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Abstract Title: *In vitro* Evaluation of New Methods to Remove Lens Epithelial Cells During Cataract Surgery to Prevent Posterior Capsule Opacification

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Purpose:

The proliferation of lens epithelial cells (LEC) remaining in the equatorial region of the lens capsule after cataract surgery is known to be responsible for formation of posterior capsule opacification (PCO). The SCI system (Sealed Capsule Irrigation) offers the opportunity to seal the capsular bag after capsulorrhexis and to apply toxic or antiproliferative substances. In vivo, distilled water appears to reduce capsule fibrosis and opacification, but dose-response curves have not been established.

Methods:

Bovine LEC were cultured in black 96-well-plates until confluence and were exposed to distilled water, hyperosmolar solutions and ethanol at different concentrations and different time periods, ranging from 1 to 60 minutes. Cell survival was quantified using the LIVE/DEAD viability/cytotoxicity kit (Molecular probes). Potential damage to the lens capsule was analyzed by electron microscopy after treatment with various modalities.

Results:

Initially, we tested the clinically feasible time interval of up to 4 minutes. After exposure to distilled water, the cells showed a mortality rate of 15,1% after 4 minutes. The maximum mortality rate of 23,2% was reached after 24 minutes in distilled water without any further increase with time. Three molar sodium chloride was the most effective hyperosmolar salt solution resulting in a mortality rate of 68,2% after 2 minutes. Exposure to 45% ethanol resulted in a mortality rate of 95,7% after 1 minute. Ultrastructurally, there were no alterations of lens capsules after exposure to any of the tested substances.

Conclusions:

The presumed reduction of the PCO rate in humans and animal models after intraoperative exposure to distilled water does not seem to be based on an immediate cytotoxic action. In contrast, hyperosmolar salt solutions or ethanol have an immediate cytotoxic effect on LEC in vitro and may be suitable agents for clinical applications.

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