

The Efficacy of Facial Artery Musculomucosal Flap in Reconstruction of Lip Defects

MOHAMED H. ABOUARAB, M.D.; ABBAS K. ELTAHAN, M.D.; NASSER A. GHOZLAN, M.D.; AHMED ESMAIL ELSHABANI, M.Sc. and HASSAN M. KHOLOS, M.D.

The Department of Plastic & Reconstructive Surgery and Burns, Faculty of Medicine, University of Alexandria

ABSTRACT

Background: Defects of the lip represent a challenging reconstructive problem. The causes of lip defects may be trauma or following excision of benign or malignant lesions. There are several options depending on the site and size of the defect. The facial artery musculomucosal (FAMM) flap provides a reliable solution for this problem transferring tissues similar to those of the lip.

Aim: Evaluation of reconstruction of lip defects using FAMM.

Patients and Methods: This study was performed on 10 patients having lower lip defects in the period between 2018 and 2020 treated by FAMM flap technique. Before flap coverage, the lip defect was prepared by removing any necrotic tissue remaining after lip trauma. In cases of malignancy, adequate excision with safety margin was done using frozen section histopathological examination.

Results: Eleven FAMM flaps were performed on 10 patients. The causes of the lip defects were mainly following excision of malignant lesions. The defect was in the lower lip in eight patients and in the upper lip in two patients. The defect was central in three cases and lateral in seven cases. Unilateral flaps were done in nine patients, while bilateral flaps were used in one patient. Two patients developed partial flap necrosis which healed spontaneously. No donor site complications were reported.

Conclusion: The FAMM flap is a local versatile flap that can be used for lip and vermilion reconstruction.

Key Words: Facial artery musculomucosal flap – FAMM flap – Lip defect.

Ethical Committee Approval: Study was registered and approved from our institutional medical ethics committee.

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INTRODUCTION

Defects of the lip are commonly met by plastic surgeons, and they represent a challenging recon-

struction problem to solve [1]. The causes of lip defects are various such as post-traumatic tissue loss, post-oncological resection, after excision of congenital vascular malformations and after release of postburn contractures. The aim of lip reconstruction should be restoring both shape and function of the lip [2].

There are several options for coverage of lip defects starting from direct closure to local flaps for small defects, regional flaps for moderate defects and up to free flaps for large complex defects. Free flaps are advantageous for reconstructing large defects, but this comes with several disadvantages such as donor site morbidity, need for microsurgical expertise, long operative time, and replacement with dissimilar tissues. The regional flaps such as submental flap, nasolabial flaps and cross lip flap are suitable for moderate defects but have some limitations as transfer of dissimilar tissues, donor site morbidity in the form of external scars and the possible need for second stage separation procedure [3].

Local flaps can be used for small to moderate defects. A few decades ago, intraoral flaps from the cheek emerged as a source of flaps for lip reconstruction. These flaps have several advantages such as short learning curve, short operative time, replacing mucosa with similar tissue, minimizing donor site morbidity by avoiding external scars. On the other hand, the amount of tissue they provide is limited, hence cannot be used in large defects [4].

The facial artery musculomucosal (FAMM) flap was described by Julian Pribaz in 1992 [5]. It has been commonly used recently [6]. The FAMM flap is an axial composite flap harvested from the cheek. It is based on the facial artery. It is composed of mucosa, submucosa, buccinator muscle, facial

Correspondence to: Dr. Mohamed H. Aboarrab
E-Mail: abouarab@outlook.com

artery, and a venous plexus. It can be based either superiorly (by retrograde supply from the angular artery) or inferiorly (by antegrade supply from the facial artery) according to the site of the defect. [7]. It is mainly useful in terms of providing tissues similar to the lip especially the vermilion instead of thick bulky tissues provided by free flaps. It has a good arc of mobility; hence it has been used to reconstruct several areas other than the lip such as nasal septum, floor of the mouth, nasopharynx, and palate [1,8].

PATIENTS AND METHODS

Patients:

This study was performed on 10 patients having lower lip defects in the period between 2018-2020. The following data were recorded: Patients' age, gender, defect details (etiology, site), flap details (superior or inferior pedicle, unilateral or bilateral, any modifications), donor site closure, operative time, duration of hospital stay, follow-up period, period for resuming normal diet, second stage procedures, complications (flap necrosis whether total or partial, wound infection or dehiscence, donor site complications as trismus, mouth opening limitation, speech affection, facial nerve injury), tumor histopathology, TNM staging, and neck dissection (if done in malignancy cases).

Methods:

This study was registered and approved from our institutional medical ethics committee. Written informed consent was taken from all patients and patients' parents included in the study. Preoperative photos of the defect were obtained. The surgery was performed in supine position, under general anesthesia through nasotracheal intubation with

the endotracheal tube positioned contralateral to the side of the defect. Preoperative antibiotic prophylaxis was given at the induction time.

The course of the facial artery on the proposed flap side was marked using doppler ultrasound on the cheek mucosa, then intraoral marking of the flap territory was done (Fig. 1).

The following guidelines were followed for flap marking: The anterior edge of the flap should start 1cm posterior to the oral commissure (to avoid its distortion and to ensure including the facial artery along the flap axis since it runs 1.5-2cm lateral to the commissure). The posterior edge of the flap should be anterior to the opening of the parotid duct (to avoid injuring it) and also 0.5-1cm anterior to the gingiva (to facilitate donor site wound closure). The maximum width of the flap to allow direct closure of the donor site is 3cm (otherwise skin graft or buccal fat advancement would be required). The flap runs obliquely from the retro-molar trigone to the gingivobuccal sulcus with the facial artery along the axis of the flap. The length of the flap was decided based on the size of the defect with the maximum possible flap length 7-8cm. Assessment of the defect size in cases of lip malignancy became more evident after complete excision of the tumor. The flap was designed superiorly based in upper lip defects and inferiorly based in lower lip defects.

The lip defect was prepared by removing any necrotic tissue remaining after lip trauma. In cases of malignancy, adequate excision with safety margin was done using frozen section histopathological examination (Fig. 2). Postburn case required excision of scar tissue and release of any adhesions to prepare the recipient area.



Fig. (1): Markings of the FAMM flap.



Fig. (2): Left: A 67-year-old female patient suffering from squamous cell carcinoma of the lower lip, Right: The lower lip defect after excision of the tumor.



The buccal mucosa was exposed using retractors or traction sutures applied on the upper and lower lips. Injection of saline with adrenaline (1:100000 dilution) in to the anterior and posterior edges of the flap. As for inferiorly based flaps, the first step for flap elevation started by incising one cm posterior to the oral commissure through the mucosa, submucosa and buccinator muscle and identifying the facial artery which runs deep to the buccinator muscle. Then, continue incising the flap borders and elevating the flap in the plane beneath the facial artery taking care to include the artery along the whole flap length. At the distal part of the flap the artery is ligated and divided. There was no need to search and include the facial vein since a sub-mucosal plexus provides the flap venous drainage. After flap elevation, the flap was transposed (Fig. 3) and inset into the lower lip defect using simple

interrupted Prolene 5-0 sutures, for the intraoral part of the flap Vicryl 5-0 sutures were used.



Fig. (3): Transposition the FAMM flap to cover a central lower lip defect.

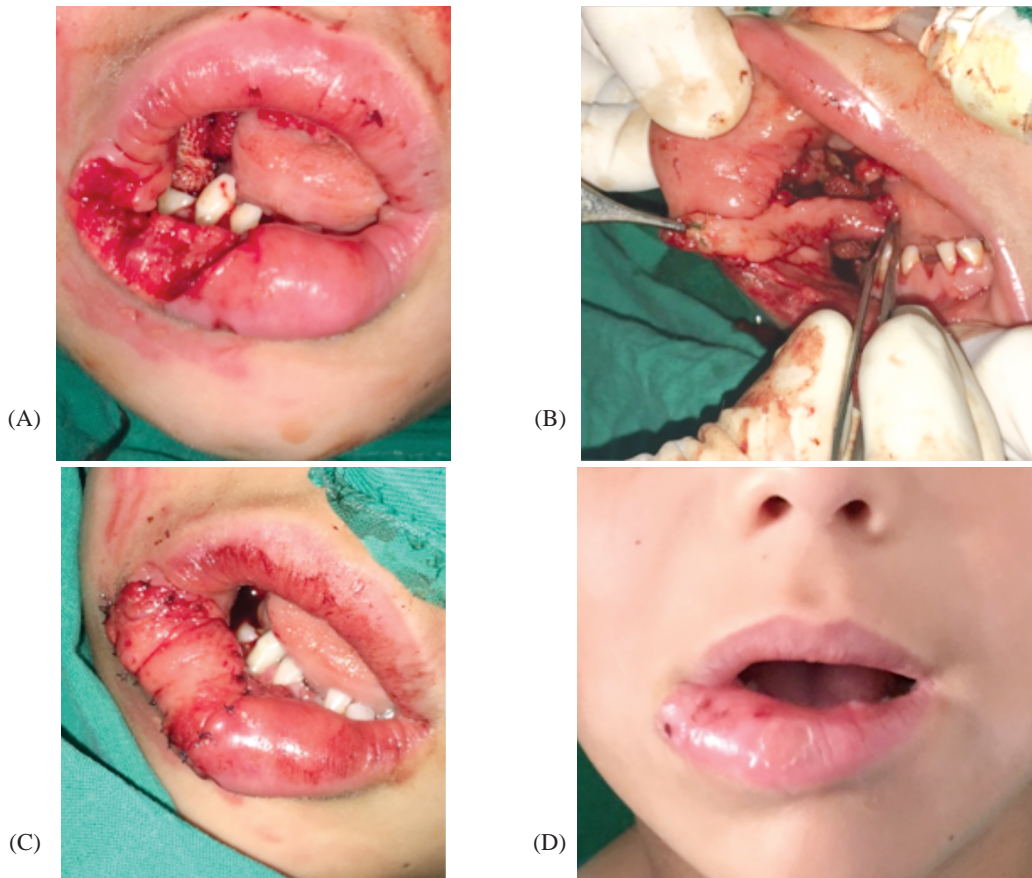


Fig. (4): A 7-year-old child with traumatic defect of the lower lip following a road traffic accident. (A): Intraoperative after debridement, (B): Preparing the flap for inseting, (C): After flap inseting, (D): One year postoperatively.

As for superiorly based flaps, the facial artery was identified at the distal part of the flap by incising posterior to the oral commissure, then the artery was ligated, divided, and traced back superiorly till the gingivolabial sulcus with flap elevation similar to the inferiorly based flaps. After

completing flap elevation, the flap was transposed to the upper lip and inset into the defect in the same manner as inferiorly based ones.

Direct closure of the donor site was performed in all cases in two layers (buccinator muscle and cheek mucosa) using Vicryl 4/0 under vision to

avoid injuring the opening of the parotid duct. No dressing was applied. The patients were instructed to start feeding by fluids upon recovery from anesthesia and soft food by the end of the first postoperative day and solid food on the seventh postoperative day. Clinical assessment was done

by close observation of the flap (color, temperature, and capillary refill time) every 4 hours on the first postoperative day then every 12 hours on the second postoperative day then once daily till discharge. Postoperative photos were obtained. Figs. (4,5) show examples of the clinical cases.

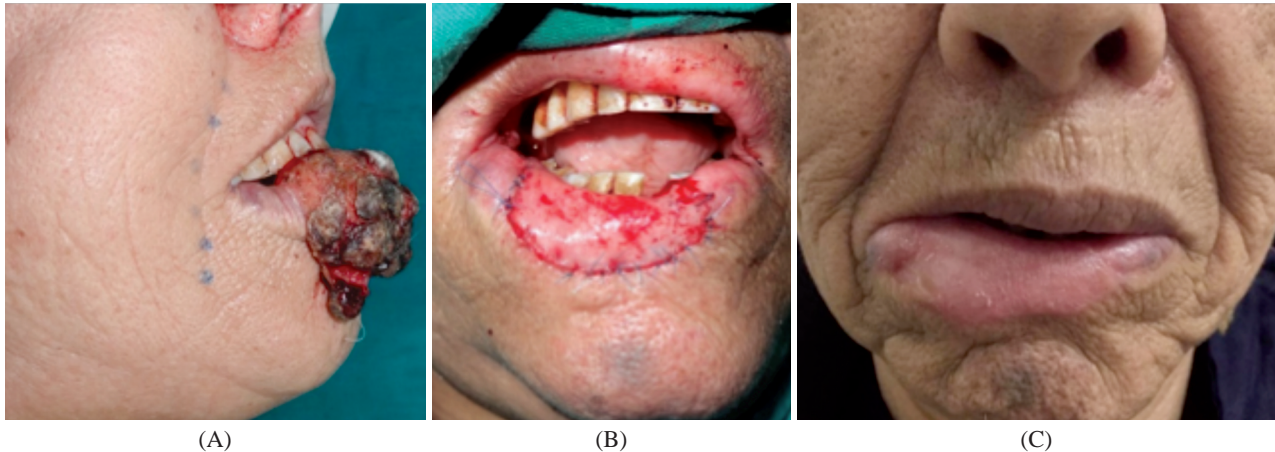


Fig. (5): A 67-year-old female patient suffering from squamous cell carcinoma of the lower lip. (A): Showing the lip SCC, (B): After flap insetting, (C): Eight months postoperatively.

RESULTS

11 facial artery Musculo mucosal (FAMM) flaps were elevated to close lip defects in 10 patients. Nine flaps were inferiorly based, and two flaps were superiorly based.

The defect was in the lower lip in eight patients and in the upper lip in two patients. The defect was central in three cases and lateral in seven cases. Unilateral flaps were done in nine patients, while bilateral flaps were used in one patient. Flap width ranged from 1.5-2.5cm, with a mean of 2cm. Flap length ranged from 3-7cm with a mean of 5cm. Operative time ranged from 1 to 2.5 hours, with a mean of 1.5 hours.

The study included five males (50%), and five females (50%). The age of the patients ranged between 7 and 70 years with a mean of about 39 years.

The causes of the lip defects were seven tumor cases (namely squamous cell carcinoma), one trauma case, one case of venous malformation and one case of postburn contracture. In tumor cases TNM staging was T2N0M0 in three cases and T3N0M0 in four cases. Neck dissection was not performed in any of the cases.

On the immediate postoperative period, all flaps appeared well vascularized but during the first postoperative day flap congestion was noted in

eight patients. Flap congestion resolved spontaneously soon after within the first 24 to 48 hours, except for two patients who had a pale distal end of the flap after 48 hours. Nine flaps survived completely. In two flaps (18% of the raised flaps), there was partial loss of the distal end of the flaps, which was noted after one week. In these cases of partial flap loss, healing by secondary intention occurred and no intervention was needed because of the small size of the lost part.

Regarding the donor site, healing was uneventful in all patients except for a sense of tightness in the cheek in three patients for the first 2-3 months, but this did not cause limitation of the mouth opening and this tightness resolved spontaneously. There was no affection of the facial expression muscles. No patient reported any speech problems.

No bleeding or wound infection or dehiscence occurred. All patients resumed normal diet within the first two weeks (mean tenth postoperative day). All cases were discharged within the first postoperative week except for the two patients who suffered from partial flap loss. These two patients were discharged on the second postoperative week. Patients were followed once weekly for the first postoperative month, then once monthly for at least six months. Only one case needed a secondary revision procedure for refashioning on the eighth postoperative month.

DISCUSSION

Lip defects represent a challenge for plastic surgeons to reconstruct. Numerous techniques and modifications have been described and developed over the years to overcome this challenge. The choice of the reconstructive method depends mainly on the size of the defect. Regional flaps and free flaps are the sole option for large complex lip defects. However, the bulky tissues brought by the flaps, long operative time, and complex surgical technique are their main disadvantages [9]. Small to moderate lip defects are managed by local flaps. Nevertheless, local flaps have several disadvantages including external facial scar causing donor site morbidity (such as in case of nasolabial flaps) and the need for second stage separation procedure (such as with crosslip and tongue flaps) [3]. Pribaz described the FAMM flap in 1992 to address the drawbacks of local flaps. It has proved to be a useful and versatile flap especially for lip and vermilion reconstruction [5].

The FAMM flap serves as one of the local flap options for lip reconstruction while minimizing donor site morbidity by avoiding external facial scars or cheek depressions [10]. The flap composition with the mucosa as its most superficial layer accounts for one of the main advantages of this flap in reconstructing lip defects which is providing similar hairless non bulky mucosa with a good color and texture match. Also, FAMM flap is characterized by ease of harvest, shorter learning curve, shorter operative time and shorter hospital stay when compared to more complex procedures such as locoregional and free flaps [9].

The FAMM flap is in close proximity to the lip defect and does not need a second stage in most of the cases of lip reconstruction. This makes it superior to other flap options such as crosslip flap and tongue flap which are difficult to tolerate generally and especially in the pediatric population and in all cases, they necessitate a second stage separation procedure. Hence, in children FAMM flap is considered as an ideal option for vermilion reconstruction [11]. In our study, only one case, needed a secondary revision procedure for refashioning which was done at the eighth postoperative month.

The main limitation of the FAMM flap is the small amount of tissue that can be harvested; hence it can be used only for small to medium sized lip defects. The maximum flap width to allow direct closure of the donor site is 3cm, otherwise larger flaps can be raised but skin graft or buccal fat

advancement will be required with their accompanying extra morbidity to close the flap donor site [10,12]. Moreover, to overcome the problem of the small flap size, bilateral flaps have been used to address larger defects [13]. In the present study, bilateral inferiorly based FAMM flaps were used to reconstruct the defect following release of a postburn lip contracture.

The FAMM flap is composed of mucosa, submucosa, buccinator muscle, the facial artery, and a venous plexus. The artery must be centralized along the flap axis to ensure adequate flap perfusion and survival. It was found that the distance between the facial vein and artery increases gradually from the level of the mandible till the level of the ala of the nose. The venous drainage of the flap is through a small buccal submucosal plexus of veins and not through the facial vein, hence it is recommended to maintain a wide base of the flap to avoid injury of the flap venous drainage [14]. Venous congestion has been observed initially in many of the cases with FAMM flap which resolved without any intervention, yet this is considered one of its disadvantages and it may be explained by the absence of the facial vein [15].

In the present study, initial flap congestion developed in eight patients, and it subsided spontaneously within the first two postoperative days except for two flaps (18%) which proceeded to partial loss of the distal part of the flap. These two cases of partial flap necrosis healed by secondary intention. This rate (18%) is comparable to the rates of partial flap necrosis reported in the literature (0 to 25%) [16].

The facial nerve branches run in a plane more superficial than that of the facial artery, so they are unlikely to be injured during dissection for flap elevation [12]. In our series, none of the cases suffered from postoperative weakness of the facial muscles of expression due to facial nerve injury.

Although the FAMM flap is a robust flap providing well vascularized tissue to reconstruct lip defects, there is a controversy regarding whether it is safe or contraindicated to perform FAMM flap in patients who have undergone neck dissection procedures and preoperative radiotherapy [2,3,6,17]. In the present study, none of the patients had neck dissection or radiotherapy to evaluate their effects on flap survival.

The FAMM flap can be raised with a superior or inferior pedicle depending on the site of the defect which adds to the flap versatility. Also, it has been mentioned that the superiorly based flap

can be safely used in cases with history of neck dissection or previous radiotherapy where the angular artery will provide retrograde supply to the flap [18].

In the present study, 11 FAMM flaps were used in 10 patients. In two patients, upper lip reconstruction was done, while in eight patients, lower lip reconstruction was done. Only one patient needed bilateral flaps. The small number of patients is considered a limitation of this study.

Conclusion:

FAMM flap is a versatile reconstructive option for small to medium lip defects. It comes with several advantages such as lack of external facial scar providing similar non bulky tissue, low complication rate, ease of harvest and few disadvantages such as initial venous congestion, not suitable for large defects. It is considered as one of the reliable tools in the plastic surgeons' armamentarium for reconstruction of small to moderate lip defects.

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