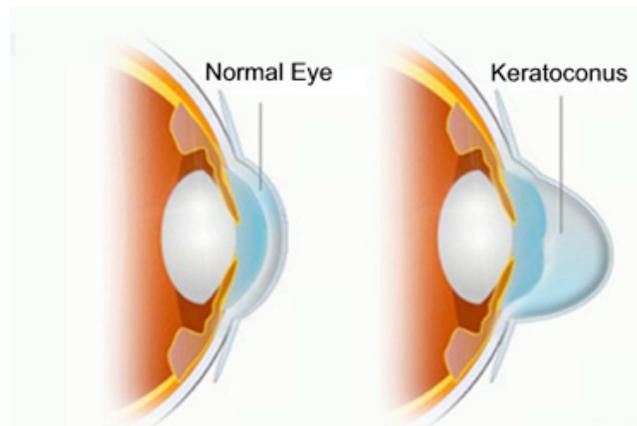


## Keratoconus



### What is keratoconus?

Keratoconus is a common bilateral corneal condition, occurring in more than 1 in 1000 people. The condition typically starts in adolescence and early adulthood. Keratoconus is a disease with an uncertain cause, and its progression following diagnosis is unpredictable. If afflicting both eyes, the deterioration in vision can affect the patient's ability to drive a car or read normal print. Further progression of the disease may lead to a need for surgery.

Despite its uncertainties, keratoconus can be successfully managed with a variety of clinical and surgical techniques, and often with little or no impairment to the patient's quality of life.

The cornea is the clear window on the front of the eye. It is usually a regular spherical dome in shape. The substance of the cornea consists of hundreds of layers that are linked to each other by a substance called collagen. If these collagen cross-links between layers are lost due to keratoconus, there is a progressive corneal thinning and stretching which gradually progresses, often in both eyes. Normal pressure within the eye causes the cornea to bulge forward into an irregular cone shape. When light enters the eye, it first passes through the cornea. If the cornea has turned conical, there is distortion of the image. The eye develops astigmatism (cylindrical errors) and myopia [shortsightedness] and the vision may become severely blurred.

## **Diagnosis**

Diagnosis can be obtained using corneal topography, in which an automated instrument projects an illuminated pattern onto the cornea and determines its shape from analysis of a digital image. The topographical map reveals distortions or scarring in the cornea, with keratoconus revealed by a characteristic steepness of curvature which is usually below or around the centre of the cornea. The topography record of the degree and extent of the deformation is used for assessing its rate of progression. Unilateral cases tend to be uncommon. Sometimes it's a mild condition in the better eye, below the limit of clinical detection. It is common for keratoconus to be diagnosed first in one eye and not until later in the other.

## **Progress**

However good the vision may be with the use of contact lenses, vision may be difficult to maintain at times as the condition progresses and contact lens tolerance varies. Contact lenses are used as temporary measures of treatment, but do not, unfortunately, slow down the rate of progression of the cone. In about 10% to 20% of keratoconus patients the cornea may become extremely steep, thin and irregular or the vision cannot be improved sufficiently with contact lenses. The cornea may then need to be replaced surgically with a corneal transplant or graft. Visual recovery after a transplant takes a long time - sometimes as long as a year to 18 months

## **Treatment**

Treatment of mild keratoconus is geared towards eliminating or reducing the myopia and astigmatism.

## **Glasses and Contact lenses**

In the mildest form of keratoconus, glasses or soft contact lenses may help. But as the disease progresses and the cornea thins and becomes increasingly more irregular in shape, glasses or soft contacts no longer provide adequate vision correction.

Treatments for moderate and advanced keratoconus include:

**Gas permeable contact lenses:** If eyeglasses or soft contact lenses cannot control keratoconus, then Gas permeable contact lenses (hard contacts lenses) are usually the preferred treatment.

Hard contact lenses can be less comfortable to wear than a soft lens. Also, fitting contact lenses on a keratoconic cornea can be difficult. You can expect frequent return visits to fine-tune the fit and the prescription, especially if the keratoconus continues to progress

## **A NEW PERMANENT NON SURGICAL TREATMENT:**

### **CORNEAL COLLAGEN CROSSLINKING WITH RIBOFLAVIN (C3-R®\*)**

It is estimated that eventually 21% of the keratoconus patients require surgical intervention to restore corneal anatomy and eyesight. A new non surgical, minimally invasive treatment, based on collagen cross linking with Ultraviolet A (UVA, 365nm) and riboflavin (Vitamin B 2), a photosensitizing agent is now available. This changes the intrinsic biomechanical properties of the cornea, increasing its strength by almost 300%. This increase in corneal strength has shown in numerous studies all over the world to arrest the progression of keratoconus.

#### **What is collagen cross-linking?**

A new treatment for keratoconus which has shown great success is Corneal Collagen Crosslinking with Riboflavin (C3-R®\*), 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.

#### **How is the treatment done?**

The treatment is performed under topical anaesthesia (using anaesthetic 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 the outer layer (epithelium) of the cornea. There is therefore discomfort and a short-term haze.

## **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 (which is the cause of keratoconus).

## **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.

## **Indications**

Keratoconus  
Pellucid Marginal Degeneration  
Iatrogenic keratectasia following refractive surgery.

## **Contraindications**

Thinnest pachymetry less than 400µm  
Age more than 50 years  
Diabetics  
Pregnancy

## **Basic requirements.**

Disorder should be progressive in nature.  
Thinnest corneal pachymetry higher than 400µm.  
There should be no central corneal scarring.  
Maximum corneal curvature should not exceed 60D

INDICAONS