

special section ASCRS  
cataract news

## Technology advancement

# Heads up: Improved ergonomics will be future of cataract surgery

High-definition, three-dimensional system also conducive to patient, physician education

By Ron Rajecki

Reviewed by Robert J. Weinstock, MD

**San Francisco**—Robert J. Weinstock, MD, has seen the future of cataract surgery, and it's in high definition (HD) and three dimensions (3-D).



Dr. Weinstock

Dr. Weinstock, speaking here at the annual meeting of the American Society of Cataract and Refractive Surgery, said that “heads-up” cataract surgery using

an HD video camera that projects the image viewed through the ocular microscope in 3-D onto a projection screen or monitor (TrueVision Systems Inc.) offers several benefits for ophthalmic surgeons.

“First of all, the ergonomics are much better,” said Dr. Weinstock, a private practitioner at Eye Institute of West Florida, Largo, FL. “Many ophthalmic surgeons suffer from chronic neck and back pain caused by being hunched over all day. This instrument puts us in a nice, comfortable position.”

## Take-Home Message

A “heads-up” high-definition, three-dimensional (3-D) system allows surgeons to perform cataract procedures without hunching over a standard microscope. In addition to the improved ergonomics, the system has wide-ranging applications for patient and surgeon education, and by using the 3-D format and overlaying graphics and metrics, holds promise to optimize results and safety margins in cataract surgery and other procedures.



**Figure 1** “Heads-up” cataract surgery aims to put the surgeon in a more comfortable position. (Photo courtesy of Robert J. Weinstock, MD)

The surgery itself goes more smoothly, according to Dr. Weinstock, because everyone in the operating room is able to view exactly what the surgeon is seeing in HD 3-D.

“It really gives a sense of immersion inside of the eye, and a very strong sense of depth perception,” he said. “My staff as well as I myself wear the 3-D glasses, so my surgical assistant is totally in tune to where I am and very able to anticipate my maneuvers and pass me instruments, because we both know exactly what’s going on inside the eye.”

The system consists of a 3-D, HD video camera that’s mounted to the surgical mi-

croscope via a bridge. The camera captures the image coming through the oculars of the surgical microscope in 1280 × 1024 pixel HD. The camera runs at 2 gigabytes-per-second data transmission.

The information from the HD camera is sent to a dual-projector system, where a computer processes and augments the image. It is then projected onto the screen through polarizing filters. The surgeon and any other viewers wear polarizing glasses to achieve the 3-D effect.

“The surgeon can still look through the ocular microscope,” Dr. Weinstock said. “But I have done roughly 2,000 cases with this system, and now that I have gained

experience with it, it's only very rarely that I find myself needing to lean forward and check something through the ocular microscope."

According to Dr. Weinstock, a retrospective review of 500 cataract cases performed using the 3-D viewing system, as well as several smaller prospective studies, have found no statistically significant differences in overall case time, effective phacoemulsification time, or complications between cataract surgeries performed using this system and traditional cataract surgeries performed using a standard microscope.

Immediate uses for this technology—in addition to the better ergonomics that can help prevent cataract surgery from becoming a pain in surgeons' necks—include patient and surgeon education.

"Many surgeons have come to watch me perform heads-up surgery working with different lenses, different instruments, different phacoemulsification machines. If you're standing behind me wearing a pair of 3-D glasses, you're going to have the exact same view I have," he said. "Instead of just

having one observer scope, you can educate fellows, residents, and surgeons in a way that we've not been able to do in the past."

In addition, Dr. Weinstock added, all of the imagery can be recorded, thus enabling an entire procedure to be presented at an educational event in 3-D format.

He said he also provides a direct feed from the operating room to his waiting room so patients can get a better idea of what cataract surgery is and help ease their anxieties.

Future considerations include biometric overlays and software to overlay graphics templates on to the screen.

"By overlaying templates, you can get an idea of where the pupil center truly is, or where the visual axis is—to trace your capsulorexis, for example," Dr. Weinstock said. "We can also lay templates down to aid in toric lens positioning to know that we're on axis based on preoperative photographs that are done in 3-D and overlaid via iris registration."

Templates also could be used to create a virtual and meticulous "cut-by-numbers"

approach to limbal relaxing incisions and to improve safety margins in cataract surgery, he said.

"Perhaps we could create depth metrics to tell how deep a phaco instrument is inside the eye, and if your instrument gets too close to the posterior capsule, a signal would warn you not to be so deep," Dr. Weinstock said.

Other possible uses of the technology, he added, include slit-lamp applications for remote medicine, 3-D for patient education, telemedicine, telesurgery, and perhaps even robotic surgery.

"There are tremendous applications to the technology," Dr. Weinstock said. "I really enjoy using it, and it's something we're going to see being used much more often in the future." **OT**

FYI

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Dr. Weinstock is an investor in TrueVision Systems Inc.

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