Prospective Evaluation of Eyelid Function With Gold Weight Implant and Lower Eyelid Shortening for Facial Paralysis

Douglas B. Chepeha, MD, MSPH; John Yoo, MD; Catherine Birt, MD; Ralph W. Gilbert, MD; Joseph Chen, MD

Objectives: To assess which signs and symptoms were relieved by gold weight implantation and which signs and symptoms persisted.

Design: Prospective observational cohort.

Setting: Tertiary care neurotology and oncology center.

Patients: Sixteen (4 males and 12 females) consecutive patients whose average age was 56 years (age range, 31-76 years). Inclusion criteria were gold weight implant, lagophthalmos of 2 mm or more, and a House-Brackmann score of 3 or less at the completion of follow-up. Mean follow-up was 13 months.

Interventions: Each patient received a gold weight implant. Six of these patients underwent a lower eyelid procedure.

Main Outcome Measures: Surgical complications, static and dynamic lagophthalmos, static and dynamic corneal coverage, visual acuity, keratitis, topical treatment, and patient satisfaction.

Results: There were no extrusions. The preoperative mean lagophthalmos was 7.5 mm and the postoperative mean was 0.5 mm, \((P<.001)\). Corneal coverage with eye closure before implantation was 73% and after implantation was 100%, \((P<.001)\). Corneal coverage with normal (reflex) blink was less than 50% in 9 of 14 patients. When wearing correction, no patients had 20/20 visual acuity. The mean patient satisfaction score before the procedure was 3.5 and after was 7.1, \((P<.001)\). Patient satisfaction was most closely related to visual acuity. The relationship was linear and statistically significant \((P<.04)\).

Conclusions: Gold weight implantation provides significant reduction in lagophthalmos and significant improvement in corneal coverage. But owing to delayed closure time and disrupted tear film, irritation may persist. As a result, some patients require ongoing topical treatment of the eye, which can compromise visual acuity.


MAINTAINING a comfortable eye in which the cornea is protected and visual acuity is normal is the goal for patients who have lagophthalmos secondary to facial nerve paresis or paralysis. Rehabilitation of these patients is difficult owing to loss of the dynamic activity of the orbicularis oculi. As a result of the impaired orbicularis function, this group of patients is prone to exposure keratitis, epiphora (depending on the function of the lacrimal gland), and impaired vision due to a disrupted tear film.

Gold weight implantation has become the most commonly used technique for rehabilitation of the eye in patients with facial nerve paralysis. Many published studies have effectively developed the technique and indications for insertion and have established the gold weight implant as a safe and reliable procedure.\(^1\text{-}\text{10}\) It has been shown to effectively reduce lagophthalmos, protect the cornea, and improve cosmesis, while having a low extrusion rate.

Although previous literature has established that the gold weight implant with lower eyelid shortening procedures has significantly improved the treatment of lagophthalmos secondary to facial nerve paralysis, patients continue to be symptomatic and are not entirely satisfied. Our objective was to assess which signs and symptoms were relieved by gold weight implantation and which signs and symptoms persisted. We believe that the passive nature of the implant was at least one factor that led to some of our patients’ difficulties. To determine which signs and symptoms were persistent after gold weight implantation and which signs and symptoms were relieved by gold weight implantation and which signs and symptoms persisted.
PATIENTS, MATERIALS, AND METHODS

This was a prospective observational study of a cohort of 16 consecutive patients who had a gold weight implant. There were 4 male and 12 female patients whose average age was 56 years (age range, 31-76 years). One woman died before follow-up could be completed, and 1 patient would only allow a telephone evaluation after her procedure. The results are reported based on a cohort of 15 patients.

Eleven of the 15 patients had a resected acoustic neuroma. The remaining 4 patients had neurofibromatosis 2 (unresected), meningioma, cholesteatoma, and a parotid malignant neoplasm. Eleven of the patients had a total facial nerve defect, and each of these patients underwent a facial rehabilitation procedure in addition to the gold weight implant. Inclusion criteria were as follows: gold weight implant, lagophthalmos of 2 mm or more, and a House-Brackmann score of 3 or less at the completion of follow-up.

The cohort was followed up for a mean of 13 months (range, 7-26 months). The mean time from extirpation (or from the reanimation procedure, if done) was 43 months (range, 0-15.6 years). Institutional policy on the study of human subjects was followed.

The mean mass of the gold weight was 1.3 g (range, 1.0-1.4 g). The approach was through a supratarsal crease excision. The weight was placed over the tarsus as inferiorly as possible and centered over the midpupillary line. It was fixed in place with three 6.0 polypropylene (Prolene) sutures on a taper needle.

Six patients had an additional procedure to correct ectropion. Of the 6 patients, 5 had a lower eyelid tightening procedure that consisted of a tarsoconjunctival wedge excision. The overlying skin and orbicularis flap was not excised, rather, it was redraped and advanced laterally in a lateral orbital crease. The sixth patient had a flexor tendon sling performed prior to referral. We were conservative in deciding to do a lower eyelid procedure. We did not quantify the amount of eyelid laxity prior to a lower eyelid tightening procedure. The procedure was performed in those patients who had ectropion of their lower eyelid, who had epiphora, and/or whom we believed would not attain a full reduction of their lagophthalmos with the gold weight implant. As this was an observational study, many outcome variables related to eye function were collected (Table).

RESULTS

Overall there was an extremely low complication rate, the procedure was effective, and the level of patient satisfaction was high despite some lingering problems with visual acuity. There were no implant extrusions, but there was one minor complication: a scleral injection with a combination of 1% lidocaine hydrochloride and 1:100000 epinephrine that was immediately identified. The procedure was terminated, there were no sequelae, and the patient received the implant successfully at a later date. As expected, lagophthalmos was improved and corneal exposure with eye closure was reduced. The preoperative mean of lagophthalmos was 7.5 mm and the postoperative mean was 0.5 mm (P<.001, power 99%) (Figure 1). Corneal coverage with eye closure before implantation was 73% and after implantation was 100% (P<.001, power 99%). Visual acuity was impaired in our...
cohort despite successful gold weight implantation. No patients had 20/20 visual acuity, presumably secondary to a disrupted tear film and/or topical medication. The patients’ overall satisfaction with the implant was high as assessed by a subjective rating scale. The mean satisfaction score before the surgical procedure was 3.5 and after the surgical procedure was 7.1 (P<.001, power 99%) (Figure 2). Patient satisfaction was most closely related to visual acuity. The relationship was linear and statistically significant (P<.04) (Figure 3). Despite a statistically significant overall improvement in satisfaction, 3 of the 15 patients were dissatisfied with the cosmetic result. A relationship was explored between the subjective rating scale and nerve deficit, number of days of eye irritation per month, and corneal coverage with normal (reflex) blink. None were statistically significant. The cohort was too small to explore multivariable relationships.

Dynamic measures of upper eyelid function revealed some of the shortcomings of the gold weight implant. The upper eyelid has a mean closure time of 1.1 seconds (range, 0.3-3 seconds) (Figure 4). Corneal coverage with normal (reflex) blink was equal to or less than 50% in 9 of 14 patients (Figure 5). These measures suggest that during normal daily blinking, there is substantially reduced corneal coverage with a gold weight implant when compared with an eye with an intact facial nerve.

Despite the reduced dynamic function of the gold weight implant, only 2 of the 15 patients had superficial punctate keratitis greater than 1+. The amount of eye irritation varied widely. The mean number of days of eye irritation per month was 10, but 5 patients experienced no irritation, while 4 patients suffered constant irritation. Although a relationship between eye irritation with
trigeminal function, facial nerve function, House-Brackmann score, superficial punctate keratitis, and subjective satisfaction score was expected, no significant relationship was present. There was a significant linear relationship between eye irritation and corneal coverage with normal (reflex) blink ($P = .008$), which may suggest that the dynamic shortcomings of the gold weight implant are important enough to influence patient symptoms (Figure 6).

Most of the patients required topical treatment at the completion of the study. Thirteen of the 15 patients were able to decrease the amount of tears and lacrilube they were using after gold weight implantation. Only 1 patient was able to discontinue all local measures. Two patients still required morning and evening lacrilube, and 4 patients frequently used mechanical closure.

As part of the subjective assessment, the patients were asked to comment on any other difficulties they were having with their eye. Many found that wearing glasses outside was a necessity, especially on windy days. Any of the patients who did a significant amount of reading found that their upper eyelid became heavy and obscured their vision. Also, retaining a driver’s license was difficult owing to the impaired visual acuity. One young patient was unable to retain a driver’s license because of the inability to pass the visual portion of the examination.

The objective of this study was to assess which signs and symptoms were relieved by gold weight implantation and which signs and symptoms persisted. We also sought to determine whether these various measures of eyelid function correlated with patient satisfaction. The cohort of patients in this study were prospectively followed up and represented a group suffering from chronic facial paralysis whose recovery was no better than a House-Brackmann score of 3.

This study shows that gold weight implants in concert with lower eyelid tightening procedures are effective in relieving lagophthalmos and improving corneal coverage. Unfortunately, it also reveals several shortcomings, which include delay in upper eyelid closure and incomplete corneal coverage with normal (reflex) blink. By extrapolation, these shortcomings in eyelid function should lead to increased corneal exposure when compared with eyes with eyelids that have an intact facial nerve. We found that two thirds of the patients continued to suffer from eye irritation. Furthermore, we were able to demonstrate a trend toward a relationship between eye irritation and corneal coverage with normal (reflex) blink. To our knowledge, there are no previous reports that show a relationship between subjective symptoms (eye irritation) and dynamic measure of eyelid function (normal reflex) blink. A previous report retrospectively examined subjective measures of patient outcome with a questionnaire.11 It yielded thought-provoking data on difficulties with eyelid function after gold weight implantation, but, unfortunately, the data were marred by a high extrusion rate secondary to not suturing the implants in position.

Our study also found that patient satisfaction after implantation correlates with postimplantation visual acuity. Patient satisfaction as assessed by a Likertlike scale of 1 to 10 shows significant improvement after gold weight implantation, and overall patients were pleased, but with a mean score of 7.1 from a possible 10 there was still room for improvement. The inability of the gold weight to normalize visual acuity was presumably secondary to a disrupted tear film and/or the continued use of topical eye care for irritation. It is likely that the delay in closure and incomplete corneal coverage with normal (reflex) blink is in part responsible for these difficulties with visual acuity and the ongoing need for ongoing eye care. Other studies have evaluated visual acuity in patients with gold weight implants who have had a similar surgical ap-

Figure 5. Frequency plot demonstrating the lack of corneal coverage with normal (reflex) blink after gold weight implantation.

Figure 6. Scatterplot demonstrating decreasing eye irritation with increasing corneal coverage with reflex blink.
These studies also show improvement in visual acuity, but incomplete normalization of visual acuity after gold weight implantation.

Clearly, incomplete normalization of visual acuity is a major problem in patients after gold weight implantation as assessed by both objective and subjective measures. The difficulty with visual acuity is likely rooted in the inability of patients with gold weight implants to completely close the eye with a normal (reflex) blink. Procedures or implants focused on improving the speed of closure but retaining the safety of gold weight implantation need to be explored. A prospective study combining superior and inferior mullerectomy with gold weight implants has shown encouraging results by improving involuntary closure. Unfortunately, in this study, the mullerectomy was not uniformly applied, some of the patients recovered facial nerve function, and ptosis was a problem in some of the patients owing to heavy gold weights. Although difficult to prove, we believe that some of our patients had difficulties owing to levator spasm. Mullerectomy may be one way to approach this problem.

CONCLUSIONS

Gold weight implantation for rehabilitation of the eye in the patient with facial nerve paralysis is safe and reliable. It provides significant reduction in lagophthalmos and significant improvement in corneal coverage. Assessed by a subjective rating scale, patients have a significant amount of improvement. In this patient population, improvements still need to be made with respect to the normal (reflex) blink. Owing to delayed closure time and incomplete corneal coverage with the normal (reflex) blink, a disrupted tear film and eye irritation may persist. As a result, some patients require ongoing topical treatment of the eye, which can compromise visual acuity. The disruption in visual acuity is subjectively the most significant problem for patients after gold weight implantation. Modifications in the surgical approach or alterations in the implant should be considered to improve the dynamic function of the eyelid in patients with facial nerve paralysis.

Accepted for publication July 31, 2000.

Corresponding author: Douglas B. Chepeha, MD, University of Michigan, Department of Otolaryngology, 1904 Taubman Center, 1500 E Medical Center Dr, Ann Arbor, MI 48109-0312 (e-mail: dchepeha@umich.edu).

REFERENCES