

RECONSTRUCTIVE SURGERY OF THE ORBIT*

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Three of the many problems of reconstructive surgery of the orbit, namely, congenital ptosis, lagophthalmos and tissue loss, will be discussed.

ANATOMY

Certain important points of the surgical anatomy of the eyelids must be emphasized. The function of the eyelids is the protection of the eye and this necessitates the ability to move the lids, particularly the upper lids which cover approximately three-quarters of the cornea. Movement also distributes the tears and assists in lacrimal drainage.

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Perfect co-aptation of the lid margin in gentle closure is necessary. The skin of the eyelid is the thinnest of the body and has no subcutaneous fat, but is subject to more movement than any other skin-area. The conjunctiva is adherent along the tarsal region, but becomes less so where it is reflected from the superior and inferior fornices onto the eyeball. The lid can easily be split into 2 layers along the 'grey line' which divides the anterior muscular layer of the skin from the posterior tarsoconjunctival one.

The upper eyelid, as mentioned, is responsible for almost 90% of the opening and closing movements. The chief function of the lower lid is support, and this is

accomplished by an active orbicularis oculi muscle, supported by a firmer tarsal plate than is present in the upper lid.

The blood supply is profuse, and the arteries anastomose to form arches near the lid margin. This excellent blood supply accounts for the rapid healing of lid wounds.

Lymph drainage from the medial part of the eye is towards the facial and submaxillary nodes, and that of the lateral half to the pre-auricular and upper cervical nodes.

CONGENITAL PTOSIS

Sarwar¹ mentions 14 different procedures with more than 30 modifications. Ferris Smith² mentions more than 70 different methods of treating ptosis. Basically the 2 main techniques are that of levator shortening^{3,4} and a suspension operation.

There is some difficulty in achieving the desired result, and this accounts for the many and varied techniques. The reason for the difficulty is that it is not possible to measure the strength or tone of the levator palpebrae muscle, and therefore the results are unpredictable. Furthermore, over-correction may produce harmful lagophthalmos.

Peet and Patterson⁵ mention the fact that a large number of cases referred to them have originally had a levator resection done without improvement, and that they have subsequently had to resort to a fascia lata sling. They state that they prefer to do this as a primary procedure. This particular method of suspension can also lead to unpredictable results, as one cannot measure the strength and tone of the occipitofrontalis muscle or the weight of the lid.

Mustarde⁶ states that he will attempt a levator resection once, and if there is no improvement of any sort after 6 months, he does a frontalis sling.

Stallard⁷ gets good results in 85% of cases with levator resection, but it takes some months to note any improvement. In view of the fact that a large number of the levator resections require a subsequent fascia lata suspension, I decided to do a combined procedure of levator resection and fascia lata suspension.

Technique

The levator resection is done by means of an external approach,⁸ on the principle of 3 mm. for every 1 mm. of ptosis. One usually has to resect approximately 8 mm. and more in order to gain any result. Rycroft, quoted by Mustarde,⁶ prefers to resect 4 mm. for every 1 mm. of ptosis.

Following the resection, the levator muscle is sutured to the upper anterior portion of the tarsus with 6/0 white silk sutures—3 sutures are usually required. The middle one is tied and cut short, and the others are left long. Following this, a section of fascia lata is removed from the right thigh and 2 strips are prepared of approximately 3 mm. in width and 5 cm. in length. Two small incisions are made just above the eyebrow, in line with the junction of the inner and middle third and lateral and middle third of the upper lid. The occipitofrontalis muscle is defined and a silk suture is inserted so that it can easily be elevated into the incision. The prepared fascia lata strips are threaded through the eyelid from the eyebrow incisions to

the tarsal plate. The fascia lata is sewn to the tarsal plate with the previously-inserted white silk sutures, which are then cut short. The upper end of fascia lata is sewn to the occipitofrontalis muscle with fine white silk. The fascia lata is sewn under normal tension, and under no circumstances is it tightened, so that it acts merely as a support to the lid and supplements the levator resection. Incisions are then closed. It will take some time before I can evaluate the results of this procedure, but thus far it has produced satisfactory results (Fig. 1).

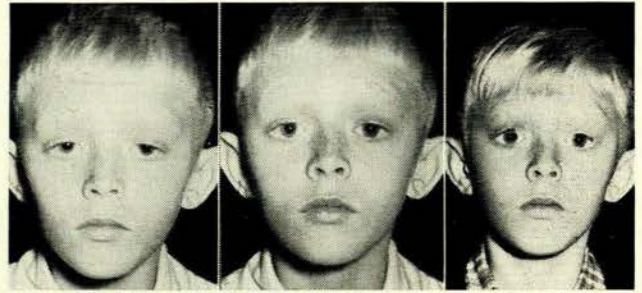


Fig. 1(a)

Fig. 1(b)

Fig. 1(c)

Fig. 1. (a) Bilateral ptosis—pre-operative. (b) Eyes wide open—pre-operative. (c) Eyes wide open—postoperative.

LAGOPHTHALMOS

A patient with lagophthalmos associated with the loss of an eye and damage to the lower lid following a gunshot wound during World War II, has had multiple procedures carried out by various surgeons.

His main complaint was that he could not close his eye properly, and that there was some difficulty in retaining the prosthesis. The lower lid was scarred, short and inactive. I first attempted to correct this by dividing the scar contracture, which caused the lid to open up to the extent of 2 cm., and the defect was then filled in with a postauricular Wolfe graft—this was not successful, although it did lengthen the lid. This was followed by a



Fig. 2(a)

Fig. 2(b)

Fig. 2. Lagophthalmos associated with artificial eye. (a) Pre-operative—eyes closed. (b) Postoperative view, showing result of a circumocular fascial sling activated by temporalis muscle.

lateral tarsorrhaphy, which also did not have the desired effect. I then carried out a procedure described by Andersen,⁵ who treated cases of lagophthalmos in leprosy patients and had excellent results. A circumocular fascial sling, activated by the temporalis muscle, was constructed. The result of the procedure was excellent. The patient could close his eyelid completely, and he had no difficulty in retaining the prosthesis. The ability to move his lids improved his appearance (Fig. 2).

According to Andersen⁵ there are 3 different methods of treating lagophthalmos:

1. Tarsorrhaphy is quick and simple. It is effective but leaves an unsightly result. Since a more reliable method is available, it should be considered as an emergency palliative.

2. A passive circumocular sling is a more complicated method. It is effective, but does not give complete closure of the eye on effort or during sleep. It has no advantage over the temporalis transfer.

3. The transfer of a sector of the temporalis muscle to activate a circumocular sling of its own attached fascia has several advantages. The fascia is in natural continuity with the muscle, and no sutures are needed to fix fascia to muscle. When the middle sector of the temporalis muscle is used, a comfortable dissection can be carried out giving a natural pull of the sling in a slightly upward direction. The lower eyelid is pulled against the bulb of the eye, giving good apposition of the lacrimal punctum. Insertion of the circumocular sling deep to the palpebral ligament gives a natural contour to the nasal canthus. A similar procedure was first described by Sir Harold Gillies.⁹

THE REPAIR OF TISSUE LOSS

Because methods of repair are similar, tissue loss due to congenital conditions, trauma and excisional surgery can be discussed under one heading. The various techniques of reconstruction have been adequately dealt with in the literature,¹⁰⁻¹⁷ particularly by ophthalmic and plastic surgeons. I will therefore enumerate principles rather than details.

Generally, the restoration of function of eyelids is more important than appearance, though appearance must be taken into consideration. The eye must be able to close completely to protect the eyeball. Ectropion, entropion and trichiasis must be avoided. Ideally, it is better to reconstruct with contiguous eyelid tissue, but this is not always possible. Repair is then done with thin skin, such as various types of free grafts or flaps.

When an eyeball is present it must always be covered by conjunctiva; if this is not possible, the next best substitute is mucosal lining from the buccal or nasal mucosa.

The palpebral edge must be restored in continuity, and its structures must be made to match without irregularity or notching.

Methods of Repair

The general principles of plastic surgery are applicable in the treatment of tissue loss. The following procedures may be mentioned.

1. Local flaps; advancement; transposition; rotation; Z-plasty; double transposition; and graft-lined flap.

2. Free grafts. *Thiersch grafts* from the inner aspect of the arm, or other sites if suitable, are used mainly for repair of upper lids or for lower lids if the loss is extensive. *Wolfe grafts*, from the postauricular or supraclavicular regions, are used mainly for repair of the lower lids and canthal region. Wolfe grafts from the upper lid would be most suitable for repair, but unfortunately the amount available is limited, as removal may result in ectropion of the upper lid. In the older patient such a graft cut as a strong narrow strip can be used, but is tedious to insert. *Mucous membrane grafts* for conjunctival losses are taken from the buccal mucosa and nasal mucosa.

3. Pedicle flaps from a distance are rarely used in reconstructive surgery around the eyelid, due to their excessive bulk.

For convenience of discussion, tissue loss may be divided into superficial, deep and full-thickness loss.

Superficial Skin Loss

This occurs following trauma, but more frequently following excision for pathological lesions.

At the time of the initial trauma, any skin loss must be corrected in order to prevent ectropion, and in such cases I prefer to do a primary repair by a Thiersch graft, in order to allow the lids to close. This graft can either be left if it proves to be satisfactory, or if necessary it can be replaced by a Wolfe graft.

Scars

As a result of interference with function of the lids or because of their unsightly appearance, scars may have to be removed. If possible they should be left for a considerable time in order to allow them to soften, which takes several months.

The only indication for early operation is inability to close the eyelids, with exposure of the eyeball. The scar excision is done on general principles. All scar tissue should be completely removed and the original defect recreated. Following this, the amount of skin loss is estimated and it can be repaired by one of the techniques mentioned above. In a large number of these cases Wolfe grafts are indicated.

Scar bands can be corrected by the Z-plasty principle. This will eliminate any contracture.

Deep burns which cause extensive cicatricial ectropion are repaired by division of all scar tissue, and defects are covered by a free graft. Thiersch grafts are mainly used for the upper lid and Wolfe grafts for the lower lid, but if the loss is extensive, Thiersch grafts are indicated for both lids. All the scar tissue must be completely divided well beyond both medial and lateral canthi, and all deep scar tissue must be divided until the particular lid can be freely elevated over its opposite member. If all four lids are burnt, it is better to repair both upper lids first, as it is usually not possible to replace skin adequately if both upper and lower lids are done at the same time.

Following the division of the scar contracture, the maximum amount of Thiersch graft is inserted on a stent mould. Owing to graft contracture, the procedure may have to be repeated. For minor deep burns of the lower lid a Wolfe graft may suffice.

TUMOURS

Skin tumours are more common in the lower eyelids. During the 10 years 1956 - 1966, 866 cutaneous tumours of the head and neck were excised at the Department of Plastic Surgery at Wentworth Hospital, and, of these, 105 were confined to the eyelids. Of these, 69 were basal cell carcinomas and 4 were squamous cell carcinomas. The majority of them were confined to the region of the lower eyelid and the inner canthus. This distribution is almost similar to that quoted by Shulman¹⁸ and by Hayes.¹⁹

Cutaneous tumours must be adequately excised. The first opportunity to excise such lesions is the most important one. The lesion must be clearly outlined at least 5 cm. beyond its border, and in some cases even further.

In order to do this properly, the lids may be elevated by fine skin-hooks placed on the tarsal edge, which allow the lids to be stretched so that the lesion can be clearly defined and the excisional area marked out.

In general, superficial skin loss is repaired, if possible, by a local flap, but this can only be done if the area is small. Larger defects and those following excision of pathological lesions can easily be repaired by using free grafts, particularly Wolfe grafts for the lower eyelid and Thiersch grafts for the upper lid.

Skin loss in the upper eyelid is not as common as that in the lower lid, and can usually be repaired by some type of local flap-adjustment, due to the fact that the skin is more freely available and looser. The so-called Tripier or bipediced flap from the upper lid, which has sometimes been used in the reconstruction of defects of the lower lid, is usually not suitable, as the amount available is limited. It tends to roll into a tube and might require more than one procedure for final correction.

DEEP LOSS

This mainly occurs following excision of pathological lesions that have invaded structures such as muscle, orbital septum, periosteum and bone. It is apt to occur in the region of the inner canthus. It may also be due to trauma, but this is not common.

In such cases, local tissue is rarely available and free grafts cannot be used. Flap-cover is required and this can



Fig. 3(a)

Fig. 3(b)

Fig. 3. (a) Rodent ulcer, inner canthus. (b) Postoperative—glabellar flap.

be done by the glabella or mid-forehead flap, temporal and supra-orbital flaps, or a rotation advancement flap from the cheek and zygomatic regions (Fig. 3).

Full-thickness loss occurs in congenital conditions and trauma but more often following excision of pathological lesions.

Division of the palpebral margin, with or without loss of tissue, can be repaired either by Wheeler's halving technique²⁰ or, more simply, by a 3-layer suture using a continuous monofilament nylon thread for the conjunctiva, a silk suture across the 'grey line' and silk sutures for skin. Small losses in the palpebral margin of quarter of its length can usually be closed directly. If a third of the palpebral margin is lost, relaxation of the lid can be obtained by a lateral canthotomy and division of the lower limb of the lateral palpebral ligament. For losses of between a third and half of the margin, this same excision is advanced laterally and is assisted by a rotation advancement flap from the cheek and zygomatic regions.

For more extensive lesions I have used a modified Hughes technique,²¹ i.e. using a tarsoconjunctival lining from the upper lid, and covering the subsequent defect with a Wolfe graft (Fig. 4).



Fig. 4(a)

Fig. 4(b)

Fig. 4(c)

Fig. 4. (a) Squamous cell carcinoma, lower eyelid. (b) Intermediate stage, showing Wolfe graft on tarsoconjunctival flap of upper lid after full-thickness excision. (c) Postoperative—modified Hughes procedure.

When preparing the tarsoconjunctival flap, it is preferable to start the incision 3 mm. above the palpebral margin, so as not to damage this part of the upper lid. Using a Wolfe graft for external cover is preferable to a local flap from the cheek which may drag down the lower lid. Bipediced Tripier flaps in the upper lid have been used for external cover, but this may cause skin shortage in the lid. This particular type of flap is also limited in amount and does tend to roll and to form a tube, so that it is not very satisfactory. Temporal and supra-orbital flaps have been used, but again they are not as satisfactory as a Wolfe graft. The Hughes²¹ procedure has been criticized because it does involve using the important upper lid for reconstruction of the relatively unimportant lower lid, and this may result in ectropion, entropion and trichiasis. The use of a Wolfe graft for cover, rather than a flap of upper-eyelid skin, will prevent some of these complications. The adequate mobilization of the tarsoconjunctival layer and, in addition, non-interference with the palpebral margin, will also help to prevent some of these possible complications.

Manchester²⁰ described an excellent method for repair of loss of lid margin. This was done by mobilizing the conjunctiva from the lower fornix to provide lining, and it was covered by a bipediced Tripier flap from the upper lid. This required further operations for trimming of the skin flaps. His results appear to be very satisfactory.

I carried out a similar procedure, which I have not seen described before, for a patient with marginal excision of a BCC. The repair was done by mobilizing the remainder of the conjunctiva in the lower fornix. This was then sutured to the tarsoconjunctival portion of the upper lid after dividing it along the 'grey line'. The resultant superficial defect was then covered by a postauricular Wolfe graft, the upper border of which was sutured to the anterior portion of the upper lid. After 6 weeks this temporary tarsorrhaphy was divided. The result and the appearance were satisfactory. There was no shortness of the reconstructed lid, and the reconstructed portion was level with the remainder of the lid.

For the reconstruction of the upper eyelid, the method described by Cutler and Beard²¹ which, in principle, is a type of Hughes procedure, appears to be very satisfactory, although I have not used it.

EXENTERATION

Mustarde⁶ has simplified lid reconstruction and states that the lower lid should be used to reconstruct the upper, but other tissues are used to reconstruct the lower. Summarized, his methods are as follows:

1. Loss of $\frac{1}{4}$ lower lid can be closed directly.
2. Loss of $\frac{1}{4}$ - $\frac{1}{2}$ can be closed directly after lateral canthotomy and division of the lower palpebral ligament.
3. Loss of $\frac{1}{4}$ up to $\frac{1}{2}$ can be closed directly, using the above technique with an advancement rotation flap from the cheek as cover.
4. Subtotal loss of more than $\frac{1}{2}$, and total loss, of the lower lid are repaired by using a nasal chondromucosal graft for lining, and external cover is achieved by a rotation-advancement, zygomatic cheek-flap.
5. For loss of lid in the horizontal direction, he prefers a method described by Manchester, that is, using conjunctiva from the lower fornix as lining, and cover provided by a bipediced eyelid flap.
6. Loss of $\frac{1}{4}$ of the upper eyelid is closed directly.
7. For loss of $\frac{1}{4}$ - $\frac{1}{2}$, a $\frac{1}{4}$ of the lower lid is transferred to the upper-lid defect, and the lower lid is closed directly; and $\frac{1}{2}$ of the lower lid is used for loss of $\frac{1}{2}$ - $\frac{3}{4}$.

8. For subtotal and total loss, $\frac{3}{4}$ of the lower lid is transferred and the lower lid is reconstructed by a zygomatic flap lined with nasal-mucosa cartilage.

Following exenteration of the orbital contents, a Thiersch graft can be applied directly,²² and the result is good, as this is one of the only parts in the body where a skin graft will take on bare bone. The deformity can be camouflaged by a special orbital prosthesis (Fig. 5).

EYEBROWS

In orbital surgery the eyebrows should never be shaved, as they are important landmarks. Minor displacement of eyebrows can be corrected by a Z-plasty procedure.

Loss of eyebrows is corrected either by a free hair-bearing graft or by a transposed flap from the scalp, using either the island-flap technique²³ or a temporal flap. The latter may be combined with a forehead flap, if there has been loss of tissue above the eyebrows. Each of these techniques has its advantages and disadvantages.

SUMMARY

Some aspects of reconstructive surgery of the orbit are discussed. The method of treating congenital ptosis by a combined method of levator shortening and fascia lata slings, used as a support, is presented.

A problem of a patient with lagophthalmos associated with an artificial eye is described, showing the use of an activated temporalis muscle circumocular fascia sling in rehabilitating this particular patient.

The principal methods of reconstruction of skin loss of the eyelid and full-thickness eyelid loss are discussed. Each case must be treated on its merits and the surgeon must be familiar with all types of plastic repair, so that he can apply the method most suitable for the particular patient.

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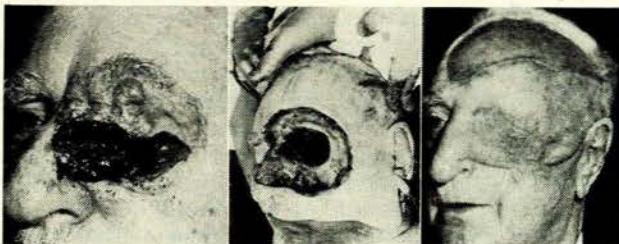


Fig. 5(a)

Fig. 5(b)

Fig. 5(c)

Fig. 5. (a) Rodent ulcer involving lids, eyeball and surrounding structures. (b) Following excision and exenteration of eyeball. (c) Defect covered by forehead flap. Post-operative cobalt therapy instituted.