Thermography

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Thermography

- Total Thermal Imaging providing Early Detection, Non Radiation based Thermography Breast and Body Screenings for Men, Women, Children, and Animals.

- Thermography, or DITI (Digital Infrared Thermal Imaging) is the technology used by both Suzanne Somers to detect her breast cancer and Oprah Winfrey to detect her thyroid disorder.

- Conditions detected include inflammation, tumors, carpal tunnel, heart disease, prostate health, migraines, thyroid conditions, TMJ, periodontal disease, and many more!
What is breast thermography

- Breast thermography is a diagnostic procedure that images the breasts to aid in the early detection of breast cancer.
- Infrared thermography, thermal imaging, and thermal video are examples of infrared imaging science.

- Thermal imaging cameras detect radiation in the infrared range of the electromagnetic spectrum (roughly 9000–14,000 nanometers or 9–14 μm) and produce images of that radiation, called thermograms.

- Since infrared radiation is emitted by all objects near room temperature, according to the black body radiation law, thermography makes it possible to see one's environment.
Introduction

- The first recorded use of thermobiological diagnostics can be found in the writings of Hippocrates around 480 B.C.[1].
- Continued research and clinical observations proved that certain temperatures related to the human body were indeed indicative of normal and abnormal physiologic processes.

- In the 1950's, military research into infrared monitoring systems for night time troop movements shared in a new era in thermal diagnostics.

- The first use of diagnostic thermography came in 1957 when R. Lawson discovered that the skin temperature over a cancer in the breast was higher than that of normal tissue.
On January 29, 1982, the Food and Drug Administration published its approval and classification of thermography as an adjunctive diagnostic screening procedure for the detection of breast cancer.
Fundamentals of Infrared Imaging

Physics

• All objects with a temperature above absolute zero (-273 K) emit infrared radiation from their surface.
• The Stefan-Boltzmann Law defines the relation between radiated energy and temperature by stating that the total radiation emitted by an object is directly proportional to the object's area and emissivity and the fourth power of its absolute temperature. Since the emissivity of human skin is extremely high (within 1% of that of a black body), measurements of infrared radiation emitted by the skin can be converted directly into accurate temperature values.
Equipment Considerations – Infrared rays are found in the electromagnetic spectrum within the wavelengths of 0.75 micron - 1mm.

- Human skin emits infrared radiation mainly in the 2 - 20 micron wavelength range, with an average peak at 9-10 microns.

- The problems encountered with first generation infrared camera systems such as improper detector sensitivity (low-band), thermal drift, calibration, analog interface, etc. have been solved for almost two decades.
State-of-the-art breast thermography uses ultra-sensitive infrared cameras and sophisticated computers to detect, analyze, and produce high-resolution diagnostic images of these temperature and vascular changes.
• The procedure is based on:
  • The principle that chemical and blood vessel activity in both pre-cancerous tissue and the area surrounding a developing breast cancer is almost always higher than in the normal breast.
  • Since pre-cancerous and cancerous masses are highly metabolic tissues, they need an abundant supply of nutrients to maintain their growth. In order to do this they increase circulation to their cells by sending out chemicals to keep existing blood vessels open, recruit dormant vessels, and create new ones (neoangiogenesis). This process results in an increase in vascular surface.
• The concept of angiogenesis, as an integral part of early breast cancer, was emphasized in 1996 by Guido and Schnitt.

• Their observations suggested that it is an early event in the development of breast cancer and may occur before tumor cells acquire the ability to invade the surrounding stroma and even before there is morphologic evidence of an in-situ carcinoma.

• New Early Signs in Breast Cancer studied angiogenesis by infrared imaging and reported that hypervascularity and hyperthermia could be shown in 86% of non-palpable breast cancers. Also noted that in 15% of these cases infrared imaging helped to detect cancers that were not visible on mammography.
- **Laboratory Considerations**
- Thermographic examinations must be performed in a controlled environment. The primary reason for this is the nature of human physiology. Changes from a different external (non-clinical controlled room) environment, clothing, etc. produce thermal artifacts. Temperature and humidity-controlled room maintained between 18-22 degree C, and kept to within 1 degree C of change during the examination, is necessary to produce a physiologically neutral image free from artifact.
The biomedical engineering evidence of thermography's value, both in model in-vitro and clinically in-vivo studies of various tissue growths, normal and neoplastic, has been established.
A positive infrared scan may indicate the presence of many different breast abnormalities such as mastitis, benign tumors, fibrocystic breast disease, cancer, and others.
Just as unique as a fingerprint,
each patient has a particular infrared map of their breasts. Any modification of this infrared map on serial imaging (images taken over months to years) can constitute an early sign of an abnormality.

In patients without cancer, the examination results are used to indicate the level of possible future cancer risk.

Consequently, in the absence of other positive tests, an abnormal infrared image gives a woman an early warning.

By maintaining close monitoring of her breast health with serial infrared imaging, self breast exams, clinical examinations, and other tests, a woman has a much better chance of detecting cancer at its earliest stage and preventing invasive tumor growth.
Breast thermography guidelines

- **Age 20** — Baseline (15-20 percent of breast cancer occurs between the ages of 20-44.)
- **20-30 yrs** — Every 3 years
- **30 years and older** - Yearly
- Additional thermograms may be performed more frequently for higher risk women or based on suspicions from prior thermographic examination at the doctor's discretion.
Breast Thermography Report

- Breast thermograms were performed with patient in the seated position. The basic thermographic pattern of the breast is: Vascular. There is a mild asymmetry of the vascular patterns of the breast, with a somewhat more prominent vessel which proceeds obliquely across the lower quadrant of the left breast. No evidence of neovascularization is observed.

- Background breast temperatures are symmetrically decreased. The thermographic edge sign is not observed. Periareolar temperatures are symmetrical.

- **Impression:**

- This study is slightly atypical because of the more prominent vessel over the lower inner quadrant of the left breast with some extension toward the midline into the upper inner quadrant. As there is no associated neovascularization or vascular anarchy, this is probably within normal limits.
Breast thermography has an average sensitivity and specificity of 90%.
Breast thermography has the ability to detect the first signs that a cancer may be forming up to 10 years before any other procedure can detect it.
An abnormal thermogram is 10 times more significant as a future risk indicator for breast cancer than a first order family history of the disease.
The procedure is comfortable, safe using no radiation or compression.
Why Thermography is Not a Replacement for Mammography

There is no one test that can detect 99-100% of all cancers. Therefore, no single test exists that can be used alone as an adequate screening or detection method for breast cancer.

A physiological imaging procedure (thermography) cannot replace an anatomical imaging procedure (mammography). The two tests are “looking” for completely different pathological processes.

Thermography is far more sensitive than mammography. However, some slow growing non-aggressive cancers will only be detected by mammography.
Conclusion

- Breast thermography's ability to detect a pre-cancerous state of the breast, or signs of cancer at an extremely early stage, lies in its unique capability of monitoring the temperature variations and blood vessel alterations produced by the earliest changes in tissue physiology (function).
When used as part of a multimodal approach (clinical examination + mammography + thermography) 95% of early stage cancers will be detected.
Breast thermography is a complementary screening and detection procedure.

The procedure can also play a role in prognosis and as a method of assisting in monitoring the effects of treatment.
The addition of breast thermography to the frontline of early breast cancer detection brings a great deal of good news for women.
THANK YOU