Customizable 3D printed accommodating intraocular lens

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Technology description

A personalized intraocular lens manufactured using three-dimensional (3D) printing technology to improve the outcomes of post-cataract surgery. #ophthalmology #medicaldevice #healthcare #personalizedmedicine

BACKGROUND

Cataract surgery is the most common surgery in the US, with an estimated 3 million per annum. The surgery involves the removal of the cloudy lens due to cataracts which prevent patients from seeing clearly. Until now, there has been one type of implantable lens used for cataract surgery. However, the design of current intraocular lenses (IOL) prevent surgeons from accurately predicting where and how to position the lens within the unique anatomy of the patient's eye. These limitations are the driving factor for nearly 50% of patients requiring the use of spectacles post-surgery.

ABSTRACT

Researchers at Northwestern University have developed a technology that enables ophthalmologists to tailor a replacement intraocular lens (IOL) on an individual patient basis. To generate the personalized IOL, a 3-D map is generated from a scan of the patient's eye providing a blueprint for both lens design as well as surgical navigation during the procedure. This process will result in both improved lens performance and address the two major factors that impact post-surgical outcomes at present: proper sizing and positioning of the lens. Moreover, as the customized features of this replacement lens are based on the geometric and optical properties of the patient's own natural lens, allowing the final custom implant to closely bio-mimic natural lens' functions, such as accommodation, the ability of the lens to change its focus using the body's own anatomy and mechanisms (e.g. ciliary bodies). In addition, the use of UV curable polymers means that post-surgical modifications can be carried out using non-invasive lasers. These improvements have the potential to yield fewer surgical complications and eliminate the need for glasses after cataract surgery, which would improve overall patient satisfaction and quality of life.

Publications

Zhou F, Cao W, Dong B, Reissman T, Zhang W and Sun C (2016) Additive Manufacturing of a 3D Terahertz Gradient-Refractive Index Lens . Advanced Optical Materials. 4: 1034-1040.

Application area

Inherited or acquired disorders (e.g. uveitis) that require surgical lens replacement (e.g. cataract, ectopia lentis)
Surgical lens replacement following blunt or penetrating injury to the eye resulting in a trauma to the IOL
Vision correction surgery (e.g. alternative to laser refractive surgery)
Disorders requiring or benefiting from the measurement of any intraocular parameter (e.g. glaucoma)

Advantages

Bio-mimic properties of the natural lens
Reduced production costs
Improved post-surgical outcomes
Non-invasive post-surgical modification using lasers

Institution

Northwestern University

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