Contact-Thermography - response to queries

Prepared by:
Luis Vitetta¹
Marilyn Johnson²
Fernando Cortizo³
Avni Sali⁴

Graduate School of Integrative Medicine,
Swinburne University

¹ Director of Research
² Research Assistant
³ Senior Lecturer and Research Supervisor
⁴ Professor and Head of School
Contact-Thermography - response to queries

Graduate School of Integrative Medicine
Swinburne University
9 Frederick Street
Hawthorn Vic 3122

Telephone: + 61 3 9214 5296
Facsimile: + 61 3 9214 8009
Email: lvitetta@swin.edu.au
Website: www.swin.edu.au/gsim

© 2003
Overall Summary:
We have been asked to comment in the form of an official scientific report on three separate screening techniques used by Australian Biologics - Testing Services Pty Ltd.

The screening technique in question is:

1. contact thermography

For this review of the scientific evidence we have utilised the rating system that is recommended by the Quality of Care and Health Outcomes Committee and has been adapted from the system developed by the US Preventive Services Task Force, which has also been adopted by the National Health and Medical Research Council of Australia. The rating system consists of the following:

- **Level I Evidence** is obtained from a systematic review of all relevant randomised controlled trials - meta analyses.

- **Level II Evidence** is obtained from at least one properly designed randomised controlled clinical trial.

- **Level III Evidence** is obtained from well designed controlled trials without randomisation or from well designed cohort or case control analytic design studies, preferably from more than one centre or research group or from multiple time series with or without an intervention.

- **Level IV Evidence** represents the opinions of respected authorities based on clinical experience, descriptive studies or reports of expert committees.

As far as contact thermography is concerned there is ample level II, III and IV evidence to show that this is a most important modality that can be considered to be most useful in determining peripheral blood flow in numerous disease states.
We refer you to our previously prepared document. Further, the evidence to date demonstrates that contact thermography has applications which have been successfully applied in the diagnosis and treatment of various disease states that include breast cancer, cardiovascular disease, diabetes, and general blood flow problems. Contact thermography has general adjuvant diagnostic properties that need to be fully exploited by the medical profession. Moreover, contact thermography has been advocated as a rapid, non-invasive diagnostic modality in evaluating patients at risk for breast cancer. In that study which was conducted approximately twenty years ago it was reported that thermograms should be reported as either being normal or abnormal, criteria that would allow the modality to show a high degree of reliability.
Responses to Queries:

1. thermography does not provide assessment of the degree of illness (slight to serious) ("thermography does not provide an assessment of the degree of all illness")

We have reviewed this screening technique in a previous report that has been delivered to Australian Biologics.

In Summary: from our interpretation of the evidence of this technique we believe contact thermography to be a most useful adjuvant screening procedure for a number of different medical problems.

At no time has there been an interpretation that this screening technique would provide an assessment of the degree of all illness. Moreover there is no current medical test/procedure that was or is currently available, that provides an assessment or measure of the degree of ALL illness.

Excerpt from our review:1 In terms of breast pathology we conclude in our report that from the evidence that is currently available that contact thermography may constitute a low cost adjuvant screening intervention that could be a yearly evaluation as part of a routine physical assessment for women who find mammography a painful and difficult procedure. Therefore
as soon as a suspicious (positive) breast thermal examination is performed, the appropriate follow-up diagnostic and clinical testing can be ordered. This would include mammography and other imaging tests, clinical laboratory procedures, nutritional and lifestyle evaluation and training in breast self examination. Thermography is a simple, non-invasive, highly accurate, inexpensive form of screening imaging technique as well as being a ‘breast friendly’ procedure.

Moreover, as thermography is capable of measuring changes in temperature that can reflect blood supply and inflammation which are general physiological changes, it is then possible to envisage its adaptation to screen other physiological changes that are associated with blood flow. An additional search of the current medical literature showed that contact thermography has been applied to other medical conditions. Namely, cardiovascular disease, comorbidities associated with diabetes and as an adjuvant method to better define cancer diagnoses.

We have identified numerous studies from the medical literature that hence emphasize the importance of this technique in medical practice.¹⁻¹⁷⁵

In addition to breast screening studies we have identified other peer reviewed studies that have employed contact thermography in other areas of medicine and these include:

**cardiovascular disease and circulation/blood flow**

- Coloured contact thermography has been employed as an additional method for the diagnosis of diseases of the abdominal aorta and its major branches.¹⁷¹
Thermography has been used to study myocardial temperature during infusion of cold cardioplegic solutions. Slow cooling was recorded distal to coronary stenosis or occlusions, thereby indicating insufficient protection of the myocardium in these areas\textsuperscript{169, 171-173}

In a recent study of thermograms in army personnel regional hothermia was investigated with thermograms.\textsuperscript{160} Further, in another recent study of thermograms in army personnel by the same group of researchers investigated thermograms during and after basic military training evaluating the temperature changes in thermograms whilst differentiating between those with normal foot parameters, those with musculoskeletal stress and others with foot stress. The thermograph showed that normal foot cooling differed between the three groups. In conclusion thermography did not reveal an exact diagnosis however it was of greatest benefit monitoring severity and healing of the foot.\textsuperscript{160}

Liquid Crystal contact Thermography has been shown to be very reliable for as a method of investigating skin blood flow and for a screening method in the diagnosis of deep venous thrombosis.\textsuperscript{59,164}

The use of thermography has been used to evaluate the peripheral circulatory function in the diagnosis of diabetic complications.\textsuperscript{163} Thermography has been employed to observe wound temperature and hence monitor healing in surgical patients.\textsuperscript{162, 163} Contact thermography in conjunction with Doppler sonograph resulted in the highest diagnostic accuracy when investigating retrograde blood flow in the internal spermatic vein.\textsuperscript{152}
Diabetic neuropathy

- Contact thermography has been successfully employed to investigate and identify diabetic patients who are at increased risk for neuropathic foot ulceration.\(^{16}\)

2. *Thermography can only assess some aspects of peripheral blood flow* and it does provide an assessment of the circulation, disturbances of cerebral and/or peripheral blood circulation and vascular occlusion.

There is substantial scientific evidence that thermography can assess various aspects of peripheral blood flow.\(^{1,8-165}\) That is, that microcirculatory disturbances can be clinically assessed by thermography. Further, the patho-physiological analysis of the peripheral circulation using thermography has been investigated as an example of functional body imaging. Moreover, since vascular damage is the main complication of diseases such as diabetes, in studies with lower limb amputations for diabetic foot have shown that the amputation level of the limb was determined by skin thermography. Thermography was useful in avoiding deep and systemic circulatory problems which are commonly associated with diabetic limb amputations. Hence, any interpretation that thermography is only useful for some aspects of peripheral blood flow and that it does not provide an assessment of the circulation of the blood as a whole is without merit as there are numerous peer reviewed studies indicating its successful employment.
3. Thermography does not provide assessment of the strain a person is able to bear before he is subject to an operation or vaccination. Thermography provides a useful assessment of peripheral blood flow abnormalities. Therefore, when combined with medical expertise, these results may have a useful adjuvant and indirect application in the assessment of the surgical patient.

4. Thermography does not provide an assessment of the success of therapies.

As an example of thermography providing success of a therapy, one can see in a recent study that assessed temporary stellate ganglion block thermographically and its effectiveness during cardio-surgical procedures. The assumption behind this method was that the increase in the temperature of the upper extremity on the side of the blockade was due to the broadening of the arterial bed. It was shown that thermography was a useful method for the assessment of stellate blockade effectiveness. Effective blockade resulted in increased blood flow in the radial artery.

Further, low temperature is an important factor in protecting the myocardium during an operation on the heart. This can be difficult to accomplish if the cold cardioplegic solution is hindered by occlusions or stenosis of the coronary arteries. Thermography has been used to study myocardial temperature during infusion of cold cardioplegic solution. Slow cooling was recorded distal to coronary stenosis or occlusions, thereby indicating insufficient protection of the myocardium in these areas.
5. thermography is not suitable for diagnostic purposes in the cardiac field

Thermography has been employed extensively in the cardiac field. Namely, thermography has been used to study myocardial temperature during infusion of cold cardioplegic solutions. Slow cooling was recorded distal to coronary stenosis or occlusions, thereby indicating insufficient protection of the myocardium in these areas. Further, in order to understand, treat, and prevent acute coronary syndromes it has been reported that there is a need to improve the ability to identify the rupture-prone, vulnerable atherosclerotic coronary plaque. In a recent review it was noted that thermography used in clinical trials provided useful results. Moreover, it has also been recently reported that an atherosclerotic plaque is considered vulnerable when it is at higher risk of inducing acute cardiac events. The early detection and follow-up of the vulnerable plaque are crucial to prevent these events from happening. Arterial wall thermography, which traces the heat signature of the activated macrophages, is a new and promising method in this direction.

6. thermography is not suitable for analytical purposes in the cardiac field

Thermography is a very suitable analytical technique in the cardiac field. The identification of vulnerable plaque is one of the primary goals in cardiology during the last years. Several techniques have been developed for the anatomic and functional assessment of atherosclerotic plaques. Thermography is a new method for the evaluation of the inflammatory process locally within the atherosclerotic plaque. Several animal and clinical studies demonstrated the value of thermography not only for the detection of inflamed atherosclerotic plaques, but its use in new fields like in the evaluation of inflammation in the coronary vascular bed and the
cardiovascular system. A recent article has reviewed the developments and the clinical implications of thermography.178

7. thermography does not represent true preventative medicine:

To claim outright that contact thermography has no preventative medicine benefits is both unsubstantiated and erroneous given the current peer reviewed literature that is available. To claim that it is a technique that prevents people from becoming ill is further erroneously misrepresented. Contact thermography is a very useful adjuvant technique that can assist the clinician to provide guidance to the patient with breast cancer or a suspicious breast lump.1 Further, it has been shown that contact thermography has other useful applications in medicine as has been pointed previously in points 4 and 5.

8. thermography does not provide an indication of unrecognised disease, hidden cause and dangerous sequelae (complications).

From the available evidence it has already been shown that contact thermography has been successfully used to monitor newly developing breast disease.1 These results support contact thermography as being useful in detecting previously unrecognised disease. Therefore contact thermography does provide some evidence for previously undiagnosed disease with serious sequelae (eg. Breast cancer).

9. thermography does not provide a valuable aid in monitoring the restoration of health.

This statement is inaccurate. Refer further to points 1, 2, 3, 4, and 8 previously.
References


Skin Thermography and Blood Flow


60. Hofferberth B, Gottschaldt M, Dykan S. Comparison of Doppler sonography and plate thermography for the detection of carotid artery stenosis.


140. Temperature and blood flow patterns in breast cancer during natural evolution and following radiotherapy. Prog Clin Biol Res. 1982; 107:21-64.


Skin thermography and central blood flow


Thermography in cardiovascular Diagnoses


