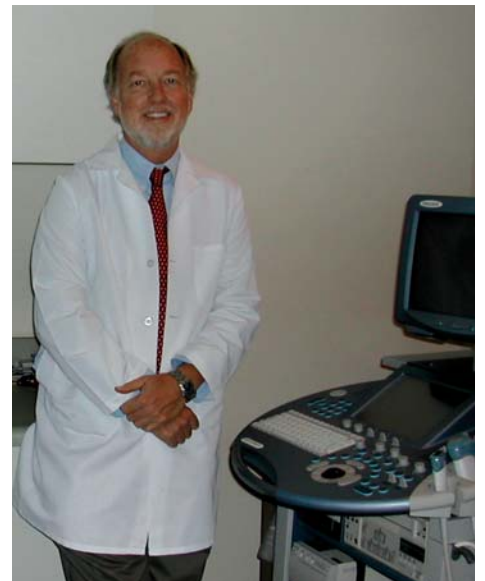


Case Study

Volume Ultrasound - Early Diagnostic Capabilities in Ovarian Cancer

Michael Crade, M.D., is the medical director at Ultrasonix in Long Beach, Calif., and specializes in ovarian cancer screening and diagnosis using ultrasound. Seeing more than 200 patients with ovarian masses per year, he uses diagnostic capabilities available exclusively on GE's Voluson 730 ultrasound system to help evaluate ovarian mass characteristics. The technique allows for proper treatment of women who have ovarian cancer - the fourth largest cause of cancer death in women in the United States¹.



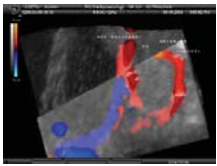


Figure 1
Benign vessels demonstrating typical "tree-branching" appearance

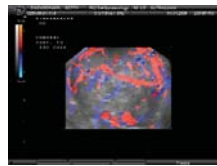


Figure 2
Malignant tissue block demonstrating chaotic vessel pattern

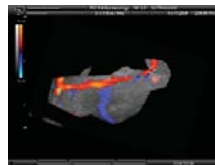


Figure 3
Cut away shows malignant pattern of 90 degree branching and irregular lumen width

Seeing inside ovarian masses - in three dimensions

"One of the major goals of gynecologic ultrasound is to detect ovarian cancer at the earliest stage possible," Crade observes. "Before Volume Ultrasound technology came along, we could only assess a growth by observing its overall shape and structure and by looking for abnormal Doppler blood flow signals. However, a complex ovarian mass with wall nodules and thick septations or an abnormal Doppler reading could be either benign or malignant."

With Volume Ultrasound, Crade is able to look inside a growth, as if with X-ray vision, and see abnormal artery and vein structures that distinguish cancers from benign growths. For example, in normal tissue, the arteries develop in a treelike pattern, and the arteries and veins tend to run together in pairs (See Figure 1). In malignant growths, the arteries often concentrate toward the center, and the veins on the periphery. Arteries in tumors also connect at atypical right angles or even twist on themselves in circular patterns. They may also have areas of widening or narrowing (See Figure 2).

Using the Voluson 730's MagiCut feature, Crade can cut away sections of the data

and study arterial patterns in great detail (See Figure 3). "I can cut arteries in cross section," Crade said. "I can follow the course and character of relationships between the arteries and veins. But we don't just pick up how the vessels are formed. We also pick up the velocity of the blood within the vessels. If I find an artery that doesn't look right, I can fillet it open and examine the Doppler blood flow pattern by the colors within the lumen. We have found that arteries in malignancies have mini-jets of blood flow just distal to areas of narrowing. These appear in color as orange shifts. We have not seen this in benign masses as yet."

Furthermore, Crade observes, the technology shows arteries and veins simultaneously, and with equal clarity. "You can map out the whole vascularity and see the relationships of the arteries and veins all at once," he says.

A simple, yet powerful procedure

A volume or tissue block of the anatomy is easily captured in one acquisition and can be rendered with or without 3D color or power Doppler. With the ease of acquisition, the information can be reviewed while the patient is present or sometime later.

While Crade personally performs about half his ultrasound scans, he also relies on his staff. "We had a case recently when I wasn't here in which my sonographer found a mass," he recalls. "She saved a series of volumes for me to look at later. It was very, very helpful. I didn't have to call the patient back for another exam."

A big step in diagnostic accuracy

Crade believes that the study of vascularity with Volume Ultrasound significantly improves diagnostic confidence. He cited research showing that qualitative study of vascularity correctly identified 95 percent of early ovarian cancers, versus 74 percent identified by morphologic study alone. The combination of morphologic and 3D vascularity analysis made identification possible in 97.7 percent of cases². "By combining morphology and advanced qualitative study of vascularity using Volume Ultrasound, I believe virtually all early cancers can be identified," Crade said.

"We have saved many patients from surgery when the masses have been complex, but the vascular patterns were benign," Crade said. "We have also identified small tumors embedded within benign endometriomas based solely upon abnormal and persistent vascular patterns. Early detection improves the prognosis."

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GE Healthcare
Internet - gehealthcare.com
GE Healthcare
tel 1-866-344-3633
P.O. Box 414
Milwaukee, Wisconsin 53201 U.S.A.



1. Source: American Cancer Society. The ACS estimates there will be 22,220 new cases of ovarian cancer in the United States in 2005 and that 16,210 women will die of the disease.

2. Kurjak, Asim, *Gynecology Oncology*, Vol. 90, Issue 2, August 2003, pp. 258-264.

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