

Japan develops monitoring technique for early diagnosis and treatment of glaucoma

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An innovative design and integration of a thin film into a contact lens



Glaucoma is a leading cause of blindness among people who are unable to monitor and manage their intraocular pressure (IOP) daily. The current tools for IOP measurement are not portable, convenient, easily accessible, or capable of continuous (24/7) monitoring. These limitations in existing IOP devices are a major contributor to inadequate ocular health management in glaucoma patients.

In a recent breakthrough, a team of researchers from Japan, at Waseda University and Yamaguchi University, has proposed an innovative design and integration of a thin film into a contact lens, enabling users to monitor their IOP in real time during everyday use.

In this study, the researchers fabricated a resistive sensor based on a cracked PEDOT:PSS/PVA (PEDOT: Poly(3,4-ethylenedioxythiophene); PSS: Poly(styrenesulfonate); PVA: Polyvinyl alcohol) thin film that leverages a multilayer structure and the intrinsic properties of each layer to readily and effectively measure and monitor the IOP in real time. They notably combined the sensor with a 70 MHz double-loop gold antenna for high-precision and continuous IOP measurement.

"It is generally very challenging to fabricate a device on a contact lens due to the size limitations while maintaining user comfort. To address these limitations, we used microfabrication to fabricate an IOP sensor that fits well on the contact lens while maintaining flexibility and user comfort. Moreover, the use of parity-time symmetry allows for much higher sensitivity in wireless detection, making this work a major step towards the future of daily, real-time ocular health monitoring devices. Overall, our platform is promising for long-term, non-invasive IOP monitoring, thus making a significant contribution to the early diagnosis and treatment of glaucoma," said the researchers.