Corneal Cooling and Rehydration During Photorefractive Keratectomy to Reduce Postoperative Corneal Haze

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ABSTRACT

PURPOSE: An increase in corneal temperature has been implicated in subepithelial haze after surface photorefractive keratectomy. We aimed to determine if cooling the cornea by means of hydration between ablations and immediately after final surface ablation in PRK reduces haze.

METHODS: One hundred five eyes of 61 patients with myopia ranging from -6.00 to -9.75 D were included. One of the surgeons irrigated with cool balanced salt solution between ablation passes and immediately at the end of the surface ablation while two others did not. Results of haze grading were analyzed at the end of 3 and 6 months and 1 year after PRK by an independent examiner.

RESULTS: Haze was significantly reduced in those eyes in which irrigation (cooling) with balanced salt solution was performed intraoperatively and immediately after ablation.

CONCLUSION: Cooling and rehydration of the cornea with chilled balanced salt solution between passes during PRK significantly reduces haze in patients with baseline myopia between -6.00 and -9.75 D. [*J Refract Surg* 1999;15(suppl):S232-S233]

One of the major problems of surface photorefractive keratectomy (PRK), especially in the medium to high range of myopia, is the development of subepithelial haze or scar formation due to secretion of collagen and glycosaminoglycan by activated fibroblast. Many factors could contribute to this. Corneal temperature increase during PRK has been implicated in the etiology of subepithelial corneal haze formation following PRK (Betney S, Doyle SJ, Efron N. Corneal temperature changes during photorefractive keratectomy. *Cornea* 1997;16:158-161). Also, dehydration and dryness of the cornea during the procedure have been suggested as factors in development of corneal haze after PRK. It is our clinical impression that cooling and rehydration of the cornea during and immediately after PRK with chilled balanced salt solution after each multipass or multizone ablation and immediately after the procedure results in significant reduction in postoperative corneal haze formation.

PATIENTS AND METHODS

We analyzed retrospectively the preliminary results of the above technique during PRK performed with the VISX 20/20B excimer laser using multipass and multizone ablations (5.5 and 6-mm optical zones) for myopia between -6.00 to -9.75 diopters (D). The epithelium was removed mechanically with the Amoil brush in all cases. One of the surgeons irrigated the cornea with chilled balanced salt solution after each pass of the laser ablation and immediately at the end of the procedure. The balanced salt solution had been chilled in the refrigerator before use. The cornea was then dried with a sponge immediately before the beginning of the next multipass/multizone ablation. The study was conducted on a total of 105 eyes of 59 patients (age range, 24 to 55 yr) in 3 groups. Thirty-one patients were female. We performed the above technique on

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Table
Mean Corneal Haze After PRK With and Without Irrigation With Balanced Salt Solution

	Group 1 with BSS* irrigation between passes	Group 2 without BSS	Group 3 without BSS
Number of patients	18	19	22
Number of eyes	35	35	35
Mean age in years (range)	35.7 (24 to 52)	42.5 (25 to 55)	36.8 (25 to 49)
Mean spherical correction (D)	-7.80 ± 1.02	-7.97 ± 1.00	-7.93 ± 0.77
Mean cylinder correction (D)	-1.52 ± 1.16	-1.13 ± 1.13	-1.11 ± 1.47
Mean corneal haze at 3 months	0.40	1.31	0.80
Mean corneal haze at 6 months	0.23	1.09	0.66
Mean corneal haze at 1 year	0.17	0.63	0.46

** Balanced salt solution*

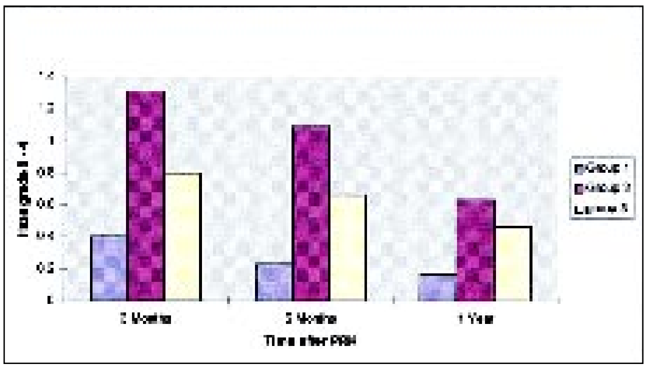

Figure: Comparison of haze in 3 groups by unbiased examiner (Group 1: 35 eyes with chilled balanced salt solution irrigation between and after final ablation; Groups 2 and 3: no irrigation).

35 eyes and compared the results with those of 2 other groups of patients operated by two other surgeons (35 eyes in each group); similar PRK ablations were performed but without irrigation of the cornea between passes.

The 3 groups of patients were for the most part matched for age, sex, and amount of baseline myopia, and received similar postoperative management consisting of soft contact bandage lenses for 2 to 4 days until the corneal epithelium had healed. Topical Ciloxan drops were given five times a day for 5 days, topical ketorolac tromethamine (0.5%) 5 times a day for 2 days, and topical fluoromethalone in tapering doses for 3 months. Patients with corneal pathology or a history of keloid and collagen disease were excluded. The postoperative corneal haze was recorded by an unbiased observer using conventional grading scales (0 to 4) at 2 and 6 weeks, 3 and 6 months, and 1 year after the procedure with slit-lamp biomicroscopy (Haag-Streit). Average haze was recorded in the central 5.5 mm zone.

RESULTS

The table and figure show that mean corneal haze at 3 and 6 months and 1 year after PRK were lowest in the chilled irrigated group (Group 1), followed by the remaining groups in which irrigation was not done. The difference between corneal haze in groups 1 and 2 was statistically significant at 3 and 6 months and 1 year ($P<.005$). The difference between corneal haze in Groups 1 and 3 was statistically significant at 3 and 6 months ($P<.01$) but not at 1 year ($P<.08$).

DISCUSSION

Our preliminary results indicate that incidence of corneal haze formation following PRK for myopia between -6.00 and -9.75 D may be reduced by cooling and rehydration of the cornea during PRK. The cornea was cooled and rehydrated with chilled balanced salt solution between passes during multipass, multizone laser ablations.

Further prospective studies with larger sample size are needed to confirm our retrospective findings and also to ascertain the accuracy of this technique in reducing corneal haze and improving spectacle-corrected visual acuity.