Comparison of soft contact lens and rigid gas permeable lens fitting after laser in situ keratomileusis (LASIK)

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Abstract: Despite the accuracy of laser in situ keratomileusis (LASIK), a portion of patients will remain partially under-corrected or over-corrected following the surgery. For these patients, contact lenses maybe the best conservative option for visual rehabilitation and sustainability of minimum level of the binocular vision post operation. Due to the fact that cornea contour has been changed after Lasik surgery, fitting lenses on these corneas can be one of the most difficult challenges in the art of contact lens fitting. In general, patients with minor regular astigmatism may be fitted successfully with spherical or toric soft contact lenses. Patients with corneal irregularities should be fitted with rigid gas permeable lenses of traditional 3 or 4 curves or special designs such as keratoconus lens or reverse geometry lens. [John Ching-Jen Hsiao, An-Chi Hung. **Comparison of soft contact lens and rigid gas permeable lens fitting after laser in situ keratomileusis (LASIK).** *Life Sci J*. 2012, 9(4):5662-5665] (ISSN:1097-8135). http://www.lifesciencesite.com.843

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1. Introduction

Residual ametropia and irregular astigmatism are the 2 major complications associated with photorefractive surgery such as laser in situ keratomileusis (Lasik). Contact lens in these cases can provide a good chance to improve the patients' visual acuity and binocular vision. The prevailing notion has been that soft contact lenses conform to corneal surface irregularities and have a limited role for managing LASIK-induced irregular astigmatism.[1] For that reason, in the case of low residual spherical refractive error following Lasik, conventional soft contact lens including disposable lens can be fitted and likely to give a good level of acuity. Where there is a moderate amount of astigmatism of greater than 1.00 D, toric soft contact lens would be the choice of treatment. In the case of high astigmatism or the presence of irregular astigmatism such as post Lasik ectasia, rigid gas permeable lens may be the only option since it is able to create a spherical anterior refractive surface over the ectatic cornea by allowing the tear to fill the gap between the irregular corneal surfaces, hereby reduces the majority of the irregular astigmatism. To fit rigid gas permeable lenses post Lasik surgery, there are a number of different designs to choose from, and they include traditional 3 or 4 curves, keratoconus lens, scleral lens, reverse geometry lens…etc. All these depend on the architecture and contour of post Lasik cornea, amount of uncorrected refractive errorincluding astigmatism and the vision demand of the patients. In this paper, we will concentrate mainly on contact lens fitting post-Lasik.

2. Material and Methods

The following examinations were performed: Visual acuity with and without correction, manifest refraction, keratometry, corneal topography, complete slitlamp biomicroscopy examination and many trail rigid lens fittings with fluorescein dye.

Visual acuity was assessed for each eye with Snellen vision test chart viewed at 3 meter with mirror reflection set up. Corneal topography was performed using Dicon topographer (Paradigm Medical, USA) and keatometry reading using Topcon keartometer. Contact lenses used were traditional 4 curves rigid gas permeable lenses (Boston EO material) and toric soft contact lens of medium water content of 42%.

3. Results and Discussion

In patient post Lasik surgery, fitting contact lens on the altered corneal architecture can be very complex and challenging. In comparing to fitting contact lens on normal cornea, fitting lens on post Lasik patient, clinician would require special diagnostic trial lenses, extensive knowledge and experience in contact lens fitting and a lot more chair time. Here we list and discuss some of the clinical facts and contact lens fitting tips for cornea of post Lasik patients.

Soft spherical contact lens: In the case of residual spherical uncorrected refractive error, either myopic or hyperopic, with relatively flat central corneal surface, can be fitted with conventional soft contact lens in the normal way. This usually will give fairly good level of acuity especially in the case of low refractive power. However, the result can be affected by the design of the lens itself. For example, the center thickness and stiffness of the lens will decide if the lens will conform on the patient's altered shaped cornea. If the lens is very thick or stiff, then the lens might resist to deform and to conform tightly to the cornea, hence inducing positive tear meniscus created under the lens. In addition, the edge design of the lens is important in achieving the proper fit and adequate movement of lens on the cornea. Since the edge design of the soft lens varies one company form another, one should trial fit different brands of the soft lenses until the most suitable one is found. To choose the starting trial lens, we usually would pick a BOZR of approximately 0.3 mm flatter than the flattest keratometry reading or topographic power values if available.

Soft toric contact lens: Just like fitting normal cornea, where there is astigmatism greater than 0.75 or 1.00 D, soft toric contact lens may be required. With the different contour of corneal surface following Lasik surgery, the toric lens' axis stability or rotation would most likely to be quite unpredictable especially in case of higher degrees of astigmatism. Empirical fitting is however not recommended because of the atypical rotation on oblate corneas post-refractive surgery compared with normal, prolate corneas.[1] Therefore, the trial fitting may be the only way in determining the final cylinder axis.

Rigid gas permeable lens: Where there is presence of irregular astigmatism or significant amount of regular astigmatism, rigid lenses may be preferable. However, the fitting of rigid lens on post Lasik cornea can be quite challenging. In a myopic patient following Lasik surgery, the central area of cornea will become flatter and the peripheral area will become steeper, and the difference of the curvatures of 2 areas will increase as the amount of ablation increases. This result in unstable optics, unacceptable central pooling and trapped bubbles when the rigid lens is fitted in alignment with the peripheral cornea.[2] Nevertheless, rigid lenses are fitted in the normal way. The goal is to achieve good lens centration, complete coverage of pupil with the optical zone, proper lens movement post blinking, adequate edge lift and acceptable minor central pooling. The keratometry readings can be used as the guide for choosing initial trial lens base curve, but the final parameter and lens modification of lens design must be based on trial lens fitting with fluorescein dye.

Reverse geometry lenses: Reverse geometry lenses (RGLs) are indicated where there is a significant difference between the flat central ablated zone and the relatively steeper peripheral cornea.[3, 4,5] This would likely to happen when the preoperative refractive error was in the range of high myopic.

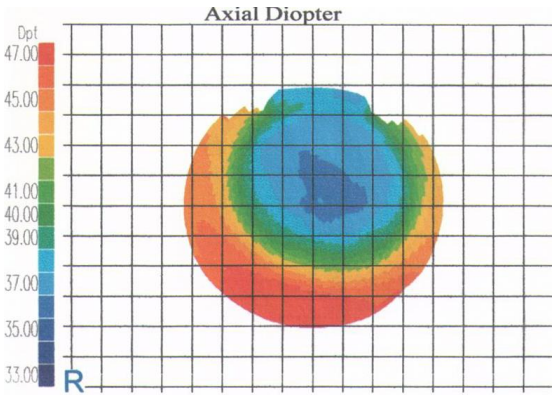

Fig. 1. Topography of OD, 1 year post Lasik.

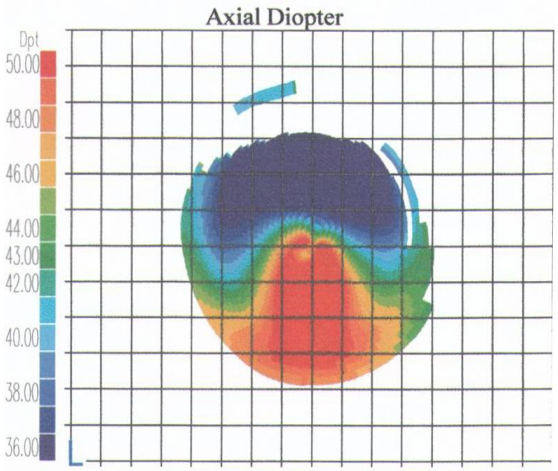

Fig. 2. Topography of OS, 1 year post Lasik, showing ectasia at inferior area.

Keratoconus lens: Where is presence of moderate or severe post Lasik ectasia. Keratoectasia is a rare but well-known complication after laser-assisted in situkeratomileusis (LASIK). By definition, ectasia is defined as inferior topographic steepening of 5 diopters (D) or more compared with the immediate postoperative appearance, loss of 2 or more Snellen lines of uncorrected visual acuity, and a change in manifest refraction of 2 or more diopters in either sphere or cylinder.[6]Although rare, patients with

this condition can have high and irregular astigmatism. The classic clinical sign of the condition is a progressive steepening and thinning of the cornea after excimer laser refractive surgery that reduces both uncorrected visual acuity and corrected visual acuity with spectacle. Management of postoperative ectasia with specialized contact lens such as keratoconus lens remains the main course of treatment for patients who do not wish to go through other surgical options or corneal transplantation. Clinically, the fit of the contact lens was assessed on a slit lamp with the use of a fluorescein dye, and the contact lens fit was judged to be good if there was apicalclearance or mild apical touch, good centration, and adequate edge lift (3 point touch method).

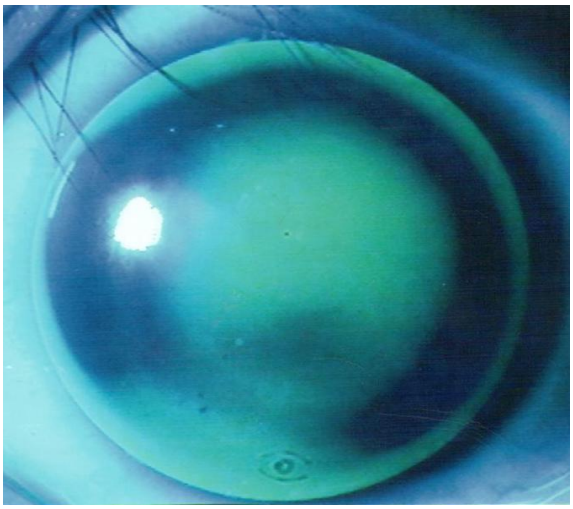

Fig. 3. Traditional 4 curves design of rigid lens fitted on a cornea with post Lasik ectasia.

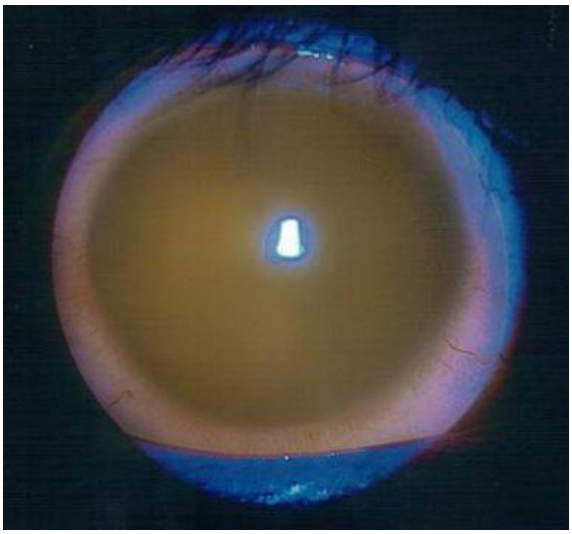

Fig. 4. Soft toric contact lens fitted on a post Lasik cornea, using large molecule fluorescein dye.

We report the course and the management of a patient with typical post Lasik ectasia developed in her left eye. A 42 year old Asian female with unremarkable health condition had a Lasik refractive surgery done to her both eyes 1 year ago. The test result showed the unaided acuities were 20/40 OD and 20/200 OS; keratometric values were37.00@161/ 38.25@071 in the right eye and 43.00@005/ 45.75@095 in the left eye; the manifest refraction were +1.75-1.25 x055 20/25+ in the right eye, and +1.25-2.25 x 138 20/60- in the left eye. Corneal topographies were taken (Fig. 1 and 2) and confirmed corneal ectasia for her left eye. Due to difficulty in getting used to rigid lens wear in the patient's both eyes, we fitted OD with a traditional soft toric contact lens of water content of 42% and OS with a traditional 4 curves rigid gas permeable lens with minor adjustment at the edge lift. The designs of the lenses were as follows:

OD: +0.50-0.75*070/8.6/14.2 Soft toric contact lens (water content 42%).

OS: 7.70-/-4.75/9.8 pc-0.1mm in radius rigid gas permeable lens (Fig. 3).

These lenses gave the patient the visual acuities of OD 20/25+ and OS 20/25-. The reason why the prescription of OD soft contact lens given to the patient is a lot more myopic in comparing to that of the manifest refraction error is because the positive tear meniscus created under the lens. This can be easily seen with accumulation of fluorescein at the center below the lens in our photography (Fig. 4). Despite one eye was fitted with soft and another eye with rigid lens, patient was pleased with corrected visual acuity and comfort achieved by these contact lenses.

4. Conclusion

Contact lens fitting following Lasik surgery can be very challenging and require lots of professional chair time and trail lenses of different designs. One can use topography map and keratometry readings as the initial guide to decide what kind of lens designs to be used. In addition, there are several parameters of lens design one can play with when fitting difficult cornea like post Lasik, and these include lens diameter, lens thickness, edge lift and curvatures of center and peripheral curves. In most cases, if the visual acuity with the spectacle prescription is good, then soft contact lenses should always be tried first because of its easier fitting and superior comfort.

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