site was closed primarily. During the postoperative period a nasogastric tube was used to avoid suture contamination (Figure 1, 2).

## RESULTS

All of the flaps survived. Revision surgery was not needed nor was tongue function of impaired in any patient. Two patients used dental prostheses after

**Table 1.** The demographic properties of patients

No	Sex	Age (years)	Etiology	Comorbidity	Follow-up (months)
1	Male	11	Fibroma		15
2	Male	40	Trauma	Mandibula fracture	18
3	Female	56	Squamous cell carcinoma		12
4	Female	24	Trauma	Mandibula fracture	26
5	Male	50	Squamous cell carcinoma		9

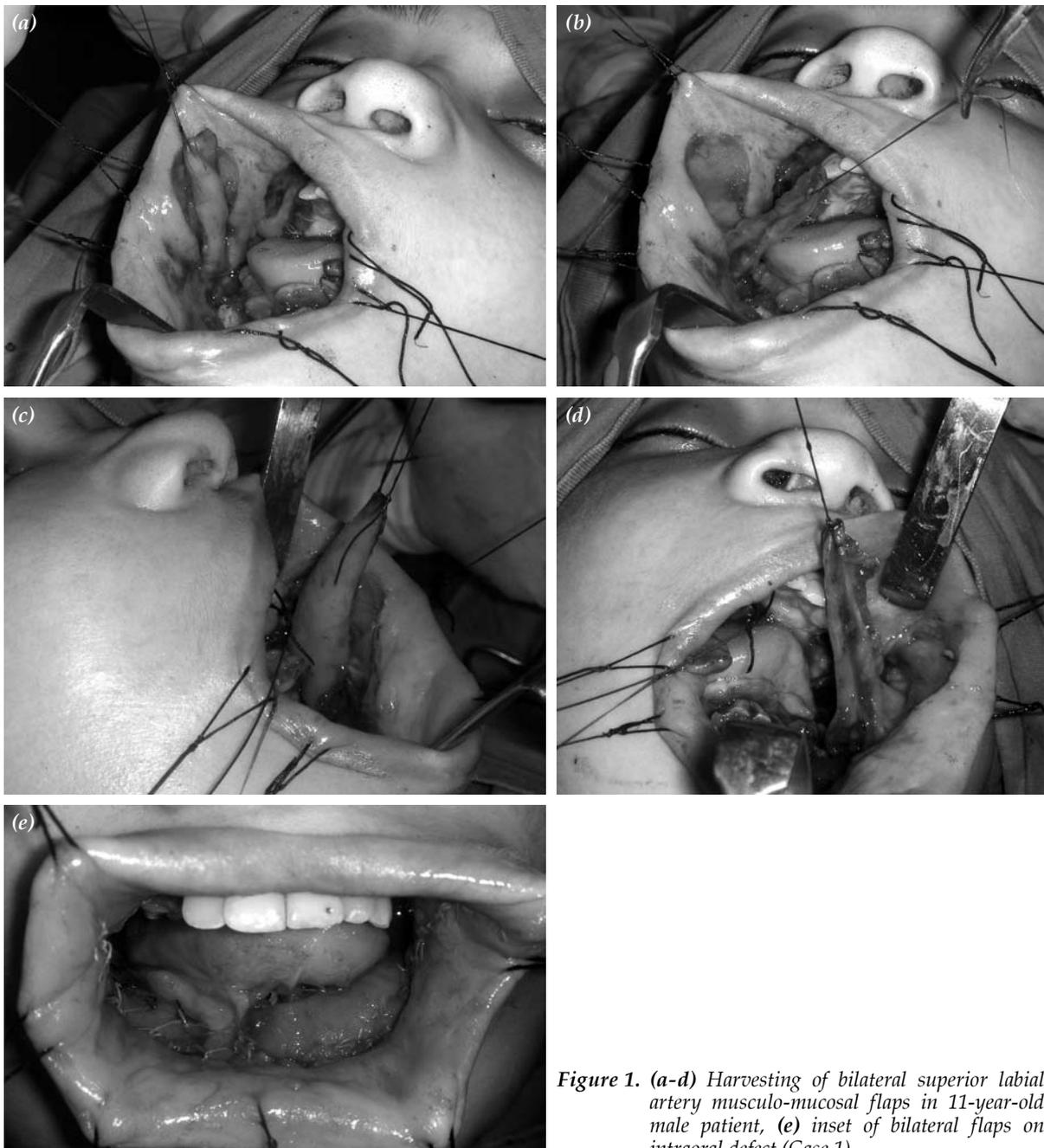
one month from surgery. During the follow-up period, contracture developed in only one patient who did not see the need for, surgical revision. No recurrence was observed in cases of oral cancer.

### DISCUSSION

Many methods have been described for the reconstruction of mouth floor defects. Free skin grafts, local mucosal flaps, island flaps and free flaps can all be used for variable sized defects.<sup>[1-12]</sup>

There is no single best procedure for reconstruction.

Allowing the wound to heal by secondary intention may be the initial choice, however it leads to wound contracture and takes a long time to heal. Free skin grafts are effective for small to medium size defects, but a stent-over bolster may be needed to prevent shrinkage of the skin graft. Although the initial results may be good, long term secondary contraction may impair tongue function.<sup>[2,4]</sup>



**Figure 1.** (a-d) Harvesting of bilateral superior labial artery musculo-mucosal flaps in 11-year-old male patient, (e) inset of bilateral flaps on intraoral defect (Case 1).

Furthermore, graft thickness may not be suitable for dental prosthesis and may cause dental pressure sores.

Random mucosal flaps may be used for intraoral reconstruction.<sup>[4]</sup> They have no reliable blood supply and have low length to width ratio, so they are not suitable for the reconstruction of large defects. The mobility of the random mucosal flap is also more limited compared to the axial pattern flap.

Local flaps like the nasolabial flap may be used to reconstruct the defect.<sup>[14]</sup> They include more bulky tissue and are more reliable than skin grafting. They have enough cushion effect to prevent dental sores, but decreased sulcus depth. Local pedicled flaps require external incisions. The mucosa is replaced by skin and may cause intraoral hair growth or epidermal inclusion cysts.

The tongue flap is a good option because of its rich vascular supply. Different flap designs are used to reconstruct various intraoral defects especially of the lower lip, palate and the mouth floor. Fischinger and Zargi<sup>[15]</sup> used central or paramedian island tongue flaps to repair anterior mouth floor defects with good results. The disadvantages of these flaps are include the necessity for second operation and restriction of tongue mobility.

Bozola et al.<sup>[1]</sup> have described a buccinator artery based musculo-mucosal flap. The flap includes the buccinator artery branch of the facial artery, mucosa, and a cuff of buccinator muscle. The flap has the advantages of high width to length ratio and an axial blood supply pattern. Intraoral defects are reconstructed with wet mucosa. The arc of rotation limits flap mobility, especially for mouth floor defects. It can only be used for lateral mouth floor defects.

The FAMM flap has been used since 1992.<sup>[2,3,5-8]</sup> Pribaz et al.<sup>[2]</sup> described the flap design and its usage for various intraoral defects. The flap has an axial pattern blood supply from the facial artery. The blood supply of the flap may be both ante-grade or retrograde. The facial artery musculo-mucosal flap has a greater width to length ratio and a greater arc of rotation than the buccinator flap. The facial artery musculo-mucosal flap also includes wet mucosa. The flaps are good choices for reconstruction of mouth floor defects. However, the FAMM flap decreases the depth of sulcus and

limits the use of dental prosthesis. While there are complex anastomoses between the facial artery and other arterial systems in the facial region, ligation of the facial artery during tumor excision may compromise blood supply to the flap.

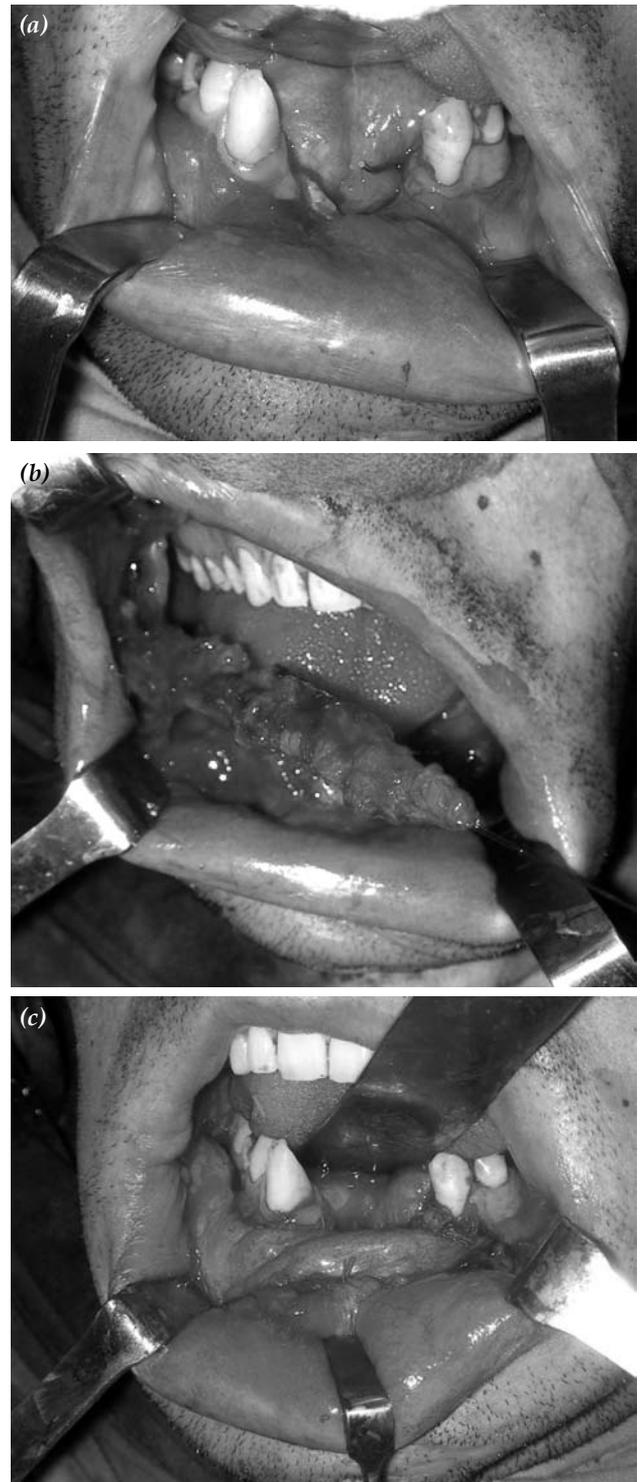


Figure 2. (a-c) SLAMM reconstruction of 50-year-old patient with exposition of the bone (Case 2).

The superior labial artery diverges from the facial artery approximately 16 mm behind the commissure. It is a constant branch of the facial artery that anastomoses with the contralateral superior labial artery at the level of the philtrum.<sup>[5]</sup> The superior labial artery based flaps are used to reconstruct oral commissure and lower lip defects.<sup>[4,16]</sup> Moreover, superior labial artery based axial flaps like the Abbe' and Estlander flaps have been used for decades. Recently mucosal pedicled Abbe' flaps have been reported.<sup>[17]</sup> The superior labial artery based musculo-mucosal flap includes mucosa, submucosa, superior labial artery, and a cuff of orbicularis oris muscle. The superior labial vein is not necessary. The well-developed submucosal venous plexus is sufficient for venous return. It has a width to length ratio of five to two. The flap has enough bulky tissue to have a cushioning effect against prosthetic loading. The flap decreases the depth of sulcus less than the FAMM flap does. The original flap length is approximately 49 mm. The length of the pedicle can be increased by dissection of facial artery. If the defect is large, a bilateral SLAMM flap can be used. The superior labial artery based musculo-mucosal flap can reconstruct both lateral or medial defects of mouth floor.

The disadvantage of the SLAMM flap is the width of the flap. The maximum width for tension free donor site closure is 2.0 cm. The SLAMM flap can only be used for small to medium sized defects and may lead to contracture of the commissure if the donor site is closed longitudinally. High width to length ratio, axial pattern blood flow, including wet mucosa, and pliability of the flap are the advantages of the SLAMM flap.

Although it might not be useful for large sized defects, the superior labial artery musculo-mucosal flap is a feasible and a simple technique for reconstruction of the small to medium sized intraoral defects.

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