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Corneal endothelial cell health and recovery time after ultrathin DSAEK graft prepared with single pass high pressurized anterior chamber (HPAC) technique

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Purpose

To evaluate the viability and recovery time of donor corneal endothelium after UT-DSEK graft preparation with single pass HPAC technique. It is our hypothesis that HPAC technique has faster endothelial cell recovery and a loss of endothelial cells comparable to low pressure IV tubing DSAEK preparation

Methods

Five donor corneas were obtained which were not transplantable for reasons other than endothelial cell density (ECD). ECD analysis was done before tissue preparation using the HPAC method and at post-preparation days 1, 2, 3, 6, and 7 using the Cell CheckD+ (Konan Medical, Japan) CENTER analysis method. A paired student t-test performed to compare results to previously established ECD studies that used the low-pressure IV tubing method. Vital dye stained endothelial photographs were taken at the end of this week using trypan blue 0.25% and alizarin red S 0.2%. Additional analysis was performed comparing 4 donor corneas using the traditional IV tubing method and 4 corneas using the HPAC method. For each sample, we obtained ECD studies before the preparation and then every few minutes after the preparation until the endothelial cells recovered to a point where accurate cell density measurements were possible. The mean “endothelial recovery time” for each method was then calculated and compared

Results

The pre-prep central ECD was 2420.40 ± 543.53 cells/mm², at 7 days post-preparation averaged 2539.40 ± 509.06 cells/mm², a mean increase of (+) 119.0 cells/mm². Endothelial cell loss was comparable to that of low-pressure DSEK preparation as established by prior studies (-300 ± 126 cells/mm²). HPAC method had a mean endothelial cell recovery time of 11.25 minutes (n=4, SD=4.57) compared to the mean endothelial cell recovery time of 46.25 minutes (n=4, SD=17.48) using the traditional low-pressure IV tubing method (P = 0.004)

Conclusion

Ultrathin DSAEK grafts prepared with HPAC method had acceptable rates of endothelial cell damage compared with the traditional IV tubing method and showed a trend towards superiority ($P = 0.0615$). ECD did not appear to continue to decrease after storage in Optisol GS for up to 7 days, demonstrating extended endothelial durability of this technique. Statistically was found significant difference in endothelial cell recovery time between the 2 different UT-DSAEK preparation methods (P -Value = 0.004). This may not be clinically significant since endothelial cells seem to recover using either method but it does add to the growing body of evidence that the HPAC method is not inferior to other more widely used methods when it comes to endothelial cell health. The majority of eye banks are still using the IV method and in our opinion this paradigm needs to be revisited.