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### **Targeting the suprachoroidal space by a novel resistance sensing mechanical injector: beyond drug delivery**

#### **Abstract:**

We invented a novel resistance sensing mechanical principle which enables precise injection of flowable material into the suprachoroidal space. Based on this principle, after three generations of iterative enhancements, the latest device has been optimized to administer with ease a liquid or viscoelastic substance into the suprachoroidal space of rabbit, porcine and donated human cadaver eyes. Building on this, we further propose a novel procedure of viscoelastic sheath protected suprachoroidal cannulation and subretinal injection. We can use the device to inject a viscoelastic material into the suprachoroidal space to facilitate dissection of the choroid from the sclera, further expanding the suprachoroidal space. Subsequently, a flexible cannula is introduced into this expanded space and carefully navigated toward the posterior segment of the eye. Using a microneedle housed within the cannula, targeted delivery of a therapeutic composition into the subretinal space could be achieved with precision, avoiding retinal penetration or vitreous removal. We have also developed a novel ab-externo suprachoroidal aqueous humor drainage MIGS implant. This implant, protected by the viscoelastic material, can be positioned into the supra-ciliary space with its anterior end located at the anterior chamber angle, forming a drainage canal between the anterior chamber and the suprachoroidal space. In a rabbit model of steroid-induced glaucoma, our device demonstrated a promising effect on lowering intraocular pressure, along with an excellent safety profile. A subsequent design was developed to enhance the stability of this MIGS implant. Additionally, the use of our novel suprachoroidal injector for suprachoroidal vitreopexy in cases of acute rhegmatogenous retinal detachment represents a potential future application.

#### **Biography**

**Chan Zhao** completed his M.D. degree at Peking Union Medical College (PUMC) in 2007, after which he joined the Department of Ophthalmology at PUMC Hospital. He advanced through the ranks to secure a professorship in 2023. Dr. Zhao possesses a keen interest in the integrative research of ophthalmology and medical engineering, an passion that has earned him numerous national and international patents. He has spearheaded the development of several innovative medical devices, earning him the Clinical Medicine Gold Award at the inaugural National Health Industry Youth Innovation Competition. Dr. Zhao has published over 30 peer-reviewed research papers as the primary or corresponding author.