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LOCAL FLAPS FOR FACIAL RECONSTRUCTION

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This chapter focuses on local flaps used in surgical management of cutaneous squamous (SCC) and basal cell carcinoma (BCC) of the face.

Nonmelanoma skin cancer (NMSC) is the most common type of skin cancer in the United States with an increasing annual incidence. [1] Worldwide, the incidence of skin cancer is also increasing.[2,3] Surgery is the most effective treatment for NMSC of the head and neck – excision or Mohs micrographic surgery (MMS).[4,5,6,7]

Cases of local basal [4] or squamous skin cancers [5] can be divided into low- and high-risk based on clinical and pathologic characteristics *(Tables 1, 2).* In addition to risk of recurrence, the best treatment plan is also dependent on the type of skin cancer, location, and patient's co-morbidities and expectations.

Standard excision

Standard excision of SCC and BCC includes excision with a margin of clinically normal appearing skin to ensure complete removal with histologically negative margins. For local low-risk SCC, standard excision of the lesion with a 4-6 mm clinical margin is a recommended option.[7] For local low-risk BCC, standard excision of the lesion with a 4mm clinical margin is recommended.[6] The depth of the excision should extend into the subcutaneous tissue. The specimen should be sent for histologic assessment of the lesion and all margins. If there is concern that margins may be close or positive, then definitive reconstruction should be delayed until histologic confirmation of negative margins.

Parameters	Low Risk	High Risk
Clinical		
• Location[i] / size[ii]	Area L <20mm Area M[iii] <10mm[1]	Area L ≥20mm Area M ≥10mm Area H[iv]
• Borders	Well defined	Poorly defined
• Primary/recurrent	Primary	Recurrent
• Immunosuppression	No	Yes
• Site of prior RT	No	Yes
Pathologic[v]		
• Subtype	Nodular, superficial[vi]	Aggressive growth pattern[vii]
• Perineural involvement	No	Yes

i	*Area L = Trunk and extremities (excluding hands, feet, nail units, pretibial, and ankles) Area M = Cheeks, forehead, scalp, neck, and pretibial Area H = Central face, eyelids, eyebrows, periorbital skin, nose, lips [cutaneous and vermillion], chin, mandible, preauricular and postauricular skin/sulci, temple, ear, genitalia, hands, and feet*
ii	*Greatest tumour diameter*
iii	*Location independent of size may constitute high risk*
iv	*Area H constitutes a high-risk area on the basis of location, independent of size*
v	*See Principles of Pathology (BCC-A in the NCCN Guidelines for Basal Cell Skin Cancer)*
vi	*Includes other low-risk non-aggressive growth patterns such as keratotic, infundibulocystic, and fibroepithelioma of Pinkus*
vii	*Having (mixed) infiltrative, micronodular, morpheaform, basosquamous, sclerosing, or carcinosarcomatous differentiation features in any portion of the tumor. In some cases, basosquamous tumours may be prognostically similar to SCC; clinicopathologic correlation is recommended in these cases*

Table 1: National Comprehensive Cancer Network risk factors for recurrence of localised Basal Cell Skin *Cancer (Adapted with permission from the NCCN Guidelines® for Basal Cell Skin Cancer V.1.2019)[5]*

Parameters	Low Risk	High Risk
Clinical (Based on H&P)		
• Location[i] / size[ii]	Area L <20mm Area M[iii] <10mm[1]	Area L ≥20mm Area M ≥10mm Area H[iv]
• Borders	Well defined	Poorly defined
• Primary/recurrent	Primary	Recurrent
• Immunosuppression	No	Yes
• Site of prior RT or chronic inflammatory process	No	Yes
• Rapidly growing tumour	No	Yes
• Neurologic symptoms	No	Yes
Pathologic[v]		
• Degree of differentiation	Well to moderately	Poorly
• High-risk histologic subtype[vi]	No	Yes
• Depth[vii, viii] (thickness or level of invasion)	≤6mm and no invasion beyond subcutaneous fat	>6mm and no invasion beyond subcutaneous fat
• Perineural, lymphatic, or vascular involvement	No	Yes

i	*Area L = Trunk and extremities (excluding hands, feet, nail units, pretibial, and ankles) Area M = Cheeks, forehead, scalp, neck, and pretibial Area H = Central face, eyelids, eyebrows, periorbital skin, nose, lips [cutaneous and vermillion], chin, mandible, preauricular and postauricular skin/sulci, temple, ear, genitalia, hands, and feet*
ii	*Greatest tumour diameter, including peripheral rim of erythema*
iii	*Location independent of size may constitute high risk*
iv	*Area H constitutes a high-risk area on the basis of location, independent of size*
v	*See Principles of Pathology (SCC-A in the NCCN Guidelines for Squamous Cell Skin Cancer)*
vi	*Adenoid (acantholytic), acantholytic (adenoid), adenosquamous (showing mucin production), desmoplastic, or metaplastic (carcinosarcomatous) subtypes*
vii	*If clinical evaluation of incisional biopsy suggests that microstaging is inadequate, consider narrow margin excisional biopsy*
viii	*Deep invasion is defined as invasion beyond the subcutaneous fat OR >6 mm (as measured from the granular layer of adjacent normal epidermis to the base of the tumor, consistent with AJCC 8th edition)*

Table 2: National Comprehensive Cancer Network Risk Factors for Local Recurrence or Metastasis of Localized Squamous Cell Skin Cancer (Adapted with permission from the NCCN Guidelines® for Squamous Cell Skin Cancer V.2.2019)[4]

Mohs micrographic surgery (MMS)

Clinical guidelines published by the *American Academy of Dermatology* recommend MMS for treatment of high-risk BCC and SCC.[8] MMS is a surgical technique that removes skin cancer with intraoperative histologic examination of 100% of the surgical margins. A single surgeon excises the lesion and margins and then histologically examines the specimen. This process is repeated until the margins are negative.

Local Flaps: Overview

A local flap comprises skin and subcutaneous tissue with a direct vascular supply, that is transferred to an adjacent or nearby site. The ***primary defect*** is the wound that is closed by the local flap; the ***secondary defect*** is the wound created after transfer of the local flap to the primary defect.

Local flaps have several advantages

- Reliable blood supply
- Matching skin texture and colour
- Single stage procedure

Flaps can be defined by

- Blood supply (random or axial)
- Configuration (rhombic, bilobed)
- Location of defect (regional, interpolated)
- Type of transfer (advancement, rotation, transposition)

Choice of local flap

Determining the type of local flap to use depends on the locations of the defect and the flap donor site.

When planning placement and design of a local flap there are important tenets of reconstruction to bear in mind:

1. ***Incisions and closures should be along relaxed skin tension lines (RSTLs)***. RSTLs are lines of skin tension that are formed by contraction of underlying facial mimetic muscle fibers which run perpendicular to the superficial skin rhytids *(Figure 1)*. Incisions placed along RSTLs can mimic facial rhytids and are often less conspicuous. In addition, closing along RSTLs helps to minimize tension, especially in areas that have significant aesthetic and functional value.

Figure 1: Incisions and closures should be planned along the relaxed skin tension lines (RSTL) which are lines of skin tension that are created by the action of underlying muscle fibers that run perpendicular to the skin

2. ***Closures should be tension free***. This is best accomplished by undermining the skin along the lines of maximal extensibility (LME). LME is the direction in which skin is most extensible and runs perpendicular to RSTLs and parallel to facial mimetic muscle fibers. Undermining parallel to LME allows maximal

distribution of tension within the flap to minimize tension at the closure sites.

3. ***Flaps should respect and preserve facial aesthetic and functional subunits*** *(Figure 2).* Placing incisions for local flaps along the borders of subunits can help preserve the neighbouring aesthetic subunits, prevent disruption of tissue contours and function, and conceal incisions in natural shadows formed by these borders.

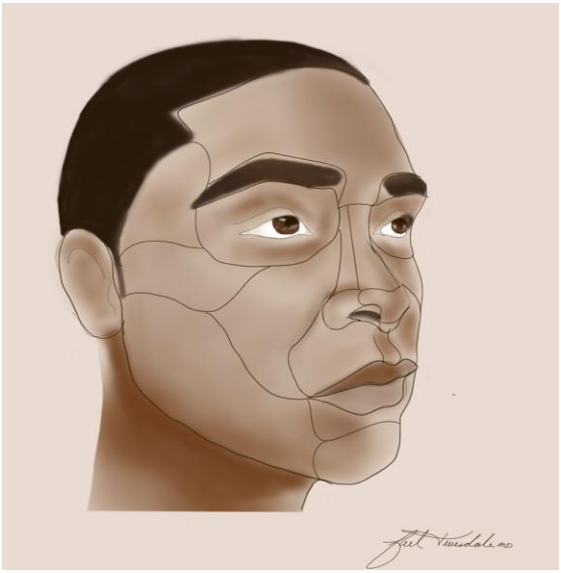

Figure 2: Illustration demonstrating aesthetic subunits of the face

Advancement Flaps

Advancement flaps are flaps that slide along a linear vector to close a defect. The flap relies on stretching of tissue for advancement and is best utilised in areas of good skin elasticity. The point of greatest wound tension is at the distal edge of the flap. Advancement flaps include unipedicle, bipedicle, and V-Y flaps.

Unipedicle advancement flaps

Unipedicle advancement flaps share a border with its defect and is advanced in a linear direction over the defect. The border between the defect and the flap becomes the leading edge of the advancement flap. As the flap is advanced, standing cutaneous deformities develop on either side of the flap's base and can be excised with ***Burrow's triangles***. Bilateral unipedicle advancement flaps can be used to close larger defects by placing the flaps on opposing sides of the defect and advancing towards each other. The resulting shape of wound closure from bilateral unipedicle flaps is referred to as an H- or a T-plasty *(Figures 3, 4).*

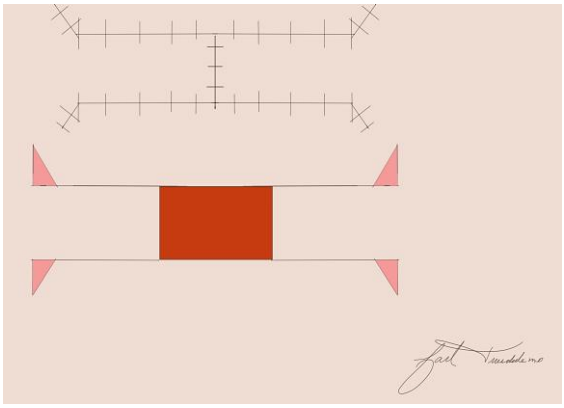

Figure 3: H-plasty

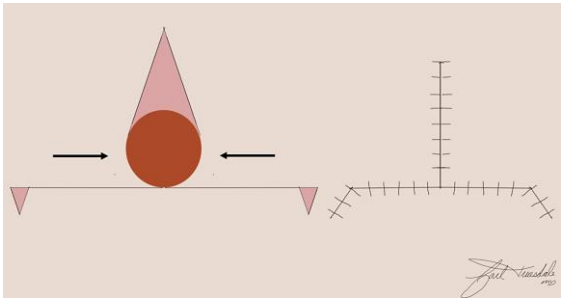

Figure 4: O-to-T flap

Note how H- and O-to-T-plasty advancement flaps utilise two opposing unipedicle flaps to close a primary defect. Burrow's triangles are removed at the base of the flap to correct standing cutaneous deformities.

H or O-to-T advancement flaps are employed in areas where minimal tissue distortion is imperative such as near the eyebrow, helical rim, and vermilion border. They can also be used to close defects of the cheek, temple, and forehead *(Figures 5a,b).*

Figure 5a: A 1.5cm circular defect of the left cheek. Standing cutaneous deformities marked on the superior and inferior border of the defect

Figure 5b: Bilateral unipedicle advancement flaps used to close the defect

Bipedicle Advancement Flap

A bipedicle advancement flap advances tissue at a right angle to the linear axis of the flap to close an adjacent defect. The flap is designed to be longer than the defect and with a width equal or slightly greater than that of the defect. A secondary defect is produced with closure of the primary defect and requires closure with a skin graft. Given the creation of a secondary defect, bipedicle advancement flaps are often reserved to repair large scalp defects and small full thickness nasal defects. A common bipedicle advancement flap involves the vestibular mucosa to repair full-thickness defects of the alae where the mucosa is pedicled medially and laterally. The secondary defect created by the advancement is repaired with a full-thickness skin graft to prevent contraction.

V-Y Advancement Flap

The V-Y advancement flap relies on a subcutaneous pedicle to supply an island of skin that is advanced in a linear direction to close a defect *(Figure 6).*

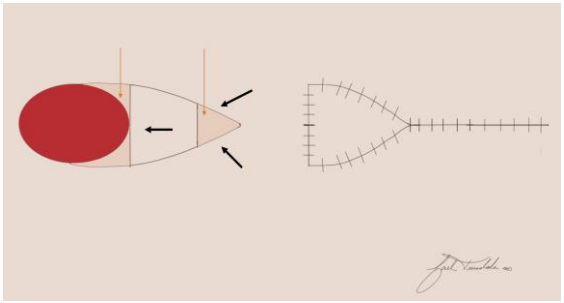

Figure 6: V-Y advancement flap with original configuration in the shape of a V. The flap is advanced in a linear direction while maintaining a subcutaneous pedicle that is at least 1/3 the length of the flap. With closure of the flap, the final configuration is Y-shaped

This flap is used to repair defects of the lip, cheek, forehead, and nose *(Figures 7a-c).* The flap is designed in a triangular fashion with the leading edge designed to be of similar size to the defect, and the sides parallel to RSTLs or within natural creases or folds. The flap is incised along all edges down to subcutaneous tissue. The surrounding tissue is undermined away from the pedicle to allow for flap mobilization. The leading and tail edges of the flap can be undermined provided that at least 1/3 of the flap is in continuity with the pedicle to ensure adequate blood supply. The maximum point of wound tension is at the apex of the flap. Closure of the wound forms a Y configuration *(Figures 7a-c).*

Figure 7a: 2cm skin defect of the upper lip involving the vermillion border

Figure 7b: V-Y advancement flap design with borders along the vermilion border and melolabial crease

Figure 7c: Flap in position after advancement with a final Y-shaped configuration

Rotation Flaps

Rotation flaps are versatile flaps and are best utilised to close triangular-shaped primary defects. Rotation flaps are best suited to repair defects of the scalp but can also be used on the cheek and nose. For scalp defects, it is often helpful to employ more than one rotation flap given the inelasticity of the scalp.

They are pivotal flaps that recruit adjacent tissue to close a primary defect. The flap is designed in a curvilinear fashion with the defect forming a portion of the flap's arc of rotation. It is best to base the flap inferiorly and medially and bordering a RTSL. The length of the flap should be about four times the width of the triangular defect. The point of greatest wound tension is at the apex of the flap. Rotation of the flap causes a standing cutaneous deformity at the base of the flap, which can be corrected by excising a Burrow's triangle. A primary defect with a height of two times the width minimizes the size of the standing cutaneous deformity. Advantages of rotation flaps include a reliable vascular supply given its broad base, and flexible design that can be placed between subunits of the face *(Figures 8ab).*

Figure 8a: Planned left cheek defect marked with blue sutures. Design of rotation flap, recruiting skin from lateral cheek. Burrow's triangle marked on inferior aspect of planned check defect to account for correction of standing cutaneous deformity after flap rotation. Arrow indicates direction of flap rotation

Figure 8b: Flap inset. Standing cutaneous deformity removed with inset along naso-labial crease

An O-Z repair utilizes two rotation flaps, oriented on opposite sides of the defect, and pivots the flaps in the same direction to close the primary defect *(Figure 9)*. When ***three rotation flaps*** are rotated in the same direction to close a defect this results in a ***pinwheel configuration***.

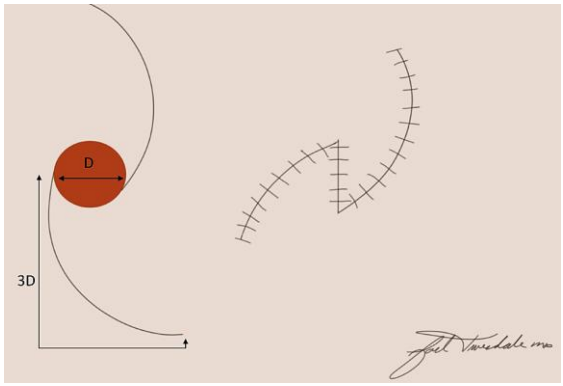

Figure 9: Two rotation flaps positioned on opposite sides of the defect. The length of the flap is three times the diameter of the defect. The final configuration after rotation of the flaps results in a Z-shape

Rotation flaps can be used for both small and large cheek defects, though they are often combined with some component of advancement. For large defects of the cheek, cervicofacial flaps are extremely reliable for reconstruction for medial and lateral defects owing to the recruitment of lateral neck skin and positioning of the scar at the borders of aesthetic subunits.

For defects of the dorsum, sidewall, and tip of the nose, a dorsal nasal flap, which utilises skin from the glabella to close defects, is a method of reconstruction.[9] The dorsal nasal flap is primarily a rotation and advancement flap but also has a pivot component.

Transposition flaps

Transposition flaps are reliable methods of reconstructing small and medium-sized defects of the cheek and nose. Transposition flaps are pivotal flaps with a linear configuration. The flap can share a border with the primary defect, like rotation flaps, but it can also be designed remotely from the primary defect. The base of a transposition flap is always contiguous with the defect. Placing the flap remotely is advantageous as the surgeon can recruit tissue from areas where there is relative skin laxity. With transposition of the flap, a standing cutaneous deformity is formed at the base of the flap. Excision of the standing cutaneous defect should be away from the base of the flap so not to compromise the flap's blood supply. The area of greatest wound closure tension is at the closure site of the secondary defect.

Types of transposition flaps include the note flap, bilobe flap, and rhombic flap.

Note flap

The note flap is a transposition flap designed as a triangle with 50-60° degree angle used to close an adjacent circular defect.[10] The flap is named for its design, which resembles a musical eighth note *(Figure 10)*. The limb of the flap adjacent to the defect has a length of 1.5 times the diameter of the defect and is drawn parallel to a RSTL. The

second limb of the flap is equal to the diameter of the defect. The triangular flap is transposed to close the primary defect, and the distal tip of the defect is trimmed as needed. The donor site is closed primarily *(Figure 10).*

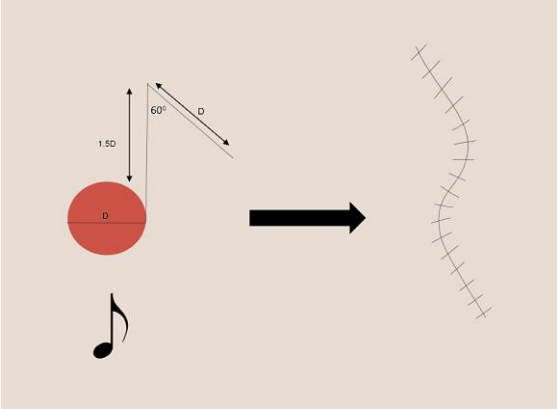

Figure 10: Transposition flap incorporates a 60°angle triangle placed adjacent to the defect, and resembles a musical eighth note

The greatest wound closure tension is at the point where the flap tangents the defect. It can be used to close circular defects up to 2cm in size anywhere on the head and neck. Advantages of the note flap are its versatility, straightforward design, and ability to camouflage the donor site in natural creases or along RSTL. The main disadvantage is the need for skin laxity to primarily close the donor site, which limits its use to closure of small defects *(Figures 11a-c).*

Bilobe flap

The bilobe flap is a transposition flap with two lobes and a single base around which the flap pivots. The flap was first described with an arc of rotation of 180° with axes of 90° between the defect and 1st lobe as well as between the 1st and 2nd lobes.[11] The flap has undergone modifications by limiting the arc of rotation to 90° to decrease the size of the standing cutaneous deformities and to decrease trapdoor deformity *(Figure 12).*[12]

Figure 11a: Skin defect of left temple

Figure 11b: Note flap design with planned tissue transposition from skin medial to defect. Burrow's triangle marked on superior aspect of defect to remove standing cutaneous defect

Figure 11c: Flap inset with removal of standing cutaneous defect superiorly along temporal hairline

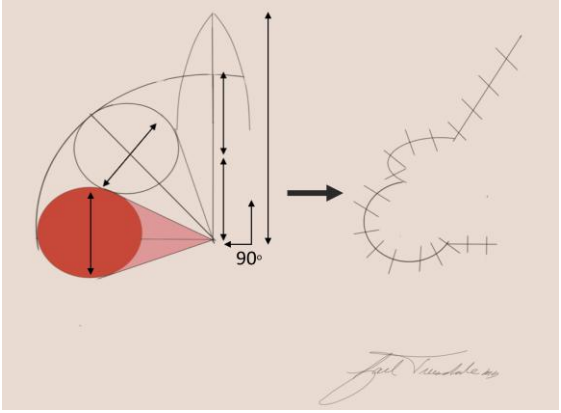

Figure 12: Bilobe flap with 90° axis of rotation. The first lobe is equal in diameter to the defect while the second lobe has a smaller diameter

Placement of the flap should be in an area of greater skin elasticity to allow for adequate tissue recruitment.

Bilobe flaps are most employed for the caudal one-third of the nose, but they can also be a good reconstructive option for large cheek defects. The primary lobe of the flap is designed to be of similar surface area and adjacent to the primary defect. For cheek defects, the primary lobe may be up to 25% less than the defect size due to the relative increased skin elasticity of the cheek compared to the nose. The size of the secondary lobe is typically smaller than that of the primary lobe (50-100% the size of the primary lobe) and is closed primarily by skin advancement. The main advantage of the bilobe flap is the ability to recruit skin from a distal site where skin redundancy allows primary closure of the tertiary defect *(Figures 13a-c)*. The major disadvantages of the flap are the large scar, the tendency for trapdoor deformity especially in patients with thick sebaceous skin, and difficulty placing the incisions parallel to RSTL due to its complex design.

Rhombic (Limberg) flap

The classic rhombic (Limberg) flap is a transposition flap used to repair defects in the shape of a rhombus with internal angles of 60° and 120°.[13] A rhombus in this configuration can also be thought of as two equilateral triangles; thus all sides of the rhombus are of equal length. If a cutaneous defect does not have a 60°-120° rhombus configuration then additional skin can be removed to create this configuration. The 1st side of the flap is designed by extending a line equal to the length of a short diagonal, which bisects one of the 120° internal angles.

Figure 13a: Skin defect of nasal tip

Figure 13b: Design of bilobe flap extending over nasal dorsum with Burrow's triangle marked on the lateral aspect of the defect

Figure 13c: The bilobe flap inset with removal of standing cutaneous deformity

The 2nd side is made parallel to the adjacent side of the rhombus and is of equal length to the 1st side. The flap is then transferred by both pivotal and advancement movement with the point of greatest wound tension at the donor site *(Figure 14)*.

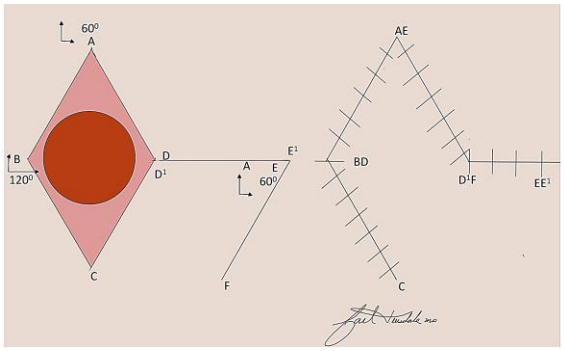

Figure 14: Rhombic flap with internal angles of 60 and 120°

The rhombic flap is versatile and can be used to repair defects of the cheek, temple, chin, and neck. Advantages include minimal tissue distortion, predictable scars, and lower likelihood of trapdoor deformity. Disadvantages are formation of standing cutaneous deformity, need to excise normal skin to create a rhombic defect, and that a portion of the scar does not lie within the RSTL.

The ***Dufourmentel flap*** is a modification of the classic rhombic flap and can be used to close rhomboids with any combination of internal angles *(Figure 15)*.[14] The advantage of the Dufourmentel flap is a smaller standing cutaneous deformity *(Figures 16a, b)*.

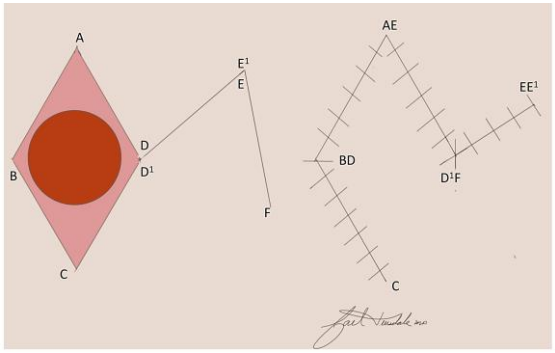

Figure 15: Modification of Limberg rhombic flap with internal angles less than 60 and 120°

Figure 16a: Right temple lesion planned for excision

Figure 16b: Dufourmentel rhombic flap designed on the inferior border of the planned defect

Interpolated Flap

An interpolated flap is a pivot flap in which the base of the flap is not contiguous with the defect and the pedicle of the flap passes over intervening tissue to close the primary defect. Given that the pedicle must pass over intervening tissue, interpolated flaps always require a 2nd stage procedure to divide the pedicle and to inset the flap. They are used for tissue defects that cannot be closed with adjacent flaps due to insufficient tissue or skin laxity. Paramedian forehead and melolabial flaps are interpolated flaps that can be used to reconstruct nasal defects.

Paramedian Forehead Flap *(Figures 17a-d, 18)*

The paramedian forehead flap is an interpolated flap with an axial blood supply provided by the supratrochlear artery and with some contributions from the supraorbital artery. It is designed over the path of the supratrochlear artery. The supratrochlear artery exits the orbit 1.7 to 2.2cm lateral to midline, which roughly corresponds to the medial eyebrow. At this level the artery travels under the orbicularis oculi and over the corrugator supercilia. The artery then pierces the orbicularis and frontalis muscles to travel more superficial in a cephalic direction. Due to its reliable blood supply, the length of the flap can be 4 times the width of the pedicle.

There are many reasons why the paramedian forehead flap is the workhorse in reconstruction of large nasal defects – it provides significant tissue for coverage; has a similar skin colour and texture to the nose; and it can revascularise cartilage or bone grafts used to reconstruct the nose.

When planning the design of the flap, it is important to assess the nasal skin defect and the nasal subunits involved. ***If the defect involves more than 50% of a subunit, the entire subunit should be excised and reconstructed***. A template is made of the defect and the excised subunits. This template is placed just below the hairline along the course of the supratrochlear artery. If the template is large or more skin / pedicle length is needed, then the template can be placed within the hair with the understandding that hair removal from the flap will be needed postoperatively.

Cephalically, the flap is raised in a subcutaneous plane, which allows for a thin and pliable flap that can easily be contoured to conform with the nasal defect. If more bulk is needed to cover a deeper defect, the frontalis muscle can be incorporated in the flap. As dissection proceeds caudally, the artery courses deeper and thus dissection should be below the fascia or periosteum to protect the pedicle. The flap is inset into the nasal defect after structural grafting has been undertaken. A full thickness skin graft taken from the supraclavicular fossa can be sewn to the open portion of the pedicle to reduce postoperative oozing. The donor site is closed primarily. If the donor site is too large to be closed primarily, portions can be left to granulate with adequate aesthetic outcomes.

The forehead flap remains attached for approximately 3 weeks to the recipient and donor sites via the skin pedicle containing the supratrochlear artery. After 3 weeks, sufficient blood supply has developed from the periphery of the recipient site, and the vascular pedicle may be safely divided and the recipient and donor sites aesthetically repaired. After detachment and inset, additional procedures, can be performed to thin and contour the flap as needed. Disadvantages of the paramedian forehead flap are the need for at least 2 procedures, a large donor site scar, potential for alopecia at the donor site, and greater risk of postoperative bleeding compared to other local flaps.

Figure 17a: Lateral view of skin defect involving right nasal tip and soft tissue triangle. Nasal subunits involving the defect and adjacent to defect outlined

Figure 17b: Bird's eye view of skin defect and outlined nasal subunits of right tip and ala

Figure 17c: Lateral view of paramedian forehead flap with reconstruction of right hemi-tip

Figure 17d: Bird's eye view of paramedian forehead flap

Figure 18a: Subtotal nasal defect of nasal dorsum, tip, columella, both alae and soft tissue triangles. Right paramedian forehead flap designed over supratrochlear artery

Figure 18b: Bird's eye view of paramedian forehead flap after inset with pedicle attached

Figure 18c: Basal view of nasal defect with grafted cartilage to reconstruct the nasal framework

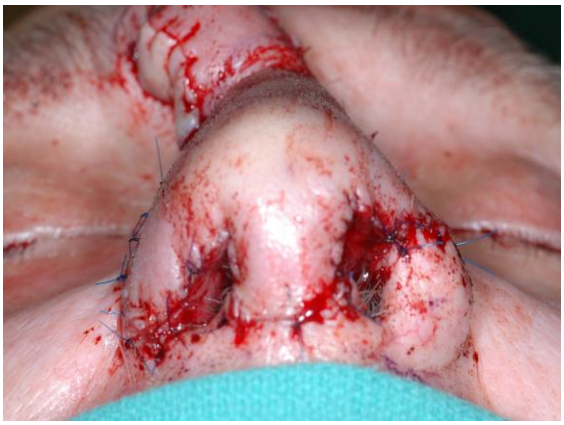

Figure 18d: Basal view after inset of paramedian forehead flap

Melolabial Flap

A melolabial flap is an interpolated flap that transfers tissue from the cheek to reconstruct nasal ala defects. The flap is designed lateral to the melolabial crease. Given inherent redundancy of tissue in this area, there is usually enough tissue for flap transfer and primary closure of the donor site. The blood supply can be based on cutaneous or subcutaneous pedicles. Advantages of the flap are its ability to recruit tissue from an area with good skin elasticity, and redundancy and ease of camouflaging the scar in the melolabial crease. The main disadvantage is the need for a second stage

procedure to take down the pedicle *(Figure 19)*.

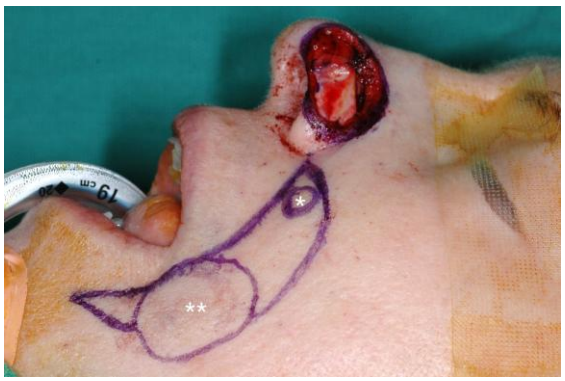

Figure 19a: Skin defect involving left nasal tip, soft tissue triangle, and ala. Melolabial flap designed along melolabial groove. Asterisk marks the pedicle of the flap to be kept intact. Double asterisks mark the skin flap to be transposed onto the defect

Figure 19b: Melolabial flap inset with pedicle intact. The pedicle is taken down 3 weeks later and the lateral aspect of the flap is inset. Asterisk marks pedicle of flap

Abbe Flap

The Abbe flap is an interpolated flap used to repair full thickness lip defects that comprise >25% of the lip and cannot be closed primarily or with advancement flaps. The flap is designed from the opposing lip with the height of the flap equal to that of the defect and the width about half the width of the defect *(Figures 20ab)*. The labial artery serves as the vascular pedicle. It runs between the orbicularis oris and lip mucosa. Once the flap has been designed, it is raised with preservation of the labial artery, and is pivoted almost 180° into the defect. Inset of the flap requires special attention to reapproximate the vermillion border and the mucosa, muscle, and skin. The secondary defect is closed primarily. While the pedicle is attached, patients consume a liquid and soft diet to limit strain on the pedicle. The pedicle of the flap is divided after 3 weeks and the flap is fully inset.

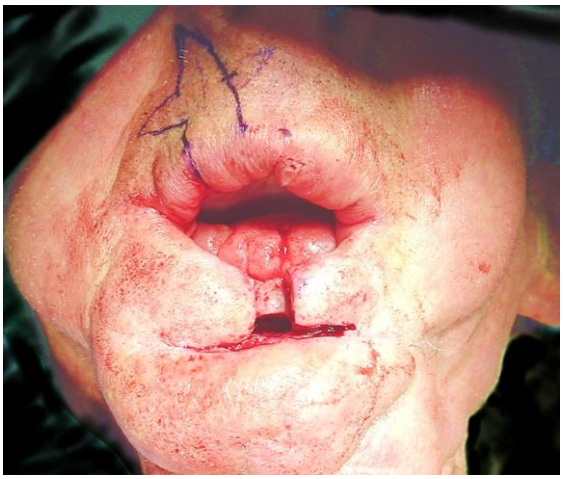

Figure 20ab: Abbe flap used to reconstruct the lower lip

Postauricular Flap

The postauricular flap is a two-stage procedure used to reconstruct large defects of the auricle that require both cartilage and soft tissue repair. The first stage involves reconstruction of the cartilaginous framework and a posteriorly based cutaneous advancement flap. The flap is elevated from the

medial aspect of the auricular defect and continued posteriorly into the postauricular sulcus and onto the scalp. The width of the flap is equal to the height of the defect. Once the flap is elevated, the cartilaginous framework is reconstructed using harvested conchal or septal cartilage. The cartilaginous framework is laid underneath the flap and the flap is secured to the skin on the anterior aspect of the defect to completely cover the cartilage. The advancement flap remains attached for 3 weeks. At the 2nd stage, the advancement flap is released from the scalp and used to cover the medial aspect of the defect. A skin graft is used to repair the secondary defect from the advancement flap *(Figures 21a-c)*.

Figure 21a: Skin and cartilage defect of helical rim and scapha

Figure 21b: Conchal cartilage graft used to reconstruct scapha and portion of helical rim

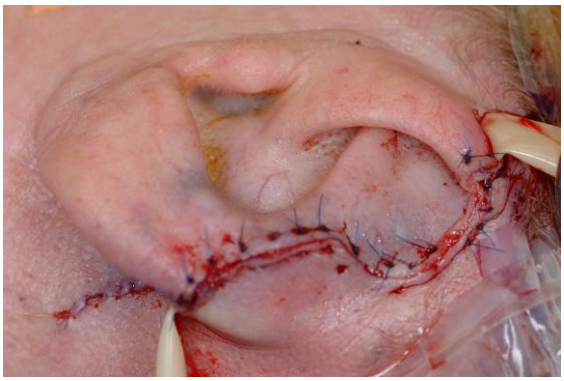

Figure 21c: Postauricular skin flap inset over cartilage framework

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Other flaps described in *The Open Access Atlas of Otolaryngology Head & Neck Operative Surgery*

- *Pectoralis major flap*
- *Cervicofacial flaps*
- *Deltopectoral flap*
- *Buccal fat pad flap*
- *Buccinator myomucosal flap*
- *Nasolabial flap*
- *Temporalis muscle flap*
- *Submental Artery Island flap*
- *Supraclavicular flap*
- *Upper and lower trapezius flaps*
- *Latissimus dorsi flap*
- *Paramedian forehead flap*
- *Local flaps for facial reconstruction*
- *Radial free forearm flap*
- *Anterolateral thigh (ALT) free flap*
- *Rectus abdominis flap*
- *Free fibula flap*
- *Thoracodorsal artery scapular tip (TDAST) flap*
- *Medial sural artery perforator (MSAP) flap*
- *Gracilis microvascular flap*
- *Principles and technique of microvascular anastomosis for free tissue transfer flaps in head and neck reconstructive surgery*

Also refer to Open Access chapter:
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