

Use of thermal imaging in complementary medicine

Kurt Ammer

Austrian Society of Thermology, Vienna, Austria

Review of the paper by Popp FA, Klimek W, Maric-Öhler W, Schlebusch KP. **Visualisierung vom meridianähnlichen Ausbreitungspfad nach optischer Reizung im infraroten Spectralbereich.** Dtsch Z Akupunkt 2006, 49(1): 6-18

The group Schlebusch, Maric-Öhler and Popp made another (already the third) attempt (1,2,3) to prove the existence of acupuncture-meridians using thermal imaging for visualization. In this study the authors used repeatedly a moxa cigar in a distance of one to several decimeters from the body surface for indirect moxibustion. After this procedure, they detected linear bands of elevated infrared emittance close to the localisation of acupuncture meridians. By comparison the temperature of these “meridian-like-channels” measured with contact thermometers and with infrared, the authors reject the argument that their findings may be just reflections on the skin. However, the attempt to repeat this study and confirm the findings in a randomized controlled study failed (4).

The studies of Schlebusch et al have several flaws both in methodology and in interpretation of findings. It is out of question that infrared thermography is a measure of infrared radiation which is part of electromagnetic spectrum. Nevertheless the infrared radiance detected by the infrared imager is displayed in temperature values (5). Therefore, differences in temperature obtained by contact or remote measurement are strong arguments for an additional infrared source. A strong heat source (probably the moxa cigar) is visible in five of nine images of the most recent publication (1). The heat radiating to the investigated body below the heat source is also very obvious.

The human skin is reflecting infrared of wavelengths below $6\mu\text{m}$ (6) which is different to the authors statement on wavelength dependent reflection. According to Kirchhoffs Law adsorption and emission of energy is equal and if the sum of absorbed and reflected energy is equal to 1, skin emissivity should be on the same high level throughout the whole range of the infrared spectrum, if reflection does not occur. But already Hardy had shown that uniform emissivity with a value close to 1 starts from wavelengths of $8\mu\text{m}$ on (7), although another peak of emissivity with values between 0.8 to 0.9 exists at the wavelength band between 4.5 and $5.5\mu\text{m}$. Skin emissivity is in the range between 0.5 and 0.8 at wavelengths 3.5 to $4.5\mu\text{m}$, and 0.7 to 0.9 at wavelengths 5.5 to $8\mu\text{m}$. Therefore, reflection of infrared waves will occur in the wavelength bands of 3-4.5 which is within the sensitivity of the infrared camera used for stimulated meridian detection.

P. Plassmann showed recently another equipment dependent measurement error, which was named “Thermal Flooding Effect”(8). Flooding is caused by the introduction of a warm object into the observed scene. Radia-

tion from the warm object “floods” the entire image area, making other objects appear to be warmer than they are. The underlying cause for this effect is insufficiency in the optical path of the camera, e.g. stray radiation. The error is small in cameras with good lens systems, moderate in others. It affects inter-image measurements, for example in timed series and also absolute temperature readouts in individual images.

Finally, the authors used the infrared camera as an imager and not as a measuring device for recording infrared radiation. That means, images were not taken in standard positions of the patient and variations in temperature measurements due to missing radiation caused by an increased angle of view from the camera to the object could occur. Temperature measurements were mentioned, but neither the method obtaining these measurements is reported nor measurement areas or spot measurements can be seen on the thermal images. In addition, the colour scale is in a different range in each thermal image, which made the comparison by the eye completely impossible.

This kind of publication (1) neither help acupuncture to achieve a status of a reliable medical treatment nor to understand the mechanism of action of traditional chinese medicine. For thermal imaging, it may be used as argument that this technique is not based on science, has no evidence for utility in medicine and is just used by quacks.

References

1. Popp FA, Klimek W, Maric-Öhler W, Schlebusch KP. Visualisierung vom meridianähnlichen Ausbreitungspfad nach optischer Reizung im infraroten Spectralbereich. DZA 2006, 49(1): 6-18
2. Schlebusch KP, Maric-Öhler W, Popp FA. Biophotonik beweist erstmals Meridianstruktur (Leitbahnen-Struktur der Akupunktur) auf der Körperoberfläche. Erfahrungsheilkunde 2004, 53, 610-622
3. Schlebusch KP, Maric-Oehler W, Popp FA: Biophotonics in the infrared spectral range reveal acupuncture meridian structure of the body. J Altern Complement Med 2005, 11:171-173.
4. Litscher G. Infrared thermography fails to visualize stimulation-induced meridian-like structures. BioMedical Engineering OnLine 2005, 4:38
5. Häuser A. Aspekte der quantitativen Infrarot-Thermographie. In: Engel J-M, Flesch U, Stüttgen G (Hrsg). Thermologische Meßmethodik. notamed, Baden-Baden 1983, pp77-98
6. Flesch U. Physik der Hautoberflächentemperatur. In: Engel J-M, Flesch U, Stüttgen G (Hrsg). Thermologische Meßmethodik. notamed, Baden-Baden 1983, pp.30-42
7. Hardy JD. The radiation of heat from the human body. J Clin Invest 1934, 13: 539-615
8. Plassmann P, Ring EFJ, Jones CD. Quality Assurance of Thermal Imaging Systems in Medicine. Thermology international 2006, 16: 10-15