ORIGINAL ARTICLE

Medial canthoplasty and platinum-weight implant: Strategy for prevention of ocular complications following facial palsy

Roberto Filipo MD, Elio De Seta MD, Rocco Plateroti MD, Giorgio Balsamo MD, Annarita Vestri MD, Gian Antonio Bertoli MD

From the Department of Otolaryngology (Roberto Filipo, Elio De Seta, Giorgio Balsamo, Gian Antonio Bertoli), Institute of Ophthalmology (Rocco Plateroti), Department of Experimental Medicine and Pathology (Annarita Vestri), University of Rome, La Sapienza, Italy.

Correspondence
Prof. Roberto Filipo
Policlinico "Umberto I" Clinica Otorinolaringoiatrica
Via del Policlinico 155 Rome
00161 - ITALY

Phone: +39064454607
Fax: +39064454864
E-mail: roberto.filipo@uniroma1.it

Submited: 28 November, 2005
Revised: 18 January, 2006
Accepted: 18 January, 2006

Mediterr J Otol 2006; 2: 9-13

OBJECTIVE: To evaluate medial canthoplasty and platinum-weight implant, intraoperatively or in an early postoperative period, when a negative prognosis in terms of facial function recovery is seen, to avoid serious ocular complications as a sequelae of neuro-otological surgery.

MATERIALS AND METHODS: Ninety-eight patients underwent surgery for otologic and neuro-otologic pathologies; 25 patients had persistent facial palsy and underwent medial canthoplasty and/or platinum-weight implant. The reliability of such techniques was evaluated via the measure of lagophthalmos through the area of scleral exposure before and after the operations.

RESULTS: All patients showed a statistically significant reduction of scleral exposure after surgery, both with open and closed eyes. All patients reported subjective improved comfort after the oculoplastic procedures.

CONCLUSIONS: Intraoperative facial nerve function and an immediate postoperative clinical observation can predict the necessity of some oculoplastic procedures to prevent ocular complications caused by paretic lagophthalmos. Medial canthoplasty and platinum-weight implant are effective procedures for preventing ocular damage in facial palsy.

Otologic and otoneurosurgical procedures can sometimes cause postoperative facial palsy.[1] There are cosmetic and functional problems related to this pathologic condition. Weakness of the orbicularis muscle causes the incomplete closure of the superior eyelid while the inferior eyelid relaxes causing mucosal eversion (paralytic ectropion) due to the loss of muscular tone. The lagophthalmos in association with insufficient tearing causes alterations of the corneal epithelium. An eventual loss of function associated with the fifth cranial nerve causes further damage to the corneal epithelium due to reduction of corneal sensitivity with the abolition of the blink reflex and loss of the neurotrophic effect on the epithelium itself.[2]

Medical solutions have been suggested to prevent or cure these complications: simple artificial hydration of the corneal epithelium or the temporary external application of weights in the superior eyelid. Surgical procedures suggested are tarsorrhaphy; oculoplastic surgery with implant of weights, magnets, or springs on the superior eyelid; medial or lateral canthoplasty; cartilage implants in the inferior eyelid; and shortening the inferior eyelid. More complex surgical options consist of muscular transpositions, neural anastomosis, and other procedures.[3-7]

The aim of this study, based on analysis of ocular complications in patients with a seventh nerve paralysis following otosurgery and otoneurosurgery, is to propose a treatment mainly based on prevention of ocular complications rather than therapy for the ocular damage.

MATERIALS AND METHODS

A retrospective study has been carried out on 98 patients (90 acoustic neuroma, 5 jugular glomus, and 3 chronic otitis media). These patients were evaluated for the evolution of ocular complications subsequent to facial-nerve paralysis. Management of these patients consisted in a presurgery clinical evaluation with electromyography (EMG) of the facial nerve and ophthalmologic evaluation. On the first day after surgery, in subjects with a paralysis of at least the fourth degree on the House-Brackmann scale,[8] ocular treatment consisted of the administration of an ophthalmic gel (methylcellulose 1%) 3 times a day, positioning surgical tape on the superior eyelid, and bandaging of the eye. After 1 week, a new clinical evaluation of the degree of paralysis was carried out with an ophthalmologic investigation that included the evaluation of the trophic condition of the cornea expressed on a scale of 5 degrees (conjunctival hyperemia, corneal abrasion, exposure keratitis, ulcerations, corneal perforation).

Photographic evaluation allowed the measurement of the scleral exposure area (SEA, mm2) with the eye open and closed; data have been expressed as a percentage of area measured in the healthy contralateral open eye. In the cases with no improvement of the degree of palsy, hydrating therapy was continued along with physiotherapy.[9]

The monthly follow-up consisted of the evaluation of the paralysis carrying out the same investigations as previously, verifying the improvements in or persistence of lagophthalmos.

The surgical procedures carried out were medial canthoplasty (MC) and platinum-weight implantation (PWI) in the eyelid. The choice between MC or PWI is based on the following criteria: MC in patients with lagophthalmos associated with atony of the lower lid and ectropion with or without eversion of the lachrymal punctum; PWI in patients with complete atony of the superior eyelid; and combined MC and PWI when these conditions are associated.

The criteria for surgical operation on ocular lesions were conjunctival hyperemia lasting more than 1 month or early keratitis.

Twenty-five patients underwent surgery 3 to 12 months after the onset of facial palsy (mean 4.6 months). The House-Brackmann scale and EMG were not used as criteria of selection.

The surgical technique for MC starts with the infiltration of the medial canthus region (1% lidocaine with epinephrine 1:100,000) after superficial corneal anesthesia with oxybuprocaine drops. A 5-mm quadrangle of skin is excised over the lachrymal canaliculus supe-

rior and inferior, avoiding damage to these structures. Sutures (5-0 Vicryl®) are put in place to create a synechia between the lower and upper eyelid (Figures 1A-D).

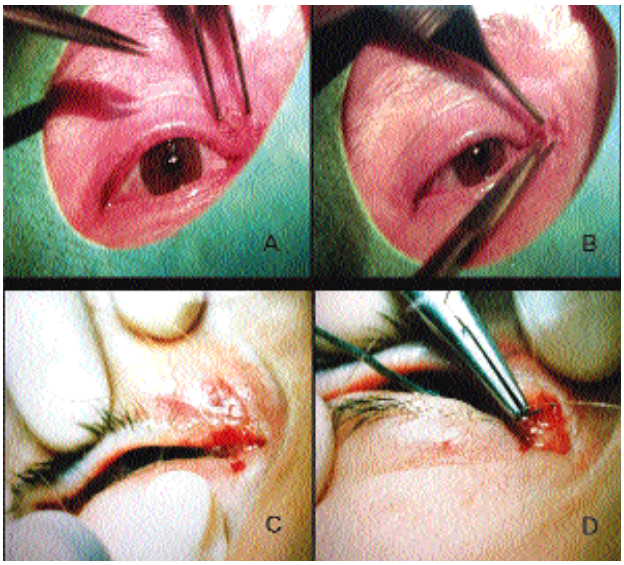

Figure 1A, 1B, 1C, 1D: Surgical technique for medial canthoplasty.

In the PWI technique, an 8-mmx4-mm, gold or platinum, curved plate implant is used, with a rectangular-ellipsoid shape and larger horizontal axis, 1 mm thick with weight between 1.2 and 1.4 g. Weights have a hole 1 mm in diameter in the upper part to allow their fixation to the tarsus with a 5-0 Maxon® suture and 2 small holes (0.6 mm) in the lower part for the ingrowth of fibrous tissue to stabilize the implant. The surgical technique for PWI implant starts by outlining the supratarsal crease with a marking pen and infiltrating the upper lid with 1% lidocaine with 1:100.000 epinephrine. After incision, a pretarsal pocket is created under the orbicularis muscle; a 5-0 Maxon® suture is used to fix in place the implant, and an interrupted skin suture with 5-0 Polypropylene® is used.

One month after surgery, an evaluation of the corneal epithelium and a measurement of the SEA is carried out.

RESULTS

The MC and PWI, individually or in association, gave subjectively good to excellent results as regards subjective ocular comfort, reduction of the sense of dryness, and improved sense of protection of the eye, in accordance with the visible reduction of the SEA (Figures 2A-B).

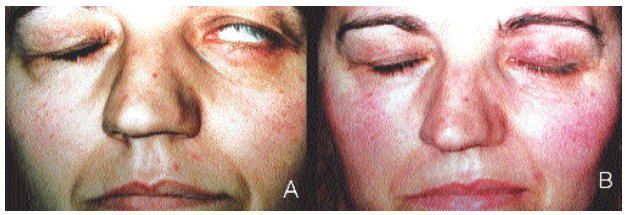

Figure 2A, 2B: Scleral exposure and postoperative results.

Figure 3 shows the mean and 95% confidence interval (CI) of percentage of the SEA presurgery and postsurgery with the open eye. Figure 4 shows the mean and 95% CI of percentage of the SEA presurgery and postsurgery with the closed eye.

Data were analyzed using the SPSS/PC program. We used the Wilcoxon signed rank test for detecting response changing due to experimental intervention before and after design, because the distribution of the variables is not normal. The Wilcoxon signed rank test considers information about both the sign of the differences and the magnitude of the differences between pairs; it is more powerful than the sign test. In this study, we report the error-bar charts that plot the CI and SD of considered variables.

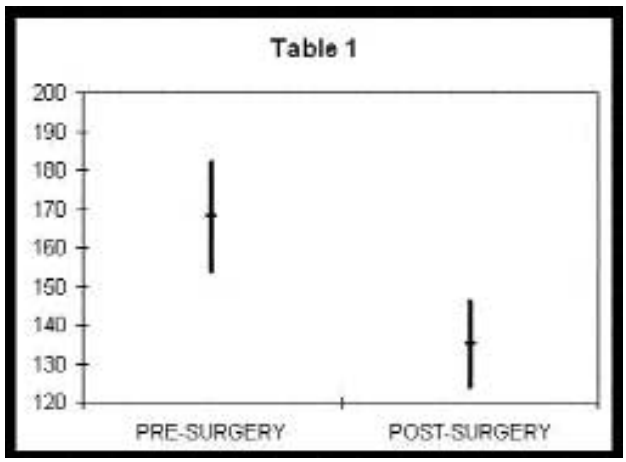

Figure 3: Mean and 95% confidence interval of percentage of area of scleral exposure presurgery and postsurgery with the open eye. Data have been expressed as a percentage in regard to the healthy contralateral open eye.

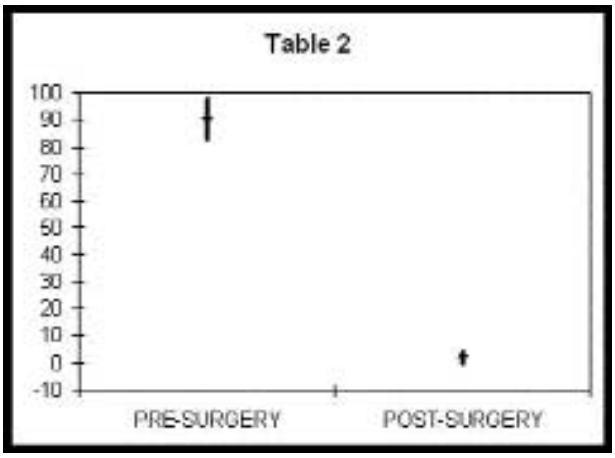

Figure 4: Mean and 95% confidence interval of percentage of area of scleral exposure presurgery and postsurgery with the closed eye.

The difference between presurgery with the open eye and postsurgery is statistically significant (Wilcoxon Z=-4.288, P=.000). Also, the difference between the presurgery with the closed eye and postsurgery is statistically significant (Wilcoxon Z=-4.374, P=.000).

We had 1 patient with dehiscence of the suture and 3 patients with unaesthetic appearance of the eyes due to unpleasant scars after MC surgery. We also had 1 patient with extrusion, 1 patient with dislocation, and 1 patient with ptosis due to excessive weight after PWI surgery.

These patients underwent a surgical revision without other complications.

DISCUSSION

The main goal in the management of patients affected by seventh-nerve paralysis is to preserve the eye physiology with low-invasiveness of treatments.

Smith and Goode showed a variety of physical procedures that maintain a high degree of humidity on the corneal epithelium to delay the complications of paralysis that does not tend to improve.[10] However, this kind of management needs careful adherence by the patient, which could decrease in time. In our patients, a few cases of corneal alterations such as corneal dysepithelization or ulcers occurred several months after otoneurosurgical operation. The hydrating therapy, if correctly applied, protects the paretic eye from complications but, sometimes, is not enough and only delays surgery for resolution of the lagophthalmos.

We chose only MC and PWI from the surgical techniques described in literature because the other techniques present some disadvantages. Tarsorrhaphy tends to tighten excessively the rima palpebrarum; lateral canthoplasty restricts the area of vision, doesn't protect the central and medial corneal epithelium area, and also causes a predisposition to abnormal growth of the eyelashes; eyelid springs and magnet implants have high rate of extrusion; the Arion technique, with the positioning of a specific eyelid silicon strip, can possibly cause slackening and ruptures.[11]

For infections, extrusions or thinning of eyelids, Foster and colleagues suggested human processed pericardium as a barrier for the implant; it appears to be well tolerated in early follow-up.[12]

Berghaus and colleagues found a higher rate of complications with gold implants compared with a new upper-lid flexible platinum-chain prostheses, especially for astigmatism and bulging.[13]

In our examination, the improvement of the corneal damage confirms the usefulness of MC and PWI for treatment of lesions caused by lagophthalmos. The 2 techniques seem to be adequate for treatment of different degrees and types of corneal exposure. Patients with hypotonicity and a lengthening of the inferior eyelid and potential candidates for lower-eyelid–shortening surgery were successfully treated with combined surgery, because the increased lengthening of the superior eyelid mimics a surgical shortening of the inferior one. Furthermore, immediate canthoplasty prevents the lengthening and consequent relaxing of the inferior eyelid, with the advantage of avoiding an operation for shortening, mandatory when this situation is definite.

The analysis of the results leads to some important conclusions: All patients underwent oculoplastic surgery only when a corneal lesion was present; our oculoplastic procedures are surgically reversible, if improvement, spontaneous or aided by physiotherapy, is shown.

These considerations induced our group to propose a new therapeutic strategy in the treatment of paralyzing lagophthalmos, based essentially on prevention rather than treatment of corneal lesions. We operated on the majority of patients between 3 and 12 months. Essential is the evaluation of negative prognostic factors like the removal of a giant tumor, weak EMG response at the end of surgery,[14] or forced intraoperative neurorrhaphy. These factors may influence performance of oculoplastic procedures at the end of otoneurosurgical operations to avoid the problems caused by ocular dryness and the need for continuous hydration therapy, with a better quality of life in the early postoperative time. The surgical reversibility of the procedures that we have described is the essential ethical and technical factor for this therapeutic strategy.

A further criterion for the prevention of corneal lesions concerns the patients with facial palsy and without intraoperative negative prognostic factors. A negative prognosis in these patients is due to the time-lapse after the operation, the health of the corneal epithelium, and the area of corneal exposition. Giving a numeric value to each of these elements, we could determine a score related to the need for ocular surgery in all patients.

In conclusion, the usual therapeutic approach used sometimes leads to serious ocular complications. Our strategy is the prevention of rather than treatment of ocular damage.

REFERENCES

1. Kartush JM, Lundy LB. Facial nerve outcome in acoustic neuroma surgery. In: Jackler R, editor. Acoustic Neuroma. Philadelphia: WB Saunders Co. 1992;669-91.
2. Beuerman RW, Schimmelpfennig B. Sensory denervation of the rabbit cornea affects epithelial properties. Exp Neurol 1980;69:196-201.
3. May M, editor. The Facial Nerve.1st ed. New York: Thieme Inc. 1986;.
4. Duvall AJ, Foster CA, Lyons DP, Letson RD. Medial canthoplasty: early and delayed repair. Laryngoscope 1981;91:173-82.
5. Dinces EA, Mauriello JA Jr, Kwartler JA, Franklin M. Complication of gold weight eyelid implants for treatment of fifth and seventh nerve paralysis. Laryngoscope 1997;107:1617-22.
6. Foda HM. Surgical management of lagophthalmos in patients with facial palsy. Am J Otolaryngol 1999;20:391-5.
7. Kinney SE, Seeley BM, Seeley MZ, Foster JA. Oculoplastic surgical techniques for protection of the eye in facial nerve paralysis. Am J Otol 2000;21:275-83.
8. House JW. Facial nerve grading system. Laryngoscope 1983;93:1056-69.
9. Barbara M. Early physical rehabilitation of the facial nerve improves the facial functions. Paper presented at the IV Congress of the European Skull Base Society. 1999. Nurberg. Abstract.
10. Smith MF, Goode RL. Eye protection in the paralyzed face. Laryngoscope 1979;89:435-42.
11. Arion HG. Dynamic closure of the lids in paralysis of the orbicularis muscle. Int Surg 1972;57:48-50.
12. Foster JA, Perry JD, Cahill KV, Holck DE, Kugler L. Processed human pericardium barrier for gold weight implantation. Ophthal Plast Reconstr Surg 2004;20:107-9.
13. Berghaus A, Neumann K, Schrom T. The platinum chain: a new upper-lid implant for facial palsy. Arch Facial Plast Surg 2003;5:166-70.
14. Kombos T, Suess O, Kern BC, Funk T, Pietila T, Brock M. Can continuous intraoperative facial electromyography predict facial nerve function following cerebellopontine angle surgery? Neurol Med Chir (Tokyo) 2000;40:501-5.