



High-definition video system captures 3-D view of surgical field

John A. Hovanesian, MD, FACS, interviews Robert J. Weinstock, MD, about using high-definition video for surgery and educating surgeons on technique.

John A. Hovanesian, MD, FACS: Today we are joined by Robert J. Weinstock, MD, who is an associate professor of ophthalmology at the University of South Florida and in private practice at the Eye Institute of West Florida in Largo, Fla. Dr. Weinstock, thanks for joining us.

Robert J. Weinstock, MD: It is a pleasure to be here.

Dr. Hovanesian: Tell us about the TrueVision microscope system for ocular surgery.



**John A.
Hovanesian**

Dr. Weinstock: The TrueVision 3-D high-definition surgical system is a high-definition 3-D video camera that hooks to a conventional microscope such as those made by Zeiss or Leica. It captures, through a binocular beam splitter, 3-D content from the surgical field. This footage can be recorded, but more importantly, this footage can be projected onto a large high-definition screen in the operating room to allow the surgeon as well as staff members and other people in the operating room — students, residents, fellows and other surgeons — to view the surgical field without looking through the microscope if they wear 3-D glasses and look at this screen in the operating room.

Dr. Hovanesian: What does the hardware look like?

Dr. Weinstock: The hardware consists of a digital camera that does not look all that different from a normal digital video camera that you would hook to a microscope, but it is a little different design in that it is capturing images out of your left and right oculars of the beam splitter. It then sends that image to a computer, which processes it and projects it through a dual projection system up onto a specialized screen. Polarization filters over the projectors as well, as polarized glasses are needed to create the 3-D image. In the pipeline, there is a flat-panel display that will further improve the ability of the system to be well-integrated into operating rooms.



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Dr. Hovanesian: What was it like when you first started transitioning to doing surgery using this instead of a normal microscope that you have used for years?

Dr. Weinstock: It is important to understand that the surgeon, when this system is on the microscope, can either look through the oculars as they normally would while others look at the screen with the glasses and see the field in 3-D, or the surgeon can sit back and actually look at the screen themselves and operate. And when I first tried doing that, I chose some cases that were simple and safe to do, such as a pterygium and a conjunctival cyst removal. I

rapidly became comfortable with the 3-D system and operating in a heads-up fashion looking at the screen, and it was within five to 10 cases of regular cataract surgery that I was able to do complete cases, start to finish, without looking through the microscope and only looking at the 3-D screen.

Dr. Hovanesian: The technology must have some limitations in this early form. What limitations have you found? In what cases is it difficult to use?



An example of the surgeon sitting upright and operating comfortably while looking at the 3-D screen.



A view from behind the surgeon facing the screen.

Dr. Weinstock: Because we are in the early development of this type of technology, there is some limitation in the resolution of the system. It probably captures somewhere between 80% to 90% of the true resolution of what is seen through the microscope. So it can be challenging in difficult cases where you really need a high-resolution view. There are going to be situations in which you revert back to the optical view through the oculars. With time, improved 3-D digital camera sensors should allow the resolution to improve significantly and still deliver a greater depth of field than the optical view.

Dr. Hovanesian: This must be a very useful tool for educating surgeons on technique.

Dr. Weinstock: Yes. This is probably the most applicable way we can use this technology at this time because now that surgeons are having this unit in their operating room and are recording cases in 3-D, we are able to come to meetings such as the American Academy of Ophthalmology and the American Society of Cataract and Refractive Surgery and begin to use 3-D display systems. Surgeons in the audience can now view interesting cases and actually learn in 3-D, with full depth perception, on giant screens. The educational value of the meetings and the video content are going to be much more appreciated by the attendees and the surgeons viewing. Hopefully, they will be able to go back into their practice and have a better understanding of how a technique is done, and it will improve their results and their skills in the operating room.



Image capture module attaches to the backside of the oculars with a beam splitting bridge.

Images: Weinstock RJ

Dr. Hovanesian: What implications does this have for ophthalmologists who are currently in practice using the existing microscopes?

Dr. Weinstock: I believe as this level of technology improves, when digital information is merged with optical information, surgeons will have new tools in the OR. Digital overlays, filters, depth gauges, metrics and the ability to draw with a mouse on the screen will open the door to improved outcomes. For example, a surgeon could template a specific capsulorrhexis size or mark the eye for limbal relaxing incisions, and depth gauges could be created to tell you how deep an instrument is in the eye. These digital applications could provide a safer operating environment and lead to better outcomes.

Dr. Hovanesian: Could this be used in telemedicine?

Dr. Weinstock: Yes. The applications are, in the future, excellent for telemedicine because potentially you could be viewing a surgery from the other side of the world in 3-D and have as good a view as if you were there. And with the advent of robotic surgery that we are seeing in other aspects of medicine, there is a potential for robotic medicines, combined with 3-D visualization, to allow you to do telemedicine and remote surgery in the not so distant future.

Dr. Hovanesian: Dr. Weinstock, thanks very much for joining us.

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