Introduction

The cornea is a membrane that forms a barrier between the eye and the external environment. [1-2]

The corneal stroma constitutes 90% of the corneal thickness and is a highly specialised tissue which is responsible for its mechanical and refractive properties[3],The specific architecture of the most anterior part of the corneal stroma (100–120μm) has been suggested to be responsible for the stability of the corneal shape.[4] The exact mechanism which maintains the corneal contour itself is not known, but may be due to the passive distension of corneal tissues which is maintained by the corneal mass, the elastic properties of corneal tissue and the mechanical force acting on this tissue (IOP). However, rigidity or elasticity per se of corneas are known to vary greatly between individuals,and these parameters have only been widely accepted as important when measuring IOP. [5]

Several studies have been performed in the past to determine the rigidity (elasticity) of the cornea. It argued that intraocular pressure(IOP) measured by the applanation tonometer does not always give a true reading.[6] Recent studies have demonstrated the importance of central corneal thickness (CCT) measurements as a measure of ocular rigidity, [7] i.e. IOP values deviated when CCT, curvature or biomechanical properties varied from normal value. [8]

The ORA is a new device which is an adaptation of the non-contact tonometer that allows measurement of IOP as well as new measurements called hysteresis and corneal resistance factor (CRF). [9]

The corneal hysteresis phenomenon is a result of viscoelastic dampening in the cornea due to the combined effect of the corneal thickness and rigidity. In other words, the tissue's ability to absorb and dissipate energy. Studies have shown that subjects whose corneas exhibit low corneal hysteresis, which can be thought of as having a "soft" cornea, are probable candidates for a variety of ocular diseases and complications. [8] It has been shown that the elastic and viscoelastic properties of the cornea are related, making possible the use of the hysteresis measurement to arrive at a more accurate measurement of IOP less influenced by corneal properties such as central corneal thickness (CCT) and does not appear to drop artificially post-LASIK.., present a complete characterization of the cornea's biomechanical state, which has potential uses in screening refractive surgery candidates and predicting/controlling outcomes.

The potential clinical applications of the corneal hysteresis measurement in the area of refractive surgery are evident. [6]Currently, CCT is the primary factor used for screening candidates for refractive surgery. Patients with thinner corneas are considered to be at higher risk for developing post-LASIK corneal ectasia. Due to the large and easily identifiable differences in hysteresis between normal and compromised corneas,it □s believed that this metric provides a more complete characterization of the biomechanical state of the cornea than does the measure of CCT. This observation, coupled with the fact that corneal hysteresis is only weakly correlated with CCT, leads that the corneal

hysteresis measurement will be a useful tool for laminating LASIK candidates who are at risk of developing post-LASIK ectasia. The corneal hysteresis measurement also has potential uses in post-LASIK follow up.[9]

The reduction in corneal hysteresis is not primarily a function of reduction in corneal tissue, but rather a result of a weakening of the structure due to the flap. The hysteresis measurement enables ophthalmologists to quantify this biomechanical material change, which may provide a more complete understanding of lower post-LASIK measured IOP.Evidence suggests that the cornea may reflect the condition of the lamina cribrosa at the back of the eye.Clinical studies utilizing the Ocular Response Analyzer support this hypothesis. [7]

Compared to normal subjects, glaucomatous subjects have a significantly lower average corneal hysteresis and a much wider range. [10]

In addition, the fact that the signal obtained from the eye of an normal-tension glaucoma subject looks similar to the signals obtained from keratoconus, Fuch's, and post-LASIK patients, reinforcing the theory that glaucomatous damage, in some manner, presents itself via the cornea. [7]