Case Report: Overcorrection of Radial and Arc Keratotomies—Two Years Postoperatively

BY LOUIS J. GIRARD, MD, FACS. MAE E. WESSON, MD. ALEKSANDRA VESELINOVIC, MD AND AKEF MAGHRABY, MD

The majority of corneas undergoing radial keratotomy, relaxing incisions, or trapezoidal incisions show an initial overcorrection that gradually decays with time and often results in an undercorrection. Recently, a patient was observed who had four arc relaxing incisions for a moderately high degree of astigmatism and later, eight radial keratotomies for myopia. The initial result was good, all medication was discontinued, and the patient was to be observed in one year. The patient was observed two years after the surgery and was found to have a marked overcorrection of the myopia and astigmatism.

Case Report

A 33-year-old Latin-American male was first observed on February 15, 1983. Vision without correction was 20/70 in each eye and with correction of RE: -3.00+3.50 x 180 = 20/20; LE: -2.25+2.25 x 180 = 20/20. Initial keratometric readings were RE: 39.75/42.50 at 180. Tension was 17 mm in each eye. Pachymetry reading was RE: 0.54 mm centrally. On March 3, 1983, four arc incisions were made in the 180 degree meridian of the right eye. The incisions were 4 mm long and were placed at 4 mm and 6 mm from the visual center of the cornea. The incisions were approximately 50% of the depth of the cornea. The first postoperative day, March 4, 1983, vision without correction was 20/70. Cycloplegic refraction showed -0.75+1.00 x 60 = 20/25. Keratometry readings were 39.87/40.87 at 74. The patient was seen periodically with initial fluctuations in the refraction and keratometry readings. By May 18, 1983, vision without correction was 20/40. Cycloplegic refraction was -3.00+1.00 x 90 = 20/20. Keratometry readings were 39.87/40.87 at 90.

On May 19, 1983, eight radial keratotomies were performed in the right eye using a 3.5 mm optical zone and cuts were 90% of the central pachymetry readings of 0.55 mm. The first day postoperatively on May 20, 1983, vision without correction was 20/100. Cycloplegic refraction showed +4.75+2.50 x 85 = 20/50. Again, the patient was observed periodically and after fluctuations in the refraction and keratometric readings, by November 29, 1983, vision without correction was 20/40. Cycloplegic refraction showed -2.50+2.50 x 75 = 20/25.

The patient was not observed again until April 2, 1985 at which time the vision uncorrected in the right eye was found to be 20/400. Cycloplegic refraction showed +3.75+3.50 x 95 = 20/40. Keratometry readings were 30.87/34.87 at 97. Tension was 13 mm in each eye. The radial incisions appeared to be 90% in depth and the arc incisions 40% in depth.

Discussion

In published reports, overcorrection of myopia resulting in a hyperopia of >+1.00 has occurred in 10% to 20% of eyes at one year. Furthermore, a followup of two years has failed to report further overcorrection. The above case report demonstrates that overcorrection, which was not present six months after the surgery, could appear two years after the surgery. Induced astigmatism of greater than 1 diopter from radial cuts alone is reported to be 5% to 11%. This has been associated with microperforations or an irregularity near the optical zone.

There are many variables in refractive surgery: the type and quality of the knife, the type of fixation, the intraocular pressure, the skill of the surgeon, and occurrence of perforations. In the case reported, the knife was a diamond knife and fixation was by a Thorn...
ton ring. There were no perforations and postoperative examination showed the radial cuts to extend an average depth of 90% with the arc cuts of approximately 40% depth.

What then caused the overcorrection? As has been pointed out previously, the corneal stroma heals slowly, sometimes taking years for completion.\(^4\)\(^-\)\(^7\) Perhaps additional changes in the refractive power of the cornea will be observed with continued observation of radial keratotomies.\(^a\) Ophthalmic surgeons should be cautious in attempting to correct "all" myopia and astigmatism.

Refractive surgery is an art, not a science—yet.

Summary

Two years after undergoing relaxing incisions for astigmatism and radial keratotomy for myopia in one eye, the operated eye showed an overcorrection of the myopia by 3.75 diopters and an overcorrection of the astigmatism by 3.50 diopters. Examination at six months postoperatively had shown a small undercorrection of both myopia and astigmatism. The possible explanation for the overcorrection is discussed. Ophthalmic surgeons are urged to be conservative in correction of myopic and astigmatic ametropia.

References


\(a\)Since this paper was submitted for publication, Dietz and Sanders have reported overcorrection of myopia occurring 4 years postoperatively.\(^a\)