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The use of rigid gas permeable contact lens in managing severe anisometropia caused by monocular aphakia following retinal reattachment surgery and high myopia in a 13 year old girl: a case report

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ABSTRACT

Anisometropia if not treated accordingly may cause other issues especially in developing pediatric eyes. This case is a 13 year old female presented with chief complaint of headache and double vision upon wearing prescribed spectacles. Patient had history of high myopia on both eye, amblyopia and spontaneous rhegmatogenous retinal detachment on the left eye. Retinal reattachment and lensectomy surgery were conducted to correct the problem. The surgery was performed without intra ocular lens (IOL) implantation, which left her left eye become high hyperope due to aphakia. Patient was treated with RGP CLs. Final best visual acuity with EDTRS chart was 6/48 on both eyes. Patient reported subjective visual improvement, no headache or double vision.

ABSTRAK

Anisometropia jika tidak ditangani dengan baik dapat menyebabkan komplikasi terutama pada perkembangan mata anak. Dilaporkan kasus, perempuan berusia 13 tahun dengan keluhan utama sakit kepala dan penglihatan ganda saat memakai kacamata. Pasien memiliki riwayat myopia tinggi pada kedua mata, ambliopia dan ablasio retina regmatogen spontan pada mata kiri. Operasi lensectomi dilakukan dengan menempelkan retina kembali untuk memperbaiki masalah. Operasi dilakukan tanpa implantasi IOL, yang membuat mata kirinya menjadi hiperopia tinggi akibat afakia. Pasien diobati dengan RGP CLs. Ketajaman visual terbaik terakhir dengan grafik EDTRS adalah 6/48 pada kedua mata. Pasien melaporkan perbaikan visual subjektif, tidak ada sakit kepala atau penglihatan ganda.

Keywords:
anisometropia;
pediatric;
myopia;
rhegmatogenous;
lensectomy

INTRODUCTION

Visual impairment is a global health problem that has affected an estimated 253 million people worldwide, among those 217 million people have moderate or severe visual impairment and 36 million have blindness.[1-3] From all visually impaired people around the globe, the prevalence of blindness in children is significantly lower than adults. Despite lower in number, prevention and treatment of childhood blindness should remain a priority because of their expected longer remaining lifetime and hindrance in both their visual and general development it may cause.[3-4]

Refractive error is one of the most common cause of visual impairment in children.[5] In some cases, difference in refractive error between the eyes might happen, this is called anisometropia. The

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prevalence of anisometropia in children vary, with most studies reported a prevalence of lower than 10%.[6-9] Although anisometropia is an infrequent finding, it is often related to spectacle intolerance due to aniseikonia.[10]

Nowadays, contact lenses are commonly used for refractive correction, especially in severe anisometropia. Previous studies have reported rigid gas permeable contact lens as an effective device in children visual rehabilitation. Since it can be customized to achieve the desired power, diameter and base curve needed for the small developing eyes.[11-13]

We reported a case of severe anisometropia with unilateral aphakia, amblyopia and low vision with reported spectacles noncompliance. An intra ocular lens (IOL) implantation was not a treatment choice in this situation, since the patient had microcornea of her both eyes. The objective of this report is to illustrate the use of rigid gas permeable contact lens as a treatment option to improve visual acuity in pediatric patients with severe anisometropia.

CASE

A 13-year old female presented with chief complaint of headache and double vision upon wearing spectacles which cause noncompliance. The spectacles prescribed were S-8.00 C-2,00x180 for the right eye and S+10.00 C-1,75x70 for the left eye. Patient had history of high myopia on both eye, amblyopia and spontaneous rhegmatogenous retinal detachment on the left eye 2 years prior. Scleral buckle, vitrectomy, endolaser, lensectomy and injection of silicon oil was conducted to correct the problem. The surgery was performed without IOL implantation due to her microcornea, which left her left eye become high hyperope due to aphakia. A year after the surgery, she was diagnosed with secondary glaucoma and leucoma. The patient then got silicone oil removal and corneal scraped for the band keratopathy. Patient was born 39 weeks of gestation with normal birth weight, with nystagmus present in the first few months of life. There was no history of ocular trauma nor systemic disease. Her guardian denied any similar condition in her family.

Patient's best corrected visual acuity (BCVA) with spectacles were 6/48-2 on the right eye and 6/48-2 on the left eye uncorrected with pinhole. The patient has bilateral nystagmus and microcornea, corneal diameter was 9.20 mm on the right eye and 9 mm on the left eye with band keratopathy. She also has aphakia, decreased light reflexes, retina attached with subtle silicone oil visible at the superior retina of the left eye. Near sight test with spectacles were 1.6M and 1.0M after magnification trial using 20 D spectacles.

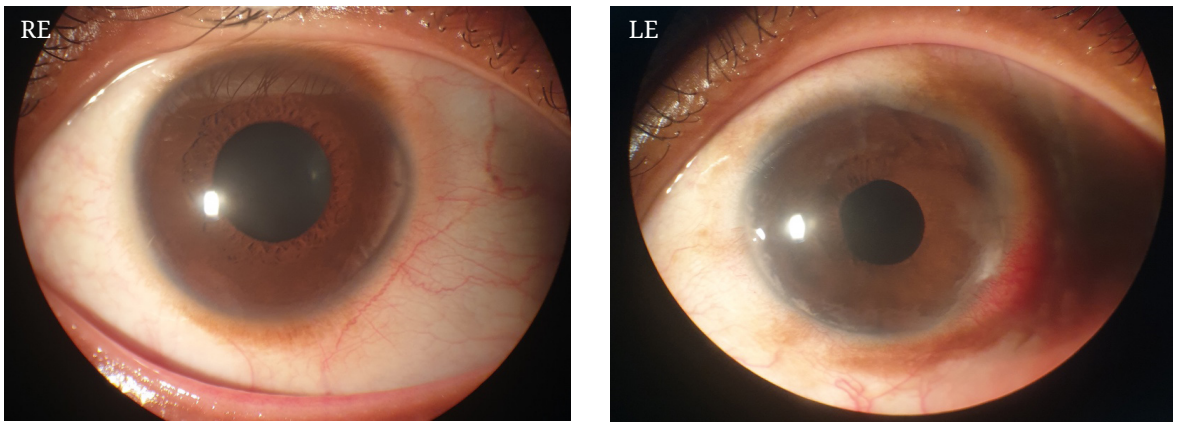

FIGURE 1. The profiles of the cornea of both eyes, as seen from the anterior with slit lamp

After considering her medical history and ophthalmological examination, she was diagnosed with severe anisometropia, amblyopia, nystagmus and low vision. Her amblyopia was likely secondary due to the central nervous system problem since there was congenital nystagmus. In order to correct her underlying issue and improve compliance, she was referred for RGP CLs.

The corneal topography of the right eye showed that the horizontal curvature was 41.70D (8.09 mm) and the vertical curvature was 43.8 D (7.70 mm), while the corneal topography of the left eye showed that the cornea was irregular with the radius of horizontal curvature was 44.8 D (7.53 mm) and the radius of vertical curvature was 46.7 D (7.23 mm).

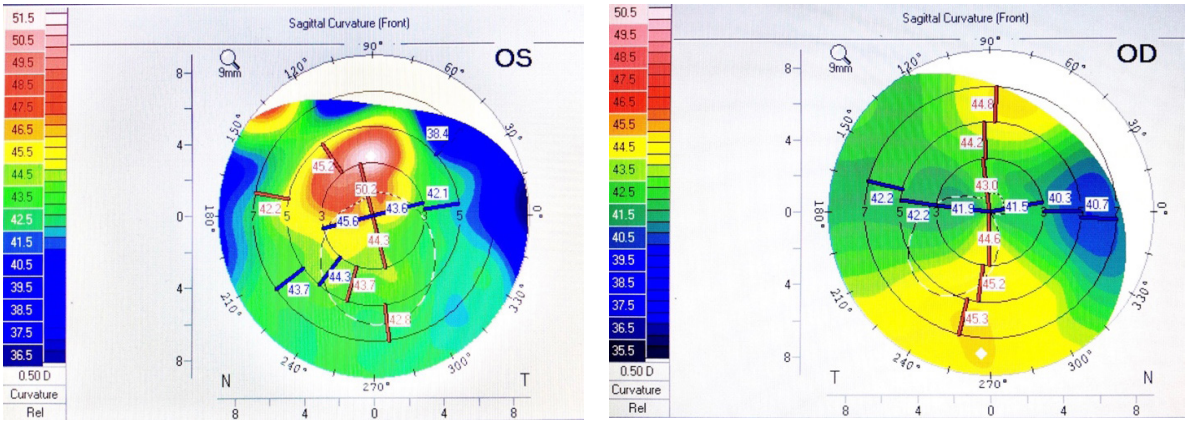

FIGURE 2. The cornea topography of both eyes, as seen from the anterior with slit lamp

Trial fitting for RGP CL was performed using tisilfocon A (Menicon Z α, Japan) lens with base curve 8.00 mm for the right eye and 7.50 mm for the left eye, power spherical -4.00D and diameter 9.20 mm for both eyes. The over refraction with the trial lens revealed no residual errors in the right eye and spherical +10.00D in the left eye. Upon evaluation, there were acceptable up riding centration between blinks on the right eye and good centration on the left eye. Contact lens movement were considerably good, it was 1.5mm upwards while blinking in both eyes. Some decentrations were shown immediately after blink with adequate pupil coverage. The up riding fitting RGP of the right eye was consistence with steep vertical cornea curvature and affected more by tight eyelid. Movement improved after full blink. Best corrected visual acuity was 6/48 on both eyes with EDTRS. Fluorescein test showed with the rule astigmatism on the right eye and acceptable slightly tight fitting with still sufficient movement while blinking on the left eye. Significant corneal with the rule astigmatism, makes the fluorescein pattern could not achieve ideal pattern with central minimal clearance. It could lead to flat band horizontally and pooling at superior-inferior as seen in the right eye, or inferior riding as seen in the left eye.

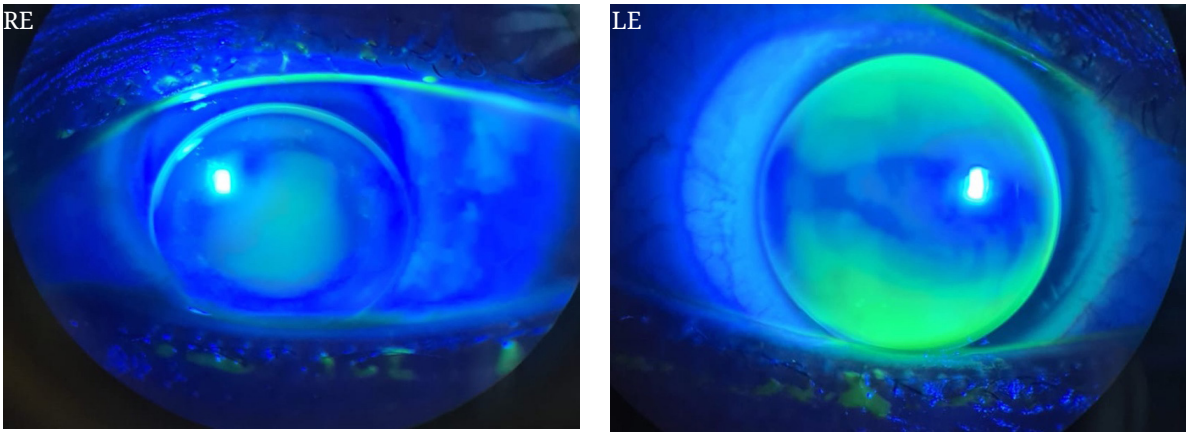

FIGURE 3. Fluorescein test after RGP lens application

The RGP CLs were then ordered with the following specification: base curve 8.00 mm with power -4.00D and diameter 9.20 mm for the right eye and base curve 7.50 mm with power +7.25D and diameter 9.00 mm for the left eye. The patient and caregiver was educated on proper handling of RGP, the importance of routine evaluation and instructed to come for a follow up one week after wearing the contact lenses. After one week of using RGP CLs on both eyes, patient reported subjective visual improvement, better compliance and overall no complaint during CLs wear despite having initial difficulty in use. Best corrected visual acuity using EDTRS chart was 6/48 on both eyes.

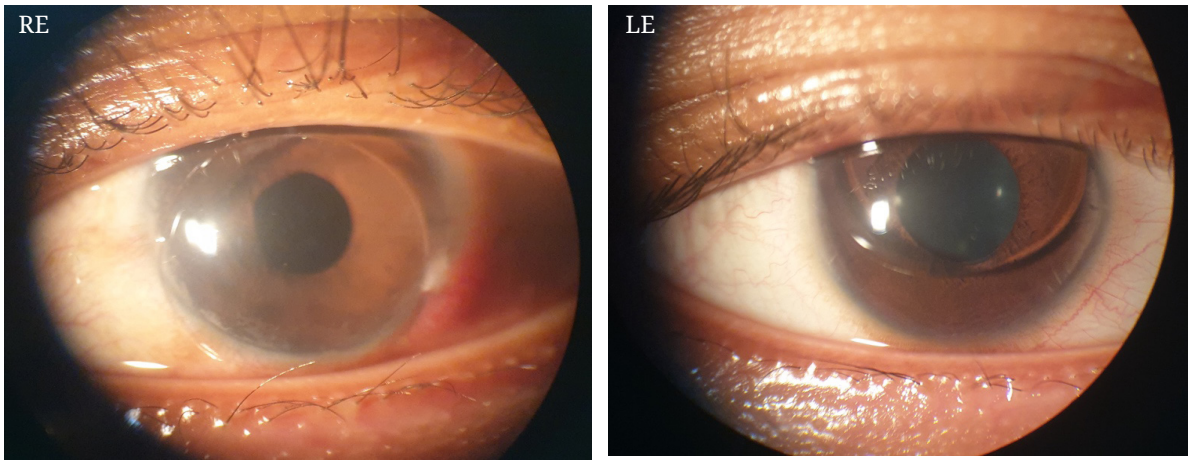

FIGURE 4. The patient wearing the RGP CLs taken immediately after blink, some decentrations were shown but with adequate pupil coverage

Next follow up was one month after using RGP CLs, patient reported broken the right RGP CL. Patient was then fitted for new right RGP CL with the same specification as before. Patient was instructed on gradual use of right RGP CL and educated to blink properly while using prescribed eye lubricant. Patient followed routine evaluation to regularly monitor eye development and complications related to contact lens usage, with the latest being 1 year after using RGP CLs. Best corrected visual acuity after one year with EDTRS chart was 6/48 on the right eye and 6/48 on the left eye. Although BCVA of 6/6 was not achieved, the patient was satisfied with the improvement. There was no complaint of headache or double vision, and better compliance was achieved than when wearing spectacles.

DISCUSSION

Anisometropia is a difference in refractive error between the eyes, where refraction difference of 1 D or greater in spherical equivalent is usually considered as a significant threshold. The prevalence of anisometropia in children vary, with most studies reported a prevalence of lower than 10%.[6-9] In the presence of anisometropia, the visual stimulus is adversely affected as one of the macula is receiving relatively blurred image. The sharper image from the better eye is processed by the visual pathways and the cortex, while blurred image from other eye is suppressed.[6] This will interfere with normal binocular vision and often associated with the development of amblyopia strabismus, aniseikonia and spectacle intolerance especially in children.[9-10]

Amblyopia is a reduction of best corrected visual acuity in one, or less often both eye, caused by abnormal visual input during the early life periode.[5] The cause of amblyopia could be classified as strabismic, refractive, visual deprivation and occlusion.[5,14] Approximately half of amblyopia is secondary to refractive errors and the other half is from other causes such as strabismus.

These conditions are reversible if detected and treated early in life, with compliance being the most critical factor for predicting a successful outcome. A side from compliance, treatment outcome also correlates with the initial degree of anisometropia as they require greater focusing effort to form a clear retinal image. If not, patients may develop low vision, as a visual impairment that cannot be corrected with regular eyeglasses, contact lenses, medicine, or surgery in which visual acuity is 3/60 or worse in the better-seeing eye.[15-16]

In this case, the patient is a pediatric female presented with chief complaint of headache and double vision upon wearing prescribed spectacles which cause noncompliance. Best corrected visual acuity with the new spectacle were 6/48-2 on the right eye and 6/48-2 on the left eye uncorrected with pinhole. While patient's VA with old spectacles were 3/60 on both eyes. Therefore, this was a case of severe anisometropia, caused by monocular aphakia that has caused aniseikonia. Amblyopia and low vision on this case was assumed due to disturbance in visual development centrally as there was congenital nystagmus.

Several modalities are available for the correction of visual impairment in anisometropia. Spectacles are often use as an initial treatment as they are the least invasive and expensive, but fitting and compliance remains an issue since patients may not perceive an improvement in their vision. They may also experience dizziness or even develop headache from spectacle because of the optically induced aniseikonia and asymmetry in lens weight, especially in hight anisometropia.[15-16] Refractive surgery can also be considered as a treatment option for severe anisometropia, since

it reduces dependency on compliance in comparison with other optical devices. However, the accurate refractive stability prediction after surgery is biased by the possible age-related refractive and anatomy changes in pediatric eye development.[12]

Contact lenses are commonly used for refractive correction in severe anisometropia caused by monocular aphakia. In contrast to other types of contact lenses, RGP CLs offers several advantages for the small developing eyes of pediatric patients. They are manufacturedin a wider range of powers which is particularly beneficial for this patient who needs both high minus and plus lenses, considering her severe anisometropia was caused by not only high myopia but also monocular aphakia. In addition, they can also be customized to the specific base curve or diameter needed to accommodate pediatric cornea that is typically steeper in curvature and smaller in diameter than the adult cornea.[13] Previous studies have reported RGP CLs as a safe and effective refractive treatment in pediatric anisometropia for reasons not only mentioned above, but also high oxygen permeability, greater contrast sensitivity, better durability and the ability to correct higher corneal astigmatism which is important to achieve best possible vision and comfort after adaptation.[11,13]

The lens design chosen for this patient was an aspheric lens and the diameter of the lens chosen for fitting was 9.20 mm, which was the only diameter available in the trial lens kit. Precise fitting is important to achieve stable vision and acceptable comfort which improves after adaptation, and should involve the evaluation of both static and dynamic criteria.[17]

In this patient, there was an up-riding centration with lid attachment lens movement and with the rule astigmatism as on the right eye. While there was good centration and with acceptable slightly tight fitting on the left eye. These patterns and movements were consistent with corneal topography profile. The aspheric lens design chosen can minimize lid-lens interaction and provide better centration on astigmatic cornea.[17]

Tisilfocon A was chosen as RGP CL material for both fitting and ensuing treatment. This lens material is a thermoset copolymer derived from fluoromethacrylate and siloxanylstyrene with benzotriazol UV absorber. It has the highest oxygen permeability (Dk) value of 163 barrers, ideal for eyes that require sufficient corneal oxygenation for successful contact lens wear.[17] Oxygen transmissibility becomes more important variable to consider in aphakic contact lens, since higher central thickness required to correct aphakia may compromise corneal oxygen uptake.[18]

Although having many advantages, some disadvantages need to be considered when using RGP CL. The primary disadvantage of RGP lenses is that their oxygen transmissibility decreases in aphakic contact lens. It also takes time for patients and caregiver to become skilled at handling RGP lenses. Studies have reported thatit took patients and caregiver at least 1 month to become skilled at handling RGP lenses. However they eventually became adept at managing RGP lenses over the course of the follow-up period.[19] Studies has also reported that RGP CL has higher rate of lens replacement than other types of contact lens. The higher rate of lens replacement maybe contributed to the greater precision that can be achieved when correcting refractive errors. But it may also reflect a greater tendency to break or lose them.[13] During the 1 month follow up, the patient reported broken right RGP CL. This might be caused by unskilled handling mentioned prior. Educating the patient and caregiver on this matter is important to prevent

lens abandonment, and for patient to properly follow routine evaluation.

CONCLUSION

Treatment for severe anisometropia in pediatric patients vary. Spectacles being the least invasive may cause aniseikonia and compliance problem. While despite reducing dependency on compliance, refractive surgery is invasive and the refractive stability prediction after surgery is biased by possible age-related refractive and anatomy changes in pediatric eye. Intra Ocular Implantation considered not be suitable for a microcornea condition.

RGP CLs is a safe and practical treatment in pediatric patients with severe anisometropia caused by monocular aphakia. It is available in a wider range of powers and can be customized to the specific base curve or diameter suitable for developing pediatric eyes. It also provides superior vision and long-term comfort after adaptation can be expected as patients and caregiver become skilled at handling RGP lenses.

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