

HAS THE ULTRASOUND TIME USED DURING PHACOEMULSIFICATION AN EFFECT ON THE CORNEAL ENDOTHELIUM?

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1. Introduction

The cataract is one of the most frequent ocular surgical disease. The cataract means the opacification of the lens. The removal of the opacified lens is made usually through the phacoemulsification technique. The removal of the lens presumes his replacement with an artificial lens.

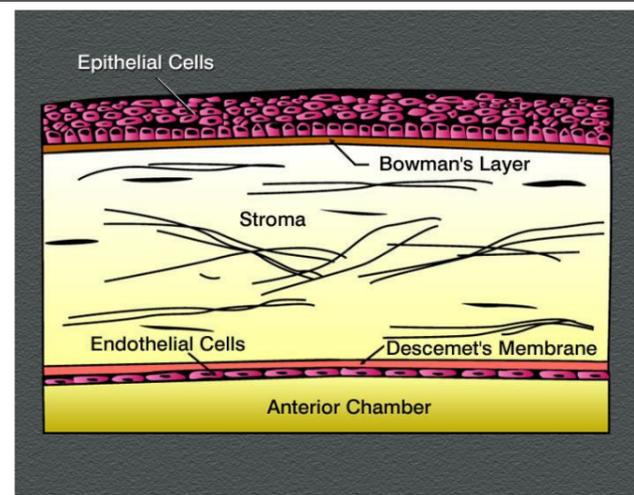
This procedure can have different effects on the endoocular structures and especially on the cornea (endothelial cells layer)

The corneal endothelium is a single layer of cells

Its role is essential in maintaining the integrity of the cornea. It's cells can't regenerate. Starting with the second decade of life the density of the cells decrease from 3000 – 4000 cells/mm² to 2500 – 2700 cells/mm² in the eight decade of life. The loss of cells with the age causes the expansion of the neighbor cells in order to fill the empty spaces.

Corneal transparency is controlled by the active endothelial ionic pumps, which maintain a low level of stromal hydration

When the endothelial cell count drops below 600 to 800 cells/mm², corneal decompensation, and corneal edema occur as a result of the compromised pump function



2. The aim of the study

The purpose is to show the effects of the cataract operation through the phacoemulsification technique on the corneal endothelium related with the total ultrasound time.

3. Material and Methods

Our study is based on 40 patients which where operated through this type of surgery in the clinic of ophthalmology of the Sibiu hospital. All cases where age related cataract with the index of nuclear sclerosis up to third degree.

Exclusion criteria where the ocular diseases , systemic diseases , corneal pachymetry greater than 0,60mm and the preoperative endothelial cells count less than 1800.

The pachymetry presumes the measuring of the cornea which is an indicator of the integrity of the corneal endothelium (normal thickness in the central area is between 0,49 – 0,56 mm)

All the surgeries where performed by the same surgeon and by the same technique.

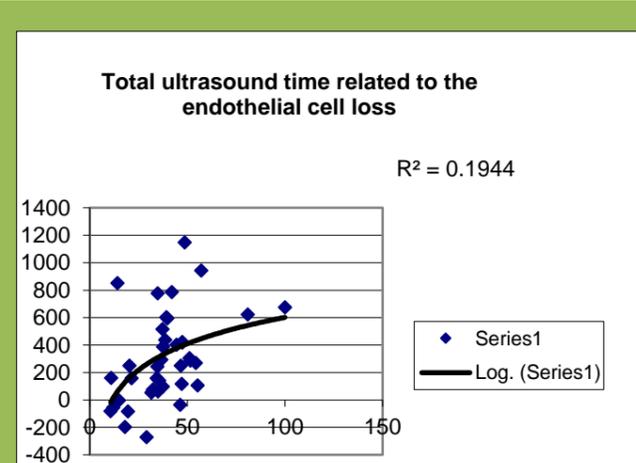
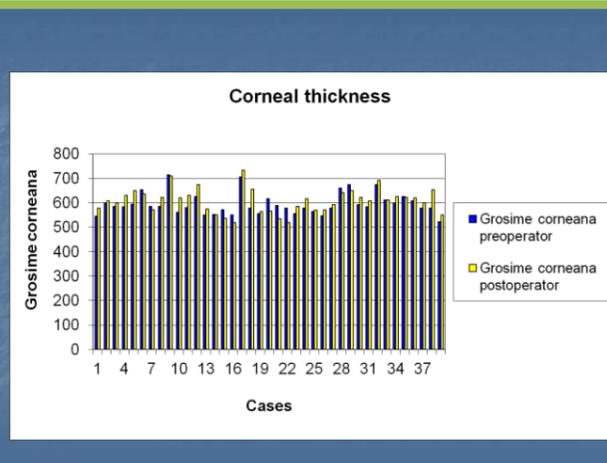
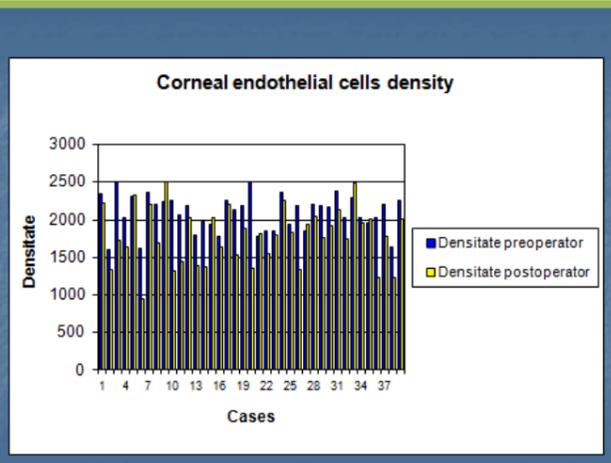
The surgical procedure:

- topical anaesthesia , with tetracaine 0,5 % administrated 10 minutes before surgery
- the clear corneal microincision (2,2mm) using OVD (ophthalmic viscosurgical device) cohesive and dispersive
- phacoemulsification with the Infinity machine.
- Implantation of foldable artificial lens

The number of the endothelial cells and the pachymetry of the cornea where performed through specular microscopy in the day before and after 7-14 days after surgery

4. Results and Discussions

We have found that the average number of the endothelial cells lost was of 304 cells/mm² and the ultrasound time had an average of 38,39 sec. The growth of the corneal thickness is correlated with the endothelial cells loss



The correlation coefficient between the ultrasound time and the endothelial cells loss has a low value

$$R^2=0,1944$$

The risk of endothelial cells loss corelated with the ultrasound time is low.

Until recently it was belived that the human cornea had an average value of 550 microns, having 5 layers: epithelium, Bowman membrane, stroma, Descemet membrane and endothelium, Recently the clinical experiented from the corneal transplantation has lead to the discovery of a new layer, the 6th. This discovery was made by Harminder Dua from the University of Nottingham.

The layer is between the stroma and the Descemet membrane. This layer has been highlited by injecting air between the layers of the cornea and has been confirmed by electronic microscopy.

Even if it is very thin (only 15 microns), Dua's layer is very resistant and is able to resist to pressure up to 1,5 – 2 bars. In the present it is belived that different corneal edema is caused by discontinuities in Dua' s layer caused by different factors.

5. Conclusions

The injury of the cornea during phacoemulsification is multifactorial.

The loss of endothelial cells related with ultrasound time is not significant

The phacoemulsification technique through microincision and the usage of OVD is very safe for the cornea.

6. References

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