

Lasso Procedure to Revise Overcorrection With Radial Keratotomy

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PURPOSE: To report three patients who underwent the lasso procedure to revise overcorrection with radial keratotomy.

METHODS: Case report and review of the literature.

RESULTS: Four eyes of three patients who had undergone radial keratotomy with resultant hyperopic overcorrection underwent a lasso procedure. Before the procedure, average cycloplegic refraction spherical equivalent was $+3.656 \pm 1.352$ diopters, and average manifest refraction spherical equivalent was $+2.250 \pm 0.621$ diopters. A 10.0 monofilament nylon suture was placed in a circumferential manner through the corneal stroma and overlapping the old radial keratotomy incisions. At 1 month postoperatively, best-corrected visual acuity was 20/20 in all four eyes, with average cycloplegic refraction spherical equivalent $+0.438 \pm 1.423$ diopters and average manifest refraction spherical equivalent -0.156 ± 1.147 diopters. Mean delta cycloplegic refraction spherical equivalent was 3.219 ± 1.724 .

CONCLUSIONS: The lasso procedure provides an immediate solution for symptomatic overcorrected hyperopic eyes after radial keratotomy. Predictability and long-term stability necessitate further follow-up. (*Am J Ophthalmol* 1998;126:825-827. © 1998 by Elsevier Science Inc. All rights reserved.)

ATTEMPTS TO CORRECT NATURAL HYPEROPIA AND overcorrection with radial keratotomy include laser thermal keratoplasty,¹ laser-assisted in situ

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keratomileusis,² lamellar keratoplasty,³ purse-string and interrupted suture,⁴ as well as photorefractive keratectomy.⁵ Review of the literature discloses no previous report of the lasso technique, which uses a single circumferential suture that passes through the corneal stroma and anterior to the radial incisions to steepen a flat cornea.

Four eyes of three patients underwent the lasso procedure in an attempt to reverse overcorrected radial keratotomy. Eyes a, b, and c had eight radial incisions. Eye d had 16 radial incisions, and none of the four eyes had arcuate or transverse radial keratotomy incisions. All patients had anisometropic symptoms and could not wear contact lenses or suffered severe fluctuating vision and associated variable cycloplegic refraction spherical equivalent (Table).

Patient 1, a 35-year-old man who underwent radial keratotomy 12 years previously for correction of myopia of the left eye, had overcorrection (eye a). Patient 2 was a 37-year-old man who underwent radial keratotomy in both eyes 8 years earlier with overcorrection of both eyes (eyes b and c; right and left, respectively). Patient 3 was a 45-year-old man who underwent radial keratotomy of both eyes 12 years previously with overcorrection of both eyes; he underwent the lasso procedure in his left eye (eye d).

Four eyes underwent the lasso procedure as follows. The surgical eye was prepared with povidone-iodine and draped in the usual sterile fashion for ophthalmic surgery. Tetracaine 0.5%, ketorolac, and ciprofloxacin were placed in the surgical eye 10 minutes before the procedure. A polymethylmethacrylate contact lens with a base curve 1.00 diopters greater than the preoperative keratometry was selected. A drop of fluorescein was placed on the cornea. The amount of steepening needed was titrated by observing the fluorescein pattern beneath the contact lens with the end point being the initial disappearance of the bubble.

A 7-mm optical zone marker was placed on the cornea. Using a 10.0 black monofilament nylon suture with a CS-B-6 spatulated needle, the first bite was placed along the 7-mm optical zone mark between the radial incisions and passed through the corneal stroma, emerging before the radial incision. The suture was then passed above (anterior to) the

TABLE. Lasso Procedure: Preoperative Data and 1-Month Postoperative Results

	CRx	CSE (D)	MRx	MSE (D)	VA	BCVA	ΔCSE (D)
Preoperative							
Eye a	+1.75 +1.00 × 019	+2.25	+1.50 +1.00 × 019	+2.00	20/25	20/15	
Eye b	+3.50 +1.00 × 130	+4.00	+2.25 +0.75 × 125	+2.625	20/40	20/20	
Eye c	+4.75 +1.25 × 165	+5.375	+2.25 +1.25 × 125	+2.875	20/30	20/20	
Eye d	+2.75 +0.50 × 180	+3.00	+1.25 +0.50 × 180	+1.50	20/25-1	20/20	
Mean		+3.656 ± 1.352		+2.250 ± 0.621			
Postoperative 1 Month							
Eye a	+1.75 +1.50 × 006	+1.50	0.00 +0.75 × 004	+0.375	20/20	20/20	+0.75
Eye b	+0.25 +0.75 × 142	+0.625	0.00 +1.00 × 150	+0.50	20/20	20/20	+3.375
Eye c	+0.50 +1.50 × 131	+1.25	0.00 +0.75 × 125	+0.375	20/30	20/20	+4.125
Eye d	-3.00 +2.75 × 139	-1.625	-3.25 +2.75 × 139	-1.875	20/25	20/20	+4.625
Mean		+0.438 ± 1.423		-0.156 ± 1.147			+3.129 ± 1.724
CRx = cycloplegic refraction; CSE (D) = cycloplegic refraction spherical equivalent (diopters); MRx = manifest refraction; MSE (D) = manifest refraction spherical equivalent (diopters); VA = visual acuity without correction; BCVA = best-corrected visual acuity; ΔCSE (D) = delta cycloplegic refraction spherical equivalent (diopters).							

radial incision, and the procedure was carried out along all clock hours of the prior corneal radial keratotomy incisions. For radial keratotomy with greater than eight incisions, we used an eight-incision radial marker as the template for suture placement. A knot was tied with the free ends of the suture and lightly "tugged" to bury the knot within the corneal stroma (Figure, top). Single drops of 0.5% ketorolac, prednisolone acetate 1%, and ciprofloxacin or ofloxacin were placed into the surgical eye at the conclusion of the procedure (Figure, bottom).

All three patients reported immediate improvement of visual acuity at the end of the procedure without correction. Postoperatively, the eyes were either patched or covered with a shield and examined on the following day. Patients had mild foreign body sensation relieved with artificial tears and with resolution in approximately 1 to 2 days.

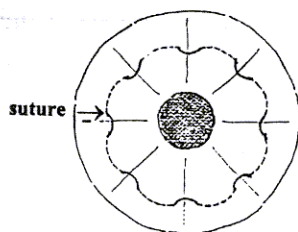
At 1 month postoperatively, anisometric complaints in patient 1 and fluctuation of vision in patients 2 and 3 were relieved, and as of last follow-up, all eyes continued to be asymptomatic after lasso surgery. All three patients are satisfied with the procedure, and patient 3 is planning the lasso procedure for the right eye in the near future (Table).

The lasso procedure appears to be a viable option for patients who have had overcorrection after

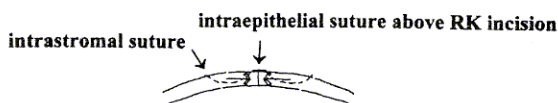
radial keratotomy, resulting in hyperopia. Although we do not have long-term results from this procedure nor have access to other long-term results in the literature, we believe this procedure can provide at least temporary relief of symptoms from anisometropia and fluctuating vision for overcorrected hyperopic eyes after radial keratotomy. Although the change in refraction after the procedure discloses some induced astigmatism, overall spherical equivalent at 1 month after the surgery was excellent and satisfactory to these patients (Table).

These few cases have produced good results with immediate patient satisfaction for symptomatic overcorrected hyperopic eyes after radial keratotomy. This technique will steepen the cornea whether there are four, eight, or 16 or more incisions. If one is concerned about transverse or arcuate incisions at the 7-mm optical zone, one can pass the suture inside or outside the incision by minimally decentering the optical zone and still attain the same result.

Anecdotal reports from other surgeons performing this procedure have mentioned the limited lifespan of nylon suture and slow reversal of the lasso procedure's myopic result over time. Although temporary, this procedure provides an effective option to other currently available procedures, which are not reversible and not presently approved by the United States Food and Drug Administration.



Cornea with "lasso" suture (frontal view)



passage of suture through stroma and above RK incision (cross sectional view)

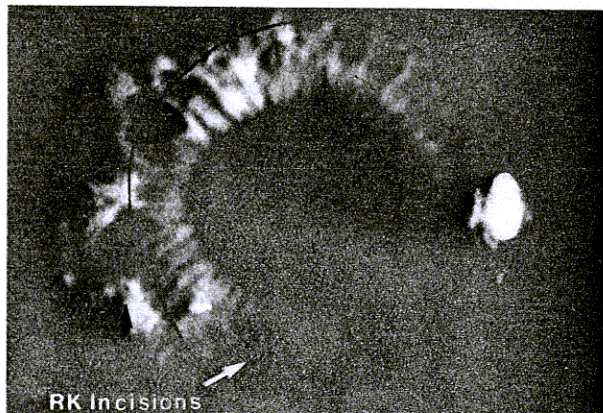


FIGURE. (Top) Illustration of the lasso technique, front and cross-sectional views (RK = radial keratotomy). (Bottom) Patient 1, eye a. Appearance after radial keratotomy and correction of hypermetropia with the lasso procedure.

In the future, sutures that do not stretch or degrade would be desirable. This surgery is also possible in patients with overcorrected photorefractive keratectomy, natural hyperopia, and presbyopia. Long-term studies will disclose the efficacy, stability, and complications associated with this procedure.

REFERENCES

1. Koch DD, Kohnen T, McDonnell PJ, Menefee R, Berry M: Hyperopia correction by noncontact holmium:YAG laser thermal keratoplasty. *Ophthalmology* 1997;104:1938-1947.

2. Suarez E, Torres F, Duplessie M. LASIK for correction of hyperopia and hyperopia with astigmatism. *Int Ophthalmol Clin* 1996;36:65-72.
3. Manche EE, Judge A, Maloney RK. Lamellar keratoplasty for hyperopia. *J Refract Surg* 1996;12:42-49.
4. Lyle WA, Jin GJ. Long-term stability of refraction after intrastromal suture correction of hyperopia following radial keratotomy. *J Refract Surg* 1995;11:485-489.
5. Venter JA. Photorefractive keratectomy for hyperopia after radial keratotomy. *J Refract Surg* 1997;13(5, suppl):S456.

Transepithelial Photorefractive Keratectomy for Treatment of Thin Flaps or Caps After Complicated Laser In Situ Keratomileusis

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PURPOSE: To report transepithelial photorefractive keratectomy treatment of corneal irregularities produced during laser in situ keratomileusis (LASIK) in which there is a thin flap or cap associated with central corneal scarring or epithelial ingrowth that threatens vision.

METHODS: Case reports. The thickness of the abnormal corneal flap or cap and associated scarring or epithelial ingrowth is estimated at the slit lamp or measured with an optical pachymeter. If residual myopia is sufficiently high to allow complete ablation of the flap or cap in the central cornea, a transepithelial photorefractive keratectomy is performed in which the epithelium is completely ablated with the excimer laser in phototherapeutic keratectomy mode; residual myopia is corrected using photorefractive keratectomy.

RESULTS: This method was used successfully in two eyes of two patients in which a thin cap was associated with a transverse cut through the central cornea or a donut-shaped flap associated with epithelial ingrowth in the central cornea. In both cases, the abnormal cap or flap was ablated, central

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