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# News in Review

COMMENTARY AND PERSPECTIVES

## Amblyopia Tx: Two Eyes Better Than One?

**F**or more than a century, the prevailing wisdom has been that the adult amblyope is simply beyond hope. With the help of a popular puzzle video game called Tetris, however, Canadian

researchers have found that the adult amblyope's brain has greater neuroplasticity than previously thought.<sup>1</sup>

Standard amblyopia therapy may also be turned on its head. "Patching is based on two assumptions," said Robert Hess, PhD, DSc, senior author of the group's paper and director of McGill University's Vision Research Unit in Montreal. "The first is that the primary problem is the poor vision of the amblyopic eye; the second is that this eye is lazy and needs to be forced to work."

Previous studies that patched the stronger eye have shown that 40 hours of

monocular video game play can improve visual acuity in amblyopic adults, he said.

Dr. Hess and colleagues took another approach. They demonstrated that making the eyes work cooperatively—not separately—can retrain the amblyopic brain at any age and diminish the primary problem, which is the active suppression of the "lazy" eye by the fellow fixing eye. Their study showed that just 10 hours of dichoptic video game play can be even more effective than 40 hours of monocular game play.

"Because amblyopia is a secondary consequence of



**HIGH TECH.** A new approach to amblyopia therapy—using the game of Tetris played through video goggles with a dichoptic display—shows promise in adult patients.

binocular function loss, we should direct our efforts at regaining binocular vision," said Dr. Hess, who has conducted amblyopia research for 30 years and was the first to pinpoint poor visual cortex processing as the culprit of amblyopia.

**The treatment.** Dr. Hess' group tested an innovative binocular therapy using Tetris, a game that involves connecting blocks of different shapes as they fall to the ground. The game was played with head-mounted video goggles that had a dichoptic display. This approach provided an objective measure of binocular

function because the user could only be successful if both eyes worked together.

**The study.** Eighteen adult amblyopes played Tetris one hour a day for two weeks using the video goggles. Nine of them played the game monocularly, with the stronger eye patched, and nine played with a dichoptic display: The weaker eye could see only falling objects, and the stronger eye could see only objects on the ground plane. Contrast was kept high in the amblyopic eye but was reduced in the fixing eye to decrease suppression of the amblyopic eye and allow the eyes to work

together for the first time. Over time, the contrast in the fixing eye was increased.

Both groups experienced significant gains in visual acuity in the amblyopic eye. However, improvements in visual acuity and binocular vision were dramatic in the dichoptic group (greater than a factor of 4); this group also experienced a reduction of suppression and positive changes in 3-D vision. Five patients at a three-month follow-up remained stable.

When switched to the dichoptic display, the previously monocular group also experienced dramatic im-

provements in visual acuity. There was also significant progress with stereopsis and significant reduction in suppression—compared with negligible changes in both with previous patching.

“Once given a chance, the system very quickly re-establishes itself,” said Dr. Hess. “In a matter of weeks, the two eyes can get back to working together under normal viewing conditions.”

**Testing in kids.** Other studies—initiated by Dr. Hess and his colleagues Drs. Ben Thompson and Eileen Birch but independently designed—have shown similar

success in both children and adults. In the United States, the Pediatric Eye Disease Investigator Group (PEDIG) will also conduct a clinical trial comparing this approach against the standard technique of patching.

Jane C. Edmond, MD, associate professor of ophthalmology and pediatrics at Baylor College of Medicine in Houston, calls the approach exciting. “If this is the next boon to amblyopic treatment,” she said, “there are still some hurdles to overcome: popularization, proof of long-term efficacy, and systemization of train-

ing.” Dr. Hess agreed that these efforts are only the beginning. However, the “edge pieces” of the puzzle have been laid down, he said, and that may make it much easier from here on out.

—Annie Stuart

1 Li J et al. *Curr Biol.* 2012;23(8):R308-R309.

*Dr. Hess is the inventor of, and McGill University holds the patent on, this new amblyopia technology, and this work was supported by a grant from the Canadian Institutes of Health Research. Dr. Edmond is a lecturer for Alcon.*

## Retina Report

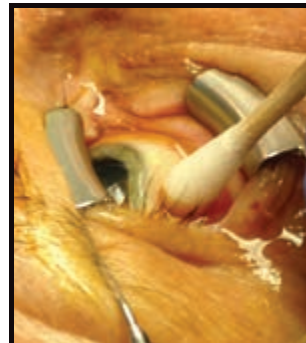
# Applying Pressure Pre-IVT May Reduce IOP Spikes

Researchers at Bascom Palmer Eye Institute recently confirmed that their standard procedure of decompressing the eye with cotton swabs during anesthetic preparation greatly reduces intraocular pressure (IOP) spikes after intravitreal injection (IVT).<sup>1</sup> This finding was a secondary outcome of a randomized clinical trial comparing the pain-control efficacy of two anesthetic techniques.

“We had suspected that pressing out the aqueous fluid softened the eye,” said lead author Ninel Z. Gregori, MD, chief of the ophthalmology section at Miami Veterans Affairs Medical Center and associate professor of clinical ophthalmology at Bascom

Palmer Eye Institute. She and her colleagues assumed that, in keeping with Goldmann analysis of aqueous humor flow, rise in IOP caused by indentation on the globe increases drainage of aqueous humor through the trabecular meshwork and uveoscleral pathways, and after release of external pressure, the reduced intraocular volume should lower the risk of an injection’s causing abnormally high IOP.

Including five patients with preexisting glaucoma, 48 patients received 0.05-mL ranibizumab injections and were randomized to one of two anesthetic methods: 3.5 percent lidocaine gel applied without pressure or three cotton swabs soaked in 4



**THE PRESSURE IS ON.** An extra step during intravitreal injection may help reduce the IOP spike that plagues some patients.

percent lidocaine applied with moderate pressure, each for 60 seconds.

The researchers recorded IOP before injection and at 0, 5, 10, and 15 minutes. IOP spiked significantly less when eyes were decompressed with cotton swabs. Mean increase in IOP was 30.9 mmHg after the gel and 25.7 mmHg after cotton swabs. Right after injection, 35 percent of the gel eyes had an IOP of 50 mmHg or greater, compared with only 10 percent of the cot-

ton swab eyes. Although pressures in the gel eyes did come down, said Dr. Gregori, the cotton swab eyes decreased much faster. She noted that IOP is also higher during actual globe compression, but this is less of a concern given the brevity of compression.

Although the technique requires some extra time, said Dr. Gregori, it has the potential to reduce risks linked to significantly increased IOP, such as short-term occlusion of the central retinal artery and the potential for direct mechanical damage to the optic nerve axons. Glaucoma patients have lower IOP reductions with compression, but their optic nerves are at greater risk. Further research should illuminate.

—Annie Stuart

1 Gregori NZ et al. *J Glaucoma.* 2013 April 29. [Epub ahead of print.]

*Dr. Gregori reports no related financial interests.*

## Genetics

## Mutations Offer Insight Into High-Grade Myopia

Researchers in the United States and Singapore have identified four heterozygous pathogenic mutations in a newly characterized gene known as *SCO2*.<sup>1</sup> The *SCO2* gene regulates copper and oxygen levels in eye tissue and is overexpressed in people with high-grade myopia ( $-6$  D or greater).

In the early 1990s, Terri L. Young, MD, MBA, professor of ophthalmology, pediatrics, and medicine at the Duke University Eye Center, began collecting clinical data and DNA from large multigenerational families, members of which were affected by heritable high-grade myopia and a

degenerative type of maculopathy.

In collaboration with researchers from the Duke-National University of Singapore Graduate Medical School and the Singapore Eye Research Institute, the investigators conducted deep sequencing studies (next-generation sequencing), a process that allows the DNA to be sequenced as many as 50 or 100 times. Dr. Young noted that this technique provides higher fidelity to an analysis and is the method the researchers used to identify the *SCO2* gene.

“Of interest regarding the *SCO2* gene is its involvement with copper metabolism,” Dr. Young said. It’s



**MYOPIA.** On its website, the National Eye Institute estimates the prevalence of myopia in the United States at 33 percent.

been reported that copper levels are different in individuals with myopia compared to those who don’t have the disorder. Studies also have found differences in copper levels in critical ocular tissues that are important for regulating eye elongation. “Perhaps copper is metabolized differently in particular eye tissues, or an altered diet may influence less-nearsighted development,” Dr. Young said.

“The caveat is that this particular gene mutation is not found in all of our patients with high-grade myopia, so there are certainly other genes associated with this disorder to be discovered,” she said.

—Marianne Doran

<sup>1</sup> Tran-Viet KN et al. *Am J Hum Genet.* 2013;92(5):820-826.

Dr. Young reports no related financial interests.

## Glaucoma Update

## Treating All NTG Patients Found to Be Cost-Effective

It is cost-effective to offer pressure-lowering therapy to all patients with normal tension glaucoma (NTG). That’s the conclusion of a study to examine the long-term cost-effectiveness of treating NTG.<sup>1</sup>

This study builds on the Collaborative NTG study, which addressed the clinical value of treating NTG, said Emmy Y. Li, MD, an author of the paper and a specialist

at Hong Kong Eye Hospital. “Despite the modest IOP reduction in response to medications in NTG, and in most cases with dual or triple therapy,” she said that the study highlights that “treatment aiming for a 30 percent reduction from baseline is cost-effective.”

Using a decision-analytic health model, the researchers assessed the incremental cost-effectiveness ratio of

offering treatment versus observation for NTG patients over a 10-year period. Cost (in 2008 U.S. dollars) included consultations, diagnostic tests, medication, and procedures.

The researchers found that the cost of treating all NTG patients over 10 years was \$34,225 per quality-adjusted life year (QALY), a measure of patients’ perceived quality of life associated with a particular health state. Cost-effectiveness would improve to less than \$27,000/QALY, if treating only patients with risk factors for progression. What’s more, results were sensitive to the cost of medications, so cost-effectiveness could

be even greater with generic substitutes.

The conclusion was based on a World Health Organization determination that an intervention is cost-effective when the cost per disability-adjusted life year is less than the country’s per capita gross national product (GNP). “With the U.S. 2008 GNP per capita being \$47,580, the treatment of NTG at \$34,225 per QALY is considered cost-effective,” Dr. Li said.

—Miriam Karmel

<sup>1</sup> Li EY et al. *IOVS.* 2013;54(5):3394-3399.

Dr. Li reports no related financial interests.