

The glabellar flap dissected

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Abstract

The glabellar flap is effective in the reconstruction of defects within the medial canthal region. The unique contour of the medial canthal region presents a challenge in the surgical planning of the glabellar flap, which is only briefly described in texts. We describe its step by step construction, including the indications and precautions. We also include a section on variations in design for improved closure. With careful planning, the glabellar flap provides excellent cosmetic results.

Key words Anatomical medial canthus, Glabellar flap, Rhomboid flap, Surgical medial canthus

The medial canthal region is a unique area which represents the convergence of skin units of differing texture, thickness and contour. The unique contour of the medial canthal region is dependent on the interrelationship of the eyelids, brow, cheek, nose and glabellar regions. This presents difficulties in the planning of the reconstruction of surgical defects in this region. As the medial canthus is an ill-defined region, it can be considered to have both anatomical and surgical boundaries (Fig. 1). The anatomical medial canthus lies in close proximity to the medial end of the palpebral fissure and is bordered laterally by the junction of the upper and lower canaliculi. The surgical medial canthus is much larger than the anatomical medial canthus, and extends vertically into the sub-brow region, medially to the side of the nose and close to the midline (Fig. 2a), and inferiorly onto the cheek. The glabellar flap can be effectively used to close defects in the surgical medial canthus (Fig. 2b) but this requires careful pre-operative planning.

Despite the complexity of the medial canthal region, the mechanics of the construction of the glabellar flap are poorly described, and the complexity of the reconstruction is often far greater than the description given in most surgical texts. In comparison, the rhomboid flap, which is used by allied specialties including plastic surgery, dermatology and ENT surgery,¹⁻³ has been described in great detail and the mathematics of the associated

tension lines have been well documented.⁴ The aim of this paper is to provide a practical description of the construction of the glabellar flap.

Principle

The glabellar flap is a V-Y flap which allows the transposition of skin from the glabellar region into a defect. In oculoplastic surgery, the glabellar flap is indicated for defects within the surgical medial canthus^{5,6} (Fig. 3). The flap may be used alone or in combination with other reconstructive procedures depending on the extent of the associated surgical defects, e.g. the Hughes tarso-conjunctival flap, the Mustarde cheek rotation flap and a skin/muscle advancement (Fig. 4a, b). For the remainder of this paper, the inverted V of the glabellar flap will be described simply as a V.

As it is based on a V-Y flap design, the glabellar flap creates vertical lengthening with its transpositional closure. Adjacent tissue is transposed on a vascular base into the medial canthal defect, and the flap may only be partially rotated which gives rise to its V-Y design. The V principle of the glabellar flap shares properties with the rhomboid flap and this has been described elsewhere.⁷ However, in contrast to a rhomboid flap, the concepts of 'lines of maximum extensibility' and 'relaxed skin tension lines' are not applicable to the glabellar flap due to the variable contour of the nose, glabellar and medial canthal regions. Consideration of these concepts is not required pre-operatively for glabellar flap construction.

There are many alternatives to the glabellar flap in the repair of surgical medial canthal defects, including *laissez-faire*,¹⁸ full-thickness skin graft with or without a deep pericranial flap, a bilobed flap or a rhomboid flap.

Patient selection

Patient selection depends on the size and location of the defect, the contour of the glabellar region and the contour of the root of the nose. The ideal defect is located within the surgical medial canthus, and does not extend laterally below the brow or too far below the medial canthus into the skin of the cheek. It is rounded so that the width and height of the

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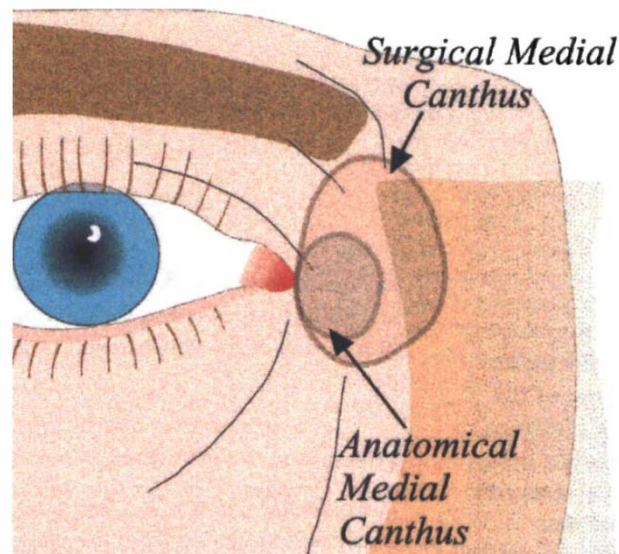
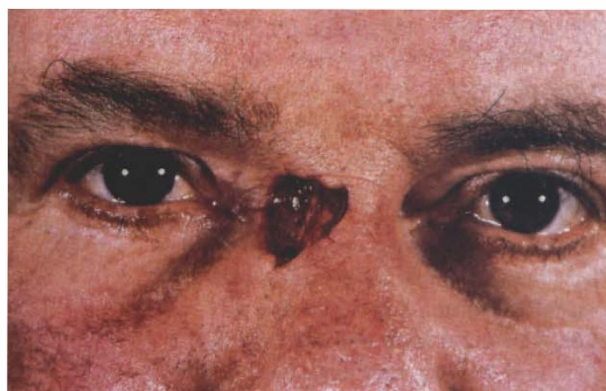


Fig. 1. Schematic showing boundaries of the anatomical and the surgical medial canthus.



(a)



(b)

Fig. 2. (a) Defect lying within the surgical medial canthus bordering the midline of the nose. (b) Same patient after closure with a glabellar flap.

defect are the same (Fig. 5); the superomedial margin of the defect may even be trimmed to achieve this requirement (Fig. 6).

Pre-operative planning

The planning of the glabellar flap is a crucial step which extends far beyond the simple sketch of a V on the forehead. There are certain pre-operative factors which can lead to unsatisfactory results with the glabellar flap. These include: a large and irregular medial canthal defect; a defect extending across the bridge of the nose; a defect extending laterally under the brow; young patients; tight facial skin; a very deep medial canthus; a very oval defect oriented vertically and extending well below the lower eyelid; or patients with a continuous brow.

For very large defects, the glabellar flap will necessarily be large and there is likely to be deficient skin. A full-thickness skin graft may be a more appropriate option in such cases. For a defect extending

across the bridge of the nose, the blood supply to the flap may be compromised as the base of the flap will be narrow, and a full-thickness skin graft may be considered. For defects extending laterally under the brow and into the eyelid, skin advancements may also be required in addition to a glabellar flap. Young patients often have inadequate glabellar skin and may not be suitable for a glabellar flap. Patients with tight facial skin have inadequate skin laxity and a glabellar flap is contraindicated. Patients with a very deep medial canthus will need a high (and therefore large surface area) V, and one must ensure adequate skin laxity is present pre-operatively. A very oval defect extending well below the eyelid may not be as aesthetically pleasing after reconstruction with a glabellar flap.

Multiple parameters exist in the design of the glabellar flap and the pre-operative planning involves determining suitability of the defect to glabellar flap reconstruction. The relevant factors include:

- size and depth of the defect

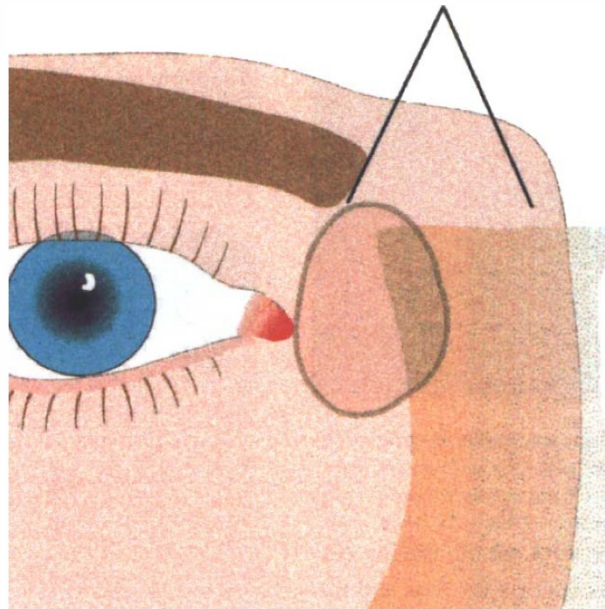


Fig. 3. Schematic showing the relation of the glabellar flap to a surgical defect within the medial canthus.



(a)

(b)

Fig. 4. (a) Pre-operative photograph of a Mohs defect involving the right medial canthus and continuous with the right lower eyelid. (b) One week post-operative photograph of combination reconstruction involving a glabellar flap and a Hughes flap with skin muscle advancement.

- orientation of the V to Y flap
- skin texture of the glabellar region
- alignment of the flap with the defect
- depth of the medial canthus
- position of the defect within the medial canthus
- contour of the margins of the defect
- presence of a continuous brow

Once suitability for glabellar flap reconstruction is confirmed, the flap is outlined on the patient. Rather than assessing the patient in the sitting position, the best perspective often comes from viewing the defect in a superior to inferior direction, with the patient in the supine position and the surgeon looking down onto the defect from above the head. This aligns the surgeon's view with the design of the flap. The flap is then outlined (Fig. 3). The outline of the flap begins with the location of the apex of the V within the glabellar region. The first arm of the V arises directly from the defect and passes

superomedially towards the apex across the medial brow. The second arm arises from the apex at an angle to the first arm and passes inferiorly. The V of the flap thus has two arms, and once the flap has been raised, it has three borders: an inferior, a lateral and a superior border (Fig. 7).

The next step is the sizing of the flap. The size of the required flap depends on the size of the defect, the distance of the defect from the glabellar region and the contour and depth of the medial canthus. The depth of the medial canthus depends on the relationship of the orbit to the nose, and the length of the nose. Patients with a flat nasal bridge and short nose will need a smaller flap than those with more prominent features. The glabellar flap size can be individually designed to fit these requirements by variation in the height of the V, the angulation between the two arms of the V and the relationship of the V to the defect. The principles of



Fig. 5. Defect of ideal size and location lying within the surgical medial canthus and approximately rounded.

sizing of the flap rely on correctly planning the lengths and relationships of the three borders of the flap, and this can be considered once an initial sketch of the V is made.

The first inferior border of the flap is created from the superior margin of the defect (Fig. 8), which is rotated inferomedially to correct the vertical height. As the correction of the height of the defect is therefore dependent on its width superiorly, the height is automatically corrected by design (Fig. 9). If necessary, the superomedial margin of the defect may be trimmed so that the superior width of the defect approximates its height.

The second lateral border of the flap is formed by the first arm of the V (Fig. 10). It arises from the defect at the most lateral point of the inferior border of the flap and passes superomedially towards the apex. The length of the first arm of the V is the most important, as this must correspond to the width of the defect at its most inferior margin. The width of the flap must take into account the curvature of the medial canthus. Hence the width of the defect determines the height of the V.

The third superior border of the flap is formed by the second arm of the V (Fig. 11). As the two arms of the V are usually equal in length, the length of the second arm is generally the same as that of the first arm, and is constructed at an angle of approximately 45° to the first arm. This angle must not be too acute otherwise there will be insufficient skin in the flap to cover the base of the nose and the blood supply will be compromised risking flap ischaemia.

Once the flap is raised, there is a very large defect continuous with the original defect (Fig. 12). Closure commences vertically to create a V-Y pattern (Fig. 13), and this may be facilitated by undermining tissue margins. Deep 5/0 vicryl sutures are placed to reduce the tension on the cutaneous closure, which is performed with either a 6/0 nylon or 7/0 vicryl suture. Once the vertical closure is complete, the original defect is closed with the flap (Fig. 14).

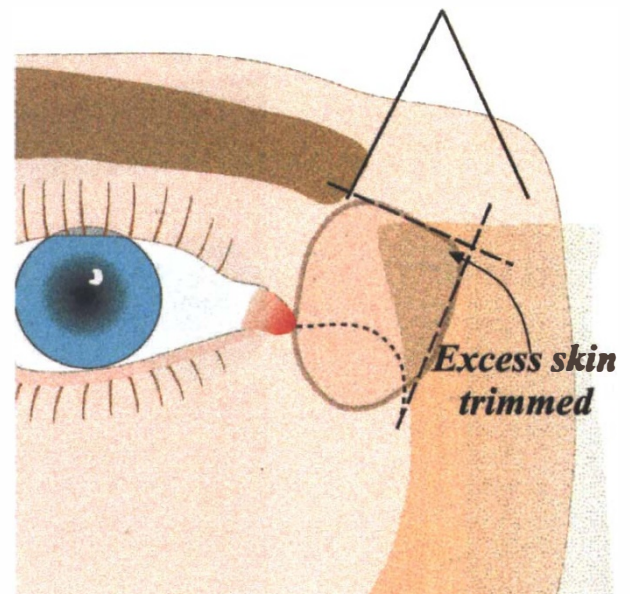


Fig. 6. Trimming of the defect to facilitate closure.

Surgical considerations

Dissection should be deep to include the subdermal plexus but not into procerus or corrugator supercillii. A superficial dissection risks flap necrosis but provides a thinner flap.⁹ Skin undermining can be considered but risks excessive bleeding, and provided there is adequate skin laxity, undermining of skin is usually not necessary. The flap may be anchored to the bed of the defect using 5/0 vicryl, although external compression is an alternative. The authors' preference for skin suture is 7/0 vicryl suture placed in a mattress fashion to the skin margins. A compression bandage is recommended post-operatively in all cases.

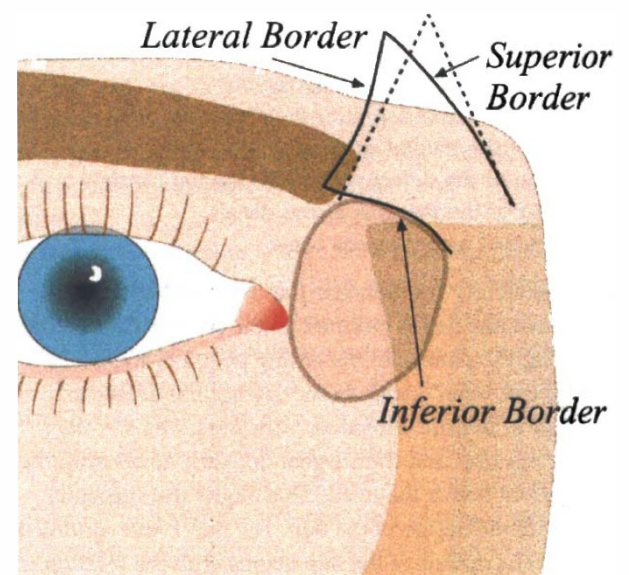


Fig. 7. Schematic showing the three borders of the glabellar flap.

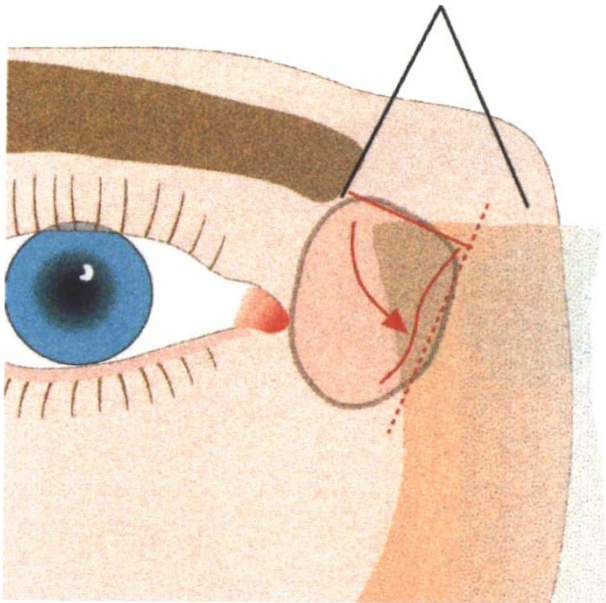


Fig. 8. Creation of the inferior border of the glabellar flap.



Fig. 9. Ideal defect architecture. The photograph illustrates the approximately equal lengths of the superior and medial margins of the defect. These margins lie at right angles and no trimming of the defect was required. The superior margin simply rotated inferomedially as shown in Fig. 8 for direct closure.

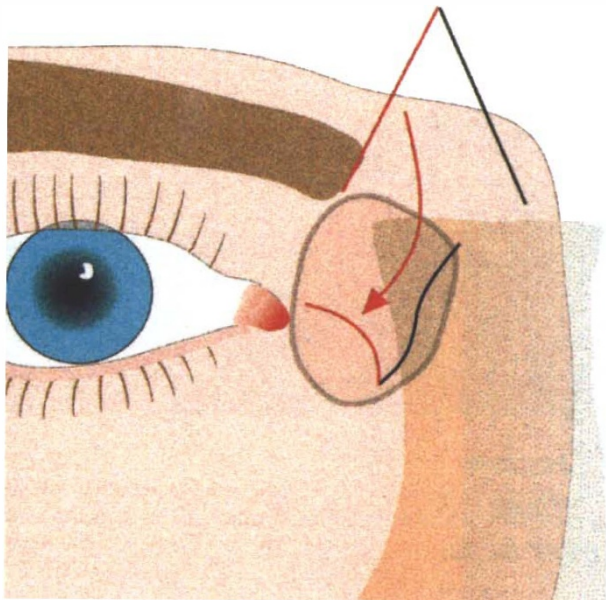


Fig. 10. Creation of the lateral border of the glabellar flap.

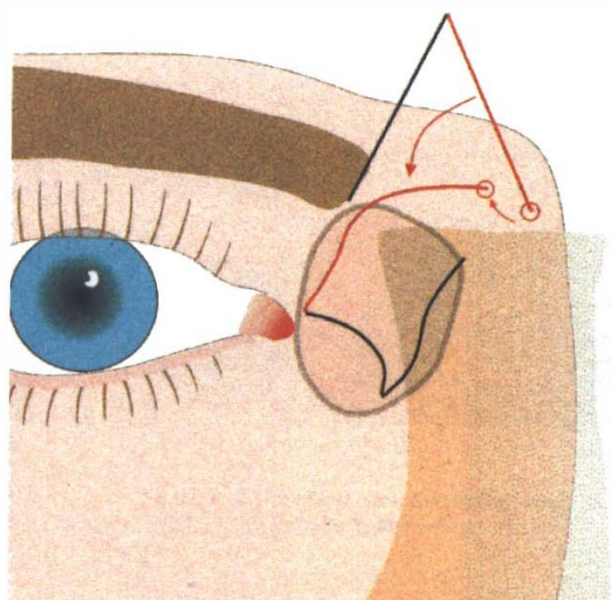


Fig. 11. Creation of the superior border of the glabellar flap.

Variations in flap design

There are a number of variations to the standard glabellar flap design which may be considered for individual cases. These include:

- curvature of the second arm of the V
- displacement of the apex of the V towards the side of the defect
- second arm of the V slightly longer than the first if necessary
- variation in angle between the two arms of the V

The curvature of the second arm of the V has the following effects: it assists with the vertical lengthening of the V-Y design; it creates the curvature required in the

third border of the flap; and it creates a slightly longer than expected third border of the flap (Fig. 15). This last point is crucial as the third border is the longest border of the flap and often limits the ability of the surgeon to close the flap. Also, the greatest tension in the flap lies along the third border as it is rotated into place, and lengthening of this border reduces the tension.

The V is classically described as being placed centrally within the glabellar region, but the authors find it more appropriate to displace the apex to the side of the defect. This has no adverse sequelae (Fig. 16a,b) and the line of closure is then located within the paramedian furrow rather than the central vertical furrow. This allows for a smaller flap size and easier closure of the donor site with less skin tension, due to the proximity of the flap to the

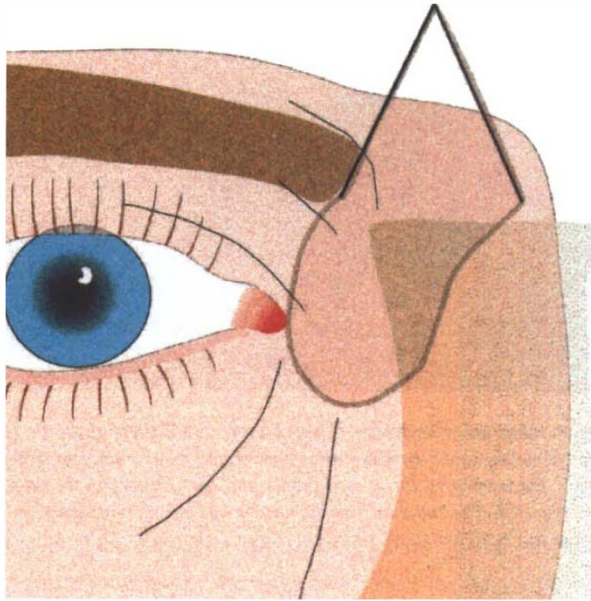


Fig. 12. Donor site defect continuous with the original defect.

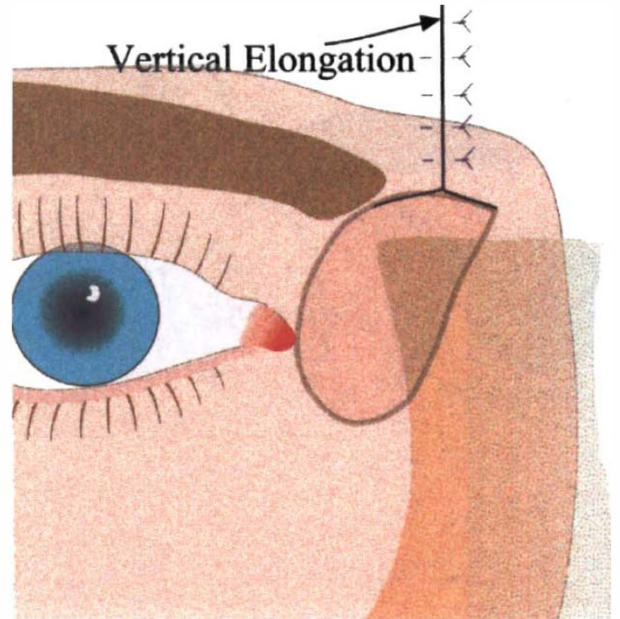


Fig. 13. Vertical closure of the glabellar flap donor site.

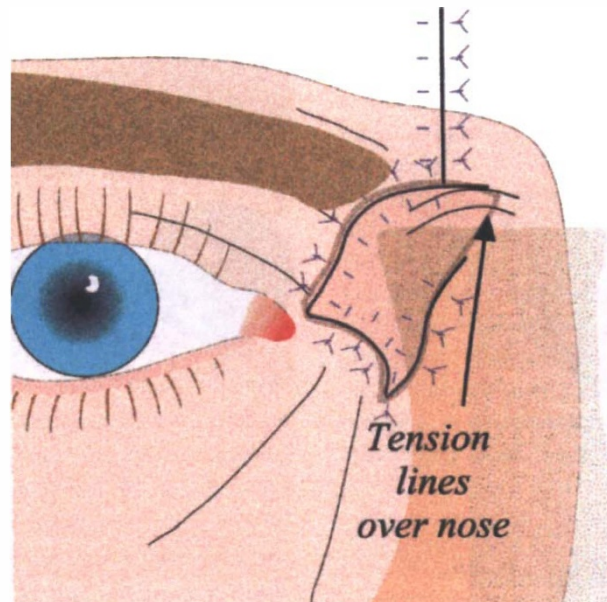


Fig. 14. Closure of the original defect with the glabellar flap.

defect. It also reduces the need for trimming of the flap to fit into the defect. For smaller defects requiring only a rhomboid flap, the apex may be placed on the nose or even on eyelid skin, provided the orientation of the rhomboid is appropriate and the skin crease is not involved (Figs. 17, 18a, 18b).

The length of the second arm of the V may be longer than the first to achieve flap closure for a defect whose length is greater than its width, provided there is adequate skin. This second arm may even extend to just below the contralateral brow provided there is adequate skin laxity.

The angulation between the two arms of the V determines the width of the base of the flap, and it depends on the amount of skin required. The greater the angulation the 'fatter' the flap and the greater the blood supply, and vice versa. The angulation must be large enough to fill the defect over the base of the nose. If too large it will be bulky and cosmetically unacceptable. If too small, it will result in a narrow base with compromised blood supply to the flap, and it may be inadequate to fill the defect over the side of the nose. Ideally, the angulation should be between 45° and 60°.

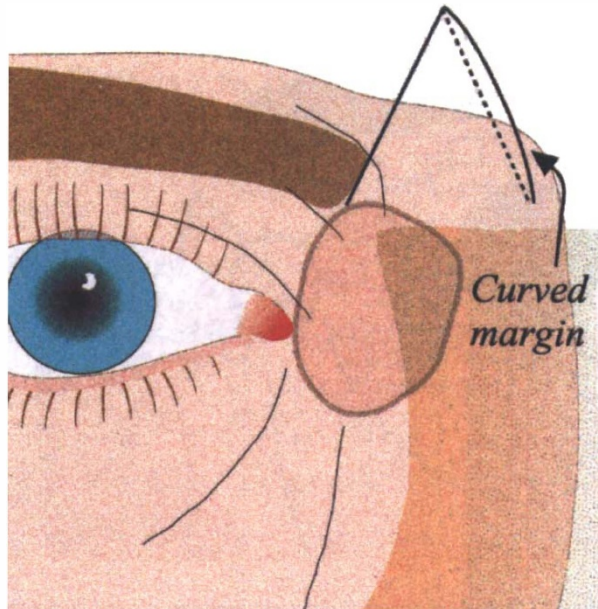


Fig. 15. Curvature of the second arm of the V to create a slightly longer than expected third border of the flap.



(a)



(b)

Fig. 16. (a) Same patient as in Fig. 5 after closure at 6 weeks. The photograph demonstrates a glabellar flap displaced into a paramedian furrow. (b) Same patient as in Fig. 9 after closure at 6 weeks. The photograph demonstrates the classically described centrally located vertical scar for comparison.

Potential problems

There are several possible short- and long-term outcomes after closure with a glabellar flap. These include: lymphoedema of flap tip, usually maximal at 3 months (Fig. 19); necrosis of tip/edges of flap in the early post-operative period, especially if the dissection is too superficial; thickening of the inferior margin of the flap as it rounds the base of the nose requiring late debulking; scar formation; depression and fusion of the brow; and contraction.

Advantages of the glabellar flap

The glabellar flap has many advantages in periocular reconstruction. It suffers from less contraction than a full-thickness skin graft; it has a relatively wide base and hence a good blood supply; it can be performed by a

single surgeon relatively quickly under local anaesthesia; there is minimal collateral damage as the region is devoid of important structures, hence it is very safe; the skin texture is usually ideal;¹⁰ if necessary, it can be used alone to cover defects extending to bone; and it can provide an excellent cosmetic result.

Conclusion

The glabellar flap is an excellent technique for reconstructing medial canthal surgical defects provided these defects meet required design principles. With appropriate planning, it can provide excellent cosmetic results.

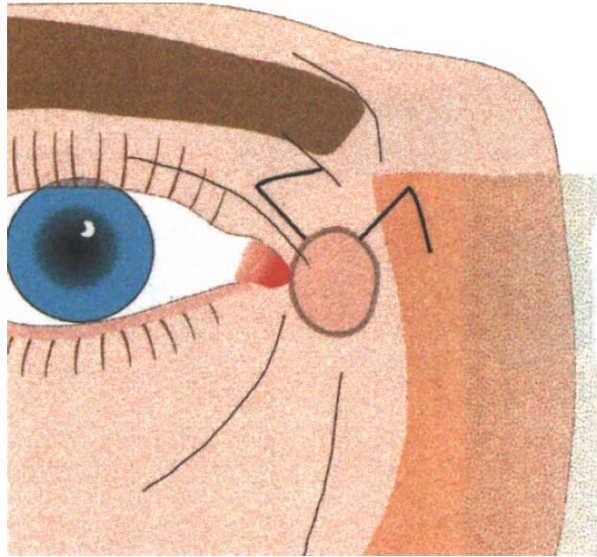
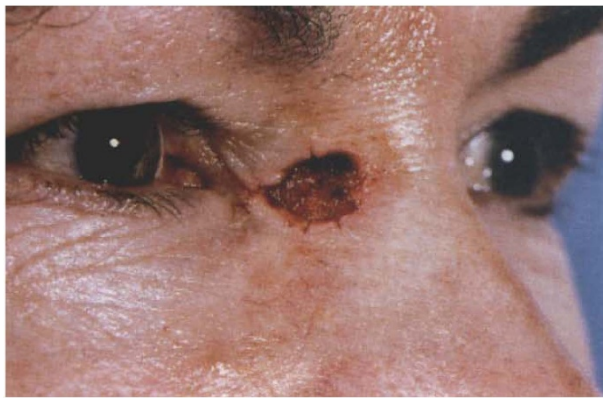


Fig. 17. Example of rhomboid flap architecture for a defect within the anatomical medial canthus.



(a)



(b)

Fig. 18. (a) Pre-operative photograph of a small defect within the anatomical medial canthus in a younger patient. (b) Post-operative photograph at week 4 after closure by rhomboid flap with care to avoid the skin crease. Note the sutures still in place.



Fig. 19. Lymphoedema of the flap tip at 6 weeks. Note the 7/0 vicryl sutures still in place.

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