

THE DEVELOPMENT OF EYELID RECONSTRUCTION

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In its infancy, ophthalmic plastic surgery, and in particular lid reconstruction, was slow to develop its own identity, and in fact was hampered by prominent physicians whose dogmatic teachings stifled change. CELSUS (Milligan, 1831) in A.D. 25 produced the adage "si nimium palpebrae deest nulla id curatio restituere potest" ("if the least portion of the lid is gone, no treatment can restore it") and this was accepted as incontestable until early in the 19th century. Little hope therefore existed, before this time, for the successful restoration of a functioning lid.

In the mid 15th century, success with large transposition and pedicle skin flaps was reported, mainly in the repair of "noses and other mutilated parts of the face", produced as a result of warfare and punishment. HEINRICH VON PFOLSPRUNDT (von Pfolsprundt, 1460) reported pedicle grafts taken from other parts of the body, mainly from the arm, to help in the repair of such defects. He ascribes this technique to BRANCA DE ELDER, who, with his son

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ANTONIO, was performing such procedures in Italy. Another to learn of this technique was GASPER TAGLIACOZZI, Professor of Anatomy and Surgery at Bologna, who described it in great detail in his treatise "*Plastic Surgery*", (Tagliacozzi, 1597) thus publicizing the so called "Italian method" which dominated facial reconstructive techniques for the ensuing three centuries. He, unfortunately, had stated in his text that "in order to live, a graft must have an attachment", a statement which again delayed experimentation with other reconstructive techniques. So large, bulky flaps, unsuited for lid substitution, persisted.

It wasn't until 1809 that CARL VON GRAEFE specifically applied the "Tagliacozzi method" to the reconstruction of an eyelid (von Graefe, 1818). He had used a pedicle skin flap from the cheek to repair a lower lid destroyed by gangrene in a young girl. The operation described was the same in principle as one which had been used for rhinoplasty centuries earlier in India and later, in the 15th century by BRANCA THE ELDER.

Great contributors like DIEFFENBACH, later to become known as the "*father of plastic surgery*", (Dieffenbach, 1845) and FRICKÉ of Hamburg (Frické, 1829), consolidated local lid reconstruction with their own local pedicle flap techniques, their methodical experimentation and their excellent writings in the late 1820's. In the following two decades, there was a boom of operative descriptions and successes, mainly in France, Germany and Spain. In 1832, DE ARGUMOSA of Spain had independently described a rhomboid-shaped transposition flap for the lower lid similar to that of Dieffenbach, and had used a conjunctival lining for the inside of the flap as well. (MARQUEZ, 1933). Up to this time, the main preoccupation was with skin coverage only, but now posterior lamella reconstruction was beginning.

In 1869, JAQUES REVERDIN made his revolutionary contribution, demonstrating conclusively that small free skin grafts could continue to live without the need of a pedicle supply. (Reverdin, 1870). This heralded the expansion of reconstructive lid surgery, with the unhindered development of its own new techniques and its own character.

Professor LEFORT, in 1870, performed a free full-thickness skin graft for ectropion, which unfortunately was unsuccessful (LeFort, 1872), but this was later repeated successfully by WOLFE of Glasgow in 1875 (Wolfe, 1875), while OLLIER and THIERSCH reported the use of partial thickness dermo-epidermis grafts in relatively large sheets with success (Ollier, 1872; Thiersch, 1874). Skin grafting was to allow greater flexibility and freedom from large cumbersome flaps. With the progress of time, various sources of both full and partial thickness grafts have been utilized, including lid, inner arm, scrotal, prepuce and retroauricular areas.

Around the same time, GRADENIGO (1870) introduced the concept of lid sharing, utilizing the structures of one lid to rebuild the opposing lid. It was based on the premise that; skin shortage in the lid was best replaced by normal lid skin when available; tarsus best replaced by tarsus, and conjunctiva by available conjunctiva. This concept has been revived several times by several authors since.

Variations of Pedicle Flaps

Pedicle based flaps were still very popular, and variations continued to be described. In 1928, IMRE described a modified technique utilizing the methods of CELSUS and BUROW. (Imre, 1928). This involved a circular sliding flap of nearby skin with large areas of undermining plus triangular releasing incisions. So-called "*biological flaps*" or vascular pedicle flaps were pioneered by MONKS in 1898, when he dissected a flap around an artery. (Monks, 1898). In 1918, ESSER refined this technique, more effectively producing a large flap with only a small vascular pedicle base. This proved to be an advantage when moving tissue over a greater distance, as for example, with an eyebrow graft from the scalp hair, based on the superficial temporal artery. (Esser, 1918).

Reconstruction of the Posterior Lamella

A smooth, mucous membrane lid lining is important for continued ocular motility and ocular comfort, although several earlier attempts at lid reconstruction ignored this fact. A pedicle graft of conjunctiva was first used as lining (TEALE, 1860), then a free graft of buccal mucous membrane was successfully performed by STELLWAG VON CARION. (ILLING, 1874). Later came reports of vaginal mucosa, and even the mucosa from a prolapsed rectum being used. Pregrafting of mucous membrane onto skin that was later to be used for reconstruction was tried, but found to have no advantage. Full thickness and partial thickness skin has also been used as lining, unsuccessfully.

To add stability and improved cosmesis to the reconstructed lid and in particular the lid margin, tarsus or tarsal substitute is required. This aspect of lid reconstruction has taken the longest to develop. In 1902, BÜDINGER introduced the use of ear cartilage (Büdinger, 1902), then in 1918, von BLASKOVICS inserted a free graft of tarsus with attached conjunctiva from the upper lid into the ipsilateral lower lid (von Blaskovics, 1918). The most recent tarsal substitute has been a composite nasal mucochondral graft, described by MILLARD (1962) and used extensively by MUSTARDÉ for lower lid repair (Mustardé, 1980).

Lid Sharing Techniques

This has been mainly a 20th century improvement, and in its various evolved forms brings us up to the present techniques. The first reports did, however, originate from LANDOLT in 1881 when he employed upper lid splitting to repair a lower lid defect, but he was using the technique mainly for skin coverage and not for posterior lamella replacement. (Landolt, 1881). CIRINCIONE appeared to be the first, in 1901, to use the technique to provide a posterior lamella. (Cirincione, 1901). He split the upper lid transversely and pulled down the inner tarso-conjunctival apron "to provide the inner layer of a new lower lid. Skin was provided by a forehead pedicle flap". Likewise in 1927, DUPUY-DUTEMPS re-emphasized the use of the opposing posterior lamella. (Dupuy-Dutemps, 1927). In 1937, HUGHES reported his technique which was a modification on the above, using a transverse split through the grey line of the lid margin and bringing down a tarso-conjunctival flap for the lower lid, with the addition of an inferior skin advancement flap and a lash transplantation. (Hughes, 1937).

However this has mainly been abandoned for a modification of the technique, which, in point of fact, was fully described by KÖLLNER in 1911. In this a tarsoconjunctival flap is constructed, but leaves the upper lid margin and lash border untouched — a major advance in the preservation of the uninvolved, shared lid. (Köllner, 1911).

Full thickness lid-sharing has also been employed from the lower lid to the upper lid by MUSTARDÉ in total upper lid repair, (Mustardé, 1980), and also in the CUTLER-BEARD technique which advances lower lid tissue under an intact lower lid marginal bridge. (Cutler-Beard, 1955). Utilization of the contralateral lid, by the transfer of a free composite graft of skin, tarsal plate and conjunctiva, was described by ALSTON CALLAHAN (1951) and more recently by HÜBNER in a slightly modified form. (Hübner, 1981).

Other Developments

In more recent years, considerable interest has been generated in myocutaneous island flaps and subcutaneous island flaps, both of which are said to have universal application in the periorbital region.

Finally, for those defects where formal lid reconstruction is extremely difficult, for example in the medial canthal region, spontaneous repair by granulation — or the laissez-faire technique — has again found recent acceptance (MEHTA, 1981), having been formally described by FOX and BEARD in 1964, but was undoubtedly utilized for several centuries prior (Fox and Beard, 1964).

All present techniques have their origin in history, and it is history that continues to teach us. The way to gain the most value from history and especially such a historical review, is not to look at any specific method, but rather to look at the evolution of these methods, which will allow us to acquire a solid foundation of principles which will be applicable in formulating a successful solution to any lid reconstruction problem.

Summary

Although first mentioned in Western literature in the first century A.D., eyelid reconstruction, in its infancy, was actually hampered by prominent physicians of the time, with dogmatic teachings that delayed experimentation in techniques specifically applicable to lid repair. A boom in operative descriptions and successes, however, came in the early 19th century from Germany, France and Spain, from such great men as Dieffenbach, Fricke and de Argumosa; but it was not until 1869 when Reverdin successfully demonstrated free skin grafting, that reconstructive lid surgery took on a character of its own and developed unhindered. Refinement in delicate local pedicle and transposition flaps quickly followed. In the early 20th century the importance of reconstructing both the anterior and posterior lamellae was recognized more, thus causing several methods of posterior lamella replacement to evolve. The most recent major development has been the lid sharing techniques, which utilize a fellow normal lid in the reconstruction of the defective lid, in various ways. Historically one can trace the development of present procedures, but more importantly, one can observe the evolution of principles which act as guidelines in formulating any successful lid repair.

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