Thin-Profile Platinum Eyelid Weighting: A Superior Option in the Paralyzed Eye

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Background: A devastating sequela of facial paralysis is the inability to close the eye. The resulting loss of corneal protection can lead to exposure keratitis, corneal ulceration, and potentially permanent vision loss. Methods to address lagophthalmos historically have included tarsorrhaphy, lid weighting, levator palpebrae superioris lengthening, chemodenervation to yield protective ptosis, and the placement of magnetic eyelid springs. The gold eyelid weight, introduced nearly 50 years ago, continues to enjoy immense popularity, despite high complication rates and nearly uniform visibility under the skin. The authors hypothesized that a commercially available, thin platinum weight would combat the visibility of the thicker gold weights and herein compare complication rates and visibility rates with literature-reported data for gold weights.
Methods: Beginning in 2004, 100 consecutive patients presenting to the authors' Facial Nerve Center with paralytic lagophthalmos requiring intervention were treated with thin-profile platinum eyelid weights. Ninety-six percent of cases were performed under local anesthesia in the office setting.
Results: Median follow-up was 22 months. In 102 weights placed, there have been six complications (5.9 percent): three extrusions, two capsule formations, and one case of astigmatism. All of the extrusions involved irradiated patients with parotid malignancies.
Conclusions: The authors report the first large series of thin-profile platinum eyelid weight implantations for the treatment of lagophthalmos. This implant significantly reduces both capsule formation phenomena and extrusion compared with gold weights and should be considered as alternative to the more conventional gold implants. (*Plast. Reconstr. Surg.* 123: 1697, 2009.)

Patients with facial paralysis involving branches to the orbicularis oculi muscle develop paralytic lagophthalmos: widening of the palpebral fissure with an inability to blink or completely close the affected eye. Nearly all of these patients develop some degree of corneal exposure keratitis and some go on to develop serious eye complications, including corneal desiccation, ulceration, abscess, and even permanent vision loss.

Conservative nonsurgical therapy includes the frequent use of artificial tears (ophthalmic drops or ointments), protective eyelid taping, occlusive moisture chambers, soft contact lenses, scleral shells, or temporary tarsorrhaphy.[1–3] These methods require ongoing patient compliance, can obscure vision, and can be particularly inadequate when there are combined fifth and seventh nerve lesions, where corneal sensation is compromised, so patients lack ocular pain to signal impending serious corneal infection.

Management strategies for protecting the cornea in facial paralysis have evolved over the past century. Tarsorrhaphy techniques are simple and reversible, yet lead to visual field deficits and can be aesthetically unappealing. Most commonly they are now used in combined fifth and seventh nerve palsies with anesthetic corneas or after failure of lid weighting.[3] May[4] described the use of a wire spring to improve eyelid function

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in facial paralysis. Techniques to address the unopposed force of the levator palpebrae superioris have been described, where a segment of autologous fascia or other material is used to elongate or advance the levator aponeurosis[5] or the levator is chemically denervated to create temporary lid ptosis.[6,7] Temporalis musculofascial transfer is also described to reanimate the eye.[8,9]

The placement of an upper eyelid weight provides reversible yet definitive surgical treatment by providing gravity-assisted closure to the upper lid. In 1950, Sheehan[10] described the use of stainless steel mesh to accentuate gravity in upper eyelid closure, and in 1958, Illig[11] described a gold eyelid weight. This weighting technique was then popularized by Smellie and later Jobe.[2,12–14] Gold weight placement is the most common technique for long-term ophthalmologic protection in paralytic lagophthalmos, likely due to the surgical simplicity of placement, relatively low cost, and reliable functional result. The incidence of complications, however, is as high as 50 percent in some series, including local inflammation (20 percent), bulging of the implant with thickening of the surrounding skin and muscle (10 to 13.4 percent), astigmatism (11.5 percent), and postoperative infection (7 percent).[15–17] Migration and extrusion of the eyelid weight, occurring in 5 to 50 percent of patients, are considered the most serious and dreaded potential short- and long-term complications.[2] Although several studies cite extrusion and ulceration as the main argument against gold eyelid weights, few techniques have been described in the literature to decrease the risk of extrusion.[18,19] To improve aesthetic and functional outcome for patients requiring lid-weighting procedures, we began to use thin-profile platinum eyelid weights in 2004 (MedDev Corporation, Sunnyvale, Calif.). These weights are approximately 11 percent smaller than their gold counterparts,[20] based on the increased density of platinum (21.45 g/cm^3) versus gold (19.3 g/cm^3) (Fig. 1). The implants are 0.6 mm thick, and the length varies according to the implant weight required. Both the platinum and the gold MedDev thin-profile implants are 0.6 mm thick; however, the traditional thicker gold implants are still commonly used by many surgeons. The low-grade allergy to gold found in approximately 3.2 to 9.5 percent of the population has not been seen with platinum implants used for other purposes,[21,22] and we hypothesized that the decreased reactivity of platinum compared with gold would improve the visibility/reactivity profile and extrusion risk. To our knowledge, there are no published large series describing the use of thin-profile platinum eyelid weights for the correction of lagophthalmos due to facial nerve palsy, and herein we present our experience with a series of 100 consecutive patients presenting to the Facial Nerve Center who have undergone placement of a thin-profile platinum eyelid weights for the correction of paralytic lagophthalmos.

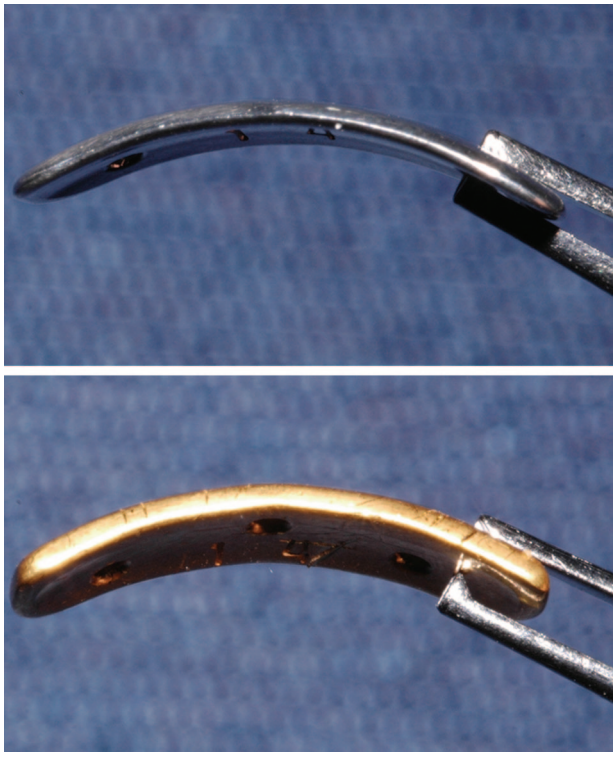

Fig. 1. Comparisons of a thin-profile platinum eyelid weight (*above*) with a traditional gold weight (*below*). Note the decreased thickness of the platinum weight.

PATIENTS AND METHODS

All patients presenting to the Facial Nerve Center at the Massachusetts Eye and Ear Infirmary between April of 2004 and July of 2008 were evaluated for the necessity of an eyelid-weighting procedure. Criteria utilized to determine candidacy for eyelid weighting included likelihood of rapid spontaneous recovery, presence of a Bell's phenomenon, and corneal health. Patients with incomplete eye closure in whom spontaneous recovery was expected to be prolonged and/or incomplete and patients with a poor Bell's phenomenon or corneal irritation were judged to be good candidates. After approval from the Institutional Review Board at the Massachusetts Eye and Ear Infirmary, a retrospective chart review was conducted to iden-

tify all patients who underwent thin-profile platinum weight implantation at the Facial Nerve Center.

A total of 100 patients were treated with platinum eyelid weights over 4 years, 98 for unilateral paralysis and two for bilateral paralysis. The patients' ages ranged from 8 to 86 years, with a mean age of 47.6 years. There were 48 male and 52 female patients. Figure 2 shows a breakdown of the underlying diagnoses. Ninety-four patients underwent primary placement, and six underwent a revision procedure in which a gold weight was removed and a thin-profile platinum eyelid weight was placed.

Surgical Technique

The vast majority of patients underwent the procedure under local anesthesia, using 1% lidocaine with 1:100,000 epinephrine injectable solution. Indications for general or intravenous sedation anesthesia were concomitant with other major facial reanimation procedures or pediatric patients. Before any anesthesia, a determination of the most appropriate weight was made by adhesive-fixing a series of external weights to the upper lid, to determine the appropriate weight to effect complete eye closure (Fig. 3). A weight was taped to the upper lid, centered on the medical limbus, and remained in place for 15 minutes, allowing the patients to adjust to having the weight in place to more accurately determine the correct weight before making a judgment as to its comfort and suitability. If complete eye closure was achieved without an unacceptable degree of lid ptosis, the weight was deemed appropriate. If there was obvious ptosis, or if complete eye closure was not achieved, then the weight was adjusted downward or upward, respectively. After selection of the weight required, the supratarsal crease was marked before injection of local anesthetic, and the upper lid was infiltrated. An incision was made in the supratarsal crease and carried through orbicularis oculi to the superficial surface of the tarsal plate. A pocket was created that was centered over the medial limbus and large enough to accommodate the weight. The weight was secured with three 6-0 clear nylon sutures placed partial-thickness through the tarsal plate, and the muscle and skin layers were closed separately (Fig. 4). Patients were followed up at 2 weeks and had periodic reassessments of the lids, corneal health, and overall facial function as dictated by their specific clinical situation.

Main Outcome Measures

Postoperatively, patients were assessed for visibility/bulkiness of the implant, evidence of cap-

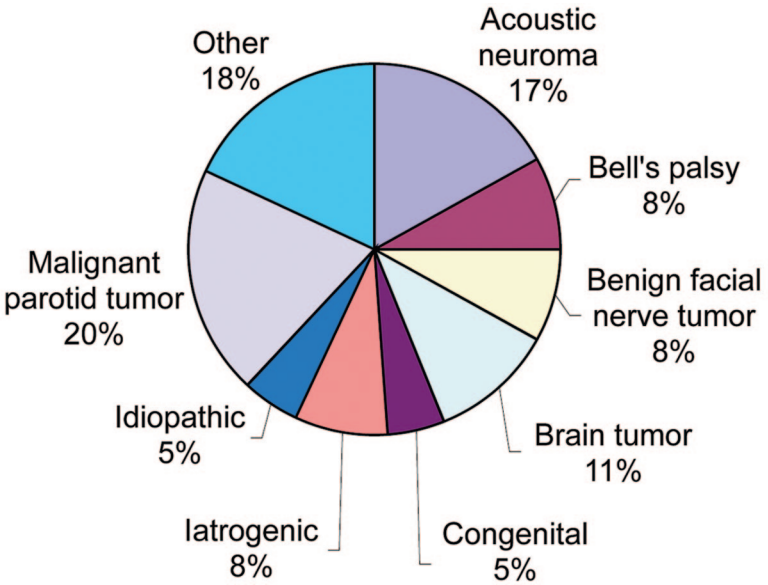

Fig. 2. Leading causes of facial nerve paralysis in our patient population. Diagnoses in the category labeled "Other" included benign parotid tumor ($n = 2$), birth trauma ($n = 1$), carcinoid tumor ($n = 1$), cholesteotoma ($n = 2$), chronic otitis media ($n = 1$), cerebellopontine angle epidermoid tumor ($n = 1$), muscular dystrophy, ($n = 1$) postpolio ($n = 2$), Ramsey Hunt syndrome ($n = 2$), squamous cell carcinoma ($n = 2$), stroke ($n = 1$), and facial nerve trauma ($n = 2$).

Fig. 3. Technique for preoperative determination of appropriate eyelid weight. (*Above*) Sizing kit consisting of a series of weights in 0.2-g increments. (*Below*) Patient with eyelid weight taped in place, centered over the medial limbus.

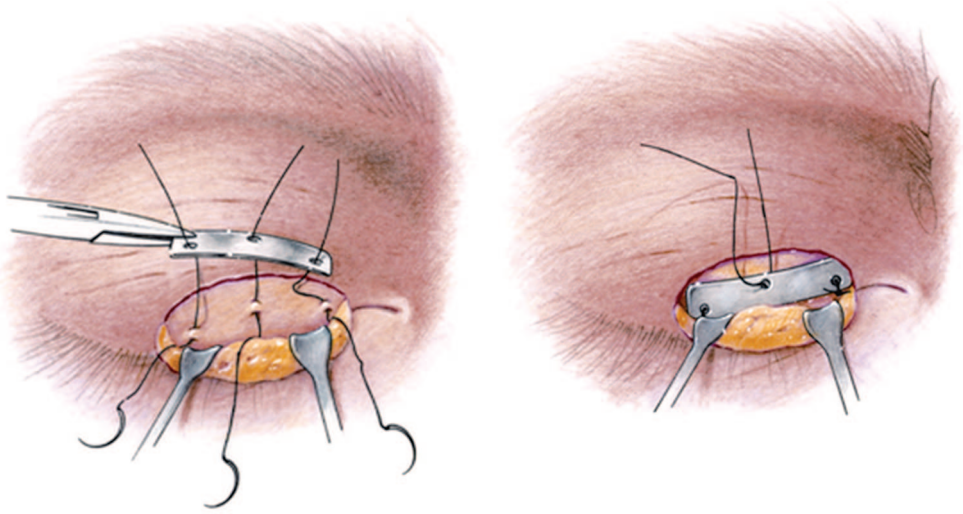

Fig. 4. Schematic of surgical technique for eyelid weight implantation. (*Left*) Tarsal plate exposed via supratarsal crease incision, with permanent sutures partial-thickness through tarsus. (*Right*) Weight in place.

sule formation, effectiveness of the weight at effecting complete eye closure, vision changes, and migration or extrusion over time.

RESULTS

Over a period of 4 years, 102 thin-profile platinum eyelid weights were placed in 100 patients for the treatment of paralytic lagophthalmos. Ninety-four patients underwent primary placement, and six underwent the procedure as a revision in which a gold weight was removed for excess bulk, excess weight, or ineffectiveness in closing the eye and a thin-profile platinum eyelid weight was placed. On average, the procedure took 25 minutes, and there were no cases of excessive bleeding, hematoma, corneal injury, or other serious complications. One patient developed minor bleeding several hours after surgery that responded to digital pressure and ice, and required no further intervention, and one patient who had undergone simultaneous temporalis muscle transfer developed a hematoma in

the facial wound and secondary ecchymosis around the eyelid wound. Once the hematoma was evacuated, the patient healed without incident. Figure 5 shows a typical result from placement of a thin-profile platinum eyelid weight and the resulting correction of lagophthalmos.

In follow-up ranging from 4 months to 4 years (mean, 19 months), we have observed six complications in 102 platinum weights placed: one astigmatism (1 percent), three extrusions (2.9 percent), and two incidents of tissue thickening (2 percent). Local inflammation, migration of the implant, and postoperative infection were not seen in this series. Interestingly, all three extrusions occurred in patients with malignant parotid tumors who had been irradiated. In two cases, the weight was removed and the lid was allowed to heal, followed by re-placement of the platinum weight. Both of these patients also had a history of previous gold eyelid weights. Both patients healed well after the second placement of the platinum weight, with 12 and 36 months of follow-up. The third patient was lost to follow-up.

In the two patients who appeared to have capsule formation around the platinum weight similar to that seen commonly with gold eyelid weights, both weights were effective and neither has been removed to date. Postoperative eye closure was judged to be nearly complete to complete in all patients, though some required daily upper lid stretching to the levator palpebrae superioris to achieve this, as has been previously described.[23]

DISCUSSION

Gold weights have been a mainstay of surgical therapy for the paralyzed eye. Although they are relatively easy to use and effective, several shortcomings to their use have emerged, including allergy, capsule formation, extrusion, and migration. Measures to decrease or eliminate these phenomena have been introduced. Several groups have described placement of a several nonabsorbable sutures to secure the gold weight to the tarsus.[5,19,24,25] Still others use temporalis fascia draped over the implant to reduce the risk of extrusion,[20] and details of surgical planning to minimize complications have been proposed.[26] Modifications of the existing gold weights have been proposed.[1,27] Chain weights were developed with the idea that they might conform more appropriately to lid shape,[28] though their profiles remained as thick as the conventional gold weights. Thin-profile platinum weights have been developed in an attempt to decrease implant visibility without compromising function, though to our knowledge no large series regarding their visibility or extrusion rates has been published to date.

Among patients presenting to our Facial Nerve Center with previously placed gold weights, we observed many instances of eyelid weight visibility and bulkiness. Therefore, in an effort to decrease implant visibility, we incorporated thin-profile platinum eyelid weights and found that not only were they much less visible but there was a substantial difference in extrusion rates compared with the literature-reported values using gold.[2] In addition, we noted a distinct lack of visible capsule formation and, with rare exception, found lack of gross evidence of capsules upon implant removal (Fig. 6). This stands in stark contrast to the 230 patients seen over the same time period who presented with preexisting gold weights, of whom nearly 85 percent ap-

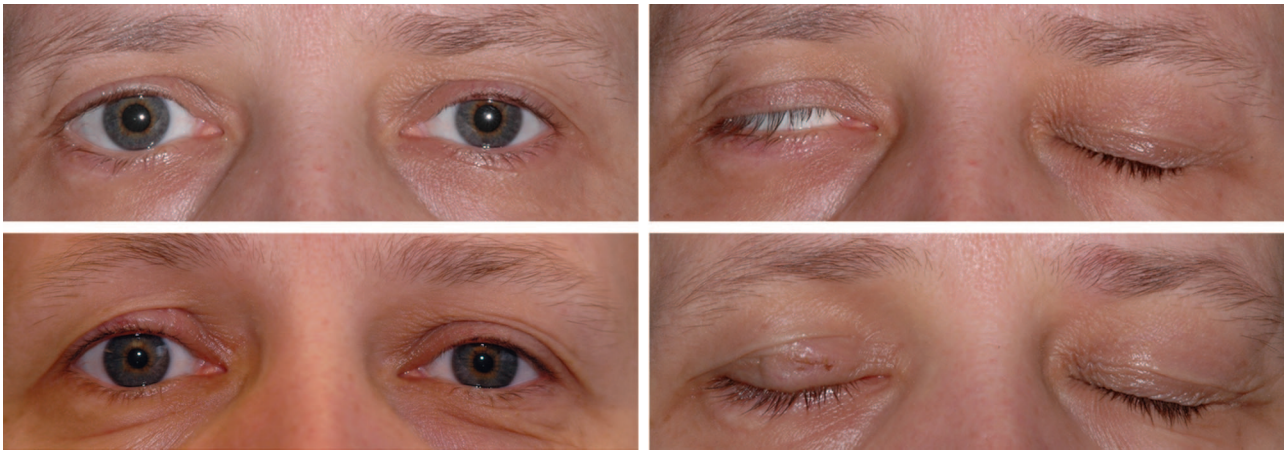

Fig. 5. Example of a typical result from thin-profile platinum eyelid weight placement. (*Above*) Preoperative views showing eyes in direct gaze and with gentle eye closure. (*Below*) Postoperative views showing direct gaze and gentle eye closure.

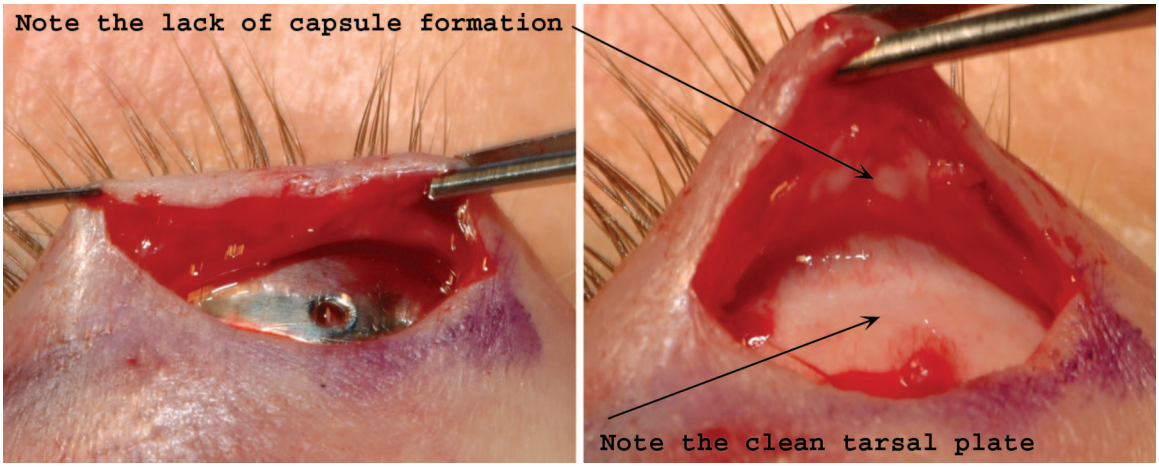

Fig. 6. Typical appearance of platinum eyelid weight at time of removal. Note the lack of capsule formation in the surgical bed.

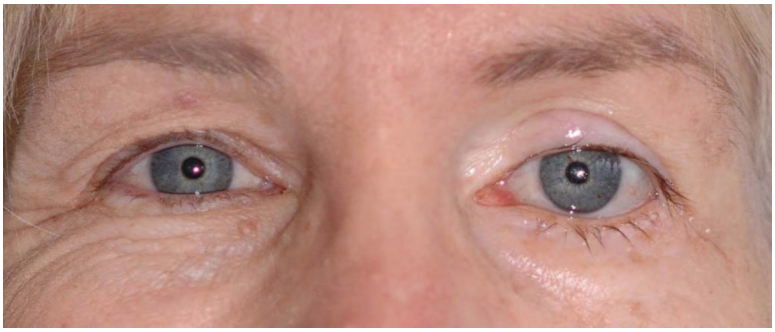

Fig. 7. Typical suboptimal appearance of gold eyelid weight.

peared to have developed bulkiness and/or capsules around the implant (Fig. 7).

CONCLUSIONS

Herein, we present our experience with using thin-profile platinum upper eyelid weights in the treatment of paralytic lagophthalmos in 100 consecutive patients presenting to the Facial Nerve Center at the Massachusetts Eye and Ear Infirmary. Because of the comparable ease of placement, the reduced tendency to contribute to lid bulk, the lower risk of allergy and/or foreign body reaction, and the lower risk of extrusion, thin-profile platinum eyelid weights appear to offer a superior treatment of lagophthalmos secondary to facial nerve palsy, when compared with gold eyelid weights.

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