**ATOMIC FORCE MICROSCOPY ANALYSIS OF SURFACE PROPERTIES OF INTRAOCULAR LENSES**

Lombardo M, MD, PhD; Carbone G, PhD; Lombardo G, Eng, PhD; De Santo MP, PhD; Barberi R, PhD

Vision Engineering, Reggio Calabria, Italy
CNR-INFM LiCoS Lab, Department of Physics, University of Calabria, Rende, Italy
Department of Engineering Science, Oxford University, Oxford, UK

**BACKGROUND**
The posterior capsule opacification (PCO) represents a significant cause of visual impairment after surgery, with an incidence of approximately 5% at 2 years after surgery. Various surgical strategies have been proposed to minimize the risk of PCO: nevertheless, the prevalence of PCO is markedly influenced by the development of new lens materials and optic design. Lens epithelial cells (LEC) are known to be key players in the process since the biochemical-physical properties of the lens optic surface represent the main factors that can influence interfacial interactions between the intracapsular lens (ICL) and the lens capsule. Hence, ICL behavior may be greatly influenced by the surface properties of the IOL implant, such as morphology or adhesiveness.

In a previous study, we investigated the surface topography of various types of IOL materials using Atomic Force Microscopy (AFM), demonstrating different features with respect to the lens biomaterial and further measuring a smoother optic surface for acrylic and silicone lenses in comparison with PMMA IOLs.

**RESULTS**
The results on the surface adhesion properties of each IOL are summarized in Table 1. Visible differences were noted among various biomaterials (ACRYL, PA, SI). The adhesive force was measured to be higher on the hydrophobic acrylic lens in comparison with the other lens materials, whereas the force curve acquired on silicone demonstrated the smallest attraction between the tip and the lens optic surface. Statistically significant differences (Tukey, P<0.05) were measured when directly comparing each pair of lenses.

The highest adhesion energy value was observed for the silicone optic surface, whereas the smallest for PA. A similar trend is observed for all the lenses, while the lowest for the acrylic lenses.

**CONCLUSION**
A sharp posterior optic edge is currently considered to be the major factor in preventing PCO development, regardless of the IOL material. On the other hand, the adhesiveness of the optic material to the lens capsule has been theorized to be one of the most desirable IOL properties for minimizing PCO. Since the posterior capsule requires weeks to be completely formed, a gap and firm contact between the lens material and the capsule likely represents the first factor that may inhibit the adhesion of LECs into the space between the lens and capsule, leading to a slower PCO formation process and thus enhancing PCO prevention.

**REFERENCES**