

Thermal imaging as outcome measure

K. Ammer

European Association of Thermology, Vienna, Austria

This issue of *Thermology international* contains a number of papers, which report the medical use of thermal imaging as an outcome measure in dermatology, surgery, neurology and sports medicine. In principle, thermal imaging can be applied in medicine either as a diagnostic test or as outcome measure in clinical trials (1). Although the technique started as diagnostic procedure for breast cancer (2), both applications have a long history in medical thermography. A recent review on the topics of presentations at the European congresses of Thermology found that roughly 10 percent of all presentations were related to thermal imaging as outcome measure (3). A similar percentage was reported in the annual review of publications related to thermal imaging and temperature measurements in medicine and biology (4).

When treatment modalities add or remove heat from the human body, the resulting change of temperature may be utilised as outcome measure of such a therapy. Thermal imaging has already been applied for recording changes induced by thermotherapy (5), but publications of cryotherapy in dermatology are scarce. A group of Polish dermatologists report in this issue (6), that patients with akne rosacea react different to cooling with carbon dioxide snow than healthy subjects. A faster recovery of the skin temperature after cold exposure in akne patients may also be indicative for skin inflammation in this disease.

Thermal imaging was used to evaluate the effects of anti-inflammatory drugs or compounds for the treatment of Raynaud's phenomenon (1). Few papers reported the use of thermography as outcome measure in clinical trials of headache paper (7). Dr. Govindan describes in this issue (8) the temperature ratio of the forehead to the nose as new outcome measure in drug treatments for migraine patients.

Sufficient perfusion of skin flaps is a critical issue in plastic surgery. Several methods for preconditioning of tissue has been developed to increase tissue viability (9). A group from Norway investigated transcutaneous electrical nerve stimulation as means to increase the perfusion of the skin and the subcutaneous tissue. They used thermal imaging in this study as outcome, but could not detect significant changes in infrared thermal and Doppler flow images, which could have been indicative for tissue preconditioning (10)

Finally, muscle contraction will affect skin temperature (11). Also massage can lead to temperature changes on the body's surface (12). The influence of massage on a graded exercise test is reported in this issue and thermal imaging was applied as outcome measure (13).

A main feature of outcome measures is the reliability of the measurement. There is sufficient evidence that thermal im-

aging is a reliable outcome measure (14) which may be used in a variety of medical applications.

References

1. Ammer K. 17th Thermological Symposium of the Austrian Society of Thermology. *Thermol int* 2004, 14(4): 148-152
- 2.) Lawson RN Implications of surface temperatures in the diagnosis of breast cancers. *Can Med Ass J* 1956, 75:309-310
3. Ammer K. European Congress of Thermology 1974-2006: A Historical Review. *Thermol int* 2006, 16(3): 85-95
- 4.) Ammer K. Thermology 2005 – a computer-assisted literature survey. *Thermol int* 2006, 16 (1): 16-36.
- 5.) Ammer K. Effects of thermotherapy determined by infrared measurement. *Physica Medica* 2004, 20: S75-S77.
6. Mikulska D, Ratajczak-Stefańska V, Maleszka R, Parafiniuk M. Dynamic thermography for the monitoring of flushing in patients with rosacea... *Thermol int* 2006, 16 (4): 126-131
7. Dalla Volta G, Anzola GP Are there objective criteria to follow up migrainous patients? A prospective study with thermography and evoked potentials. *Headache*. 1988; 28(6):423-5
8. Govindan S Zolmitriptan Nasal Spray for the Treatment of Migraine. *Thermol int* 2006, 16 (4) 131-137
- 9.. Mercer JB, de Weerd L The effect of water-filtered infrared-A (wIRA) irradiation on skin temperature and skin blood flow as evaluated by infrared thermography and scanning laser Doppler imaging. *Thermol int* 2005, 15(3): 89-94
10. de Weerd Mercer JB. Intermittent isometric contractions of the rectus abdominis muscle by application of Transcutaneous Electrical Nerve Stimulation (TENS) and its effect on blood flow in the overlying skin. *Thermol int* 2006, 16 (4): 150-154
11. Melnizky P, Ammer K, Schartelmüller T. Thermographische Überprüfung der Heilgymnastik bei Patienten mit Peroneusparese. *Thermol Österr* 1995; 5, 97-102.
12. Kainz A. Quantitative Überprüfung der Massagewirkung im Thermogramm. *Thermol Österr* 1993, 3(2): 79-83
13. Bonnett P, Hare DB, Jones CD, Ring EF, Hare CJ. Some Preliminary Observations of the Effects of Sports Massage on Heat Distribution of Lower Limb Muscles During a Graded Exercise Test. *Thermol int* 2006, 16 (4): 143-149
14. Ammer K. Influence of Imaging and Object Conditions on Temperature Readings from Medical Infrared Images. *Polish Journal of Environmental Studies* (submitted)

Address for correspondence

Prof Kurt Ammer MD, PhD
European Association of Thermology
Hernalser Hauptstr. 209/14
A-1170 Vienna, Austria
Email: KAmmer1950@aol.com