Visual Performance of Mini Scleral Contact Lens in Keratoconus

Ritesh Khowal, Simi Afroz

Abstract— Keratoconus is a progressive, bilateral, asymmetric, ectatic disease which causes progressive corneal thinning and protrusion of the cornea leading to irregular astigmatism and visual deterioration. Keratoconus is a rare condition characterized by asymmetric decrease in vision. Its presentation is usually second decade of life and ceased in the end of 3rd decade of life. Symptoms at presentation depend on severity of the disease. We herein report a rare presentation of unilateral keratoconus with failed INTACS in a 22 years old male Indian patient. Pentacam and previous reports revealed stage 2 keratoconus with failed INTACS. A wide range of options for the management of keratoconus described in the literature, they should be used with proper care and management. In today's scenario miniscleral contact lens for moderate to advanced keratoconus with or without scaring of cornea is good option for masking irregular cornea and providing good and comfortable vision. The objective of this case report is to high light the use of mini scleral lens to mask corneal irregularity and scars and provides a good and comfortable vision.

Index Terms—corneal irregularity, ectatic disease, INTACS, irregular astigmatism, keratoconus and mini scleral contact lens.

1. Introduction

Keratoconus is a progressive, bilateral, asymmetric, ectatic disease which causes progressive corneal thinning and protrusion of the cornea leading to irregular astigmatism and visual deterioration. John Nottingham is considered the first author to describe keratoconus and its associations [1]. Typical sign and symptoms of keratoconus are listed below [2]:

- Patient present with early twenties (second and third decade of life)
- Blurring or distortion in vision
- Frequent changes in refractive error
- Retinoscopy shows scissoring reflex and an "oil-droplet" reflex (Charleux sign).
- Prominent corneal nerves
- Corneal ectasia is accompanied by thinning at the cone position (figure 1).
- Subepithelial and anterior stromal scars may be present, secondary to breaks in Bowman's membrane.
- Vogt's striae
- Fleischer's ring is formed due to deposition of hemosiderin.
- Munson's sign (figure 1)
- Rizzuti's sign
- Acute hydrops

Treatment of keratoconus is based on the severity, age of reporting and progression of the disease. In ancient time spectacle were the only solution for vision correction and in extreme cases where total scaring was present full thickness corneal transplants were done. With the evident of new technology newer and better options are available in terms of vision correction. Early Keratoconus can be managed by giving rigid Contact Lenses to the patient which correct the irregularity of the cornea and provide better quality of vision. However, the disadvantage of contact lenses is that, in severe cases, optimal fit is not achieved and rigid lenses are more difficult to wear. In moderate to advanced cases mini scleral or scleral lenses can be given which also correct the corneal irregularity and give better vision [1].

The introduction of cornea cross-linking (CXL) in the late 1990s has significantly altered the management of keratoconic patients. Recent studies report a significant reduction in the annual number of keratoplasties performed after CXL introduction. 90% of individuals it has been successful in preventing their condition from deteriorating after CXL application [3]. In order to achieve a strengthening effect of corneal tissue and arrest keratoconus progression, the use of riboflavin (vitamin B2) is combined with ultraviolet A (UV-A) irradiation. Riboflavin plays the role of a photosensitizer in the photopolymerization process and when combined with UV-A irradiation increases the formation of intrafibrillar and interfibrillar carbonyl-based collagen covalent bonds through a molecular process that has still not been completely elucidated [4]. Intrastromal corneal ring segments (INTACS) are medical devices made of synthetic material designed to alter the morphology and refractive power of the cornea. INTACS implantation is a safe and irreversible technique that can achieve corneal flattening and improved visual outcomes. Several factors such as the type of ICRS, the insertion technique, and patient selection contribute to the final outcome. Proper selection of the ICRS depends mainly on the refractive error, corneal thickness, and keratometry readings of the keratoconic patient. PK has been the treatment of choice for advanced forms of keratoconus and the last choice. However, improvements in opera-

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tive techniques have increased the popularity of DALK. The advantages of DALK over classic PK consist of lower rates of graft rejection, endothelial cell preservation, avoidance of an open-sky procedure, and shorter period of postoperative instillation of steroid agents, leading to lower incidence of postoperative cataract and glaucoma formation [(1), (4)].

We report a rare case of unilateral keratoconus with failed INTACS accompanied by refractive maps acquired on the anterior segment tomographer (Pentacam HR).

2. Case Report

A 22-year-old male Indian college student were reported in our clinic (Advance Vision Care Centre) with progressive loss of vision, Glare, Shadowing of image, photophobia in his right eye. He had previously been treated medically elsewhere for keratoconus and corneal collagen crosslinking with INTACS implant in his right eye was done 9 months prior but no INTACS ring was seen in slit lamp exam. A rigid gas-permeable contact lens was fitted but no improvement in vision was noted and also the lens was extremely discomfort upon insertion. Spectacles were provided without significant visual improvement. At that time uncorrected visual acuity was 6/24 OD and 6/18 OS. The patient was not satisfied with the current vision so he come to our clinic.

He was reported to us with worsened vision in his right eye and scaring. At the time he presented in our clinic his uncorrected vision in right eye was 6/60 and in left eye was 6/18+2 on Snellen's chart. He had no known systemic illness and no history of ocular trauma also. It was not known whether he had any family history of keratoconus and all family members were reported to have good uncorrected vision.

Previous reports revealed explanation of INTACS due to exposure of INTACS edge, on questioning revealed only occasional eye rubbing. He was not taking any medicine also not allergic to any drug.

Subjective refraction was done using hit and trial method for right eye and Acceptance for right eye was +1.00DSph / -4.00Dc @ 140°and -0.75 @ 100 For left eye. Best spectacle-corrected visual acuity on presentation to our department had deteriorated to 6/36 OD and 6/6 OS. IOP was measure using Non-contact Tonometer- 13mm Hg and 14mm Hg for right and left eye respectively at 11:00 am.

Marked scissoring reflex was noted on retinoscopy for OD and for left eye retinoscopy value -0.50 Dsph/-0.50 Dc @ 100°(undilated). Munson's signs were noticed in right eye. The lids were otherwise normal.

Slit-lamp bio-microscopy revealed inferior corneal thinning OD. There were superior Vogt striae, deep stromal scars, and underlying vertical Descemet's membrane breaks OD. There were faint Fleischer rings OD noticed only on cobalt blue illumination. The central corneas in both eyes were slightly haze with scarring from 4 to 9 O'clock position no inflammation or vascularization present. There was no evidence of current or previous allergic keratoconjunctivitis. The lenses were clear with no posterior segment abnormalities OU.

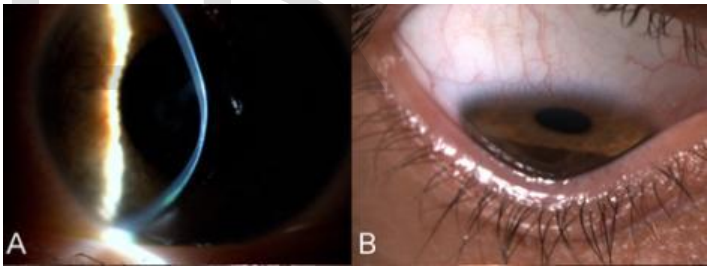
Anterior segment tomography (Pentacam HR) demonstrated inferior thinning in OD with inferior steepening OD. Pentacam HR shows deep scaring in Scheimpflug image in OD (figure 2). It also reveals increase in D-Value of 11.30 and 1.57 in right and left eye respectively (figure 5 and 10). Pachymetry at thinnest point was 503 µm and 563 µm for OD and OS respectively. (figure 2 and 5)

The points of maximal posterior elevation in relation to the best-fit sphere was +81 µm OD and +13 µm (figure 3and 8) OS were in direct relation to the location of the thinnest points OU. For pellucid Margin Degeneration (PMCD) there should be an inferior thinning band of 2mmto3mm from 4 to 8 O'clock position which is not observed in this case neither a superior steeping was observed as in case of Terrien's Margin Degeneration (TMD). These readings correlate with a stage 2 keratoconus for right following the scale of ABCD classification of keratoconus so the final diagnosis was OD stage 2 keratoconus [(5)].

Arrangements were made for trial of mini scleral contact lens fitting after keratometric stability in OD where as Biofinity toric for left eye. Visual acuity with contact lens is 6/6 in both eyes. Clinical image of right eye showing adequate fit was captured (figure 6and 7).

Patient was comfortable with lenses and happy with the vision. his binocular vision is also good with no complaint of glare and shadowing.

Figure 1: Image showing A: thinning of cornea, B: Munson's sign.



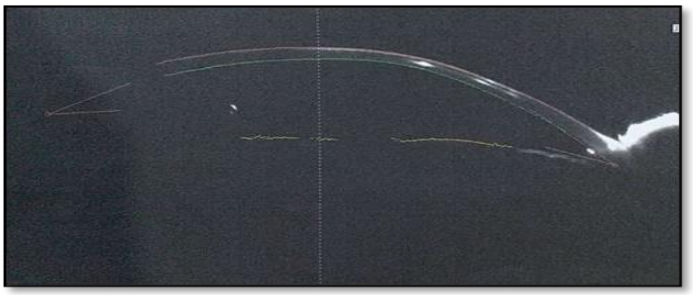


Figure 2: Scheimpflug image showing deep corneal scar in right eye.

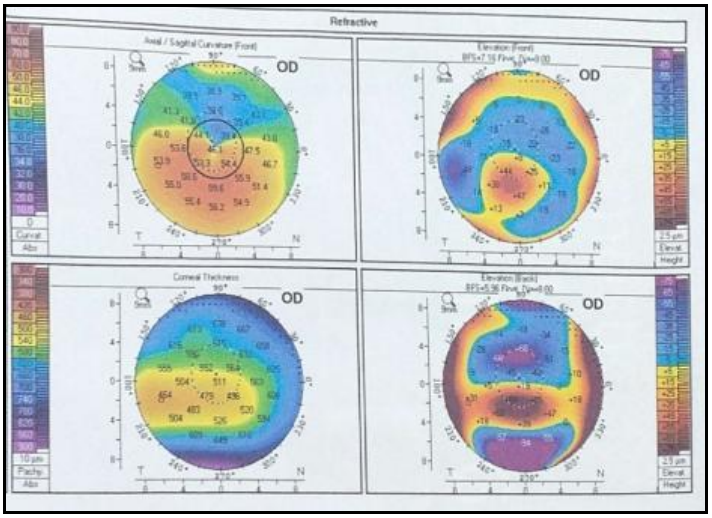


Figure 3: Pentacam image of refractive maps showing corneal curvature, pachymetry, anterior and posterior elevation of right eye.

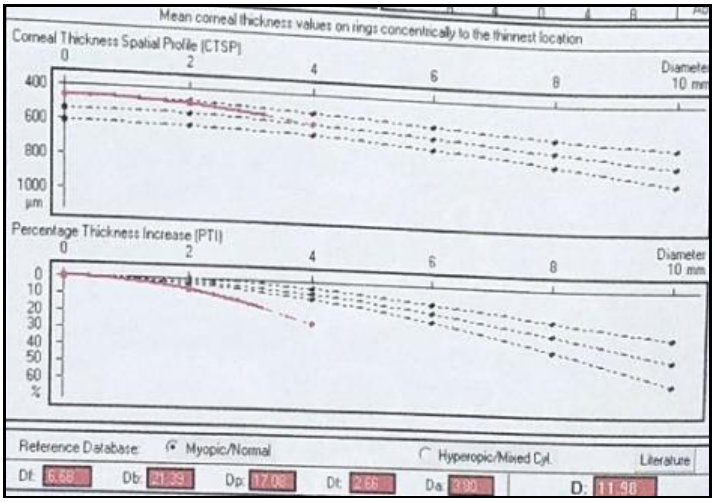


Figure 5: Pentacam Image showing D-value, CTSP and PTI of right eye.

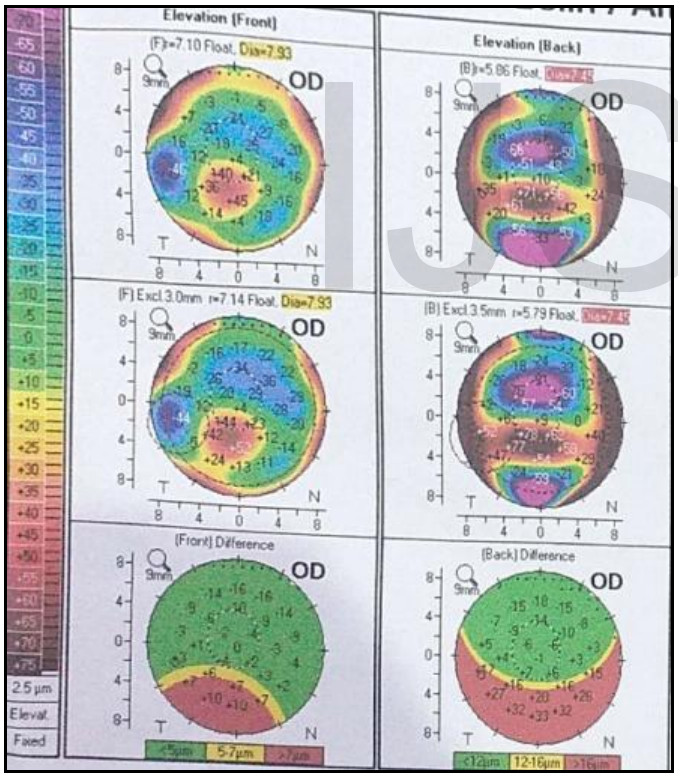


Figure 4: Pentacam Image showing enhanced front and back elevation map of right eye.

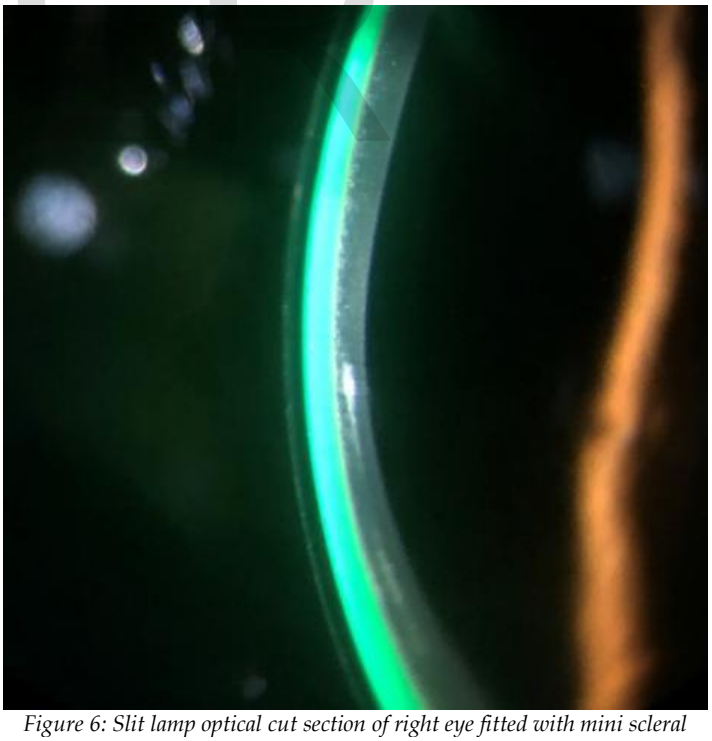


Figure 6: Slit lamp optical cut section of right eye fitted with mini scleral lens

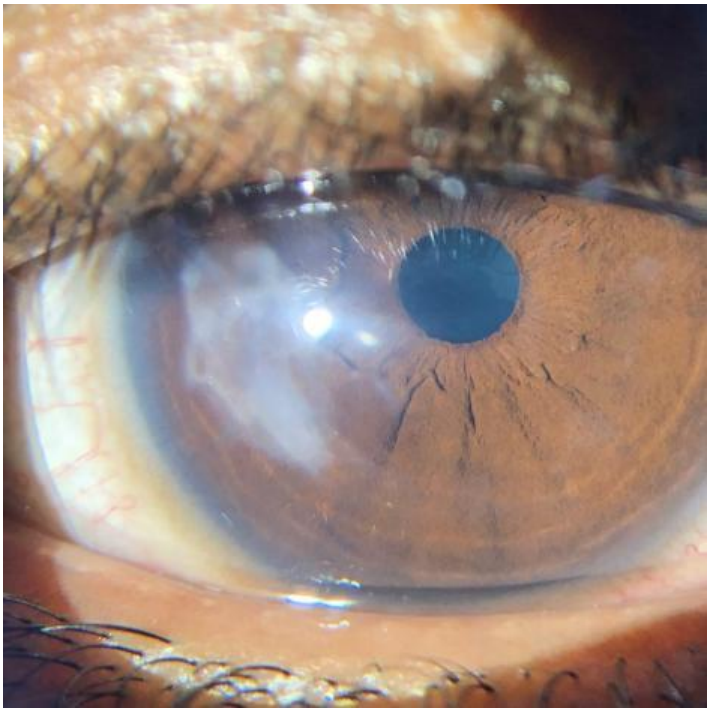


Figure 7: Diffuse direct illumination of right eye showing scar due to failed INTACS fitted with mini scleral lens.

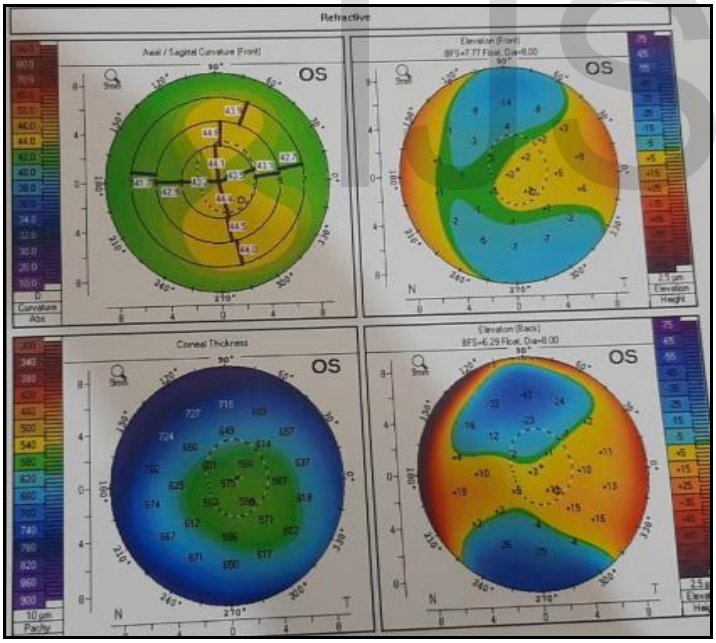


Figure 8: Pentacam Image showing refractive maps of left eye showing corneal curvature, pachymetry, anterior and posterior elevation.

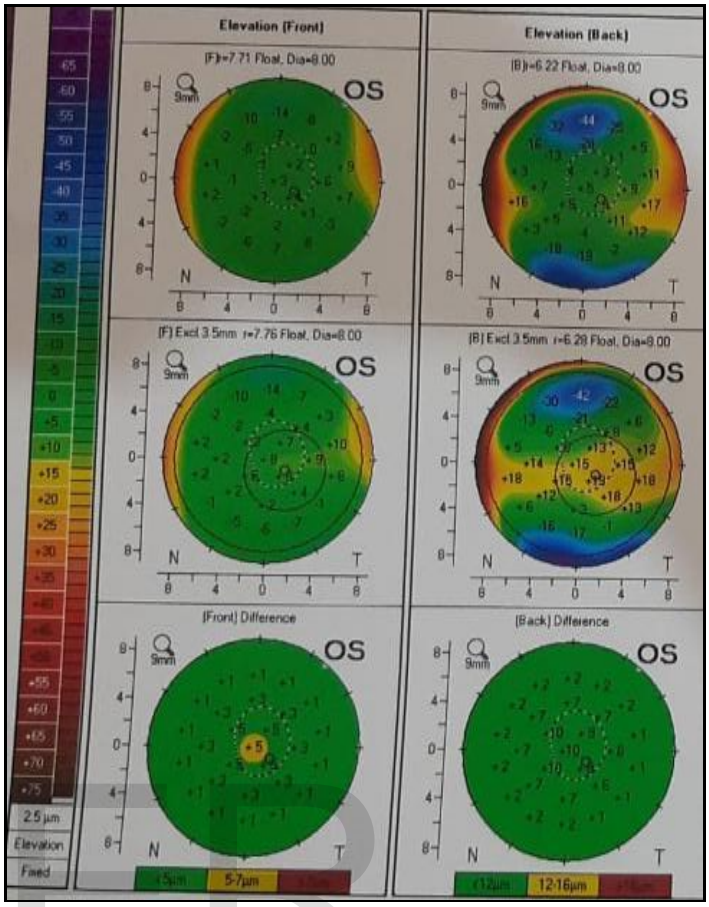


Figure 9: Pentacam Image showing enhanced anterior and posterior elevation of left eye.

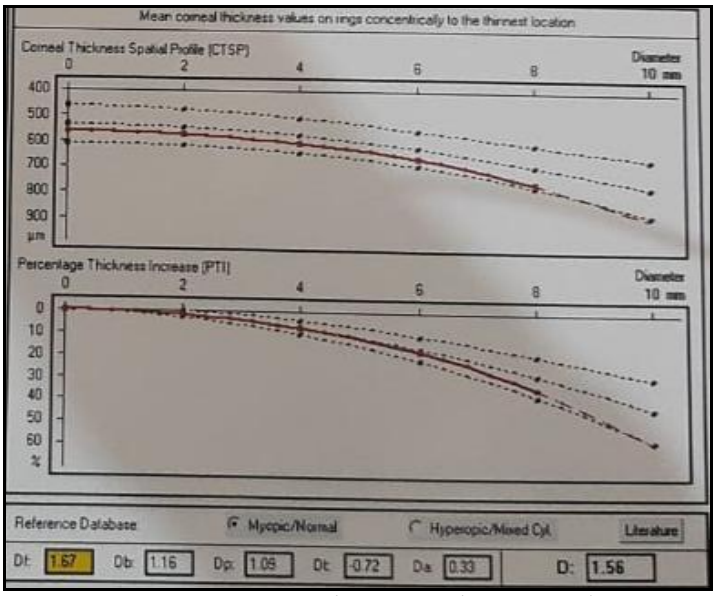


Figure 10:Pentacam Image showing D-Value, CSTP and PTI.

3. Discussion

Keratoconus is a noninflammatory ectatic disorder of the cornea. The cause of keratoconus [6] is still unknown, but rubbing the eye is a well-known risk factor. The prevalence of Keratoconus is 2.3% in India [7] and will affect both eyes in 96% of cases, with one eye typically progressing more than the other. The disease tends to actively progress for four to seven years and often ceases progression by the end of 3rd decade. The protruding corneal apex and the cornea's thinnest points are paracentral and almost always inferior to the visual axis. This condition may result in poor uncorrected vision on the basis of irregular and/or asymmetric astigmatism. Approximately 15% of these patients would require corneal surgery to gain any notable improvement in vision, while the rest can be satisfactorily managed with RGP contact lenses. *Hardly few patient had trial of mini scleral lenses because of its larger size optometrist scare to handle on compromised corneae which leads to less practice and awareness of mini scleral lenses in India.*

This patient presented with unilateral stage 2 keratoconus in right eye with failed INTACS and is successfully managed with miniscleral contact lens. Ours is the first case having evidence of failed INTACS in the right eye got normal vision with miniscleral contact lens to our best knowledge.

4. Conclusion

Our patient developed a progressing unilateral keratoconus which is been arrested by corneal collagen crosslinking (CXL) in his right eye. It must be emphasized that though he had undergone INTACS surgery and was failed due to unknown reason and leads to scar but has gain a good vision (6/6) with the use of mini scleral lenses and these lenses are comfortable also.

In conclusion, mini scleral lenses are good option for correcting irregular cornea and also provide comfortable vision.

5. References

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