Long-Term Results for the Use of Gold Eyelid Load Weights in the Management of Facial Paralysis

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Background: The placement of gold eyelid load weights to improve passive upper eyelid animation is integral to the management of patients with facial palsy, particularly for patients with long-term paralysis.
Methods: In a retrospective cohort review, outcomes after placement of 104 gold weights in 94 eyelids implanted by one surgeon from 1986 to 2000 were evaluated. The primary outcome measures were improvement in corneal exposure and visual acuity. Secondary outcome measures included time to removal and rates of adverse effects and complications.
Results: Mean time of follow-up was 43.37 ± 41.40 months (range, 1 to 53 months). Visual acuity and corneal compensation improved after weight placement ($p = 0.0001$), while the necessary daily ocular care decreased. Overall, 91 (97 percent) of the 94 first-time weights implanted were successful in providing improved protection for the patient's eye and decreasing the daily care needs. Eleven weights (10.6 percent) became exposed and were removed. Kaplan-Meier survival curve analysis predicted a 3 percent exposure rate at 12 months, 5 percent at 24 months, and 10 percent at 5 years, which increased to 35 percent at 153 months. When needed, replacement weights were equally effective in maintaining ocular health.
Conclusions: This study demonstrates that gold eyelid load weights help preserve vision and improve corneal compensation, while minimizing ocular nursing care. The complications are few, but after approximately 5 years, the incidence of weight exposure increases to approximately 10 percent. The exposure rate continues to increase with longer follow-up intervals. Extruded weights can be replaced multiple times with the expectation that they will continue to provide a good result. (*Plast. Reconstr. Surg.* 125: 142, 2010.)

Patients with facial paralysis may experience severe limitations. They may have difficulty with speech and eating, and may experience drooling. Furthermore, these patients may have significant ophthalmic complications from the loss of the blink reflex, upper and lower eyelid retraction, and lagophthalmos. The absence of orbicularis tone also causes a loss of the corneal "squeegee" effect and predisposes the patient to dry eye symptoms and corneal exposure.[1] The goals of therapy are to limit ocular exposure and to restore blink response to protect the eye and improve the patient's appearance.

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Many procedures have been described in the literature that are directed at rehabilitating the patient with facial palsy. To aid the systematic management of patients with facial paralysis, a staged approach has been developed by the senior author (S.R.S.) over the past 20 years.[2–8] In this algorithm, supportive ocular care is provided in stage 1, while stage 2 includes planning for general facial reanimation. In stage 3, the lower eyelid and canthi are supported or resuspended. Stage 4 addresses passive upper eyelid animation, typically through the use of eyelid load weights. Dynamic eyelid animation is undertaken in stage 5, and stage 6 includes soft-tissue repositioning. In addition, an "epi-

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logue" focuses on the management of synkinetic movements due to aberrant regeneration and hypertonicity, which often accompany recovery of facial nerve function.

The placement of gold eyelid load weights (stage 4) to improve passive upper eyelid closure is integral to this staged approach, particularly in the management of patients with long-term paralysis (Figs. 1 and 2). The aim of this study was to evaluate the long-term outcomes of using gold eyelid load weights as a method for passive upper eyelid animation in patients with facial paralysis.

PATIENTS AND METHODS

Between 1986 and 2000, 104 weights were placed in 91 patients. Three patients had weights placed in each upper lid. When needed, patients had weights replaced. Patients with at least 1 month of follow-up were included. The study was granted Committee on Human Research exempt status. None of the authors has a financial interest in any of the products, devices, or drugs mentioned in this article.

Preoperative Management and Surgical Technique

Patients were offered placement of eyelid weights if they had an expected long recovery period for their facial palsy; ineffective management of corneal exposure with drops, ointment, and moisture chamber; or an inability to perform the necessary care to maintain corneal compensation.

All weights were placed using a technique similar to that previously described.[9] The weights were fabricated of 1 × 4.5-mm bars of 99.99% gold in sizes of 0.6 to 1.6 g (Meddev Corporation, Palo Alto, Calif.). Shaped to conform to the shape of the lid, the weights have three 1-mm fixation holes. Initially, the corners of the weights were fairly square, but the company rounded the edges over the years with the belief that this decreased exposures of the weights.[10]

Fig. 1. Eyelid closure before placement of gold weight.

Fig. 2. Eyelid closure after placement of gold weight.

Preoperatively, the proper weight size was determined by temporarily fixing the weight to the eyelid with double-stick tape. The weight selected for implantation was 0.2 g heavier than the weight that just allowed lid closure. This weight was cleaned with alcohol and sterilized.

At surgery, the incision was marked at the lid crease (Fig. 3, *above*) and made with a no. 15 scalpel blade. Dissection was carried down through the orbicularis muscle to the superior tarsal surface. A pocket slightly larger than the weight was dissected just medial to the center of the lid inferiorly. The weight was attached to the tarsal surface with 5-0 polyglycolic acid sutures through the two lower fixation holes at a level just above the lashes. The superior suture was appropriately placed to secure the weight through the upper hole (Fig. 3, *below*). Care was taken to tighten the sutures without causing tarsal buckling. In 1996, the technique was modified by moving the weight superiorly to align the upper hole with the superior tarsal edge, which was done to minimize the appearance of the weight with the eyes open.

The wound was then irrigated with bacitracin solution. The eyelid crease wound was closed in two layers: orbicularis first with 6-0 chromic suture, followed by 6-0 silk for the skin. The eye was patched overnight. Antibiotic ointment was applied to the wound each night for 2 weeks. Sutures were removed at 5 to 7 days.

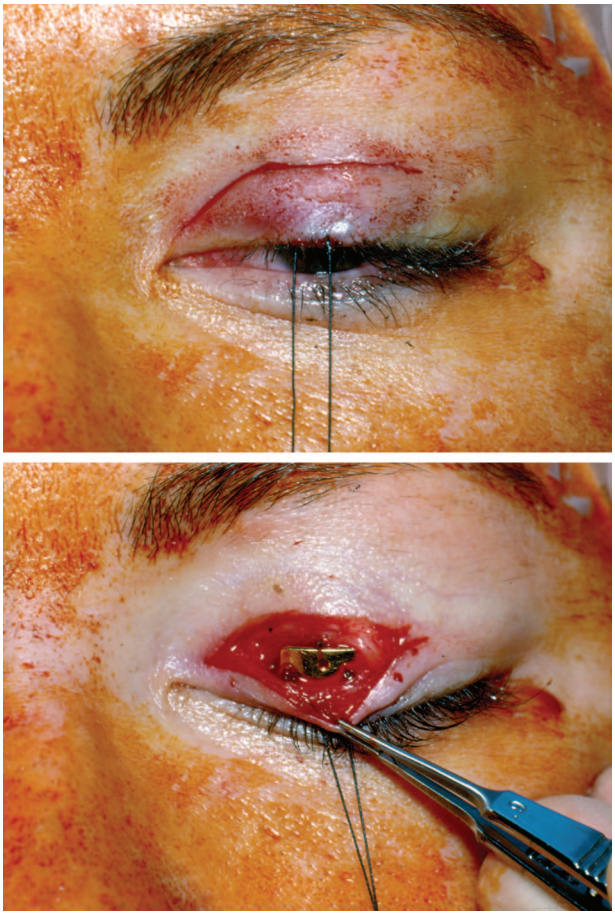

Fig. 3. (*Above*) Eyelid crease incision for placement of gold weight. (*Below*) The gold weight is sutured into position on the anterior tarsal surface.

Table 1. Additional Procedures by Stage

Stage and Procedure	No. of Patients
Stage 1	
Tarsorrhaphy	16*
External weight	9
Stage 2	
Serratus muscle transfer	1
Facial nerve graft	6
XII–VII anastomosis	6
Facial suspension	7
Stage 3	
Canthoplasty	37
Sub–orbicularis oculi fat lift	3
Sub–orbicularis oculi fat lift with hard palate graft	5
Temporalis muscle transfer	4
Temporalis fascia sling to lower lid	1
Stage 5	
Palpebral spring	3†
Stage 6	
Eyebrow lift	3
Upper lid skin excision (blepharoplasty)	1

*Nine patients had tarsorrhaphies placed prior to evaluation in this practice.
†Weights were placed after spring failure in these patients.

Additional Procedures

All patients in this series were managed with the staged approach discussed above (Table 1). In stage 1 (supportive care), nine patients had used an external weight before undergoing implantation. Despite the general goal of avoiding tarsorrhaphy, 16 patients had a tarsorrhaphy placed at some point during their care. The majority of these had been performed before presentation to us and were ultimately opened. Twenty-one patients underwent a general facial reanimation procedure (stage 2). These procedures included serratus muscle transfer, facial nerve grafts, XII to VII nerve anastomoses, and facial suspensions. In stage 3, 37 patients underwent canthoplasties, three had sub–orbicularis oculi fat lifts alone, while five had sub–orbicularis oculi fat lift combined with a hard palate graft to the posterior lamella of the lower lid. Four patients had temporalis muscle transfers, and one patient had a temporalis fascia sling placed in the lower lid. Three patients had palpebral springs removed before weight placement. Endoscopic brow lifts were performed in three patients, and one patient underwent excision of upper lid skin over the weight. In general, this was not an ideal procedure, as it tended to make the weight more visible and potentially increased the risk of extrusion.

Data Collection

Information was collected on each patient, including sex, date of birth, date, and age at onset of facial palsy, cause of palsy, and the affected side. The severity of the palsy, graded according to the House scale,[11,12] was recorded (Table 2), as were any other cranial nerve pareses. Snellen visual acuity and refraction before weight placement were recorded as well as postoperative refraction when available. This was converted to a linear scale for analysis. Eyelid closure was recorded on the basis of persistent lagophthalmos with a normal closure effort. Corneal exposure was rated on a scale modified from Kartush (Table 3).[13] Frequency of use of artificial teardrops, ointment, and/or moisture chambers were also recorded. Rehabilitation procedures done before weight placement were noted.

The time in months from the onset of the palsy or removal of the prior weight was recorded. Patient age at the time of weight placement was recorded. Indications for surgery, size of the weight, and any concurrent procedures done were

Table 2. House Grading Scale for Facial Paralysis and Frequency (Total *n* = 104)

Grade	Facial Paralysis
Grade 1	Normal ($n = 0$)
Grade 2	Slight weakness noticeable only on close inspection ($n = 0$) Complete eye closure Synkinesis barely noticeable
Grade 3	Obvious weakness but not disfiguring ($n = 4$) Complete eye closure Synkinesis, spasm obvious but not severe
Grade 4	Obvious disfiguring weakness, fairly symmetric at rest ($n = 2$) Incomplete eye closure Severe synkinesis, spasm
Grade 5	Motion barely perceptible ($n = 14$) Incomplete eye closure No synkinesis, spasm
Grade 6	No movement ($n = 84$) Loss of tone No synkinesis

Table 3. Corneal Exposure Staging

Scale Rating	Corneal Exposure
0	No keratopathy
1	Mild exposure keratopathy anywhere
2	Punctate keratitis inferior 1/4 of cornea
3	Punctate keratitis inferior 1/2 of cornea
4	Punctate keratitis inferior 3/4 of cornea
5	Corneal ulcer

indicated. Postoperatively, months from weight placement, final best Snellen visual acuity, and refraction, when available, were recorded. Again, eyelid closure and corneal exposure were noted. Artificial teardrop, ointment, and moisture chamber use at the time of the final visit were recorded, as was development of aberrant regeneration. Removal of the weight due to exposure or for any other reason was noted. Generally, in these situations, the last examination was the preoperative evaluation before weight removal. Other procedures and complications, including patient concerns regarding the weights, were recorded.

Statistical Analysis

To evaluate the functional outcomes and complications of the technique used, descriptive statistics, confidence intervals, and Kaplan-Meier analysis were used. Each weight was considered independently. Statistical analysis was completed with Microsoft Excel and Stata programs.

RESULTS

Over 14 years, 104 weights were implanted. The average age at weight placement was 53.2 years (range, 15 to 87 years). Fifty-six percent ($n = 54$) of patients were male. Fifty-three weights were implanted in right lids. The most common cause of the palsy was tumor ($n = 83$), including 55 acoustic neuromas (Table 4). Eighty-four patients had House grade 6 paresis, 14 had grade 5, two had grade 4, and two had grade 3 (Table 2). Nine patients had an associated trigeminal neuropathy.

The mean time from onset of palsy to weight placement was 45.7 ± 91.8 months (range, 1 to 468 months). Eighteen patients (19.1 percent) underwent early placement of the weights 1 month or less after onset of the palsy. Fifty-three percent ($n = 55$) of the weights were 1.2 g (Table 5). The mean weight size was 1.225 g.

Overall, 91 (97 percent) of the 94 first weights implanted were successful in providing improved protection for the patient's eye and decreasing the daily care needs. Two patients developed repeated corneal ulcers (pseudomonas) with subsequent corneal scarring. Of the three patients who did not have successful outcomes, two patients had decreased corneal sensation secondary to trigeminal neuropathy. Weights were successful in seven of nine patients with decreased corneal sensation.

Best Snellen visual acuity was recorded before weight placement and at the final follow-up ex-

Table 4. Causes of Facial Palsy (Total *n* = 104)

Cause	*n*
Idiopathic Bell palsy	8
Infection	
Bacterial	2
Herpes zoster (Ramsay-Hunt)	3
Leprosy	1
Trauma	4
Tumor	
Acoustic neuroma	55
Astrocytoma	1
Cholesteatoma	2
Chordoma	1
Fifth nerve schwannoma	2
Hemangioma	2
Melanoma	1
Meningioma	8
Parotid tumor	10
Sarcoma	1
Vascular	3

Table 5. Frequency and Size of Weights Used in Grams (Total *n* = 104)

Size of Weight	No. of Times Used
0.6 g	0
0.8 g	4
1 g	14
1.2 g	55
1.4 g	27
1.6 g	4

amination. There was a mean improvement in visual acuity of 1.4 lines (95 percent CI: 0.83, 1.99). The condition of the cornea showed a statistically significant improvement based on the modified Kartush scale.

After weight placement, 49 patients were using fewer drops, while 43 patients were using the same number and two patients were using more drops (each eye in patients with bilateral weights was considered separately). Postoperatively, the patients in this series were using artificial teardrops a mean of 1.60 ± 1.85 times per day and lubricating ointment a mean of 0.45 ± 0.72 times per day. Twenty-two patients who had been using moisture chambers were found to be using them less after weight placement, 12 patients continued as before, and one patient was noted to need a moisture chamber after surgery although he did not use one preoperatively.

Eighty-eight patients had better eyelid closure postoperatively with less lagophthalmos. No improvement was found in six patients; three due to upper eyelid scarring related to prior spring removal, two due to eyelid scarring from other causes, and, in one case, the reason for persistent lagophthalmos was unclear.

Eleven of 104 weights eroded through the skin and partially extruded (10.6 percent overall). These 11 exposures occurred in only seven patients. Four patients had one weight extrude, two patients had two extrusions, and one patient had three extrusions. None became clinically infected. All were removed and nine were replaced. The first-time exposures developed at 1, 1, 6, 18, 61, 78, and 118 months (mean, 40.4 months). Repeated exposures occurred at 42, 44, 60, and 117 months (mean, 65.8 months). Overall, the mean time to weight exposure for all 11 events was 43.3 months. There was no statistically significant difference between the times to initial weight exposure versus subsequent weight exposures ($p = 0.4180$). The prevalence of repeated exposure, however, for these seven patients was 43 percent, higher than the 7.4 percent prevalence (seven of 95) of an initial extrusion. These extrusions were associated with a tight skin wound in one case and prior lid scarring in six (two prior palpebral springs, four prior weights). One extrusion was due to a documented gold allergy confirmed with skin testing. This weight was replaced with a platinum weight, which has been retained for over 4 years to date. The cause of extrusion was unclear in two cases.

Kaplan-Meier survival curve analysis was done to evaluate weight retention over time. This analysis predicted a 3 percent exposure rate at 12 months (0.9699; 95 percent CI: 0.91, 0.99), 5 percent at 24 months (0.9551; 95 percent CI: 0.88, 0.98), and 10 percent at 5 years (0.8773; 95 percent CI: 0.74, 0.94), which increased to 35 percent at 153 months (0.6537; 95 percent CI: 0.40, 0.82), the longest follow-up in this series (Fig. 4). When needed, replacement weights were equally effective in maintaining ocular health.

Preoperative and postoperative refractions were available in 44 cases. No change in refraction was noted after weight placement in 41 patients. Three patients did show a mild astigmatic shift (6.8 percent). All patients did well with a change in their spectacles.

Eight patients developed aberrant regeneration, hypertonicity, and/or spasm, which was managed with botulinum toxin injections. Four patients developed a relative blepharoptosis on the affected side as a result of the weight (4 percent).

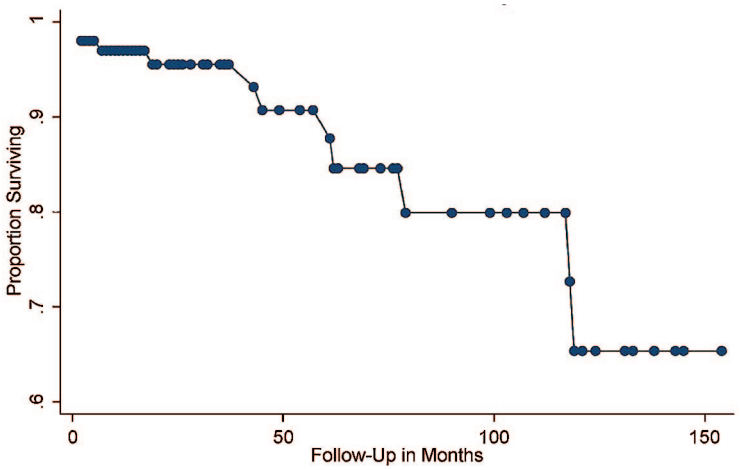

Fig. 4. Gold weight success versus time (months).

Five patients were dissatisfied with the aesthetics of the weight (5 percent) and elected to have the weights removed. Four weights (4 percent) migrated in the lid, three of which were revised, with one replacement. There were no wound infections. The weights were removed in two patients whose nerve function returned. They both did well after removal.

DISCUSSION

Given the multitude of procedures that have been described for the management of facial paralysis, an organized approach is required for therapeutic success. During the past 15 years, it has become apparent that the eyelid load weight is an integral component in the staged management of facial palsy.[2–8] Several authors have shown the efficacy of the eyelid weights when combined with other procedures.[13–19]

This report describes the largest series of gold weight implants by one surgeon in the literature, with among the longest follow-up periods. Gold weights, when used as an integral part of the staged management system described above, were successful in 97 percent of cases in maintaining visual acuity and corneal compensation, with a minimum of ocular nursing care.

Mean visual acuity improved 1.4 lines after weight placement, which is clinically important but not statistically significant in this series. This is likely due to limitations in analysis due to retrospective conversion to a linear scale. Similarly, Kartush et al.[13] found a mean of 2.4 lines of improvement in his study, and given the mean and standard deviation in the current series, these results are not dissimilar. There was also statistically significant improvement in corneal exposure, based on the modified Kartush scale, after weight placement. Three patients did not meet the goals of improved vision and corneal protection after weight placement. Two of these patients had decreased corneal sensation, and two patients had difficulty caring for themselves due to generalized neurologic compromise. Seven of nine patients with decreased corneal sensation, however, did well in this series, reflecting a success rate of 78 percent in patients with both facial palsy and trigeminal neuropathy.

Weights were not placed in patients in this series with mild or short-term palsies. Ninety-four percent (98 of 104 weights) were placed in patients with House scale grades of 5 or 6, and only six patients had grades of 3 or 4. Thus, the high success rate in this cohort represents management of some of the most severe facial palsies.

No unexpected complications were noted in this series. There was one case of documented gold allergy.[20,21] There were no infections, even in the presence of extruding weights, which is in contrast to reported infection rates as high as 8 percent.[15,22] It can often be difficult to differentiate between infection and noninfectious inflammation. An empiric trial of antibiotics can help to clear up any infection, and then corticosteroids and/or weight removal can be used if noninfectious inflammation is suspected.[22,23]

Erosion of the weight through the skin with partial extrusion was the most important complication observed. In this series, 11 of 104 weights (10.6 percent) eroded through the skin, with a mean time to exposure of 41.73 ± 45.20 months. This included secondary exposures, as well. If only first-time weight exposures are considered, the rate drops to 7.4 percent (seven of 95). Reexposure of weights occurred in 43 percent (three of seven).

Many authors have reported low extrusion rates with short follow-up periods.[14,16,19,24] Kaplan-Meier survival curve analysis showed risk of weight extrusion was less than 5 percent at 42 months, which increased to 44 percent at 153 months. This lower retention rate with longer follow-up is consistent with data from a series that showed a 61 percent extrusion rate with follow-up to 18 years.[24]

The risk of extrusion did not appear related to weight size or the sharper angled edges in the earlier Meddev weights. Anecdotally, single-layer closures over the weights were noted to have a high incidence of early exposures and were thus avoided (personal communication, Bruce Ostler, M.D., 1991).

Scarring of the lid from previous surgery or other causes seemed to increase the risk of weight extrusion. Lid closure also remained poor after weight placement in lids with excessive scarring. This may be considered a relative contraindication to weight placement.

Implantation of palpebral springs and weights has raised concerns regarding the safety of these metallic objects in the event the patient needs magnetic resonance imaging. In this series, there were 83 weights placed in patients who had facial palsy as the result of tumors. Most of these patients have been followed with magnetic resonance imaging, and there have been no problems with the gold weights or distortion of the images, which is similar to the experience of others.[25,26]

Astigmatic shift in refraction after eyelid load weight placement has been noted in as many as 5 percent of cases.[13,27] Our data (6.8 percent) sup-

port this rate. One suspects that the pressure from the weight on the superior portion of the globe accounts for this change.

Relative blepharoptosis was noted in approximately 4 percent of cases. These tended to occur in the early years of the series. At that time, a more extensive pretarsal dissection was undertaken that likely disinserted sufficient levator-tarsal attachments to cause ptosis. More recently, the pretarsal dissection was limited horizontally and higher, and ptosis did not seem to occur. Other series have suggested that the ptosis was secondary to an excessively heavy weight,[13,28] which did not appear to be the case in this series.

Cosmetic dissatisfaction with the weights also occurred in approximately 5 percent. This complaint came from patients early in the series when the weights were placed lower, making them more visible with the eye open. Because weight placement was moved to the top of the tarsus, this issue has been minimized.

Limitations

The retrospective study design potentially introduces biases in data interpretation, and important data may be absent. It was felt, however, that reporting the outcomes of this large series with long follow-up would be an important contribution to the literature regarding the surgical outcome of facial palsy patients. The data were generally recorded by a single observer in a standardized fashion at the time of regular patient visits, and this helped to minimize missing data or interobserver variability. The study did use the status of the eye before weight placement as a retrospective control.

Corneal compensation was assessed using a scale modified from Kartush et al.[13] (Table 3). Unfortunately, the original version of the scale did not reflect a linear progression of corneal exposure. The central portion of the scale was thus modified to represent increased epithelial compromise by 1/4 corneal diameter increments. Clearly, grades 1 (mild keratitis anywhere) and 5 (corneal ulcer) do not represent linear extensions of the scale but are again useful for preoperative and postoperative comparisons.

CONCLUSIONS

This study demonstrates that gold eyelid load weights, when used as part of a comprehensive approach to the management of facial palsy, help preserve vision and improve corneal compensation, while minimizing ocular nursing care. Overall, 91 (97 percent) of the 94 weights implanted were successful in providing improved protection for the patient's eye and decreasing the daily care needs. Weights were successful in seven of nine patients with concomitant trigeminal neuralgia, resulting in decreased corneal sensation. The complications are few, and after approximately 5 years, 90 percent of the weights are retained, with two-thirds retained at over 12 years. Extruded weights can be replaced multiple times with the expectation that they will provide similar success.

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REFERENCES

1. Goldberg R, Seiff S, McFarland J, et al. Floppy eyelid syndrome and blepharochalasis. *Am J Ophthalmol.* 1986;102:376–381.
2. Seiff SR, Chang JS Jr. The staged management of the ophthalmic complications of facial palsy. *Ophthal Plast Reconstr Surg.* 1993;9:241–249.
3. Seiff SR, Chang J. The management of ophthalmic complications of facial nerve palsy. In Jackler RK, ed. *Otolaryngologic Clinics of North America.* Philadelphia: Saunders; 1992:669–690.
4. Boerner M, Seiff S. Etiology and management of facial nerve palsy. *Curr Opin Ophthalmol.* 1994;5:61–66.
5. Seiff SR. Current concepts in the management of lagophthalmos and other ophthalmic complications of 7th nerve palsies. *Orbit* 1996;14:173–181.
6. Seiff SR, Tovilla-Canales JL. Tratamiento de la paralisis facial: El punto de vista del oftalmologo. *Av Oftalmol.* 1997;1:23–31.
7. Seiff SR. Surgical management of seventh nerve paralysis and floppy eyelid syndrome. *Curr Opin Ophthalmol.* 1999;10:242–246.
8. Seiff SR, Choo PH, Carter SR. Facial nerve paralysis In Mauriello JA. Jr, ed. *Unfavorable Results of Eyelid and Lacrimal Surgery.* Boston: Butterworth Heinemann; 2000:227–234.
9. Seiff SR, Sullivan JH, Freeman LN, Ahn J. Pretarsal fixation of gold weights in facial nerve palsy. *Ophthal Plast Reconstr Surg.* 1989;5:104–109.
10. Jobe R. Lid loading with gold for upper lid paralysis. *Plast Reconstr Surg.* 2000;106:735–736.
11. House JW. Facial nerve grading systems. *Laryngoscope* 1983; 93;1056–1069.
12. House JW, Brackman DE. Facial nerve grading system. *Otolaryngol Head Neck Surg.* 1985;93:146–147.
13. Kartush JM, Linstrom CJ, McCann PM, Graham MD. Early gold weight eyelid implantation for facial paralysis. *Otolaryngol Head Neck Surg.* 1990;103:1016–1023.
14. Maas CS, Benecke JE, Holds JB, Schoenrock LD, Simo F. Primary surgical management for rehabilitation of the paralyzed eye. *Otolaryngol Head Neck Surg.* 1994;110:288–295.
15. Linder TE, Pike VE, Linstrom CJ. Early eyelid rehabilitation in facial nerve paralysis. *Laryngoscope* 1996;106:1115–1118.
16. Moser G, Oberascher G. Reanimation of the paralyzed face with new gold weight implants and Goretex soft-tissue patches. *Eur Arch Otorhinolaryngol Suppl.* 1997;1:S76–78.
17. Choi HY, Hong SE, Lew JM. Long-term comparison of a newly designed gold implant with the conventional implant in facial nerve paralysis. *Plast Reconstr Surg.* 1999;104:1624–1634.

18. Foda HM. Surgical management of lagophthalmos in patients with facial palsy. *Am J Otolaryngol.* 1999;20:391–395.
19. Chepeha DB, Yoo J, Birt C, Gilbert RW, Chen J. Prospective evaluation of eyelid function with gold weight implant and lower eyelid shortening for facial paralysis. *Arch Otolaryngol Head Neck Surg.* 2001;127:299–303.
20. Bair RL, Harris GJ, Lyon DB, Komorowski RA. Noninfectious inflammatory response to gold weight eyelid implants. *Ophthal Plast Reconstr Surg.* 1995;11:209–214.
21. Dinces EA, Mauriello JA Jr, Kwartler JA, Franklin M. Complications of gold weight eyelid implants for treatment of fifth and seventh nerve paralysis. *Laryngoscope* 1997;107:1617–1622.
22. O'Connell JE, Robin PE. Eyelid gold weights in the management of facial palsy. *J Laryngol Otol.* 1991;105:471–474.
23. Catalano PJ, Bergstein MJ, Biller HF. Comprehensive management of the eye in facial paralysis. *Arch Otolaryngol Head Neck Surg.* 1995;121:81–86.
24. Kelley SA, Sharpe DT. Gold eyelid weights in patients with facial palsy: A patient review. *Plast Reconstr Surg.* 1992;89:436–440.
25. Gardner TA, Rak KM. Magnetic resonance imaging of eyelid springs and gold weights. *Arch Ophthalmol.* 1991;109:1498.
26. Canady JW, Meine J, Thompson SA, Yuh WT. Effects of magnetic resonance imaging fields on gold eyelid loads. *Ann Plast Surg.* 1993;31:76–77.
27. Jobe RP. Gold lid loads. *Plast Reconstr Surg.* 1993;91:563–564.
28. Harrisberg BP, Singh RP, Croxson GR, Taylor RF, McCluskey PJ. Long-term outcome of gold eyelid weights in patients with facial nerve palsy. *Otol Neurotol.* 2001;22:397–400.