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Ambulatory Intraocular Pressure Fluctuation Recording with a Novel Wireless Smart Silicone Contact Lens Sensor

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INTRODUCTION: Monitoring of treatment response in the management of glaucomatous optic neuropathy relies on single intraocular pressure (IOP) measurements during regular clinic hours at regular intervals. However IOP is a dynamic parameter with circadian rhythms as well as posture and exercise related fluctuations. The introduction of continuous 24 hour IOP monitoring technology has created a paradigm shift in glaucoma management. Our wireless smart contact lens sensor was previously validated in-vivo and ex-vivo in animal models. Here we describe the performance of the sensor in ambulatory human subjects. **METHODOLOGY:** The performance of the sensor is tested in healthy human subjects over 24 hours while assuming normal activities to document individualized circadian rhythms. The sensor is then used to document specific postural changes and moderate aerobic exercise. The order of serial postural changes was as follows: sitting ⇒ supine 10 mins ⇒ supine 30 mins ⇒ sitting. For moderate aerobic exercise, IOP fluctuation was tested during 20-minute moderate submaximal exercise (60-80 Watts) on a bicycle ergometer. **RESULTS:** 5 healthy subjects were recruited for preliminary testing. Intraocular pressure fluctuation profiles firstly over 24 hours and secondly during specific postural changes and moderate aerobic exercise are documented. Highly individual and repeatable profiles were obtained. **CONCLUSION:** This contact lens sensor can detect IOP fluctuations related to circadian rhythms, postural changes and exercise. It has potential to be used in 24 hour IOP monitoring in glaucoma management.