FUNCTIONAL AND AESTHETIC RESTORATION OF LARGE UPPER LIP FULL-THICKNESS DEFECTS

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ABSTRACT

Introduction: The lips carry a major role in speech articulation, facial features, deglutition, aesthetic look of and oral competence. Lip Reconstruction is of great challenge to the surgeon. It needs a great attention to the precise details of the lip anatomy.

Many Surgical procedures have been used to reconstruct the lip, however, Reconstruction of the aesthetic appearance and function of the lips require the replacement of the defective tissues with similar quality of a functioning tissue. These goals are difficult to be achieved large-sized lip defects. Classical flaps and their variations have been described and modified during the 19th century. In this study the author developed a new surgical technique for treatment of major upper lip defects.

Patients and Methods: This study was carried out on 20 patients presented with large upper lip defects, 15 cases were post tumor excision and five cases were post traumatic. Reconstruction was done using dermal-fat flap, muco-buccal flap and muscle transfer to achieve a good cosmetic and functioning upper or lower lip.

Results: As regard aesthetic results, the satisfaction rate as regard the aesthetic appearance and lip functions, was excellent in 12 patients (60%), and good in 8 patients (40%), but there was no case with bad results. Flap survival was excellent (100%) in all cases without any partial or total loss. As regard EMG study and two point discrimination tests, all cases showed very good motor and
INTRODUCTION

The lips are one of the most defining features in the face, play a very important role in look and self-esteem. The lips carry a major role in speech articulation, facial features, deglutition, aesthetic look and oral competence (Baumann & Robb, 2008). Lip reconstruction is of great challenge to the surgeon. It needs a great attention to the precise details of the lip anatomy. It has been documented that upper lip defects of > 30% should not be closed primarily (McCarn & Park, 2005; Seo et al., 2013).

Many Surgical procedures have been used to reconstruct the lip, however, Reconstruction of the aesthetic appearance and function of the lips require the replacement of the defective tissues with similar quality of a functioning tissue. These goals can be achieved easily in small lip defects. Local tissues can be used to give a good aesthetic and functional result. Classical flaps and their modifications have been described during the 19th century. Well known flaps to manage lip defects include Karapandzic, Bernard-Burrow-Webster and the Abbé flap (Shinohara et al., 2000), with Karapandzic and Bernard-Burrow-Webster dominating in the early 20th century (Brinca et al., 2011). In Karapandzic technique, semicircular incisions from base of the defect are performed at both sides, overlying the edge of orbicularis oris muscle. Blunt dissection is performed taking care of muscle fibers and branches or facial, preserves good functioning lower lip. Bernard-Burrow-Webster technique includes medially advanced bilateral full-thickness cheek advancement flaps with mucosal advancement to rebuild vermilion (Degala & Shetty, 2015).

However, the restoration of large defects (i.e., defects comprising more than two-thirds of the lip) with local tissues is a very difficult to perform. It usually results in microstomia, and unaesthetic appearance. At the same time the quality of life of the patients may be negatively affected due to drooling while eating and speaking. As a result of this situation, specific importance is paid to skin cover, mucosal lining, and mouth opening diameter, sensation, vermilion and reconstruction of a competent oral sphincter, preferably using innervated musculo-cutaneous flaps (Tobin & O'Daniel, 1990).

As Oral competence relies mostly upon lip function, efforts should be exerted to avoid an in-competent sphincter by appropriate choice of reconstruction. Many authors have tried the transfer of a functioning muscle. Burt et al 2000 used functional gracilis muscle transfer to reconstruct oral sphincter (Burt et al., 2000). Also a lot of microsurgical free tissue transfers, including the anterolateral thigh flap and free radial forearm flap have been used for lip reconstruction (Tan et al., 2013; Daya & Nair, 2009). However, free tissue transfer carries increased risks of prolonged operative time and the increased potential for reconstructive failure. The complexity of technique, flap texture, thickness and overall quality of tissue does not always resemble the characteristics of the defect, making loco-regional options more favorable (Gupta et al., 2013).

Conclusions: The combination of dermal-fat flap, muco-buccal flap, and muscle transfer is a very good reconstructive technique for extensive upper defects. We consider that, the procedure is ideal for reconstruction of major upper lip defects.

Level of Evidence: Level IV, therapeutic study.

Keywords: Lip Tumors, Lip Trauma, Lip Reconstruction, Lip Malignancy, Upper Lip.
We have started using dermal fat flap, muco-buccal flap and muscle transfer in lower lip reconstruction (Elmelegy, 2017). This article presents the authors’ experiences in reconstructing large defects at the upper lip using dermal fat flap, muco-buccal flap and muscle transfer as a good option for the functional and aesthetic reconstruction. The goals of the procedure were to evaluate flap survival, oral competence, speech, and overall esthetics.

MATERIAL AND METHODS

This study was carried out on 20 patients presented with large upper lip defects, 15 patients were suffering from upper lip carcinoma and five patients were suffering from post-traumatic upper lip defects. All patients were presented to plastic surgery department, Tanta University Hospitals, in the period between January 2011 and December 2018.

Reconstruction was done using dermal fat flap, muco-buccal flap and muscle transfer to achieve a good cosmetic and functioning upper lip.

SURGICAL TECHNIQUE

First, we determined the edge of the lesion that was planned to be excised at the upper lip (Figure 1a) then we defines the safety margin needed, (Figure 1b). The post excision defect or the post traumatic defect was measured. Half of the defect was reconstructed from each side of the cheeks by the following method. A Right angle triangle was drawn on the skin, starting at each angle of the mouth. The base of the triangle is in the same direction of cupid s bow of the upper lip and the triangle direction is downwards. The length of the base of each triangle is equal to half of the resultant defect. The right angle of the triangle stated at the angle of the mouth. The skin of this triangle is de-epithelialized. Then dermal fat flap was raised keeping its base carrying random blood supply to the flap, starting from the angle of the mouth in the direction of cupid s bow (Figure 1c). Another right angle triangle, opposite to the previous one, on the mucosal side of the oral cavity was raised with its base at the angle of the mouth. The mucosal triangle was slightly larger in diameter than the dermal fat triangle (Figure 1d). Reflecting the dermal fat flap externally upwards and muco-buccal flap internally upwards will expose the muscles up to the risorius muscle (Figure 2e). Splitting of risorius muscle was done starting from the angle of the mouth and extended laterally till the end of the base of each triangle (Figure 2f). The dermal fat flap was then rapped over the upper part of the spitted risorius muscle. The mucosal flap was sutured over the dermal fat flap to give aesthetic lip contour (Figure 2g). In this way, we finished the formation of the lower part of the newly formed upper lip. At the upper part of the newly formed lip, another triangle of skin and subcutaneous fat was excised at nasolabial fold (Figure 2h). After excision of the tumor, the upper lip defect (Figure 3i) is then closed by withdrawing of the newly formed lip medially and sutured to each other, mucosa to mucosa and risorius of one side to risorius of the opposite side to form upper part of mouth sphincter. At the upper part of the newly formed lip, the remaining parts of the levator labii superioris, levator labi alaque nasi, zygomaticus minor and zygomaticus major are re-sutured to the upper part of the newly formed lip. Skin Closure of the newly formed upper lip skin, and the resultant triangles was performed, Thus reforming a new upper lip (Figure 3j).
FIGURE 1
OPERATIVE STEPS OF UPPER LIP RECONSTRUCTION
A: PALPABLE EDGE OF THE TUMOR; B: SAFETY MARGIN; C: DERMAL FAT FLAP; D: MUCO-BuccAL FLAP

FIGURE 2
E: THE RISORIUS MUSCLE; F: CUTTING THROUGH THE RISORIUS MUSCLE; G: NEWLY FORMED OF ONE HALF OF THE LIP; H: EXCISED SKIN TRIANGLE AT NASOLABIAL

FIGURE 3
I: THE RESULTANT DEFECT AFTER EXCISION; J: AFTER BILATERAL CLOSURE OF THE LIP AND THE TRIANGULAR DEFECTS
RESULTS

20 patients presented with large defects at the upper. 15 of them after tumor excision, and the other five patients after traumatic insult. They were treated with dermal fat flap, muco-buccal flap, and muscle transfer.

The age of the patients ranged from 23 to 67 years. 10 patients (50%) were males, and 10 patients (50%) were females. There were no cervical lymph adenopathy or distant metastases in malignant cases. The defect size after tumor excision comprised 60% to 90%. The follow-up period of the patients ranged between 6 months and 7 years. In all patients, no complications were reported and all cases healed well. There were no local recurrences of the tumor during the period of follow-up. There were no problems regarding drinking or feeding. Speech was normal, and pronunciation was excellent (Table 1 and Figures 4-6).

<table>
<thead>
<tr>
<th>Table 1</th>
<th>OVERALL ASSESSMENT OF LIP FUNCTION AND AESTHETIC APPEARANCE AFTER RECONSTRUCTION</th>
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<tr>
<td>Overall evaluation</td>
<td>Score</td>
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<td>---------------</td>
<td>----</td>
</tr>
<tr>
<td>Flap survival:</td>
<td></td>
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<tr>
<td>Total survival:</td>
<td>2</td>
</tr>
<tr>
<td>Partial loss:</td>
<td>1</td>
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<tr>
<td>Total loss:</td>
<td>0</td>
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<tr>
<td>Oral competence:</td>
<td></td>
</tr>
<tr>
<td>Competent</td>
<td>2</td>
</tr>
<tr>
<td>Sialorrhea with food</td>
<td>1</td>
</tr>
<tr>
<td>Sialorrhea at rest</td>
<td>0</td>
</tr>
<tr>
<td>Mouth opening:</td>
<td></td>
</tr>
<tr>
<td>Normal : as before operation</td>
<td>2</td>
</tr>
<tr>
<td>Macrostomia: more</td>
<td>1</td>
</tr>
<tr>
<td>Microstomia: less</td>
<td>0</td>
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<tr>
<td>Overall aesthetics:</td>
<td></td>
</tr>
<tr>
<td>Satisfactory</td>
<td>2</td>
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<tr>
<td>Good</td>
<td>1</td>
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<td>Bad</td>
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<td>EMG study</td>
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<td>Good</td>
<td>2</td>
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<td>Moderate</td>
<td>1</td>
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FIGURE 4
A: UPPER LIP EPITHELIOMA WITH RED ARROWS REFERRED TO EXTENT OF EXCISION IN FEMALE PATIENT; B: POSTOPERATIVE ANT POST WITH CLOSED MOUTH; C: PREOPERATIVE VIEW WITH OPEN MOUTH; D: POSTOPERATIVE ANT POST VIEW WITH OPEN MOUTH; E: MOVING UPPER LIP TO LEFT SIDE; F: MOVING UPPER LIP TO THE LEFT SIDE; G: TIGHT MOUTH CLOSURE; H: WHISTLING

FIGURE 5
A: POST UPPER LIP EPITHELIOMA EXCISION IN FEMALE PATIENT AGED 58 YEARS OLD; B: PREOPERATIVE ANT-POST VIEW WITH CLOSED MOUTH; C: THE SAME VIEW POSTOPERATIVE; D: PREOPERATIVE ANT: POST VIEW WITH OPEN MOUTH; E: THE SAME VIEW POSTOPERATIVE; F: PREOPERATIVE RIGHT LATERAL VIEW WITH OPEN MOUTH; G: THE SAME VIEW POSTOPERATIVE
FIGURE 6
A: POST UPPER LIP EPITHELIOMA EXCISION IN MALE PATIENT AGED 65 YEARS OLD; B: PREOPERATIVE ANT-POST VIEW WITH CLOSED MOUTH; C: THE SAME VIEW POSTOPERATIVE; D: PREOPERATIVE ANT-POST VIEW WITH OPEN MOUTH; E: THE SAME VIEW POSTOPERATIVE; F: MOVING UPPER LIP TO THE RIGHT SIDE; G: MOVING UPPER LIP TO THE LEFT SIDE

FIGURE 7
PREOPERATIVE POST TRAUMATIC BADLY HEALED UPPER LIP WITH LOSS AROUND 60% IN MALE PATIENT AGED 23 YEARS OLD; A: PREOPERATIVE VIEW SHOWING DIFFICULT OPENING; B: GOOD OPENING EARLY POSTOPERATIVE; C: PREOPERATIVE RIGHT LATERAL VIEW WITH OPEN MOUTH; D: THE SAME VIEW LATE POSTOPERATIVE; E: PREOPERATIVE ANT POST VIEW WITH OPEN MOUTH; F: THE SAME VIEW LATE POSTOPERATIVE G: POSTOPERATIVE LEFT LATERAL VIEW WITH OPEN MOUTH; H: THE SAME VIEW LATE POSTOPERATIVE
It was performed by the patient himself and three independent plastic surgeons that were not sharing in this work.

Flap survival was excellent (100%) in all cases without any partial or total loss. As regard oral competence, it was excellent in 16 cases (80%). 4 cases (20%) suffered from sialorrhea with food, none of the cases suffered from sialorrhea at rest. As regard the mouth opening it was excellent in 18 cases (90%). As regard Macrostomia, two upper lip cases (10%) suffered from Macrostomia but, none of the patients suffered from Microstomia.

As regard aesthetic results, the satisfaction rate from the aesthetic appearance and lip functions, it was excellent in 12 patients (60%), and 8 patient (40%) showed good results. There were no cases with bad results. In upper lip reconstruction, the nasolabial scars were hidden at the nasolabial fold.

As regard EMG study and two point discrimination tests, all cases showed a very good motor and sensory function, with all muscles functioning very well (Figures 7-8).

FIGURE 8
EMG STUDY SHOWING COMPLETE FUNCTIONING MUSCLES SUPPLIED BY FACIAL NERVE AT BOTH SIDES OF THE RECONSTRUCTED UPPER LIP

DISCUSSION

The main goals of lip reconstruction are providing mouth functions, proper opening, competence, speech, whistling, sensation, and aesthetic appearance. Defects involving less than 30% of the upper lip may be closed primarily. Lip defects that are too large for primary closure, are usually reconstructed using flaps from the adjacent tissues, distant flaps, or free flaps.

For large defects of the lip many techniques have been used like, Abbe flap (Nyame et al., 2014), however, the main disadvantages of this method are the fact that it is a two-stage
procedure and that there is a possibility of complete loss of the flap. But in our technique is one stage procedure and there is no chance to loss any part of the flap.

Some authors used Abbe estlander flap (Genc et al., 2012). They found that the key for successful restoration of lip function is the reconstitution of the orbicularis oris muscle with its re-innervation, which is not the case in this type of flap. In our technique we have substituted the sphincteric role of the excised orbicularis oris muscle by the risorius muscle which we have found that it was functioning very well in controlling the oral competence, during food intake, during speech and during rest.

Gillies fan flap (Bello, 2012) have been employed for the reconstruction of large lip defects but it had the disadvantage of microstomia which could affect articulation, speech, and masticatory functions of the lips. In our technique we have a normal lip length which gave rise to normal speech and normal mouth opening.

McGregor, suggested a modification for the rectangular of Gillies fan flap in order to reconstruct a full thickness lip defects even up to the entire lip, with the aim of preserving the oral commissure and avoiding Microstomia (Saraiya, 2011). This technique provided a round oral commissure, which added a difficulty in oral competence. In our technique we have a normal angle of the mouth as well as normal mouth opening and good competence.

Using Bernard technique (Frunza et al., 2015), functional rehabilitation seems to be improved with muscle transposition. The obvious advantage of this operation is its ability to reconstruct nearly the entire lip in a single-stage procedure. The disadvantage of this technique is the reduction in the size of the mouth opening and a “permanent smile” deformity of the lips. In our technique we have normal lip function with normal facial expression.

The Webster-Bernard flap (Denadai et al., 2015) provides reliable resurfacing of extensive lip defects from the adjacent cheek skin. The addition of local tissue to the lip decreases the incidence of microstomia. Its potential disadvantages include notching of the central lip incision and effacement of the gingiva-labial sulcus. It is also an adynamic reconstruction. In our technique we have a normal gingiva-labial sulcus and also our technique is dynamic as, all muscles of the lip were working very well after muscle transfer as have been proved by the EMG studies.

Kazuhide et al (Nishihara et al., 2016) performed the upper lip reconstruction using 2 sliding advancement cheek flaps and buccal mucosal eversion. A curvilinear region involving Burow’s triangle was designed along the bilateral alar base of the nose and cheek skin crease to allow for sliding of the advancement cheek flap. However in this technique the aesthetic appearance of the lip was lost and to avoid this we have used dermal fat flap as filler and we take the needed mucosa from the oral mucosa to form a good vermilion.

The use of combined dorsalis pedis skin flap, extensor hallucis, and digitorum brevis muscles as a conjoined free flap is found to be good for a subtotal defect of the full-thickness lip when local or regional flaps are not suitable (Oh & Chung, 2011). Also Full-thickness reconstruction of large upper lip defects and the reconstitution of the function have been performed using modified bilateral nasolabial flaps (Lorenz & Maier, 2010). However in these studies reconstructed lips were adyamic but in our cases it was completely function as have been proved by EEG studies.

Radial forearm free flaps have been used in lip reconstruction (Mandrekas et al., 1994). Most of the patients achieved the goals of providing an adequate mouth opening with competence. The refinement of dynamic palmaris sling attachment to the perioral muscle provided a good oral competence and support. However, the major drawback of this technique is the aesthetic appearance of the lip. Refinements like fat injections, defatting by liposuction, or vermilion tattooing, may be needed to get better results. In our technique the aesthetic acceptance was satisfactory in 12 patients [60%] and good in 8 patients [40%].
However our procedure is simpler without the complications of free flaps. We have no bad results.

Pedicled superficial temporal artery flap have been used in upper lip defects (Al-Qattan & Kattan, 2018). Authors advised taking Care during insetting of the flap to care that the direction of the hair is downwards to match the direction of the growth of the normal moustache hair. In their cases the red lip was not reconstructed. In our case vermillion reconstruction was good and hair growth of transferred flaps was good in all male patients.

**CONCLUSION**

The combination of dermal fat flap, muco-buccal flap, and muscle transfer is a very good reconstructive technique for extensive upper lip defects. We consider that the procedure is ideal for reconstruction of large upper lip defects. Based on our results, good functional and aesthetic results can be regained by using this technique. We recommend using this technique in reconstruction of major upper lip defects, whether after tumor excision or after trauma, it is simple, preserving all functions of the muscle and with less conspicuous scars.

**REFERENCES**


