Department of Ophthalmology

Corneal Cross-linking for Keratoconus

This leaflet is for patients with Keratoconus

What is Keratoconus?

You have a condition called Keratoconus that has affected your corneas (the transparent covering to the front of the eye). In Keratoconus, the progressive change in shape of the cornea leads to visual deterioration and increasing refractive error. Usually this is treated initially with spectacles or contact lenses, but this does not stop the progressive nature of the condition. About 20% of patients eventually will require a corneal transplantation procedure to improve vision. However, corneal transplantation is only performed when the Keratoconus has progressed to an advanced stage. Following corneal transplantation visual rehabilitation could take anything between 12 and 18 months. There is also a lifelong risk that a corneal graft may be rejected by your body which might require a second transplant procedure. Until recently, there was no medical intervention available to stop the progression in Keratoconus corneas. Current evidence has shown that corneal cross-linking could delay and/or halt the progression in Keratoconus. The following pages describe some useful facts on this new surgical procedure.

How does Collagen Cross-Linking with Riboflavin and Ultra Violet(UV) light work?

Riboflavin is a vitamin (B2) which occurs naturally in many common foods (for example milk, cheese, leafy green vegetables).

In corneal cross-linking, riboflavin is applied to the surface of the eye in the form of eye drops and is absorbed into the cornea and aqueous fluid of the eye. Riboflavin has two effects during the UV treatment: one is to help the chemical reaction between riboflavin and UV light to form stronger cross-links between collagen fibres in the cornea, thereby increasing the corneal strength. The other is to absorb any UV light that penetrates through the cornea. This prevents damage to the internal structures of the eye such as the lens and retina from unnecessary UV light exposure.

The total dose of riboflavin applied to the eye will be less than half the amount that is found in a single pill of a typical over-the-counter vitamin B2 supplement. Currently there is no licensed pharmaceutical preparation of riboflavin eye drops, but the drops used in this study are supplied from the manufacturer as EC (the **CE marking**, or formerly **EC mark**, is a mandatory conformity marking for products sold in the European Economic Area (EEA) since 1993.[1] The CE marking is the manufacturer's declaration that the product meets the requirements of the applicable EC directives.[2]

What does the procedure involve?

The procedure will be performed under local anaesthesia with anaesthetic eye drops in an operating theatre; occasionally a general anaesthetic may be considered. The surgery involves removing the surface cells (epithelium) from the cornea in the area to be treated followed by regular instillation of riboflavin eye drops until your surgeon achieves sufficient saturation in the cornea (15-30 minutes). At this point the ultra-violet light will be directed onto your cornea to produce collagen cross-linking. Cross-links are small bridges between the fibres in the cornea, which strengthen their biomechanical properties. The riboflavin eye drops are instilled at regular intervals throughout the period of UV illumination. The procedure typically takes around 30 minutes.

After the procedure is finished a special bandage soft contact lens is placed on the surface of the cornea which is left in place until your first review in the hospital.

Oral tablets will be provided for pain relief postoperatively and you will continue on antibiotic and steroid drops to prevent infection and allow smooth healing for two to three weeks. Your eye will be examined in a few days by the ophthalmologist. The first visit after surgery will take place between three to seven days and at this stage they might consider removal of the contact lens. Further follow-up appointments at one month, and three months after surgery will be arranged.

What do I have to do?

It would be normal to take a week off work to facilitate the frequent administration of drops and allow time to recover from the gritty/ watery discomfort which is common after surgery. You should not go swimming for two weeks after surgery. You are advised not to go out in bright sunlight conditions for 24 hours following surgery and it is suggested you wear UV protective sun glasses for the first 24 hours following the procedure. You should also adhere to the regime for drop treatment specified by your surgeon. Otherwise there are no special restrictions on activity.

What are the alternative treatments?

There are no proven alternative treatments for delaying progression in Keratoconus. Treatments for Keratoconus which has already progressed include rigid (gas permeable) or scleral contact lenses, corneal surgery such as Intacs implants, or to have a conventional deep anterior lamellar or a full-thickness corneal transplant.

Benefit

Current evidence has shown that corneal cross-linking could delay and/or halt the progression in Keratoconus.

What are the possible risks and side effects?

The risks associated with corneal cross-linking treatment are as follows:

1. The surface of the cornea (epithelium) is removed prior to application of the riboflavin eye drops. Until the epithelium heals over, the eye may be quite sore. A bandage contact lens will be placed onto the cornea after the procedure to make the eye more comfortable, and antibiotic and steroid eye drops will need to be applied regularly. You may also need to take some pain killers like paracetamol for a few days. Some patients find the eye sensitive to light for some weeks after the treatment. Although there is an apparent mild haze to the corneal structure this hardly impairs vision and is reflective of the reaction of treatment in the cornea. However, in an occasional patient, depending on their healing capacity, there might be a risk of significant scarring that could impair vision.

2. An infection of the cornea may occur in around 1 in 1000 patients.

3. There is theoretical possibility of damage to the inner lining cells of the cornea (endothelium) if your cornea were to be too thin. Therefore corneal cross-linking is advised as early as possible in Keratoconus when patients have sufficient thickness to their cornea. Alterations to protocol are available for patients with thin corneas. Ultraviolet light may also potentially damage retinal cells, but virtually all the ultra-violet light is absorbed by the riboflavin in the cornea, so the UV light level reaching the retina should be well within recommended safe limits.

4. UV light is considered a factor in the causation of cataract (opacity in the lens of the eye). However in the presence of the riboflavin, the amount of UV light actually reaching the lens of the eye should be reduced to levels lower than that encountered under normal environmental conditions. No cases of cataract caused by cross-linking treatment have been described so far.

5. Although conventional cross-linking treatment has been shown to stabilise Keratoconus in patients with corneal thickness greater than 400 microns, it does not necessarily follow that a similar treatment to a thinner cornea will have the same beneficial effect. Depending on the severity of progression, 7-8 % of patients could continue to progress despite the treatment. The concept of cross-linking is primarily to delay the progression rather than halt the progression. Also, the treatment is not performed to improve vision and patients often return to wearing contact lenses or spectacles in a few weeks following treatment. The prescription of lenses might require an adjustment.

6. Published studies on corneal cross-linking up to seven years show good benefit with no untoward side effects but further long-term data are awaited and currently not available.

7. In the event of Keratoconus progression, cross-linking treatment could potentially be repeated or a conventional corneal graft operation could be performed at a later date.

Corneal cross-linking is not available on the NHS and awaiting NICE guidance.

Contacts/ Further information

For further information, please do not hesitate to speak to a member of the clinical cornea team, Ophthalmology department at Addenbrooke's Hospital, Cambridge.
01223 216401

References/ Sources of evidence

http://www.nice.org.uk
http://guidance.nice.org.uk/IP/763

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