

# **MODERN MANAGEMENT AND REHABILITATION OF THE EYE IN FACIAL PARALYSIS**

**By**

**Robert E. Levine, M.D.\***

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## **INTRODUCTION**

This is the first in a series designed to update the membership as to the latest modalities available to manage problems with the eye following facial paralysis. This article will deal with normal lid function, the goals of therapy in restoring that function, and current concepts in medical management. In a subsequent article, I will explain the principles of lid reanimation with the enhanced palpebral spring.

## **NORMAL EYELID FUNCTION**

Aesthetic considerations aside, the major function of the eyelids is to protect the eye. They do this in a variety of ways. Both lids cover a portion of the globe, limiting the extent to which evaporation can take place from its front surface. Both lids also participate in the re-wetting of the front surface of the eye that occurs with every blink. The upper lid is principally responsible for the blink movement, moving through an excursion of 7-9 mm, whereas the lower lid moves upward only 1-2 mm with the normal blink. The lower lid, however, has the additional function of supporting the lake of tears which is the reservoir upon which the upper lid relies to obtain fluid to draw across the front surface of the eye and wet the cornea. The position of the lower lid therefore is critical. When it is too low, not only is the lower portion of the eye exposed, but the tear lake is not available for distribution by blinking. In addition to the blink function which re-wets the front surface of the eye, blinking is required to protect the eye from foreign material which approaches it. During the night, blinking is replaced with lid closure, protecting the eye from injury and drying during the period of somnolence.

## **ABNORMAL LID FUNCTION IN FACIAL PARALYSIS**

Both the upper and lower lids are innervated by the seventh cranial nerve (the facial nerve). This nerve provides muscle tone, which supports the lower lid. It also triggers the orbicularis oculi muscle, which blinks and closes the eye. The upper lid in addition contains the levator muscle which opens the eye and is supplied by the third cranial nerve. Since the third cranial nerve comes to the eyelid from directly behind the eye, it is typically not involved by problems occurring in the area of the facial nerve, such as acoustic neuromas which occur in the eighth cranial nerve, adjacent to the seventh cranial nerve and frequently involving it. As a result, the levator (opening muscle) continues to work even when the orbicularis (closing muscle) does not. The upper lid is therefore pulled open to a wider than normal configuration when the facial nerve is not working. At the same time, the lower lid droops and/or falls away from the eye because the lower lid is no longer supported by muscle tone supplied through the facial nerve. A secondary result of the wider eye is increased surface area for evaporation, compounding the problems of absent or reduced blinking and closure, as well as a malpositioned (and therefore possibly unavailable) tear lake.

## **NORMAL TEAR FUNCTION**

Normal tears consist of three principal components: An inner mucinous layer, a central watery layer, and an outer oily layer. The function of the inner mucinous layer is to bond the tears to the eye. The function of the outer oily layer is to decrease evaporation of the watery layer which makes up the bulk of the tears. The watery portion of the tears is manufactured by the lacrimal gland which sits underneath the orbital rim at the upper-outer aspect of the eye. The mucinous and oily layers are manufactured in glands in the conjunctiva and eyelids.

The innervation to the lacrimal gland is supplied by a network of very thin fibers which are wound, like a grapevine, around the facial nerve. Although they are not truly part of the facial nerve, they are frequently injured when the facial nerve is injured by acoustic tumors. As a result, the nerve supply to the tear gland fails and the result is a dry eye, compounded by the increased dryness due to the failure of lid function as described above. The mucin glands of the eye try to compensate, although unsuccessfully, for this increased dryness, frequently resulting in a mucinous discharge when a dry eye is present.

The drainage of tears is not a static process like water going down the drain in a sink. Rather, it is a dynamic one, like water being removed by a sump pump. The pumping mechanism is dependent on the movement of the orbicularis muscle to propel the tears through the tiny openings and channels (tear puncta and canaliculi) at the nasal aspect of each eye. When the facial nerve is not working, the tear pump is also not working and tears are not drained from the eye. If tear innervation is intact, lacrimal pump failure results in a wet eye. If tear innervation is decreased or absent, lacrimal pump failure ameliorates the situation by retaining the tears already present in the eye.

## **GOALS OF THERAPY**

The goals of therapy follow directly from an understanding of normal lid and tear function. Each component of therapy is an attempt to replace or emulate the elegant mechanism that God initially created. Very simply, we want to put the lower lid back where it belongs, reanimate the upper lid so that it can again blink and close, add artificial lubricants when tears are absent or deficient, and do whatever else we can to protect the cornea while the lids are physiologically unable to do so.

## **ROLE OF SURGICAL THERAPY**

Surgical intervention is utilized when medical management alone fails to adequately protect the eye, or when it is reasonable to assume that a long period of recovery (six months or more) will be required for facial nerve function to return. Of course, the decision needs to be individualized for every patient. Unfortunately, we do not have available a meter that we can connect to the facial nerve to tell us how long it will take for recovery. What we do have are some clinical guidelines developed from experience. Typically, if the facial nerve is intact, stimulates well at the end of surgery, functions well immediately after surgery, and then starts to function poorly, this is a favorable scenario. The likelihood is good for short-term rather than long-term recovery. On the other hand, if the facial nerve had to be cut and re-anastomosed at the time of surgery in order to remove the tumor, if a nerve graft were required, or if the nerve stimulated poorly and functioned poorly immediately after surgery, a longer period of

recovery would be anticipated. In the latter cases, the need for surgical intervention is much greater. In any given patient, the treatment plan must be based on the prognosis assessment combined with modalities to address each specific deficit.

### **RESTORING LOWER LID POSITION WITH TAPE**

An effective way of elevating the lower lid and opposing it to the globe for the short term is X-taping. A small strip of tape, approximately one-eighth inch wide, is placed on the lower lid. The end of the tape starts at the middle of the lid, approximately one-quarter inch away from the lashes. The tape is then pulled up and laterally like a pull-tab until the lid position is corrected. The tape is then set down on the skin along the remainder of the lid, extending approximately three-quarters of an inch beyond the lateral end of the lid. The upper component of the X-taping is described below.

### **SURGICAL CORRECTION OF LOWER LID POSITION**

The lower lid is suspended at each end by tendons, analogous to a hammock suspended by ropes. Tightening the tendons at the medial aspect of the eye (medial canthoplasty) stabilizes the medial aspect of the lid and allows the lid to be pulled taught by tightening the lateral canthal tendon (lateral canthoplasty). Often, these procedures are enough to elevate the lid.

If additional elevation of the lower lid is required, it can be accomplished by utilizing various slings or stents. The slings can be formed from tissue from the upper leg (fascia lata graft) or preserved tissue of a similar type, tendon from the forearm (palmaris longus graft), tissue from adjacent to the eye (temporalis fascia or muscle), or artificial material such as silastic. Stents to stiffen and elevate the lower lid can be formed from ear cartilage (auricular cartilage graft), nasal cartilage or hard palate. My own preference is to use a stent made of a plastic material (Porex) as it avoids creating a surgical donor site. The procedure selected will of course depend on the choices of the individual patient and surgeon.

In severe cases, the drag of the mid-face on the lower lid works to decrease the effect of procedures done to elevate the lid. In those cases, some form of stabilization of the mid-face is necessary, ranging from elevating the mid-face through an incision between the eyelid and the eye, to doing a suspension in the cheek area, or doing a full-blown mid-face lift (often in conjunction with a complete face lift on that side).

### **IMPROVING UPPER LID CLOSURE WITH TAPE**

For short-term management, X-taping the upper lid during the day and/or taping it shut at night is an excellent solution. To X-tape the upper lid, a one-eighth inch strip of plastic tape is placed across the lid fold, beginning in the middle of the lid. The tape is then pulled down and laterally (forming an X with the tape on the lower lid, hence the name X-taping). Enough tension should be placed on the lid to get it just closed on attempted lid closure. If this amount of tension is uncomfortable, one might settle for slightly less. The result of the X-taping is to narrow the lid fissure and decrease drying, as well as giving some simulation of a blink.

In mild cases, a small piece of tape (approximately one-half inch long and one-quarter inch high) placed in the center of the lid fold serves to limit the upper movement of the lid. This too

narrows the lid fissure and assists closure. Taping at bedtime can be accomplished either with a vertical or horizontal piece of one-inch plastic tape. Forming a tab at the end of the tape facilitates tape removal.

It is important to note that patients should never patch their eyes to achieve closure. The eye may open under the patch without the patient being aware of it, in which case the patch will rub on the cornea and do severe damage. This risk is eliminated by taping since the tape is stiff and will not rub on the cornea. Also, since plastic tape is translucent, the patient is aware when the eye becomes open and can deal with the problem.

### **SURGICAL REANIMATION OF THE UPPER LID**

Whereas in the past sewing the lids together or partially together (tarsorrhaphy) has been used, the more modern methods of gold weight lid-loading and enhanced palpebral spring implantation have, for the most part, replaced tarsorrhaphy as the procedure of choice when surgical lid reanimation is needed. I have personally replaced numerous tarsorrhaphies with eyelid springs, with gratifying results from the patients' standpoint. The ongoing use of tarsorrhaphy as a treatment modality should, except in very specific instances, be discouraged. Gold weights and lid springs will be discussed in more detail in subsequent articles in this series.

### **BROW ELEVATION**

A drooping brow is a common part of the facial paralysis picture, especially in older patients. The weight of the drooping brow assists lid closure in some patients. If brow elevation is contemplated, it is important to evaluate its effect on lid closure. In general, surgery to reanimate the lid (spring implant or weight) is a prerequisite to brow elevation, except in mild cases.

### **LASH PROBLEMS**

The most frequent lash problems encountered in facial paralysis are a downward tilt of the lashes of the upper lid, and aberrant lashes occurring at the site of prior tarsorrhaphy surgery. Downward tilting lashes can be addressed surgically by a series of sutures placed at the level of the lid fold (supratarsal fixation sutures) which pull the lashes back into their correct position. The aberrant lashes can be treated with electrolysis or the argon laser (my preference) to destroy the roots of the lashes and prevent regrowth. The procedure is simple, but several sessions may be required to eliminate all of the problem lashes.

### **LUBRICANTS**

A wide variety of drops and ointments are available. These are detailed in the list I included in the ANA booklet, "Eye Care after Acoustic Neuroma Surgery". Basically, drops vary from very thin watery drops to medium-weight drops, to heavy oily drops. The thinner the drop, the less blur it creates, but also the shorter its duration of action. The thicker the drop, the more protection it provides, but also the more blur. The trick is then to mix and match drops to obtain the adequate level of protection required without excess blur. For those patients who are sensitive to drops, preservative-free drops are also available.

Ointments and gels are longer lasting than drops but create considerable blur. They are best used only at night. Use just enough to provide protection without resultant excess gel or ointment still being present in the morning. They may also be of use in cases where the eye is not being used, for whatever reason (occluded because of double vision, decreased vision from intrinsic ocular causes, etc.).

### **BANDAGE CONTACT LENSES**

Bandage contact lenses are soft contact lenses used for their protective value rather than to correct refractive errors. Think of a bandage contact lens as a transparent moist sponge placed on the cornea. The lenses help to keep the cornea well-lubricated and protect the cornea against drying and mechanical irritants. Because soft lenses become hard and brittle when they become dry, it is important to lubricate the eye adequately while using bandage lenses. Concurrent use of

X-taping often helps keep the contact lens in its proper position.

Exciting new developments in the contact lens field include high water content lenses and lenses with high oxygen permeability. Lenses are now available with two to three times the oxygen transmission that was available a year or two ago.

I have seen many patients with facial paralysis who have been told in the past by their eye practitioners that because of their paralysis and dry eye they could not wear contact lenses. Generally speaking, with the modern lenses available, and the adjunctive use of X-taping, that is no longer true. Bandage lenses are an extremely important and very under-utilized modality in providing protection and comfort in the presence of facial paralysis.

### **ADJUNCTIVE DEVICES**

Simple techniques such as using swim goggles in the shower to keep shampoo out the eye, humidifying the air with a room humidifier to decrease corneal drying, using a one-sided goggle (moisture chamber) to protect the eye in the presence of such things as air jets on airplanes, fans and nearby air conditioners, can improve the quality of life for patients with ocular problems.

I frequently explain to patients that oculoplastic surgeons cannot make the lids work as well as the original manufacturer. However, we have many ways of doing better than we used to.

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\* Dr. Levine is a member of the ANA Medical Advisory Board, Clinical Professor of Ophthalmology at the USC School of Medicine, and Co-Founder & Co-Director of the Facial Nerve Disorder Center of the House Ear Clinic in Los Angeles, California. As an oculoplastic surgeon with a special interest in facial paralysis, he has cared for thousands of patients with facial paralysis over the past 30+ years.

