The Use of Flaps in Upper Eyelid Reconstruction

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Introduction

Upper eyelid reconstruction presents a complex problem to both oculoplastic and reconstructive plastic surgeons. Reconstruction of the upper eyelid is indicated during tumour resection (commonly basal cell carcinoma) and trauma. The eyelids have a vital function in distributing tear fluid across the ocular surface, in addition to protecting the eyes (1). The upper eyelid forms a significant facial landmark, demanding an aesthetically pleasing reconstruction. The reconstruction should match the symmetry and contours of the contralateral eye.

Anatomy

A detailed knowledge of the specialised anatomy of the region is essential for successful reconstruction. The eyelid consists of two layers: the anterior lamella, composed of skin and muscle, and the posterior lamella, composed of the tarsal plate and conjunctiva. The orbicularis oculi muscle forms the bulk of the anterior layer and acts to close the eye. The skin overlying this muscle is very thin and there is little to no subcutaneous fat between the layers. The tarsal plate is formed from dense connective tissue, which provides structural strength and rigidity to the eyelid, as well as defining the contour of the eyelid. Care must be taken to ensure symmetrical curvature to the contralateral eye is achieved to optimise the cosmetic appearance of reconstruction. The posterior surface of the tarsus is coated in mucous membrane, the conjunctiva, which protects the underlying cornea.
The eyelids end medially and laterally at the medial and lateral canthi. The lacrimal puncta are located at the medial canthus and the lacrimal drainage system must be patent to avoid epiphora (watery eyes). This is an important landmark for surgeons to ensure restoration of normal physiological function of tear drainage.

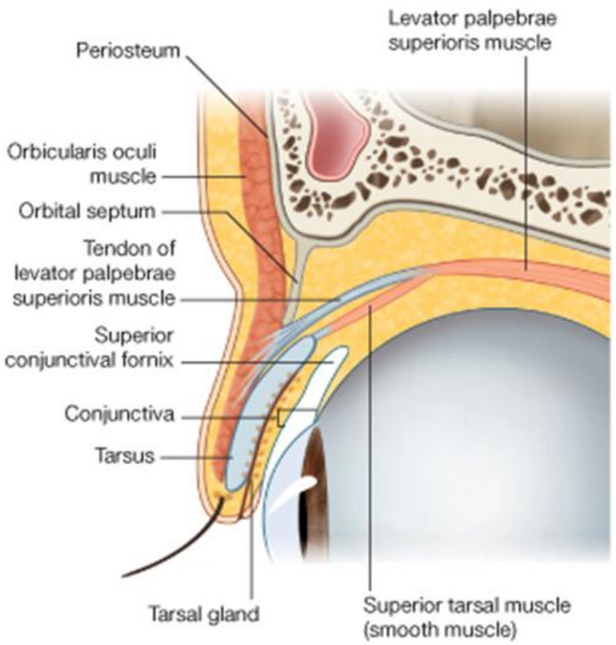

Figure 1: The normal anatomy of the upper eyelid. The upper eyelid is retracted by the levator palpebrae superioris muscle aided by the Müller's muscle and is closed by the orbicularis oculi muscle.

Flaps in reconstructive surgery

The main workhorse of reconstructive surgery is the flap – the movement of tissue and its blood supply from a donor site to reconstruct the recipient site. Traditionally pedicle flaps were used with the original blood supply intact and division of the pedicle occurring 2-4 weeks after. Microsurgery using an operating microscope has revolutionised flap surgery, allowing the surgeon to reattach small diameter blood vessels and nerves from the donor flap to the recipient site. This has developed to allow free flaps to be used in reconstructive surgery, where a flap of tissue can be isolated and sourced distant from the recipient site.

Flaps in anterior lamella reconstruction

Anterior lamella reconstructions require skin and muscle. Semicircular rotational flaps are commonly used to achieve this by harvesting tissue lateral to the lateral canthus of the eye, in parallel to the defect. This is known as the Tenzel flap (1). This flap is dissected and then rotated 180 degrees around the lateral canthus and sutured into place. The curved shape of the flap must match the eyelid.

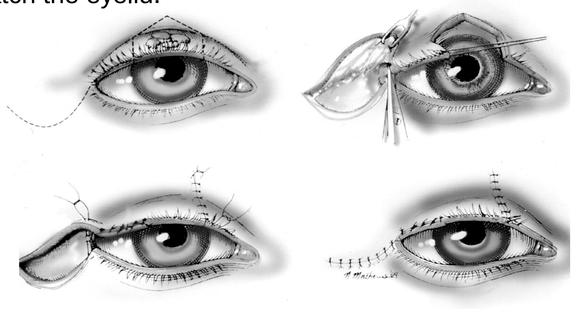

Figure 2: The Tenzel flap

In rare cases where other donor sites are not feasible, a surgeon can utilise a forehead pedicle flap as a last attempt (1). The blood supply is derived from the supratrochlear and supraorbital arteries. The main disadvantages of this method are, that the procedure is two stage, and the flap is usually too thick for good cosmetic results.

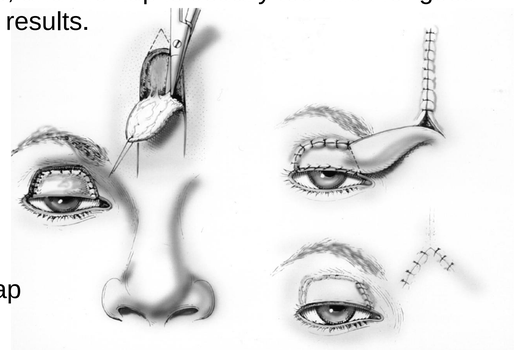

Figure 3: The forehead pedicle flap

Use of flaps for posterior lamella and full thickness reconstruction

The posterior lamella presents the most challenge, due to importance of the fibrous tarsal plate which provides the rigidity and support for the eyelid. Small defects can be repaired using an adjacent portion of intact posterior lamella, a sliding tarsoconjunctival flap. For larger defects, the contralateral eye can be used for a free tarsoconjuctival flap (2). Other autologous options exist for reconstruction including: cartilage from the ear or the Achilles tendon (3) can be used for a 'like for like' substitute tarsal plate, and oral mucosa can be used to line the posterior surface of eyelid.

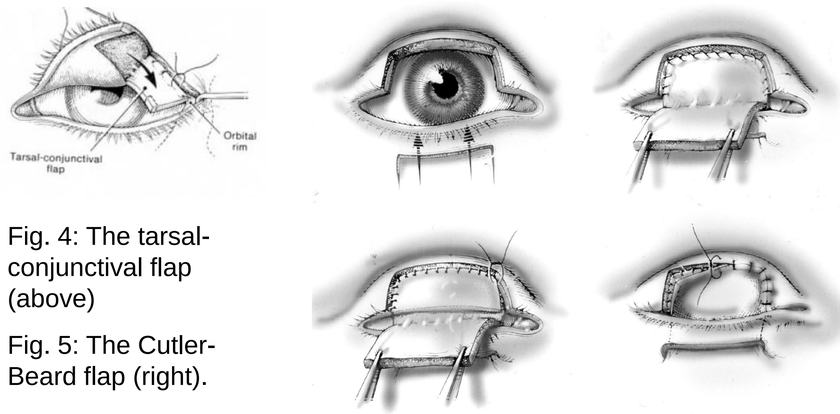

Fig. 4: The tarsal-conjunctival flap (above)

Fig. 5: The Cutler-Beard flap (right).

The Cutler-Beard (Bridge) flap are used for 60% defects of the total lid (4). Muscle and skin tissue are mobilised from the lower lid and usually augmented with cartilage from the ear to provide the support that the tarsal plate should provide. The flap is passed under the lower lid margin, sutured to the upper lid and divided after 6 weeks. Conjunctiva is also donated from the lower lid to repair the defect in the upper lid.

Conclusions

Upper eyelid reconstruction requires innovative and unorthodox approaches to flap surgery to ensure restoration of form and function. Plastic and oculoplastic surgeons alike continue to strive for better aesthetic and functional outcomes using more lateral approaches to harvesting the tissue components required.

References:
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