Scand J Rheumatol 2002;31:245–8

SHORT REPORT

The value of bone scintigraphy in the evaluation of osteoporotic patients with back pain

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We evaluated the role of bone scintigraphy in 60 osteoporotic patients with back pain. Thirty-four had scintigraphic evidence of vertebral fracture and were found to have a significantly lower bone density compared to those without fractures ($p = 0.01$). In only 14 patients was vertebral fracture considered to be the sole cause of pain with 38 having alternative abnormalities, the most common of which was facet joint disease ($n = 30$). Results of bone scintigraphy influenced a direct change in management in 18 patients and were able to exclude vertebral fracture as a cause of symptoms in 30. In symptomatic osteoporotic patients the bone scan may be helpful in elucidating the etiology of back pain and can impact on patient management.

Key words: ^{99m}Tc MDP bone scan, osteoporosis, back pain

Back pain can have multiple causes. It is often difficult in osteoporotic patients to differentiate symptoms of vertebral fracture from many other possible causes of pain. It is important to document vertebral fracture in osteoporotic subjects as this infers a poorer prognosis with an increased risk of subsequent fracture (1). It also allows the clinician to make predictions on the natural history of symptoms and instigate appropriate palliative and prophylactic treatment. Spinal radiographs are often employed as the first investigation in symptomatic osteoporotics but large variations in interpretation have been reported with respect to vertebral fracture (2). Even in the presence of radiographic vertebral deformity its clinical relevance may be unclear as it has been shown that a number of vertebral deformities are present in asymptomatic, non-osteoporotic women (3). It is accepted that bone scintigraphy is a sensitive method for investigating skeletal pathology. Its functional nature has the potential to act in a complementary manner to radiography in the evaluation of complications of osteoporosis but its role has not been studied in detail in a clinical setting.

We have therefore retrospectively reviewed the use of bone scintigraphy in osteoporotic patients with back pain, attempting to further define the potential role of this technique.

Method

All patients attending a metabolic bone clinic over a two-year period for evaluation and treatment of osteoporosis, who had bone scintigraphy performed to elucidate problematic back pain, were included. This amounted to 60 patients (11 male) with a mean age of 63.9 years. This was approximately 2 to 3% of the total number of patients seen in the clinic. Each patient had a planar, whole body ^{99m}Tc MDP bone scan performed and in 48 (80%) single photon emission computed tomography (SPECT) images of the spine were also acquired. Some patients were unable to tolerate additional SPECT acquisitions due to their back symptoms.

Characteristic bone scan appearances of vertebral, rib and sacral fractures were recognised in accordance with well described patterns (4–6). A subjective assessment was made on the intensity of vertebral fracture activity to differentiate recent (weeks to a few months – significantly more intense than normal vertebrae) from old fractures (more than a few months – only slightly more intense than normal vertebrae) (7,8). All patient records and imaging request forms were reviewed to determine the impact on patient management of bone scintigraphy. Spinal radiographs were available in 43 (72%) patients.

All patients had bone density measurement by dual X-ray absorptiometry performed on a Hologic QDR 4500 densitometer (Hologic Inc, Waltham, MA, USA) at the lumbar spine and femoral neck and the manufacturer's normal database was used to obtain T scores for the lumbar spine (9).

Results

Thirty-four of the 60 patients (57%) had scintigraphic evidence of vertebral fracture of whom 20 were considered on the basis of intensity of uptake to be recent and the remainder considered less acute

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Received 4 December 2001
Accepted 21 May 2002

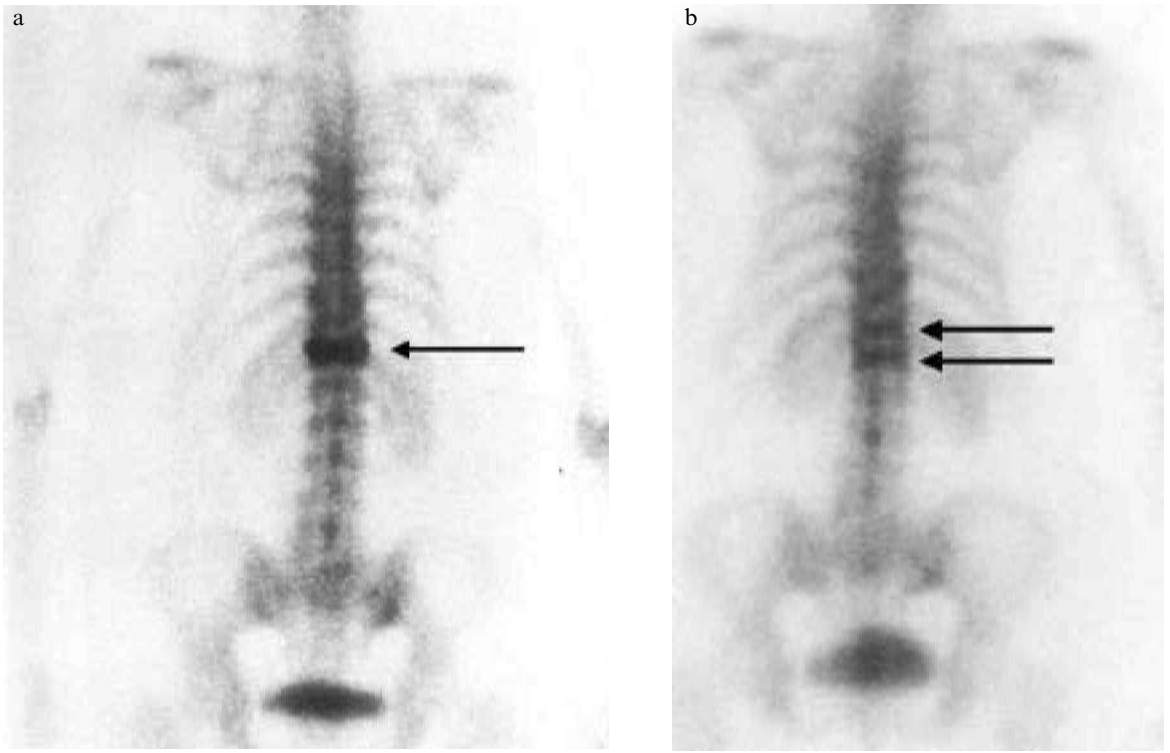

Fig. 1. ^{99m}Tc MDP posterior bone scans. a) demonstrating high uptake in an acute vertebral fracture at T12 (arrow) and b) demonstrating old fractures at two adjacent levels at the thoraco-lumbar junction (arrows).

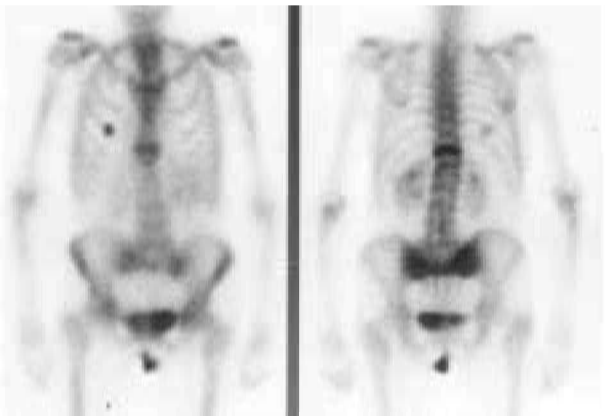

Fig. 2. Anterior (left) and posterior (right) ^{99m}Tc MDP bone scan demonstrating a recent vertebral fracture in the lower thoracic spine, a sacral fracture and a right anterior rib fracture.

(Fig. 1). Six patients with radiographic evidence of vertebral deformity had normal bone scans and were considered to have old, healed fractures or to have vertebral deformities that were not due to fracture. Eleven of the 34 patients (32%) with evidence of vertebral fracture also had scintigraphic evidence of at least one other fracture outside the lumbar or thoracic spine, including ribs (n = 8), sacrum (n = 4) and other sites (n = 3) including scapula, pubic rami and sternum (Fig. 2). Of these only 4 had been suspected clinically.

The 34 patients with scintigraphic evidence of vertebral fracture had a significantly lower T score (mean T = − 3.45) than those without (mean T = − 2.76) (p = 0.01, students unpaired t-test). In 14 patients (23%) vertebral fracture was considered to be the sole cause of symptoms but in 38 of the patients studied (63%) non-fracture abnormalities were considered to be contributing to symptoms (n = 13), or to be the sole cause of pain (n = 25), including facet joint disease (n = 30), discovertebral degenerative disease (n = 8), or other causes (n = 4).

Overall, 30 patients (50%) had evidence of facet joint activity. Of the 16 who also had scintigraphic evidence of previous vertebral fracture the facet joint activity was at the level of a fracture or at immediately adjacent levels in 11 (69%) (Fig. 3).

The results of bone scintigraphy directly influenced a change in management in 18 patients (30%). Four had their osteoporosis medication changed to drugs considered more effective in future fracture prevention and 14 patients received appropriate management changes for causes of pain other than fracture determined by bone scans. These included referral to a specialised pain management unit or rheumatology clinic for consideration of facet joint injection or management of rheumatological causes of pain (n = 12), further investigation of a bone scan lesion felt to be suspicious of metastasis in a patient with a

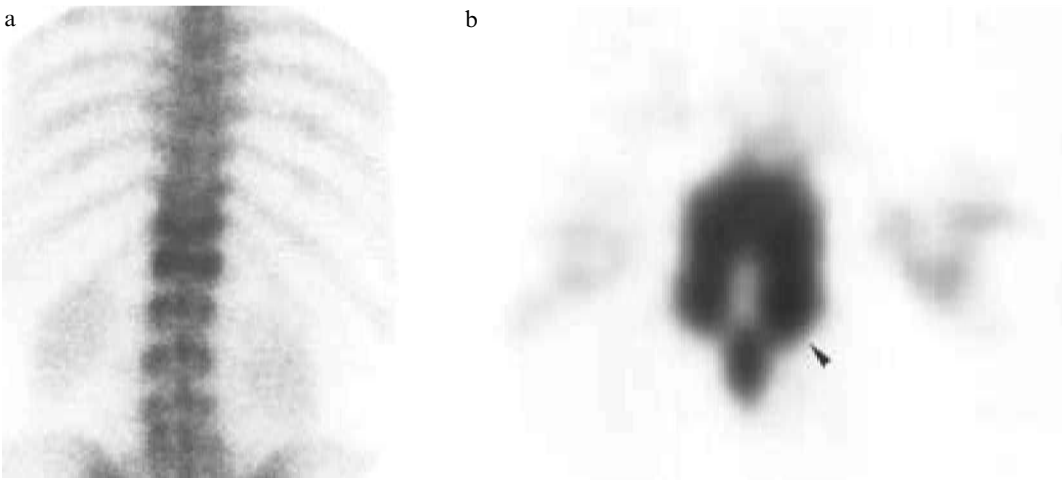

Fig. 3. a) Posterior ^{99m}Tc MDP bone scan demonstrating a fracture at L1. b) The corresponding transaxial tomographic slice at this level confirms high uptake within the vertebral body but also within the facet joints, particularly on the left (arrow).

previous history of breast cancer (n = 1) and the treatment of previously unsuspected Paget's disease (n = 1).

Many of the patients, with alternative causes of pain other than vertebral fracture, required only appropriate explanation and advice with no specific changes in management.In the 30 patients with negative bone scan results for vertebral fracture, it was possible to reassure them that osteoporotic fracture was not a cause of their symptoms. Eight patients had normal bone scans with no cause for their symptoms identified.

Discussion

Whilst only a small fraction of osteoporotic patients require further investigations after radiography, nevertheless a problematic group exists with back pain which is more difficult to evaluate. The results from this study support the use of bone scintigraphy as a complementary investigation to guide subsequent management in this group.

In this series, just over half of the patients had scintigraphic evidence of vertebral fracture, but in less than half of these (14/34, 41%) was vertebral fracture considered to be the only source of symptoms. In these patients this information allowed appropriate advice on the expected duration of symptoms and management of analgesia, this being facilitated by the ability to approximately date the fracture, depending on the intensity of activity (7,8). In those with radiographic evidence of vertebral deformity but with no scintigraphic activity it can be assumed that either the fracture is old and unlikely to be contributing to current symptoms or that the deformity was not fracture related, e.g. congenital deformity.

A surprisingly large number of patients with vertebral fracture (11/34) had scintigraphic evidence of other fractures, the majority of which had not been suspected clinically. This illustrates an advantage of bone scintigraphy over radiography in that the whole skeleton can be assessed in one scan. Further, such fractures were often in skeletal sites that are recognised as being difficult to assess radiologically e.g. the sacrum and ribs (5,6). The risk of fracture increases with lower bone density (1,10,11). It is not surprising that in this series vertebral fractures occurred in those patients with lower lumbar spine bone density.

Perhaps the most interesting finding from this study is the large number of symptomatic osteoporotic patients who had scintigraphic abnormalities that were not due to vertebral fracture, suggesting other possible causes for pain, and in particular facet joint pathology. Although facetal arthritis is a common finding in this age group, the large proportion of patients with vertebral fracture and adjacent facet joint activity (11/16), lends support to the findings of Ryan et al. They suggested that facet joint activity following vertebral fracture may be a common cause of chronicity of symptoms, either due to abnormal mechanical strain following vertebral collapse or due to secondary degenerative changes (12). The finding of facet joint activity, not only may explain the failure of a patient's symptoms to resolve following fracture but also offers an alternative treatment with facet joint injection of local anesthetic and steroid (13). However, the management of facet joint symptoms specifically in an osteoporotic group requires further study. In those with abnormal facetal activity but no evidence of adjacent vertebral fracture it is assumed that the findings represent coincidental facetal

osteoarthritis but nevertheless may explain symptoms and aid in selecting an appropriate treatment for this group of patients.

It is largely the bone scan's ability to delineate possible causes for back pain, other than vertebral fracture, that enables it to positively influence management, allowing specialist referral and treatment in some and explanation and advice in the remainder. The bone scan is also of value in those without evidence of vertebral fracture who can be reassured that this is not a cause for their symptoms.

Although this was a retrospective study and was not designed as a comparison with radiography, which was not available in all patients, it demonstrates the potential for bone scintigraphy as a complementary imaging method that may also provide additional information not available from other techniques. The majority of patients had a possible cause for back pain identified and bone scintigraphy influenced a change in management or enabled appropriate advice or reassurance. It is therefore concluded that in osteoporotic patients with back symptoms the bone scan is a valuable investigation that contributes to management.

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