Radiosurgery aids in salivary gland transplants for severe dry eye

Radiosurgically assisted transplantation of labial salivary glands to the conjunctiva can reduce symptoms of severe dry eye.

by Peter Raus, MD

Special to Ocular Surgery News

Severe dry eye is an important and common problem. Although many different types of artificial tears, gels and ointments are available, frequent eye drop instillations sometimes offer only temporary or partial relief of symptoms.

Transplantation of salivary glands can be a more fundamental solution. These glands are easily accessible, and their secretion product is very similar to natural tears.

For transplantation in cases of severe dry eye, we use the labial glands of the lower lip. These form a group of lobula that are so numerous, they form an almost compact layer between the quadratus labii muscle and the oral mucosa. Each lobule is approximately 2 mm by 2 mm by 3 mm and has a short excretory duct that exits in the oral cavity.

The secretions of the various glands have distinct characteristics; in the labial glands, it is mixed mucoserous and very similar to the composition of natural tears but more viscous. Its lipid level is four to five times greater than in other salivary glands. This aspect makes it suitable to replace natural tears. In addition, whole saliva is known not to damage the ocular surface.

Transplantation of salivary glands for the treatment of dry eye has been described in the literature. The technique of transplanting labial salivary glands that we use was first described by Prof. Juan Murube del Castillo and colleagues. I modified the protocol and used Ellman high-frequency/low-temperature radiosurgical equipment for all 10 of the transplants we performed for this study.

Radiosurgery

Radiosurgery is the passage of high-frequency radio waves (4 MHz) through soft tissues to cut, coagulate or remove that tissue. The resistance of the tissue to these waves causes the water in the cells to heat and the cells to volatize.

The radio waves produced by the radiosurgery unit are transmitted through the handpiece and its active electrode and are focused in the tissue by an antenna plate. This technique has been shown to yield only very limited collateral tissue damage when an ultrafine wire electrode, a low-power setting, the fully filtered waveform (cutting mode of the unit) and fine, light strokes are used.

The unit can deliver different waveforms. For this particular intervention I prefer the cut/coagulate mode, which gives 50% cutting and 50% coagulation. The small coagulation effect limits the bleeding of the highly vascular mucosa. The depth of the incision is controlled by using insulated needle electrodes. These electrodes have a fine, insulated tip with only 1 mm of needle exposed, which limits the penetration.

In this way, mucosa and salivary glands can be excised without damaging the firm glandular structures or the quadratus labii muscle.

Material and methods

Through April 2003, 10 patients with severe dry eye were operated with this technique using the patented Ellman Surgitron high-frequency/low-temperature radiosurgical generator. All patients were previously examined by other ophthalmologists and diagnosed with severe dry eye. They all tried different types of artificial tears, gels and/or ointments with insufficient results.

All patients were treated using the same protocol:

Therapy began with artificial tears.

If results were insufficient, therapy was changed to administration of gel during the day and eventually ointment at night.

If this therapy did not give satisfactory results, the lower punctum was closed in a reversible way, using silicone plugs and/or cutting the upper canaliculus and coagulating the cut ends.

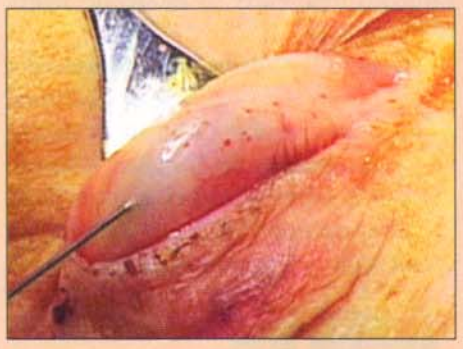
If problems persisted, a Murube operation was proposed as possible therapy.

Most patients were already aware of this procedure because the first patient who underwent a Murube operation appeared on national television. Patients reporting dry mouth were excluded from surgery or asked to undergo a biopsy of the mucosa of the lower lip.

Procedure

All surgery is performed under general anesthesia.

First the recipient beds in both upper and lower lid are prepared. The lid is everted using a Desmarres lid retractor. Xylocaine 1% solution with epinephrine is injected under the tarsal conjunctiva to separate it from the underlying Mueller's muscle in the upper lid or retractor muscle in the lower lid. The



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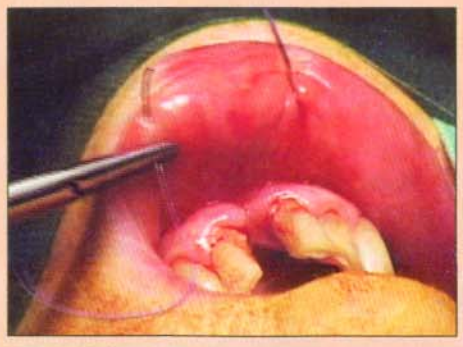
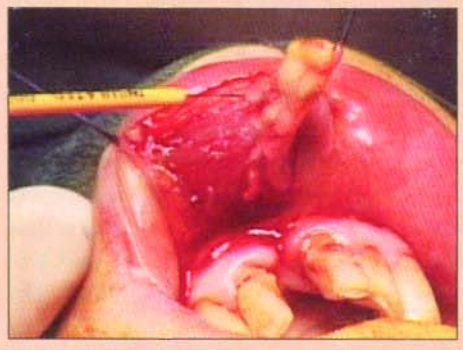


The inferior lip is everted with two 4-0 silk sutures, entering the inner aspect of the lip rim and exiting through the inner aspect again but 1 cm more laterally.



The insulated microfiber electrode helps cut through the complete mucosa thickness without going too deep and without damaging the quadratus labii muscle. The use of this type of electrode also facilitates careful dissection of the lip mucosa with the attached salivary lobules from the underlying muscle.

The lower lid is everted again with the Desmarres retractor. The donor piece is carefully sutured to the receptor site with ...

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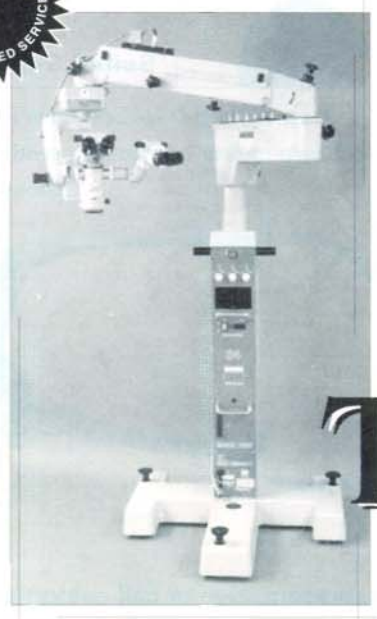

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epinephrine causes a local vasoconstriction to (further) limit the bleeding.

Next, an incision of approximately 2.5 cm is made along the rim of the tarsal plate using an Ellman insulated RF microfiber electrode using the cut/coagulation setting of the high-frequency radiosurgical unit. In this way, the conjunctiva is dissected posteriorly for approximately 1.5 cm. The Desmarres retractor is removed, and the same procedure is repeated on the other lid of the same eye.

The inferior lip is then everted with two 4-0 silk sutures, entering the inner aspect of the lip rim and exiting through the inner aspect again but 1 cm more laterally.

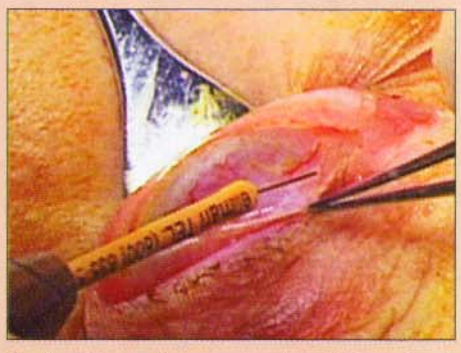
Applying traction to these sutures, the inner, mucosal side of the lip can be exposed, facilitating the taking of the grafts. A first horizontal incision is made in the lip mucosa, not closer than 1 mm from the mouth opening and starting 0.5 cm laterally to the midline of the lip and ending 2 cm to 2.5 cm more laterally. We have found that fewer salivary glands are found in the central third part of the lower lip; they are more numerous in the lateral portions of the lip.

Two vertical incisions are then made from the end of the horizontal incisions in the direction of the gingivo-labial sulcus. The insulated microfiber electrode helps us to cut through the complete mucosa thickness without going too deep and without damaging the quadratus labii muscle. The use of this type of electrode also facilitates careful dissection of the lip mucosa with the attached salivary lobules from the underlying muscle.

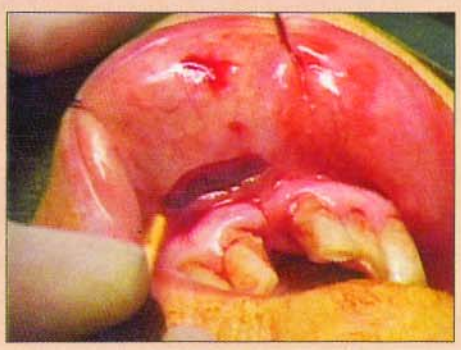
The resulting labial wound is cleaned with a polyvidone solution and left with no cover. We never suture this labial wound. Thanks to the very limited tissue damage we see when using radiosurgery, the wound easily granulates in the days after surgery. The obtained donor piece is cut in two fragments, carefully avoiding damaging any of the glandular structures and, of course, not bisecting any of the lobules.

The upper lid is everted again with the Desmarres retractor, and the donor piece is carefully sutured to the receptor site with interrupted 8-0 poly-

(**Radiosurgery,** continued on page 18)



An incision of approximately 2.5 cm is made along the rim of the tarsal plate using an Ellman insulated RF microfiber electrode using a cut/coagulation setting of the high-frequency radiosurgical unit.



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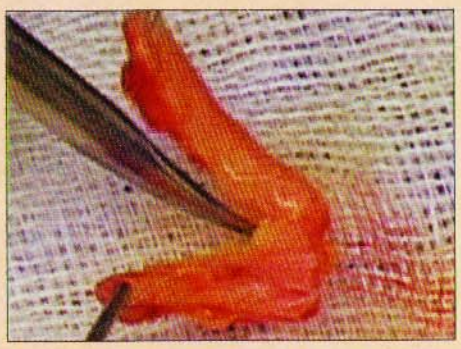

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... interrupted 8-0 polygalactin sutures with buried knots. *(All images courtesy of Peter Raus, MD.)*

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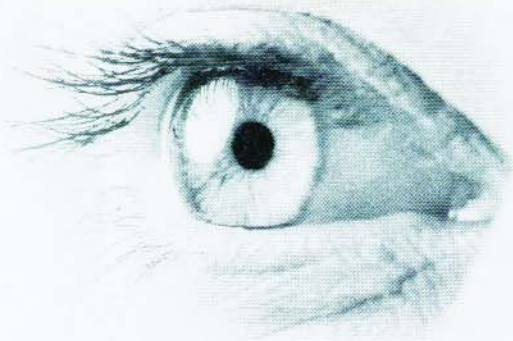

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Radiosurgery

(continued from page 17)

galactin sutures with buried knots.

The same technique is then used for the lower lid. We always try to maintain as many lobules as possible, and if any salivary glandule pops out during the suturing, it is reintroduced with a blunt instrument (forceps without teeth, strabismus hook).

The area is rinsed by an ophthalmic 5% polyvidone solution, and a bandage contact lens is placed to avoid corneal erosion by the sutures. A lightly compressive bandage is placed over the treated eye and checked 24 hours postop.

At this time the eye is rinsed with antibiotic drops and a new bandage is placed over the treated eye. Next checkups are done 4, 7 and 14 days postop, then every 2 weeks for 2 months. The contact lens is left on the eye for 3 to 4 weeks to ensure that all sutures under the upper lid are dissolved. Theoretically, sutures could be removed earlier, but in the first weeks after surgery, everting the upper lid is very difficult and could damage the graft.

Postop clinical course

The day after surgery, the graft looks rather pale and we can see a variable degree of chemosis. All patients have conjunctivitis to some extent during the days after the operation. When we change the bandage, secretions are gently wiped off with a wet cotton tip. During the first week we prefer to put a bandage under light pressure to prevent any bleeding that could influence the survival of the graft. Although Prof. Murube leaves the lids unopened for 10 days, I prefer to check the eye on days 2, 4 and 8 so that bacterial or herpetic keratitis can be ruled out.

We saw one case of herpes simplex virus keratitis on the fourth day postop. The contact lens was removed and therapy with acyclovir was started immediately.

After 1 week, we notice a vascularization of the graft, and after 2 weeks a secretion of saliva can be seen. In the beginning, this secretion product seems to be more viscous than normal tears, but 1 month later no difference in appearance with "normal" tears can be noticed.

Results

In this article we describe the first 10 cases we operated with this technique. One patient was operated on both eyes in one operation, two patients were operated in both eyes in two operations, and four patients were operated in one eye.

The donor site for the mucosal graft heals without any further treatment, although local anesthesia of the mucosal part of the lip can persist for a few months. This anesthesia usually diminishes gradually.

Even in the immediate postop period, the patients reported only minor discomfort.

Despite the use of polyvidone solution at the end of the operation and the subconjunctival injection of lincomycin, all patients had bacterial conjunctivitis to some extent.

All the grafts had a whitish color during the first postop week. Sometimes the transplant had a violet color in some areas that was probably caused by a local submucosal bleeding, but in all cases these areas recovered to a normal reddish color afterward with no apparent functional effect on the final result.

After 1 week, when the eyes are left open, ie, without a bandage, patients usually already report some subjective improvement.

The Schirmer test increased in all cases, but we also saw a significant improvement in fluorescein breakup time that can be explained by the excretion of lipids by the labial mucosa.

All patients improved significantly after surgery. Only two patients still have to use artificial tears sporadically.

Evolution

The first patient complained of "watery" eyes that persisted for 18 months; in this particular case, the grafts of both lower lids were resected under local anesthesia.

The pathologist reported the persistence of acinar tissue in both specimens.

The function of the transplanted glands could also be proven biochemically by examining the presence of specific compounds in the tear film, as was done previously by other authors after transplantation of submandibular glands.

Complications

All patients had bacterial conjunctivitis to some extent. We saw one case of HSV keratitis. The contact lens was removed, and the keratitis reacted very well to topical treatment with acyclovir ointment five times daily.

One partial necrosis (less than 10% of the graft) was seen without any effect on the final result.

There was one corneal erosion after losing the contact lens on the fourth day.

All patients had viscous secretions 2 to 4 weeks postop.

There was swelling of the lower eyelids and slight ptosis of the upper lids that disappeared completely in seven cases and slightly persisted in three cases, with no need for further corrections.

Conclusions

The transplantation of salivary glands promises to be a good treatment for severe cases of dry eye. The procedure is easy with only minimal surgical risk. Radiosurgery makes an important contribution to facilitation of the surgery and survival of the graft. OSN

For Your Information:

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