

Infrared thermographic imaging of lumbar dysautonomia owing to lumbar disc protrusions: an observational single blind study

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Summary. Infrared thermography (IRT) scans were performed on 66 patients with CT/MR documented disc bulges and herniations (without direct nerve root compression) to determine common patterns of thermal asymmetry in the lower extremities. The objectives of this study were to determine the most common levels of disc protrusion seen in clinical practice and to determine the somatoautonomic pattern of thermal changes associated with the different levels of disc lesions. The IRT scans were interpreted blind, i.e. without knowledge as to the extent or presence of disc pathology, by an experienced clinical thermographer. The most common level of disc involvement was L5-S1, and herniation was more common than bulging. The most common thermographic observation was not a singular dermatomal pattern, but multiple cutaneous areas of dermatomes. We propose calling this somatoautonomic reflex pattern an "autonomal pattern," and the specific cutaneous fields as "autonomes." Lumbar disc protrusions will often result in lumbar dysautonomia which can be measured by infrared thermography.

Key words: Thermography - Lumbar disc - Herniated disc - Radiculopathy - Sympathetic mediated pain - Dysautonomia - Autonomie

The use of thermography in patients with lumbar disc disease and lumbar radiculopathy has been will documented in the scientific literature.

In 1974, Raskin (19) published a paper in the *Journal of Neurology*, correlating IRT with myelography. He concluded that IRT was a useful test to screen patients with lumbar disc symptoms, and that a positive thermogram would predict a positive myelogram. Eideken had earlier published similar findings in the *American Journal of Roentgenology* (7).

Many correlation studies have since been done correlating patients who had positive CAT scans, MRI Scans, Myelography and EMG studies with IRT (9, 11,14-17). Most of these studies conclusively showed the high sensitivity and reliability for IRT. Chafetz and Wexler recently published in *Spine* that thermography

has 100% sensitivity and 60% specificity in detecting patients with nerve fibre dysfunction in 19 patients with CT documented disc lesions (5). Uematsu published that in low back/sciatica patients with root impingement from HNP, IRT had a 94.7% predictive value and 87.5% specificity (22). There have been a few negative studies criticizing the low specificity of thermography in the diagnosis of radiculopathy. The most recent critical study was that of So et al; (21). They studied 27 normal patients and 30 patients with low back pain. They concluded that although thermography is non-invasive, risk-free, and just as sensitive, if not more so, than EMG for radiculopathy, it has little value because of its non-specificity. They found that IRT was non-specific because of its inability to pin-point the anatomic level of lesion accurately as EMG could, or the side of the abnormality. They also had difficulty because they could not explain how IRT measured the sympathetic response below L2, because the sympathetic chain does not extend any lower. Therefore, no sympathetic fibres could be compressed. Their group failed to realize several things. First, many clinical procedures depend upon clinical knowledge and history (to determine side of pathology e.g. fracture on an X-ray examination). Secondly, they were comparing "apples and oranges" (or, in this case, motor nerve versus autonomic function). Thermography measures autonomic function and dysfunction, and EMG measures motor nerve function and dysfunction. The fact that EMG can specifically identify the level of a root lesion and thermography cannot be irrelevant. Thermography measures autonomic/sympathetic dysfunction and somatoautonomic patterns of thermal asymmetry and EMG does not. These areas of thermal asymmetry are not confluent with dermatomes. The point of this study is to show that IRT measures autonomal patterns and not sensory dermatomal patterns. This had previously been descuiped by Leroy as a "thermatome" (13), which is a good word for thermal patterns seen thermographically but does not adequately describe the associated clinical syndrome.