

Achieving a Wide-angle View During Vitreous Surgery

High-resolution images and wide-angle views of the fundus can contribute to a successful vitrectomy.

BY KAZUAKI KADONOSONO, MD, PhD

In this issue of Retina Today, Kazuaki Kadonosono, MD, PhD, discusses his surgical experience achieving visualization of the retinal fundus during vitrectomy with the Resight 700 fundus viewing system (Carl Zeiss Meditec AG, Jena, Germany).

We extend an invitation to readers to submit pearls for publication in Retina Today. Please send submissions for consideration to Ingrid U. Scott, MD, MPH (iscott@psu.edu); or Dean Elliott, MD (dean_elliott@meei.harvard.edu). We look forward to hearing from you.

—Dean Elliott, MD; and Ingrid U. Scott, MD, MPH



What is the key to successful vitreous surgery? No single answer would be acceptable to every surgeon. However, it is a fact that a clear view of the retinal fundus during surgery is one key to a successful vitrectomy. The recently developed wide-angle viewing microscope sys-

tem, the Resight 700 (Carl Zeiss Meditec AG, Jena, Germany), which is now commercially available, allows surgeons to obtain clearer visualization much more easily than with previously available devices (Figure 1A). Based on my personal experience, the Resight, which is incorporated into the Lumera 700 microscope (Carl

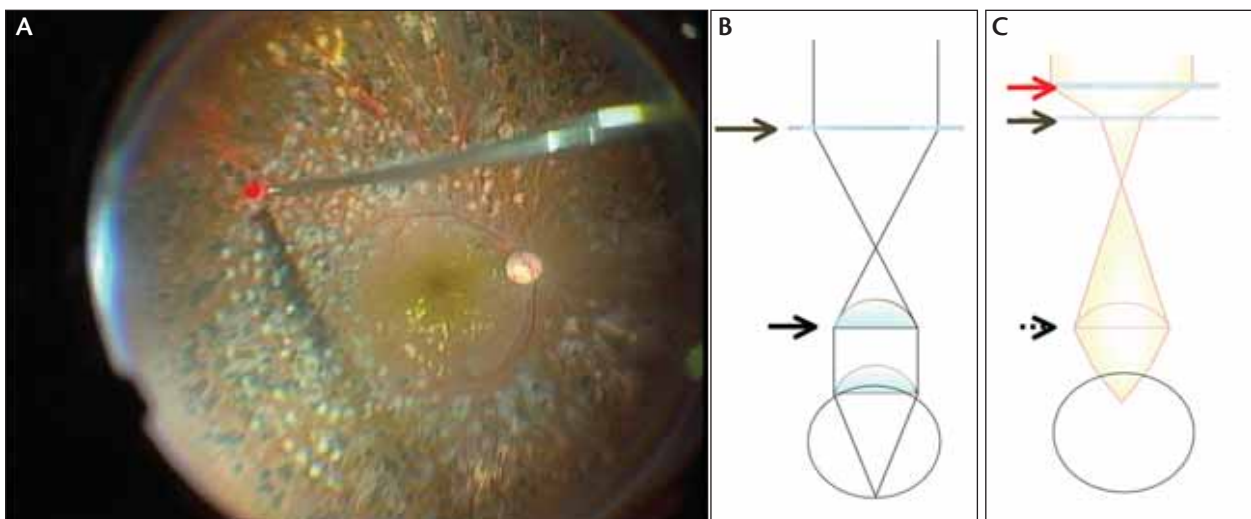


Figure 1. The Resight 700 provides clear, wide-angle images of the fundus (1A). With the BIOM, a clear image can be obtained by controlling both the indirect lens (bottom arrow) and the operating microscope (top arrow; 1B), but with the Resight 700 only the reduction lens (red arrow) inside the operating microscope has to be controlled, and surgeons do not have to use the other lens (black arrows) for focusing (1C).

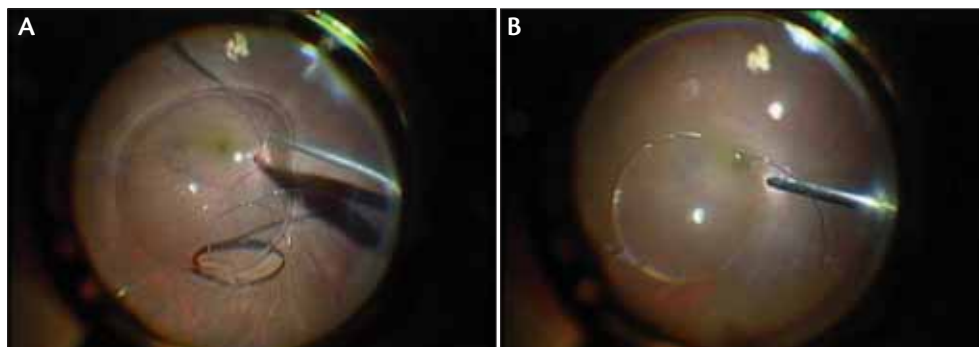


Figure 2. The IOL is floating on PFCL, and it gradually comes up to the anterior chamber (A,B). With the Resight, a clear image of the IOL and a wide-field view of the fundus was obtained.

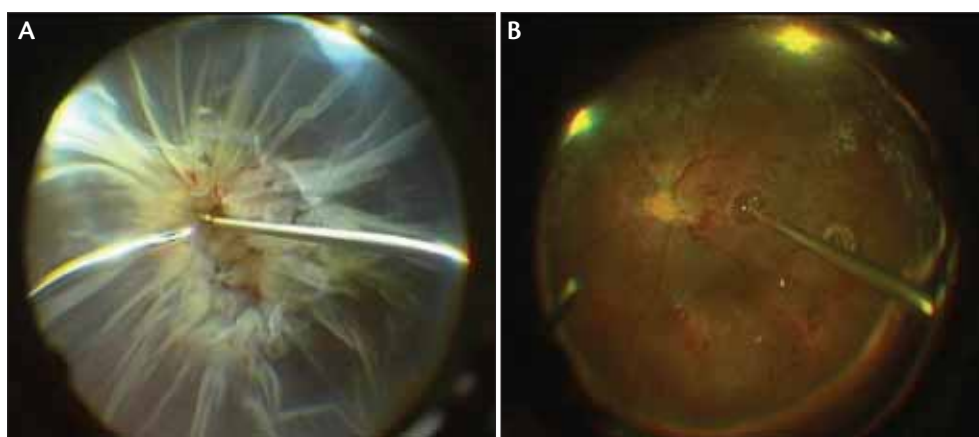


Figure 3. A clear image of the membranes and a wide-field view of the fundus in an eye with proliferative vitreoretinopathy were obtained (A), and the PFCL drop was clearly seen during replacement with silicone oil (B).

Zeiss Meditec), offers several advantages over earlier widefield-viewing systems, as this article describes.

MECHANISMS OF WIDE-ANGLE VIEWING SYSTEMS

Vitreous surgery can be facilitated by indirect viewing systems that provide surgeons with a wide-angle view of the fundus.¹⁻³ Although the image is sufficiently wide field with these devices, it is inverted, which can be confusing, especially when surgeons are performing complex maneuvers. The stereoscopic diagonal inverter (SDI), originally introduced to change the optics during vitreous surgery, made the wide-angle field of the panfunduscope possible.¹

Wide-angle viewing systems consist of two components: an indirect ophthalmoscopic lens system and a stereo reinverter system that reinverts the image. The field of view depends primarily on the distance between the indirect-noncontact lens surface of the operating microscope and the corneal surface. As the noncontact lens approaches the cornea, the observed field grows

larger. Another determinant of the observed field is the refractive power of the lens: The stronger the power of lens, the larger the field of the fundus that can be observed.

Focusing the operating microscope is as important as the visual field because it qualifies the image. The images obtained by noncontact lenses are inferior to those obtained by contact lenses, and the resolution of fundus images by wide-angle viewing systems has not been very good. Focusing the binocular indirect ophthalmoscope (BIOM; Oculus, Lynnwood, WA), which has been the most popular wide-angle viewing

system, is complicated, requiring most surgeons to spend a great deal of time learning how to use the BIOM system.

There are two key elements to focusing with the BIOM system: (1) maintaining a suitable distance between the indirect lens and the corneal surface, and (2) maintaining the optimal distance between the height of the operating microscope and the corneal surface. This means that surgeons have to control both the indirect lens and the operating microscope at the same time in order to obtain high-resolution images of the fundus (Figure 1B).

RESIGHT FOCUSING SYSTEM

The Resight wide-angle viewing system has a unique focusing system. The Resight is equipped with an inner focusing system that allows the reduction lens set inside the microscope to be moved automatically. Surgeons can obtain clearer images by controlling this inner focus system alone (Figure 1C). The focusing system has been simplified even more in the Resight operating microscope

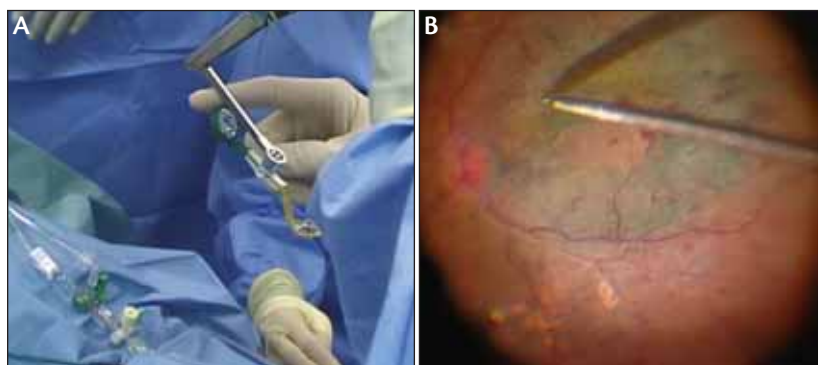


Figure 4. The Resight has a magnifying lens (green color). This 60 D lens can be used to magnify the image (A). The stained internal limiting membrane was imaged clearly and peeled smoothly without using a contact lens (B).

system than in conventional operating microscopes.

This technology can hold two lenses, a 128 D lens for wide-angle viewing and a 60 D lens for magnifying images of the posterior pole. These lenses provide clear fundus images with minimal distortion. The fundus image is inverted automatically by Resight's Invertertube E. Users can also adjust the focus with the footswitch of the microscope through an internal focusing system.

The following are several case reports illustrating the utility of this wide-angle viewing system.

Case 1. A 67-year-old man who had undergone cataract surgery and IOL implantation 7 years earlier experienced sudden visual loss. The patient's IOL had dislocated posteriorly. Vitrectomy was performed to remove the IOL and fixate a new one to the sclera. When perfluorocarbon liquid (PFCL) was injected into the vitreous cavity, the IOL floated on the PFCL and gradually approached the anterior segment. The Resight wide-angle viewing operating microscope made it possible to obtain a wide view and clear image of the IOL during surgery (Figure 2). As a result, there was little possibility of losing visualization of the floating IOL during surgery, and safe and successful rescue of the IOL was performed. The IOL was sutured to the sclera, and the patient's vision improved.

Case 2. Vitrectomy was performed to treat funnel-shaped retinal detachment secondary to proliferative vitreoretinopathy in the right eye of a 56-year-old woman. Membrane resection was safely and effectively performed bimanually with forceps because the surgeon had both a clear image of the membrane and a wide-angle view of the fundus. After removing the membranes and performing partial peripheral retinectomy, PFCL was injected into the eye and subsequently exchanged with silicone oil. The PFCL was replaced with silicone oil

because the oil afforded the surgeon a clear image of the PFCL and the retina (Figure 3). The patient's vision was improved postoperatively, and there were no complications. Surgical complications such as retinal slip-page and retention of drops of PFCL, which sometimes occur during silicone oil exchange, did not occur.

Case 3. The Resight was used to perform vitrectomy in a 57-year-old patient with a macular hole. When the 60.00 D lens was used, the surgeon could perform macular surgery without using the contact lens (Figure 4A). The patient's internal

limiting membrane was removed safely and effectively by staining with indocyanine green and using the wide-angle viewing system alone (Figure 4B).

CONCLUSION

The Resight wide-angle viewing operating system has several advantages over other operating systems. It facilitates obtaining both high-resolution images and a wide-field view of the fundus at the same time. This technology can provide great benefits when performing macular surgery to treat challenging cases. ■

Kazuaki Kadosono, MD, PhD, is Professor and Chairman of the Department of Ophthalmology at Yokohama City University Medical Center, Japan. He states that he has no financial relationship to disclose. Dr.

Kadosono may be reached by phone at +81-45-253-8490; or via e-mail at kado@med.yokohama-cu.ac.jp.

Dean Elliott, MD, Dean Elliott, MD, is Associate Director of the Retina Service, Massachusetts Eye and Ear Infirmary, Harvard Medical School, and is a Retina Today Editorial Board member. He may be reached by phone: +1 617 573-3736; fax: +1 617 573-3698; or e-mail: dean_elliott@meei.harvard.edu.

Ingrid U. Scott, MD, MPH, is Professor of Ophthalmology and Public Health Sciences, Penn State College of Medicine, Department of Ophthalmology, and is a Retina Today Editorial Board member. She may be reached by phone: +1 717 531 4662; fax: +1 717 531 8783; or e-mail: iscott@psu.edu.



1. Spitznas M. A binocular indirect ophthalmoscope (BIOM) for non-contact wide-angle vitreous surgery. *Graefes Arch Clin Exp Ophthalmol.* 1987;225(1):13-15.
2. Landers MB, Peyman GA, Wessels IF, et al. A new, non-contact wide field viewing system for vitreous surgery. *Am J Ophthalmol.* 2003;136(1):199-201.
3. Horiguchi M, Kojima Y, Shimada Y. New system for fiberoptic-free bimanual vitreous surgery. *Arch Ophthalmol.* 2002;120:491-494.