

# Lagophthalmos after Facial Palsy: Current Therapeutic Options

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## Key Words

Lagophthalmos · Facial palsy · Lid retraction

## Abstract

As the facial nerve carries sensory, motor and parasympathetic fibres involved in facial muscle innervation, facial palsy results in functional and cosmetic impairment. It can result from a wide variety of causes like infectious processes, trauma, neoplasms, autoimmune diseases, and most commonly Bell's palsy, but it can also be of iatrogenic origin. The main ophthalmic sequel is lagophthalmos. The increased surface exposure increases the risk of keratitis, corneal ulceration, and potentially loss of vision. Treatment options are wide; some are temporary, some permanent. In addition to gold standard and traditional therapies and procedures, new options are being proposed aiming to improve not only lagophthalmos but also the quality of life of these patients.

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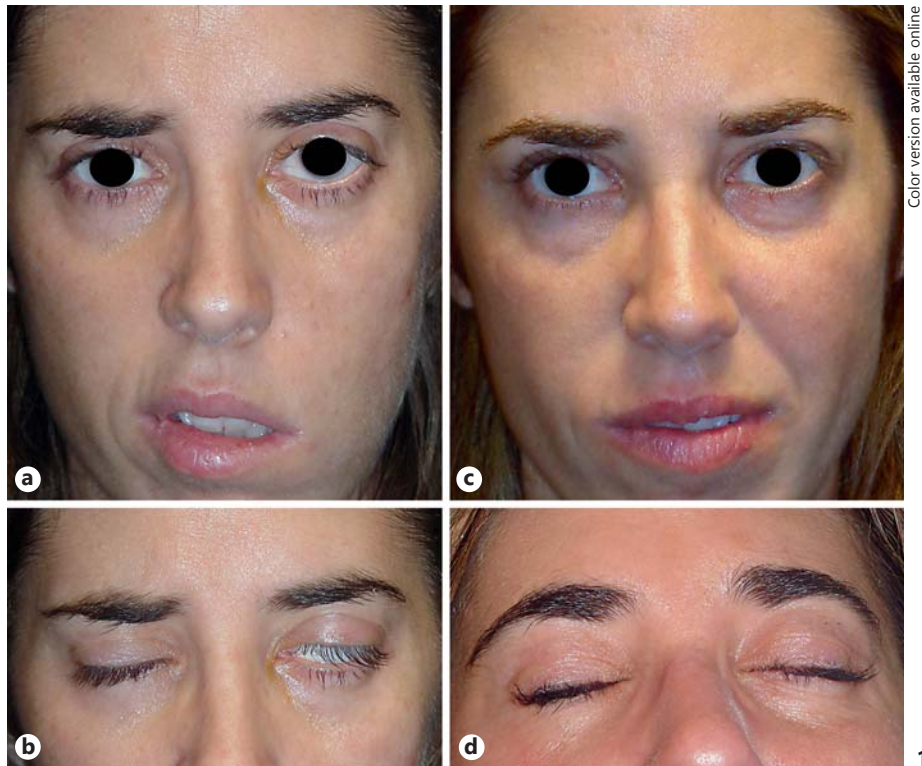
As the facial nerve carries sensory, motor and parasympathetic fibres involved in facial muscle innervation, facial palsy results in functional and cosmetic impairment. Facial palsy can result from a wide variety of causes, Bell's palsy (idiopathic) being the most common (70%) [1], but it can also result from infectious processes, trauma, neoplasms, autoimmune diseases, and it can be of iatrogenic origin [2].

The prognosis of the paralysis has been proven to depend on the cause of nerve damage: traumatic and iatrogenic lesions have less chances of functional recovery, while most patients with Bell's palsy show complete recovery without intervention within 3–4 months [1]. The main ophthalmic sequel is lagophthalmos, or the inability to close the eyes completely. The paralytic orbicularis oculi muscle is unable to promote eyelid closure and with the counterpart force offered by the normal-functioning levator muscle and the effect of laxity and gravity in the lower eyelid, the corneal protection is compromised. The increased surface exposure and the disruption of the tear film put the eye at risk of keratitis, corneal ulceration, and potentially vision loss.

There are several ways to address paralytic lagophthalmos in these patients; some are temporary, some permanent. The decision is based on the clinical examination and basically on the exposure risk of the cornea.

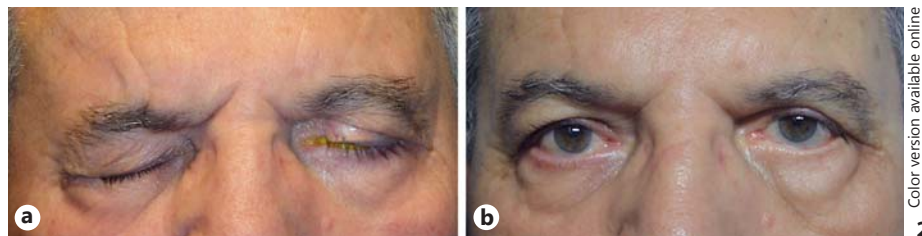
## Non-Surgical or Temporal Therapy

Temporary and non-surgical measures aim to protect the ocular surface while recovery is awaited. They traditionally include the frequent use of artificial tears, ophthalmic ointments, soft contact lenses, protective taping, occlusive moisture chambers, scleral shells and external eyelid weights [2, 3], but new options are constantly being reported.



**Fig. 1.** Patient with left facial palsy secondary to cranioencephalic trauma: 20 days after the trauma, she had evident facial asymmetry and lagophthalmos (**a, b**). Due to good Bell's reflex, only local measures to protect the cornea and mime therapy were prescribed. Good recovery of facial symmetry and eye occlusion was achieved after 1 year (**c, d**) without any other treatment.

**Fig. 2.** Patient with left gold weight present for 10 years. **a** Clinical picture showing good occlusion of his left eye aided by the gold weight present in his upper left eyelid. **b** The weight is visible through the skin when the eyes are closed, but the aesthetic aspect is good when the eyes are open, with proper symmetry and no visibility of the plaque. The thinning of the skin has remained unchanged for almost 4 years.



The American Academy of Otolaryngology and the American Academy of Neurology strongly recommend the use of oral steroids in adults (16 and older) within 72 h of symptom onset for Bell's palsy as it increases the probability of facial function recovery. The use of antivirals is only recommended if associated with steroids as its benefit is not so clear [4, 5].

Regarding rehabilitation techniques, the role of acupuncture as an alternative or adjunct therapy in facial palsy is unproven [6], but mime therapy [7] was found to be effective in improving the functional outcomes (fig. 1). It includes exercises of self-massage, relaxation and breathing, combined with the performance of movements of the face and the pronunciation of letters and words.

The efficacy of botulinum toxin to correct upper eyelid retraction and generate ptosis in paralytic lagophthalmos after facial palsy is well reported. The main concern with this practice is the risk of extension to the superior rectus muscle with consequent hypotropia and reduction of Bell's reflex. Naik et al. [8] recommended the use of a half-inch needle instead of a 25-mm needle to place the toxin in a more anterior position where the relation between the superior rectus and the levator muscle is not as intimate as in the posterior orbit, thereby decreasing the risk of such complications. Yucel and Arturk [9] injected 7.5 IU of botulinum toxin into the upper eyelid adjacent to the midpoint of the superior orbital rim to the orbital roof. A full-length 12-mm-long 27-gauge needle was used to penetrate the orbital septum as closely as possible to the levator palpebrae supe-

rioris muscle. They reported an average of 10 weeks of ptosis with a maximum effect in decreasing the eyelid aperture at week 1 and a gradual increase from week 4 [9].

The advantages of hyaluronic acid as a weight on the upper eyelid include easy and safe in-office administration, low resorption rate due to the diminished motility of the eyelid, and reversibility with hyaluronidase. Mancini et al. [10] applied an average of 0.9 ml of hyaluronic acid gel in multiple layers in the pretarsal and/or prelevator aponeurosis regions of the paralytic upper eyelid with significant improvement of the lagophthalmos. It was used alone and associated with gold weights with residual lagophthalmos, avoiding a surgical intervention for weight exchange.

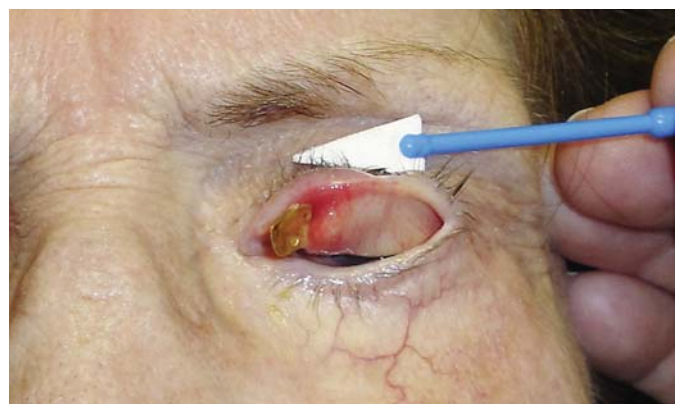
### Surgical Therapy

#### *Upper Eyelid Retraction*

Gold weights have been a mainstay of surgical therapy since Illig [11] first described them in 1958. They are effective and relatively easy to insert and remove, but the incidence of capsule formation, allergy, migration, visibility through the skin (fig. 2) and, finally, extrusion (fig. 3) have made necessary the introduction of new measures to decrease these phenomena [12, 13].

Lessa et al. [14] reported a technique to cover the gold implant with the aponeurosis of the levator muscle. After advancing and suturing the aponeurosis to the tarsus inferiorly, two marginal myotomies were created in order to correct the residual upper eyelid retraction. The pretarsal upper eyelid surface was improved cosmetically, extrusion was avoided, and adequate eyelid position was obtained [14]. The same benefits were reported after the use of autologous fascia lata by Egemen et al. [15].

In a study comparing low- versus high-level insertion of the weight (2 vs. 5 mm from the lid margin), the higher insertion showed better aesthetic outcome, with less bulging and ptosis and good functional results [16]. Rozen and Lehrman [17] used a higher position. Through a skin crease incision, the septum was opened 2 mm above the tarsal plate, the postseptal fat was retracted superiorly and the weight was fixed to the levator aponeurosis. An average of 0.2 g was added to the pre-surgically calculated weight to compensate for the decreased vertical vector of the new position. The technique was used for primary and secondary weight implants, successfully addressing several common problems, such as visibility while the eye



**Fig. 3.** Extrusion of the gold weight. Extrusion is one of the most common complications of lid loads. It can happen through the skin or through the conjunctiva as in this case.

is open and entropion, and decreasing the risk of exposure or extrusion due to multiple layers on top of the weight.

Silver et al. [18] reported the use of thin-profile platinum eyelid weights in 100 patients. They reported a decrease in implant visibility and reduced capsule formation and extrusion compared with the reported rates for gold plates. Berghaus et al. [19] used a flexible platinum chain of their own design in 30 patients and compared the outcomes with 33 patients operated with the same technique but using a gold implant. As the former showed fewer complications with better results, they decided to discontinue the use of gold plates.

A new device was tested in rabbits by Asik et al. [20], consisting of ferromagnetic steel plates attached to the eyelids, which detect blinking of the healthy opposite eyelid, inducing artificial blinking of the paralytic eyelid and therefore addressing the issue of the delayed blinking still present when weight loads are used. However, the device is not yet suitable for humans [20].

Surgical techniques to improve upper lid retraction such as müllerectomy [21] and lengthening of the levator muscle [22] offer good aesthetic results with respect to symmetry in primary position, but as the orbicularis function is not improved and no opposite force is presented to the levator muscle, the lagophthalmos is not fully improved.

#### *Lower Eyelid Retraction and Laxity*

For years, patients with mild to moderate laxity have been treated by means of tarsorrhaphy and lateral or medial canthal tightening procedures. These procedures may



**Fig. 4.** Midface lifting. **a** Patient with right facial palsy secondary to brain tumour surgery, showing upper and lower lid retraction. The consequent lagophthalmos with corneal exposure resulted in severe ulcers. **b** Postoperative aspect after upper gold weight and transconjunctival midface lifting with HPG with resolution of the retraction and therefore also of the lagophthalmos. **c** Patient with left facial palsy with no exposure symptoms but evident midface ptosis. **d** After transconjunctival midface lifting with HPG, good symmetry is achieved, even with a slightly youthful appearance of this side compared with the opposite non-paralytic side.

be insufficient in patients with chronic lagophthalmos, for whom the gravity and the weight of the paralytic cheek play an important role against the weak forces of the canthal tendons. Tarsorrhaphy may be temporal or permanent and is usually located laterally or paracentrally (lateral to the lacrimal punctum) and results a narrowing of the lid aperture, which is an undesirable aesthetic result.

There are many techniques described to give support to the lower eyelid. d'Alcontres et al. [23] used an orbicularis oculi muscle flap from the upper eyelid to the lower eyelid. Taking advantage of an upper blepharoplasty, the orbicularis flap was created with the pedicle at the medial canthus. The flap was then passed through a pretarsal tunnel on the lower eyelid and then anchored to the arcus marginalis. The technique was used on 5 patients, achieving good symmetry and improvement of the lagophthalmos [23].

Hontanilla and Gomez-Ruiz [24] used a strip of palmaris longus tendon or fascia lata to give support to the lower eyelid. The strip was passed through a similar pretarsal tunnel. Using screw anchors, the medial portion of

the tendon was fixed to the frontal apophysis of the maxillary bone (0.5 cm above the medial canthus) and the lateral portion to the external orbital bone, aiming to leave the free border of the lower eyelid 1.5 mm above the pupil in anticipation of the posterior lowering. The authors reported good lower lid position at 2 years' follow-up [24].

For more severe retraction, posterior lamellar spacer grafting may be required. Many autografts and allografts have been used. A hard palate graft (HPG) is considered the gold standard graft but it has the disadvantage of a second surgical site. The use of allografts, such as decellularized porcine-derived membrane (Tarsys) [25] or acellular human dermis (Alloderm) [26], avoids that extra morbidity. Nonetheless, the HPG is reported to have fewer failures and greater lid elevation when compared with allografts [25, 27].

Posterior lamellar spacer grafting combined with midface lifting not only addresses the lower lid retraction, but also the malar ptosis and offers more support against the

gravitational forces with a more stable result over time (fig. 4). According to the study by Ben Simon et al. [28], the use of the HPG enhances the surgical outcomes of midface lifting.

Patel et al. [29] used a tripartite approach (HPG, lateral canthal suspension, and midface elevation) in patients with lower lid retraction (including 5 patients with paralytic aetiology), and Graziani et al. [30] used subperiosteal midface lifting with Endotine midface ST implants anchored to the temporal fascia without any type of graft, both with satisfactory functional and cosmetic results.

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## Conclusions

There is no perfect way to treat lagophthalmos in patients with facial palsy. Many factors need to be taken into account, such as the recovery expectation, age, the degree of lagophthalmos and orbicularis function, Bell's reflex, etc. Each patient requires an individualized approach, most of the time involving two or more different techniques in order to achieve ocular comfort and protection as well as good aesthetic outcome. Knowing all available options is always in favour of our patients.