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Complete Lower Lip Reconstruction with a Large Lip Switch Flap and a Composite Modiolus Advancement Flap

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Summary: Total loss of the lower lip is debilitating and poses a reconstructive challenge. Aiming to restore oral continence and function and also cosmetic appearance, a successful reconstruction has a huge impact on the quality of life for the individual patient. Early sources of local tissue rearrangement for lip reconstruction date back 3000 years, with earliest reports of lip switch procedures more than 2 centuries ago in Europe, when noma was still endemic in Europe, indicating that the anatomy was better understood by the barber surgeons of the past than we like to acknowledge. We are still faced with such challenging cases all over the world where resources are limited. Our current understanding of perforator anatomy and blood supply makes more frequent revisits to flaps of the past with modern advances. Innovative solutions are imperative for salvage, and old ideas tend to reappear when they prove to be useful. Herein, we describe in open access a new reconstructive method where we combined a large lip switch flap together with a composite advancement modiolus flap to reconstruct a whole lower lip and the donor defect of the upper lip all at once, a procedure that is simple to perform and works in settings where it is greatly needed. (*Plast Reconstr Surg Glob Open* 2017;5:e1607; doi: 10.1097/GOX.0000000000001607; Published online 22 December 2017.)

Total reconstruction of the lower lip is a challenging surgical procedure aiming to restore oral continence and function and also cosmetic appearance. A successful reconstruction has a huge impact on the quality of life for the individual patient. Lips are a complex anatomical structure, which can be divided into 3 interconnecting layers: oral mucosa, muscle, and skin. The reconstruction has to provide all 3 layers to offer the best chance of optimal function, and various solutions have been proposed over the years ranging from local flaps to free tissue transfer.¹ Each method has specific limitations; however, it seems apparent that local tissue, when available, does provide the best match for all missing components.^{1,2}

The lip switch flap has been well known for more than a century and when available fulfils the aim of a topographically correct reconstruction. However, the lip switch is not large enough to be used for a total lip reconstruction, and some form for advancement has to compensate for what is lacking. We have, in an earlier issue of this journal, described the modiolus perforator flap, a versatile and reliable flap for perioral reconstruction.³ Herein, we describe a reconstructive method where we combined a large lip switch flap together with a composite advancement modiolus flap to reconstruct a whole lower lip and the donor defect of the upper lip all at once. This is the first time, for our part and to our knowledge, that both flaps have been used in combination for a total lower lip reconstruction.

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CASE REPORT

The patient, an Ethiopian man, had a total lower lip resection 11 months previously because of squamous cell carcinoma (Fig. 1). The resection entailed approximately 95% of the lower lip stretching from commissure to commissure and to the mental crease, leaving the patient with an exposed gingiva and lower teeth. He suffered in social

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isolation because of total oral incontinence and impaired and incomprehensible speech. Before reconstruction, clinical examination did not reveal any signs of tumor recurrence. The surgery was performed at the ALERT center hospital in Ethiopia under local anesthesia: a nerve block of the infraorbital and mandibular branches of the trigeminal nerve was performed, before proceeding to infiltrate 1% xylocaine with adrenalin along the planned incisions (Fig. 2). The scar was excised and sent for histopathology, showing no signs of residual tumor. A left-sided lip switch flap was designed and raised, starting 5 mm medial to the commissure to the medial edge of the philtrum including all 3 layers of the upper lip. Based on the known modiolus blood supply as a base, we designed a large advancement flap of the remaining cheek to advance it in a composite manner in the shape of a large V to Y closure

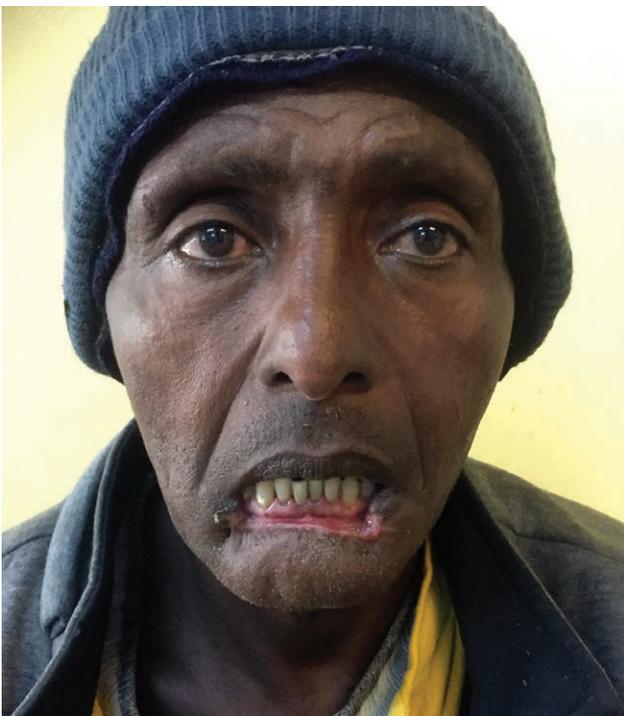


Fig. 1. A near-complete >90% loss of the lower lip after removal of squamous cell carcinoma 11 months in the past.

of the donor site and a myomucosal counterpart on the inside. The rich blood supply of the facial artery running axially along the flap makes this flap extremely robust, and advancement of all 3 layers is made available in this manner. The lip switch flap was then transposed into the lower lip defect and sutured from the inside out followed by advancement of the modiolus composite flap. Both flaps were sutured in 3 layers, making sure the orbicularis muscle was inset completely using 3.0 polymer resorbable suture (Fig. 2). The lip switch flap pedicle was resected 3 weeks later by the attending resident, who assisted during the primary surgery, and the early postoperative result is shown (Fig. 3).

DISCUSSION AND CONCLUSIONS

This case demonstrates the successful combined use of a large lip switch flap and a composite modiolus advancement flap for total lower lip reconstruction and reconstruction of the upper lip donor site. The patient regained his ability to eat and drink normally. He shows adequate oral aperture with slight microstomia that we were prepared to correct with a commissuroplasty, but the patient did not feel it was necessary. His speech is well audible, almost in the same manner as before the tumor resection. Facial animation and cosmetic appearance are markedly improved, and he feels blessed to have regained his quality of life. The patient was lost to long-term follow-up, and we are therefore unable to test his muscle function. However, we would expect a regain of muscle function because this has been our clinical experience using large lip switch flaps in the past, and the recovery of muscle function has been recognized by several authors when the muscle is meticulously reinserted to reconstruct the orbicularis oral sphincter.^{4,5}

Local tissue from the cheek has always been an attractive first choice for lip reconstruction with earliest source dating back 3000 years.⁶ The floppy upper lip and tight lower lip resulting from total lower lip reconstruction have always been a challenge, and a lip switch has been an attractive alternative, replacing like with like.² The earliest written source of the lip switch flap in Europe dates back to 1756 in Sweden with improvements from surgeons from Italy, Denmark, and Germany long before the famous

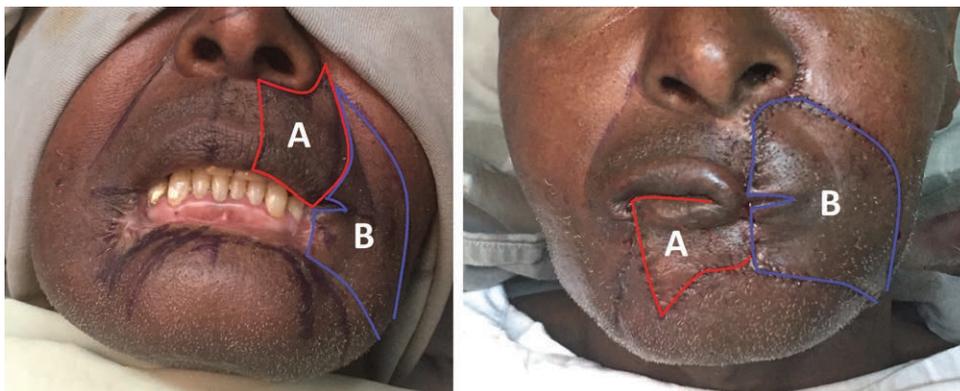


Fig. 2. The design of a large lip switch flap (A) and a composite modiolus advancement flap (B). Preoperative design and immediate postoperative result after the first stage procedure.

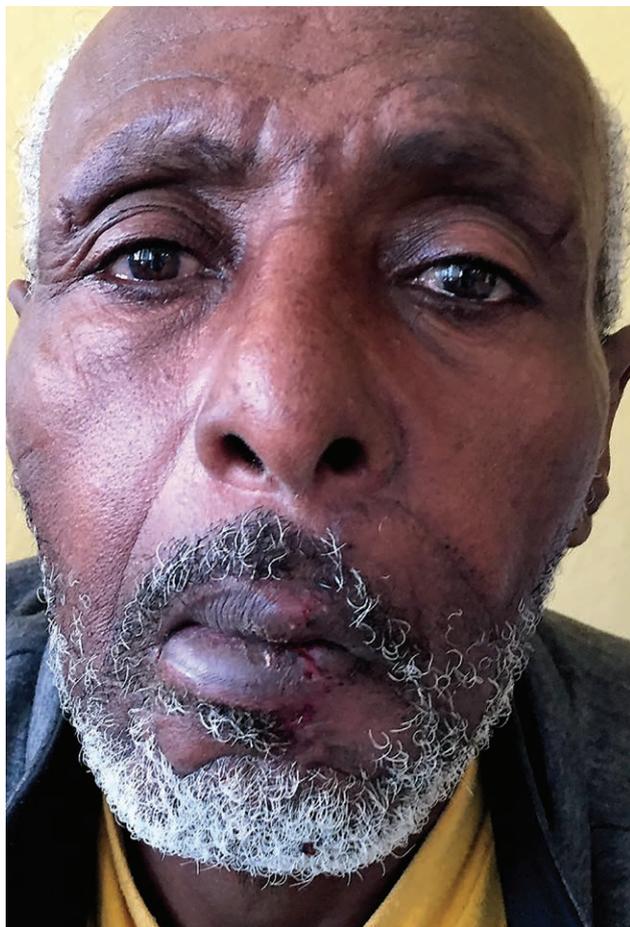


Fig. 3. Final postoperative result at the time of suture removal.

American surgeon William Abbe presented the method in English literature in 1898.⁷ The origin of the lip switch idea is disputed, and therefore it is referred to herein simply as lip switch flap to honor joint efforts of all the inspirational surgeons utilizing the method for the benefits of their patients in the past.

Reduction of the upper lip seems appropriate, and using it to reconstruct the lower lip and also the advancement of the remaining commissure makes the most of the remaining functionality: a complete tissue rearrangement without sacrificing any excess tissue. The modiolus is where the facial muscles meet in a chiasma lateral to the angle of the mouth. We have shown attention to a particular facial artery perforator, lateral to the modiolus, and described the versatility of the modiolus perforator flaps in the past.^{3,8} The composite modiolus advancement flap represents an anatomical principle of subunit rearrangement rather than a new flap. It includes the facial artery without changing its course, utilizing its perforators to the skin, muscle, and mucosa without distorting the muscular innervation or sensibility.

A forgotten father of the nasolabial flap and lower lip surgery, Victor von Bruns, used adjacent flaps superiorly or inferiorly based, and many of the successors were inspired by his full-thickness nasolabial, facial artery flap, including Gillies and Karapandzic.⁹ The fan flaps used by Gillies, a

composite axial pattern flap of the facial artery, were bulky and sacrificed the facial nerve innervation, aggravating oral incontinence.^{1,2} The Bernard and Webster method resulted in a tight, insensate lower lip with the need for a tongue flap for reconstruction of the vermilion.^{1,2} Karapandzic used a von Bruns flap design to recreate the oral sphincter while preserving its neurovascularity and to provide a functional reconstruction that has become quite successful for reconstruction of up to 2/3 of the lip.^{1,2} The modiolus advancement flap relies mainly on the modiolus perforators of the facial artery and its mobility without severing the lateral musculature of the mouth. The modiolus advancement allows for reconstruction of two fifths of the upper lip and the lower lip simultaneously and that has not been demonstrated by any other flap to our knowledge. A potential microstomia must be anticipated as with the Karapandzic flap and would be solved in a similar manner with a lateral commissuroplasty. An alternative unproven idea might be the traditional expansion of the vermilion mucosa in accordance to Ethiopian Mursi tribal customs of full-thickness incision and serial expansion using pieces of wood in increasing size.

A microsurgical procedure would of course allow for a total closure of the defect; however, the functional and cosmetic result would be inferior to the use of local flaps, and furthermore microvascular facilities are still very limited in Ethiopia.

The lip switch and composite modiolus advancement flap reconstruction is simple to perform and works in settings where it is greatly needed. This may be the first report of its successful use for total lower lip reconstruction, but it shall not be the last.

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