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Temporal galeal fascia cover of custom-made gold lid weights for correction of paralytic lagophthalmos: long-term evaluation of an improved technique

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SUMMARY. Background: **Chronic paralytic lagophthalmos is a condition that is often conservatively treated with ophthalmic ointments and eye drops, but usually requires definitive surgical correction.** Purpose: **An effective modification of the gold lid loading technique is described, which we have found to be the simplest and most reliable method for lid reanimation.** Material: **After empiric evaluations with lead fisherman's weights 'glued' to the eyelid, a custom-made gold lid weight is made by a jeweller on the basis of the tarsal dimensions of the individual patient, and then sutured to the tarsus under local anaesthesia and covered with a fine sheet of temporal galea. Other ancillary procedures (lower lid suspension, lateral tarsal strip, lateral tarsoplasty) are added as required.** Methods: **Between 1990 and 1996, 27 patients underwent this type of surgery, of whom 24 were re-evaluated after a mean follow-up period of 73.2 months (range 36–96 months), 14 of these for a minimum of 5 years.** Results: **None of the gold weights was extruded, all 24 patients experienced marked improvement of their dry-eye symptoms and expressed a high degree of satisfaction. Six patients underwent further minor surgery (lateral McLaughlin tarsorrhaphy) in order to improve relative underaction. Two patients had ptosis (less than 2 mm of asymmetry) of the affected side but refused further correction.** Conclusion: **The use of custom-made gold lid weights and a protective galeal layer is a simple, reliable and successful means for permanently rehabilitating paralysed eyelids.**

INTRODUCTION

Patients with complete facial nerve palsy are at risk of severe eye complications due to corneal exposure. The initial treatment is usually based on the use of ophthalmic drops or ointments (*Jelks* et al., 1979), protective taping, occlusive moisture chambers, soft contact lenses or scleral shells (*Goren* and *Clemis* 1973), and sometimes temporary tarsorrhaphy. However, the majority of patients require definitive surgical treatment to correct chronic impairment.

A large number of different surgical methods have been proposed (*Gillies*, 1934; *Edgerton* and *Wolfort*, 1969; *Arion*, 1972; *Mühlbauer* et al., 1973; *Montandon*, 1978; *Brusati* et al., 1984), but the most widely used are lateral tarsorrhaphy (*McLaughlin*, 1957) and lid loading. Various loading materials have been used in the past (*Sheehan*, 1927; *Freeman*, 1979), but gold is now generally preferred because it combines considerable density with malleability, and is relatively well tolerated by the surrounding tissues (*Smellie*, 1966; *Barclay* and *Roberts*, 1969; *Jobe*, 1974; *May*, 1987; *Chapman* and *Lamberty*, 1988; *Soll*, 1988; *Seiff* et al., 1989; *Sobol* and *Alward*, 1990; *Kartush* et al., 1990; *Jobe*, 1993; *Choi* et al., 1999). Despite a relatively high rate of patient satisfaction, simple gold lid weight implantations are not always successful due to weight migration and extrusion which are quite common short- and long-term complications (15–50%; *Habal*, 1974; *Jelks* et al., 1979; *Mustarde*, 1979, *Vaillant* et al., 1983; *May*, 1985; *Lisman* et al., 1987; *May*, 1987; *Neuman* et al., 1989). Another extremely common complication is excessive implant visibility: *Chapman* and *Lamberty*, (1988) had to replace six out of 19 weights because of 'an unnatural subcutaneous prominence'.

The aim of this paper is to describe our 9-year experience of using an elliptical custom-made gold implant with four fixing holes in a series of 27 patients. In all cases, a fine sheet of temporal galeal graft was draped and sutured over the tarsus. No complications occurred requiring the removal of the implant, and a good cosmetic and functional result was achieved in all patients.

PATIENTS AND METHODS

Twenty-seven patients underwent insertion of custom-made implants between April 1990 and December 1996; 24 were followed up for a minimum of 3 years and 14 of these were re-evaluated more than 5 years postoperatively. One patient died of a stroke thus limiting follow up to one year and two patients were lost to follow-up after three months (Table 1).

Sixteen of the patients were referred to us after surgery for neurinoma of the eighth nerve had led to facial palsy (the time interval before lid surgery ranged from 11 months to 36 years); three had facial palsy due to ablative cancer surgery in the facial region (time to lid surgery: 3–9 years); four had facial palsy due to trauma in the mastoid (Fig. 1) or parotid regions (time to lid surgery: 2–27 years); and four had idiopathic Bell's palsy with longstanding facial weakness (time between disease onset and surgery: 5–22 years).

Table 1 –Patient data

Patient no.	Age	Sex	Etiology	Gold eyelid weight	Follow-up duration (months)	Complication and further surgery
1	63	M	Neurinoma of eighth nerve	1.4	12	Lost to follow (died of stroke)
2	68	F	Neurinoma of eighth nerve	1.5	36	Lateral tarsorrhaphy
3	64	F	Neurinoma of eighth nerve	1.5	36	Ptosis (2 mm of asymmetry)
4	58	M	Neurinoma of eighth nerve	1.6	60	–
5	60	M	Neurinoma of eighth nerve	1.4	62	Lateral tarsorrhaphy
6	67	M	Ablative cancer surgery in the facial region	1.4	36	Lateral tarsorrhaphy
7	75	M	Neurinoma of eighth nerve	1.5	61	–
8	65	M	Ablative cancer surgery in the facial region	1.0	36	–
9	49	M	Idiopathic Bell's palsy	2.1	60	–
10	59	F	Neurinoma of eighth nerve	1.3	62	–
11	67	M	Neurinoma of eighth nerve	1.7	63	Lateral tarsorrhaphy
12	60	F	Neurinoma of eighth nerve	1.7	36	–
13	62	F	Neurinoma of eighth nerve	1.8	36	–
14	65	F	Neurinoma of eighth nerve	1.9	62	–
15	70	F	Neurinoma of eighth nerve	1.6	36	–
16	40	M	Idiopathic Bell's palsy	1.6	14	–
17	72	M	Neurinoma of eighth nerve	1.4	62	–
18	75	M	Ablative cancer surgery in the facial region	1.4	62	Lateral tarsorrhaphy
(*)19	73	M	Trauma in the mastoid	1.5	62	Lateral tarsorrhaphy
20	68	F	Neurinoma of eighth nerve	1.6	62	–
21	27	F	Idiopathic Bell's palsy	1.8	62	–
22	42	F	Trauma in the parotid region	1.4	62	–
23	67	M	Neurinoma of eighth nerve	1.8	62	Ptosis (2 mm of asymmetry)
25	45	M	Trauma in the mastoid	1.6	3	Lost to follow up
26	56	M	Trauma in the parotid region	1.8	36	–
27	51	M	Idiopathic Bell's palsy	1.5	3	Lost to follow up

*Patient presented in Figs.

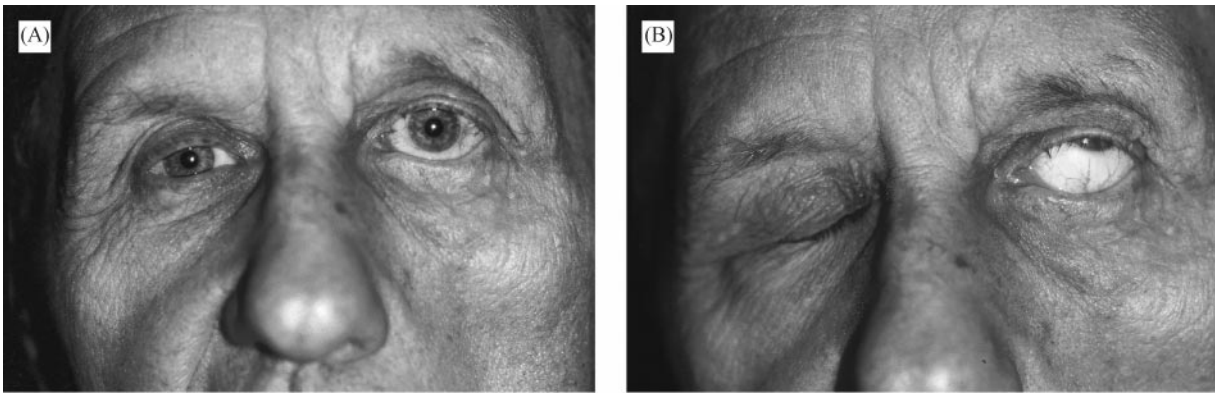

Fig. 1 – 73-year-old male, facial palsy following trauma to the temproral bone. Pre-operative view. (A) Open eyes; (B) closed eyes. The left lid remains open exposing the cornea.

Surgical technique

Preparation of custom-made weight: The affected upper lid was everted and the dimensions of the tarsus measured using a caliper and carefully reproduced on a paper model. Commercially available fisherman's lead weights of 0.1 to 0.5 g were applied to the upper eyelid skin using forceps and a commercially available cyanoacrylate glue: the starting weight was one gram, and then 0.1 g weights were added as required in order to obtain a good closure without ptosis (after 1 or 2 days, the lead weights spontaneously detach from the lid skin and meanwhile the patients themselves can evaluate eyelid function). In the present series, the final weight ranged from 1–2.1 g (1.4–1.8 g in 23/27 patients).

The prosthesis was made by a jeweller using the required weight of pure 24 k gold and subtracting 1.0 mm from the paper model. The curvature was standard and was initially obtained by making an imprint of the outer surface of the eyelids using a normal dental impression material. The jeweller was specifically asked to thin and taper the borders, and two or four holes were made in order to fix the prosthesis to the tarsus (Fig. 2). The prosthesis, usually took a few days to make and was then carefully cleaned and sterilized.

Operative technique: Local anaesthesia (temporal region and affected eyelid) with or without sedation

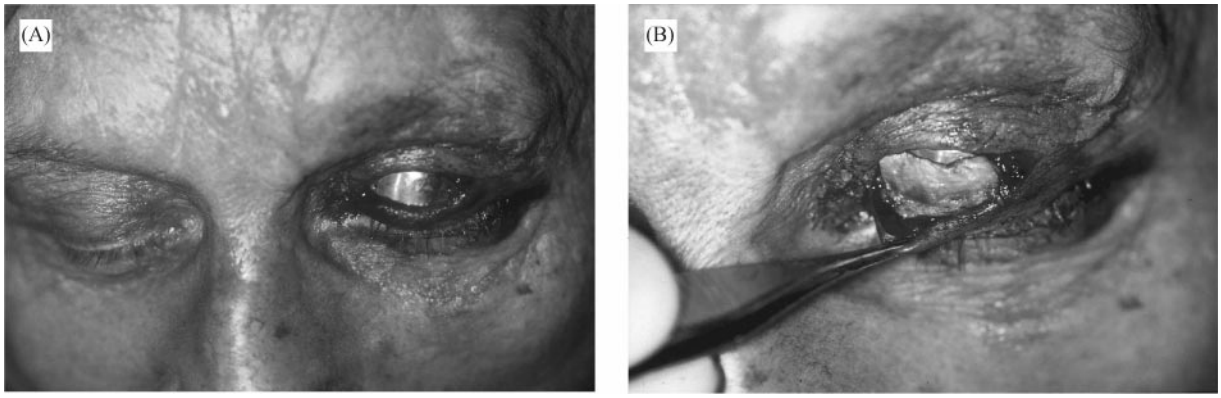

Fig. 2 – Same patient, intra-operatively. (A) Gold implant positioned on the surface of the tarsus and fixed with two 6/0 nylon sutures; (B) galeal graft adapted to cover the gold weight, and fixed by resorbable sutures.

was used. Broad-spectrum antibiotics were given one hour before the operation and continued for five days.

The temporal hair was combed and held with a rubber band (but not shaved). A 3 cm incision was made through the dermis and subcutaneous fat, and spread to expose the outer surface of the temporal galea (which is not the 'temporal fascia'; (*Brusati* et al., 1984; *May*, 1985; *Tremolada* et al., 1994). An area (4×2 cm) was removed taking some subgaleal fascia with the graft, and was placed in saline with antibiotics and the wound closed using skin staples that were removed after two weeks.

An incision in the upper lid crease was deepened through the orbicularis muscle. Great care was taken to avoid damaging the levator aponeurosis (the upper tarsal vascular arcade should never be directly visible). A suborbicularis dissection was made as deep as possible up to 1.5 mm towards the upper lid margin on the surface of the tarsus, which was then widely exposed in order to snugly accommodate the gold weight. The weight was sutured to the tarsus using two 6/0 nylon sutures, taking care not to penetrate the full thickness of the tarsus (Fig. 2). The galeal graft was then adapted to cover the gold weight and sutured using 7/0 Vicryl stitches (Fig. 2).

Skin and muscle were closed in one layer with 6/0 nylon, which was removed after 4 days.

Follow-up examinations were made after 4 days, 2 and four weeks. At 3 months review, any additional surgery (lateral canthoplasty (*McLaughlin*, 1957), lateral tarsal strip, or lower lid supporting graft) was planned, and finally, the patient was seen one year after surgery. Then the patient was asked to return if any problems developed. Ten of our patients had additional surgery for lower eyelid support during the first operation (seven lateral canthal strips and two auricular cartilage grafts). Subsequently, eleven patients had: four lateral canthal strips, one cartilage graft to the lower eyelid, and six McLaughlin lateral canthoplasties of no more than 3 mm in order to support the lower eyelid and to improve relative insufficiency of the gold weights' action (*Tremolada* and *Aschero Tremolada*, 1997).

RESULTS

No complications were observed in the eyelid or galea donor site. The gold weight was always much less visible than without a galeal graft (Fig. 3). Twenty-three patients (including four who underwent the McLaughlin procedure after 3 months) had stable function and almost perfect symmetry after one year; two patients had minor ptosis but declined any correction. All the patients with dry-eyes showed symptomatic resolution, and expressed a high degree of satisfaction. All but three were seen again during a long-term follow-up ranging from three to nine years, during which it was found that the clinical result was essentially stable.

DISCUSSION

Gold lid loading is probably the most widely used method for permanent eyelid rehabilitation, because of its simplicity, relatively low cost and reliable functional results. However, despite these advantages, the procedure still suffers complications, particularly implant displacement and extrusion (*Jelks* et al., 1979; *Vaillant* et al., 1983; *May*, 1985; *Kartush* et al., 1990). When this is not the case, the implants are usually quite visible especially in Caucasian patients who have thinner eyelid skin and higher eyelid creases (from our previous experience and looking at many patients operated elsewhere). Less common complications relate to selection of the wrong weight, giving insufficient or excessive correction.

It was believed that some of these disadvantages can be overcome by this relatively simple technical modifications introduced over the last decade.

As previously reported (*Chapman* and *Lamberty*, 1988), displacement of this gold weight can be minimized by fixing the prosthesis to the tarsus using

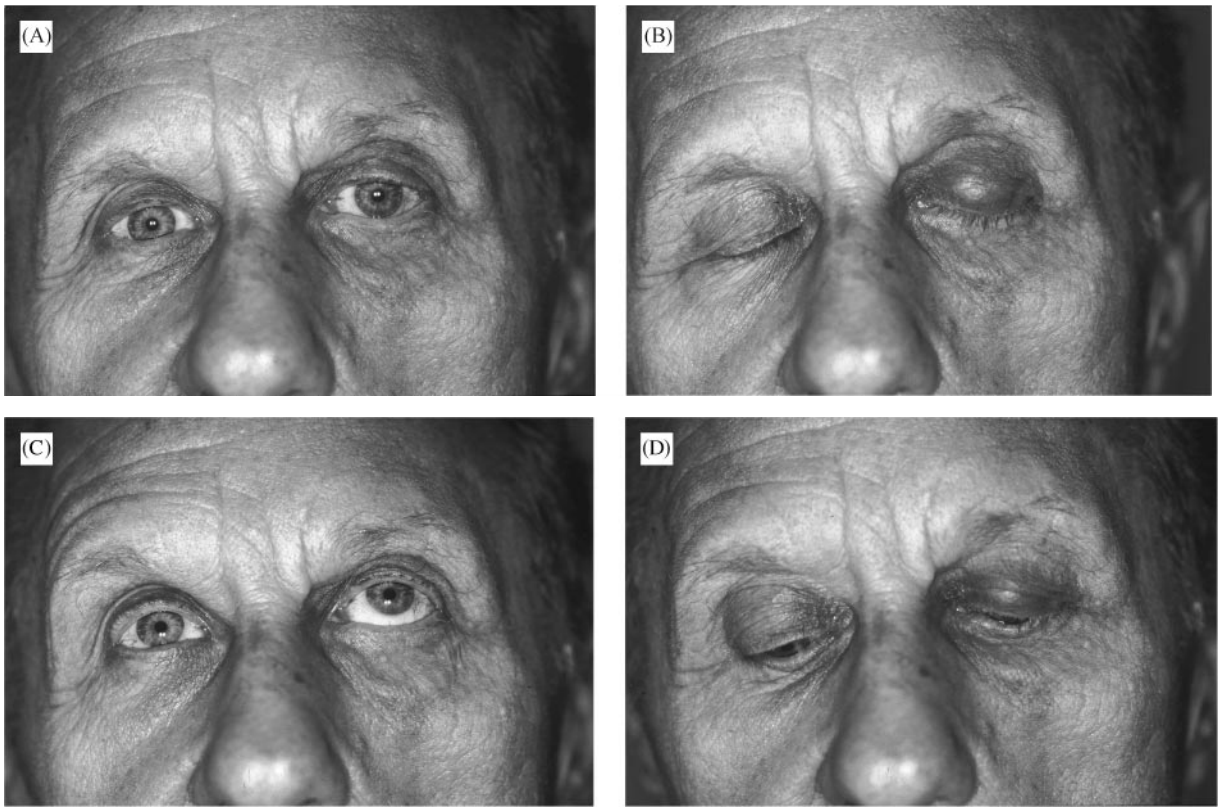

Fig. 3 – Same patient 3-years postoperatively. (A) Eyes open: natural contour, no ptosis; (B) eyes closed: gold implant allows good lid closure and is not visible through skin of upper eyelid. (C, D) natural movement of the eyelid in looking up and down. (This patient underwent further surgery for lower eyelid support during the first operation: 2 mm of lateral canthoplasty using McLaughlin's procedure).

non-absorbable suture material. The use of four holes is the best and the simplest way to fix the prosthesis, although two-holes have also been successful. The rate of extrusion (the most feared complication) is significantly reduced by simply fixing the prosthesis to the tarsus (*Anderson*, 1961; *Morel-Fatio* and *Lalardrie*, 1964; *Wood-Smith*, 1973; *Morel-Fatio*, 1976).

The use of a protective sheet is not new, both ear cartilage (*Ozun* and *Ferrand*, 1994) and alloplastic grafts (*Sheehan*, 1927; *Gillies*, 1934; *Anderson*, 1961; *Morel-Fatio* and *Lalardrie*, 1964; *Wood-Smith*, 1973; *Mühlbauer* et al., 1973; *Morel-Fatio*, 1976; *Mühlbauer*, 1977; *Freeman*, 1979) have led to relatively good results. However, the material used to protect the skin from extrusion should be as thin as possible in order to avoid excessive and unnatural bulkiness, should be readily accessible and of little cost. The temporal galea satisfies all of these requirements and can be easily and quickly harvested. It is preferred to the temporal fascia because it is thinner and probably equally robust.

Visibility is perhaps the most difficult drawback to avoid, but the technical variations described are very useful in minimizing the problem. The use of a custom-made prosthesis based on the patient's tarsus as a template provides a 'unit' that is much less visible than ready-made 'patches'. This is in accordance with *Burget's* (1995) 'unit' and 'subunit' nose reconstructions. Patients have a fuller tarsal subunit postoperatively, and do not show any unnatural rectangular fullness over the tarsus. Thinning the edges of the prosthesis and carefully draping the galeal graft to cover it completely are essential to obtaining a good result. Some authors have suggested placing the weight higher in the lid, but this is mechanically less effective in producing satisfactory closure. Furthermore, in contrast to other authors (*Harvey* and *Anderson*, 1981), it is felt undesirable to detach and then resuture the levator aponeurosis because this may make it difficult to correct palpebral malpositioning. It may also be unwise to place the prosthesis too deep within the eyelid (deep to the tarsus just superficial to the conjunctiva) as this may exert pressure on the cornea and lead to astigmatism (*Schrom* et al., 1999).

The key to avoiding insufficient or excessive correction is to use the right weight. Careful preoperative planning using simple lead weights secured to the eyelid skin by cyanoacrylate glue has led to very satisfactory postoperative results, and the patients can subjectively appreciate the action of the weight for 8–24 h before the lead weights spontaneously detach, and can indicate their preference for a lighter or heavier weight.

CONCLUSION

Custom-made gold lid weights and the use of a protective sheet of temporal galea can substantially improve the result of this relatively simple procedure for repairing paralytic lagophthalmos, certainly in Caucasian patients.

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