

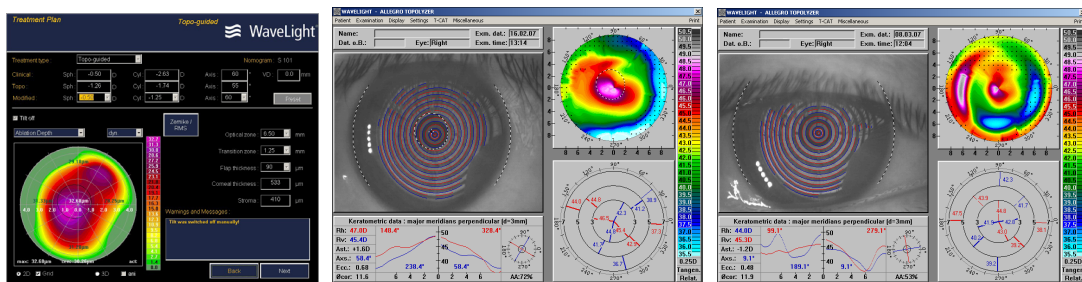
# Topography–Guided Custom excimer laser Ablation Treatment (T-CAT) with Corneal Collagen Cross-Linking.

## Treatment of eyes with mild keratoconus (that have not had grafts).

In the past, it has been felt that it was inappropriate to treat corneas with keratoconus by excimer laser, as the laser treatment results in further thinning of the cornea, and possible destabilisation of the corneal structure, which could lead to progressive deterioration of the corneal shape.

The introduction of corneal collagen cross-linking with riboflavin and UV light has potentially changed this situation, since it is now possible to stabilise the keratoconus condition with cross-linking treatment, and prevent progression of corneal ectasia. As a result, it may be possible to use a limited amount of surface laser ablation to improve corneal symmetry in early cases of keratoconus, in the hope that any weakening of the cornea by the loss of tissue from the laser treatment, is compensated for by the increased strength of the cornea induced by the cross-linking. Although early reports suggest that such treatment can be effective, there is not yet long-term data available to show that such treatment is safe or appropriate.

The Topography-guided Custom Ablation Treatment (T-CAT) is designed to improve the central corneal symmetry, without attempting to correct other spherical, or regular astigmatic, optical defects. By not attempting to correct the whole optical defect of the eye, the T-CAT treatment can be kept to a small degree of ablation with the maximum depth of tissue loss typically being less than 50 microns. The cross-linking treatment is applied immediately after the laser treatment. Any residual spherical or regular astigmatic optical defect remaining after the treatment can be corrected subsequently by contact lens wear or by phakic intra-ocular lens implantation.



*The image on the left is a typical T-CAT treatment profile. Centre shows topography before surgery with a steep and irregular corneal profile. Right shows some post-operative reduction of corneal steepness and reduced astigmatism, with improved symmetry.*

## **Causes and types of optical defect**

Optical defects of the eye are mainly caused by abnormalities in the cornea, the lens, or in the overall length of the eyeball.

When the cornea is not spherical in shape there will typically be an astigmatic optical defect in the eye. Most astigmatism is regular and symmetrical, and this type of astigmatism can be corrected by spectacles, toric or rigid contact lenses, or conventional astigmatic laser surgery. However, sometimes corneal astigmatism is irregular and asymmetrical, and this type of optical defect cannot be corrected with spectacles. Irregular astigmatism is typically seen in the condition of keratoconus, and other types of corneal ectasia.

## **Correction of irregular astigmatism**

Because irregular astigmatism is almost always due to abnormalities in the shape of the corneal surface, it can usually be corrected by fitting rigid gas-permeable contact lenses. These work by masking the corneal irregularity behind the smooth surface of the contact lens. Alternatively these corneal irregularities can now be permanently corrected by custom topography-guided excimer laser treatment.

Accurate measurement of corneal surface irregularities can be made with a corneal topography device, and this information can be used to programme an excimer laser to re-profile the cornea.

## **How is T-CAT & Cross-Linking treatment given?**

The treatment is carried out with topical anaesthesia (eye drops). Firstly the surface epithelial cell layers are removed from the central part of the cornea. Then the custom topography-guided laser treatment is applied. Next the cornea is saturated with riboflavin which takes about 20 minutes. Finally, UV light is focussed onto the central area of the cornea for 30 minutes to create the cross-linking.

When the treatment is complete a 'bandage' soft contact lens is applied. This contact lens is worn for around three to seven days, until the surface epithelial cell layers have re-grown. During the first few days after the treatment the eye will be sore and watery. You will need to apply eye drops frequently, and take pain killers as required. Sometimes there is slight haziness under the epithelial layer after treatment, and rarely there may be scarring that can reduce the quality of vision obtained. You would generally need a couple of weeks off work to undergo this treatment.