

The Diagnostic Value of Bone Scintigraphy in Patients with Low Back Pain

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Abstract. Bone scintigraphy has been studied in two groups of patients presenting with low back pain. In one group of 38 patients suffering "non-specific" back pain, bone scintigraphy and laboratory findings were negative in 24. There were abnormal laboratory findings in all of the remaining 14 and 7 had positive bone scans indicative of clinically significant disease. Selection of patients for bone scintigraphy in this group should therefore be influenced by abnormal laboratory findings and elevation of the erythrocyte sedimentation rate in particular. By comparison, the bone scans were reviewed from another group of patients suffering previously known malignancy. Out of 138 patients, nearly 40% showed a positive bone scan due to subsequently proven metastasis. Bone scintigraphy was positive in a further 14% as a result of osteoporotic rib fracture and vertebral body collapse. In half of these, it was not possible to exclude malignancy by scintigraphy. The present findings indicate that bone scintigraphy is not a useful procedure in patients with long-standing low back pain who have normal radiographs and normal laboratory findings.

Key words: Bone scintigraphy – Low back pain – Metastasis – Infective spondylitis

Low back pain is a common and disabling disorder presenting a considerable challenge to the clinician and diagnostic radiologist. There has been considerable debate about the diagnostic value of various radiographic examinations but information on the

use of bone scanning in this condition is much less readily available. It is known that radionuclide imaging may be more sensitive than radiography in detecting metastasis, inflammatory conditions such as ankylosing spondylitis, subtle trauma, and certain specific tumours such as osteoid osteoma. There do not appear to be, however, any reports of the diagnostic value of bone scintigraphy in a heterogeneous population suffering low back pain. The present study was undertaken to compare the value of bone scintigraphy in low back pain patients in two particular groups: one with known malignancy and the other with no previously recognised disease.

Material and Methods

Over 4,000 bone scans have been retrospectively reviewed to select patients in whom low back pain was the predominant presenting feature. This produced 176 patients who probably fell into two groups, those with previously unknown disease and a larger group with known malignancy.

Group I

Low Back Pain with Previously Unrecognised Disease. Thirty-eight patients were found to have adequate clinical and laboratory data with normal radiographs at the time of scanning. The examination was justified in the majority on the basis of a high index of clinical suspicion and in a smaller number of patients bone scanning was considered most appropriate to obtain diagnostic information in the absence of other clinical data.

Group II

Low Back Pain with Known Malignant Disease. There were 138 patients in this group. The bone scan was performed to confirm the presence and location of suspected metastatic disease. Patients receiving adjuvant chemotherapy and/or radiation were excluded. The initial diagnosis was established by bone scintigraphy and subsequently confirmed during follow-up for at least 1 year, by clinical and radiographic data or by autopsy. Bone biopsies were seldom taken.

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Table 3. Low back pain in patients with known malignant disease and positive bone scans

<i>Malignant disease</i>		<i>Non-malignant disease</i>	
Metastasis		Osteoporotic rib fracture	
Breast	18	Vertebral collapse	19
Prostate	16		
Lung	11		
Renal	6		
Myeloma	4		
Total	55		19

Group II: Known Malignant Disease

In this group, 138 patients were suspected of metastatic disease accounting for low back pain symptoms. Bone scans were therefore performed before radiography, since this is known to be a more sensitive examination [11, 15, 24]. The scans were positive in 74 patients and metastasis was ultimately confirmed in 55 patients (Table 3). Nineteen patients showed positive scans associated with osteoporotic rib fracture and vertebral body collapse. Ten of these were presumptively diagnosed as metastasis on the basis of the bone scan. On follow-up, however, none of these patients subsequently manifested any malignant lesions at the expected sites, and have to be considered as false-positives. Bone scintigraphy, therefore, recorded an overall detection rate of 39.8% for metastasis and a false-positive rate of 7.2%. Sixty four patients had negative bone scans. Detailed follow-up studies failed to reveal any instances where further metastatic lesions developed in the lumbar region. There were no false-negative examinations.

Discussion

The patients included in this investigation were selected from an outpatient population referred by orthopaedic surgeons, general surgeons, or internists. The indications for investigation were a matter for individual clinical judgement. Appropriate radiographs were taken to exclude fractures, spondylolysis, and less common lesions such as osteoid osteoma, aneurysmal bone cyst, infection, or malignant disease [6, 14]. X-ray examination is of limited value for the early detection of destructive lesions or because of the long interval between the onset of symptoms and the appearance of detectable changes. On the other hand, radionuclide imaging with ^{99m}Tc phosphate compounds has been shown to be much more sensitive. Recent reports have indicated its usefulness in the diagnosis of osteoid osteoma [12, 20], ankylosing spondylitis

[3, 8, 10, 16, 17, 21], joint disease in drug abusers [9], obscure skeletal pain in children and in malignant disease [11, 15, 24], rheumatoid arthritis [23], sacroiliitis [1-3, 10], spondylolysis [4], and fractures [16, 17]. Conversely, bone scintigraphy may have a low value in patients with skeletal pain of unknown origin. In a report on a group of 70 such patients, only one was found to have metastatic disease [19].

How then may the diagnostic yield be increased and appropriate patients selected for bone scanning? In this series, 55 of the patients (39.8%) had metastatic disease, whilst in the remaining 64 patients this could be confidently excluded. The scintigraphic features of osteoporotic rib fracture and vertebral body compression could not be distinguished from metastasis in 10 patients.

The frequency of positive results in malignant disease is slightly lower than previously reported. Schaffer and Pendergrass [18] reported the sensitivity of bone scans in patients with prostatic carcinoma to be 53%. Where bone pain has been the indication for scintigraphy, the relationship with the presence of bone metastases can be approximately 60% [13, 19]. The 38 patients with backache and no previously known disease, probably represent a so-called "non-specific" back pain syndrome; 81.5% of these had a negative bone scan. Bone scintigraphy was positive in seven patients and in each instance there were positive laboratory findings; most notable of these was elevation of the erythrocyte sedimentation rate. Furthermore, seven patients with negative bone scans, suffering systemic disease, most frequently retroperitoneal, also had positive laboratory tests. Again, the erythrocyte sedimentation proved to have a higher reliability, the only negative finding was that of hydro-nephrosis. Although these numbers are small, the results do suggest that simple laboratory screening, and in particular, the erythrocyte sedimentation rate, could be used to select the most appropriate patients for bone scintigraphy in the "non-specific" back pain syndrome.

Patients with established ankylosing spondylitis and rheumatoid arthritis were excluded from this series. The results from qualitative and quantitative sacroiliac joint scanning have been variable [2, 5, 21, 22]. In order to avoid the possibility that early sacroiliitis had been missed during the initial evaluation, this was specifically investigated subsequently, but no such instance became apparent.

In conclusion, this study indicates that bone scintigraphy may demonstrate metastasis in 40% of patients suffering low back pain with known malignancy. The possibility of misinterpretation

should be borne in mind when osteoporotic rib fractures and vertebral compression are present. In patients with non-specific low back pain, bone scanning is most likely to be positive when there is elevation of the sedimentation rate and other abnormal laboratory findings. When the low back pain is of long-standing and laboratory findings are normal, scintigraphy is not a useful procedure.

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