INTRODUCTION

Upper lip reconstruction is still a surgical challenge due to the detailed lip anatomy, including the special texture of vermilion. “Like for like” reconstruction using an “Abbe” or “Estlander” flap for the upper lip has been widely performed. However, these flaps have the disadvantage of causing microstomia, and an Abbe flap causes inconvenience in eating and speaking because the flap bridging the upper and lower limits of mouth opening is free.1,2

Jin et al. introduced a 2-stage reconstruction procedure for a defect of the upper lip in patients with hemifacial atrophy, using a modified cross-lip vermilion flap with the pedicle specifically positioned at the commissure for functional and esthetic purposes.3 This technique reduces microstomia and inconvenience in eating and speaking compared with a common horizontal cross-lip flap and provides better color-and texture-matched tissue compared to reconstruction using a tongue flap or mucosal flap. The technique is simple, requires a relatively short surgical time, has minimum donor-site morbidity and permits good esthetic and functional reconstruction of the central upper lip vermilion for a relatively small defect. (Plast Reconstr Surg Glob Open 2019;7:e2279; doi: 10.1097/GOX.0000000000002279; Published online 25 June 2019.)

CASE REPORT

An 71-year-old woman presented with a 15 mm × 10 mm superficial basal cell carcinoma of the middle upper lip, which was excised with the cutaneous upper lip to vermilion, including part of the orbicularis oris. This resulted in a 23 mm × 18 mm defect over the upper lip that included the upper dry red lip and some of the wet red lip (Fig. 1).

METHODS

The defect of the cutaneous upper lip and vermilion was reconstructed with a labial artery-based horizontal long cross-lip flap. Before the operation, the location of the inferior labial coronary artery was determined using a Doppler blood flow meter, and the flap was designed with correct inclusion of the artery. The anterior margin of the flap was located at the junction of the wet and dry vermilion. The vermilion flap containing the inferior labial coronary artery was elevated starting from the contralat-
eral commissure. The surrounding orbicularis oris muscle cuff was included at the basement of the flap. A 5 mg bolus of indocyanine green (ICG) was injected through the peripheral intravenous line 90 seconds after flap elevation, and the vascularity of the flap was checked by ICG angiography using an infrared camera (Photodynamic Eye [PDE] neo; Hamamatsu Photonics K.K., Hamamatsu, Japan). The tip of the flap that showed the weakest ICG fluorescence was removed for safe transplantation.

The maximum width of the harvested vermillion flap was 0.8 cm and the length was about 3.7 cm, giving a length:width ratio of approximately 4:1. In addition, the distal end of the flap was purposefully de-epithelialized to reconstruct the vermillion tubercle following satisfactory inset of the vermillion flap (Fig. 2). The defect of the cutaneous upper lip was reconstructed with full-thickness skin grafting from the left nasolabial fold (Fig. 3). The flap and dermis harvest sites were closed with direct suture. Nine days later, a delayed procedure was performed by clumping the base of the flap, and after another 3 days the pedicle was divided and redundant tissue was minimally trimmed to restore the appearance of the lateral commissure.

The reconstructed upper vermillion was full and plump and largely symmetrical at 1 year after surgery (Fig. 4). The function of the oral sphincter and sensitivity of the red lip had fully recovered, and there had been no recurrence or metastasis of the tumor at the last checkup at 2 years after surgery. The morphology of the commissure was normal and the donor-site scar in the lower lip was inconspicuous. The patient remains satisfied with the surgical outcome.

**DISCUSSION**

Vermillion reconstruction is sometimes required for a defect due to malignant tumor resection, trauma or congenital anomaly. Higher quality reconstruction is particularly required for a centrally located defect because this part of the upper lip easily attracts attention, even if the defect is not large. However, there are very few candidates as ideal tissue that is color- and texture-matched to the original tissue.

Use of normal vermillion tissues or adjacent tissues of similar color, such as an Abbe flap, tongue flap or buccal mucosal flap, can be used to achieve a reconstructed vermillion that is similar to the original.1,2,4–6 A vertical type cross-lip flap such as an Abbe flap is a good option for reconstruction of the central upper lip and can achieve ideal "like for like" reconstruction. However, this technique causes microstomia and requires a period in which the patient does not open his or her mouth because the
pedicle is centrally located, which imposes an excessive burden on the patient.\textsuperscript{7} A tongue flap and buccal musculomucosal flap can be used to repair a large vermilion defect, but the color and texture of the tongue or oral vestibular mucosa do not completely match those of the vermilion.\textsuperscript{4–6} These techniques require application of lipstick to camouflage the color difference, and this make-up does not apply well to a newly reconstructed vermilion. Moreover, immobilization of the tongue before division of the pedicle is extremely uncomfortable for the patient and can cause difficulty in speaking and eating, as with the Abbé flap.

A labial artery-based horizontal long cross-lip flap resolves these unfavorable clinical problems and results in satisfactory esthetic and functional outcomes with minimum donor-site morbidity. This surgical technique is simple and not too time-consuming. However, care is required for successful and safe raising of the flap. One tip is that the labial coronary artery, which is a branch of the inferior labial artery extending from commissure to commissure, should be properly included in the flap pedicle. Preoperatively, this artery can be detected by ultrasound echo and marked, if possible including a vein. Second, it is recommended that ICG imaging is used for determining the extent to which the distal flap is vascularized. Third, if the lower lip is narrow in width, this technique is hard to use because collection of sufficient donor site tissue could reveal the oral mucosa, which loses the good appearance.

Our case required an additional donor site for cutaneous upper lip reconstruction with full-thickness skin grafting, but a scar is not evident if a nasolabial fold is used as the harvest site. In cases with deep defects through the full thickness of the vermilion, insufficient tissue volume may result in lip depression and whistle deformity. Therefore, our technique may be most appropriate for less than full-thickness defects of pure vermilion. When the full thickness of the vermilion including the cutaneous lip is resected, it may be better to select an Abbé flap for reconstruction because this method provides wide and bulky tissue.

To the best of our knowledge, this is the first report of use of a labial artery-based horizontal long cross-lip flap to reconstruct a unilateral upper lip vermilion defect after skin tumor resection. The surgical technique reported here provides a good esthetic and functional outcome for the central upper lip vermilion for a relatively small defect.

Yoshihiro Sowa, MD, PhD
Department of Plastic and Reconstructive Surgery
Kyoto Prefectural University of Medicine, Graduate School of Medical Sciences
Kawaramachi-Hirokoji Kajii-cho 465, Kamigyo-ku
Kyoto 602–8566, Japan
E-mail: sowawan@kpu-m.ac.jp

REFERENCES
1. Yih WY, Howerton DW. A regional approach to reconstruction of the upper lip. J Oral Maxillofac Surg. 1997;55:383–389.
2. Culliford A 4th, Zide B. Technical tips in reconstruction of the upper lip with the Abbé flap. Plast Reconstr Surg. 2008;122:240–243.
3. Jin X, Teng L, La J, et al. Upper-lip vermilion reconstruction with a modified cross-lip vermilion flap in hemifacial atrophy. J Plast Reconstr Aesthet Surg. 2013;66:e101–e106.
4. Kakudo N, Kuro A, Morimoto N, et al. Combined tongue flap and deepithelialized advancement flap for thick lower lip reconstruction. Plast Reconstr Surg Glob Open. 2017;5:e1513.
5. Jin X, Teng L, Zhang C, et al. Reconstruction of partial-thickness vermilion defects with a mucosal V-Y advancement flap based on the orbicularis oris muscle. J Plast Reconstr Aesthet Surg. 2011;64:472–476.
6. Utushidate S, Yokoi K, Higuma Y, et al. New way to raise the V-Y advancement flap for reconstruction of the lower lip: bipedicled orbicularis oris musculocutaneous flap technique. J Plast Reconstr Hand Surg. 2011;45:66–71.
7. Okazaki M, Hisatomi T, Sarukawa S. Aesthetic upper lip reconstruction with vermilion submucosal-pedicle cross-lip flap. J Craniofac Surg. 2006;17:1259–1262.