



# Nasolabial and forehead flap reconstruction of contiguous alar–upper lip defects

Jonathan A. Zelken <sup>a,b</sup>, Sashank K. Reddy <sup>c</sup>, Chun-Shin Chang <sup>a</sup>,  
Shiow-Shuh Chuang <sup>a</sup>, Cheng-Jen Chang <sup>a</sup>, Hung-Chang Chen <sup>a</sup>,  
Yen-Chang Hsiao <sup>a,\*</sup>

<sup>a</sup> Department of Plastic and Reconstructive Surgery, Chang Gung Memorial Hospital, College of Medicine, Chang Gung University, Taipei, Taiwan

<sup>b</sup> Department of Plastic and Reconstructive Surgery, Breastlink Medical Group, Laguna Hills, CA, USA

<sup>c</sup> Department of Plastic and Reconstructive Surgery, Johns Hopkins Hospital, Baltimore, MD, USA

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## KEYWORDS

Nasal reconstruction;  
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**Summary** *Background:* Defects of the nasal ala and upper lip aesthetic subunits can be challenging to reconstruct when they occur in isolation. When defects incorporate both the subunits, the challenge is compounded as subunit boundaries also require reconstruction, and local soft tissue reservoirs alone may provide inadequate coverage. In such cases, we used nasolabial flaps for upper lip reconstruction and a forehead flap for alar reconstruction.

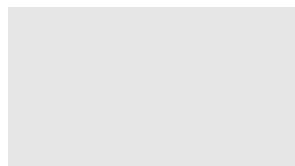
*Methods:* Three men and three women aged 21–79 years (average, 55 years) were treated for defects of the nasal ala and upper lip that resulted from cancer ( $n = 4$ ) and trauma ( $n = 2$ ). Unaffected contralateral subunits dictated the flap design. The upper lip subunit was excised and replaced with a nasolabial flap. The flap, depending on the contralateral reference, determined accurate alar base position. A forehead flap resurfaced or replaced the nasal ala. Autologous cartilage was used in every case to fortify the forehead flap reconstruction.

*Results:* Patients were followed for 25.6 months (range, 1–4 years). All the flaps survived, and there were no complications. Satisfactory aesthetic results were achieved in every case. With the exception of a small vertical cheek scar and a vertical forehead scar, all incisions were concealed within the subunit borders.

*Conclusion:* From preliminary experience, we advocate combining nasolabial flap reconstruction of the upper lip with a forehead flap reconstruction of the ala to preserve normal

\* Corresponding author. Department of Plastic and Reconstructive Surgery, Chang Gung Memorial Hospital, 5, Fu-Hsing Street, Kweishan, Taoyuan 333, Taiwan. Fax: +886 3 3287260.

E-mail address: [nosehsiao@gmail.com](mailto:nosehsiao@gmail.com) (Y.-C. Hsiao).



facial appearance. This combination addresses an important void in the algorithmic approach to central facial reconstruction.

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## Introduction

The nasal aesthetic subunit, as introduced by Burget and Menick, is one of the nine distinct territories of the nose that should be entirely replaced when a majority of it is deficient. Subunits of the lip include the upper lip, philtrum, and vermilion. Subunit boundaries are points of inflection or concavities amenable to favorable scarring and should be preserved or recreated.<sup>1,2</sup> Facial defects spanning more than one aesthetic subunit are commonly encountered following tumor extirpation and trauma. Such defects pose reconstructive challenges that may not be addressed by conventional local flap designs. Although reconstructive algorithms and flap designs specific to the defects of the upper lip or nasal alar subunits have been described, little attention has been given to defects that span both.

In 2012, Burget and Hsiao described a novel design for extended nasolabial flap coverage of large superficial defects of the upper lateral lip.<sup>3</sup> This design generates aesthetically favorable results but does not address defects that traverse subunit boundaries. Specifically, the extended nasolabial flap does not provide adequate tissue to resurface the lip and ala without undue tension and subsequent distortion. In one case of an isolated upper lip defect that did not extend to the ala, Hsiao and Burget noted alar notching that necessitated secondary reconstruction with a forehead flap.<sup>3</sup> In the present study, we considered soft tissue losses extending from the upper lateral lip to the nasal ala. We offer a novel strategy for the reconstruction of contiguous alar–upper lip defects. Indications for this approach, description of the technique, and results of reconstruction are presented in a small series of patients.

## Patients and methods

Three men and three women aged 21–79 years (average, 55 years) presented with large superficial defects of the upper lip and nasal ala following trauma or cancer (Table 1). Patients were of Taiwanese ethnicity. Labial defects occupied >50% of the upper lip subunit, and five of six labial lesions involved the cutaneous and subcutaneous layers only. One patient with a full-thickness lip defect resulting from squamous cell carcinoma had a prior free-flap reconstruction that was revised for debulking and cosmetic improvement. Three patients were treated by the dermatologists for basal cell carcinoma at the alar base. Two patients had alar defects resulting from trauma; one involved both nasal alae. Nasal alar defects were partial or full thickness in nature, but all approached or exceeded 50% or more of the alar subunit.

## Indications

It may be necessary to combine nasolabial and forehead flaps for the reconstruction of contiguous defects that involve the majority of the upper lip and alar subunits. Patients included in this series had (1) partial-thickness defects of >50% of the upper lip subunit, (2) composite defects of the nasal ala, and (3) high aesthetic expectations.

## Surgical technique

The upper lip was reconstructed before the nasal ala in every case (Figure 1). Skin cancers were excised to clear margins. The remainder of the upper lip subunit was then excised as previously described.<sup>3</sup> Subunit boundaries were the philtral column, nostril sill and alar base, and nasolabial fold. Nasolabial flaps were based laterally. The lateral border of the nasolabial flap was positioned at the nasolabial fold after inset. The upper lip flap was modeled after the contralateral subunit to assure accurate alar base positioning.

The alar subunit was then excised to the subunit boundaries in preparation for staged forehead flap reconstruction.<sup>4</sup> Nasal subunits and the defect were recreated on a foil template. Forehead flap design was based on the unaffected contralateral nose or a gender-, age-, and ethnicity-appropriate prototype. The supratrochlear artery was identified by Doppler examination. The foil template was marked on the forehead along the vascular axis and then expanded 1 mm circumferentially to account for anticipated scar contraction. If necessary, the alar cartilages were reinforced using autologous cartilage.

The forehead flap was inset in such a way that it and the nasolabial flap were precisely opposed along the nostril sill and alar base. In cases with a full-thickness defect with missing nasal lining, the forehead flap was folded over as previously described to simultaneously restore the lining and skin (Figure 2).<sup>5</sup> In subsequent stages, the forehead flap was elevated to create, reinforce, or refine the framework, and conservative flap thinning was performed. In the final stage of reconstruction, the pedicle was divided. Additional refinements were performed several months later to create nasal grooves, enhance definition, and open the airway as desired (Figure 3).

## Results

All patients had three-stage forehead flap reconstruction combined with unilateral ( $n = 5$ ) or bilateral ( $n = 1$ ) nasolabial flaps. Autologous cartilage was required in every

**Table 1** Patient demographics.

Patient	Age (years)	Sex	Indication	Site	Site of defects other than UL and Ala	Cartilage framework donor	Additional procedures	Follow-up (months)	Complications
1	66	F	BCC	Right alar base	No	Concha	No	38	None
2	54	M	SCC	Right UL and alar contracture after ALT flap	No	Septum + Concha	prior ALT flap	24	None
3	21	F	Trauma	Right ala and UL	No	Septum + Concha	No	48	None
4	79	F	BCC	Left alar base	No	Septum	No	17	None
5	48	F	Trauma	Left ala and UL	Right UL	Rib	right NL flap	15	None
6	62	F	BCC	Right ala	No	Concha	No	12	None

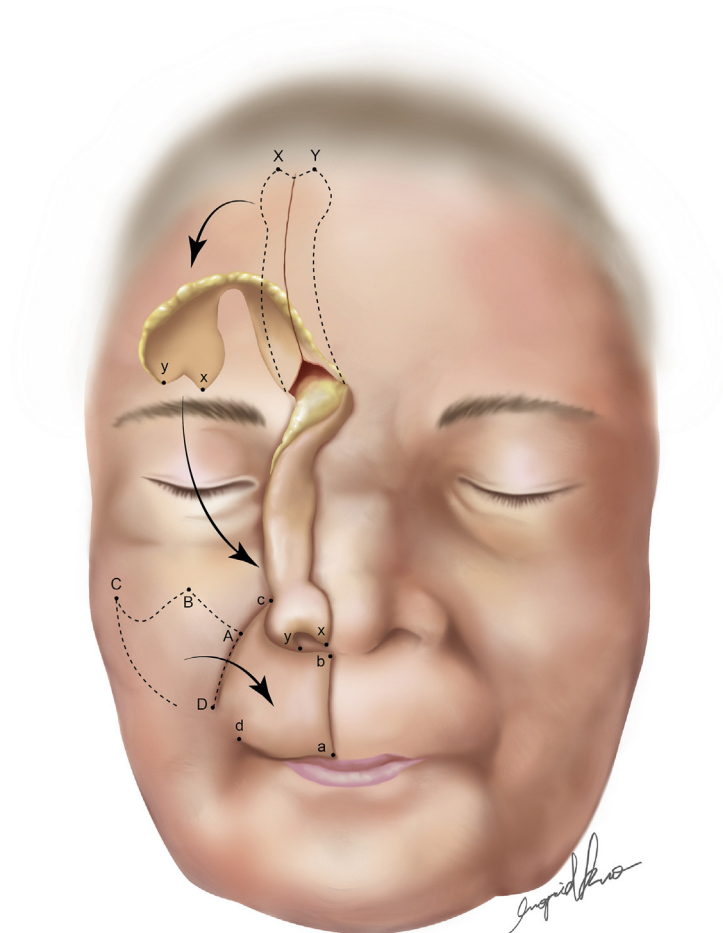
BCC, basal cell carcinoma; SCC, squamous cell carcinoma; UL, upper lip; ALT, anterolateral thigh; NL, nasolabial.

alar reconstruction (Table 1). Patients were followed for 25.7 months (range, 1–4 years). All the patients were satisfied with the aesthetic outcomes at the donor site. The cheek donor site was vertical in nature but did not cause significant distortion or alar notching. The alar groove was effaced in three cases. No patients had infection, hematoma, or nerve injury. There were no partial or complete

flap losses. Inset scars and flap interfaces were well hidden in the natural contours of the ala, upper lip, and vermillion.

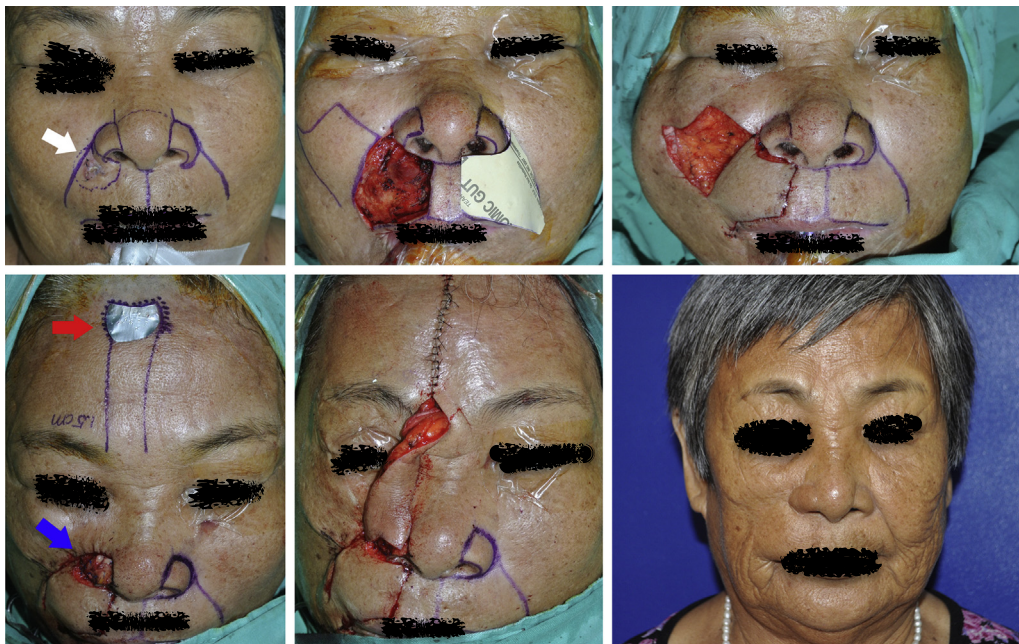
## Discussion

Refinements in technology and technique enable flaps to do more than cover a wound. Aesthetics and donor-site



**Figure 1** The nasolabial flap and forehead flap are inset (nasolabial flap: A to a, B to b, C to c, and D to d; forehead flap: X to x and Y to y).

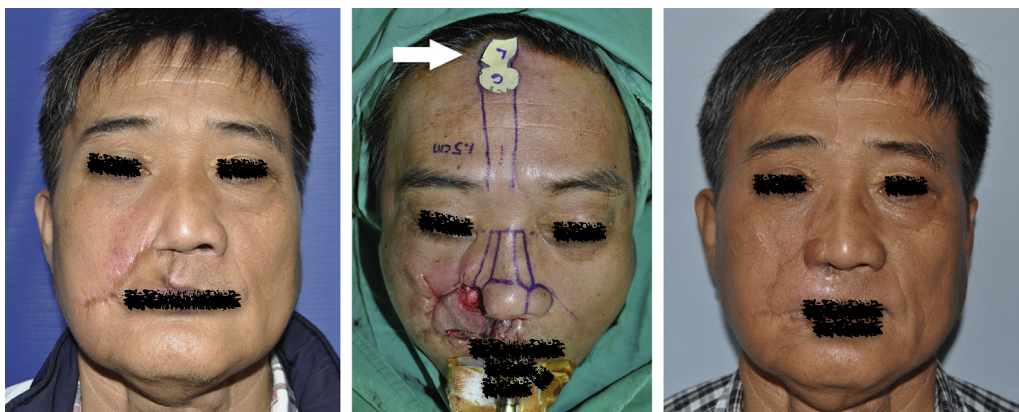




**Figure 2** (Above, left) The defect created from the excision of a basal cell carcinoma (white arrow) and its margins approach 50% of the right upper lip and alar subunits in a 66-year-old woman. (Above, center) The upper lip subunit is excised to subunit boundaries; a resurfacing nasolabial flap is designed by mirroring the contralateral upper lip subunit using a foil template made from a suture wrapper. (Above, right) The nasolabial flap is transposed into position, tension free, taking special care to inset the upper border at the level of the native nostril sill and alar base. (Below, left) Following the inset and closure of the nasolabial defect, the remainder of the alar subunit skin is excised, the alar cartilages are reinforced with autologous conchal cartilage (blue arrow), and the template is then extended (red arrow) by 1 mm to account for foreseeable contraction. (Below, center) The forehead flap is inset. (Below, right) Satisfactory postoperative appearance at 38 months.

morbidity have become critical considerations in reconstruction; this is particularly relevant in central facial reconstruction. In the present study, we aimed to restore a normal appearance, drawing from advances in both reconstructive and aesthetic disciplines. The forehead flap is a dependable option for nasal reconstruction that offers

excellent color, texture, and volume match and is the ideal counterpart to the nasolabial flap for central facial reconstruction. When the nasal aesthetic subunit principle is respected, excellent cosmetic results can be achieved. Despite efforts to challenge and modify the subunit principle,<sup>6–10</sup> most surgeons honor its role in the



**Figure 3** (Left) A 54-year-old man with squamous cell carcinoma of the upper lip had wide excision and reconstruction with a free anterolateral thigh flap resulting in distortion and contracture of the whole right upper lip subunit and most of the adjacent ala. (Center) Revision surgery warranted excision and resurfacing of the upper lip and excision and replacement of the full-thickness ala. After the inset of the nasolabial flap, a forehead flap was designed (white arrow) to replace both the skin (C) and lining (L) of the ala. (Right) Improvement of facial appearance at 24 months.

reconstructive armamentarium. The technique we described emphasizes the importance of preserving or recreating this essential feature of the normal-appearing nose.

Jin et al. advocated the use of nasolabial flaps for nasal alar reconstruction, reserving the forehead flap for larger distal nasal defects in an Asian population.<sup>11</sup> When there are combined defects of the upper lip and ala, the use of the nasolabial flap is advocated for upper lip reconstruction, reserving the forehead flap for nasal alar and lining reconstruction. Much attention has been focused on restoring lip and alar defects in cleft patients, but comparatively very less research has focused on adult patients who commonly present with combined defects. Recently, facial artery-based propeller flaps have been described to restore nasolabial defects.<sup>12</sup> Although patients achieved wound closure without significant distortion, the technique was principally suitable for perinasal defects and cannot be used to resurface the true upper lip.

Similarly, methods using local flaps to resurface the lip inadequately address coexisting alar defects, necessitating secondary procedures.<sup>3,13</sup> Free tissue reconstruction of central facial defects spanning multiple subunits has been reported with satisfactory results.<sup>14,15</sup> However, even a well-executed free flap may result in color and texture mismatch. Donor-site morbidity of distant sites must also be considered. We believe that patients with lower cosmetic expectations and composite defects may be better suited for free tissue transfer. In contrast, patients with partial- or full-thickness cutaneous defects and high cosmetic expectations may benefit from local options.<sup>16,17</sup>

The present technique was successfully executed in six patients. Advantages of the approach include the ability to (1) restore both upper lip and alar defects using local tissue alone; (2) hide inset scars at anatomical boundaries including the dorsal–alar, alar–cheek, and alar–upper lip junction and the upper lip vermilion border<sup>7</sup>; and (3) hide donor site scars on the forehead and in the nasolabial fold. Drawbacks include the multiple stages required for forehead flap reconstruction and the presence of a vertical cheek scar. Midfacial scars may be very visible, particularly in Asian patients; however, satisfaction remained high and no complaints were documented. Undoubtedly, patients must be made aware of this trade-off in the consent process. Other stigmata may include effacement of the nasolabial fold, elevation of the ala, and effacement of the alar base. In most cases, optimal results were achieved after 4–6 months. Dissatisfaction can be minimized by preoperative education and guidance.

To account for possible scar contracture and soft tissue changes, we enlarged the alar aesthetic subunit in the forehead flap design by 1 mm. In addition, structural and contour-defining cartilages were overbuilt with the expectation that a contracting skin envelope would impose greater forces than normal skin. We consider that cartilage replacement alone tends to be inadequate in Asian patients; defects must be replaced *and* reinforced. Accumulating the ongoing experience will create a pool of enriched knowledge that can further counter and improve imperfect results. In summary, combined nasolabial and forehead flap reconstruction as described generates predictable and satisfactory results in the reconstruction of the upper lip and nasal ala.

## Conclusions

Defects of adjacent aesthetic subunits require soft tissue replacement of the affected subunit and preservation of the naturally occurring boundaries. When multiple central facial subunits need replacement, superior aesthetic results are achieved when these subunits are individually reconstructed with the flap interface placed precisely at the naturally occurring subunit boundary. In the case of combined labial–alar defects, we advocate the use of nasolabial flap reconstruction (upper lip) combined with a forehead flap (ala) to preserve the normal facial appearance with acceptable donor site morbidity. This combination addresses an important void in the algorithmic approach to central facial reconstruction.

## Ethical approval

Not required.

## Funding

None.

## Conflicts of interest

None declared.

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