

Position Statement

The use of thermography as a breast cancer screening or diagnostic tool

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Position

The National Screening Unit (NSU), the Cancer Society of New Zealand, The New Zealand Breast Cancer Foundation and The New Zealand Branch of The Royal Australian and New Zealand College of Radiologists (RANZCR) do not support the use of thermography as a breast cancer screening or diagnostic tool as there is insufficient evidence to do so.

Thermography

Clinical thermography is the recording of heat distribution in order to form an image (a thermogram) of the temperature distribution on the surface of the body. Thermography has been used in medicine since the 1960s and has been promoted as a tool in the early detection of breast cancer. Whilst not well understood, the underlying mechanisms for the raised temperature of a breast cancer include increased tumour metabolism and elevated blood flow.¹ The detection of cancer is based on differences in temperature distribution compared with the other breast. Thermography has been promoted as particularly useful in the detection of abnormalities in women aged 30–50 years, women with small breasts and women with breast implants.

History of thermography

Thermography was used and studied in the 1960s and 1970s, with up to 3,000 thermography clinics operating in the US at this time.¹ Two important trials in this period involved thermography.¹ The first² compared the use of thermography, an early form of mammography (xeromammography) and clinical examination as a screening tool in a clinical trial involving 16,000 women. Thermography's sensitivity and specificity were 39 percent and 82 percent respectively, compared with xeromammography's 78 percent sensitivity and 98 percent specificity. Modern mammography has a sensitivity up to 90 percent and a specificity up to 95 percent.³ In a separate trial, the Breast Cancer Detection Demonstration Project (BCDDP) planned to compare thermography, mammography and clinical examination but dropped thermography early in the project due to a high false positive rate and low sensitivity.⁴ Following these trials, thermography was largely abandoned, but technological advances in recent years have led to renewed interest in the technology.¹

Thermography in New Zealand

Thermography is currently being marketed to women and general practitioners in New Zealand. The NSU, the Cancer Society of New Zealand, The New Zealand Breast Cancer Foundation and The New Zealand Branch of RANZCR have been concerned about the use of thermography as a tool in the screening and diagnosis of breast cancer. Their concern is that women who undergo thermography may delay visiting their doctor with a significant symptom, or attending for screening mammography, if they believe that thermography is an adequate replacement for a visit to their doctor or a mammogram. Thermography has been promoted in New Zealand as both a breast screening and diagnostic tool. Screening and diagnostic tools serve different functions and adhere to different standards.

Screening

Women are invited to take part in screening on the understanding that, overall, participating in screening will, when all the risks and benefits are considered, be beneficial to them. This is in line with international minimum standards for screening. **It is vital that any new screening test is assessed through well-conducted medical research – ideally randomised controlled trials (RCTs) or meta-analyses of RCTs.**^{5–7}

Diagnosis

The role of a diagnostic test is to evaluate abnormalities that have been detected either clinically or by screening. To be clinically efficacious, a diagnostic test must allow a confident characterisation of the nature of a lesion and be shown to alter patient management for the better.⁸

Systematic Review

The NSU commissioned a systematic review of the international literature on the effectiveness of thermography for population screening and diagnostic testing of breast cancer. This review was conducted by the New Zealand Technology Assessment Clearing House for Health Outcomes and Health Technology Assessment (NZHTA) – a highly respected and impartial unit of the University of Otago – using a rigorous methodology.⁹ The review was completed in 2004. NZHTA reviewed

studies evaluating the use of infrared thermography as an adjunctive or stand-alone tool for the population screening of breast cancer and the role of infrared thermography as an adjunctive tool for the diagnosis of breast cancer. The review used a systematic approach, which included a comprehensive search strategy that identified 1,154 abstracts. The review found that much of the literature on infrared thermography was in the form of narrative review, discussion or opinion articles. Most of the published study reports on infrared thermography referred to studies of infrared devices that are outdated or no longer available or to non-infrared methods of thermography. No studies of this technology have been conducted in New Zealand. NZHTA concluded that the available evidence did not provide enough support for the role of infrared thermography for either population screening or adjuvant diagnostic testing of breast cancer. A recent literature review of breast thermography in 2010 confirms these conclusions. All recent papers have been anecdotal evidence, cohort studies or papers discussing ethical issues related to the technology being used.^{10, 11} Key professional groups do not support the use of thermography for breast assessment. The Royal Australian and New Zealand College of Radiologists Breast Imaging Reference Group does not recommend the use of thermography for the early detection of breast cancer.¹² Similarly, the American Medical Association states that

the use of thermography for diagnostic purposes cannot be recommended.¹³ Breast thermography is not supported by the American Cancer Society. Thermography is not used in either the United Kingdom or Australian breast cancer screening programmes. The International Agency for Research on Cancer states that "...the sensitivity and specificity of thermography are poor and its application to screening is unlikely."⁵

Conclusion

To date, there has been no satisfactory, large scale, prospective, statistically valid, randomised controlled trials assessing the value of breast thermography.

The NSU, the Cancer Society of New Zealand, The New Zealand Breast Cancer Foundation and The New Zealand Branch of the RANZCR do not support the use of thermography for breast cancer screening or as a diagnostic tool to detect breast cancer as there is insufficient evidence to do so. If thermography is offered to women for breast assessment, it is vital that women are fully informed of the potential harms of thermography, including the likelihood of false positive results and false negative results, and typical annual costs. This information should include an acknowledgement of the lack of proof of efficacy and effectiveness of breast thermography as a screening and diagnostic tool.

References

1. Nass SJ, Henderson C, and Lashof JC, *Mammography and beyond: developing technologies for the early detection of breast cancer*, in *Institute of Medicine and Commission on Life Sciences*, 2001, National Research Council.
2. Feig SA, et al., *Thermography, mammography, and clinical examination in breast cancer screening*. *Radiology*, 1977. 122(1): pp. 23–127.
3. Ferrini R, Mannino E, Ramsdell E, Hill L, *Screening Mammography for Breast Cancer: American College of Preventive Medicine Practice Policy Statement*. *ACPM* Sept/Oct 1996; 12 (5): 340–41.
4. Moskowitz M, *Thermography as a risk indicator of breast cancer. Results of a study and a review of the recent literature*. *Journal of Reproductive Medicine*, 1985. 30(6): pp. 451–459.
5. International Agency for Research on Cancer. *IARC Handbooks of Cancer Prevention: Breast Cancer Screening*. 2002, March. pp 34–39. Lyon, France: IARC Press.
6. National Health Committee, *Screening to improve health in New Zealand: Criteria to assess screening programmes*. 2003, National Health Committee: Wellington.
7. Muir-Gray JA, *Evidence-based healthcare: How to make health policy and management decisions*. 2nd ed. 2001, Edinburgh: Churchill Livingstone.
8. Orel SG and Troupin RH, *Nonmammographic imaging of the breast: Current issues and future prospects*. *Seminars in Roentgenology*, 1993. 28: pp. 231–241.
9. Kerr J, *Review of the Effectiveness of Infrared thermal imaging (thermography) for population screening and diagnostic testing of breast cancer*, in *NZHTA Tech Brief Series*. 2004: Wellington.
10. Arora N, et al., *Effectiveness of a noninvasive digital infrared thermal imaging system in the detection of breast cancer*. *The American Journal of Surgery*, 2008. 196: pp. 523–526.
11. Irwig I, Houssami N, and van Vliet C, *New Technologies in screening for breast cancer: a systematic review of their accuracy*. *British Journal of Cancer*, 2004. 90: pp. 2118–2122.
12. The Royal Australian and New Zealand College of Radiologists, *Royal Australian and New Zealand College of Radiologists Breast Imaging Reference Group policy on the use of thermography to detect breast cancer*, 2001.
13. American Medical Association, *American Medical Association thermography update*, in *AMA Policy Finder* ND.