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Watching a movie with fellow eye may help keep operated eye steady during cataract surgery

A stronger eye-catching stimulus might perceptually suppress the bright light of the microscope during rivalry and allow for more steady fixation.



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Jordanis Chatziangelidis, a young ophthalmologist training in Athens, tells us about his efforts to improve the cataract surgery experience for patients, and possibly help the surgeon, too. Using established technology in a new way, the patient watches a video with his or her unoperated eye during the procedure.

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Is it feasible for a patient to watch a movie with the non-operated eye during a cataract procedure? Would this help keep the operated eye steady by directing the fixation of the fellow eye? Might this improve the surgical experience, reduce anxiety and distract the patient under the drape? Finally, would the patient like it?

Usually, under the microscope, the patient is subjected to two different stimuli: the bright white light of the microscope and the darkness under a non-transparent drape. Theoretically, in a normal

visual system, the two different stimuli should elicit the binocular rivalry phenomenon, for which perception alternates between the two different images presented to each eye. Theoretically again, by stimulating the non-operated eye with a bright, attention-attracting image such as a video rather than darkness, binocular rivalry might be partly suppressed and the cortex might select the video as the dominant stimulus.

According to Arnold and colleagues, complex images spread dominance. Therefore, an optically interesting video will be preferred by the cortex against a bright white stimulus. Mitchell and colleagues also found that object-based attention determines dominance in binocular rivalry. Peli used a head-mounted monocular display (HMD) to investigate dominance in relation to the characteristics of stimuli used. While not recent, this paper is still relevant and interesting to read in the era of Google Glass.

Based on this information, we hypothesized that a stronger eye-catching stimulus such as a movie might perceptually suppress the bright light of the microscope during rivalry and allow for more steady fixation.

The procedure

We purchased an Icuiti DV920 (Figure 1), a HMD model from the 1990s, used by the U.S. Army and stockbrokers to visualize information within the visual field. The first phaco case was performed with peribulbar anesthesia on a patient who already had a previous cataract operation. The operation

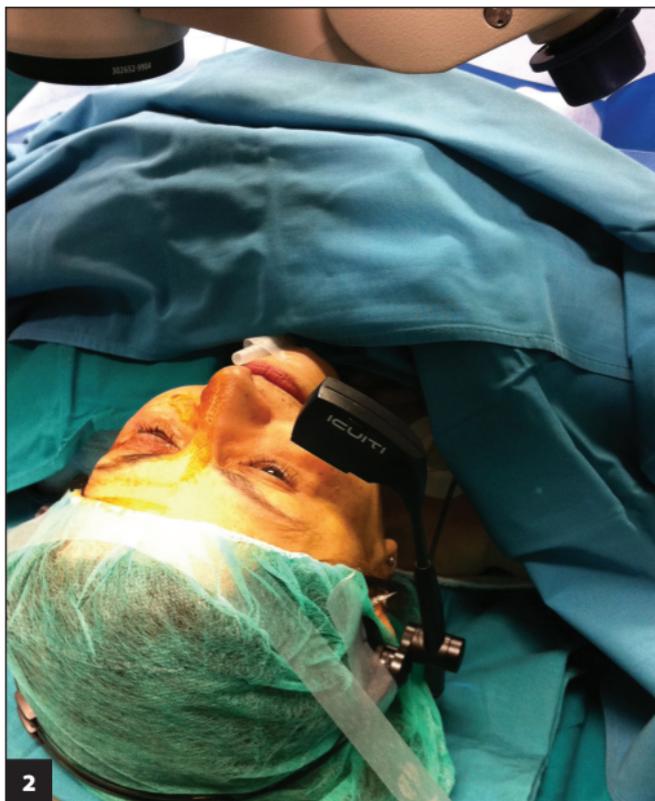


Icuiti DV920 is a head mounded monocular display model.

was uneventful, and the patient liked the experience. The surgeon, however, found that the HMD, which came in the form of a headset (Figure 2), was not stable under the drape and needed continuous readjustments, with the surgeon grasping the drape and the HMD under it and repositioning it so that the patient could continue watching the movie. Another issue was the risk that the second surgeon might accidentally press the HMD against the patient's eye. Therefore, we modified the device by fixating the HMD to a metallic gooseneck, taken from a table lamp. In this way, it could be firmly secured to the operating bed, and the movie could be watched through a transparent eye shield placed over the non-operated eye. The source of the

video was an iPod.

With the modified HMD, we completed seven phaco procedures on six patients. Because we know that endogenous attention prolongs



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dominance duration in binocular rivalry, the surgeon reminded the patient several times during surgery to look at the monitor.

The choice of the best movie to be used was made after a month of personally testing lots of movies and short videos under the microscope. We went for *Koyaanisqatsi*, “a collection of expertly photographed phenomena with no conventional plot. The footage focuses on nature, humanity and the relationship between them,” according to the Internet Movie Database. This film had all the expected characteristics to prevail in binocular rivalry; it was optically interesting, with brightly colored views, landscapes and human faces, and in slow motion to avoid nausea and saccadic movements. We silenced the soundtrack, although we know that music increases satisfaction in patients undergoing cataract surgery.



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Results

Our results were presented at the 2014 European Society of Cataract and Refractive Surgeons winter meeting. All cases were uneventful, and postop best corrected visual acuity within 1 month was 20/20. All patients reported that they could watch the movie during the operation and generally liked it. A patient with a previous phaco experience by the same surgeon reported that he perceived the operation to be longer. Perceptual aftereffects cannot be excluded, as he could not describe exactly what he had been seeing at given moments. The same patient said that he did not like the movie and would prefer a Western or “something more interesting as a film.” You can watch a video of this case at <http://youtu.be/RENdf6cfsXw>.

Surgeons reported that the casing under the drape was an extra burden and that the modified table-mounted device was better, but that the preparation and setup of the HMD increased the total operation time. We look forward to using a more advanced, smaller

device, such as Google Glass. We would also like to experiment with our technique in longer procedures, such as vitreoretinal surgery.

A lot of questions need to be answered by further research. Eye trackers could be used to have quantitative data, and neuro-ophthalmology could tell us more on binocular rivalry, fusion and ways to analyze it. But research funds and technology are beyond the reach of a young ophthalmologist in Athens.

I would like to thank my director, mentor and friend Artemios Kandarakis, MD, PhD, and Panagiotis Vlachos, MD, for trusting me, for supporting me through the ethical committee approval, and for accepting to test the concept and the device with their patients.

We are navigating uncharted waters, as never before in the literature or on the Internet has something similar been reported. No relevant reference could be found on a computerized PubMed, Medline or Google search. We received approval from the ethical committee of our hospital, Ophthalmiatreion Athinon. An informed consent was signed by all the patients, on which it was clearly stated that there are no data on safety or potential complications and that they were the first internationally to test the procedure and device.



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