Long-term Outcomes After Mechanized Arcuate Keratotomy for the Correction of Astigmatism After Keratoplasty

The management of high postoperative astigmatism remains a major challenge for corneal refractive surgeons and various techniques have been evaluated. The recent introduction and development of femtosecond laser-assisted keratotomy could potentially combine a wide range of corrections with the accuracy and safety of laser treatment. Assessing the long-term visual and keratometric outcomes of mechanized keratotomy may provide interesting data to predict the evolution of corneal incisions over time. The purpose of this study was to assess the long-term outcome and stability of mechanized arcuate keratotomy in patients after keratoplasty. We also studied the accuracy and predictability of the incisions using high-resolution optical coherence tomography of the cornea.

Patients with a minimum of 3.5 diopters (D) of regular astigmatism after keratoplasty were included. All patients had to have their surgery at least 24 months earlier and have all sutures removed. The main outcome measures were: corrected distance visual acuity (CDVA), keratometric power, corneal topography (Orbscan II; Bausch & Lomb, Salt Lake City, UT), and depth of corneal incisions (RTVue; Optovue, Inc., Fremont, CA). Arcuate keratotomy procedures were performed using the Hanna arcitome (Moria, Antony, France) and parameters were set using the Hanna nomogram (depth set to 75% of minimum central corneal thickness; Moria). Refractive and keratometric changes were calculated using the Alpins method. The Wilcoxon rank-sum test was used to analyze differences between preoperative and postoperative data.

A total of 15 eyes of 15 patients were included. Median age at the time of surgery was 38 years. Mean follow-up was 10.5 ± 2.3 years. CDVA improved from 20/50 preoperatively to 20/37 postoperatively (P = .084). There was no significant difference between CDVA measured at the first time point in 2007 and at the last follow-up visit (P = .247). The mean keratometric cylinder decreased from 8.0 ± 3.0 D preoperatively to 5.96 ± 3.94 D at the last follow-up visit (P = .096). There was no significant difference between the keratometric cylinder measured at the first time point in 2007 and at the last follow-up visit (P = .167). There was no statistical difference between mean surgically induced astigmatism and mean target-induced astigmatism (P = .594) (Figure 1). The mean correction index was 1.12 ± 0.55. The mean scheduled incision depth was 418 ± 39 µm and the mean actual depth at the last follow-up visit was 432 ± 101 µm (P = .427). One microperforation occurred and required corneal suturing.

The development of femtosecond laser-assisted astigmatic keratotomy has been of particular interest in the field of corneal refractive surgery, but the long-term outcome has not yet been documented. There is still concern about potential late complications, such as astigmatic regression or corneal ectasia. One major contribution of this study is the comparison of scheduled and actual incision depths measured with high-resolution optical coherence tomography over time, which revealed a substantial lack of reliability of the automated technique. However, it appears to be an effective technique for the long-term reduction of large amounts of corneal astigmatism, with keratometric stability now having been demonstrated throughout long-term follow-up. No corneal deformations such as late corneal ectasia were noted.

The long-term data obtained for this mechanized technique may be of value for predicting and assessing the eventual long-term results of recently initiated femtosecond laser-assisted keratotomies.

REFERENCES


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