

A comparative study of stromal reaction in Epi-on & Epi-off techniques post-C3R in Keratoconus patients with OCT.

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INTRODUCTION

Corneal collagen cross-linking with riboflavin (**vitamin B₂**) (CXL, C3-R, CCL and KXL), better known as **Cross-linking**, is a parasurgical treatment for keratoconus. The ability of adjacent collagen fibrils to form strong chemical bonds is called “**cross linking**”. This halts the progression of ectasia by strengthening the cornea.[1] It was first developed in Germany in 1998. The two techniques:

- **Epithelium-Off (Dresden protocol):** The standard technique requires the removal of corneal epithelial layer.
- **Epithelium-On (transepithelial):** The corneal epithelium layer is left intact.[2]

The OCT is useful in studying the optical characteristics of cornea after surgical interventions such as collagen cross linking.[3]

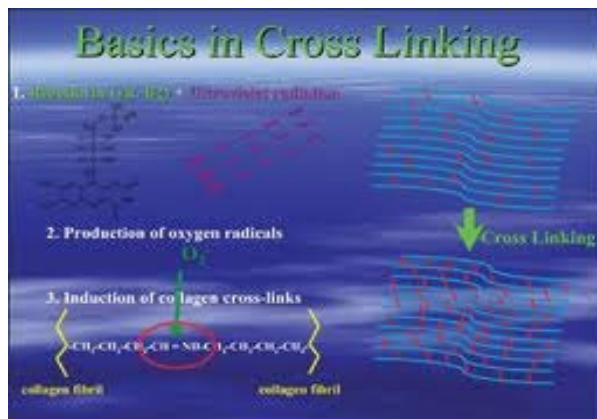


Figure 1: Basics in Cross Linking

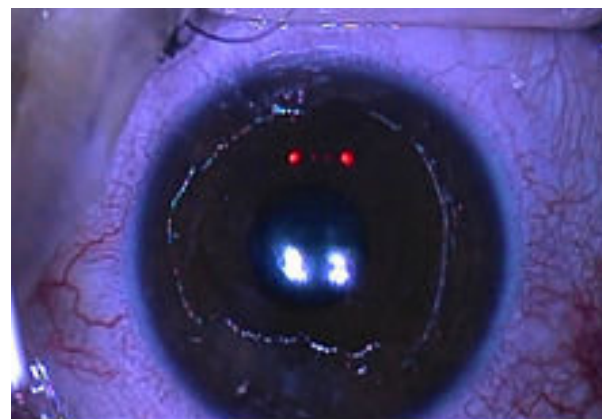


Figure 2: Epithelium scrapping

AIMS & OBJECTIVES

To see the effect on the corneal structure and stromal reaction after Corneal Collagen Cross Linking (C3R), through the Anterior Segment imaging technique- OCT. To compare the effect of C3R on the stromal reaction in epi-ON & epi-OFF technique.

METHODS AND MATERIALS

The Study was done from July 2014 to September 2014 of 20 patients having progressive keratoconus (10 each of Epi-on and Epi-off technique). The diagnosis and progression was confirmed with pentacam. C3R was done. (Epi-on or Epi-off) Anterior segment OCT (a Spectral Domain type of Topcon) was done on one week and one month follow up.

PROCEDURE

1. EPI-OFF:

- ⊙ Central 8-9 mm of cornea is scrapped under total aseptic precautions in the OT.
- ⊙ A drop of dextran-based 0.1% photosensitizer riboflavin solution and paracaine was instilled every 5 mins for 6 cycles.
- ⊙ UV-A (typically 365-370 μm) light for 30 mins with an intensity of 3 mW/cm^2 & 5.4 J/cm^2 of energy in 6 cycles, 5 min each.
- ⊙ Wash with BSS, antibiotic drops, BCL on the cornea.

2. EPI-ON:

- ⊙ In this, the epithelium is kept intact.
- ⊙ A special dextran-trometamol EDTA based 0.1% riboflavin solution is used, rest of the procedure is same.
- ⊙ The Anterior segment OCT: Spectral domain type of Topcon, we used the Radial, 12 slice scan, 6mm length with 1024 resolution.



Figure 3: Instilling riboflavin drops



Figure 4: UV-A rays

INCLUSION CRITERIA

- ⊙ Patients of any age and sex having progressive keratoconus confirmed by pentacam.

EXCLUSION CRITERIA

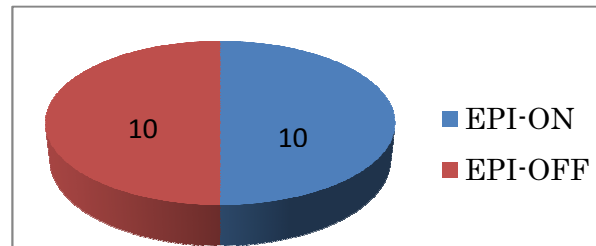
- ❖ Corneal thinning or ectasia due to any other cause than keratoconus.
- ❖ Corneal thickness < 400 μm .
- ❖ Any infective condition of cornea.

OBSERVATIONS & RESULTS

The Study included 20 patients presenting to our tertiary centre between July 2014 to September 2014. Collagen Cross Linking was decided as the line of management in these patients after pentacam.

- ⦿ EPI-ON: 10/20 (50%)
- ⦿ EPI-OFF: 10/20 (50%)

Table 1: Type of technique



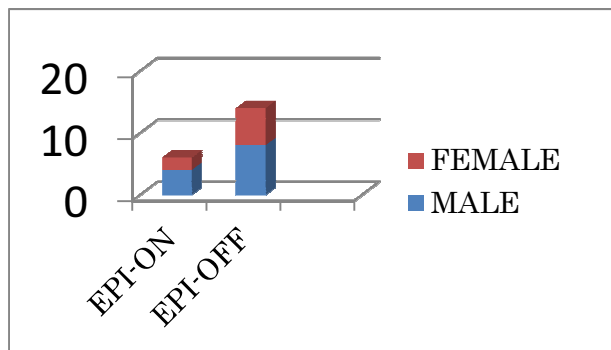
SEX DISTRIBUTION

- ⦿ There were 12 males and 8 females in the study and the technique used distribution was as under:

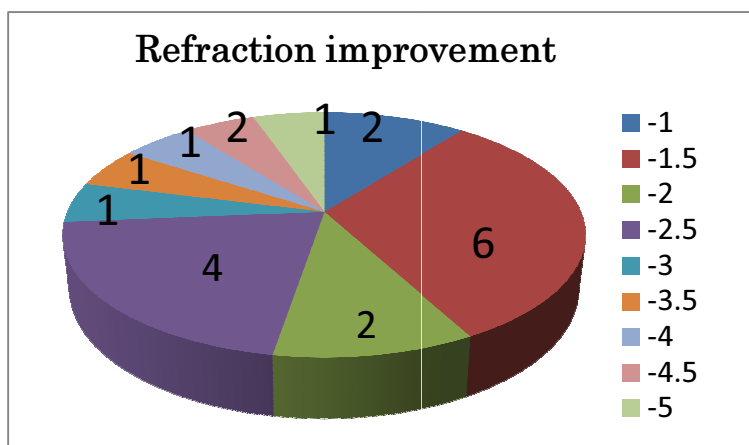
Table 2: Sex distribution

	EPI-ON	EPI-OFF
MALE	4	8
FEMALE	2	6

Graph 1: Sex distribution

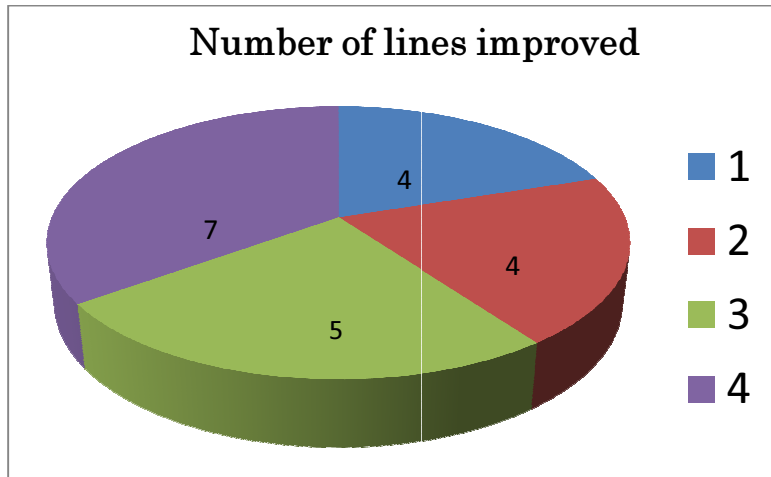


REFRACTION



The preoperative and 1 month postoperative refraction was done and change in the astigmatism in dioptrre cylinder was noted.

BEST CORRECTED VISUAL ACUITY



The preoperative and 1 month postoperative best corrected visual acuity with contact lenses was assessed and the improvement was noted.[4]

ANTERIOR SEGMENT OCT- 1 WEEK

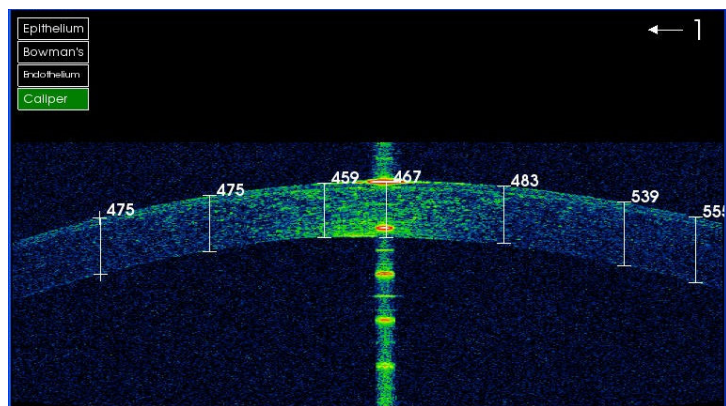


Figure 5: A faint hyperreflectivity is noted in the anterior stroma one week after Cross Linking.

ANTERIOR SEGMENT OCT- 1 MONTH ANTERIOR SEGMENT OCT- 1 MONTH

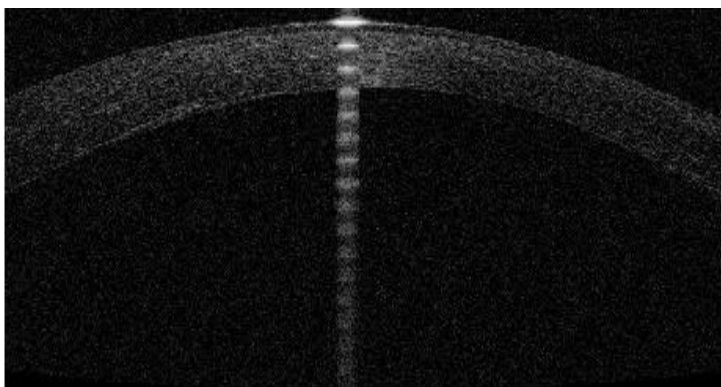


Figure 6: A distinct demarcation line is noted between the cross-linked and the non-cross-linked areas of the cornea. [5]

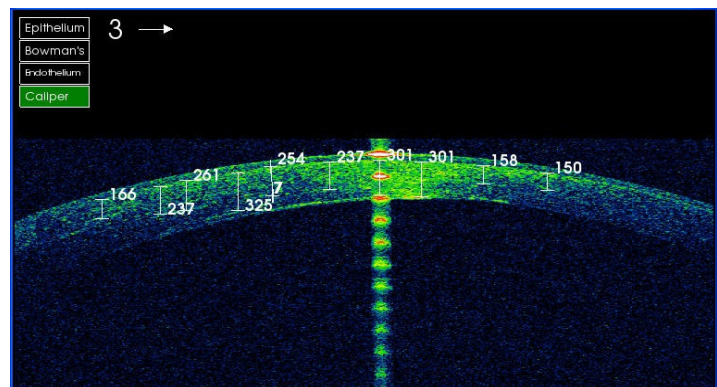
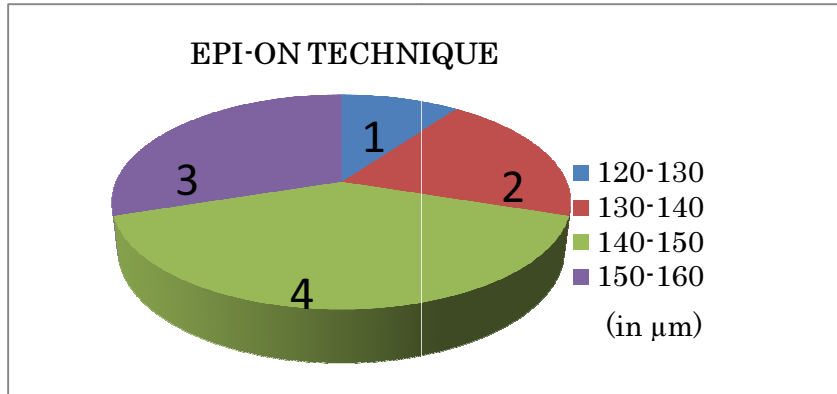


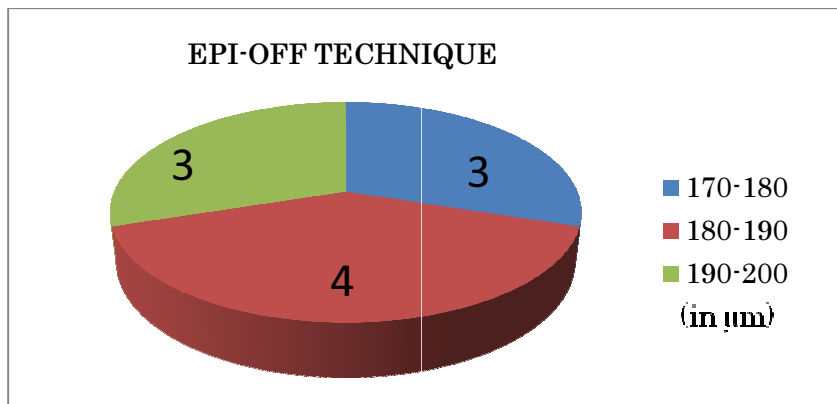
Figure 7: The depth of structural changes and stromal reaction in the cornea post-C3R is measured with the calliper in OCT. [6]

DISTRIBUTION OF CHANGES IN EPI-ON TECHNIQUE



The distribution of stromal reaction according to the depth involved in EPI-ON technique.

DISTRIBUTION OF CHANGES IN EPI-OFF TECHNIQUE



The distribution of stromal reaction according to the depth involved in EPI-OFF technique.

COMPARISON IN THE DEPTH OF CORNEAL STRUCTURAL CHANGES POST C3R

EPI-ON TECHNIQUE

EPI-OFF TECHNIQUE

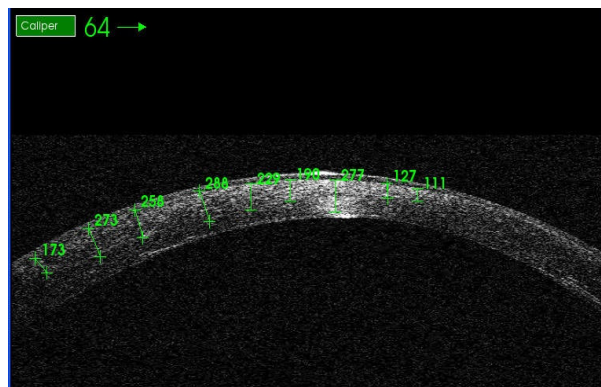
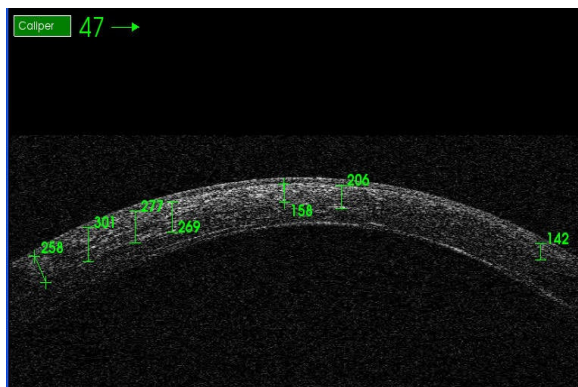


Figure 8: Measurements in the depth of stromal reaction (Epi-On)

Figure 9: Measurements in the depth of stromal reaction (Epi-Off)

RESULTS

OCT after first week shows a faint hyperreflectivity in the anterior stroma in both epi-ON and epi-OFF technique. OCT after one month shows a distinct demarcation line between the cross-linked and non-cross-linked areas of the cornea. The stromal reaction in epi-ON technique is maximum in 140-150 μ m depth range & in epi-OFF technique in 180-190 μ m depth range. The structural changes in the cornea (hyperreflective stromal reaction in the OCT) are epi-OFF > epi-ON technique.

CONCLUSION

- ⦿ In both the epi-ON and epi-OFF technique, a hyper reflective change is seen in the anterior stromal in one week.
- ⦿ A demarcation line is seen after 1 month.
- ⦿ In epi-OFF technique the depth of structural changes is more as compared to the epi-ON technique.
- ⦿ A significant decrease in the astigmatism was seen.
- ⦿ The acceptance of contact lenses and visual acuity with contact lenses improves post-C3R.

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