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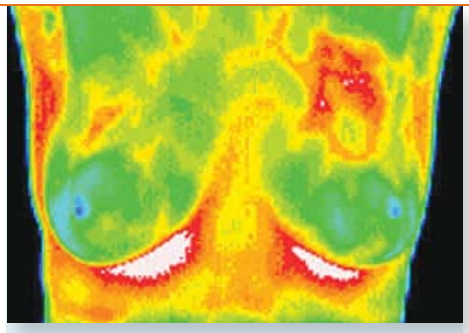

Thermal imaging

Radiation-free screening complements mammography

By Bernarda Zenker, MD, and Valerie Zumbusch, CCT

After skin cancer, breast cancer is the most common type of cancer among women in the United States and, according to the American Cancer Society, the leading cause of cancer deaths in women ages 20 to 59. The National Cancer Institute estimates 207,090 new cases of invasive breast cancer will be diagnosed in women in the United States this year, and 39,840 American women will die from breast cancer. Overall among women breast cancer deaths are second only to lung cancer, which will take the lives of an estimated 157,300 Americans, male and female, in 2010.

Screening for breast cancer

Most doctors agree that until the causes of breast cancer can be identified and prevented, early detection is the best weapon we have for averting deaths from breast cancer. Until about 1976, an annual clinical breast exam (CBE) for women 18 and older, supplemented by monthly self-examination, was the standard screening method. In 1976, mammography was added to the protocol, first as a tool to assist with diagnosis and then for screening patients without symptoms. In recent years, the standard recommendation for women at average risk has been for a baseline mammogram at 40, followed by annual screening mammograms. Last year, the U.S. Preventive Services Task Force issued a statement concluding that the risks of mammogram (chief among them low-dose radiation, a false-negative or false-positive finding, and unnecessary additional testing) outweighed the benefits—one life saved for every 2,000 mammograms—for women at average risk between the ages of 40 and 49, and that a mammogram every other year was sufficient for most women 50–59. The new recommendations aroused controversy among breast cancer survivors and others, and the American Cancer Society and most medical centers have not adopted them.

In this 38-year-old woman with a lump in the upper-mid part of the left breast, mammography showed bilaterally dense fibroglandular tissue, more prominent on the left side. Infrared imaging (above) shows an asymmetrical vascular pattern over the left breast. Histopathology revealed a 2-cm infiltrating ductal carcinoma of the left breast.

Breast thermography

As controversy continues to swirl around the balance of risk and benefits from mammograms, there is another, lesser-known screening technique that complements CBE and mammography.

Breast thermography, also known as digital infrared thermal imaging (DITI), is a radiation-free, contact-free, state-of-the-art clinical screening test appropriate for women of all ages. This test is part of an early breast-disease detection program that provides women an opportunity to greatly increase their chances of addressing early stages of cancer and other breast disease. Unlike conventional mammography, DITI is completely safe for pregnant women, women with breast implants, and women with large, dense, or sensitive breasts, since there is no radiation and no contact with or compression of breast tissue.

How thermography works

Thermography is a physiologic test that demonstrates heat patterns strongly indicative of breast abnormality. The test can detect subtle changes in breast temperature that indicate a variety of breast diseases including fibrocystic disease, which is a noncancerous condition and not life-threatening. Using an infrared medical camera, the technician captures images that are read by board-certified medical doctors specifically trained in this area. If abnormal heat patterns are detected, follow-up procedures may include a physical exam, mammography, and/or ultrasound. A biopsy, in which a surgeon or other specialist removes tissue that is examined under a microscope by a pathologist, is the only test that definitively diagnoses breast cancer.

DITI is a unique technology that creates a map of the infrared patterns of the body. It is different from other screening tools because it shows physiologic function. Magnetic resonance imaging (MRI) and x-ray detect

anatomical changes but could miss such things as active inflammation or angiogenesis, the development of new blood vessels that increase blood supply, as occurs in cancer. The U.S. Food and Drug Administration first approved DITI as an adjunctive tool for breast cancer screening in 1982. In 2009, researchers at New York-Presbyterian Hospital conducted a major study of breast thermography, concluding it was "a valuable adjunct" to mammography and ultrasound.

Thermal imaging has been shown to be effective in finding some early signs of breast changes up to 10 years before changes may be seen with conventional mammography. It is in this role that thermography provides its most practical benefit. It is important to understand that thermography is an adjunct to the appropriate usage of mammography and not a competitor. In fact, thermography can identify patients at high risk and increase the effective usage of mammographic imaging procedures.

Until such time as a cure has been found for breast cancer, progress will come in the fields of early detection and risk evaluation coupled with sound clinical decision-making.

Establishing a baseline

For thermal breast screening, it is recommended to form a baseline by doing two screenings three months apart. It takes three months for blood vessels to show change, so this is the earliest a physician reading the images would be able to see change in heat patterns. Waiting much more than three months can miss significant change that may have already taken place.

Establishing an accurate baseline is a necessary foundation for evaluating changes. This baseline represents a patient's unique thermal fingerprint, which will only be altered by developing pathology. A baseline cannot be established with only one study, as there is no way of knowing if this is a patient's normal pattern or if change is under way at the time of the first exam. While the first study is limited, DITI is very sensitive for detecting active pathology in the form of inflammation, lymph dysfunction, angiogenesis, hormonal abnormalities, and other physiological dysfunctions.

What thermal imaging will not do

DITI will not show any cancers from a structural or pathological perspective. It has been found to show positive physiological findings in 83 percent of patients with ductal carcinoma in situ, the earliest form of breast cancer, leaving 17 percent that are thermographically silent. This is much the same as mammography detection rates.

There are better tests than DITI for detecting established tumors. When a lump is present it can be detected by physical examination, mammogram, and ultrasound. DITI is aimed at screening for change over time to detect developing pathology at an early stage. Tumors that appear thermographically silent are mainly in advanced stages due to established blood supply, encapsulation, and pathology type.

Breast thermography screening is an adjunctive test to mammography. It also is a specialized physiological test designed to detect:

- Angiogenesis, the formation and differentiation of blood vessels
- Elevated nitric oxide, which helps a breast cancer cell grow
- Estrogen dominance, the presence of excess estrogen in relation to progesterone, which encourages the development of breast cancer
- Lymph abnormality and inflammatory processes, including inflammatory breast disease

None of these can be detected with mammography.

Other uses for thermography

Chronic pain is another area where thermography can be helpful. DITI an be used to evaluate any type of neurological dysfunction, including nerve entrapment syndromes. However, inconclusive findings may occur if the condition has evolved over a long period of time and the body has created accommodations. If there is pain, thermography should be able to provide useful information.

In summary, thermography is useful as a screening tool for:

- Inflammatory phenomena, including early detection of cardiovascular disease; arthritis; fibromyalgia; or trauma such as strains, sprains, or chronic pain.
- Neurovascular phenomena such as cancer, which is fed by the body's own blood supply. Development of the increased blood supply that is a hallmark of cancer can be detected well before anatomical changes occur that are detectable by other screening tools.
- Neurological phenomena such as chronic regional pain syndrome and nerve irritation that can cause referred pain in other areas. Circulatory deficits are easily seen in thermographic images.

DITI has been used extensively in the United States, Europe, and Asia for the past 20 years. Until now, cumbersome equipment has hampered its diagnostic and economic viability. Current state-of-the-art, PC-based infrared technology designed specifically for clinical application has changed this.

Clinical uses for DITI include defining the extent of a previously diagnosed lesion, localizing an abnormal area so that further diagnostic tests can be performed, detecting lesions before they are clinically evident, and monitoring the healing process.

Filling the gap

X-ray, CT scans, ultrasound, and MRI are tests of anatomy. Electromyography (EMG) is a test of motor physiology. DITI is unique in its capability to show physiological change and metabolic processes. It has proven to be a useful complementary procedure to other diagnostic modalities.

DITI breast imaging costs around $160. Most insurers do not cover DITI.

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