A novel device to facilitate performing Descemet's Membrane Endothelial Keratoplasty (DMEK)

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Technology description

Unmet Need

Over 3 million U.S. patients suffer from severe eye pain and possible blindness due to corneal dystrophies, which can only be cured by corneal transplants. Corneal transplantation can be performed through surgical procedures known as Descemet’s Stripping Automated Endothelial Keratoplasty (DSAEK) and Descemet’s Membrane Endothelial Keratoplasty (DMEK). DMEK outperforms DSAEK by almost every post-operative metric, including shorter recovery times and better restoration of visual acuity, but surgeons are hesitant to adopt DMEK because it is a more challenging and risky procedure. The corneal graft tissue used in DMEK is significantly thinner and more delicate than DSAEK tissue, and naturally rolls up into a tube, which makes manipulating the tissue difficult. To avoid damaging the grafts, surgeons cannot directly unroll them and instead must shoot fluid onto the grafts and tap at the surface of the eye. This process of unrolling the graft carries a high risk of damaging the graft and is the most time intensive and inconsistent step of the surgery, taking anywhere from five minutes to two hours. Hence, there is a need for a specialized device for DMEK that aids surgeons in unrolling corneal grafts, improves operation consistency, and reduces the risk of graft damage.

Technology Overview

Treyetech’s product is a DMEK corneal graft delivery device to be used in conjunction with a newly proposed surgical workflow. In the new workflow, eye bank technicians will first fully separate the graft from a donor eye and prepare it through a novel technique that tri-folds the tissue in the opposite direction to which it naturally scrolls. The device includes a wide-loading platform that allows technicians to easily fold and load the graft into the device’s storage compartment. The device also includes permeable caps to ensure that the grafts remain secure and hydrated during transport from eye banks to hospitals. The innovative tri-fold configuration allows surgeons to simply inject the graft into the eye, where it naturally unfurls. This new surgical workflow shifts the most time-consuming and risky step of graft preparation from surgeons to eye bank technicians, who are more skilled in handling grafts, which standardizes the DMEK procedure and improves operation consistency while also reducing the risk of graft failure. Unlike existing alternatives where surgeons have to squirt fluid or air to position the graft correctly, Treyetech’s device enables the graft to naturally orient itself on the eye. As the only tool that addresses graft unrolling, Treyetech’s device significantly reduces operation time and improves outcome consistency. Also, compared to current devices that are made of components

repurposed from other procedures, Treyetech’ s device is the first tool that is fully specialized for DMEK procedures. The device includes an ergonomic handle that prevents backflow of fluid during graft insertion, making it more comfortable and intuitive for surgeons to use. Additionally, unlike existing models with round injector tips, Treyetech’ s device uses a flattened injector tip to ensure that grafts do not prematurely unfold while loaded and reduces stress on the patient’ s eye during the injection step.
Stage of Development

Institution

Johns Hopkins University

Inventors

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