Assessment: Thermography in neurologic practice

Report of the American Academy of Neurology, Therapeutics and Technology Assessment Subcommittee

1. Overview. Infrared thermography provides information about the relative emission of infrared energy from the surface of the body. Information on how the test should be performed and interpreted is available. A controlled ambient environment is needed, and photographs must be repeated to assure that emissions are stable. There are differences among anatomic sites but only slight differences between sites of the body.* The variables related to testing technique and to the influence of site, age, sex, height, weight, physiologic condition, and disease variables have not been explored adequately. Although there are published statements that age does not affect emission, the data provided are insufficient to establish that the question has been adequately addressed. Infrared energy emission changes after nerve injury and vessel occlusion, but the underlying pathophysiologic mechanisms, particularly in chronic lesions and especially those affecting nerve roots, are not clearly understood. The influence of labile vasomotor responses and dermatologic condition also needs further study.

Reported uses. Thermography has been reported to be useful in the detection and characterization of nerve root irritation and compression,** peripheral nerve injury, entrapment, and reflex sympathetic dystrophy;** occlusive disease of cranial vessels and mechanisms associated with headaches;** and spinal cord abnormalities.** It is useful in distinguishing neuropathic from nonneuropathologic pain syndromes.

In reviewing published reports and volunteered and solicited statements on the value of thermography in neurologic practice, the Therapeutics and Technology Assessment Subcommittee found considerable polarization of opinion. Some respondents reported excessive and inappropriate use of the technique. The majority thought that the technique was useful for certain specific purposes.

The Subcommittee found that thermography is useful in neurologic practice but that it is better for some purposes than others and that further critical work is needed to define its use, value, and limitations.

 Favorable characteristics of thermography. Assuming that thermography is useful in the characterization of neurologic dysfunction, it has several appealing features: it is painless and noninvasive, it has no adverse biologic effect, it is objective (except in a few trained patients, responses probably cannot be willed), it produces a permanent record, and it is not more expensive than many other evaluative procedures.

Radiculopathy. Thermography has been reported to be useful for the detection of cervical and lumbar nerve root irritation and compression. It has been reported to be sensitive (recognizing a radiculopathy, given that one is present) and specific (not recognizing it when one is absent) compared with computed tomography (CT), myelography, electromyography (EMG), or surgical exploration. However, it should be appreciated that, in this context, agreement with results of contrast studies or surgical findings was judged to have occurred when thermography revealed an abnormality (either cooler or warmer) in the general vicinity of the cutaneous distribution of the nerve root. The sensitivity and specificity of the test would be low if precise localization (to correct side and segmental level) and to pathologic process (disk, tumor, or other) were the criteria of thermographic success. Lack of precision of thermographic localization may have influenced other investigators to report that the test was not sensitive or specific.

Perhaps more important than the question of sensitivity and specificity is the question of the clinical usefulness of the test. Does thermography provide as much or the same information as EMG, CT, MRI, and myelography? EMG provides information about the root or nerve involved, side the lesion is on, chronicity, kind of lesion (demyelinating or axonal degeneration), and occurrence of regenerative events. CT, MRI, and myelography provide more specific information about site, severity, and structural features of the lesion. EMG provides more localizing and characterizing information than does thermography, whereas CT, MRI, and myelography provide more specific information about site, size, and kind when there is a space-occupying lesion. On the other hand, EMG and thermography may reveal parenchymatous or interstitial root or nerve abnormalities when CT, MRI, and myelography are negative. Knowing that radiculopathy is present is helpful in diagnosis and treatment.

Hubbard's observation** that, when thermography is negative, nerve root compression will not be found by myelography led him to suggest that the test be used "in those cases where it is felt necessary to proceed beyond conservative therapy to work-up." He found the test to be "an effective screening method for recognizing a pathological abnormality before proceeding with CT scanning or myelography." Other workers have not found thermography to be that sensitive or specific.