Nightmares give all of us sleepless nights. Whenever we have nightmares in refractive surgery they get even more disastrous as we are treating patients mainly for a cosmetic reason. The aim of this session is to enable the refractive surgeon to diagnose and treat effectively the various complications that can be associated with refractive surgery. The common complications encountered intra and post operatively and their management are discussed.

**POST LASIK IATROGENIC KERATECTASIA ETIOLOGY**

1. Two well-known contributing factors are an excessively deep ablation and LASIK in a previously undiagnosed forme fruste keratoconus. The lamellar cut in the cornea as well as the decreased residual bed thickness or RBT, both contribute to the decreased biomechanical stability of the cornea after LASIK (fig 1). Larger ablation diameters result in lesser RBT postoperatively and also result in a larger area of thin cornea. The RBT should not be less than 250 µm to avoid subsequent iatrogenic keratectasia.

Figure 1: Illustration depicting corneal ectasia(right). Orbscan
picture shows the iatrogenic keratectasia after lasik in a 3 D pattern. Notice the ectasia seen clearly in the elevation map.

2. Factors like drying of the stromal bed may result in an ablation depth more than intended. The normal intraocular pressure (IOP), inadvertent excessive eye rubbing, prone position sleeping, and the normal wear and tear of the cornea all play a role in the progression of ectasia.

3. Patients with thin corneas less than 500 microns, primary posterior corneal elevation and forme fruste keratoconus are at greater risk for post LASIK ectasia.
4. In some cases, no preoperative risk factor can be identified. Structural rigidity of the individual cornea and IOP may play major roles in these cases. Attempted correction, the optical zone diameter and the flap thickness are other parameters that have to be considered. The flap thickness may not be uniform throughout its length.

**CORNEAL TOPOGRAPHY**

Topography is invaluable for preoperative ophthalmic examination of LASIK candidates. Topographic analysis with ORBSCAN uses three dimensional slit scanning technology. Three-dimensional imaging allows us to predict which candidates would do well with LASIK and also confers the ability to screen for subtle configurations, which may be a contraindication to LASIK.

**CLINICAL FEATURES**

The patient with post LASIK ectasia presents with

1. Progressively increasing myopia, irregular astigmatism, fluctuating refraction.
2. Difficulties in scotopic vision, glare, haloes, ghosting of images
3. Loss of best corrected visual acuity weeks, months or even years

1. RGP lenses can be worn to slow down or halt the process of ectasia and they may delay the need for
after an uneventful LASIK.

MANAGEMENT

Detection of a mild keratectasia requires knowledge about the posterior curvature of the cornea. The earliest changes are detected on the posterior corneal surface as a posterior corneal bulging. Increased negative keratometric diopters and oblate asphericity of the posterior corneal curvature are seen. An eccentric posterior bulge below the centre of the laser ablated area is most ominous. Later, a central or paracentral area of steepening which is seen to progressively worsen on follow up evaluations is seen. Decreased pachymetry is seen in the area of steepening. Increasing amounts of irregular astigmatism are also seen in these patients.

There have been numerous advancements in the treatment of post LASIK ectasia.

1. RGP lenses can be worn to slow down or halt the process of ectasia and they may delay the need for any surgical intervention.

2. Topical ocular antihypertensives have been used and act by relieving the biomechanical strain on the cornea.

3. Intacs or Intrastromal Corneal Ring Segments(fig 2) are clear micro-thin PMMA intra-corneal inserts, hexagonal in cross-section. Intacs act by distending the peripheral cornea and hence flattening the central cornea, thicker segments producing a greater effect. For central ectasia, two segments can be
inserted and in cases of inferior keratectasia, the irregular astigmatism can be corrected with a single IntacS segment placed at the site where corneal flattening is needed, that is, inferiorly or inferotemporally. The placement of a single Intacs segment prevents overcorrection of the myopia. The exact role of Intacs in slowing or halting the progression of ectasia is still not known. A unique characteristic of the Intacs refractive surgical procedure is its potential reversibility.

4. New bonds between adjacent collagen molecules are created by the C3-R treatment or collagen cross linking with riboflavin. This increases the stiffness of the cornea one and a half times, making it less malleable. The procedure involves application of 20% riboflavin over the deepithelialized cornea, followed by irradiation of the cornea with UVA light for 30 minutes. Cessation of continuing keratectasia has been noted with an improvement in best corrected visual acuity and maximal keratometry values in about 50% of patients. The C3-R treatment can be combined with Intacs.

1. RGP lenses can be worn to slow down or halt the process of ectasia and they may delay the need for
5. Deep anterior lamellar keratoplasty (Fig 3) is a new technique based on adding tissue to strengthen the cornea. Here, a host bed consisting of Descemet’s membrane and endothelium is created into which a full-thickness corneal stroma and epithelial button is placed. The recovery time is faster and visual recovery quicker than a penetrating keratoplasty. The risk of endothelial rejection is not there.

5. Penetrating keratoplasty is the ultimate resort for a patient with post-LASIK ectasia.

Figure 3: Deep anterior lamellar keratoplasty being performed. Note the dissection till the Descemet’s membrane (left).