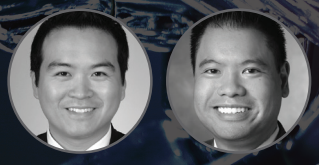
The Top 5 Innovations Improving Efficiency in Today's Retina Practice



The authors' choices of the latest innovations that help keep clinics and ORs running smoothly.

BY PETER H. TANG, MD, PHD, AND THEODORE LENG, MD, MS

With the development of new therapeutics, advances in surgical and diagnostic equipment, and the changing landscape of health care reimbursements, there are enormous pressures placed upon physicians and surgeons to adapt and evolve. Retina specialists have met these challenges head on with innovative new tools and updated clinic workflows that improve accuracy, maximize efficiency, and minimize waste. In this article we describe five innovations that have significantly changed the field of retina, allowing us to deliver the best possible care to our patients.

1 SMALL-GAUGE VITRECTOMY

Surgical innovation is built upon the desire to develop less invasive approaches to achieve similar or better clinical outcomes compared with more traditional methods. Small-gauge vitrectomy has caused a paradigm shift in the surgical management of posterior segment disease. Before the 1970s, open-sky vitrectomy was standard of care, but this approach was potentially fraught with devastating complications such as choroidal hemorrhage.[1] Development of the 17-gauge pars plana vitrectomy (PPV) system and subsequent evolution to the 20-gauge bimanual PPV platform revolutionized posterior segment surgery, and this technology remains in use today.[2,3]

One shortcoming of the early systems was the amount of time needed to open and close the overlying conjunctiva and to suture sclerotomy openings to prevent postoperative hypotony. To improve efficiency and safety, the development of platforms with 23-, 25-, and 27-gauge instruments has allowed surgeons to perform transconjunctival sutureless PPV.[4-6] These instruments are the new standard of care and are widely used today (Video 1).

With the transition to smaller-gauge PPV platforms, technologies for illumination, fluidics, and vitreous cutting also had to progress to allow safe and successful clinical outcomes. Faster cutting speeds and miniaturization of the vitrector probe have translated to safer posterior segment surgery. Additionally, those faster cutting speeds, combined with smaller port openings, cause less traction on vitreous collagen fibers that can cause the retina to jump into the port. Thus, surgeons can maneuver close to the retina with less risk for iatrogenic breaks.

Currently, 7,500 cuts per minute (cpm) is the fastest commercially available speed for PPV platforms; development of a 10,000 cpm system is well under way, and this capability may be introduced soon.

2 NONCONTACT WIDE-ANGLE VIEWING SYSTEMS

A wide-angle viewing (WAV) system improves the safety and efficacy of vitrectomy by providing an adequate view of the surgical field. WAV systems were initially introduced in the 1980s, and they have been continually modified and enhanced. WAVs use the indirect ophthalmoscopic principle, producing an inverted image that is then reinverted by a prismatic device typically connected to the microscope. Contact and noncontact WAV systems are available.

CONTACT WAV SYSTEMS

Contact WAV systems consist of a lens that is placed directly on the

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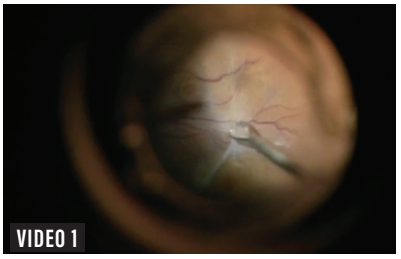

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cornea to eliminate corneal aberrations and reflections from the corneal surface. These systems provide superior image resolution, contrast, and stereopsis compared with noncontact WAV systems. Although drying of the ocular surface is less of a concern with these systems, the ability to position and rotate the eye is limited. Furthermore, the contact lens must be held in place either by a ring sutured to the sclera or manually by a skilled assistant to maintain stability and positioning. The latter is a feat that is both tiresome and time-consuming.[7] Contact WAV systems such as the AVI Panoramic Viewing System (Advanced Visual Instruments) are still used for portions of surgery that require high magnification and enhanced depth perception (eg, membrane peeling). Most surgeons, however, have switched to the use of noncontact WAV systems.

NONCONTACT WAV SYSTEMS

With noncontact WAV systems, the viewing angle can easily be changed by moving the viewing system up and down and adjusting the distance between the cornea and the viewing system. This gives the surgeon more control of his or her view without the need for a skilled assistant. More than 3 decades ago, the binocular indirect ophthalmomicroscope system (BIOM, Oculus) was introduced. The BIOM, consisting of a noncontact front lens, a reduction lens, and a stereoscopic inverter, is still widely used today.[8] One of the BIOM's key disadvantages is that it requires the surgeon to spend a significant amount of time manually focusing both the distance of the indirect lens and the operating microscope from the corneal surface to achieve the best view.

More recently, the Resight (Carl Zeiss Meditec AG) noncontact WAV system was introduced. Its automatic focusing system, built into a compatible surgical microscope, simplifies the process of achieving an adequate view and improves surgical efficiency.[9] The Resight can simultaneously hold both 128 D (wide-angle) and 60 D (magnified) lenses, so the surgeon can quickly switch to a high-magnification view for macular surgery without the need to switch to a contact WAV. This greatly improves efficiency in the OR and enhances patient safety in vitrectomy surgery.

3 HIGH-RESOLUTION OCT IMAGING

The introduction of optical coherence tomography (OCT) imaging of the posterior segment in the 1990s completely changed the way we practice clinical retina. OCT devices use near-infrared light to generate cross-sectional or 3-D images of the retina, providing a level of detail that cannot be achieved through traditional biomicroscopy. OCT imaging allows objective monitoring of macular diseases, enables us to intervene at earlier stages of disease to prevent progression, and promotes efficiency in clinic flow by facilitating definitive diagnosis without the need for multiple imaging modalities or numerous follow-up appointments.

With its ability to visualize everything from epiretinal membrane to macular edema, OCT imaging has become an indispensable part of the retina clinic. OCT has gone through multiple iterations since its introduction, from time-domain OCT to the current standard of spectral-domain OCT (SD-OCT) and the emerging technology of swept-source OCT.[10] Advantages of SD-OCT over previous OCT technology include faster scanning speeds, which minimize motion artifacts, and higher resolution of details.[11] SD-OCT systems are now available from multiple manufacturers, and each has its own advantages.

4 OCTA

OCT angiography (OCTA) is a novel noninvasive imaging modality that provides visualization of retinal and choroidal vasculature without the need for dye injection, as is required for traditional imaging modalities such as fluorescein angiography (FA)

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and indocyanine green angiography (ICGA). OCTA relies upon motion contrast to discriminate objects in motion from their stationary surroundings. In the setting of fundus imaging, OCTA can identify transient erythrocytes, thus directly determining blood flow and indirectly highlighting the vasculature. Numerous studies have shown that OCTA is as sensitive as FA and ICGA in detecting neovascular AMD.[12]

There are three main advantages of OCTA over traditional FA. Because exogenous dye is not required to highlight retinal and choroidal vasculature in OCTA, intravenous access is not required, making visits more comfortable for patients and minimizing anxiety and infection risk. OCTA also eliminates the complications associated with fluorescein injection because no dye is needed. Fluorescein may extravasate under the skin during injection, which can be extremely painful and (rarely) cause necrosis and sloughing of the skin.[13] Nausea from fluorescein is a frequent side effect, occurring in about 5% of patients. Hives and itching are the most frequent allergic reactions. Bronchospasms and anaphylaxis have been reported, though extremely rarely. Finally, OCTA can improve clinic flow, as traditional FA studies may take up to an hour because of the time it takes to obtain intravenous access, inject the fluorescein dye, and acquire images for up to 15 minutes after injection in some cases. This shortened time may allow clinicians to increase the number of studies a patient receives on subsequent visits to enhance monitoring (Video 2).

5 CLINICAL SCRIBES

Electronic health record (EHR) systems have become a fixture of our health care system, and their implementation has entailed a mixture of success and frustration. As with any change to the foundation of our clinical practice, the adoption of an EHR system brings about new challenges. According to a 2015 survey by the American Academy of Ophthalmic Executives, the majority of respondents did not observe the predicted cost savings in the clinic nor any improvements in work flow efficiency related to the use of EHR systems.[14] In one recent paper, retina specialists reported that they felt they were spending less time talking with their patients after EHR implementation.[15]

How can these negative aspects of the EHR be mitigated? One solution is the use of clinical scribes. Retina specialists have turned to scribes to reduce documentation overload and to support workflow. This is especially helpful if ophthalmic technicians are cross-trained to handle patient intake (ie, review of systems and family and social histories) and to scribe the physician's dictation. In numerous high-volume retina practices, the implementation of scribes has significantly increased clinical efficiency and volume; however, several factors must be considered. Regulation requirements for scribes vary by state, with some requiring certification. Furthermore, improvement in clinical efficiency and subsequent increase in patient volume must be adequate to offset the cost of scribes, as the largest single cost of operating a medical practice is payroll for support staff.[16]

STAYING AHEAD OF THE CURVE

Although this is far from a comprehensive list of meaningful innovations within retina, each of the innovations discussed above has improved clinic flow and enhanced the ability of retina specialists to provide the best treatment for patients. As technologies and clinical practices continue to evolve, retina specialists will surely adapt and innovate to stay ahead of the curve. ■

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THEODORE LENG, MD, MS
- Director, Clinical and Translational Research at the Byers Eye Institute at Stanford, Stanford University School of Medicine, in Palo Alto, California; member of the *Retina Today* editorial advisory board
- vision.md@gmail.com
- Financial disclosure: None acknowledged

PETER H. TANG, MD, PHD
- Clinical Instructor of Ophthalmology at the Byers Eye Institute at Stanford, Stanford University School of Medicine, in Palo Alto, California
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