

## **Total Lower Lip and Commissure Reconstruction Using a Composite Radial Forearm Palmaris Longus Free Flap**

AHMED BAHAA EL-DIN, M.D.

*The Department of Plastic Reconstructive Surgery, Faculty of Medicine, Mansoura University.*

### **ABSTRACT**

Restoration of form, shape and function in total lower lip and commissure loss must be considered together. The ideal reconstruction of such defects should replace external skin, provide adequate mucosal lining and labial sulcus and maintain adequate oral sphincter.

In this study, eighteen patients under-went reconstruction of full thickness total lower lip and oral commissure. Reconstruction was done using a composite radial forearm palmaris longus free flap. The flap was folded on to itself. Both ends of palmaris longus tendon were passed intramuscularly at the angles of the mouth and anchored to remaining orbicularis muscle of the upper lip with adequate tension which is adjusted so that oral competence could be achieved.

The patients had been followed up for 1 year. All patients had excellent oral competence during rest, speaking and eating. Good sphinctric function was obtained in early postoperative days. No drooling or air leakage. The aesthetic results were accepted in all patients.

### **INTRODUCTION**

Large, full thickness lip defects after head and neck surgery continue to be a formidable challenge for reconstructive surgeons. The reconstructive aims are to restore the oral lining, oral competence, and function (i.e. articulation, speech, and mastication) [1].

Lower lip reconstructive procedures using the regional flaps such as the Abbe flap [2], the Estlander flap [3], or Gillies fan flap [4], provide an excellent texture match and sphincter function for defects limited to 80% or less of the lower lip. If the defect is greater than 80% horizontally and extends beyond the labial mental sulcus vertically, these regional flaps are not suitable for reconstruction [5], because adequate lip sulcus and oral aperture can not be obtained. Distant flap reconstruction can be used for these larger defects. Temporal and deltopectoral flaps [6] or pectoralis major musculocutaneous flaps [7] are used. However the temporal and deltopectoral reconstruction is a two-stage operation. The musculocutaneous flap often

results in unacceptable cosmetic outcome. With the advent of microvascular free tissue transfer, one-stage reconstruction of lower lip is available with satisfactory aesthetic and functional results. Radial forearm free flap has been used by many authors for lower lip reconstruction [1,5,8-13].

Sakai et al. [5] and Sadove et al. [9] used composite radial forearm palmaris longus free flap for total lower lip reconstruction. Satisfactory lip seal and speech were obtained. Others used radial forearm free flap combined with local muscle transfer, to improve both aesthetic and functional results [14,15]. Masseter muscle was used, however this muscle is too short to be connected with orbicularis oris muscle.

In this study, the radial forearm flap combined with palmaris longus muscle tendon for total lower lip reconstruction or complete commissure defects is used. The flap is folded to reconstruct both outer skin and inner mucosal lining. Both ends of vascularized tendon were laid through the bilateral modiolus and anchored with adequate tension to the intact orbicularis muscle on both sides.

The purpose of this study is to describe the technique of using composite radial forearm palmaris longus flap for total reconstruction of lower lip and commissure. Also to evaluate of both functional and aesthetic outcomes.

### **PATIENTS AND METHODS**

From June 2003 to December 2005, 18 patients (11 females and 7 males) underwent reconstruction of full thickness total lower lip and oral commissure. The patients mean age was 51 years, ranging from 41 to 68 years. Ten patients had lower lip cancer that completely excised. Two patients had ulcerative lesion near commissure that completely excised with adjacent 30% of lower lip. Six patients had post traumatic loss of one commissure with

part of lower lip. Reconstruction was done using radial forearm palmaris longus tendon free flap. The patients have been followed up for 1 year. An Allen test was done before flap elevation. This predict potential postoperative ischemia.

#### *Surgical technique:*

The patients were prepared in supine position. The vessels were marked on the skin surface. The skin paddle overlies the artery and is best positioned over the anterior or anterolateral aspect of the wrist where subcutaneous tissue is thinner.

The skin flap was designed according to the size of oral mucosa and external face defect. Under tourniquet, the skin island was incised down to the subcutaneous tissue. Dissection was continued superficial to paratenon of the flexor tendons of the wrist. Distally the radial artery was identified, ligated and divided. The palmaris longus tendon was isolated at distant edge of the flap. It is divided 3cm faster than the distal and proximal edge of the flap. Cephalic vein and radial artery were dissected proximally to get longer pedicle.

At this point tourniquet was released to check hemostasis and circulation of the hand. Blood flow to the flap was ensured. The pedicle was divided and the flap was removed. At the recipient site, the defect is prepared. The skin flap was properly inset to obtain adequate sulcus and lip. Both ends of palmaris longus tendon were passed intramuscularly at the angles of the mouth and anchored to the remaining orbicularis muscle of the upper lip Fig. (1). The tension of tendon suturing was adjusted so that oral competence could be achieved, and the lips after reconstruction could achieve maximum closure of the mouth passively.

Microvascular anastomosis was performed. Radial artery was anastomosed end to facial artery in all cases except one to superior thyroid artery. Cephalic vein was anastomosed end to facial vein in fifteen cases and external jugular vein in 3 cases.

The donor site was grafted with split-thickness skin graft from the thigh. Tie over dressing was applied over the graft.

The patients were taken intravenous fluids for 24, hours then started oral feeding with fluid diet in the first week.

### RESULTS

The free flap survival rate was 94 percent (17 of 18) flaps. With one total failure in one patient undergone total lower lip reconstruction. In this patient pedicle flap was done (deltopectoral).

Functional outcome was assessed regarding deglutition and oral continence. All patients had excellent oral competence during rest, and during speaking and eating. Good sphinctric function was obtained in early postoperative days. No drooling or air leakage was seen up to 1 year after operation. The patients articulation was near-normal. The aesthetic results were accepted in all patients. All patients were able to resume regular diet. No complications were observed such as dehiscence, frstula formation or abcess formation. In patients with total lower lip reconstruction, the newly formed lip started to get involved with lip movements. Patients are presented in Figs. (2,3,4).

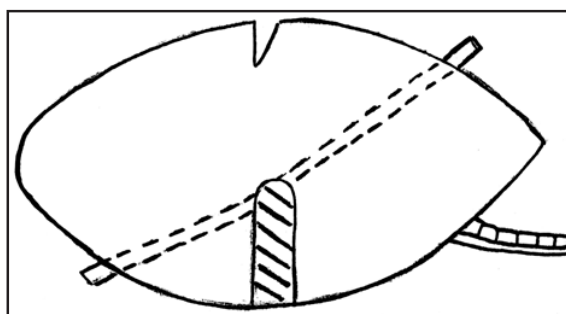


Fig. (1-A): Schematic illustration of the operation. The flap was folded onto itself to replace both the skin and buccal mucosa. Palmaris longus tendon was seen across the flap (dotted line).

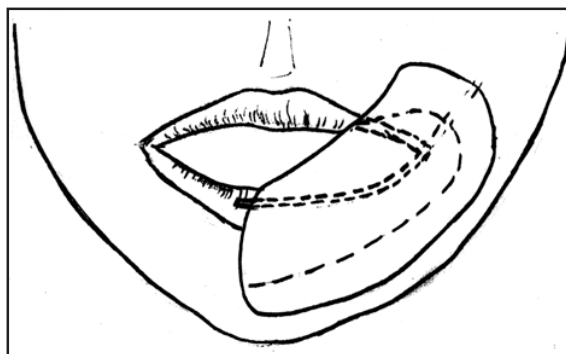


Fig. (1-B): Design of commissure reconstruction. The tendon passed through orbicularis oris muscle on both sides.



Fig. (1-C): Radial forearm flap for total lower lip reconstruction.



Fig. (2-A): A 62-year old woman with squamous cell carcinoma involving whole lower lip.

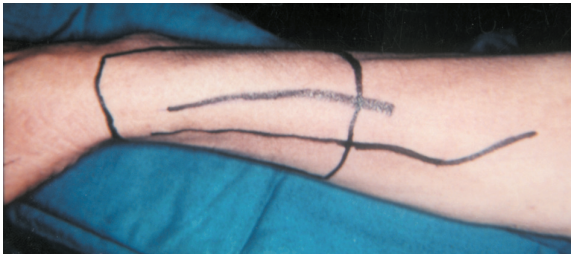


Fig. (2-B): 8 x 14 composite radial forearm palmaris longus free flap was elevated from left forearm.

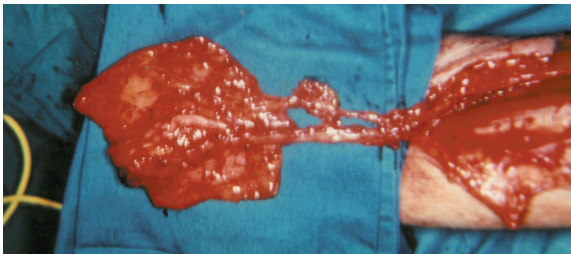


Fig. (2-C): Complete elevation of radial forearm flap.



Fig. (2-D): Flap inset. Intraoperative view of the transplanted flap replacing total lower lip.



Fig. (2-E): Result of reconstruction 1 year after flap transfer. Mouth was closed. There was acceptable aesthetic and functional result.



Fig. (3-A): A 45 year old woman with post donkey bite, right commissure was completely lost. Primary sutures were done. Patient cannot open her mouth.

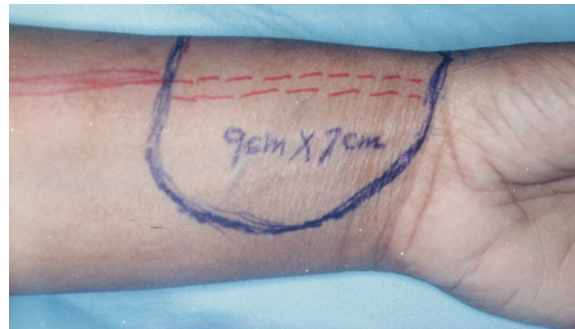


Fig. (3-B): 9x7cm composite radial forearm palmaris longus free flap was elevated.

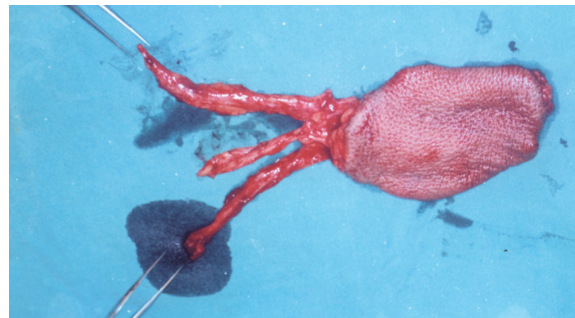


Fig. (3-C): The defect after excision of scary tissue. Orbicularis oris was dissected.



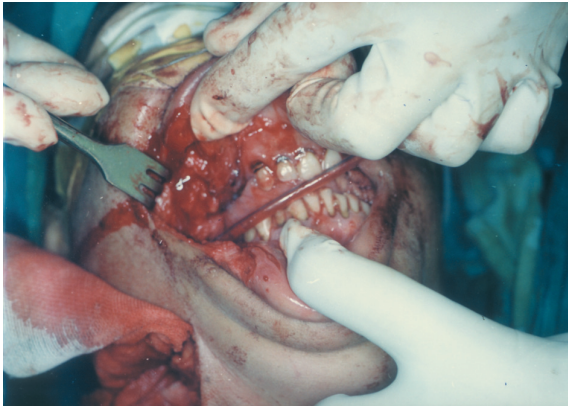


Fig. (3-D): Complete flap elevation showing skin flap, vascular pedicle and palmaris longus tendon.



Fig. (4-A): A 55-year old man with previous history of ulcerative lesion near commissure which was excised with adjacent 30% of lower lip.



(E)



(F)

Fig. (3-E&F): Result 10 months after reconstruction mouth was closed and opened freely with accepted cosmetic look.



(B)



(C)

Fig. (4-B&C): Result 1 year after operation. The defect was reconstructed. Mouth was closed and opened freely.

## DISCUSSION

Lips are circular structures that play a role in intraoral space and in providing oral continence as sphincter. They are also the starting point of the gastro-intestinal tract and respiratory systems and play a role in controlling food entry [11].

Requirements of lower lip reconstruction include both aesthetic and functional considerations such as avoidance of drooling and microstomia [16]. A deep enough labiogingival sulcus and a normal looking freely mobile lower lip that can facilitate continence and good pronunciation must be the goals of lower lip reconstruction. The newly formed oral aperture must not be too narrow. A shallow sulcus and numb lower lip may cause drooling and physiological problems [17].

Several methods of reconstruction of lower lip and commissure have been reported in the literature. It has been reported that full thickness lower lip defects of less than 80 percent can be successfully reconstructed using local flaps such as the fan flap [4] the Estlander flap [3], gate flap [18] or the Karapandzic flap [19]. Depending on the size and location of the defect. However reconstruction using these local flaps for extensive defects may be insufficient or lead to microstomia [20,21], fail to provide good function and cause additional scars. These local flaps can not be used to reconstruct an involved commissure, and total lower lip loss. They distort the commissure in addition to narrowing the lip. Also drooling is more common as a result of disrupted motor and sensory innervations of the lip. Such local techniques still may cause varying degrees of deterioration of the remaining tissues [11,22].

To avoid these pitfalls, several reports described how to provide oral lining and how to replace the missing lip segment. Most of the reports have described the use of a free flap to reconstruct the lip by incorporating it into the sphincter [23].

Since its original description by Yang et al. [24], the radial forearm flap has proven to be extremely versatile in head and neck reconstruction [23]. The radial forearm flap supplies thin, relatively hairless skin that conforms readily to irregular three dimensional contours. It can provide simultaneous intraoral lining and external skin coverage for full thickness defects of the lip [25,26]. In this technique, all the residual tissues are protected, including commissures while covering large defects that may never involve the chin.

Although one-stage reconstruction of such complex defects is possible with free flaps, the functional results is often far from ideal. To overcome this composite radial forearm flap with palmaris longus tendon was used by many authors. Sakai et al., were the first to use the radial forearm flap with palmaris longus tendon for total lower lip reconstruction. Sakai's group fixed the vascularized palmaris longus tendon to orbicularis oris muscle and to nasolabial dermis [5]. Here, the radial forearm flap provided three components, namely, skin, buccal and alveolar mucosa, as well as a way of preventing sagging of the newly constructed lip. Sadove et al., preferred to fix the tendon to the modiolus with nonresorbable sutures [9]. Serlett et al., fixed the tendon to the orbicularis oris muscle and proposed that fixing it to the periosteum of the lateral malar eminence through separate incision would provide additional lower lip support [10]. Fixing the tendon to malar eminence may decrease the conduction of the modiolus movement to the lower lip and may even render it motionless.

In this study, both tendon ends were passed through subcutaneous tunnels looping the tendon around the modiolus to be sutured to orbicularis oris muscle of the upper lip. This helps to transfer motion to the newly formed lip. Functionally, adequate support for the lower lip was achieved, vertical height was preserved, and good oral aperture was maintained. There were no problems of sagging or drooling. Further advantages of vascularised tendon transplantation are faster healing process, and a higher resistance to infection.

Although a true dynamic reconstruction of the lower lip can only be achieved with functioning muscle transfer. This technique is one stage reconstruction that provides reasonable symmetry of the reconstructed lip. Local muscle transfer like masseter was done. An advantage of this technique is simple and easy because the transfer is in area adjacent to the defect. However, the transported muscle cannot left the oral commissure cranially and sometimes too short to be connected with residual orbicularis oris muscle.

The aim of this study is to regain the continuity of orbicularis oris muscle around philtral columns by looping the tendon around the modiolus. This mimics the function of the horizontal fibers and restores complete circumference of oral sphincter.

By this technique all goals of total lower lip reconstruction with or without commissure loss were achieved, there were maintenance of oral

competence, adequate lip sulcus, ample oral aperture, sufficient lower lip support. This flap provided a static dam or curtain that functions as a lip.

### Conclusion:

In lower lip reconstruction the composite radial forearm palmaris longus free flap is thin enough that it can be folded onto itself without a significant increase in bulk. The flap is easy to dissect. The pedicle contains long vessels of large diameter, and the skin is of a good colour and texture match for the perioral region. With the use of vascularized tendon, good, sphincter function was seen. This makes the flap ideally suited for total lower lip and reconstruction.

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