Thermoplastic IOL fills capsule like natural lens

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in Paris

A NOVEL thermodynamic, pliable and capsule-filling IOL that is implantable through a small incision could provide a means of restoring natural physiological accommodation to cataract patients and presbyopes, according to Samuel Masket MD, Clinical Professor, University of California, Los Angeles, California, USA.

The new lens, called the SmartIOL™ (Medennium) is composed of a thermodynamic hydrophobic acrylic material identical to that used in the Medennium SmartPlug™. The lens expands from a compressed thin rod into its original lens shape in response to an increase from room temperature to body temperature, Dr Masket told the XXII Congress of the ESCRS.

Furthermore, as the lens is full-sized and as its material is very pliable, it should respond naturally to accommodation forces applied to the capsular bag, he noted, adding:

“The SmartIOL is anticipated to accommodate in the manner of the young human crystalline lens.”

In its present design, the lens is 9.5 mm in diameter and has a central thickness of 3.5 mm. Prior to implantation, the lens is compressed to form a thin long rod of 2.5 mm diameter and approximately 30 mm in length, and is stored below body temperature.

Dr Masket explained that each acrylic unit of the lens material has a 16-18 carbon side chain. These side chains cause the material to become wax-like. Varying the amount of side chains that are added can change the material’s thermodynamic properties. In its current composition the chemically bonded “wax” accounts for 75% of the material’s weight and its “melting” temperature is in the range of 10°C-30°C.

“At human body temperature, the “wax” flows like a liquid resulting in a gel-like polymer while still maintaining its shape.

“Overfilling the capsular bag...” Dr Masket said.

“Among the important challenges that remain for the lens is the development of a reliable means to control postoperative reactions of the lens epithelial cells in order to reduce fibrometaplasia and maintain the long-term clarity and flexibility of the capsule bag.”

“...we will require parallel technology, not lens technology, to achieve that.”

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Other new technologies that will be required for the lens include new imaging systems that may provide more precise measurements of intraocular anatomy, such as the size an individual eye’s capsular bag. In this way surgeons will be able to provide a more perfectly fitting lens in order to achieve both optimal refractive outcome and accommodation.

“My sense is that as we approach human implantation we will be using high resolution ultrasound biomicroscopy to measure the capsular bag, because unfortunately there are no clinical parameters that turn out to be accurate predictors; white-to-white and axial length are really not valid. Therefore we need other means to measure the capsular bag and use different sized lenses for different capsular sizes.”

Dr Masket said that the next phase of study with the lens would include rabbit investigations for biocompatibility and toxicity and further accommodative studies in the laboratory.

“The SmartIOL holds promise as a truly accommodating, fully sized, pliable IOL implantable through a 3.5 mm incision,” he added.