EFFECT OF ARCUATE INCISION ON POST-KERATOPLASTY ASTIGMATISM

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Abstract— This work is a report of 9 cases of arcuate incision for correction of astigmatism, after penetrating keratoplasty. Plannings were based on corneal topography, and the first operation was always arcuate incision alone. The secondary plans were based on refractive errors. The mean of preoperative astigmatism was 6D with the range of 5 to 9D. After arcuate incision of the graft-host interface in the first operation, the mean reduction of astigmatism was 3.05D with the range of 0.5- 4.5D. Mean spherical equivalent change was 0.16D. Arcuate incision is an appropriate method for correction of astigmatism after PK and can be considered as a single procedure for low astigmatism, although the results may be unpredictable. Acta Medica Iranica 33 (3&4): 91-95; 1995

Key words: Post-keratoplasty astigmatism; arcuate incision

INTRODUCTION

With advances in tissue preservation and microsurgical techniques, graft clarity can be expected in up to 90% of uncomplicated penetrating keratoplasty (PK) cases (1). High degrees of astigmatism, often coupled with large amounts of myopia, are common obstacles to optimal vision after corneal transplantation. Therefore ophthalmic surgeons' attension has been drawn to reducing astigmatism after PK. The concept of reducing post-operative astigmatism dates back at least to Snellen (1869) and the surgical correction of astigmatism, to the end of 19th century (2). Relaxing incisions in the peripheral cornea were made by Bates, Lans and others (3,4). In the 1930s, incisional refractive surgery for astigmatism and myopia was introduced by Dr. Tsutoma Sato (5). Japanese observers noted bullous keratopathy in more than 85% of eyes followed for 20 to 30 years (6). Modern refractive surgery was introduced in U.S.A. in 1978 by Svyatoslav Fyodorov and Leo Bores (2)and during these years, the procedures gradually developed and improved. Troutman and Swinger (7) estimated that less than 10% of all clean penetrating keratoplasties are associated with high post-operative astigmatism. Although there are multiple optical and surgical methods of astigmatism correction, unfortunately there are limited reports on the effect of arcuate incision after PK. The use of arcuate AK anterior to the graft-host interface combined with compression sutures is described in three studies (7,8,9).

McCartney and coauthors (8) who made all incisions 0.5 mm anterior to the graft-host interface found a mean cylinder decrease of 8D, correcting 68% of astigmatism. In similar series, Lustb Ader alenp (9) corrected 56% of astigmatism. Guided by corneal topographic analysis, Frangieh and coworkers (10) reduced 81% of preoperative astigmatism. However in all of these studies alterations of astigmatism were unpredictable. Today, changing of surgical procedures, makes intraincisional relaxing incision with compression sutures, become more effective and predictable.

In this report, arcuate incision in graft-host interface without compression suture was done. For selecting the site of incision, topograghic analysis was performed.

METHODS

Before any surgical intervention in the post-keratoplasty patient, all sutures were removed and the stability of the refraction was observed for at least one month. Astigmatism was evaluated using cyclorefraction, keratometry, and corneal topography and accurate funduscopy. Afterwards, pachymetry was done for all of them and by the use of topographic analysis the site and the length of each incision was selected. Then, in sterile condition and with topical anesthesia (Tetracain drop) the visual axis was determined and the astigmatism marker (Katena) was utilized to select the position and the length of incisions on the epithelium of cornea. The eye was, then, fixated by ring forceps and the graft-host interface was incised by diamond knife, 85% thickness (Meyco 0.2 double edge). At the end of operation, cycloplegic and antibiotic drops were used and the eye was occluded by a shield. The day after operation, antibiotic and steroid (Betamethasone) drops were prescribed for the patients.

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Antibiotic drops were stopped at the fourth day and steroid was continued for one month depending on the response of the patient. The patient was followed up in the first day, first week, first month and the third month after operation. The final results were assessed after three months. In case of inappropriate results, the second operation was scheduled depending on the state of refractive errors and topographic analysis, and utilizing arcuate incision on the graft or other procedures.

CASE REPORT

Case 1. A 50-year-old woman had undergone PK of OS three years ago due to pseudophakic bullous keratopathy by 10-0 running nylon sutures. Post-keratoplasty refraction was +3 (-5.5 × 135°) and k-reading was 42 @135°-47@ 45°. She had undergone one pair 45° length arcuate incision of host-graft interface in 45° meridian. Refraction became +1.00 (-2.25 × 117°) (Fig. 1).

Case 2. A 21-year-old man had undergone PK of OD, three years ago due to keratoconus by 10-0 running nylon sutures. Post-operative refractive state was +2.25 (-6.5 × 85°) and k-reading was 48.2@170°-43.5@80°. He had undergone 45° length arcuate incision in the 170° meridian superiorly and 60° length arcuate incision inferiorly (asymetric arcuate incision), due to corneal topographic condition (at the interface). Refraction became -0.25 (-4.00 × 90°), k-reading was 48@5°-44@95° and his visual acuity rised to 6/10.

Case 3. A 26-year-old man had undergone PK of OD, five years ago, due to keratoconus by 10-0 running nylon sutures. Refraction was +2.25 (-9 × 65°) and k-reading was 6.20@150° - 8.00@60°. He had undergone one pair 45° length arcuate incision in the 130° meridian (at interface), due to topographic state. Refraction became -1.5 (-4.5 × 80°) and k-reading was 6.75@165°-7.45@75° and visual acuity rised to 6/10.

Case 4. A 60-year-old man had undergone PK of OD. The operative data were unavailable. Refraction was +2 (-5 × 90°) and k-reading was 46@180°-40.8@90°. He had undergone one pair 45° length arcuate incision in 180° meridian (at interface). Refraction became +1.5 (-4.5 × 180°) and k-reading 46@180°-41.5@90°. All of the incisions were perfect.

Case 5. A 30-year-old man had undergone PK of OD due to traumatic corneal scar, two years ago, by interrupted nylon sutures. Refraction was +2 (-5 × 180°) and k-reading was 41.75@108°-39.05@180°. Because of topographic state, he had undergone one pair 45° length arcuate incision in 90° meridian and inferior hemi Ruiz with 4mm optical zone. Refraction became +0.5 (-3 × 180°) and his visual acuity rised to 6/10.

Case 6. A 64-year-old man had undergone PK due to pseudophakic bullous keratopathy by 10-0 running nylon sutures. Refraction was -2.25 (-9.00 × 55°) and k-reading was 50@115°-42@30°. He had undergone one pair 45° length arcuate incision in the 120° meridian (at the interface). The k-reading became 49@160°-42.75@70°. He had undergone Ruiz in the 120° meridian. The refraction changed to -2.00 (-4 × 50°) and visual acuity rised to 4/10 (Fig. 2).

Case 7. A man had undergone PK of left eye due to keratoconus by 10-0 running nylon sutures. Refraction was -2.5 (-6 × 150°) and k-reading 50.5@60°-44.0@150°. He had undergone one pair 45° length arcuate incision in the 60° meridian (at the interface); k-reading changed to 48@60°-45@150°.

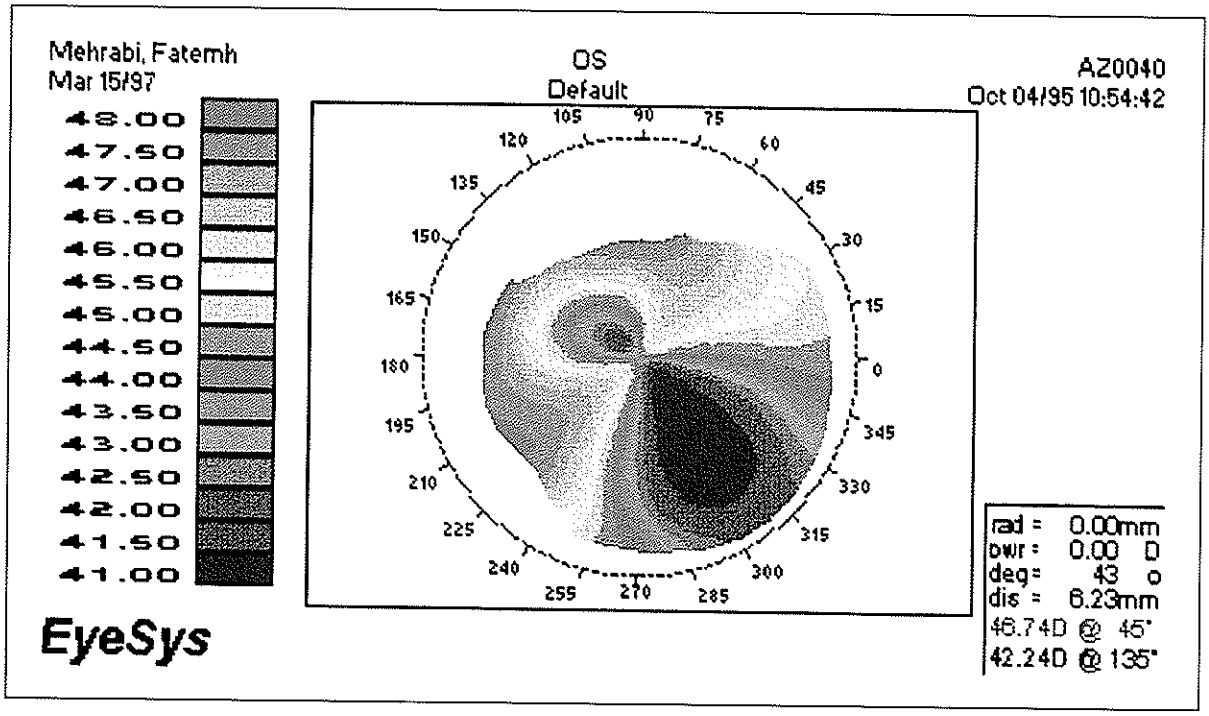
Case 8. A man had undergone PK of OS due to PBK by 10-0 running nylon sutures. The k-reading was 56@155°-48@65°. He had undergone one pair 45° length arcuate incision in the 155° meridian (at the interface). The k-reading became 53@140°-49@50°.

Case 9. A 22-year-old woman had undergone PK of OS due to keratoconus by running sutures. Refraction and k-reading were +3 (-10.00 × 80°) and 6.6@165°-8.00@57°, respectively. She had undergone one pair 45° length arcuate incision in 165° meridian (at the interface). Refraction changed to +1 00 (-6.00 × 80°). She had a repeated arcuate incision at the 6 mm optical zone on the graft. Final refraction was plano (-2 × 80°) and her visual acuity became 9/10.

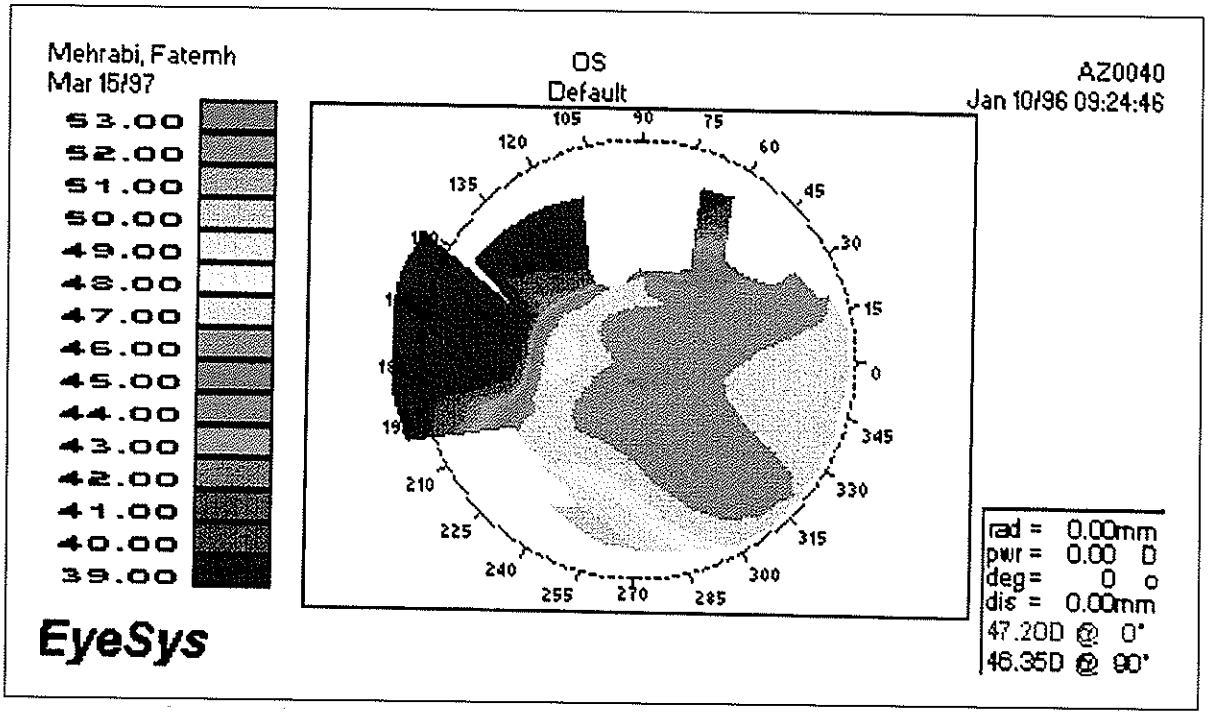
DISCUSSION

In this study, plannings were based on refraction and topographic state, and the first operation was arcuate incision at graft-host interface, possibly with no other procedures. This protocol was chosen for assessing arcuate incision at interface. Mean post-keratoplasty astigmatism was 6 diopters with range of 5 to 9D.

After first opration the mean decrease of astigmatism was 3.05D with the range of 0.5 to 4.5D. With 0.5D decrease of astigmatism no cause of failure was found, perhaps prekeratoconic cornea was grafted to the patient. The mean change of spherical equivalent was 0.16D with

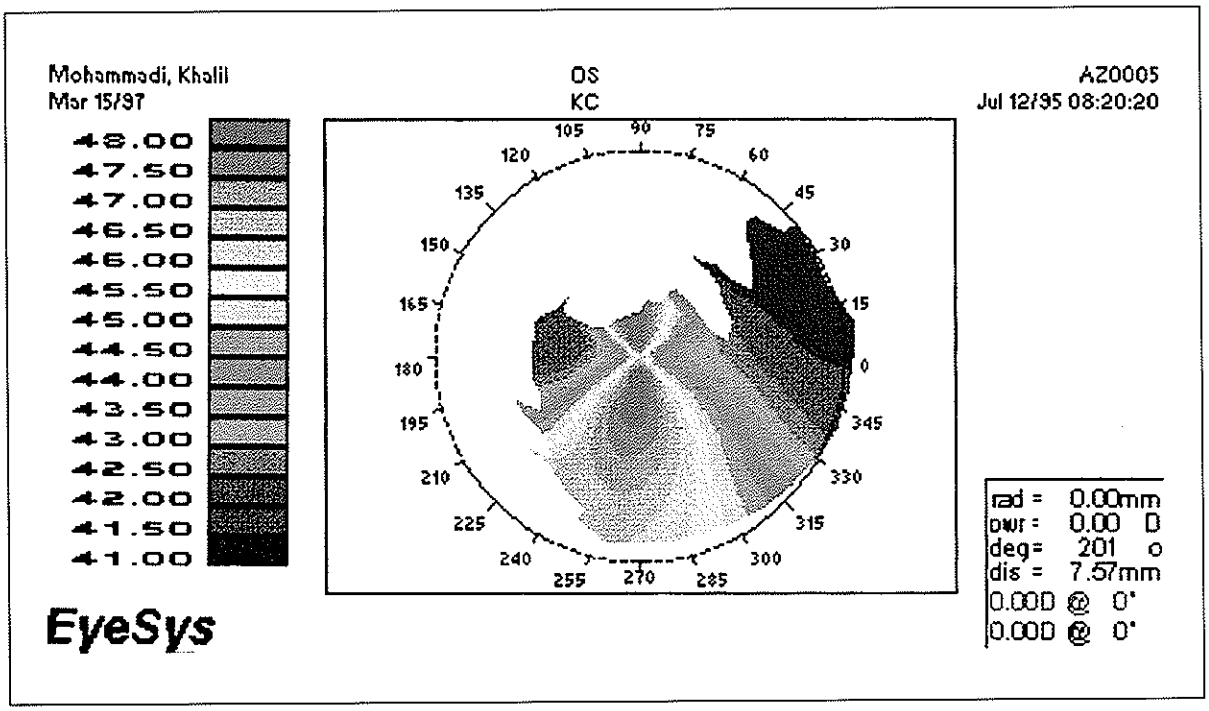


(A)

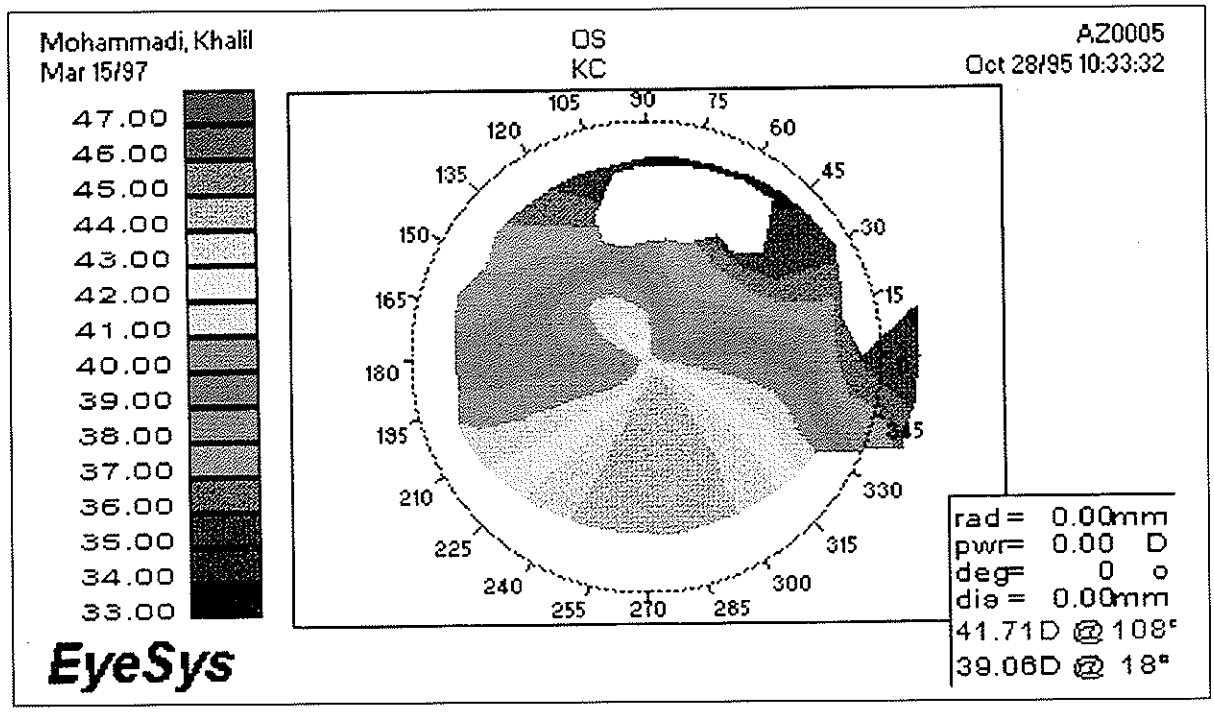


(B)

Fig. 1. Topographic analysis of case 1 (A) before arcuate incision (B) after arcute incision.



(A)



(B)

Fig. 2. Topograghic analysis of case 6 (A) before arcuate incision (B) after arcuate incision.

the range of -0.25 to +2.75.

Arcuate incision alone could be effective for reducing astigmatism after PK. It's better that plannings are guided by corneal topographic analysis. Probably arcuate incision can be used for low astigmatism after PK, although the results may be unpredictable, and a rule cannot be made for it. For better understanding of the effect of this procedure, further studies covering more cases should be undertaken.

REFERENCES

1. Bourne WM. Current techniques for improved visual results after penetrating keratoplasty. Ophthalmic surg **12:** 321; 1981.

2. Mackensen G. Discussion in surgery of astigmatism. Adv Ophthalmol **33:** 210; 1976.

3. Lans LJ. Eperimentelle untersuchungen uber Entstehung von astigmatismus durch night perforrirende corneavunden. Albrecht von Graefer Archiv Klin Exp ophthalmol **45:** 117-152; 1981.

4. Szuniewicz W, Fasonella RM. Surgery in an attempt to change corneal curvature. Ophthalmic surg **12:** 719-726; 1981.

5. Sato T, Akiyama K, shibata H. A new surgical approach to myopia. Am J Ophthalmol **36:** 823-829; 1953.

6. Akiyamak, Tanaka M, Kanai A, Nakajama A. Problems arising from Sato's radial keratotomy procedure in Japan. CLAO **10:** 179-184; 1984.

7. Troutman RC, Swinger C. Relaxing incision for control of post-operative astigmatism following keratoplasty. Ophthalmic Surg **11:** 117-120; 1980.

8. McCartney DL, Whitney CE, Stark WJ et al. Refractive keratoplasty for disabling astigmatism after penetrating keratoplasty. Arch Ophthalmol **105:** 954; 1987.

9. Lustbader JM, Lemp MA. The effect of relaxing incisions with multiple compression sutures on post-keratoplasty astigmatism. Ophthalmic Surg **21:** 416-419; 1990.

10. Frangieh GT, Kwitkos, McDonnell PJ. Prospective corneal topographic analysis in surgery for post-keratoplasty astigmatism. Arch Ophthalmol **109:** 506-510; 1991.

11. Alejandra A, Luis EA. Arcuate incision: parameters. Ann Opthalmol-Glaucoma **26:** 225-258; 1994.

12. Agapitos PJ, Lindstorm RL, William PA et al. Analysis of astigmatic keratotomy. J Cataract Refract Surg **15:** 13-18; 1989.

13. Karachmer JH, Ching SST. Relaxing corneal incisions for post-keratoplasty astigmatism. Int Ophthalmol Clin **23:** 153; 1983.

14. Surger J, Kirk AK. Relaxing keratotomy for post-keratoplasty high astigmatism. Ophthalmic Surg **14:** 156; 1983.

15. Lavery GW, Lindstorm RL, Hofer LA et al. The surgical management of corneal astigmatism after penetrating keratoplasty. Ophthalmic Surg **16:** 165-169; 1985.

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