

## What's the difference? Thermography, Mammography, or Ultrasound?

**Alexander Mostovoy, H.D., D.H.M.S., BCCT**

One of the most frequent questions I am asked as a clinical thermographer is: "What exactly is the difference between mammography, ultrasound and thermography?" There seems to be some confusion on this subject by thinking that one replaces the other as tests, nothing could be further from the truth. Both mammography and ultrasound are structural (anatomical) tests, while thermography is a functional (physiological) test. None of these tests are truly diagnostic technologies. Thermography images the breast and surrounding area and provides us with risk assessment, while mammography and ultrasound detect structural abnormalities. If a breast abnormality is found that could possibly be malignant, a biopsy is performed. A biopsy removes a tissue sample for examination under a microscope.

Many women, after their initial assessment with thermography, may be asked to follow up either with an ultrasound or mammogram or both to rule out the existing pathology. Frequently some will be relieved that their mammogram or ultrasound test results show no abnormal findings, however this does not necessarily mean that nothing is going on with their breasts. Several other factors may be contributing to a high risk (abnormal) thermogram, such as: hormonal imbalance, early angiogenesis (proliferation of blood vessels), lymphatic swellings and poor function and other contributing factors – all of these are important contributors to breast disease and malignancy and are not detected by mammography or ultrasound as these factors do not appear as structural changes.

***The following is a list comparing all three types of tests with their pros and cons:***

### ***Mammography***

- Structural test: can pinpoint the location of suspicious area
- Compresses the breast
- X-ray radiation produces an image; the area of concern must have greater density to stand out against regular tissue
- Can detect tumors in mainly slow growing stage or pre-invasive stage
- Cannot detect fast growing tumors in the pre-invasive stage
- The use of hormones decreases sensitivity
- Large, dense and fibrocystic breasts are difficult to read

- The upper portions of the breast including the tail of the breast and the Axillary region cannot be visualized
- Can detect tumors 1-2 years earlier than physical examination
- Average Specificity 75% (25% false-positive) 9 out of 10 biopsies initiated by mammography are negative

### ***Ultrasound***

- Structural test, can pinpoint the location of suspicious area
- Uses sound waves with moderate contact
- High frequency sound waves are bounced off the breast tissue and collected as an echo to produce an image
- Able to detect some tumors missed by mammography
- No data available on detecting pre-invasive tumors
- May be affected by the hormonal influence due to the menstrual cycle, (i.e. cystic changes)
- All areas of the breast and Axillary region can be analyzed
- Good for distinguishing between solid and fluid masses, helpful in investigating an area of concern due to mammography, thermography or physical examination findings
- Average Specificity 66% (34% false positive)
- Average Sensitivity 83% (17% of cancers missed)

### ***Thermography***

- Functional testing, able to detect physiological changes, cannot pinpoint the exact location of suspicious area
- No radiation, non-invasive, no risk, can be used as often as necessary to observe the effectiveness of treatment over time
- Uses infrared detectors to detect heat and increased vascularity that may be related to angiogenesis
- Can detect physiological changes many years prior to any other method of screening
- Very sensitive to fast growing aggressive tumors
- Hormonal activity in the breast will affect thermographic imaging but not to the point of abnormality
- All breast shapes, conditions and areas are within the scope of imaging
- Earliest warning system with breast tissue and physiological changes that usually precedes tumor formation years prior to its occurrence
- Average Specificity 90% (10% false positive)

Of course everyone has heard by now that early detection prolongs life expectancy, this is a given. However if cancer has been detected early, it would mean that you already have cancer. Prevention should take precedence over detection. Prevention means not getting cancer in the first place. If we are going to reverse the present trend of the epidemic proportion of breast cancer, we need to come up with a more proactive approach, which needs to become the norm for patient assessment. Cancer starts with one abnormal cell, and it takes nearly 8 years for that one abnormal cell to replicate to one billion cells. One billion cells produce a detectable lump that is one centimeter in size. This is the size of a lump that can be seen on a mammogram. This is not an early finding.

Every woman should know her risk for breast cancer. With proper risk assessment that includes different testing modalities, the patient is able to determine her risk factors and develop an action plan on how to improve the breast tissue or even reverse the existing trend. The current screening strategy is not enough to protect women from breast cancer. Medical infrared imaging should be added to every woman's regular breast health care.

***Dr. Alexander Mostovoy***  
***HD, DHMS, BCCT Board Certified Clinical Thermographer***