Using 3-D Technology for Diagnosis and Patient Management

The 3D OCT-1000 combines speed and resolution to offer improved imaging.

BY CHARLES W. MANGO, MD

In the average retina practice, an optical coherence tomography (OCT) machine has become one of the most utilized pieces of diagnostic equipment. The practical data that is gained from having an OCT machine more than justifies the financial investment. I have found this to be particularly true in the case of the 3D OCT-1000 system (Topcon, Paramus, NJ), which combines the benefits of a nonmydriatic fundus camera with the speed, resolution, and 3-D imaging capabilities of spectral domain (SD) OCT technology.

Since acquiring this system over 1 year ago, I have found that the 3D OCT-1000 has become a useful instrument in diagnosis and management of vitreoretinal disorders. The 3D OCT-1000's ability to image tissue detail in high resolution is the main reason it provides improved diagnostic accuracy over traditional time domain OCT. This system resolves structural tissue detail down to the level of approximately 5 µm to 6 µm, which is about twice the resolution of time domain OCT. The 3D OCT-1000 also has a unique 3-D modeling interface, providing for improved conceptualization of posterior ocular structures.

BRVO CASE STUDY

A woman, 63 years of age, presented with complaints of a 2-week period of blurry vision in her left eye. After clinical evaluation and imaging with the 3D OCT-1000, it was noted that she had retinal hemorrhages in the superior macula and macular edema in her left eye, and she was diagnosed with a branch retinal vein occlusion (BRVO) and macular edema secondary to the BRVO.

The treatment plan initially involved an observation period followed by focal grid laser photocoagulation. Despite this treatment, her clinical picture worsened, with declining visual acuity (finger counting) and increasing macular edema. I administered an injection of bevacizumab (Avastin, Genentech, Inc.), and found that although her vision initially improved only slightly, the OCT image showed dramatic improvement in the edema. From a patient education viewpoint, the 3D OCT-1000 was valuable to educate the patient on her anatomic improvement. The patient elected to undergo two more bevacizumab injections, and she had eventual full resolution of edema with restoration of normal foveal architecture. Subsequently, the patient's vision improved to 20/30. Figure 1 shows the patient's 3D OCT-1000 images before treatment and after treatment.

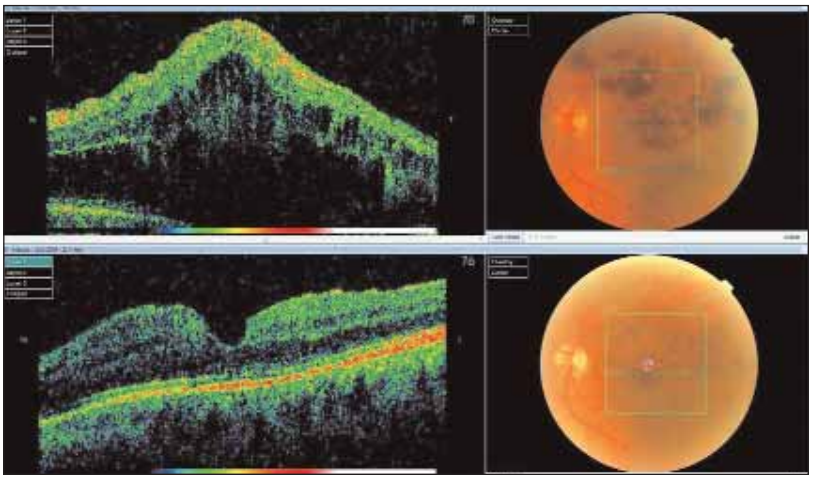

Figure 1. BRVO: 3D OCT-1000 images before treatment (top) and after treatment.

VTS CASE STUDY

The 3-D imaging capability of this system is helpful in planning surgery. Key surgical landmarks can be readily identified and viewed from a variety of helpful angles. For instance, when analyzing a case of vitreomacular traction syndrome (VTS), the 3-D model can show how much potential space there is between the posterior vitreous face and the underlying retina. This is illustrated in the following case study.

A woman, 66 years of age, presented with blurry vision in her right eye, which she had been experiencing for 3 months. A blunting of foveal reflex and a trace epiretinal membrane were noted on clinical exam. OCT imaging also revealed significant VTS. A pars plana vitrectomy with membrane peel was performed, and the patient's vision improved from 20/80 to 20/25. She experienced resolution of all visual distortion. After surgery, there was no epiretinal membrane present, and vitreomacular traction was resolved.

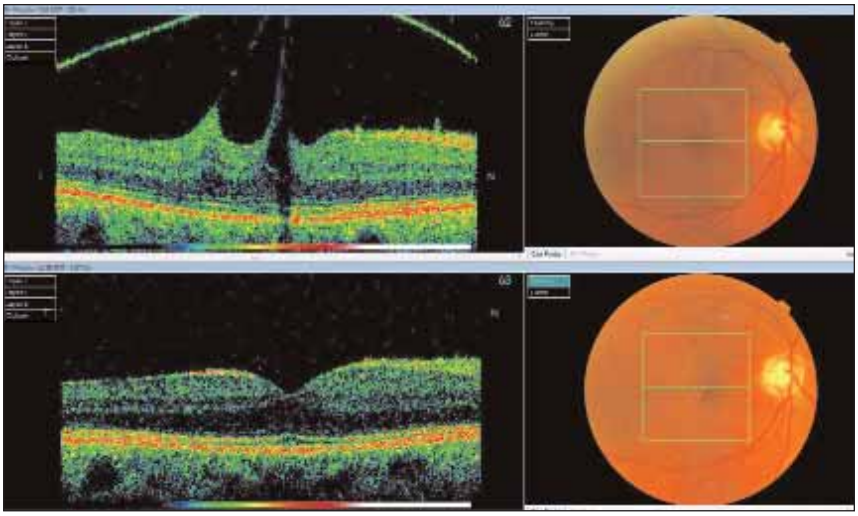

Figure 2. VTS: OCT comparison demonstrates a complete restoration of the normal foveal architecture 3 months after surgery (bottom).

The 3D OCT-1000 scans clearly demonstrates the posterior vitreous face, focal adhesions of the vitreous to the parafoveal area, traction on the retina, a partial thickness macular hole developing secondary to the traction, and a trace epiretinal membrane. With respect to its value in surgical planning, the OCT illustrates the extent and focal locations of the vitreomacular traction. Three months after surgery, the OCT comparison (Figure 2) demonstrates a complete restoration of the normal foveal architecture.

SYSTEM FEATURES

The 3D OCT 1000 has a nonmydriatic color fundus camera built into the system. Acquiring a fundus image with this device is simple, and the quality of the fundus image is quite good with a 3-megapixel resolution. One of the most useful functions of the 3D OCT-1000 is that it enables dynamic viewing of B-scans that the software aligns to a color fundus image. A 6-mm x 6-mm area scan can be created by combining 128 (or up to 256) horizontal B-scans. Point-to-point registration allows the user to pinpoint the location of retinal landmarks with comparison between the OCT image and the photograph. The ability to actively review individual B-scans in rapid succession is helpful in localizing pathology. For example, in an eye with suspected wet age-related macular degeneration, it may not be clear if there is subretinal fluid present. This feature permits the physician to go right to the suspected area (based on the color photo) and then scan line by line to localize for any subretinal fluid on B-scan.

Discussing a retinal disease diagnosis with a patient is sometimes difficult, but the 3D OCT-1000 can simplify the situation because it performs as an outstanding patient education tool. The 3-D imaging helps patients understand their disease processes and enables them to better comprehend their ocular pathology.

Ease of use is another key factor that makes the 3D OCT-1000 a positive addition to our practice. The interface is user-friendly, making it simple to train new technicians. Although technicians are the primary users in our office setting, our physicians are equally adept at routinely acquiring excellent scans on even the most challenging patients. The base on which the OCT is mounted makes it relatively undemanding for elderly or disabled patients to position, and the broad range of vertical movement is helpful for accommodating wheechair-bound patients.

In summary, the 3D OCT-1000, combined with good examination skills, a thorough knowledge base, and sound clinical judgment, has the ability to improve diagnosis and management of retinal disease. ■

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