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Retinal Light Toxicity

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Introduction

Patients with only one seeing eye will be under the care of every ophthalmologist. The other eye may have had severe vision loss due to trauma, complications from surgery, or advanced disease, or it may have had poor visual function for a long time due to dense amblyopia. Ophthalmologists are always concerned about patients with one seeing eye, or "only eye," especially when the better-seeing eye requires surgery. This better eye may have an urgent problem like sight-threatening glaucoma, severe, uncontrolled intraocular pressure, acute macula-threatening retinal detachment, or a slowly progressing, non-urgent problem like cataract. Other possibilities include both. Both the patient and the surgeon face the possibility of surgical complications causing sudden, total and permanent vision loss, which could have life-altering effects, when they enter a surgical zone. Patients' quality of life (QoL) can be significantly affected when they lose vision in just one eye, also known as their "better" eye. It is therefore we accept that main eye a medical procedure is fittingly considered 'high-stakes' a medical procedure.

Discussion

In many cases, minimally invasive robotic surgery necessitates the use of adaptable, flexible tools that can change their compliance in response to the surgical environment and requirements. A phase-change alloy catheter with a submillimeter continuous variable stiffness and high stiffness variation across its states is proposed in this paper to facilitate rapid compliance control. A controlled radial temperature gradient gives the alloy a variable phase boundary, which results in variable stiffness. In order to apply the desired force at the tip, this catheter can be maneuvered safely in its soft state and then rigidified to the required stiffness during operation. The catheter's maximum contact force with tissue can be continuously adjusted by a factor of 400 (20 mN–8 N). An electromagnetic navigation system is used to perform a fully robotic ophthalmic minimally invasive surgery on an eye phantom using the catheter's magnet and microgripper.

The idea that light damages the retina is supported by a lot of reports in the literature. Duke-Elder and MacFaul conducted the first clinical study of solar damage to the retina, the retina pigment epithelium (RPE) and the choroid in 1916. In 1966, Noell et al.4 proposed that low-intensity light could also cause damage to the retina. Green and Robertson conducted histological studies on eyes of patients scheduled for enucleation due to choroidal melanoma that were exposed to various levels of light. The potential toxic effect of light on the neurosensory retina and RPE was further supported by these studies. By demonstrating retinal damage as a result of the experimental application of light through slit lamp or indirect ophthalmoscopy, new reports have added to our understanding of phototoxicity. Retinal harm auxiliary to the utilization of the working magnifying instrument for waterfall medical procedure or endoillumination during vitreoretinal medical procedure has filled in as additional proof of phototoxicity. In the treatment of diabetic retinopathy, choroidal neovascularization and a variety of intraocular neoplasms, the application of light in the form of lasers has been utilized therapeutically to cause injury to the retina. The compound and photograph harmfulness of chromophore retinal on cells have for quite some time been discussed. A comprehensive investigation of the molecular basis of this perturbation and its effects on cellular fate has not been conducted, despite our recent discovery that exposure to blue light and the retina disrupts cellular signaling [1-4].

Using live-cell imaging and in vitro experiments, we present molecular evidence for blue light excited-retinal induced oxidative damage to polyunsaturated lipid anchors in membrane-interacting signaling molecules and DNA damage in cells. The caused sub-atomic harm irreversibly disturbed subcellular limitation of these particles, a urgent standard for their flagging. In addition, we demonstrate that the accumulation of retinal in lipid-bilayers of cell membranes may extend the lifespan of retinal in cells. Retinal reactions and the production of reactive oxygen species in cells may be triggered by photoexcitation in a manner analogous to that of photodynamic therapy agents, according to comparative response signals. Data also show that exposing cells with retinas to sunlight causes significant cytotoxicity. Together, our findings provide an explanation for the likely in vivo mechanism and reaction conditions under which cells are damaged when bioavailable retinal is exposed to physiological light [5].

Conclusion

Because this research employs an inductive method, we do not seek generalizability based on large sample sizes but rather the suitability of the sample to produce a meaningful balance between dense and rich data. As a result, we spoke with ophthalmic surgeons in person. Surgeons who were known to only perform eye surgery were invited to participate using purposeful sampling. Ten surgeons were contacted and all of them agreed to take part. The vast majority of the surgeons either resided in specialized eye hospitals or worked in large general hospitals.

Acknowledgement

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Conflict of Interest

There are no conflicts of interest by author.

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