Surgical Technique

Sutureless Homoplastic Lamellar Keratoplasty

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ABSTRACT

BACKGROUND: Previously, penetrating keratoplasty has been used to treat corneal cap complications related to keratomileusis. We sought to develop a technique to avoid the unnecessary use of penetrating procedures for lamellar problems, that would be technically easier than standard lamellar keratoplasty—sutureless homoplastic lamellar keratoplasty.

METHODS: Five eyes with complications from automated lamellar keratoplasty underwent sutureless homoplastic lamellar keratoplasty utilizing an automated microkeratome and topical anesthesia.

RESULTS: Three of the five eyes had improved vision; two eyes with final visual acuities of 20/20 and 20/30. The two remaining eyes had poor host stromal beds and required penetrating keratoplasty. The mean follow-up time was 13 months (range 3 to 36 months). All lamellar grafts were clear and well-seated at the last postoperative examination.

CONCLUSION: Sutureless homoplastic lamellar keratoplasty is an alternative to penetrating keratoplasty in some eyes that have cap-related problems. [*J Refract Surg* 1997;13:185-187]

Keratomileusis complications that damage the corneal cap have previously been managed by penetrating keratoplasty. A new technique permits placement of a donor lamellar graft in selected eyes. It has the advantages of lamellar keratoplasty, is sutureless, technically easier, and can be done with topical anesthesia.

As automated lamellar keratoplasty (ALK) and laser in situ keratomileusis (LASIK) have gained popularity, complications associated with the corneal cap and stromal interface have arisen.[1,2] Penetrating keratoplasty has been used to treat irregular astigmatism, anterior stromal haze, lost caps, and other lamellar refractive complications.

Prior to development of the "hinged technique," automated lamellar keratoplasty was performed with a "free cap" that was replaced without sutures. Out of this experience, one of us (JCC) attempted a sutureless homoplastic lamellar keratoplasty in a patient who had lost a cap following automated lamellar keratoplasty for hyperopia. Following success in this patient, the technique was tried in four eyes of four patients; the results are reported here.

SURGICAL TECHNIQUE

A whole donor globe with intact epithelium was obtained from the eyebank and placed in a small Vigor Crystal container (LL Hyde, MD, Kanas City, MO). The globe and clamp were positioned under the operating microscope, and the clamp was tightened to increase intraocular pressure.

The donor cornea was marked with a pararadial marker centered on the pupil. The automated lamellar keratoplasty unit (Chiron Vision, Claremont, CA) was centered and suction was applied. Adequate intraocular pressure and centration were confirmed. An applanation lens was placed, and the instrument was adjusted to create a diameter equal to the defect on the recipient eye. A free cap was created with the microkeratome, using a plate to match the thickness of the lamellar defect of the recipient eye. The free cap was placed in an antidessication chamber, epithelial side down, with a drop of balanced salt solution (BSS).

The eye was anesthetized with topical tetracaine (1%) drops, and the patient was positioned under the operating microscope. The recipient bed was then prepared by mechanical removal of epithelium. If the recipient stromal bed was scarred, the microkeratome was passed to excise an additional 30 μm of tissue.

The bed was lavaged with BSS and dried with a Merocel sponge. The donor cap was moistened with BSS and centrally positioned on the dry recipient

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bed. The field was left undisturbed for 5 minutes, to allow for primary cap adhesion. To confirm adhesion, a fine forceps was used to gently depress the peripheral cornea and create striae, which are transmitted to the cap if the cap has adhered to the bed.

The lid speculum was carefully removed, and the cap moistened by closing the lids. Cap placement was checked after a few lid excursions. A fox shield was placed, and the patient kept his or her eyes closed for 4 hours, at which time the cap was checked at the slit-lamp, and the patient discharged with a fox shield in place. The patient was examined the following morning, and each day until the cornea was fully epithelialized. Antibiotic corticosteroid combination drops were begun on the first postoperative day, four times daily. The patient was seen weekly until edema resolved and vision had stabilized, usually by 3 weeks after surgery, at which time drops were tapered.

RESULTS

One of us (JCC) performed sutureless homoplastic lamellar keratoplasty on five eyes of five patients since February, 1993. The mean follow-up was 13 months (range 3 months to 3 years). Indications for surgery included two patients (two eyes) with complications from ALK for myopia, two patients (two eyes) with complications from ALK for hyperopia, and one patient (one eye) with a LASIK-related complication. One patient had anterior stromal haze, three patients had irregular astigmatism, and one patient had a lost cap.

Following surgery, three of the five donor caps were completely epithelialized and edema cleared within 48 hours. One donor cap had residual edema that resolved by 1 week after surgery. There were no lost caps, but one cap was decentered inferiorly on the first postoperative day. The patient was taken back to the operating room and the cap repositioned. It epithelialized within 48 hours, and edema cleared by 3 weeks.

Visual acuity results varied. At 3 months after surgery, two eyes had improved spectacle-corrected visual acuity: one eye from 20/50 to 20/20 and the second from count fingers to 20/30. One eye had mild improvement of spectacle-corrected visual acuity from 20/50 to 20/40. Despite cataract formation that required extraction in one eye, all eyes had maintained stable spectacle-corrected visual acuity at the most recent examination.

All of the lamellar grafts remained clear and well-seated. Two eyes had no improvement and were referred for corneal transplants. Both of these eyes had abnormal stromal beds, noted intraoperatively.

DISCUSSION

In this small series of five eyes, two eyes were spared penetrating keratoplasty by the procedure. Two eyes did not improve, although the procedure yielded a clear graft without decentration. In these two unsuccessful eyes, the visual result was related clinically to the condition of the recipient stromal bed, which was noted to be irregular or pitted at the time of the procedure. In eyes with compromised recipient beds, penetrating keratoplasty might be the procedure of choice.

Cap adherence in sutureless lamellar procedures depends on the endothelial generation of an osmotic gradient, in the presence of an intact epithelium. Therefore, cap adherence in eyes with a compromised endothelial layer is less likely, and this procedure should not be attempted in such eyes. Furthermore, every effort should be made to maintain the epithelium of the donor cap during the procedure, to promote rapid cap adherence.[3]

Sutureless homoplastic lamellar keratoplasty may provide an alternative to manual lamellar keratoplasty techniques, which place great demands on the skill of the surgeon.[4] Lamellar keratoplasty has been previously performed using a Barraquer microkeratome to treat anterior corneal pathology.[5,6] However, the Barraquer microkeratome is not fully automated and therefore is user-dependent, the procedures are not sutureless, and retrobulbar or general anesthesia is utilized exclusively.

Sutureless homoplastic lamellar keratoplasty is technically similar to standard automated lamellar keratoplasty and utilizes instrumentation that is widely available. The procedure is sutureless and can be done in a minor surgery suite with topical anesthesia, decreasing morbidity and cost. Sutureless homoplastic lamellar keratoplasty may also help avoid penetrating keratoplasty in some eyes, and the attendant potential for significant intraoperative and postoperative complications associated with intraocular procedures. Although it requires meticulous attention to surgical detail and close follow-up in the immediate postoperative period, it may offer advantages over other techniques currently in use.

Sutureless homoplastic lamellar keratoplasty may be useful in treating patients with anterior corneal pathology that is unsuccessfully treated with phototherapeutic keratectomy or is too deep to be treated by phototherapeutic keratectomy. Although we have not yet treated such a patient, the greatest utility of sutureless homoplastic lamellar keratoplasty may be in managing unsuccessful phototherapeutic keratectomy patients prior to

recommending penetrating keratoplasty. As LASIK and automated lamellar keratoplasty become more common, we envision a significant role for sutureless homoplastic lamellar keratoplasty in the management of complications related to the cap and anterior stroma.

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