i-HEALTH®

Contact Thermography: A scientific evaluation of the literature and own data.

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Introduction.

Contact Thermography is commonly used for diagnostic imaging, especially as an alternative for mammography. Because of the structure of our nervous system, it is also suited to mark those moments where the nervous system received input that changes its reflexes (fig.1) and homeostatic management.

Summary

During the eighties and following the development and advent of precision temperature measuring instruments known as contact thermometers, contact Thermography has evolved as significant and reliable diagnostic method (Rost, 1982). The scientific published evidence has shown that Thermography is a very instructive method of showing the interaction between direct changes in heat radiation of the surface of the skin and its relation to reflex processes (Stuttgen, 1982). Thermography is a simple, non-invasive, highly accurate, inexpensive form of monitoring.

Review of literature

Contact-Thermography is a rather commonly used method for:

- Establishing zones with vaso constriction;
- Diagnosis of arterial conditions in the legs;
- Finding inflammations;
- Screening for breast-cancer;
- Evaluation of the effects of treatments;
- The measurement of temporal changes of the micro-circulation.


Thermoregulation is the control of body temperature. The liver produces a lot of heat, which is transported around the body by blood. Normal body temperature in humans is 37°C. Stability and circadian variations in core body temperature are homeostatic responses that have been well documented for many decades (Holtzclaw, 2001). Research in thermal physiology has illuminated several of the deficits present in the understanding of temperature regulation, and while discoveries are still evolving, existing information provides valuable clues about physiological responses to heat loss or over-heating that could improve clinical assessment and intervention. Compared to the organism as a whole, the
Hypothalamus has an incredibly high function per size ratio. Encompassed within its designated 1 cubic cm of area is the homeostatic regulatory system for the entire organism. The hypothalamus, connected via nerve fibers to the cerebral cortex, thalamus, and other parts of the brain stem, receives input from these locations allowing it to regulate many visceral activities as it serves as a link between the nervous and endocrine system, the circulatory system and the skin (Holmes, 1993).

Among the many functions of the hypothalamus are regulation of heart rate, blood pressure, body temperature, water and electrolyte balance, body weight, hunger, reproduction, and circadian rhythms. Many of these mechanisms, such as temperature regulation, can be traced to specific anatomical locations. The physiology of thermo diagnosis is intimately associated with the brain, the parasympathetic and sympathetic nervous systems (fig 1.). Moreover, the skin circulation and its heat output are largely influenced by processes within the body. The physiology and anatomy of the vascular supply to the skin produces a certain temperature and regulation pattern that may be within certain limits that are considered normal. Yet human beings show strong deviations from this ideal pattern.

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The i-HEALTH Thermography module is being used for measuring the influence of EM-signals, as these influence reflex-processes, on direct changes in the heat-output. It is also possible to evaluate the effects of treatments and the measurement of temporal changes of the micro-circulation. Especially with the monitoring of the treatment of diabetic ulcers and Claudicatio much experience has been gained.

Changes in the output of energy are the result of:
- Vasodilatation;
- Changes in the energy-consumption due to an increase of activity, infections, stress, relaxation, exhaustion, intoxication, external stimulation, a.o.;
- Autonomous regulation, meaning sympatico- of parasympaticotone regulation of the microcirculation.

Comparable thermo-regulatory changes may be induced, for example for plethysmographic measurements or to diagnose the degree of atherosclerosis and to mark changes in time. (Winsor, 1985: the non-invasive laboratory; Fushimi, H et al, 1998,Peripheral vascular reactions to smoking ).
Figure 1 – Brain and autonomic nervous system
Fig. 2. The segmental innervation of the skin-dermatomes.
Review of data

The i-HEALTH system uses contact Thermography for:

- Selecting moments of increased vasodilatation that occur during a sweep of different pulsating magnetic fields. Those signals can be selected for therapeutic usage that effectuates the strongest vasodilatation reflex.

By means of electro-magnetic (EM) frequency-sweeps, those frequencies can be selected that generate the strongest effect on the output of energy, vasodilatation or the balance between sympathetic/parasympathetic regulation.

Figure 4 shows the increase of skin-contact temperature that occurs as a reaction to one of the signals during an EM-frequency sweep. This frequency can be applied successfully to stimulate the micro-circulation and to stimulate the parasympathetic nervous-system. At 966 Hz the temperature change was the most marked. Clear reactions such as in this case occur in a percentage of approx. 3 %, but usually the thermographic changes are less outspoken, shorter lived and more subtle.

![Graph showing temperature change](image)

Fig 3.: example of routine thermographic scan. Increase of the skin temperature of 2°C within 90 Secs. during an EM-frequency sweep. Practice as well as research have shown that the EM-signal that triggers such a reaction is a very effective signal to stimulate vasodilatation and thereby increase the micro-circulation.
Fig. 4 Example of routine thermographic scan. showing the more common, short lived reaction during a sweep of different EM-frequencies. Treatment with the frequency where this reaction occurred effectively stimulates the micro-circulation and vasodilatation.

Fig. 5. Automated evaluation, where moments of regulatory changes induced by input to the nervous system are pin-pointed.
Literature cited (out of 200 consulted references):


