

## Optics of conductive keratoplasty: Implications for presbyopia management

The purpose of this study was to define the corneal optics of conductive keratoplasty (CK) and to assess the clinical implications for hyperopia and presbyopia management. Four analyses were done. (1) Multifocal effects: In a prospective study of CK, uncorrected visual acuity (UCVA) for a given refractive error in 72 postoperative eyes was compared to control eyes. (2) Surgically induced astigmatism (SIA): 203 eyes were analyzed for magnitude and axis of SIA. (3) Higher-order optical aberrations: Corneal higher-order optical aberrations were assessed for 36 eyes after CK and a similar patient population after hyperopic laser in situ keratomileusis (LASIK). (4) Presbyopia clinical trial: Visual acuity, refractive result, and patient questionnaires were analyzed for 150 subjects in a prospective, multicenter clinical trial of presbyopia management with CK. (1) 63% and 92% of eyes after CK had better UCVA at distance and near, respectively, than controls. (2) The mean SIA was 0.23 diopter (D) steepening at 175 degrees ( $P > .001$ ); mean magnitude was 0.66 D (SD, 0.43 D). (3) After CK, composite fourth- and sixth-order spherical aberration increases; change in ( $Z_{12}$ ) spherical aberration alone was not statistically significant. When compared to hyperopic LASIK, there was a statistically significant increase in composite fourth- and sixth-order spherical aberration ( $P > .01$ ) and spherical aberration ( $Z_{12}$ ) alone ( $P > .02$ ); spherical aberration change was more prolate after CK. (4) After the CK monovision procedure, 80% of patients had J3 or better binocular UVCA at near; 84% of patients were satisfied. Satisfaction was associated with near UCVA of J3 or better in the monovision eye ( $P = .001$ ) and subjectively good postoperative depth perception ( $P = .038$ ). CK seems to produce functional corneal multifocality with definable introduction of SIA and higher-order optical aberrations, and development of a more prolate corneal contour. These optical factors may militate toward improved near vision function.—Hans E. Grossniklaus

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