

MANAGEMENT OF IRREGULAR ASTIGMATISM AFTER CORNEAL ULCER WITH RGP CONTACT LENS IN PATIENTS WITH HIGH MYOPIA

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ABSTRACT

Introduction: The use of RGP contact lenses is indicated for correcting refractive errors in cases of high myopia and irregular astigmatism due to changes in the corneal curvature.

Case Report: A 30-years-old female came with complaints of redness, pain, glare, blurred vision, and yellow discharge and tearing on the left eye for 2 days. History of using Soft Contact Lens (SCL) since 10-years-old due to myopia. Visual Acuity of the right eye (VOD) with glasses was 6/12 and VA of the left eye (VOS) was 1/300. Patient was diagnosed with left eye corneal ulcer and was given levofloxacin eye drops, hydroxypropyl methylcellulosa eye drops, and vitamin C 1000 mg. After 3 days, the complaints were decreased but corneal ulcer in the left eye leaving scars, causing irregular corneal surface. Patients were advised to replace the contact lenses with RGP contact lenses. After the RGP fitting, the appropriate size was obtained in both eyes and the patient adapted well with VOD RGP 1.0 and VOS RGP 1.0 False. The patient felt helped by the RGP contact lens.

Discussion: RGP was given because it helped to reduce the risk of bacterial infection. RGP has a higher oxygen transmissibility as well as maintain the shape of the corneal curvature to become more regular so it can be used for irregular astigmatism beside as optical device for correcting high myopia.

Conclusion: RGP contact lens can be an option for irregular astigmatism after corneal ulcers due to the SCL use in patients with high myopia to provide good outcomes.

Keywords: rigid gas permeable contact lens, irregular astigmatism, corneal ulcer, high myopia

INTRODUCTION

Irregular astigmatism is astigmatism that occurs when the orientation and strength of the astigmatism vary at any point in the pupil.^{1,2} The causes of irregular astigmatism include primary and secondary causes. The primary cause is idiopathic. Secondary causes are corneal surgery, trauma, corneal dystrophy, and infection. Significant causes of irregular astigmatism are infection and the presence of scars on the cornea. Corneal infection also triggers a permanently irregular corneal surface. Correction of irregular astigmatism with Rigid Gas Permeable (RGP) contact lenses allows for a significant improvement in visual acuity compared to standard eyeglass correction. For this reason, RGP contact

lens management is the first choice in some corneal pathologies with irregular astigmatism.³

Infections often occur due to the use of contact lenses beyond the time limit, and lack of knowledge in caring for or storing contact lenses. According to a study conducted in America in 2016, of all contact lens users at least 85% have a risk of eye infection due to a lack of understanding about maintaining the cleanliness of the Soft Contact Lens (SCL).⁴ As many as 50% of patients using SCL in America who have infected keratitis, have a maximum vision of 20/60, and 25% have vision of 20/200.⁵

Corneal scarring due to infection causes a significant decrease in vision, mainly due to clouding of the corneal

surface and irregular corneal astigmatism. Penetrating keratoplasty and RGP contact lenses can correct a large number of irregular astigmatism and thus improve visual morbidity in some patients. In developing countries where there is a shortage of donor corneal materials, contact lenses are considered the first choice of optical rehabilitation in eyes with corneal scars following the occurrence of corneal ulcers.⁶

Based on their material, contact lenses are divided into RGP and SCL lenses. SCL is made of silicone-hydrogel which contains water so that it is soft, flexible, and allows oxygen to reach the cornea. RGP is made from Cellulose Acetate Butyrate, Silicone Acrylates, and Fluorine copolymers. The advantage of RGP compared to that is that it can correct astigmatism due to the presence of a layer formed by tears between the posterior surface of the contact lens and the cornea, which can be used for dry eye conditions and tear film disorders. RGP contact lenses last longer so they are economically beneficial.⁷

CASE ILLUSTRATION

The female patient, a 30-year-old foreigner, had a history of blurry vision since childhood, when saw far objects. The patient has started wearing glasses since the age of 3 years and started wearing SCL since the age of 10 years. The patient also had history of changing the power of the glasses every year. Her father and her twin brother had the same bad eyesight as she had. Patient worked as a marketing in one of the villas in Bali and was often working in front of the computer.

On August 4, 2020, the patient came to a private hospital with complaints of redness, pain, and watering in her left eye for 3 days. Previously, she had been to the clinic and received combination of

steroid and antibiotic eye drops 3x2 drops in her left eye and oral antibiotics. The patient had a history of using SCL monthly since teenager due to high myopia. From the eye examination, founded visual acuity with spectacles 6/12 in the right eye, and 1/300 in the left eye. The patient was then diagnosed as corneal ulcer in her left eye and received 6x1 drops of levofloxacin eye drops in her left eye, hydroxypropyl methylcellulosa eye drop for each hour in her left eye and 1000mg of vitamin C. The patient was advised to come for follow up in the next 3 days.

On August 8, 2020, the patient came for follow up and there was an improvement of the ulcer. The redness, discharge, swelling, and pain had decreased. The visual acuity using SCL is 6/12 in the right eye, and 2/60 in left eye. The patient continued previous therapy and addition of ibuprofen 2x1 tab if necessary. The patient was consulted to an ophthalmologist of the Infection and Immunology Department at Sanglah Hospital for further therapy and treatment.

On August 18, 2020 the patient came to the VIP polyclinic to have her eyes checked. The corneal ulcer had got better with decreased symptoms of pain, glare and watering. The size of the ulcer was decreased but there was corneal scar on the left eye (Figure 1). The patient was suggested to contact lens division to obtain the refractive error correction and choose the proper contact lens for her.

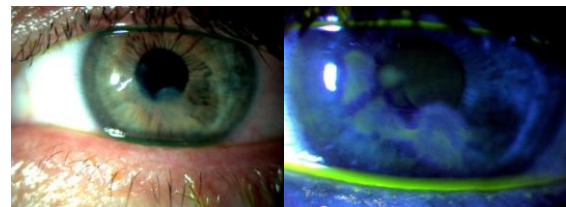


Figure 1. Corneal scar on the left eye.
(Courtesy: Juliari)

On August 24, 2020 the patient came to the doctor's private practice for follow up. Corneal topography of the patient can be seen in Figure 2 that showed irregular astigmatism on the left eye. The VOD with her former glasses (S-13.50 D) was 0.125 and her VOS with S-13.50 C-1.00 X 170° was 0.25. The best corrected VOD with S-16.00 was 0.63 and VOS S-16.00 C-1.00 X 10° was 0.25. The patient was diagnosed with OD Myopia; OS Myopia Astigmatism Compositus with corneal scarring and recommended to use RGP contact lenses as a distant vision aid. RGP (Menicon Z^α®) with trial power S-4.00 were fitted for the right eye with Base Curve (BC) 7.70 and it showed good centration, good movement and thin edge with fluorescein test. The over refraction with S-11.00 was 1.0. The left eye was fitted with BC 8.00, and it had good centration, pooling of the fluorescein in cicatricial area, and over refraction with S-10.00 was 1.0 F.

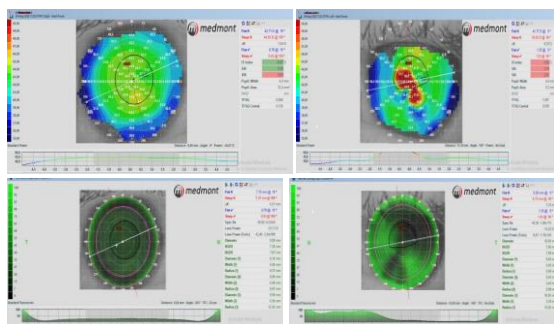


Figure 2. Corneal topography of right eye (upper left) and left eye (upper right) and the result of RGP software as a guidelines of fitting (lower right and left)

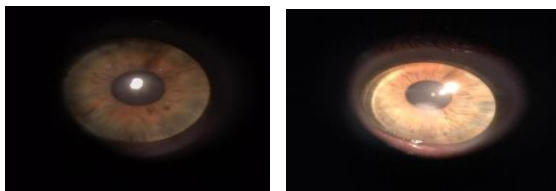


Figure 3. Fitting of RGP Contact Lenses on the right eye (Left) and left eye (Right). (Courtesy: Handayani)

The patient adapted well to the RGP and she was happy with her lens. After 2 months, through a telephone interview, the patient said that she was felt helped by the use of RGP contact lenses in carrying out daily activities, and no difficulties of adaptation and handling the lens.

DISCUSSION

The patient had a history of high myopia on both eyes. Soft contact lens as one of the corrections of high myopia had the risk of infection. In this patient, a corneal ulcer was caused by the improper use of SCL that caused corneal scarring in her left eye which resulted in irregular astigmatism. According to a study at L V Prasad Eye Institute, Hyderabad, 71.9% of corneal ulcers had positive cultures; of which 63.9% were positive for bacteria, 33% for fungi, 2.1% for parasites, and 6.2% for mixed infections.⁸

Corneal ulcers and changes in corneal curvature due to long-term use of SCL are caused by hypoxia, decreased oxygen supply to the cornea, and mechanical effects on the cornea itself. The hypoxic condition in cornea due to the use of SCL will increase anaerobic metabolism so that energy and glycogen production is lower. It can also increase the risk of corneal and stromal edema. This can occur due to hypoxia, chronic microtrauma that causes changes in the shape of the corneal surface. The irregular corneal surface is still present even though the SCL is no longer used.⁹

RGP has several advantages compared to SCL, such as greater tolerance in patients with dry eyes, because RGP provides more physiological interactions both between the lens surface and the ocular surface, as well as higher oxygen transport, which means that they let air pass through, allowing your eyes to "breathe." These lenses provide a superior oxygen supply because the materials they're made of allow more oxygen

through. Besides, they're smaller than SCL and therefore cover less of the surface of the eye and because they move around on the eye more, allow moisture and oxygen to circulate underneath the lens and make RGP higher oxygen transport than SCL.¹⁰

The factors that cause these infections other than using contact lenses over the time limit, are lack of knowledge in caring for or storing contact lenses, use of contact lenses without consulting an ophthalmologist, use of contact lenses during sleep, not changing contact lens storage fluids every day, not rinse contact lenses with sterile liquid before storing them back, and washing contact lenses using tap water.¹¹

The effect of a healed corneal ulcer is scar tissue. Ninety percent of corneal scarring causes permanent blindness, which requires therapy to keep the optimum visual acuity.¹² Several studies have tried to determine the factors that influence visual outcome in traumatized/scared eyes. The main choice of therapy is conservative without surgery, one of them is by using contact lenses.¹³ Titiyal et al in 2006 RGP has a 92.5% success rate in improving visual acuity in irregular astigmatism, RGP improve visual acuity by providing a smooth refracting surface negating the irregular astigmatism due to scar. The tear film underneath the RGP may also neutralize surface irregularities.

In patients with keratitis, the mainstay of therapy is medication with 24-48 hours monitoring of the progress of therapy. If within that time period there is an improvement, then the therapy can be successful and continued. In this patient, the corneal ulcer improved with medication but leaving a scar causing irregular astigmatism. To correct irregular astigmatism and high myopia of patients, the most minimally invasive procedure was chosen, namely the use of RGP

which in the end gave very good results and high satisfaction to the patient.¹⁴

The indication for selecting RGP than SCL because it is superior to correct irregular astigmatism, mild to moderate astigmatism and high myopia. RGP is used because the risk of bacterial infection is lower than SCL.^{11,15} According to the study of Genvert et al. quoted by Gogri and Bhombal in 2020, it is said that RGP is the main choice for the treatment of irregular astigmatism.¹⁶ Another study by Opacic in 2012 also supports this claim. With the use of RGP contact lenses, the visual acuity of patients with irregular astigmatism can be maximally achieved, more stable, and better than the use of astigmatism correcting glasses.¹⁷ RGP has a higher oxygen content than other types of contact lenses, so it rarely causes corneal edema and is not a problem if used for more than the prescribed time. Vision with RGP is also sharper and more consistent. It was found that the change of the corneal curvature was more significant when wearing RGP contact lenses than SCL.^{18,19}

CONCLUSION

High Myopia and irregular astigmatism are conditions that interfere with daily activities and reduce the patient's quality of life. RGP contact lenses were selected as the choice of correction in these conditions due to its lower risk of bacterial infection, better improvement of visual acuity especially for irregular astigmatism that cannot be best corrected with glasses or SCL and RGP has a higher oxygen.

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