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INFRARED THERMOGRAPHIC IMAGING, MAGNETIC RESONANCE IMAGING, CT SCAN AND MYELOGRAPHY IN LOW BACK PAIN

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SUMMARY

Sixty-five cases of chronic low back pain were studied. Infrared thermography (IRT) was abnormal in 92%, magnetic resonance imaging (MRI) in 89%, computerized tomography (CT) in 87% and myelography in 80%. IRT correlated with MRI in 94% of cases, and with CT in 87% of cases. Of 22 MRI positive disc and root cases, 21 (95%) had significant leg abnormalities on IRT. All 19 cases with radicular involvement on CT and all 18 with radicular involvement on myelography demonstrated significant leg changes on IRT.

KEY WORDS: Imaging, Spine, Skin temperature, Lumbar nerve root, Comparisons, Thermography.

COMPUTERIZED infrared thermography (IRT) and magnetic resonance imaging (MRI) are useful in the assessment of low back pain. Thermography measures local skin temperature and therefore provides physiological data mediated through sympathetic nerve fibres. Characteristic skin surface temperature changes occur with lumbar nerve root irritation [1], non-radicular referred leg pain [2], and with lumbar disc pathology [3]. The diagnostic information shows significant correlation with CT scan, myelography [4] and MRI [5].

Magnetic resonance imaging provides fine anatomical details of the lumbar disc, nerve root and associated structures and can reveal changes which may have clinical relevance.

In the present study, both visual and computerized IRT of patients with chronic lumbar pain with and without leg discomfort were compared prospectively with MRI and previously performed CT scans, myelography and discography. Many of the reported comparative studies between IRT, MRI and conventional radiological tests have relied largely on visual assessments of side-to-side leg temperature differences rather than more objective computer derived temperatures.

PATIENTS AND METHODS

Sixty-five patients with chronic back pain with and without referred leg pain (radicular or non-radicular) were assessed prospectively with MRI and IRT. Sixty-one of these were also examined by lumbar CT scan, 41 by myelography and 12 by discography. Thirty-seven were male and 28 were female, with a mean age of 41 (range 23–71 years). The mean duration of back pain at initial assessment was 2 years (range 2 months to 14 years).

Thermographic assessments were performed with an Agema 782 infrared system using CATS (computer assisted thermographic software) and an IBM PXT for digitization of signals, storage and analysis of data. All patients followed a strict preparation protocol prior to IRT involving fasting for 3 h with no analgesics, smoking, exercise, physiotherapy or acupuncture on the morning of the test. Patients were advised to shower and remove cream or cosmetics over areas to be thermographed. Clothes were removed and equilibration occurred in a room thermostatically cooled to 21°C for 20 min prior to IRT assessment. Four areas were evaluated: lumbar spine and buttocks, anterior and posterior aspects of legs, and plantar area of feet. Thermographic temperature assessments were performed on 14 areas (seven each side) by computer analysis using boxes of standardized size for each area. The areas were gluteal, anterior and posterior areas of thighs, anterior and posterior areas of forelegs, dorsal and plantar surfaces of feet. The side-to-side temperature difference was computed for six specific regions as follows: (1) anterior leg (summation of thigh, foreleg and dorsal foot areas); (2) posterior leg (summation of gluteal, posterior thigh, calf and plantar foot areas); (3) gluteal; (4) plantar foot; (5) anterior foreleg; (6) anterior thigh. It was assumed that region 1 (anterior leg) represented more L5 root than region 2 (posterior leg), which contained more S1 root. Region 3 (gluteal) covered S2 and S3 roots, region 4 (plantar foot) L5 and S1 roots, region 5 (anterior foreleg) L4 and L5 roots and region 6 (anterior thigh) L3 and L4 roots.

Thermographic analysis of the lumbar area was recorded visually; abnormal if there was a unilateral heat flare, a general increase centrally over the lower lumbar area or with bilateral heat flares. The leg thermograms were also examined visually and recorded abnormal with significant side-to-side thermal asymmetry. For computer based side-to-side temperature difference (Δt°C), if the symptomatic side was colder a negative prefix was given before t°C and a positive prefix if the temperature on the symptomatic side was hotter.

MRI assessments were performed using a Siemens Magnetom, using a super conductive magnet of 1 tesla strength cooled with liquid helium and nitrogen. T2 weighted sagittal scans and T1 weighted axial scan views were taken of the lumbar spine. All MRI scans were reported by SL. The significance of differences between group means was assessed by paired and non-paired Student's t-tests.

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