

# Why do patients with improved visual acuity drop out of RGP contact lens use? Ten-year follow-up results in patients with scarred corneas

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**PURPOSE.** To evaluate the long-term results of rigid gas permeable (RGP) contact lenses and to investigate the reasons for patient dissatisfaction with this therapy.

**METHODS.** Records of 17 patients (20 eyes) who started using RGP contact lenses for correction of irregular astigmatism due to scarred corneas between 1995 and 1996 were evaluated retrospectively. Best-corrected visual acuities with or without RGP contact lenses were noted. The mean duration of contact lens use, reasons for discontinuation of therapy, and treatment methods preferred over contact lens use were evaluated.

**RESULTS.** The irregular astigmatisms were induced by herpetic keratitis (3 eyes), corneal trauma (5 eyes), and previous corneal infections (12 eyes). All of the patients had increase in visual acuity with RGP contact lenses ( $p=0.000$ ). At the end of the follow-up it was found that only one patient was still using RGP contact lenses (5%). The mean duration for contact lens use was  $21.42 \pm 4.53$  SE months (2–72 months). The reasons for dropping out contact lenses were intervening surgical procedures (57.8%), loss of patient motivation (26.3%), recurrent punctate epitheliopathy (10.5%), and herpes simplex keratitis reactivation (5.2%).

**CONCLUSIONS.** RGP contact lens use is a successful method of increasing visual acuity in scarred corneas. However, patients with good visual acuity in the fellow eye find it hard to remain motivated for RGP contact lens use in the unhealthy eye. Furthermore, patients prefer permanent treatment methods even though these methods would result in decreased visual acuity. (*Eur J Ophthalmol* 2009; 19: 343-7)

**KEY WORDS.** Rigid gas permeable contact lens, Scarred corneas

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## INTRODUCTION

Corneal penetrating injuries and infections may lead to corneal scars. Corneal scars cause significant visual reduction, mainly because of direct obstruction of rays by the opacity and also because of the irregular corneal astigmatism. Eyeglasses cannot fully compensate for an irregular corneal surface (1, 2). Treatment options for this high degree of astigmatism have been expanded during recent years, with the advent

of finely controlled corneal ablation using excimer laser (3, 4). Before that, limited correction of astigmatism was possible with selective incision placement, placement and removal of sutures, and penetrating and lamellar keratoplasty. However, these procedures are of limited value due to limited availability of donor tissues, technical difficulties in traumatized eyes, and postoperative complications. Another treatment option for irregular corneal astigmatism is optical correction with rigid gas permeable (RGP) contact lens-

es in which the tear fluid layer under the contact lens evens out irregularity (5). The use of RGP contact lens might be the first treatment option, since this type of lens provides good visual acuity, reduces high degrees of irregular astigmatism, and has high oxygen permeability. It is also economic and noninvasive. The aim of this study is to evaluate the role of RGP contact lenses in improving visual acuity in patients with corneal scars and to evaluate the continuity of the use of RGP contact lenses among these patients.

## METHODS

Patients with corneal scars caused by corneal trauma or corneal infections who were treated with RGP contact lenses were enrolled in this study. Two types of contact lenses were used: Persecon92E (Ciba Vision, polyfluorosilicone methacrylate, Dk:92) RGP contact lenses in 8 eyes and Quantum (Bausch and Lomb, fluoro-silicon-acrylate copolymer, Dk:92) RGP contact lenses in 12 eyes. All patients underwent complete ophthalmic examination. Uncorrected and best-corrected visual acuities (BCVA) and keratometry readings were recorded. Contact lens fitting was performed according to refraction and keratometric values, and trial and error method was used if keratometric values could not be obtained because of irregular astigmatism. The fit was evaluated on parameters of centralization, movement, and coverage and the fluorescein pattern under trial lens to achieve the best fit.

After the contact lenses were applied, the fit was evaluated and the best contact lens-corrected visual acuity and contact lens-related complications were recorded at the follow-up visits. The patients were evaluated at 1st, 2nd, 3rd, and 6th weeks, and then every 6 months. Records of the patients were evaluated after 10 years. Some of the patients had various surgeries in other clinics and discontinued using RGP contact lenses and follow-up. The patients who dropped out contact lenses and discontinued follow-up were also recalled and examined. The duration of contact lens use after prescription, the reasons for dropping out, and final ophthalmic examinations of the patients were noted.

The differences between BCVA with and without RGP contact lenses were compared with Wilcoxon signed ranks test (SPSS 13.0, SPSS, Chicago, IL). The cor-

relation between the BCVA with RGP contact lenses and etiology of the corneal scar was evaluated with Mann-Whitney *U* test (SPSS 13.0). The correlations between the duration of contact lens use and BCVA with spectacles, and the duration of contact lens use and BCVA with RGP contact lenses, were analyzed with Pearson correlation test (SPSS 13.0).

## RESULTS

Records of 17 patients (20 eyes) who started using RGP contact lenses between 1995 and 1996 for scarred corneas were evaluated retrospectively. Five of the patients were female and 12 were male, ranging in age from 10 to 61 (mean age  $29.80 \pm 2.90$  SE). The irregular astigmatism was induced by herpetic keratitis in 3 eyes, corneal trauma in 5 eyes, and previous corneal infections in 12 eyes. Etiology of corneal scar, age, visual acuity with or without RGP contact lenses, and duration of contact lens use of each patient are shown in Table I. There was no correlation between the BCVA with RGP contact lenses and etiology of the corneal scar ( $p=0.121$ ).

All the patients had increase in visual acuity when they started using RGP contact lenses. The mean BCVA with spectacle correction was  $0.28 \pm 0.04$  SE, and the mean BCVA with RGP contact lenses was  $0.71 \pm 0.04$  SE in the beginning of the study. There was a statistically significant increase in visual acuity with RGP contact lenses ( $p=0.000$ ). Seventeen patients (85%) had increase in visual acuity more than two lines.

It was found that 19 eyes (95%) were still using contact lenses after the first 3 months. However, at the end of 10 years, the number of eyes that were treated with RGP contact lenses was only 1 (5%). This eye was the fellow eye of the patient who was using contact lenses bilaterally. The mean duration for contact lens use for the patients who dropped out of contact lenses before 10 years was  $21.42 \pm 4.53$  SE months (between 2 and 72 months). There was no correlation between the duration of contact lens use and the BCVA with RGP contact lenses ( $p=0.806$ ,  $r=-0.59$ ). There was also no correlation between the duration of contact lens use and BCVA with spectacle correction ( $p=0.763$ ,  $r=0.72$ ).

The main reason for dropping out of RGP contact lens use was surgical interventions (57.8%). These pro-

**TABLE I - ETIOLOGY OF CORNEAL SCAR, AGE, VISUAL ACUITY WITH OR WITHOUT RIGID GAS-PERMEABLE (RGP) CONTACT LENSES, AND DURATION OF CONTACT LENS USE OF EACH PATIENT**

Patient	Etiology	Age, yr	BCVA with glasses	BCVA with RGP contact lenses	BCVA at the end of 10 years	Duration of contact lens use, mo
1	Herpes keratitis	17	20/40	20/25	20/25	8
2	Corneal abscess	16	20/100	20/50	20/50	48
3	Corneal abscess	16	20/50	20/25	20/25	—
4	Herpes keratitis	11	20/100	20/20	20/20	14
5	Corneal abscess	45	20/32	20/25	20/32*	36
6	Corneal abscess	45	20/25	20/20	20/20	36
7	Corneal abscess	41	20/100	20/25	20/40†	30
8	Herpes keratitis	36	20/200	20/32	20/1000†	3
9	Corneal abscess	10	20/100	20/32	20/32*	2
10	Corneal abscess	28	20/400	20/200	20/40†	15
11	Corneal abscess	28	20/63	20/40	20/63†	24
12	Corneal abscess	61	20/630	20/32	20/32†	72
13	Corneal abscess	23	20/32	20/25	20/25*	10
14	Corneal abscess	38	20/100	20/32	20/32	4
15	Trauma	40	20/50	20/25	20/25	4
16	Trauma	24	20/200	20/40	20/40	17
17	Trauma	30	20/100	20/25	20/32†	54
18	Corneal abscess	27	20/100	20/20	20/32†	13
19	Trauma	35	20/63	20/32	20/32	3
20	Trauma	25	20/400	20/20	20/32†	14

\*Patients underwent phototherapeutic keratectomy.

†Patients underwent keratoplasty.

BCVA = best-corrected visual acuity.

cedures were keratoplasty in 8 eyes (42.1%) and phototherapeutic keratectomy in 3 eyes (15.7%). The other reasons for discontinuation of the contact lens use were recurrent punctuate epitheliopathy in 2 eyes (10.5%), recurrence of herpes simplex keratitis in 1 eye (5.2%), and loss of motivation in 5 eyes (26.3%) (Tab. II). When the patients with motivation loss were questioned, boredom with contact lens use in three patients and financial burden in two patients were found to be responsible.

## DISCUSSION

RGP contact lenses improve visual acuity by providing a smooth refractive surface in patients with corneal scars and nebular and nebulomacular corneal opacity (6-10). It was also found that improvement in visual acuity was much better with contact lens than spectacle correction in all types of corneal scars (7). Titiyal et al (9) determined the improvement in visual

**TABLE II - REASONS FOR DROPPING OUT OF THE RIGID GAS-PERMEABLE CONTACT LENSES**

Reason for dropping out	No. of patients
Loss of motivation	5
Keratoplasty	8
Phototherapeutic keratectomy	3
Recurrent punctuate epitheliopathy	2
Herpes infection reactivation	1

acuity with RGP contact lenses in patients with repaired corneal perforations. They found that the BCVA with spectacles was  $0.20 \pm 0.13$  while it was  $0.58 \pm 0.26$  with contact lenses. In another study, Kanpolat et al (8) compared the improvement in visual acuity with spectacle correction and RGP contact lens correction in patients with scarred corneas. They found that 61% of the patients with RGP contact lenses had 20/40 or better visual acuity, while only 40% of the patients with spectacle correction achieved the same

levels of visual acuity. In our study we observed a significant improvement in visual acuity in all patients using RGP contact lenses ( $p=0.000$ ).

The edge of the RGP contact lenses provokes a constant lid sensation and a greater degree of discomfort compared to hydrogel lenses so they are less readily accepted by patients and have a longer adaptation period. Additionally, rigid lenses cause greater corneal insult due to increased mechanical friction of the lens on the corneal epithelial surface (11). However, it has been shown that there was no significant difference in the frequency of ocular pain between soft contact lenses and RGP contact lenses, once the patients have adapted to wearing RGP contact lenses (12). Fujita et al (13) evaluated the effect of initial ocular discomfort of RGP contact lenses on becoming a successful wearer. They claim that the visual analogue scale (VAS) score at 1 week might be a useful marker to determine the patient's tendency to continue wearing RGP contact lenses. The patients in our study had been trained to wear contact lenses when they were first using the RGP contact lenses, and their adaptation to contact lenses was evaluated during the first months of the lens use. However, we observed that the patients drop out of RGP contact lenses and seek different treatment methods despite a successful adaptation period and improved visual acuity (shortest duration of contact lens use was 2 months and the mean duration of contact lens use was  $21.42 \pm 4.53$  SE months).

Our success rate in using RGP contact lenses is significantly different from the literature. Kanpolat et al (8) observed contact lens failure in 6 eyes (18%) during 4 years follow-up time. They reported that the rest of their patients (82%) became successful RGP contact lens wearers without any complaints. However, 31 of their patients ( $n=33$ ) were aphakic due to the injury, whereas none of our patients was aphakic. This might explain why most of their patients continued to use RGP contact lenses during 4 years of follow-up time. Shaughnessy et al (14) evaluated the safety and efficacy of RGP contact lenses in the pediatric population and found that 83.3% of their patients were still wearing RGP contact lenses after a mean follow-up of 17.8 months. Like in the former study, 53.3% of their patients were aphakic. Additionally, the patients had different indications for RGP contact lens use. Only 4 of their patients ( $n=12$ ) had corneal scars.

In consequence, long follow-up time and profile of patients are the factors which create the difference of our study.

Although the patients had significant visual acuity increase with RGP contact lenses, continuity of contact lens use could not be maintained in the long term and some patients preferred permanent treatments although visual acuity was worse with the new treatment. These patients had different kinds of corneal surgeries in other clinics. Titiyal et al (7) showed that there was more improvement in visual acuity with RGP contact lenses than in glare acuity, contrast sensitivity, and mesopic vision. This might be a reason for dropping out the contact lenses and seeking new treatment methods which would remove the corneal scar and provide better improvement in visual performance. Patients who have good visual acuity in the fellow eye could not realize the effect of RGP contact lenses on visual acuity improvement, since they were satisfied with the vision of the uninjured eye. In our study, there was only 1 patient (5%) who was still using contact lenses after 10 years. This patient had bilateral corneal scars, and he was using the contact lens on only one eye. Kanpolat et al (8) found that two of their patients ( $n=33$ ) dropped out of contact lenses because of motivation loss. They also claim that the patients were satisfied with the vision of the uninjured eye. Another reason for motivation loss in our study was the price of RGP contact lenses, since two of the patients claimed that they could not afford them.

The other reasons for dropping out the RGP contact lenses were herpetic infection reactivation and recurrent punctuate epithelial keratitis. Herpetic infection reactivation was treated with topical antiviral and lubricating drops and discontinuation of the contact lens wear. Recurrent punctuate epithelial keratitis, a contact lens-related complication, was also treated with antibiotic and lubricating drops. However, these patients could not get used to wearing contact lenses again. Other RGP contact lens-related complications such as corneal neovascularization, giant papillary conjunctivitis, or corneal edema were not seen.

In conclusion, we suggest that RGP contact lens use is a successful method of increasing visual acuity in scarred corneas. However, patients with good visual acuity in the fellow eye may lose their motivation for RGP contact lens use. Additionally, many prefer permanent treatment methods despite worse visual acu-

ity. These patients could be directed to refractive surgery, to avoid spending time and effort for RGP contact lenses. The weakness of the present study was the small number of patients evaluated. Further studies with larger case series with long follow-up are needed to demonstrate the long-term results of RGP contact lens use in patients with scarred corneas.

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## REFERENCES

1. Kok JH, Visser R. Treatment of ocular surface disorders and dry eyes with high gas-permeable scleral contact lenses. *Cornea* 1992; 11: 518-22.
2. Schein OD, Rosenthal P, Ducharme C. A gas-permeable scleral contact lens for visual rehabilitation. *Am J Ophthalmol* 1990; 109: 318-22.
3. Hafner A, Langenbucher A, Seitz B. Long-term results of phototherapeutic keratectomy with 193-nm excimer laser for macular corneal dystrophy. *Am J Ophthalmol* 2005; 140: 392-6.
4. Förster W, Altzler U, Ratkay I, Busse H. Therapeutic use of the 193-nm excimer laser in corneal pathologies. *Graefes Arch Clin Exp Ophthalmol* 1997; 235: 296-305.
5. Goggin M, Alpins N, Schmidt LM. Management of irregular astigmatism. *Curr Opin Ophthalmol* 2000; 11: 260-6.
6. Dada VK, Agarwal LP, Martin S, Harris RL. Visual acuity improvement in eyes with corneal scars with contact lenses. *Am J Ophthalmol Physiol Optics* 1975; 52: 211-5.
7. Titiyal JS, Das A, Dada VK, Tandon R, Ray M, Vajpayee RB. Visual performance of rigid gas permeable contact lenses in patients with corneal opacity. *CLAO J* 2001; 27: 163-5.
8. Kanpolat A, Çiftçi OU. The use of rigid gas permeable contact lenses in scarred corneas. *CLAO J* 1995; 21: 64-6.
9. Titiyal JS, Sinha R, Sharma N, Screenivas V, Vajpayee RB. Contact lens rehabilitation following repaired corneal perforations. *BMC Ophthalmol* 2006; 6: 11.
10. Jupiter DG, Harold RK. Management of irregular astigmatism with rigid gas permeable contact lenses. *CLAO J* 2000; 26: 14-7.
11. Mehta M, Bhagwanjee A, Hilliar O. A clinical and optical evaluation of a modified lens for irregular corneae. *Clin Exp Optom* 2006; 89: 30-6.
12. Vajdic C, Holden BA, Sweeney DF, Cornish RM. The frequency of ocular symptoms during spectacle and daily soft and rigid contact lens wear. *Optom Vis Sci* 1999; 76: 705-11.
13. Fujita H, Sano K, Sasaki S, et al. Ocular discomfort at the initial wearing of rigid gas permeable contact lenses. *Jpn J Ophthalmol* 2004; 48: 376-9.
14. Shaughnessy M, Ellis FJ, Jeffery AR, Szczotka L. Rigid gas-permeable contact lenses are a safe and effective means of treating refractive abnormalities in the pediatric population. *CLAO J* 2001; 27: 195-201.

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