Case report

Flap design challenges for upper lip defect: a case series

Nugrohoaji Dharmawan,[1,2]✉ Prasetyadi Mawardi,[1,2] Ayu Kusuma Dewi[1,2]

[1] *Department of Dermatology and Venereology, Faculty of Medicine, Sebelas Maret University, Surakarta, Indonesia*
[2]*Dr. Moewardi General Hospital, Surakarta, Indonesia*

Abstract

Basal cell carcinoma (BCC) of the upper lip poses significant reconstructive challenges due to the need to restore both function and aesthetics in a highly visible area. This case series presents four patients with upper lip BCC that underwent Mohs micrographic surgery followed by individualized local flap reconstruction. Flap selection was tailored to each defect, utilizing rotational, advancement, O-to-Z, and transpositional flaps to address variations in size, location, and tissue availability. All patients experienced satisfactory healing, restoration of lip contour, and preservation of oral competence, with no major complications or recurrences during follow-up. These results highlight the importance of careful preoperative planning and personalized surgical approaches in achieving optimal outcomes for upper lip reconstruction. Our findings support the use of versatile local flaps as effective options for managing complex upper lip defects following BCC excision.

Keywords: upper lip reconstruction, BCC, rotational flap, advancement flap, transpositional flap

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Introduction

Basal cell carcinoma (BCC) is the most frequently encountered neoplasm affecting the lips, particularly in the upper lip region (1). In 2019, an estimated 4 million cases of BCC were reported globally (2), with the nodular subtype being the most common, accounting for approximately 57.6% to 78.7% of all cases (3). The upper lip plays a vital role in aesthetics, speech, and facial expression, making precise reconstruction essential after tumor excision (4). Reconstruction in this region requires designs that restore both function and appearance while minimizing scarring and preserving the natural contour (1, 5). Flap techniques, including rotational, advancement, O-to-Z, and transpositional flaps, are highly effective in achieving these goals. These methods utilize local tissue to ensure vascular integrity and tension-free closure, tailored to the defect's size, location, and complexity. This case series highlights the application of advanced flap designs for upper lip reconstruction, demonstrating their versatility in addressing aesthetic and functional challenges. All the patients were diagnosed with BCC based on clinical manifestation and dermoscopic features, confirmed by histopathological examination with a tumor-free margin through a Mohs micrographic surgery (MMS) surgery procedure.

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Case I

A 62-year-old male farmer presented with a dark lump on his left upper lip that had been growing for 2 years. Dermatological examination identified a well-defined dark nodule (Fig. 1A, B). Tumor excision with a

✉ nugrohoaji_d@staff.uns.ac.id

rotational flap was performed (Fig. 1C, D), achieving excellent healing and cosmetic outcomes at a 1-month follow-up (Fig. 1F).

Case II

A 63-year-old woman presented with a 4-year history of a growing lump on her right upper lip. The lump was itchy and painful, and it easily bled. Clinical examination revealed a hyperpigmented nodule with rodent ulcer characteristics (Fig. 2A, B). The tumor was removed with the advancement island pedicle flap design (Fig. 2C–F). Postoperative care and follow-up after 2 months showed excellent cosmetic and functional outcomes (Fig. 2G, H).

Case III

A 63-year-old male presented with a 2-year history of an ulcer on the philtrum of his upper lip, accompanied by itching, pain, and bleeding. The tumor was excised using O-to-Z-plasty (Fig. 3A, B), and postoperative recovery was uneventful, with no complications (Fig. 3C, D). Follow-up care included suture removal and monitoring for infection, with satisfactory outcomes (Fig. 3E–G).

Case IV

A 78-year-old male presented with an itchy lump on the upper lip extending to the nasolabial fold, which had been growing for 5 years. The lump bled after scratching. Clinical examination confirmed multiple confluent nodules (Fig. 4A, B), and nodular BCC was diagnosed. The tumor was excised using the transpositional flap design (Fig. 4C–G). Satisfactory functional and aesthetic outcomes were achieved without hypertrophic scarring (Fig. 4H–J).

Discussion

The management of BCC requires a combination of tumor excision and reconstructive designs to address aesthetic and functional challenges, particularly on facial areas such as the upper lip (6). Standard excision is the primary treatment for BCC, but MMS offers a low recurrence rate, particularly for high-risk or recurrent cases, despite more costly and longer operative time (7). Recent literature underscores the importance of individualized flap selection, considering defect size, location, and patient characteristics to optimize outcomes and minimize complications (8–10). In our series, a spectrum of local flap techniques was employed, each tailored to the unique anatomical and clinical context presented by the defect.

For a relatively small well-defined defect on the lateral upper lip, the rotational flap provided an effective solution. This technique, which involves mobilizing adjacent crescent-shaped tissue and rotating it into the defect, is favored for its ability to minimize tension, preserve vascularity, and align with relaxed skin tension lines (11, 12). A rotational flap was employed to close the defect while maintaining vascular integrity, contour, and texture match, as shown in the first case. The rotational flap has been validated in both oncologic and congenital settings for its capacity to restore natural lip contour and function, with recent studies demonstrating low complication rates and favorable long-term aesthetic outcomes (8, 13). By carefully planning the incision to follow natural facial creases, the resulting scar is typically inconspicuous, as observed in our first patient, who achieved excellent healing and cosmetic results within a month (14, 15).

When addressing a defect with compromised skin elasticity and requiring precise vermillion border restoration, the advancement island pedicle flap was selected. This method, which involves creating an "island" of tissue on a vascular pedicle, allows for tension-free closure and reliable perfusion (16). Recent series have highlighted the versatility of island flaps for upper lip reconstruction in the second case, particularly in defects that are too large for primary closure yet not extensive enough to warrant more complex regional or free flaps (16). By hiding incisions within the nasolabial fold or along the vermillion border, this approach achieves both functional and cosmetic goals. The procedure demonstrates excellent results with precise defect coverage, minimal recurrence, and rapid recovery (17). Our experience aligns with these findings because the patient demonstrated rapid recovery and minimal scarring at follow-up.

Central upper lip defects, especially those involving the philtrum, present unique challenges due to the need for symmetry and preservation of the philtral columns. In the third case, O-to-Z-plasty offers a strategic advantage by converting a circular defect into a *Z*-shaped closure, combining elements of rotation and advancement to redistribute tension and maintain structural integrity (18). O-to-Z-plasty is a reconstructive approach that converts a circular skin defect into a *Z*-shaped closure after suturing, combining elements of both the rotation flap and advancement flap to optimize tissue repositioning and ensure tension-free closure. This approach reduced distortion and tension, specifically in cosmetically sensitive areas such as the lips. By undermining surrounding tissue and mobilizing adjacent arcs, the flap achieved tension-free closure, preserving structural integrity and delivering an aesthetically favorable outcome (19). The challenge in this case was the lesion's site, which was on the philtrum, necessitating a technique that maintained philtral alignment. O-to-Z-plasty was chosen because it allows the flap to be divided from both the right and left sides, ensuring symmetry. At a 4-year follow-up, the cosmetic outcomes remained favorable, with minimal distortion of the upper lip and preservation of natural contours.

For extensive defects extending into the nasolabial fold, as seen in our elderly patient (the fourth case), a transpositional flap was employed to reconstruct a complex defect from a BCC tumor. This design offers flexibility by recruiting donor tissue from distant areas, making it ideal for medium-sized defects with limited local tissue availability. Due to the extensive lesion, the defect was closed using a transposition flap taken from the buccal area. The rhomboid transposition flap provided excellent color, texture, and elasticity matching, as well as minimizing tension (20, 21). This method proved that it is effective for complex defects, ensuring functional restoration and satisfactory cosmetic results (22). Our transpositional flap design for defects involving the nasolabial fold challenges the traditional contraindication of cross-regional tissue transfer in elderly patients. By preserving angular artery perforators, we achieved reliable vascularity and tension-free closure, consistent with recent reports on perforator-based transposition flaps for midface and perioral reconstruction (23, 24). Notably, none of our patients developed microstomia, a complication that has been reported in approximately 0.5% to 33% of cases depending on flap type and defect complexity, with lower rates observed in modern series utilizing local flaps for upper lip reconstruction (25).

This case series demonstrates the scientific value of individualized flap selection for upper lip reconstruction following BCC excision, providing novel insights by applying and adapting rotational, advancement, O-to-Z, and transpositional flaps to a range of complex defect scenarios, including challenging cases in elderly patients and those involving the nasolabial fold. The strength of this study is the comprehensive illustration of flap selection rationale across diverse clinical scenarios, demonstrating consistent achievement of optimal functional and aesthetic outcomes without adverse events, thus providing evidence-based insights for surgeons facing similar cases. However, the main limitation is the small sample size and lack of quantitative outcome measures or long-term multicenter follow-up, which may restrict the generalizability of the findings. Future research should focus on prospective studies with larger cohorts, standardized outcome assessments, and integration of emerging technologies such as three-dimensional surgical planning and patient-reported outcome measures to further refine reconstructive algorithms and optimize patient care.

Conclusions

Individualized flap selection for upper lip reconstruction after BCC excision can provide excellent functional and cosmetic outcomes, as demonstrated by our series using rotational, advancement, O-to-Z, and transpositional flaps. Careful planning based on defect characteristics and patient factors is essential to minimize complications and optimize results. Further research with larger cohorts and standardized outcome measures will help strengthen and refine these reconstructive strategies.

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Figure 1. (A, B) A well-defined solitary dark nodule with a diameter of 1 cm on the upper lip, 1 cm to the left of the philtrum, without signs of pus, bleeding, necrotic tissue, crusts, or granulation tissue; (C) tumor excision; (D) post-incision donor flap defect; (E) sutured wound outcome; (F) day 7: intact sutures on the flap surface with no signs of infection, crusting, bleeding, or pus.

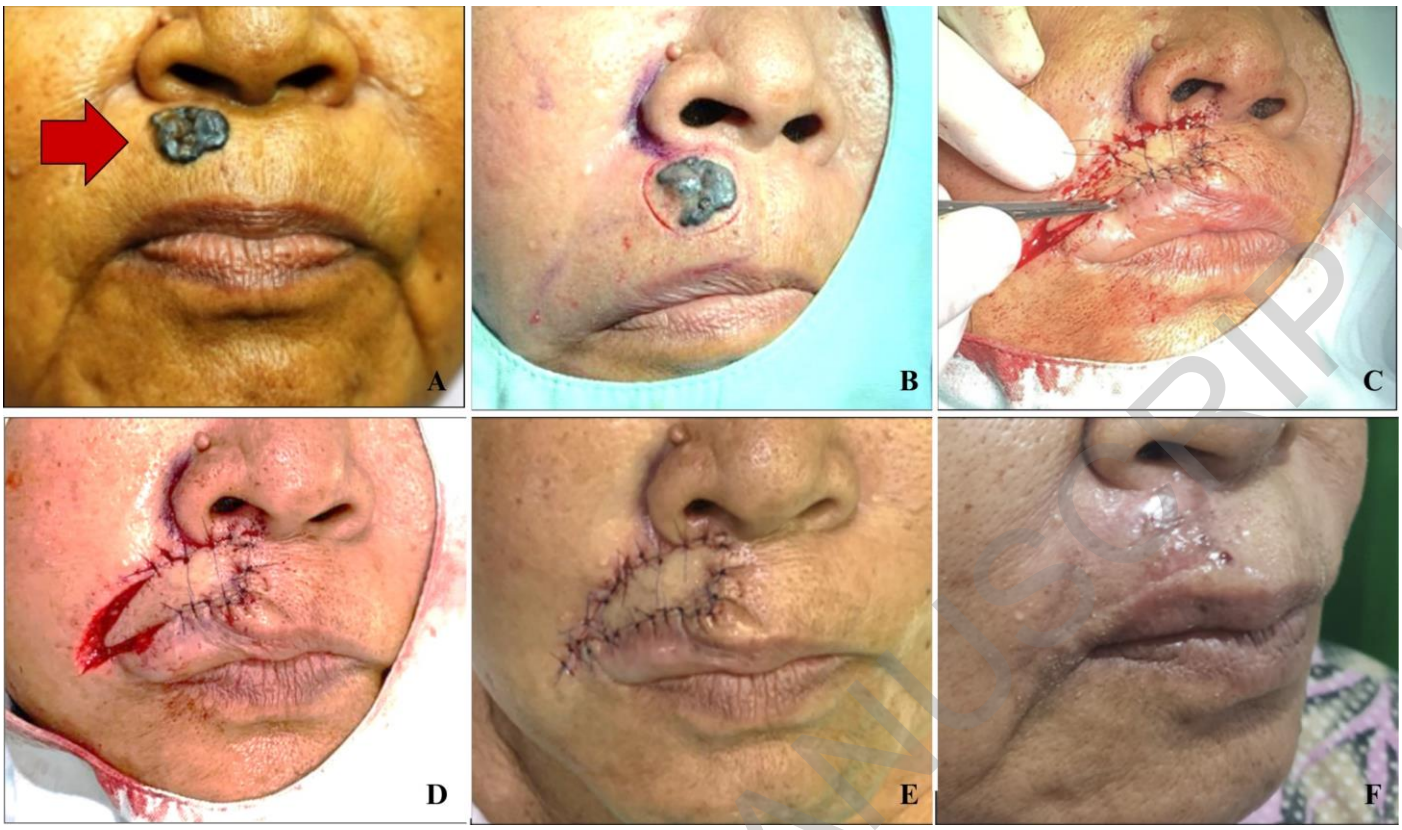

Figure 2. (A) A well-defined solitary hyperpigmented nodule measuring 2 × 1.5 cm on the right upper lip, with a rodent ulcer covered with crust and blood, without pus, necrotic tissue, or granulation tissue; (B, C) marking of the surgical site; (D) donor flap incision; (E) defect closure; (F) 2 months post-procedure, the surgical site remained infection-free with no visible scarring.

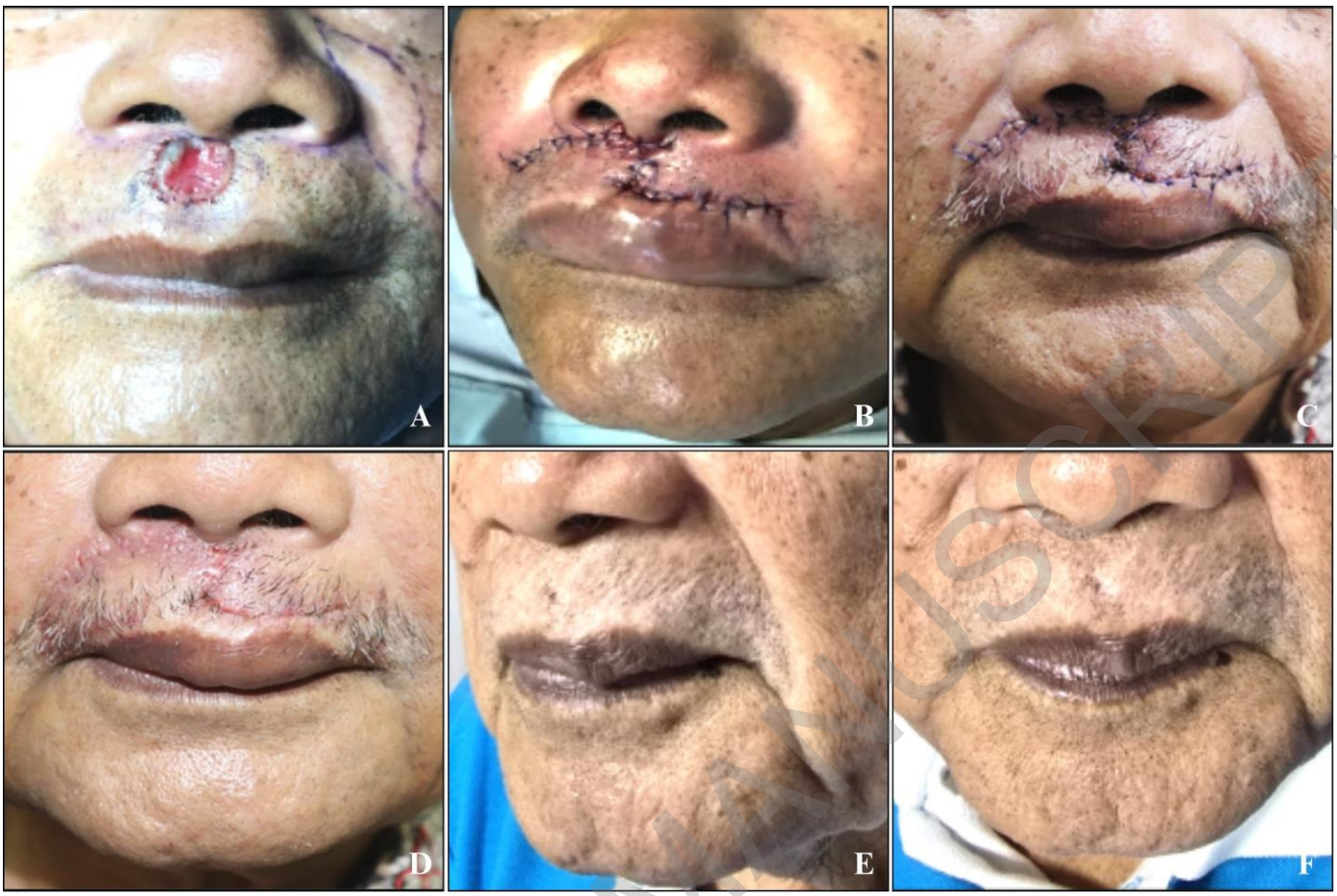

Figure 3. (A) Tumor excision and removal; (B) flap reconstruction; (C) postoperative day 7: the flap surface appears intact with sutures in place, showing no signs of infection, crusting, or pus; (D) the sutures were removed and the wound has no signs of infection or scarring; (E, F) 4 years post-procedure.

Figure 4. (A, B) Multiple confluent nodules with well-defined borders measuring 6 × 5 cm on the nasolabial region, featuring central erosion and rodent ulcers; (B) marking of the surgical site; (C–E) intraoperative procedure: lesion excision and defect closure using the transpositional flap design; (F, G) 12-month follow-up demonstrating satisfactory outcomes with no hypertrophic scarring or lesion recurrence.