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Pretarsal Fixation of Gold Weights in Facial Nerve Palsy

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Implantation of a gold weight in the pretarsal space was performed on 17 patients with poor eyelid closure secondary to facial nerve weakness. Successful results were obtained in 14 (82%) of 17 patients. Postmortem histopathology of such a case demonstrated firm fibrous encapsulation of the weight. Although some authors advocate fixation of lid weights to the orbital septum, fixation in the pretarsal space is preferred for the following reasons: (a) "cheesewiring" is less likely to occur, (b) a limited levator recession may be more easily performed, (c) greater mechanical benefits are obtained, and (d) the potential for inferior migration is less.

Key Words: Acoustic neuroma-Facial nerve palsy-Gold weight-Lagophthalmos-Lid loading-Seventh nerve palsy.

Function of the facial nerve may be lost on a temporary or permanent basis due to a variety of causes including tumor, trauma, infection, surgery, and idiopathic (including Bell's palsy). Ophthalmologists are often called on to manage problems such as lacrimal hyposecretion, brow ptosis, lagophthalmos, lid retraction, paralytic ectropion, and exposure keratopathy in these patients.

Various measures are available for treatment depending upon the nature and severity of the problem. Lagophthalmos may result in a medically unresponsive exposure keratopathy and require surgical correction. A lateral tarsal strip procedure may be done (l), but additional measures are usually necessary. Tarsorraphy is commonly performed; however, this limits visual field and may obscure the visual axis (2). The implantation of various different devices has been used in order to provide a more dynamic cure than that provided by tarsorraphy. Sheehan described the use of a tantalum wire and mesh implant in the upper lid (3). Fourteen years later, Morel-Fatio and Lalardrie reported on the use of a palpebral spring placed in the upper lid; this may be particularly useful in patients with severe impairment of eyelid closure (2,4). Use of an encircling silicone rod is another approach that may be beneficial in some patients (5). Techniques such as direct facial nerve repair, autogenous nerve grafting, cross-face nerve grafting, and nerve crossovers (especially utilizing the hypoglossal nerve) may be employed. Muscle transfers, free muscle grafts, and suspension with fascia lata, tendon, or alloplastic materials help provide bulk and support to the paralytic face (6).

The implantation of a gold weight to allow for gravity-assisted closure of the upper lid was first described by Smellie (7). Others have subsequently reported on their experience with gold weight implantation (2,8-14). Many of these authors believe the weight should be attached to the orbital septum

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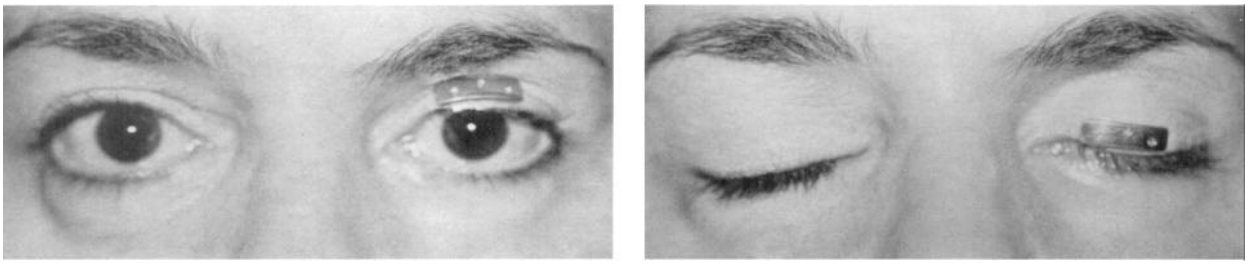

FIG. 1. Preoperative determination of appropriate weight. The correct weight places the upper lid 2 mm below the superior limbus with the eye open (a), and allows for passive closure (b).

(2,9,12,13). We describe our technique of implantation and attachment of the gold weight in the pretarsal space combined with limited levator recession, and report the results we have obtained in a series of patients. Histopathology is available for one case.

PATIENTS AND METHODS

The records of the surgical practices of two of us (S.R.S. and J.H.S.) were reviewed to identify patients who had undergone implantation of a gold weight. Seventeen patients were identified, each of whom required gold weight implantation because of ophthalmologic complications of facial nerve palsy.

The indications for surgery were essentially those outlined by Levine (15). Patients were strongly considered for gold weight loading if facial paralysis was likely to be longstanding and if keratopathy and/or marked irritation was present despite intensive medical measures or previous surgery. Surgery was more likely to be performed if decreased tear production, loss of cornea1 sensation, and/or poor Bell's phenomenon were present.

The gold weights are fabricated from 99.99% pure gold and are curved to fit the shape of the upper lid. The dimensions are approximately 10 mm length, 5 mm height, and 1 mm thickness. Two or three 1 mm holes are spaced across the length of the weight to allow for suture fixation. Weights are available in 0.2 g increments varying between 0.6 and 1.6 g.

The appropriate weight was selected for each patient preoperatively. By taping the different weights to the outside of the lid in the area overlying the tarsus, the correct weight for a given patient could be selected by a trial and error basis. The desired weight placed the upper lid 2 mm below the superior limbus with the eye open, and allowed the lid to close passively with the patient in the sitting position (Fig. 1). A slight overcorrection is desirable since the levator muscle appears to strengthen postoperatively.

The surgical technique is as, follows: Local anesthesia is achieved with the use of topical 0.5% proparacaine hydrochloride and subcutaneous injection of 1.5 cc of 2% lidocaine with l:l00,000 epinephrine into the upper lid. The lid crease is marked. A 4-O black silk suture is placed near the upper lid margin to allow for downward traction. A blade is used to incise at the lid crease through skin and orbicularis. Scissors dissection is performed inferiorly to the pretarsal space. The levator aponeurosis is stripped from its attachments to tarsus in the area of planned implantation, thus baring the anterior tarsal surface and effecting a modest levator recession. Hemostasis is achieved. The previously selected gold weight (which has been thoroughly cleansed and sterilized) is centered over the bare tarsal surface, and sutured directly to the tarsus with three interrupted 5-O polyester sutures (Fig. 2). Antibiotic solution is irrigated into the

FIG. 2. The gold weight is centered over the bare tarsal surface and sutured directly to the tarsus.

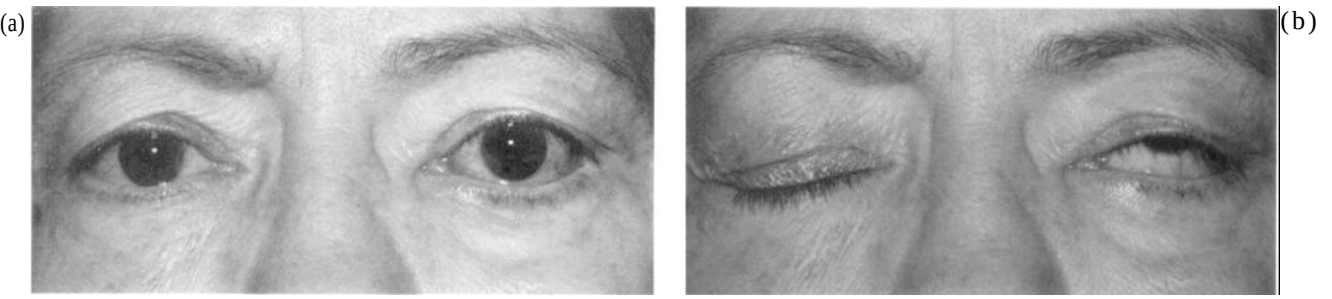

FIG. 3. A 62-year-old woman with left facial palsy due to herpes zoster oticus. Preoperative appearance with eyes open (a) and with attempted closure (b).

wound. Orbicularis is closed over the implant with interrupted 6-O polyglactin sutures. The traction suture is removed, and the skin is closed with a running 6-O silk or nylon suture. Antibiotic ointment is placed over the wound and a double eye pad is applied.

RESULTS

Five men and 12 women underwent gold lid load implantation with limited levator recession. The procedure was unilateral in all cases. The mean age at time of surgery was 54 years (range of 29-85 years). The time interval between the onset of facial nerve palsy and the eventual implantation of a gold weight averaged 99 months (range of 1 month-77 years).

The etiology of facial nerve palsy was cerebellopontine angle tumor in 11 patients (65%), idiopathic (Bell's palsy) in 2 patients (12%), and congenital, trauma, *Pseudomonas* otitis, and herpes zoster oticus in 1 patient each (6% each). Acoustic neuromas accounted for 10 of the 11 cerebellopontine angle tumors ; the nature of 1 of the 11 tumors was not specified.- Ten of the 11 patients with tumors presented to the ophthalmologist following resection of the tumor; 1 patient was initially referred as a case of Bell's palsy, but an acoustic neuroma was eventually found and resected.

As part of the surgical rehabilitation plan, seven patients underwent lateral tarsal strip procedures either before or simultaneous with gold weight implantation. Three patients had previously undergone implantation of an encircling silicone rod (two of whom also had tarsorraphy performed), but because of persistent problems, gold weight implantation was done. In another patient, a previous attempt at cross-face nerve grafting with muscle transposition had been unsuccessful.

The lid loads used varied between 0.8 and 1.6 g. The most commonly used weights were 1.2 g (six patients) and 1.4 g (five patients).

The mean duration of follow-up from the time of lid load implantation was 17 months (range of l-60 months).

We defined a successful postoperative result as one in which good lid closure and elevation were present, cornea1 staining was absent or significantly reduced from the preoperative state on decreased medication, and the patient was comfortable (Figs. 3 and 4). Fourteen patients (82%) were successes by these criteria. Three patients (18%) were considered failures. In two patients, the weight had to be removed because of lid swelling and erythema. The

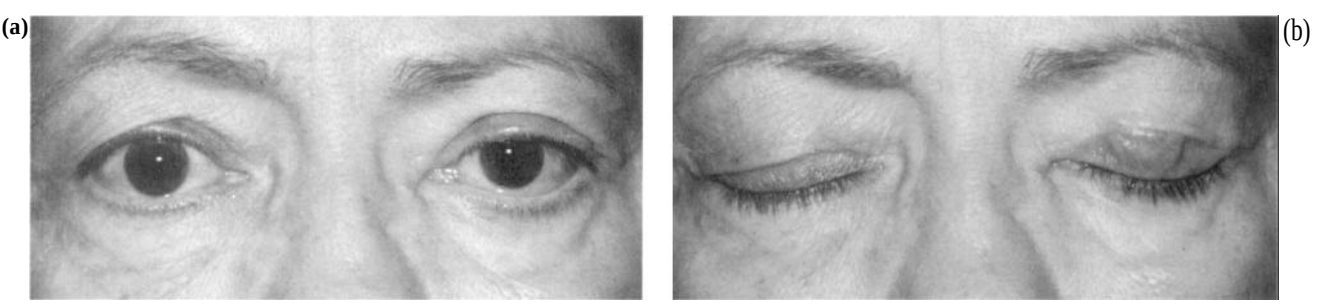

FIG. 4. Postoperative appearance of the same patient with eyes open (a) and closed (b).

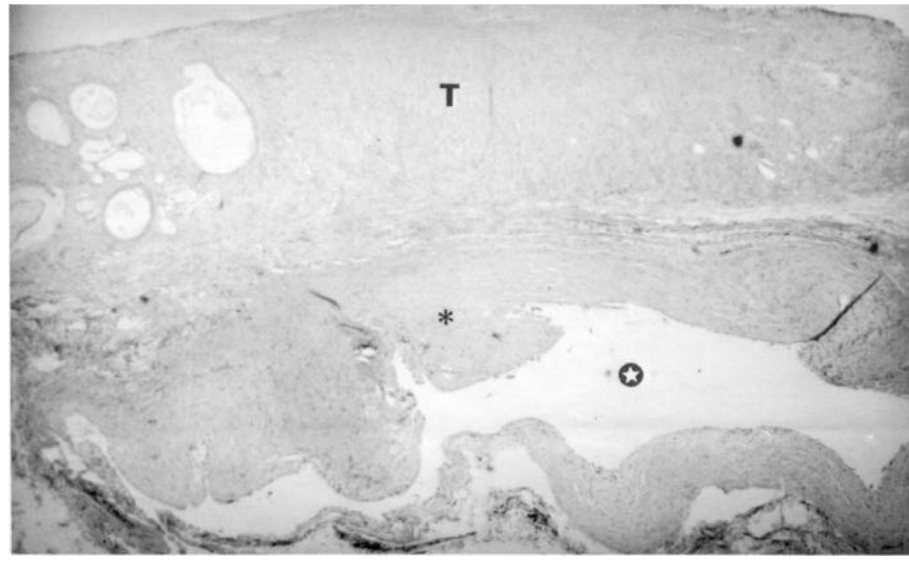

FIG. 5. A dense layer of fibrous tissue (asterisk) surrounds the space where the gold implant had been previously placed (star). T, tarsus.

third patient had persistent corneal staining despite use of the lid load and eventually required additional tarsorraphy.

Special mention should be made of two patients who were considered successes. In one case, there was good closure postoperatively and the patient was comfortable, but ptosis was noted about 3 months following gold weight implantation. This was thought to be due to partial return of facial nerve function plus the effect of the lid load. The gold weight was removed and ptosis repair was subsequently carried out. Another patient initially underwent implantation of a 1.6 g weight; however, wound closure was modified from that described above. In this case, supratarsal fixation of the levator aponeurosis to the skin was included in an effort to form a defined lid crease. The gold weight began to extrude 2 months later and was removed. One month later, a 1.4 g weight was implanted with routine skin closure without supratarsal fixation. The patient has done well since the second operation. No other cases of extrusion occurred in this series.

Histopathology was obtained from an 8 l-year-old man who underwent gold lid loading for facial nerve palsy caused by *Pseudomonas* otitis. The postoperative result was good with excellent lid closure and a clear cornea with minimal or no staining. Four months after the lid surgery, the patient died from a myocardial infarction and permission for autopsy was granted.

Histopathologic examination revealed a dense layer of fibrous tissue surrounding the area in the pretarsal space where the gold implant had been placed (Fig. 5). A few lymphocytes and epithelioid cells were seen in the region of the fibrous tissue. No foreign body giant cells were present.

DISCUSSION

Tarsorraphy has been traditionally used when exposure keratopathy develops in patients with facial nerve palsy, but besides limiting vision, the procedure may lead to an unappealing cosmetic defect. Following release of a tarsorraphy, problems such as lid notching or entropion may occur (2).

Lid loading operations may be very effective in patients with weakness of the facial nerve. Gold has been used more commonly than other materials because of superior color match as seen through skin combined with minimal tissue reactivity (7). The surgical technique of lid loading is relatively simple, and by selecting the correct weight for loading, the eyelids will open and close well on volition. Though dependent upon gravity for its effect, closure in the supine position (e.g., during sleep) is possible if the head is slightly elevated (13). If facial nerve function returns or complications associated with the lid weight develop, the weight may be easily removed.

Different authors have described various locations in which the lid load may be implanted. Smellie indicated placement of the weight subcutaneously in the lower part of the lid without mentioning whether dissection was superficial or deep

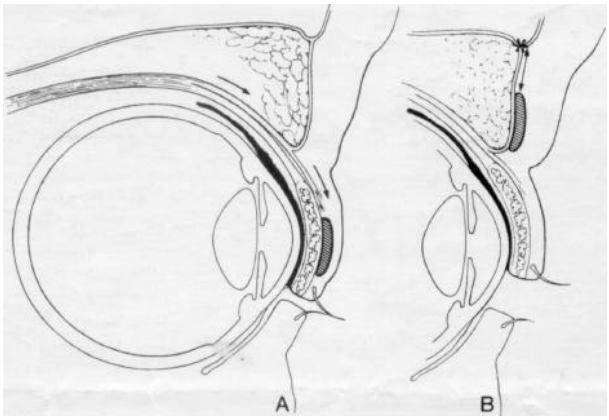

FIG. 6. With pretarsal fixation of the implant (A), the effect of the weight is transmitted directly to the mobile lid. With the implant in this position, the globe does not provide any support for the weight and therefore the effect on lid depression is maximized. With septal fixation (B), the effect of the weight is transmitted primarily to the fixed arcus marginalis (asterisk) rather than to the mobile lid. Also, the globe is able to support part of the load when placed in this position.

to the orbicularis (7). Though placement of the load in the pretarsal space has been described (8,14), attachment to the orbital septum is the approach reported most frequently in the U.S. literature (2,9,12,13). The package insert that accompanies the gold weights also suggests attachment to the septum.

We believe there are several advantages to our technique of implantation and fixation of the implant in the pretarsal space. In pretarsal fixation, the weight is fixed to a dense connective tissue plate. This is theoretically superior to septal fixation in which "cheesewiring" of sutures through thin tissue could take place. Also, in exposing the pretarsal space, attachments of the levator aponeurosis to the tarsus in the area of planned insertion are intentionally released in the manner of a levator recession. This is helpful in lessening upper lid retraction in these patients.

Placement of the load in the pretarsal space instead of the tissue overlying the orbital septum provides mechanical benefits as well (Fig. 6). When attached to the orbital septum, the effect of the weight is transmitted primarily to the origin of the septum at the fixed arcus marginalis. Thus, much of the force needed for eyelid closure is lost with the weight in this position. Positioning the weight in the pretarsal space enables full transmission of the loading to the eyelid. Further, attachment of the weight higher in the lid (on the septum) allows the globe to support part of the load. This also reduces the effect of the load on the eyelid. In theory, the potential for migration of the implant inferiorly is lessened by placement in the pretarsal space since the lid margin provides a natural barrier to downward migration. No such immediate barrier to inferior migration is present when the weight is attached to the septum.

Histopathologic findings in lid loading have not been reported previously. The histopathology in our case showed that the weight became well encapsulated in a relatively brief period of time and incited a fairly mild inflammatory reaction. This suggests that these weights might be well tolerated for long durations in this position.

We do believe that the mass of the weight is more visible when placed in the pretarsal space as opposed to when placed on the septum. However, the cosmetic result has been acceptable to our patients and they have not in general been bothered by the postoperative appearance. One patient who is a functional success is somewhat disturbed by the presence of a lid bulge, however.

Our results with this technique were encouraging in this series. Fourteen patients were successfully treated by gold lid loading. Gold weight implantation with limited levator recession was beneficial either as an isolated procedure or in combination with a lateral tarsal strip as part of a surgical rehabilitation plan. Also, the lid loads could be used in patients who had undergone previous unsuccessful surgical attempts at correction of the problems associated with facial nerve palsy.

On the basis of our experience, we encourage the use of gold weight implantation in the pretarsal space combined with limited levator recession in selected patients with facial nerve weakness.

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