Cross – Infection and Contact Ophthalmic Devices: Clinical Trials of a Disposable Ophthalmic Barrier System

Purpose
It’s generally accepted that there is a potential risk of cross-infection from patient to patient from contact ophthalmic devices such as the Goldmann tonometer, Gonioscope lenses, A-scan ultra sound probes, and ultrasonic pachymeters. A Department of Health funded project has developed a four-layer barrier system consists of barrier layer, which is coated with an adhesive hydrogel. The adhesive layer is covered with backing paper until use to maintain the adhesiveness, and the barrier layer is covered with a protective liner until use to maintain a sterile environment.

Methods
Clinical trials demonstrated that not only does the prototype developed perform successfully in terms of the functional properties such as ease of use, barrier properties but also the effect on the intra ocular pressure measurements are accurately recorded in comparison to the Goldmann Tonometer.

Results
This poster summarises the work completed to date on the development of the novel sterile universal barrier system and the next stages of further design refinement, involving extended clinical consultation in conjunction with professional design input, interlinking the three aspects: materials, fabrication and ease of use in the clinical environment. In this way, an optimized product with demonstrated acceptability to clinical practitioners can be developed.

Conclusion
There is a need for an effective disposable ophthalmic barrier system which is clinically acceptable.

Age-related changes in the corneal thickness profile assessed with Orbscan

Purpose
To assess the corneal thickness with scanning slit (Orbscan) pachymetry at central, mid-peripheral, and peripheral sites and to generate a ratio to describe the corneal thickness profile from the centre towards the periphery as a function of age.

Methods
Orbscan measurements were performed on 98 right eyes of 98 healthy subjects. Three readings were taken and data was extracted from the pachymetry maps at the geometrical centre, mid peripheral locations 2.5 mm to either side of the centre, and peripheral locations 4.5 mm from the centre along the horizontal meridian. Nasal and temporal measurements were averaged for each cornea.

Results
The mean age of the subjects was 44.9 +/- 14.1 years (+/- SD), range 19 to 82 years. The mean central corneal thickness was 0.584 +/- 0.0411 mm. For the mid-periphery and the periphery the readings were 0.633 +/- 0.0442 mm and 0.713 +/- 0.0407 mm respectively. The mean M/C ratio (ratio between mid-peripheral and central corneal thickness) was 1.09 +/- 0.003 and the mean P/C ratio (ratio between peripheral and central corneal thickness) was 1.22 +/- 0.06. The M/C ratio was only weakly correlated to age. However, the P/C ratio showed a much stronger correlation to age. The results of our study strongly indicate that corneal thinning does occur at peripheral sites but is not as pronounced in the mid-periphery about 2.5 mm from the centre.

Conclusion
Age-related changes in the corneal thickness profile (peripheral corneal thinning) predominantly occur at locations outside 2.5 mm from the centre of the cornea.

Gene therapy promotes corneal graft survival

Purpose
Corneal endothelial cells (CEC) are essential to keep the cornea clear. Loss of CEC is thought to occur in graft failure, particularly in graft failure due to rejection, an immune reaction that targets endothelial cells. We postulate, that CEC loss during graft failure is due to apoptosis. Furthermore, because CEC in vivo are thought to have little regenerative capability, we hypothesize that preventing apoptosis in the donor corneal endothelium will promote cornea graft survival.

Methods
Anti-apoptotic genes (Bcl-xL, Bcl-2, p35 and survivin) were cloned into a retroviral plasmid vector. Retroviruses were used to infect CEC. Apoptosis was induced by etoposide or IFNγ and TNFα, and detected by annexin V and Propidium iodide staining and flow cytometry analysis. For in vivo studies, we used an orthotopic cornea transplant model. BALB/c mice were used as recipients, and C57BL/6 or BALB/c (syngeneic) corneas were used as donors. For transduction of the endothelium, excised corneas were treated with eGFP or IzsGreen or IzsGreen-Bcl-xL lentivirus. Apoptosis in the graft’s endothelium was detected by TUNEL staining and confocal microscopy.

Results
Apoptosis of the graft endothelium occurred in rejecting corneas as early as 2 weeks. We found that Bcl-xL, but not other genes, protects CEC from apoptosis. Lentiviral-delivery of Bcl-xL to the corneal endothelium of donor corneas significantly improved the survival of low risk allografts.

Conclusion
Graft failure is accompanied by apoptosis of the endothelium. Bcl-xL protects CEC from apoptosis in vitro and promotes allograft survival.