Breast Thermography

SBI Position Statement

The Society of Breast Imaging does not currently support the use of thermography/infrared imaging of the breast as either a screening tool in the detection of breast cancer or as an adjunctive diagnostic tool. Breast thermography was approved by the FDA in 1982 only as an adjunct to mammography. A detailed background and review of the scientific data follows below. In summary, there are currently no studies supporting the use of thermography alone or thermography as an adjunct to mammography that show clear benefits of the technique. It is also unclear how the abnormal areas detected by thermography were aspirated or biopsied. No method was described to accurately transpose the thermographic location of the lesion to the mammogram and then to the actual location in the breast.

Until there are more encouraging data available, the SBI cannot support the use of thermography/infrared imaging of the breast.

Background

Breast thermography, also known as infrared imaging of the breast, is a pictorial representation of the infrared emission of the breasts. A heat-sensing imaging device is used to acquire the temperature data and the results are displayed either as different colors or on a gray scale. The rationale is that breast cancers have increased metabolic activity and angiogenesis therefore resulting in higher temperatures compared to other normal parts of the breast.

The first thermogram was performed in 1956 by a Canadian surgeon Dr. Ray Lawson (1).

He noted that the skin temperature of his breast cancer patients was higher compared to normal patients and he used modified declassified military scanners to evaluate these temperature differences.

Later methods included liquid crystal thermography and computed thermography; the former required the positioning of thin plastic sheets containing heat-sensitive encapsulated liquid crystal cholesterol esters against the breast. The infrared radiation of the breast caused the black crystals to change color. The color changes depended on the amount of infrared energies radiating from the breast surface. Computed thermography used multiple thermisters to acquire the infrared signal. These electric signals were sent to a computer, were analyzed with specific algorithms and were classified as either normal or abnormal. (2)

Some studies in the 1960's 70's and 80's by noted thermographers touted the benefits of thermography. For example, Isard described three thermal patterns of normal breasts and four patterns of abnormal breasts.(3) He reported on 10,000 patients who underwent combined mammographic and thermographic studies. In his asymptomatic population 36 cancers were identified. Thermography found 22(61%) of them and mammography detected 30(83%). For his symptomatic population adding thermography to mammography increased cancer detection from 85% to 88% while adding mammography to thermography increased it from 72% to 88%.

In 2003 Parisky reported the results of a multi-center trial whose purpose was to determine the efficacy of a dynamic computerized infrared imaging system in differentiating between benign and malignant mammographically-detected lesions which were to undergo biopsy.(4) According to him the addition of thermography to mammography resulted in a 97% sensitivity,14% specificity, 95% negative predictive value, and a 24% positive predictive value. 524 of the 1293 enrolled subjects (40%) were excluded due to technical reasons.

On the other hand, Moskowitz noted that Parisky's study population was heavily cancer-weighted (22% malignancies). (5) The PPV increased only by 9% (from 22% to 24%) with the addition of thermography to mammography and the false positive rate of thermography was 86%. He also observed that mammography was necessary to localize the lesion seen by thermography. The actual biopsy procedure was not described by Parisky.

Another study by Moskowitz published in 1976 looked at 42 patients with thermograms and stage 1 or smaller carcinomas, 44 confounding cases and 64 randomly selected screening patients (6). Expert thermographers identified 24% of the patients with carcinoma. This varied little from the untrained readers who actually detected 30% of the cancers. He also noted a high index of suspicion in the expert readers (44%) along with the relatively low detection rate of 24% (p=0.0005). He concluded that thermography had a limited role as a screening or pre-screening modality in the detection of breast cncer.

The Breast Cancer Detection and Demonstration Project (BCDDP) compared mammographic and thermographic screening in a multi-center prospective trial conducted between 1974 and 1981. Feig reported on 16,000 women in the study and he found that the sensitivity of thermography was 39% and the specificity was 82% (7). He concluded that thermography was not a viable screening tool.

Recent studies have examined newer infrared technology in the detection of breast cancer. Arora et al imaged 92 patients with digital infrared thermal imaging (DITI). Their prospective study only included women with suspicious breast lesions detected by mammography or sonography. For the 94 lesions detected the mean sensitivity was 94.4% and the mean specificity was 27.5% (8).

Wishart et al used DITI to examine 100 women with suspicious lesions prior to their undergoing core needle biopsy. 106 biopsies were performed; 65 were malignant and 41 were benign. The sensitivity of DITI plus a new software program was 78% and the specificity was 75%. The combined sensitivity of DITI and new software with mammography was 89% (9).

Research studies continue to explore the potential of infrared imaging of the breast. However, many of these studies continue to compare the performance of this technique to mammography alone in a population of symptomatic patients with suspicious or highly suspicious lesions. Studies have yet to compare thermography to mammography with ultrasound, breast MRI, or nuclear imaging of the breast – imaging methods which have demonstrated benefits in managing patients with breast problems. They have also not tested these new modalities in a screening population.

References

1. Lawson, RN. A new infrared imaging device. Can. Med. Assoc. J. 1958: 79: 402.

2. Bassett LW, Jackson VP, Jahan R, Fu YS, Gold RH. In diagnosis of diseases of the breast. Philadelphia, Pennsylvania: Saunders 1997, pp18-19.

3. Isard HJ, Becker w, Shilo,R Ostrum BJ. Breast thermography after four years and 10,000 studies. AJR 1972; 115: (4) 811-821.

4. Parisky YR, Sardi A, Hamm R et al. Efficacy of computerized infrared imaging analysis to evaluate mammographically suspicious lesions. AJR 2003; 180:263-269.

5. Moskowitz M. Efficacy of computerized infrared imaging. AJR 2003; 181:596

6. Moskowitz M, Milbrath J, Gartside P, Zermeno A, Mandel D. Lack of efficacy of thermography as a screening tool for minimal and Stage I breast cancer. N Engl J Med. 1976; 295(5):249-252.

7. Feig SA, Shaber GS, Schwartz GF, et al. Thermography, mammography, and clinical examination in breast cancer screening. Review of 16,000 studies. Radiology 1977; 122:123-127.

8. Arora N, Martins D, Ruggerio D, et al. Effectiveness of a noninvasive digital infrared thermal imaging system in the detection of breast cancer. Am J Surg 2008; 06.015.

9. Wishart GC, Campisi M, Boswell M, et al. The accuracy of digital infrared imaging for breast cancer detection in women undergoing breast biopsy. Eur J Surg Onc 2010; 36: 535-540.

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