Reconstruction of Cutaneous Cancer Defects of the Head and Neck

Issam N. Eid, MD[a], Oneida A. Arosarena, MD[a,b,*]

KEYWORDS

• Head and neck reconstruction • Mohs • Local flaps • Cutaneous malignancy
• Microvascular free tissue transfer

KEY POINTS

- The goal of cutaneous malignancy reconstruction is to restore the best functional and aesthetic outcome.
- Reconstruction should aim to restore all layers of the defect.
- The range of reconstructive options varies from healing by secondary intention to microvascular free tissue transfer for the different head and neck subsites.
- Local flaps are the mainstay of head and neck Mohs reconstruction.

INTRODUCTION

Mohs defect reconstruction in the head and neck requires functional and aesthetic restoration.[1] Well-established principles include replacing losses in kind.[2] Factors to consider when planning Mohs reconstruction include aesthetic subunits, relaxed skin tension lines (RSTLs), available tissue recruitment areas, structures that should not be distorted, and the patient's ability to participate in postoperative care.[3–6] It is best to place scars along aesthetic subunit borders or in RSTLs in order to camouflage them. Structures that should not be distorted include the anterior hairline, brows, eyelids, and auricular lobules.[3]

Reconstructive surgeons have often approached head and neck defects with the reconstructive ladder concept. This advocates a graduated approach from the simplest reconstruction method to more advanced methods.[7] However, the decision

[a] Department of Otolaryngology–Head and Neck Surgery, Lewis Katz School of Medicine at Temple University, 3440 North Broad Street, Suite 300, Philadelphia, PA 19140, USA; [b] Office of Health Equity, Diversity and Inclusion, Lewis Katz School of Medicine at Temple University, 3500 North Broad Street, Room 324E, Philadelphia, PA 19140, USA
* Corresponding author. Office of Health Equity, Diversity and Inclusion, Lewis Katz School of Medicine at Temple University, 3500 North Broad Street, Room 324E, Philadelphia, PA 19140, USA.
E-mail address: Oneida.Arosarena@tuhs.temple.edu

Otolaryngol Clin N Am 54 (2021) 379–395
https://doi.org/10.1016/j.otc.2020.11.011 **oto.theclinics.com**
0030-6665/21/© 2020 Elsevier Inc. All rights reserved.

Descargado para Binasss B (binas@binasss.sa.cr) en National Library of Health and Social Security de ClinicalKey.es por Elsevier en abril 08, 2021. Para uso personal exclusivamente. No se permiten otros usos sin autorización. Copyright ©2021. Elsevier Inc. Todos los derechos reservados.

on which reconstructive method to use should depend on defect characteristics and the patient's and surgeon's preferences in order to achieve the best outcome.

HEALING BY SECONDARY INTENTION

Healing by secondary intention is a useful reconstructive method in patients with multiple comorbidities that make a general anesthetic less desirable.[2] This approach's advantages include ease of cancer surveillance, procedural cost avoidance, and lower risk of complications.[2,8] The disadvantages include length of time and extent of wound care needed. The wound should be kept moist with an occlusive dressing. Healing by secondary intention is useful in scalp and forehead defects, even in cases of defects down to or with missing periosteum. It can be particularly advantageous in areas with absence of surrounding skin laxity from prior resections.[9] It can also be used for small defects of the cheek, medial canthal area, temple, and concave surfaces of the ear and nose.[2,4,8,9]

SKIN AND COMPOSITE GRAFT PHYSIOLOGY

Optimizing the wound bed by removing nonvital tissue promotes graft survival. Full-thickness skin grafts (FTSGs) offer better color match, and decreased contraction and depression compared with split-thickness skin grafts (STSGs). STSGs are commonly indicated for large scalp defects, for coverage of a wound bed being monitored for cancer recurrence, or for muscle free flap coverage. Delay of grafting by 12 to 14 days with wound care allows granulation tissue in-growth, which in turn decreases graft loss, depression, and contracture.[5,10] Composite graft cooling for 7 to 14 days reduces metabolic requirements and has been shown to improve survival.[5]

SKIN FLAP PHYSIOLOGY

Local flaps have several advantages over healing by secondary intention and skin grafting, including better color and texture match and decreased wound contraction.[11–13] The arterial blood supply to the skin can be categorized as musculocutaneous, direct cutaneous, and septocutaneous. Direct cutaneous arteries include the superficial temporal, posterior auricular, occipital, supratrochlear, and supraorbital arteries. Within the skin, at least 5 different vascular plexuses have been described: dermal, subdermal, subcutaneous, prefascial, and subfascial networks. These plexuses are interconnected via anastomosing (choke) vessels, creating collateral blood flow that allows cutaneous flap survival. Vascular delay enhances flap survival through loss of sympathetic tone, and axial reorientation and dilatation of choke vessels.[14]

Flaps may be categorized according to movement and/or blood supply. The basic flap movement types are advancement, rotation, and transposition. Advancement flaps are designed by moving tissue adjacent to the defect in 1 linear direction, while rotation flaps are curvilinear and rotate about a pivot point into the defect.[4,8,11,15] The simplest advancement flap is incisional closure with undermining. Advancement flaps can be subcategorized as unipedicle (eg, U-plasty), bipedicle (O→T, A→T), V→Y, Y→V, and H-plasty.[11] The ideal defect for a rotation flap is triangular in shape, with the triangle's height to width ratio being 2 to 1. The curve's radius should be 1 to 2 times the triangle's height. Transposition flaps are lifted over an incomplete skin bridge into the defect. Transposition flap examples include the rhombic, bilobe, and note flaps.[15]

Random pattern flaps rely on blood supply from surrounding reticular dermal vessels or perforating vessels from the subdermal plexus.[4,8] If the perfusion pressure at any portion of the flap falls below the arteriole closing pressure, the distal soft tissues

Descargado para Binasss B (binas@binasss.sa.cr) en National Library of Health and Social Security de ClinicalKey.es por Elsevier en abril 08, 2021. Para uso personal exclusivamente. No se permiten otros usos sin autorización. Copyright ©2021. Elsevier Inc. Todos los derechos reservados.

will necrose.[14] Axial pattern flaps obtain their blood supply from a named artery.[4,8] Reconstruction within the major facial aesthetic subunits will be described in the rest of the article.

FOREHEAD AND SCALP

Considerations in scalp and forehead reconstruction include maintaining the hairline and avoiding hair-bearing skin loss (**Fig. 1**). Scalp skin is immobile, making reconstruction challenging.[16]

Primary closure is generally limited to defects that are less than 3 cm in diameter.[16] Healing by secondary intention is appropriate for large forehead defects that have first been reduced in size by advancement flaps. This may result in a better cosmetic result that skin grafting, and the resulting scar may be serially excised.[3]

Skin thickness of the scalp and forehead makes skin grafting a less desirable reconstructive option. Defects extending to the bone are better served by local advancement flaps. However, drilling the calvarium's outer cortex will increase STSG survivability.[16] Use of wound matrix material (Integra, Integra Life Sciences Corporation, Princeton, New Jersey) can aid grafting and has been used in full-thickness defects in patients who are not microvascular reconstruction candidates.[17]

Advancement flaps can be incised in forehead rhytids.[1,3,11] These are deal for eyebrow reconstruction.[11] Bilateral advancement flaps can be designed in H-plasty, A→T, and O→T/O→Z closures (**Figs. 2** and **3**).[3,8,11,15] Rotation flaps can be designed along the hairline.[1]

Healing by secondary intention or poor flap planning can lead to hairline and eyebrow position distortion in the forehead. Distortion can be minimized by securing the galea at the hairline or eyebrow to periosteum. Injury to the facial nerve's temporal branch can be avoided by dissection in a subcutaneous plane or at the deep temporal fascia level.[1]

OCULAR ADNEXA

Periocular reconstruction goals are to restore eyelid form and function, including globe protection.[1,18] Several techniques are available for eyelid reconstruction that depend

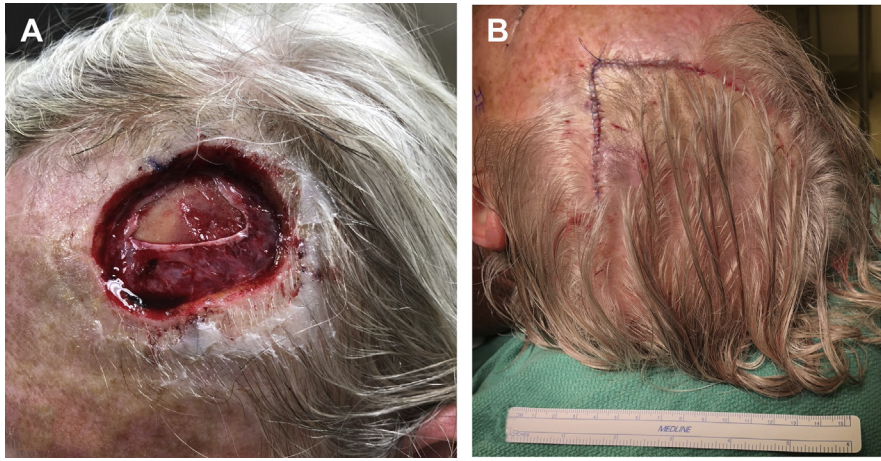

Fig. 1. (*A*) Scalp defect involving hairline. (*B*) Defect repaired with advancement/rotation flap.

Descargado para Binasss B (binas@binasss.sa.cr) en National Library of Health and Social Security de ClinicalKey.es por Elsevier en abril 08, 2021. Para uso personal exclusivamente. No se permiten otros usos sin autorización. Copyright ©2021. Elsevier Inc. Todos los derechos reservados.

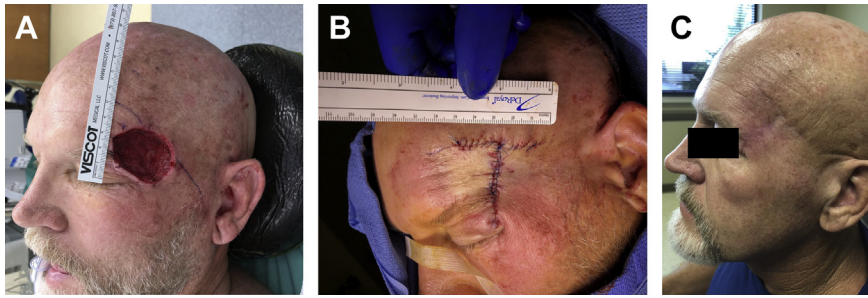

Fig. 2. Forehead Mohs reconstruction O→T flap. (*A*) Defect. (*B*) Immediate postoperative closure. (*C*) Several months postoperative result.

on defect size. Healing by secondary intention is appropriate for small (<1 cm), shallow, upper eyelid defects involving the concave medial canthal area.[8,12,18] Primary closure of small, nonmargin-involving, anterior lamella defects using an elliptical excision, M-plasty, O→-Z-plasty, or double-S ellipse also provides acceptable results.[8,12,13] Ellipses in the periorbital area should be oriented perpendicular to the RSTLs to avoid vertical tension on the eyelids.[13] For larger defects, local advancement and transposition (note, rhombic, V→Y, and bilobed flaps) can be designed from adjacent tissue.[12,13,18] FTSGs from the upper eyelid, pre- and postauricular area, supraclavicular area, and inner arm provide hairless skin with acceptable color matching for anterior lamellar defects.[8,12,13,18] Grafts should be oversized by up to 30% to prevent eyelid malposition.[8,18]

For larger defects involving the lower eyelid anterior lamella, a pedicled transposition flap from the upper eyelid can provide defect closure up to two-thirds the lower eyelid width.[8,12,13,19] Lower eyelid retraction can be prevented with lateral canthal tightening procedures and a suborbicularis fat lift.[13] Posterior lamellar defects can be repaired with nasal septal composite grafts, buccal mucosal grafts with cartilage support (eg, auricular cartilage), hard palate mucoperiosteum, or upper lid tarsoconjunctival grafts/flaps.[12,13,18]

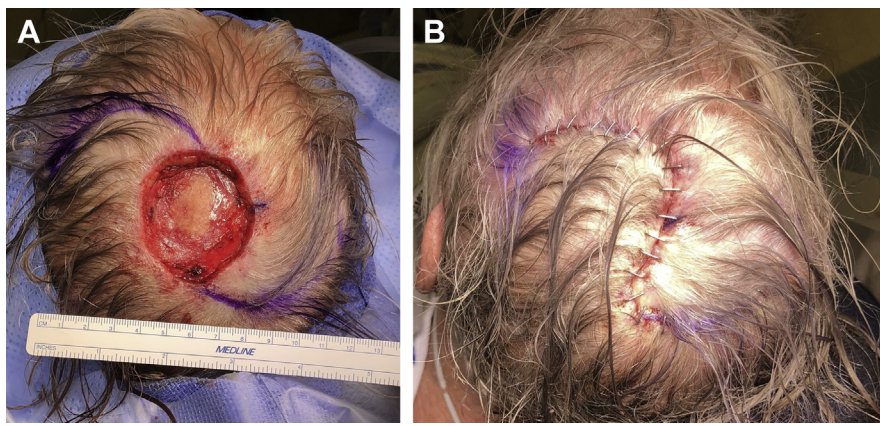

Fig. 3. Scalp Mohs reconstruction with O→Z flap. (*A*) Defect. (*B*) Immediate postoperative closure.

Descargado para Binasss B (binas@binasss.sa.cr) en National Library of Health and Social Security de ClinicalKey.es por Elsevier en abril 08, 2021. Para uso personal exclusivamente. No se permiten otros usos sin autorización. Copyright ©2021. Elsevier Inc. Todos los derechos reservados.

For full-thickness defects, end-to-end eyelid closure with wedge excision (with or without lateral canthotomy) is appropriate for defects less than 15 mm in length or less than 40% of the lid margin.[8,12,13,18,20] For defects up to two-thirds of the eyelid length, orbicularis flaps such as the Tenzel semicircular advancement flap, bolstered by cartilage grafts, may be used.[12,13,18] For larger, full-thickness defects, a cross-lid tarsoconjunctival flap may be used (Hughes procedure). When designing this flap, at least 4 mm of upper lid tarsus must be preserved to prevent eyelid malposition. The anterior lamella can be covered with a local flap, or a postauricular FTSG. The second-stage separation is performed after 4 to 6 weeks.[8,12,13,20] The Cutler-Beard flap is a cross-lid flap used to reconstruct the upper eyelid. This skin-muscle-conjunctival flap requires a cartilage graft between the lamellae to restore the upper eyelid tarsus.[12,18]

An alternative to the Hughes procedure is the cheek rotation (Mustardé) flap[8] with a nasal septal composite graft for posterior lamella reconstruction.[18] Drawbacks to this method's use include lower lid atonia and possible ectropion.[20] Frost sutures can prevent lower lid retraction.[8]

Defects involving the medial canthus are approached by securing the upper and lower lid remnants to the medial canthal tendon's posterior reflection or the lacrimal crest with permanent suture. The skin defect can then be replaced with an FTSG, or, if the defect extends to bone, with a paramedian forehead transposition flap (PFF).[8,12,18,20,21] Intubation of the remaining lacrimal canalicular system or conjunctivodacrocystorhinostomy can be performed at the time of reconstruction for defects involving the lacrimal system.[13,18] Lateral canthal reconstruction is directed toward the lateral orbital rim periosteum at Whitnall tubercle. If the periosteum is absent in this area, fixation may be performed with a drill hole placed at the Whitnall tubercle.[18]

Complications include epiphora, hypertrophic scarring, ectropion, edema, infection, exposure keratopathy, lagophthalmos, ptosis, corneal abrasion, trichiasis, and change in visual acuity.[1,13] Factors associated with complications are FTSG use and a defect more than one-half of the horizontal eyelid length repair. Webbing can complicate reconstruction in the medial canthal area and can be treated with Z-plasty.[1] When the medial canthus has been excised for margin control, superior or inferior canthal displacement and angle deformity can result.[20]

NOSE

Nasal reconstruction goals are to restore contour and maintain the airway.[1] Cartilaginous alar batten or sidewall support grafts are used to prevent airway compromise, minimize scar contracture and restore contour.[22–24]

Healing by secondary intention is limited to defects less than 5 mm on concave surfaces. Primary closure of defects less than 1 cm may be used for nasal dorsum and sidewall defects.[22,25,26] FTSG use is most successful in patients with Fitzpatrick 1 or 2 skin types and nasal skin that is not very sebaceous.[3,22] Skin grafting should be avoided when the perichondrium and periosteum are not intact. Conchal bowl composite grafts may be used for defects less than 1 cm (**Fig. 4**).[22]

Cheek advancement flaps can be used to reconstruct nasal sidewall defects.[4] The Lemmo flap is a laterally based bipedicle advancement flap that advances skin from the upper nasal dorsum to reconstruct lower nasal dorsal defects. The glabellar defect is closed in a V→Y fashion, avoiding long dorsal scars for a more favorable glabellar scar.[25]

Transposition flaps commonly used for nasal skin reconstruction include the nasolabial, bilobed, rhombic and note flaps. These flaps are based on facial and angular

Descargado para Binasss B (binas@binasss.sa.cr) en National Library of Health and Social Security de ClinicalKey.es por Elsevier en abril 08, 2021. Para uso personal exclusivamente. No se permiten otros usos sin autorización. Copyright ©2021. Elsevier Inc. Todos los derechos reservados.

Fig. 4. (*A*) Defect of soft triangle. (*B*, *C*) early postoperative result of reconstruction with conchal composite graft.

artery branches that perforate the levator labii muscle,[3,4,23,27] or for medially-based bilobed flaps, on ophthalmic artery branches.[28] The bilobed flap is used for dorsum, sidewall, and nasal tip defects that are less than or equal to 1.5 to 2.0 cm.[3,15,22,25,26] It is designed so that the linear scar is situated at the dorsum-sidewall subunit boundary (**Fig. 5**).[3] The bilobed flap allows for greater tension dispersion than note or rhombic flaps.[15,22] The note flap is used for small-to-moderate sidewall defects. This triangular flap is drawn tangent to the defect above the alar groove and is 1.5 times the defect's diameter.[3,4,25–27]

Melolabial flaps may be used for defects involving the nasal sidewall, and partial- and full-thickness alar, columellar, and tip defects.[3,4,22,23,26,27] These include transposition and interpolated flaps.[4,23,26,29] Cheek interpolation flaps are advantageous for preserving the nasofacial junction, as they are transposed over the alar-facial sulcus.[22–24,26] The flap should be 1 mm larger than the defect in all dimensions to allow for contraction.[24] The pedicle is divided in a second stage 3 to 4 weeks after flap inset.[23,24] Melolabial flaps may be used to reconstruct full-thickness alar defects by folding the flaps on themselves to provide internal lining and external reconstruction.[23]

Glabellar rotation-advancement (Rieger) flaps may be used to reconstruct nasal defects up to 2.5 cm, with at least 5 mm of native tissue between the defect and free alar margin to prevent retraction.[22,25,26] The PFF is a workhorse flap for defect reconstruction ranging from a single subunit to total nasal reconstruction, and can provide both internal and external lining for through-and-through defects. Based on the supratrochlear artery, the PFF gives some of the most natural-appearing results. The flap can be performed in a 2- or 3-stage fashion with 3 to 5 weeks between each stage (**Fig. 6**).[21,26,30,31]

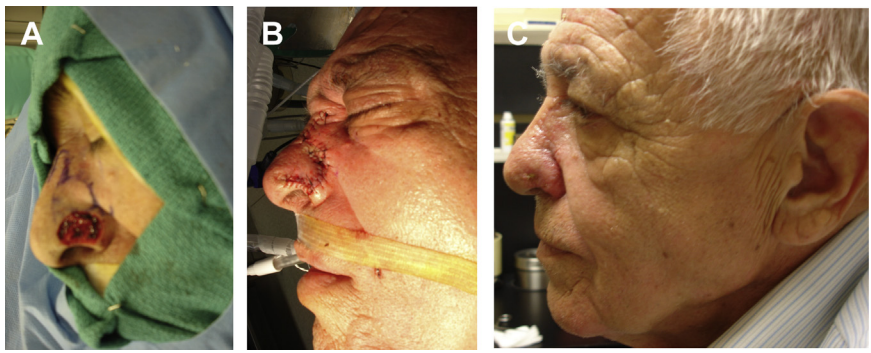

Fig. 5. (*A*) Defect involving nasal alar subunit. Bilobe flap design depicted. (*B*) Intraoperative repair. (*C*) Postoperative result.

Descargado para Binasss B (binas@binasss.sa.cr) en National Library of Health and Social Security de ClinicalKey.es por Elsevier en abril 08, 2021. Para uso personal exclusivamente. No se permiten otros usos sin autorización. Copyright ©2021. Elsevier Inc. Todos los derechos reservados.

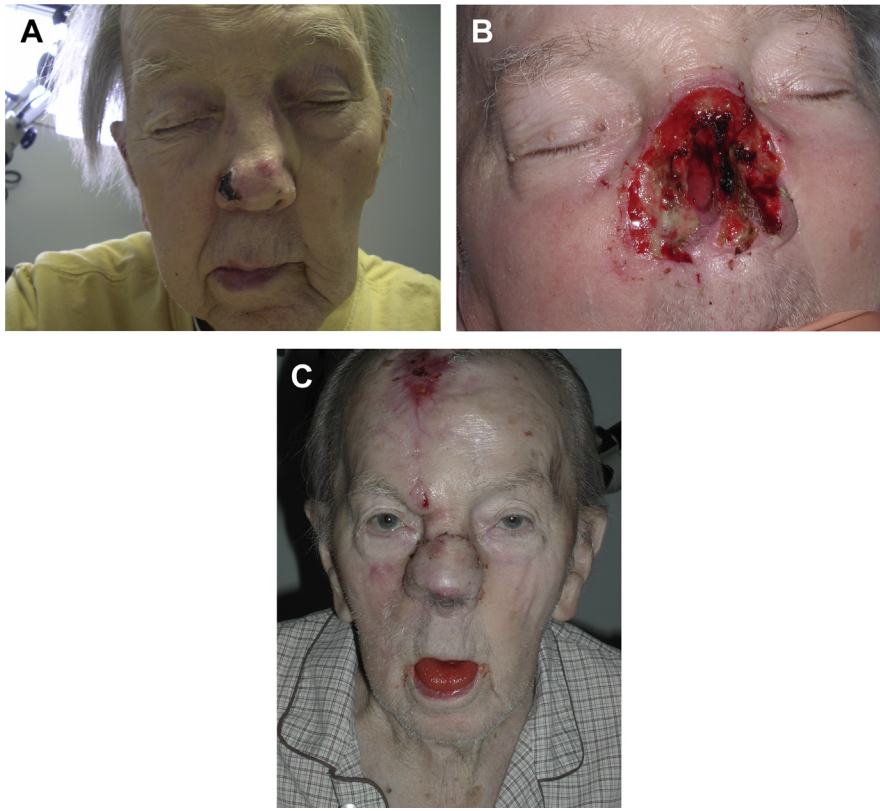

Fig. 6. (*A*) Advanced basal cell carcinoma in dementia patient. (*B*) Through-and-through defect following tumor excision. (*C*) Postoperative result following structural reconstruction with bilateral conchal cartilage grafts, and PFF used for cutaneous reconstruction and internal nasal lining.

Options for restoring the internal nasal lining include bipedicled vestibular skin advancement, septal mucosal or composite flaps (**Fig. 7**), conchal composite grafts, turbinate flaps, and microvascular free tissue transfer.[22,26] Costal cartilage or iliac crest bone can be used to restore the upper third of the nasal vault.[22] A forearm free flap with bone grafting is another option for reconstruction of the upper third in the setting of a large soft tissue defect.

Complications include nasal obstruction (from valve stenosis or synechiae), alar retraction, nasal deformity (eg, saddle deformity, asymmetry, pin-cushioning, or tip ptosis), and septal perforation.[1,29] Alar retraction, valve stenosis, tip ptosis, and saddle deformity can be prevented by use of cartilage grafting. Pin cushioning can be treated with steroid injections and dermabrasion postoperatively.[1] Cheek interpolation flap use can result in terminal hair transfer to the nose in men.[24] Superiorly based melolabial flaps are prone to nasofacial junction obliteration.[23]

CHEEK

Healing by secondary intention is reserved for small nasofacial, melolabial, preauricular, and alar-facial sulcus defects.[6] Cheek defects less than 1 to 2 cm can usually

Descargado para Binasss B (binas@binasss.sa.cr) en National Library of Health and Social Security de ClinicalKey.es por Elsevier en abril 08, 2021. Para uso personal exclusivamente. No se permiten otros usos sin autorización. Copyright ©2021. Elsevier Inc. Todos los derechos reservados.

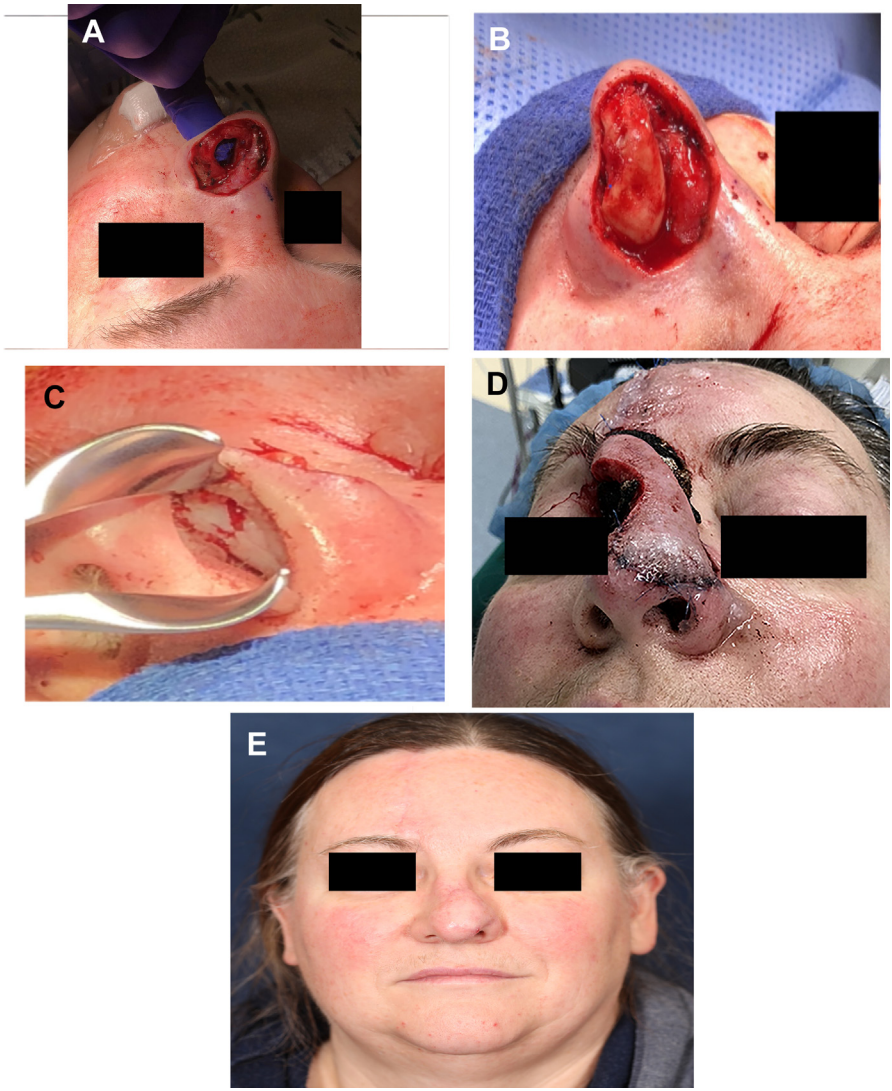

Fig. 7. Nose through-and-through defect reconstructed with composite graft and PFF. (*A*) Defect. (*B*) Composite graft inset. (*C*) Lining reconstructed with composite graft. (*D*) PFF inset. (*E*) Postoperative result.

be closed primarily, particularly if they abut subunit boundaries or are able to be closed parallel to RSTLs.[6,11] Cervicofacial advancement and rotation flaps are commonly used for upper medial cheek defects[1,3,6,8,32] (**Fig. 8**), although these defects can also be reconstructed with a PFF.[21] Defects that abut the nose and lip may be reconstructed with perialar crescentic advancement flaps.[32]

V→Y advancement flaps may be used for reconstruction of medial cheek defects that abut the melolabial crease,[3,32] or for lateral cheek defects.[6] Note transposition flaps may be used for medial cheek defects up to 3 cm in size.[6] Lateral and central cheek defects can be reconstructed with rhombic transposition flaps.[3,6] Similarly, defects of the

Descargado para Binasss B (binas@binasss.sa.cr) en National Library of Health and Social Security de ClinicalKey.es por Elsevier en abril 08, 2021. Para uso personal exclusivamente. No se permiten otros usos sin autorización. Copyright ©2021. Elsevier Inc. Todos los derechos reservados.

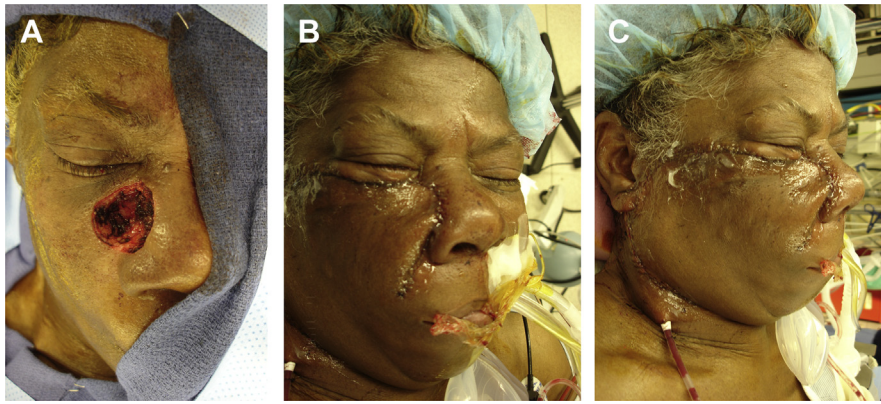

Fig. 8. (*A*) Medial cheek defect following excision of basal cell carcinoma. (*B*, *C*) Cervicofacial rotation flap repair.

perilabial cheek that abut the chin may be reconstructed with bilobed flaps.[6,32] O→T and A→T closures may be used for defects abutting the preauricular sulcus.

Microvascular free tissue transfer is indicated for combined cheek and eyelid defects with exposed bone, or when soft tissue bulk is required (**Figs. 9** and **10**). FTSGs may be used to reconstruct cheek defects in patients whose medical condition may not allow for local flap reconstruction. Limitations of free flaps and FTSG include inability to provide color-matched skin.[32]

PERIORAL RECONSTRUCTION

Perioral reconstruction goals are to maintain oral competence, motion, sensation, and cosmesis. Aesthetic subunits (ie, the vermillion border, philtral ridges, cupid's bow and

Fig. 9. Cheek defect reconstructed with anterolateral thigh free flap.

Descargado para Binasss B (binas@binasss.sa.cr) en National Library of Health and Social Security de ClinicalKey.es por Elsevier en abril 08, 2021. Para uso personal exclusivamente. No se permiten otros usos sin autorización. Copyright ©2021. Elsevier Inc. Todos los derechos reservados.

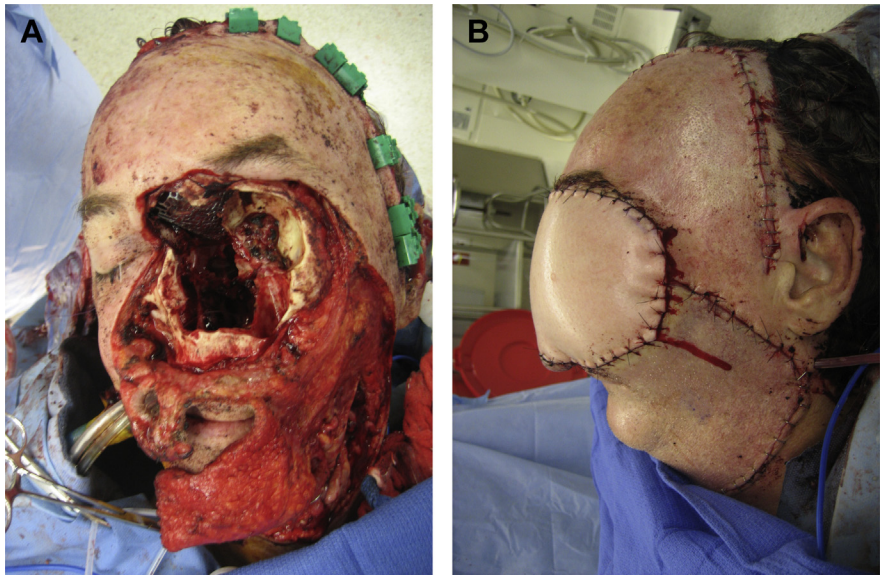

Fig. 10. (*A*) Defect from excision of advanced squamous cell carcinoma necessitating orbital exenteration, en-bloc ethmoidectomy and resection of cheek soft tissue; (*B*) reconstruction with rectus abdominus free flap.

labiomental crease) should be reconstructed while maintaining lip height and projection.

Primary Closure of Small Cutaneous Defects

Primary, V-shaped closure may be used for defects up to 30% of the lip.[2] This is done with wide undermining and advancement for tension-free closure (**Fig. 11**).

Bilateral Mucosal Advancement Flaps for Isolated Red Lip Defects

Advancement flaps such as the Burow wedge flap can be used for partial-thickness, lateral upper lip defects.[33] Rhombic flaps may be used for central and lateral upper lip defects, allowing incisions to fall at the philtral ridges, vermilion-cutaneous border, and nasolabial fold.[34] Central upper lip defects may also be reconstructed with a PFF.[21]

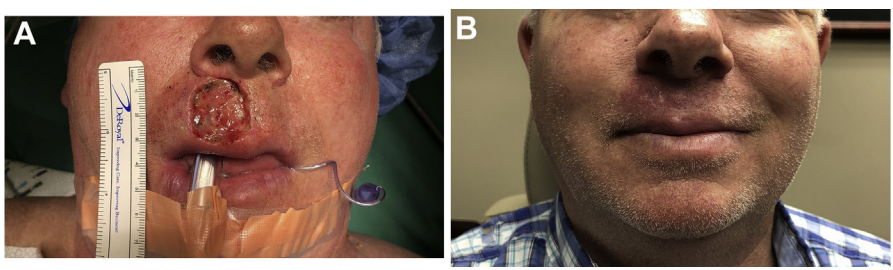

Fig. 11. Primary lip closure with advancement flaps. (*A*) Before surgery. (*B*) Shortly after surgery.

Descargado para Binasss B (binas@binasss.sa.cr) en National Library of Health and Social Security de ClinicalKey.es por Elsevier en abril 08, 2021. Para uso personal exclusivamente. No se permiten otros usos sin autorización. Copyright ©2021. Elsevier Inc. Todos los derechos reservados.

Fig. 12. (*A*) Defect resulting from excision of basal cell carcinoma of upper lip. Abbe flap marked with perialar crescentic excision for cheek advancement. (*B*) Abbe flap transposed with cheek advancement.

Lip Switch Flaps (Abbe or Estlander)

Lip switch flaps are based on the labial artery. These flaps involve a lip switch from the opposite lip with the same lip height taken but half the width to distribute the tissue deficit between the donor site and the recipient. The Abbe flap is used for central defects and requires the pedicle to remain attached for a delayed section and inset, usually after 3 weeks (**Figs. 12** and **13**). The Estlander flap involves the oral commissure and can be done in a single stage.[2]

Bilateral Advancement Flaps

The most common among these flaps are the Karapanzic, the Gillies fan flap, and Bernard-von Burrow closure. These flaps borrow tissue from the cheek and upper lip to restore the lower lip, and cause some degree of microstomia. The Karapanzic flap's advantage is neurovascular structure preservation that aids in maintaining oral competence.[2]

Microvascular Free Tissue Transfer

Complete lower lip defects require microvascular tissue transfer for optimal results. The radial forearm free flap with palmaris tendon suspension yields the best results in this case (**Fig. 14**).

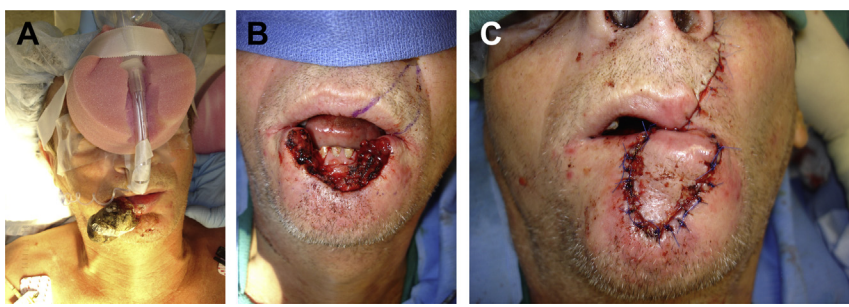

Fig. 13. (*A*) Lower lip squamous cell carcinoma with cutaneous horn. (*B*) Defect after excision and margin control. (*C*) Abbe flap transposed.

Descargado para Binasss B (binas@binasss.sa.cr) en National Library of Health and Social Security de ClinicalKey.es por Elsevier en abril 08, 2021. Para uso personal exclusivamente. No se permiten otros usos sin autorización. Copyright ©2021. Elsevier Inc. Todos los derechos reservados.

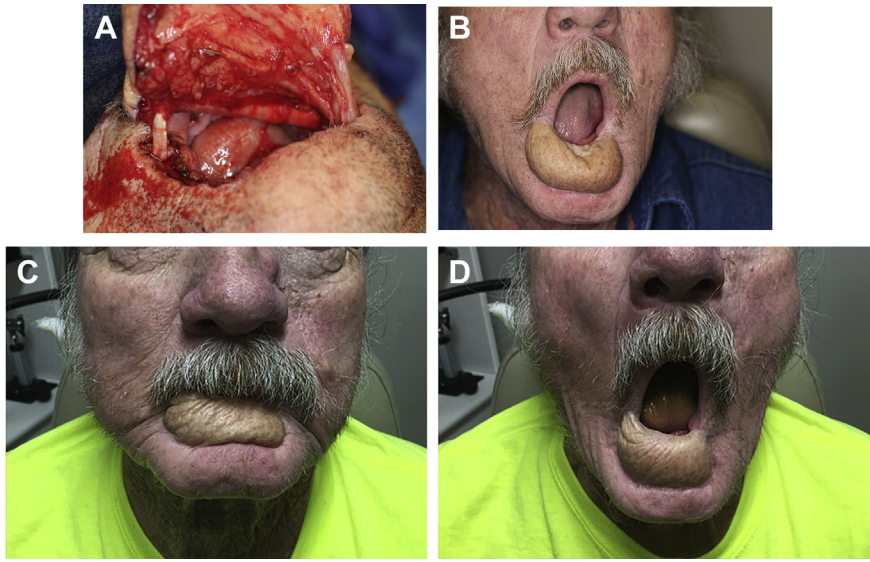

Fig. 14. Complete lower lip reconstruction. (*A*) Radial forearm flap inset with palmaris tendon sling. (*B*) 6-month follow-up (*C, D*) 2-year follow-up after debulking.

Complications

Upper lip reconstruction can lead to meliolabial fold distortion with the potential of bringing nonhair-bearing skin into the moustache area.[1,33] Other complications include microstomia; distortion of cupid's bow, the philtral ridges, and vermillion border; oral incompetence from lack of sensation; and oral commissure blunting.[1,33]

CHIN

Chin skin is the thickest skin in the face, leading to poorer scars, and is not very suitable for skin grafting.[35,36] Chin reconstruction is best accomplished by local advancement flaps. Primary vertical or horizonal closure is possible only for small defects.[36] H-plasty is a frequently used repair that employs bilateral advancement flaps with incisions hidden in the mentolabial crease. Other available options are the O→T closure and V→Y flap.[35]

EAR

Primary closure is advocated for small defects at the helix and antihelix skin.[37] A triangular wedge is taken with the triangle's apex extending to the concha around the helical root. This will inevitably lead to shortening of the ear.[36]

A wound that has intact perichondrium in a concave area is ideal for secondary intention healing.

FTSG use requires intact periosteum or a temporoparietal flap[24]

Helical rim advancement flaps can be used after wedge excision for defects up to one-fourth of the auricular circumference.[11,24]

Interpolated flaps from the retroauricular or preauricular areas can be used to reconstruct the helical rim, scaphoid fossa, and conchal bowl (**Fig. 15**).[24] The postauricular advancement flap is particularly useful for larger defects. It can be performed in 2

Descargado para Binasss B (binas@binasss.sa.cr) en National Library of Health and Social Security de ClinicalKey.es por Elsevier en abril 08, 2021. Para uso personal exclusivamente. No se permiten otros usos sin autorización. Copyright ©2021. Elsevier Inc. Todos los derechos reservados.

Fig. 15. (*A*) Through-and-through defect of conchal bowl and anterior ear canal following excision of basal cell carcinoma. V→Y advancement flap marked. (*B*) Folded advancement flap inset. (*C*) 4-month postoperative result.

stages with a possible cartilage harvest from the contralateral ear to give support and structure.[36]

Costochondral cartilage is the ideal framework for larger auricular defects and requires good soft tissue coverage with a local or regional skin flap.[37] Total auriculectomy defects can be addressed in several ways. Many patient factors come into play including patient aesthetic goals, while factoring in age and comorbidities. In older patients, an ear prosthetic is a viable option. Massive defects around the ear require flaps ranging from a supraclavicular flap to free tissue transfer such as a radial forearm or anterolateral thigh free flap for coverage. Reconstruction with alloplastic frameworks is prone to implant exposure.

Healing by secondary intention has a greater infection risk compared with other reconstructive methods. Healing by secondary intention and FTSG use are associated with wound depression. Wedge excision of defects greater than one-fourth of the auricular circumference can lead to distortion and auricular cupping. Postauricular tissue advancement can result in placing hair-bearing skin on the ear and postauricular sulcus blunting, which can make wearing glasses difficult. Reconstruction adjacent to or in the external auditory canal can result in stenosis.

SKIN EXPANSION

When defects are greater than half the cheek aesthetic unit, greater than one-third of the forehead, or over 6 cm in the scalp, expansion techniques are indicated (**Fig. 16**). Forehead skin expansion may be indicated for complete nasal reconstruction.

Descargado para Binasss B (binas@binasss.sa.cr) en National Library of Health and Social Security de ClinicalKey.es por Elsevier en abril 08, 2021. Para uso personal exclusivamente. No se permiten otros usos sin autorización. Copyright ©2021. Elsevier Inc. Todos los derechos reservados.

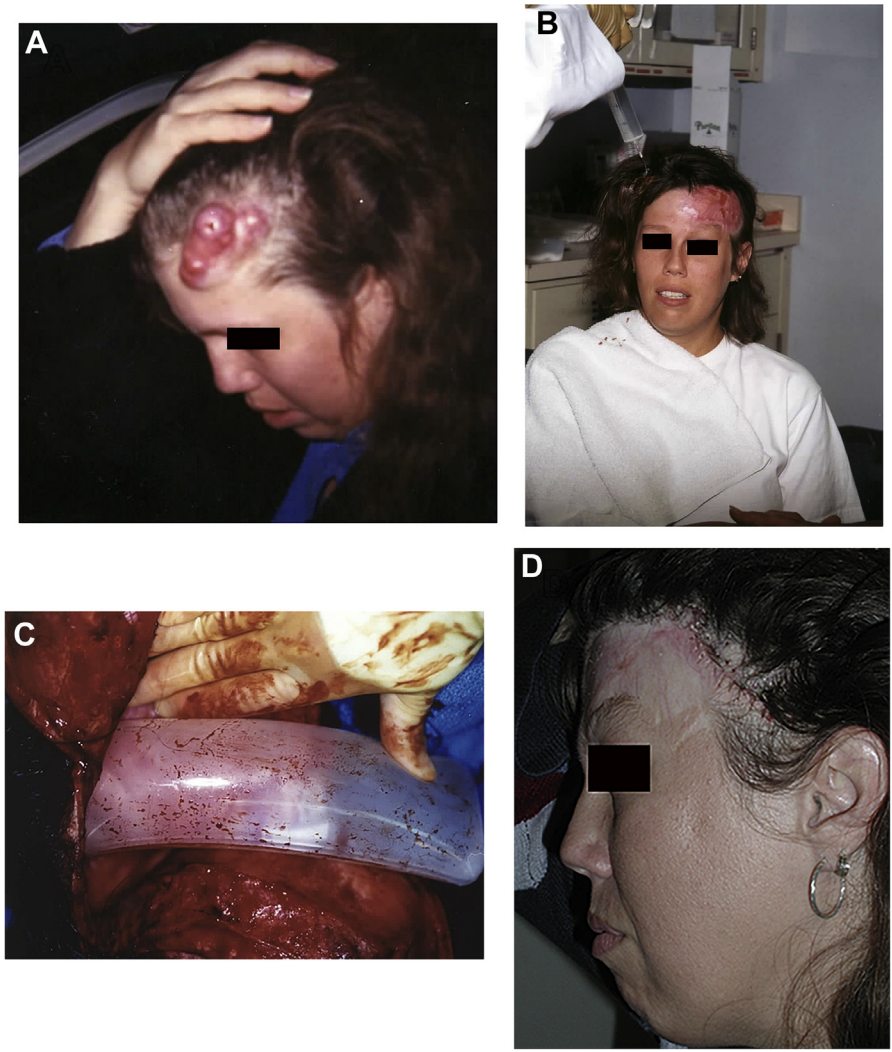

Fig. 16. (*A*) Patient with dermatofibrosarcoma protuberans of left scalp and forehead. (*B*) Defect initially covered with STSG at the time of expander placement. (*C*) Intraoperative implant removal after expansion complete. (*D*) Immediate postoperative result following advancement of expanded scalp skin.

Temporary cosmetic deformity and discomfort from expansion in the supraorbital region are this technique's disadvantages.[38] Tissue expander use includes risks of infection, implant extrusion, mechanical failure, tissue necrosis, bony changes, hematoma, and seroma formation.[1,38]

COMPLICATIONS

The incidence of complications following Mohs defect reconstruction varies from less than 0.5% in the glabella, jawline, and nasolabial folds, to greater than 45% in the nose. The complication rate also varies with the reconstructive method, ranging

Descargado para Binasss B (binas@binasss.sa.cr) en National Library of Health and Social Security de ClinicalKey.es por Elsevier en abril 08, 2021. Para uso personal exclusivamente. No se permiten otros usos sin autorización. Copyright ©2021. Elsevier Inc. Todos los derechos reservados.

from less than 0.5% with primary closure and 27% with advancement flaps. Transposition and interpolated flaps, particularly if superiorly based, are prone to pincushioning.[1,21,23]

Complications increase in frequency with defect size. Excessive wound tension, vascular compromise, and infection can lead to complete or partial flap necrosis.[1,14] Smoking, uncontrolled hypertension, collagen disorders, diabetes mellitus, and previous radiation therapy can compromise flap and graft vascularity.[1,4,15,21,23,26] Other complications include persistent scar erythema, hypopigmented scar, sensory neuropathies, telangectasias,[1] incisional pain,[4] hematoma, bleeding,[4,21] and obscuring tumor recurrence.[4]

CLINICS CARE POINTS

- Healing by secondary intention is a useful reconstructive method in patients with comorbidities that preclude general anesthesia, or when surveillance for aggressive malignancies is necessary.
- When considering skin grafting, delay of skin grafting for 12-14 days to promote granulation tissue in-growth decreases the risk of graft loss, depression and contracture.
- Reconstruction with local flaps provide the best color and texture match, and decrease the risk of wound contracture.
- Smoking, uncontrolled hypertension, auto-immune disease, diabetes mellitus and previous radiation therapy can compromise flap and graft viability.

DISCLOSURE

The authors have no commercial or financial conflicts of interest, or any funding sources to disclose.

REFERENCES

1. Berens AM, Akkina SR, Patel SA. Complications in facial Mohs defect reconstruction. Curr Opin Otolaryngol Head Neck Surg 2017;25(4):258–64.
2. Becker GD, Adams LA, Levin BC. Secondary intention healing of exposed scalp and forehead bone after Mohs surgery. Otolaryngol Head Neck Surg 1999; 121(6):751–4.
3. Joseph AW, Joseph SS. Mohs reconstruction and scar revision. Otolaryngol Clin North Am 2019;52(3):461–71.
4. Chen EH, Johnson TM, Ratner D. Introduction to flap movement: reconstruction of five similar nasal defects using different flaps. Dermatol Surg 2005;31(8 Pt 2): 982–5.
5. Brenner MJ, Moyer JS. Skin and composite grafting techniques in facial reconstruction for skin cancer. Facial Plast Surg Clin North Am 2017;25(3):347–63.
6. Hanks JE, Moyer JS, Brenner MJ. Reconstruction of cheek defects secondary to mohs microsurgery or wide local excision. Facial Plast Surg Clin North Am 2017; 25(3):443–61.
7. Ge NN, McGuire JF, Dyson S, et al. Nonmelanoma skin cancer of the head and neck II: surgical treatment and reconstruction. Am J Otolaryngol 2009;30(3): 181–92.
8. Harvey DT, Taylor RS, Itani KM, et al. Mohs micrographic surgery of the eyelid: an overview of anatomy, pathophysiology, and reconstruction options. Dermatol Surg 2013;39(5):673–97.

Descargado para Binasss B (binas@binasss.sa.cr) en National Library of Health and Social Security de ClinicalKey.es por Elsevier en abril 08, 2021. Para uso personal exclusivamente. No se permiten otros usos sin autorización. Copyright ©2021. Elsevier Inc. Todos los derechos reservados.

9. Deutsch BD, Becker FF. Secondary healing of Mohs defects of the forehead, temple, and lower eyelid. Arch Otolaryngol Head Neck Surg 1997;123(5):529–34.
10. Robinson JK, Dillig G. The advantages of delayed nasal full-thickness skin grafting after Mohs micrographic surgery. Dermatol Surg 2002;28(9):845–51.
11. Shew M, Kriet JD, Humphrey CD. Flap basics II: advancement flaps. Facial Plast Surg Clin North Am 2017;25(3):323–35.
12. Huggins AB, Latting MW, Marx DP, et al. Ocular adnexal reconstruction for cutaneous periocular malignancies. Semin Plast Surg 2017;31(1):22–30.
13. Segal KL, Nelson CC. Periocular reconstruction. Facial Plast Surg Clin North Am 2019;27(1):105–18.
14. Lucas JB. The physiology and biomechanics of skin flaps. Facial Plast Surg Clin North Am 2017;25(3):303–11.
15. Starkman SJ, Williams CT, Sherris DA. Flap Basics I: rotation and transposition flaps. Facial Plast Surg Clin North Am 2017;25(3):313–21.
16. Olson MD, Hamilton GS 3rd. Scalp and forehead defects in the post-Mohs surgery patient. Facial Plast Surg Clin North Am 2017;25(3):365–75.
17. Richardson ML, Lange JP, Jordan JR. Reconstruction of full-thickness scalp defects using a dermal regeneration template. JAMA Facial Plast Surg 2016; 18(1):62–7.
18. Lu GN, Pelton RW, Humphrey CD, et al. Defect of the Eyelids. Facial Plast Surg Clin North Am 2017;25(3):377–92.
19. Perry MJ, Langtry J, Martin IC. Lower eyelid reconstruction using pedicled skin flap and palatal mucoperiosteum. Dermatol Surg 1997;23(5):395–7 [discussion: 397–8].
20. Moy RL, Ashjian AA. Periorbital reconstruction. J Dermatol Surg Oncol 1991; 17(2):153–9.
21. Reckley LK, Peck JJ, Roofe SB. Flap basics III: interpolated flaps. Facial Plast Surg Clin North Am 2017;25(3):337–46.
22. Dibelius GS, Toriumi DM. Reconstruction of cutaneous nasal defects. Facial Plast Surg Clin North Am 2017;25(3):409–26.
23. Carucci JA. Melolabial flap repair in nasal reconstruction. Dermatol Clin 2005; 23(1):65–71, vi.
24. Nguyen TH. Staged cheek-to-nose and auricular interpolation flaps. Dermatol Surg 2005;31(8 Pt 2):1034–45.
25. Lu GN, Kriet JD, Humphrey CD. Local cutaneous flaps in nasal reconstruction. Facial Plast Surg 2017;33(1):27–33.
26. Joseph AW, Truesdale C, Baker SR. Reconstruction of the nose. Facial Plast Surg Clin North Am 2019;27(1):43–54.
27. Alam M, Goldberg LH. Oblique advancement flap for defects of the lateral nasal supratip. Arch Dermatol 2003;139(8):1039–42.
28. Skaria AM. The medial based bi- or trilobed flap for repair of distal alar defects. Dermatology 2013;227(2):165–70.
29. Arden RL, Miguel GS. The subcutaneous melolabial island flap for nasal alar reconstruction: a clinical review with nuances in technique. Laryngoscope 2012;122(8):1685–9.
30. Menick FJ. Nasal reconstruction. Plast Reconstr Surg 2010;125(4):138e–50e.
31. Correa BJ, Weathers WM, Wolfswinkel EM, et al. The forehead flap: the gold standard of nasal soft tissue reconstruction. Semin Plast Surg 2013;27(02):096–103.
32. Rapstine ED, Knaus WJ 2nd, Thornton JF. Simplifying cheek reconstruction: a review of over 400 cases. Plast Reconstr Surg 2012;129(6):1291–9.

Descargado para Binasss B (binas@binasss.sa.cr) en National Library of Health and Social Security de ClinicalKey.es por Elsevier en abril 08, 2021. Para uso personal exclusivamente. No se permiten otros usos sin autorización. Copyright ©2021. Elsevier Inc. Todos los derechos reservados.

33. Oberemok S, Eliezri Y, Desciak E. Burow's wedge flap revisited. Dermatol Surg 2005;31(2):210–6 [discussion: 216].
34. Skaria AM. The transposition advancement flap for repair of postsurgical defects on the upper lip. Dermatology 2011;223(3):203–6.
35. Larrabee YC, Moyer JS. Reconstruction of Mohs defects of the lips and chin. Facial Plast Surg Clin North Am 2017;25(3):427–42.
36. Badash I, Shauly O, Lui CG, et al. Nonmelanoma facial skin cancer: a review of diagnostic strategies, surgical treatment, and reconstructive techniques. Clin Med Insights Ear Nose Throat 2019;12. 1179550619865278.
37. Smith RM, Byrne PJ. Reconstruction of the Ear. Facial Plast Surg Clin North Am 2019;27(1):95–104.
38. Hodgkinson DJ, Lam Q. Expansion techniques after Mohs' surgery on the face. Australas J Dermatol 2001;42(1):9–14.

Descargado para Binasss B (binas@binasss.sa.cr) en National Library of Health and Social Security de ClinicalKey.es por Elsevier en abril 08, 2021. Para uso personal exclusivamente. No se permiten otros usos sin autorización. Copyright ©2021. Elsevier Inc. Todos los derechos reservados.