Hydrocarbon Acid Gel Weight: A Nonsurgical Option for the Management of Paralytic Lagophthalmos

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Objectives/Hypothesis: Management of lagophthalmos should be a priority in the treatment of patients with facial palsy. The aim of the study was to evaluate the safety and efficacy of injecting hydrocarbon acid gel into the upper eyelid as a nonsurgical alternative for patients with temporary facial palsy.

Method/Study Design: Retrospective study of 26 patients treated with hydrocarbon acid gel injected into the pretarsal region of the upper eyelid. Measurements taken before and after treatment were standardized and compared using digitized photographs. Patients were followed up for 1 year, and overall outcomes were assessed.

Results: All patients initially demonstrated improvement in lagophthalmos, which decreased to 0.0 mm. After 1 month, a significant increase in lagophthalmos was observed in two patients (initial fissure of 8 and 9 mm), and a platinum weight was implanted to control keratopathy. The remaining patients (initial lagophthalmos below 6.5 mm) maintained the improvement until facial restoration. Only three patients had recurrent lagophthalmos (2 mm) due to resorption, which was resolved by injecting an additional 0.3 cc. The mean improvement in lagophthalmos was 4.6 mm (range, 3.5–6.5 mm). Complications included transient ecchymosis and minimal blepharoptosis due to nonreabsorption in five patients. These patients were successfully treated with hyaluronidase.

Conclusions: Hydrocarbon acid gel has proven effective in reducing paralytic lagophthalmos and controlling keratopathy in patients with temporary facial palsy, especially those with palpebral fissure with attempted closure no greater than 6.5 mm. Injection of hydrocarbon acid gel is safe, quick, and easily performed. In addition, it is more cost-effective than surgery.

Key Words: Facial palsy, lagophthalmos, eyelid weight, hydrocarbon acid gel.

Level of Evidence: 4.

INTRODUCTION

The balance between the eyelid retractor and the orbicularis oculi muscle is broken in patients with facial palsy; therefore, the orbicularis oculi muscle weakness results in paralytic lagophthalmos.

Almost 70% of patients with facial palsy (any grade) have keratopathy, which in most cases involves punctate epithelial erosions, although corneal ulcer and even corneal perforation (more frequently in those with associated trigeminal palsy) can also be observed.1

Because of this, the management of lagophthalmos should be a priority in patients with facial palsy. The initial approach includes ointments, artificial tears, and other lubricants, as well as moisture goggles and eyelid taping for nocturnal protection. Although these options can minimize ocular problems, they are not normally sufficient to control them.

Surgery offers a reasonable degree of protection and includes static procedures such as temporary tarsorrhaphy2; however, this is used only in very specific cases (e.g., patients who are restless during sleep, patients in deep coma, or patients with severe ocular damage).

Today, dynamic measures are more common. These include springs, magnets, or silicone encircling bands, but the most widely used technique is eyelid weight implantation. For more than 30 years, the weights used were made of gold.3,4 Because these were observed to produce astigmatism,5 they were replaced by platinum chain weights.6 Platinum weights are also prone to complications such as allergy, extrusion, eyelid distortion, blepharoptosis by overcorrection, or residual lagophthalmos by undercorrection.7,8

The hydrocarbon acid gel weight was initially proposed as a minimally invasive technique9 that could obviate the need for surgery and, as it is reversible, benefit patients with nonpermanent facial palsy. Furthermore, implantation of hydrocarbon acid gel could be repeated in cases of undercorrection or when facial recovery takes longer than the duration of the implanted gel.

The aim of the present study was to determine the efficacy, advantages, safety, and potential complications of hydrocarbon acid gel in the management of patients with facial palsy initially considered as temporary.

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MATERIALS AND METHODS

We performed a retrospective chart review of 26 consecutive patients with paralytic lagophthalmos treated with hyaluronic acid gel weight at Gregorio Marañon Hospital (tertiary center) between September 2009 and March 2011. The study patients had facial palsy, considered as temporary, and were only included with a minimum of 1 year of follow-up. Patients with other previous orbital or eyelid disorders were excluded from the study. Fourteen patients were men, and twelve patients were women. The average age was 43 years (range, 19–72 years).

We recorded the etiology of paralytic lagophthalmos, facial palsy grade (House-Brackmann), time from facial palsy to injection, and amount of hyaluronic acid gel used.

The pretreatment, posttreatment, and residual lagophthalmos were measured by photographing the eye face-on, with a surgical ruler leaning against the external canthus. Measurements were then taken by tracing an imaginary vertical line through the center of the cornea between the upper and lower eyelid to the surgical ruler (Fig. 1).

We also recorded recovery time, follow-up treatment, and complications. Before and during treatment, all patients underwent an ophthalmology examination to evaluate keratopathy.

Procedure

All procedures were performed in the clinic or at the bedside. The patient was seated, thus allowing us to check the results after each injection. Our technique involved topical anesthesia (ethyl chloride solution) applied to the area seconds before injection in order to produce a refrigerant effect.

The same gel (Restylane (R)) was used in all cases. We injected it into the pretarsal space under the orbicularis oculi muscle to avoid large superficial deposits, which could cause adverse reactions. We then made a series of small punctures from the lower to the upper part of eyelid and avoided the area adjacent to the upper canaliculus (Fig. 2).

We checked residual lagophthalmos. In cases of large lagophthalmos, we also induced a blockade effect in the elevator muscle by injecting the hyaluronic acid gel over the prelevator aponeurosis.

RESULTS

Hyaluronic acid gel was administered in 26 of the 61 eyelid weight procedures. All patients had partial facial palsy that was expected to resolve in less than 6 months, and all were diagnosed with exposure keratopathy.
In most cases, facial palsy was caused by resection of a vestibular schwannoma (16). Some of the other etiologies included resection of paraganglioma (infratemporal approach) (5), temporal bone trauma (2), Bell palsy (1), iatrogenic trauma (1), and middle ear tuberculosis (1).

Facial palsy was considered grade V (House-Brackmann) in five cases (19%), IV in 18 cases (69%), and III in three cases (12%). The palpebral fissure with attempted closure measured 3.5 mm to 4.4 mm in 15 patients, 4.5 mm to 6.4 mm in eight patients, and 6.5 mm to 9 mm in three patients. The average volume of hyaluronic acid gel used was 0.6 cc (range, 0.3–1 cc).

In all of our cases, lagophthalmos decreased to 0.0 mm immediately after treatment and was accompanied by an improvement in keratopathy.

Twenty-four of the 26 patients maintained the improvement after 2 months, while the remaining two patients had a palpebral fissure with attempted closure measuring 3 mm and 4 mm, respectively. These two patients had undergone a vestibular schwannoma resection and had initially HB grade V facial palsy (lagophthalmos of 8–9 mm). Owing to worsening of keratopathy, platinum chains were implanted. Surgery was uneventful (Fig. 3).

Four months after treatment, 21 patients maintained the improvement, and three had recurrent lagophthalmos (2 mm) due to resorption, which was completely corrected with a repeat injection of 0.3cc of gel.

At 6 months, 17 patients had recovered, while the remainder maintained the improvement until recovery with no need for further injections of hyaluronic acid gel (Fig. 4).

The final check-up was 1 year after treatment, when all patients had their facial palsy resolved (Table I).

The average improvement in lagophthalmos with these treatments was 4.6 mm (range, 3.5–6.5 mm)(Fig. 5).

As for ophthalmological effects, exposure keratopathy was controlled during recovery; all patients underwent periodic ophthalmological examinations, checking the absence of any corneal problem or visual complications. Furthermore, due to improvement in dry eye symptoms, the requirement of adjunctive measures was reduced, keeping in most of the cases some lubricant drops.

Transient orbicular ecchymosis was recorded in only three patients; and minimal blepharoptosis was observed in five patients after 6 months, which was a result of nonreabsorption. These patients were treated with local injection of hyaluronidase (60–70 IU), and the residual hyaluronic acid gel disappeared within 24 to 48 months.

In most cases, facial palsy was caused by resection of a vestibular schwannoma. (A) Lagophthalmos (9 mm) before injection. (B) Immediately after injection. (C) Residual lagophthalmos (3 mm) 1 month after injection. (D) Surgical findings during platinum chain implantation. [Color figure can be viewed in the online issue, which is available at wileyonlinelibrary.com.]

Fig. 3. Photographs of a 49-year-old patient with left facial palsy after treatment for vestibular schwannoma. (A) Lagophthalmos (9 mm) before injection. (B) Immediately after injection. (C) Residual lagophthalmos (3 mm) 1 month after injection. (D) Surgical findings during platinum chain implantation. [Color figure can be viewed in the online issue, which is available at wileyonlinelibrary.com.]

Fig. 4. Photographs of a 44-year-old patient with right facial palsy after treatment of vestibular schwannoma. (A) Lagophthalmos (4 mm) before injection. (B) Immediately after injection. (C) Six months after injection. [Color figure can be viewed in the online issue, which is available at wileyonlinelibrary.com.]
hours. Blepharoptosis resolved and the eyelid returned to normal\textsuperscript{10,11} (Fig. 6).

**DISCUSSION**

The eye is now considered a priority in the management of facial palsy as approximately 70% of patients experience corneal conditions ranging from punctate epithelial erosions to corneal neovascularization and scarring. These conditions could be worse in patients with corneal hypoesthesia as a result of recurrent ulceration, eventually leading to corneal perforation.\textsuperscript{1}

Besides supportive medical measures, various kinds of procedures have been developed. Complete and lateral tarsorrhaphy were initially the most frequently used,\textsuperscript{2} until the advent of upper eyelid weight implants. These techniques proved to be a good option, enabling patients to close the eye by the gravitational action of the predetermined weight and to open the eye by the action of eyelid retractor muscle.

Although different materials have been used to load the upper eyelid, gold\textsuperscript{3,4} and subsequently platinum\textsuperscript{6} were considered first choice because of their inertness, high density, and nonallergic properties. However, in addition to the need for surgery, eyelid weight implantations are prone to complications such as extrusion (ranging from 0%–43% in the literature), migration, blepharoptosis, and residual lagophthalmos.\textsuperscript{7,8}

When hyaluronic acid gel was approved by the U.S. Food and Drug Administration (December 2003) for soft-tissue augmentation,\textsuperscript{12} its functional applications\textsuperscript{13–15} were extended to include upper eyelid loading as an alternative to gold or platinum.\textsuperscript{9}

We applied this technique to patients with different grades of facial palsy that were initially considered temporary. We found an initial 100% reduction in lagophthalmos in all patients. After follow-up, our results showed the technique to be effective in patients with a palpebral fissure with attempted closure no

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Twenty-six patients classified according to their House-Brackman Score (HB score) and palpebral fissure with attempted closure pretreatment (PFAC pre). Hyaluronic acid gel volume injected (HA volume). Palpebral fissure with attempted closure 2, 4, 6 months posttreatment (PFAC 2, 4, 6 months post). Volume of hyaluronic acid gel reinjected (HA volume reinjected). One year of follow-up (1 year post). Complications, transient orbicular ecchymosis, and nonresorption blepharoptosis (NR blepharoptosis).
greater than 6.5 mm (92%). This effect was maintained for at least 4 months without the need for reinjection. In our series, only three patients needed one reinjection before complete recovery. The two patients with lagophthalmos greater than 6.5 mm required a platinum weight implant to control their keratopathy 2 months after injection. The procedure was performed without difficulty, even in patients who had already had treatment.

During follow-up, the 24 patients with complete resolution of lagophthalmos reported no ocular problems and good control of exposure keratopathy.

The complications associated with hyaluronic acid gel are minor most of the time.16 Although the risk of serious complications is remote, intravascular injection may cause tissue necrosis17 and arterial embolization,18 which could lead to severe complications, as with any type of filler. In our study and in previous works,9 only minor complications were reported. Transient orbicular ecchymosis affected three patients, and in five patients minimal blepharoptosis due to nonreabsorption caused a long-term cosmetic problem, which was easily resolved with hyaluronidase injections.10,11

CONCLUSION

In conclusion, hyaluronic acid gel loading of the upper eyelid is an attractive procedure that obviates the need for more invasive procedures. It can be useful in temporary facial palsy and in patients that can not consider surgical management. The duration of the gel adjusts perfectly to the management of patients with nonsevere lagophthalmos, and injections can be repeated until facial palsy resolves completely. The technique has proven effective in reducing paralytic lagophthalmos and in controlling the accompanying exposure keratopathy. The
technique is also safe and quick and can be performed at the bedside or at the clinic, thus reducing costs.

BIBLIOGRAPHY