

# UDAYA RAVI EYE HOSPITAL

Passion for eye care

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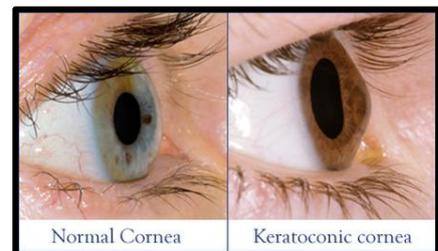
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## KERATOCONUS & C3R

### Corneal Collagen Crosslinking

“Keratoconus is a disorder of the cornea characterized by progressive thinning and ectasia which results in deterioration of the quality of vision and also the quality of life. As the disease begins in young adults, it affects the most productive years of life. It is estimated that eventually 21% of the keratoconus patients require surgical intervention to restore corneal anatomy and eyesight. Collagen Crosslinking with the help of Ultraviolet A (UVA, 365 nm) and riboflavin changes the biomechanical properties of the cornea, increasing its strength by almost 300%. This increase in corneal strength has shown to arrest the progression of keratoconus in numerous studies all over the world.”

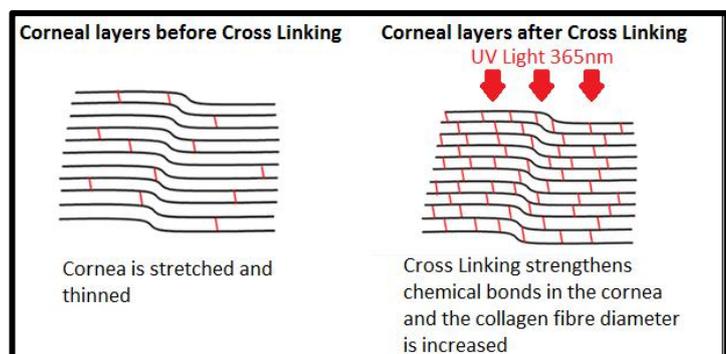


### Corneal Collagen Crosslinking with Riboflavin (C3R) OR CXL

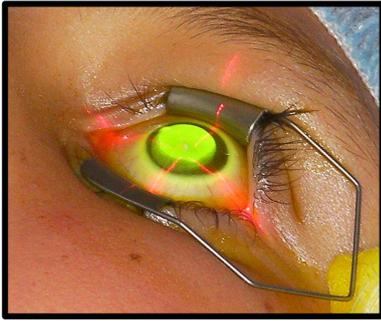
With current methods using rigid contact lens or intra corneal ring segments, only the refractive error (spectacle numbers) can be corrected, but it has very little effect on the progression of keratoconus. A new non surgical, non invasive treatment, based on collagen cross linking with Ultraviolet A (UVA, 365nm) and riboflavin (Vitamin B 2), a photosensitizing agent is now available. This has been shown to arrest the progression of keratoconus.

### What is Collagen Cross-linking?

A treatment for keratoconus which has shown great success is Corneal Collagen Crosslinking with Riboflavin (C3-R®\*) or CXL, a one-time application of riboflavin eye drops to the eye. The riboflavin, when activated by approximately 30 minutes illumination with UV-A light, augments the collagen cross-links within the stroma and so recovers some of the cornea's mechanical strength. C3-R®\*, developed at the Dresden university, Germany, has been shown to slow or arrest the progression of keratoconus, and in some cases even reverse it, particularly when applied in combination with intracorneal ring segments.



### How is the treatment done?



The treatment is performed in our operation theatre under complete sterile conditions. Usually, only one eye is treated in one sitting. The treatment is performed under topical anesthesia (using anesthetic eye drops). The surface of the eye (cornea) is treated with application of Riboflavin eye drops for 30 minutes. The eye is then exposed to UVA light for 30 minutes. Hence, the treatment takes about an hour per eye. After the treatment, antibiotic eye drops are applied; a bandage contact lens may be applied, which will be removed by our doctor during the follow up visit. Protective eye wear, such as sunglasses (also given by us) is to be worn for a few days until complete healing takes place.

### Who can benefit from this treatment?

Collagen cross-linking treatment is not a cure for keratoconus, rather, it aims to slow or even halt the progression of the condition. This is important to understand. Patients may need to continue to wear spectacles or contact lenses (although a change in the prescription may be required) following the cross-linking treatment but it is hoped that it could limit further deterioration in the patient's vision and reduce the case for keratoplasty. The main aim of this treatment is to arrest progression of keratoconus, and thereby prevent further deterioration in vision and the need for corneal transplantation.

### What are the risks and consequences involved?

Very few potential risks associated with this treatment have been reported so far. The Ultraviolet light dose used is designed to prevent damage to the cells that line the back of the cornea or the other structures within the eye. No lens opacities (cataracts) have been attributed to this treatment in European trials.

The treatment involves removal of the outer layer (epithelium) of the cornea, there will be some discomfort for few days and a short-term haze for few weeks to months.

Other lesser but more common risks include

- Inability to wear contact lenses for several weeks after the treatment
- Changes in corneal shape necessitates fitting of a contact lens or an occasional change in spectacle correction.
- As is the case with any treatment, there may also be long-term risks that have not yet been identified.
- The increased corneal rigidity induced may wear off over time and further periodic treatments may be required.

### How does Cross Linking arrest keratoconus?

Until recently, there was no method to change the integrity and strength of the cornea itself for keratoconus patients. The non-invasive treatment C3-R®\* (corneal collagen cross-linking riboflavin) treatment has been proven to strengthen the weak corneal structure in keratoconus. This method works by increasing collagen cross-linking, which are the natural "anchors" within the cornea. These anchors are responsible for preventing the cornea from bulging out and becoming steep and irregular.

The figures above show the parallel corneal layers (white) and the collagen cross-linking (red) which increased after C3-R®\* treatment.

### Are there any published studies for the same?

In published European studies, such treatments are proven safe and effective in patients. The 3 and 5 year results of Dresden clinical study in human eyes has shown arrest of progression of keratoconus in all treated eyes. (Wollensak G. Crosslinking treatment of progressive keratoconus: New Hope. Current Opinion in Ophthalmology 2006; 17: 356 – 360). Biomechanical measurements have shown an impressive increase in corneal rigidity of over 300% after cross linking. The Dresden, Germany clinical study has shown that in all treated eyes the progression of keratoconus was stopped ('freezing'). In over 53% of those eyes there was a

slight reversal and flattening of the keratoconus by up to 2.87 diopters. Best corrected vision improved by 1.4 lines. This technique has shown great promise in treating early cases of the disease.

### **Advantages Of Cross Linking**

- Permanent
- Simple- Single- one hour treatment
- No follow up sittings required
- No need for admission
- Stops the progress and causes regression of disease
- Does not need eye donation as in corneal transplant
- No major precautions
- No injections or stitches
- No incisions as in Intacs or Corneal ring segments
- Quick recovery with short follow up

### **Other modalities of treatment for Keratoconus**

Contact lenses and Special Lenses – Rose K Lenses®

Initial management is tried with rigid contact lenses by our contact lens specialist. In very early stages of keratoconus, spectacles can suffice to correct minor astigmatism. As the condition progresses, spectacles may no longer provide the patient with a satisfactory degree of visual acuity, and most doctors will move to managing the condition with contact lenses.

Rigid gas permeable contact lenses for keratoconus improve vision by means of tear fluid filling the gap between the irregular corneal surface and the smooth regular inner surface of the contact lens, thereby creating the effect of a smoother cornea.

Many specialized types of contact lenses such as Rose K Lenses or Kerasoft CLs have been developed for keratoconus, and our contact lens expert helps you with the best fit. The irregular cone needs expertise to produce a contact lens with optimal contact, stability and steepness. Some trial-and-error fitting might be necessary.

Traditionally, contact lenses for keratoconus have been the ‘hard’ or rigid gas-permeable variety, although manufacturers have also produced specialized ‘soft’ or hydrophilic contact lenses. A soft contact lens has a tendency to conform to the conical shape of the cornea, thus diminishing its effect. These do not however prove effective for every patient.

Some patients also find good vision correction and comfort with a “piggyback” contact lens combination, in which gas permeable rigid contact lenses are worn over soft contact lenses, providing clarity of vision and comfort.

Precaution with contact lenses: There is a small risk of infection when wearing contact lenses and the risk becomes much greater if the contact lenses are not kept clean, so it is important to strictly follow the hygiene instructions given when the contact lenses are fitted.

### **Our Experience**

Dr Vidyashankar G Kulkarni has over 10 years experience with C3R; results have been very promising with the slowing or cessation of keratoconus progression in 100% of eyes. The average amount of topographic improvement we have observed is about 2 D.