

A Modified Rhomboid Flap for Medial Canthal Reconstruction

Christoph Tasch, MD
Alexander Pattiss, MD
Monika Lanthaler, MD
Gerhard Pierer, MD

Background: The reconstruction of medial canthal defects is often challenging in achieving continuity of color and texture, obtaining adequate tissue for large defects, and the reproduction of natural external appearance with inconspicuous scars. We describe a technique for reconstruction of the medial canthal area, using a modified rhomboid flap.

Methods: The technique is based on the use of a modified rhomboid flap for medial canthal defects—superiorly based on the root of the nose for defects mostly above the medial canthal tendon, inferiorly based on the cheek for defects mostly below the medial canthal tendon, and in cases of large defects, using a combination of the two flaps. We present a case series of five patients successfully reconstructed with the mentioned technique after resection of medial canthal basal cell carcinoma.

Results: Of the five patients with a mean age of 76.2 years (range 62–84 years), reconstruction was performed in three patients with a superiorly based rhomboid flap, in one patient with an inferiorly based rhomboid flap, and in another patient with a large defect using a combination of the two flaps. Mean follow-up was 374.4 days (range 30–1247 days). All patients achieved a complete primary closure with no further surgery and satisfactory cosmetic and functional results.

Conclusion: The modified rhomboid flap is a simple and reliable technique for all defects of the medial canthal area. (*Plast Reconstr Surg Glob Open* 2022;10:e4074; doi: 10.1097/GOX.0000000000004074; Published online 27 January 2022.)

INTRODUCTION

The canthal areas are common locations for cutaneous tumors, particularly basal cell carcinoma (BCC).¹ However, the reconstruction of defects of the medial canthal region following surgical resection of cutaneous malignancies presents many challenges. The skin covering this area is thin and supple, expressing the curvature of the periorbital area, and the complexities of the region's structural anatomy make reconstruction challenging for surgeons.²

Challenges associated with surgical reconstruction of the medial canthal region include matching recipient site skin, color and texture, minimizing donor site morbidity, and camouflaging resulting scars.³ Moreover, preserving the natural concavity of this highly noticeable

periorbital area with no distortion of the surrounding tissue and achieving symmetry must be considered during reconstruction.⁴

A multitude of surgical repair methods exist depending on the defect's size, location, and depth, and patients' preference: simple direct closure for small defects, secondary healing, skin grafts, local flaps, and regional flaps.

Although various options are available, optimal results are obtained when “like is used to repair like.” The use of tissues of similar color, texture, and thickness for the repair of defects is essential.⁵ Adjacent tissue to the defect has the greatest similarity on color and texture. Hence, in reconstruction of the medial canthal region local flaps, using neighboring tissue should be the first choice to achieve natural appearance, color, and tissue harmony.⁴

The classical rhomboid flap is a useful surgical technique to cover defects created by simple excisions in the shape of a rhombus and seems to be well suited for reconstruction in the periorbital area.⁶ The aim of our study was to describe a new technique for reconstruction of medial canthal defects using a modified rhomboid flap.

MATERIALS AND METHODS

We report our experience using a modified rhomboid flap for medial canthal reconstruction. Reconstruction by

Disclosure: The authors have no financial interest to declare in relation to the content of this article.

From the University Hospital for Plastic, Reconstructive and Aesthetic Surgery Innsbruck, Medical University Innsbruck, Innsbruck, Austria.

Received for publication July 18, 2021; accepted November 24, 2021.

Copyright © 2022 The Authors. Published by Wolters Kluwer Health, Inc. on behalf of The American Society of Plastic Surgeons. This is an open-access article distributed under the terms of the [Creative Commons Attribution-Non Commercial-No Derivatives License 4.0 \(CCBY-NC-ND\)](https://creativecommons.org/licenses/by-nc-nd/4.0/), where it is permissible to download and share the work provided it is properly cited. The work cannot be changed in any way or used commercially without permission from the journal.

DOI: 10.1097/GOX.0000000000004074

means of this procedure was performed in five patients with defects after resection of medial canthal basal cell carcinoma. Surgery was performed on an outpatient basis under local anesthesia in all cases.

The cases were collected retrospectively. Outcome measures documented clinically and photographically included complete closure of the defect, the cosmetic result, complications, and reoperations.

TECHNIQUE

The Limberg or rhomboid flap was first described by Alexander Limberg in 1946.⁸ Its use in periocular defects has been described.^{6,9-11} All classic designs with its modifications are focused on a rhomboid shape defect. However, in clinical practice, especially in the face, many defects will end up having an almost circular shape, and according to those needs, modifications were described for round defects.¹² According to the described usability in circular defects, we designed our rhomboid flaps as follows.

For defects located mostly above the medial canthal tendon, the rhomboid flap is marked on the skin, starting with a line horizontally on the nose parallel to relaxed skin tension lines (RSTL) in continuity with the defect. The chosen diagonal is extended equal to its own length. The other side of the flap is equal to the extension, drawn at approximately 60 degrees (Fig. 1). For defects located mostly below the medial canthal tendon, the rhomboid flap is marked, starting with a line in continuity with the defect at the junction of the aesthetic units of the nose and cheek equal to the length of the diameter of the defect. The other side of the flap is equal to the extension, drawn at approximately 60 degrees (Fig. 1). For large defects of the medial canthal region, the defect is imagined to be divided into two round defects. The upper part of the defect is covered with one rhomboid and the lower part with another rhomboid flap, as described. If necessary both flaps can be trimmed to fit perfectly (Figs. 2, 3).

The procedure is performed under local anesthesia after excision of the cutaneous malignancy with safety margins of 5 mm in basal cell carcinoma and clearance of tumor margins confirmed by histopathological examination. Initially, the defect at the medial canthal region is measured, and a flap or flaps of adequate size is/are marked depending on the size and location of the defect. An incision is then made through the skin into the subcutaneous tissue, followed by elevation of the flap with wide undermining of the adjacent tissue to gain better mobility and movement. Then, the flaps are thinned and trimmed before transposition in the defect and anchored with deep sutures at the canthal area to restore canthal concavity, minimize tenting, and avoid tension on the skin. The skin margins are sutured with 6/0 Prolene (polypropylene; Ethicon). The area is padded with gauzes to achieve adequate compression to hold the flap down securely into the concave surface. Sutures are removed after the skin edges heal (usually in 1 week).

Takeaways

Question: Reconstruction of medial canthal defects.

Findings: Case series of five patients successfully reconstructed after resection of medial canthal basal cell carcinoma.

Meaning: The modified rhomboid flap is a simple and reliable technique for all defects of the medial canthal area.

RESULTS

This series includes five patients who underwent medial canthal reconstruction with a rhomboid flap at the University Hospital Innsbruck during the period from September 2015 to October 2019. There were two male patients and three female patients, with an average age of 76.2 years (range 62–84). Follow-up ranged from 30 to 1247 days (mean 374.4 days). All of the patients had basal cell carcinoma confirmed by biopsy. In three patients we did a superiorly based flap (Fig. 4), in one patient an inferiorly based flap (Fig. 5) and in one patient a combination of the two flaps (Fig. 6). Primary closure of the defect was achieved in all cases without wound dehiscence. The postoperative period was uneventful, except initial pincushioning of the superiorly based flap in two cases, which disappeared in one patient completely during the follow-up. The other patient was lost to follow-up. In all cases the cosmetic appearance was highly satisfactory to the surgeons and patients. Table 1 shows dimension and location of the defects and the flaps used.

DISCUSSION

After its initial description by Fox and Beard, the *laissez-faire* method has become well established as a method of medial canthal reconstruction.^{14,15} Advantages are its simplicity and the lack of further surgical manipulation.¹⁶ However, besides a prolonged healing time and meticulous wound care, disadvantages also include overcontraction with distortion, ectropion formation, medial canthal webbing, trichiasis, eyelid notching, and hypertrophic scarring.^{4,17} However, secondary healing can be considered in small and superficial defects especially in elderly patients.

Medial canthal defects can also be covered by means of skin grafting, which can be either split thickness skin graft (SSG) or full thickness skin graft (FTSG). However grafts can not be used if the periosteum is excised. In particular, grafts tend to contract, especially to be more prominent as the thickness of the graft decreases as in SSG.¹⁸ Besides graft shrinkage, long-term complications are color and texture mismatch, hyper- or hypopigmentation, and, in particular, graft hypertrophy, leading to poor cosmetic and functional results.¹⁹ Graft hypertrophy was most common in medial canthal defect reconstruction compared with other periocular sites.¹⁹ Although not fully understood, the larger number of hypertrophic grafts in the medial canthal area may be due to a higher degree of cellular proliferation and wound healing in this area.¹⁹ It is believed that replacing lost skin with grafts of similar

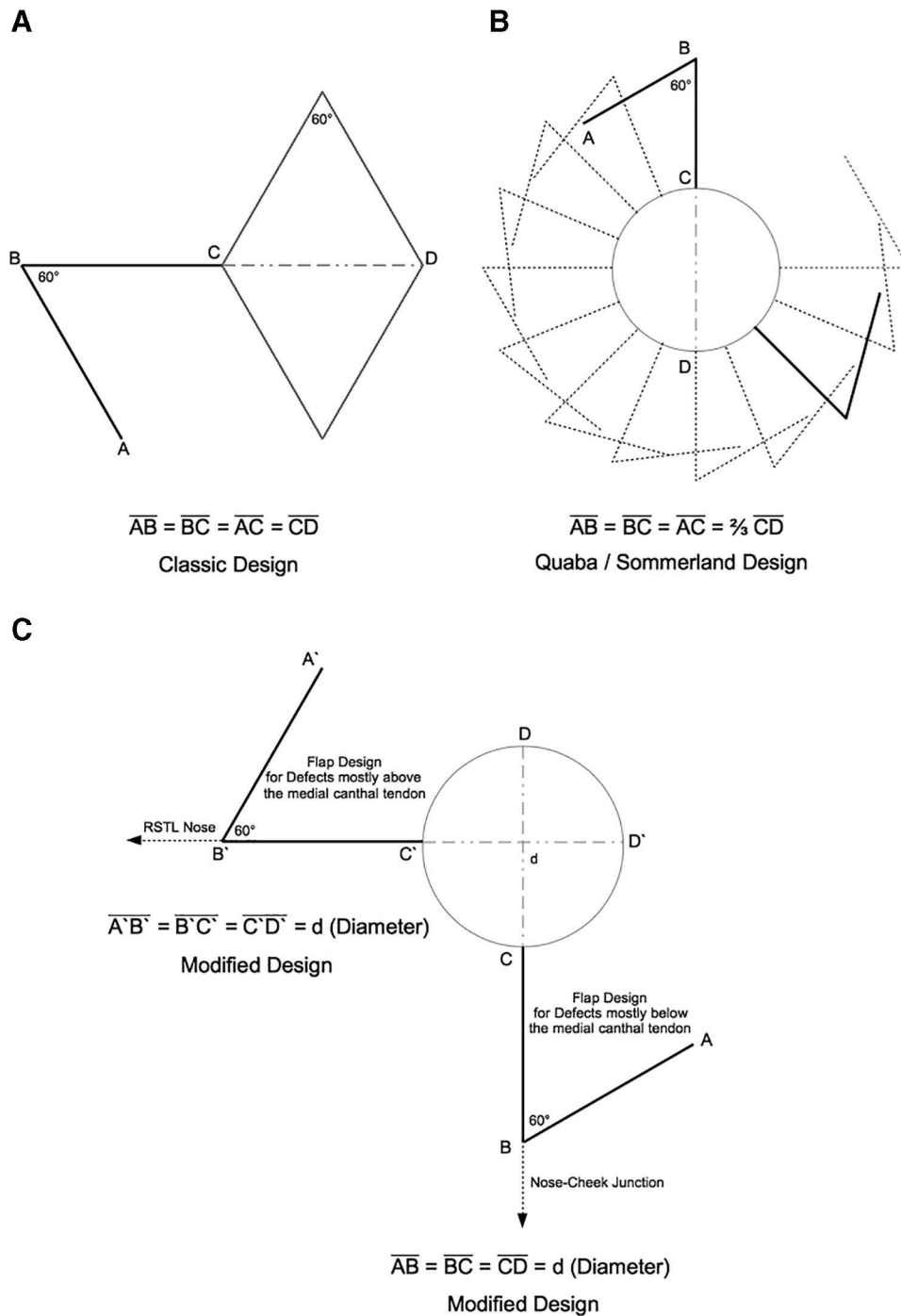


Fig. 1. Rhomboid flap designs. A, Classical rhomboid flap by Limberg. B, Rhomboid flap for circular defects by Quaba/Sommerland. C, Modified rhomboid flap for medial canthal defects.

histology, texture, and thickness may have favorable cosmetic results.²⁰ Taking into consideration the drawbacks of skin grafting and secondary healing, reconstruction with flaps is frequently performed as the first choice.

Mobilization of tissue as a flap from the forehead or glabellar area is well known. The most popular flap has been historically from the glabellar region. However, there are several drawbacks to using a glabellar transposition flap for medial canthal reconstruction, such as

deformity due to a bulky flap because of discrepancy in donor and recipient skin thickness, tendency of eyebrow approximation, and conspicuous vertical scarring crossing the relaxed skin tension lines (RSTL).^{21,22}

The forehead flap can be used for large defects. However, besides the necessity of a two-stage operation, the flap lacks texture match, is significantly thicker, often requiring debulking procedures later, and has a potential of telecanthus formation.^{7,23} Forehead flap reconstruction

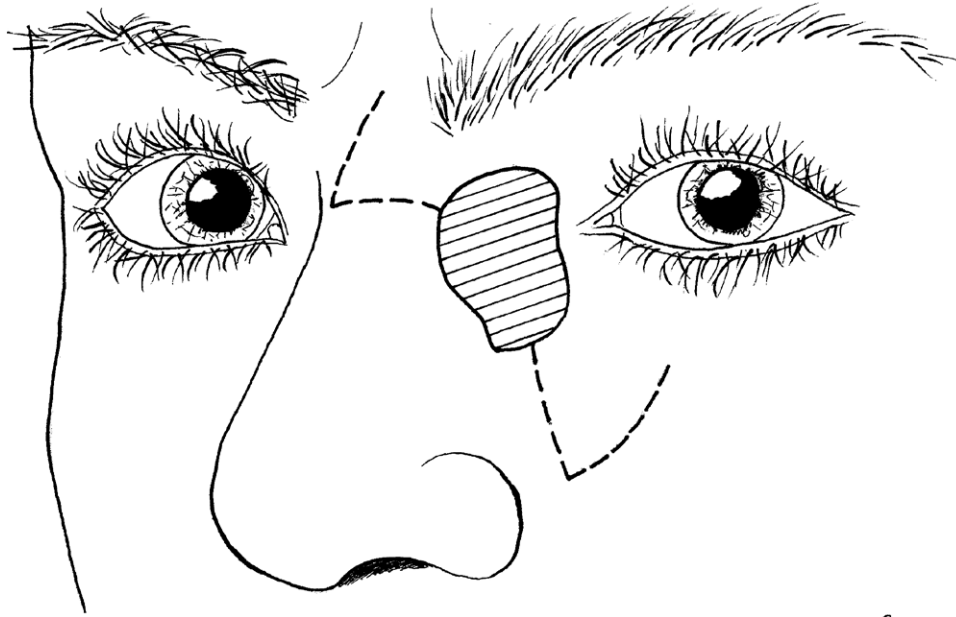


Fig. 2. Large defect of the medial canthal region with drafted double flap design.

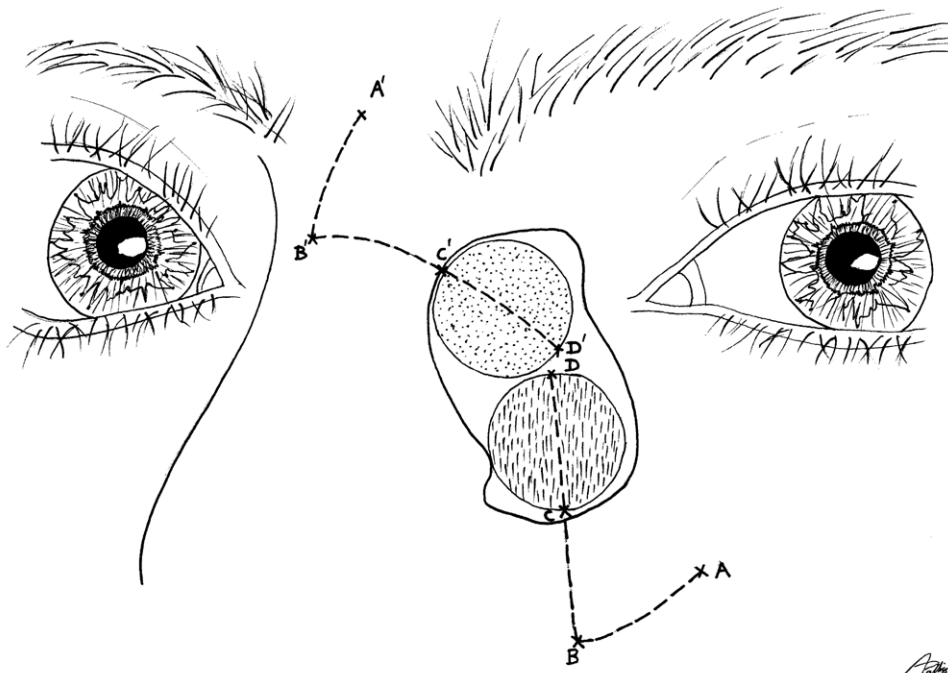


Fig. 3. Flap design for large defects in detail after imaginary division of the defect in two circular defects using a glabellar-based modified rhomboid flap ($\overline{A'B'} = \overline{B'C'} = \overline{C'D'}$ = diameter of the imaginary circle) for the upper portion and a cheek-based modified rhomboid flap ($\overline{AB} = \overline{BC} = \overline{CD}$ = diameter of the imaginary circle) for the lower portion of the defect.

also leads to long, poorly disguised midline forehead scars. In contrast, the upper eyelid myocutaneous flap is excellent regarding flap thickness, texture, color match, and inconspicuous scars at the donor site²⁴⁻²⁶ but lacks on width the flap can be harvested from and therefore is only indicated in patients with abundant upper eyelid skin.⁷ V-Y

advancement flaps from the nasal bridge are limited to reconstruct only small defects.²⁷

However, adjacent tissue to the defect has the greatest similarity on color and texture. Hence, optimal donor skin for medial canthal defects includes the adjacent tissue of the nose and the cheek.¹⁶ Particularly, skin from the dorsum



Fig. 4. Case example. A, Preoperative view of a patient with a defect on her left medial canthal region with superiorly based flap design. B, Immediate postoperative view of the patient after inseting the flap. C, Postoperative photograph at 17 months follow-up.

of the nose contains fewer skin appendages and less subcutaneous fat and seems to blend well with host tissues in the nasojugal fold region.²² The loose skin of the dorsum of the nose and the cheek has good skin laxity to provide sufficient tissue for defect coverage. Thus, the rhomboid flap can be the method of choice for medial canthal reconstruction.

Although the classic design of the Limberg flap allows only four possible choices of flaps, the modifications first described by Quaba allow an unlimited choice of flaps, placing the donor scar at the least conspicuous site¹² (Fig. 1). So, in the highly noticeable area of medial canthal defects, the rhomboid flap can be planned to obey natural relaxed skin tension lines and the borders of aesthetic units. Ideally, the scar is largely horizontal across the bridge of the nose and a relaxed skin tension line may be hidden in the natural skin crease at the root of the nose¹⁰ or located at the nasofacial junction, resulting in an inconspicuous positioned donor scar (Figs. 1–3). Moreover, compared with frequently used glabellar flaps, the tendency of drawing the eyebrows together can be reduced. However, one disadvantage is the proclivity toward pin-cushioning in superiorly based rhomboid flaps.

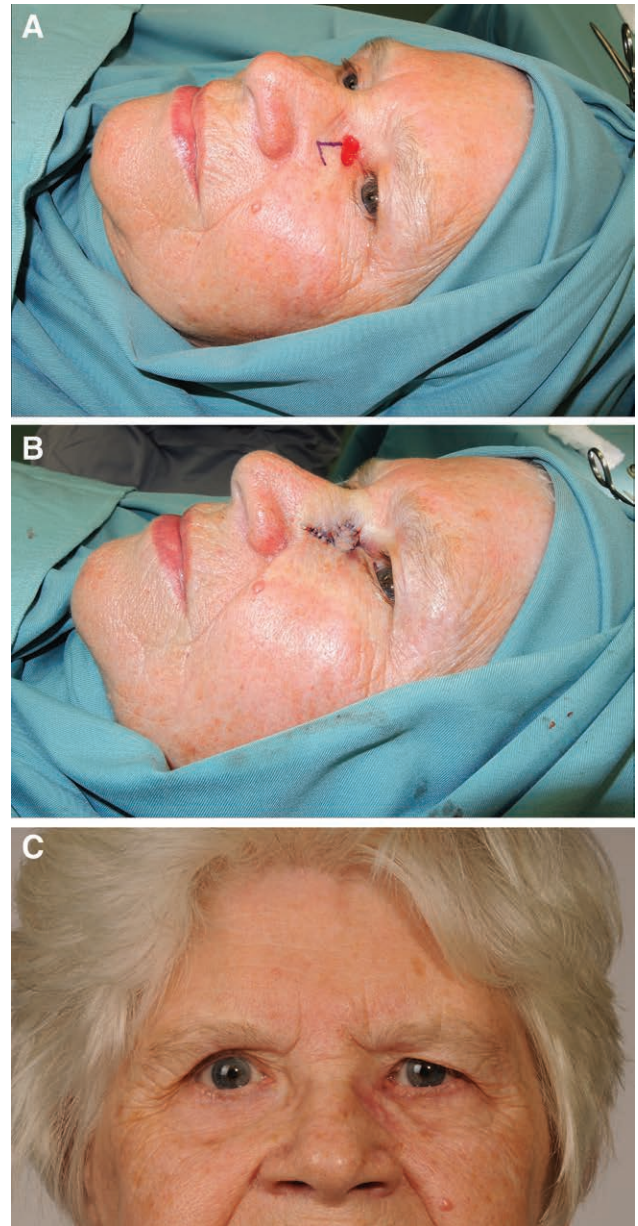


Fig. 5. Case example. A, Preoperative view of a patient with a defect on her left medial canthal region with inferiorly based flap design. B, Immediate postoperative view of the patient after inseting the flap. C, Postoperative photograph at 5 months follow-up.

Following the basic principles of plastic surgery of like-for-like tissue replacement and donor site, the rhomboid flap may be a favorable method in medial canthal reconstruction. Unlike the description of Quaba, which uses a smaller flap for the defect by extending the diagonal only by about two-thirds, in our modification the diagonal was extended an equal length to avoid/minimize tension at the defect site to gain enough tissue to restore the medial canthal concavity and prevent tenting of the flap (Fig. 1). By combining a superiorly and inferiorly based rhomboid flap, the technique can also be used to cover large defects with inconspicuous scars.



Fig. 6. Case example. A, Preoperative view of a patient with a defect on her left medial canthal region. B, Flap design—superiorly based flap and inferiorly based flap. C, Immediate postoperative view of the patient after inseting the flap. D, Postoperative photograph at 41 months follow-up.

Contrary to antigravity flaps, a rhomboid flap based on the dorsum of the nose has no tendency to ectropion formation because of the opposing vector. The potential for ectropion formation for rhomboid flaps based on the cheek/lower lid region can be militated against by fixation to the medial canthal tendon or, if

resected to bone or periosteum and in large defects, also by attachment to the opposing antigravity rhomboid flap. To restore the natural concavity of the medial canthal area and minimize tenting, the suspension sutures to the canthal tendon or periosteum are recommendable.

Table 1. Location and Dimension of the Defects and the Used Flaps

Patients	Defect Location	Defect Size	Flap for Reconstruction
I	Mostly above medial canthal tendon	9 × 6 mm	Glabellar-based modified rhomboid flap
II	Mostly above medial canthal tendon	10 × 9 mm	Glabellar-based modified rhomboid flap
III	Mostly above medial canthal tendon	14 × 10 mm	Glabellar-based modified rhomboid flap
IV	Mostly below medial canthal tendon	12 × 8 mm	Cheek-based modified rhomboid flap
V	Large defect	30 × 15 mm	Glabellar-based modified rhomboid flap + cheek-based modified rhomboid flap

CONCLUSIONS

The modified rhomboid flap is an effective technique for all defects of the medial canthal area, providing good cosmesis and few complications. We recommend the use of the flap because of two reasons. First, it is easy to harvest, can be done in one stage, and is reliable and reproducible with versatility in design and inconspicuous scars that can be concealed in the RSTL of the nose or in the nasal-cheek junction. It can be easily performed under local anesthesia from a variety of surgeons with rapid rehabilitation and no perceivable donor morbidity. Second, in large defects, a combination of two flaps provides ample tissue with tension-free repair regardless of the size of the defect in this area.

Christoph Tasch, MD

University Hospital for Plastic, Reconstructive
and Aesthetic Surgery
Medical University Innsbruck
Anichstrasse 35
A-6020 Innsbruck
Austria
E-mail: christoph.tasch@i-med.ac.at

PATIENT CONSENT

Patients provided written consent for the use of their images.

REFERENCES

- Inkster C, Ashworth J, Murdoch JR, et al. Oculoplastic reconstruction following Mohs surgery. *Eye (Lond)*. 1998;12 (Pt 2):214–218.
- Han J, Kwon ST, Kim SW, et al. Medial and lateral canthal reconstruction with an orbicularis oculi myocutaneous island flap. *Arch Plast Surg*. 2015;42:40–45.
- Parker AM, Richardson MA, Jordan JR. Functional reconstruction of large medial canthal defects. *Facial Plast Surg*. 2014;30:656–660.
- Kesiktas E, Eser C, Gencel E, et al. A useful flap combination in wide and complex defect reconstruction of the medial canthal region: Glabellar rotation and nasolabial V-Y advancement flaps. *Plast Surg (Oakv)*. 2015;23:113–115.
- Koch CA, Archibald DJ, Friedman O. Glabellar flaps in nasal reconstruction. *Facial Plast Surg Clin North Am*. 2011;19:113–122.
- Bullock JD, Hamdi B. Double rhomboid flap in ophthalmic plastic surgery. *Ophthalmic Surg*. 1980;11:431–434.
- Onishi K, Maruyama Y, Okada E, et al. Medial canthal reconstruction with glabellar combined Rintala flaps. *Plast Reconstr Surg*. 2007;119:537–541.
- AA L. *Mathematical Principles of Local Plastic Procedures on the Surface of the Human Body*. Leningrad: Medgis; 1946.
- Bullock JD, Koss N, Flagg SV. Rhomboid flap in ophthalmic plastic surgery. *Arch Ophthalmol*. 1973;90:203–205.
- Shotton FT. Optimal closure of medial canthal surgical defects with rhomboid flaps: “rules of thumb” for flap and rhomboid defect orientations. *Ophthalmic Surg*. 1983;14:46–52.
- Ng SG, Inkster CF, Leatherbarrow B. The rhomboid flap in medial canthal reconstruction. *Br J Ophthalmol*. 2001;85:556–559.
- Quaba AA, Sommerlad BC. “A square peg into a round hole”: a modified rhomboid flap and its clinical application. *Br J Plast Surg*. 1987;40:163–170.
- Mehta JS, Olver JM. Infraglabellar transnasal bilobed flap in the reconstruction of medial canthal defects. *Arch Ophthalmol*. 2006;124:111–115.
- Fox SA, Beard C. Spontaneous lid repair. *Am. J. Ophthalmol*. 1964;58:947–952.
- Harrington JN. Reconstruction of the medial canthus by spontaneous granulation (Laissez-Faire): a review. *Ann Ophthalmol*. 1982;14:956–60, 963.
- Behroozan DS, Goldberg LH. Upper eyelid rotation flap for reconstruction of medial canthal defects. *J Am Acad Dermatol*. 2005;53:635–638.
- Lowry JC, Bartley GB, Garrity JA. The role of second-intention healing in periocular reconstruction. *Ophthalmic Plast Reconstr Surg*. 1997;13:174–188.
- MIR y MIR L. Biology of the skin graft; new aspects to consider in its revascularization. *Plast Reconstr Surg (1946)*. 1951;8:378–389.
- Leibovitch I, Huilgol SC, Hsuan JD, et al. Incidence of host site complications in periocular full thickness skin grafts. *Br J Ophthalmol*. 2005;89:219–222.
- Gonzalez-Ulloa M. Restoration of the face covering by means of selected skin in regional aesthetic units. *Br J Plas Surg* 1956;9:212–221.
- Matsuda H, Takahashi Y, Ichinose A, et al. Combination of nasolabial v-y advancement flap and glabellar subcutaneous pedicled flap for reconstruction of medial canthal defect. *Case Rep Ophthalmol*. 2014;5:50–53.
- Perry JD, Taban M. Superiorly based bilobed flap for inferior medial canthal and nasojugal fold defect reconstruction. *Ophthalmic Plast Reconstr Surg*. 2009;25:276–279.
- Kim JH, Kim JM, Park JW, et al. Reconstruction of the medial canthus using an ipsilateral paramedian forehead flap. *Arch Plast Surg*. 2013;40:742–747.
- Jelks GW, Glat PM, Jelks EB, et al. Medial canthal reconstruction using a medially based upper eyelid myocutaneous flap. *Plast Reconstr Surg*. 2002;110:1636–1643.
- Tezel E, Sönmez A, Numanoğlu A. Medial pedicled orbicularis oculi flap. *Ann Plast Surg*. 2002;49:599–603.
- Stagno d’Alcontres F, D’Amico E, Colonna MR, et al. The orbicularis oculi myocutaneous flap in the repair of the medial canthal region. A new strategy for canthal resurfacing. *Br J Plast Surg*. 2004;57:540–542.
- Moretti EA, Gomez Garcia F. Myocutaneous flap (V-Y design) from the nasal bridge for medial canthal reconstruction. *Ophthalmic Plast Reconstr Surg*. 1998;14:298–301.