

Scintigraphic Findings in Ankylosing Spondylitis

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A prospective study of bone scintigraphic findings has been carried out in 63 patients, firmly diagnosed as having ankylosing spondylitis. In addition to abnormal uptake of the radiotracer at the sacroiliac joints, a peripheral arthropathy has been a common finding, particularly in the proximal joints, occurring in up to 50% of patients. Increased uptake of radiotracer in the spine has also been found both diffusely and focally. Focal increases have been noted at the apophyseal joints in 40% of patients and in three patients with a sterile intervertebral diskitis, an unusual complication of this disease only diagnosed in two patients after bone scintigraphy.

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In an accompanying paper we have described the scintigraphic evaluation of the sacroiliac joints and referred to previous work in this context (1).

While the radiologic changes found in patients with ankylosing spondylitis (AS) have been extensively reported and reviewed (2-4), we wish to document here the scintigraphic findings from a prospective study of patients with this disease.

Ankylosing spondylitis (also known as rheumatoid spondylitis, Marie-Strümpell, and von Bechterew's disease) is a progressive inflammatory disease of the sacroiliac joints and spine leading to bony fusion, with variable involvement of the peripheral joints (5). It is associated with occasional non-skeletal manifestations such as uveitis and aortic incompetence (6,7). Unlike rheumatoid arthritis, it is not associated with the finding of rheumatoid factor in the blood, and its delineation from that disease has been advanced by the observation that in patients with AS there is a high incidence of the histocompatibility antigen HLA-B27 (8-10), previously temporarily identified as HLA-W27. Ankylosing spondylitis has a variable number of clinical, radiologic, and scintiscan findings (1) in common with Reiter's disease, psoriatic arthropathy, and the arthropathy seen in some patients with Crohn's disease and ulcerative colitis. In the majority of patients, however, it is a well-defined entity.

PATIENTS AND METHODS

The patients investigated have had either clinical and radiologic evidence of AS or the clinical sus-

picion of the disease. Sixty-three such patients have been examined by bone scintigraphy.

The "Normal" bone scintiscan findings are those defined by an experience of more than 4,000 examinations in patients with suspected metastatic carcinoma, osteomyelitis, bone tumor, osteoarthritis, and other arthritides.

The approach is the same as is detailed in an accompanying paper (1).

FINDINGS

Sacroiliitis. Because of the normal registration of the sacroiliac joints on a bone scan with Tc-99m-pyrophosphate and its analogues, it has been found necessary to develop a more objective digital assessment of abnormal uptake of the radiotracer at the sacroiliac joints (1). Predictably the method proves exquisitely sensitive in that it is possible to identify such abnormal uptake in patients with a clinical suspicion of AS, but whose radiographs are normal or equivocal. The scintigraphic findings are probably meaningful because they occur in a disproportionately large number of patients who have HLA-B27 in the blood. Equally predictably, however, the method proves nonspecific in that abnormal scintigraphic findings are encountered in a variety of conditions other than AS—conditions known to be as-

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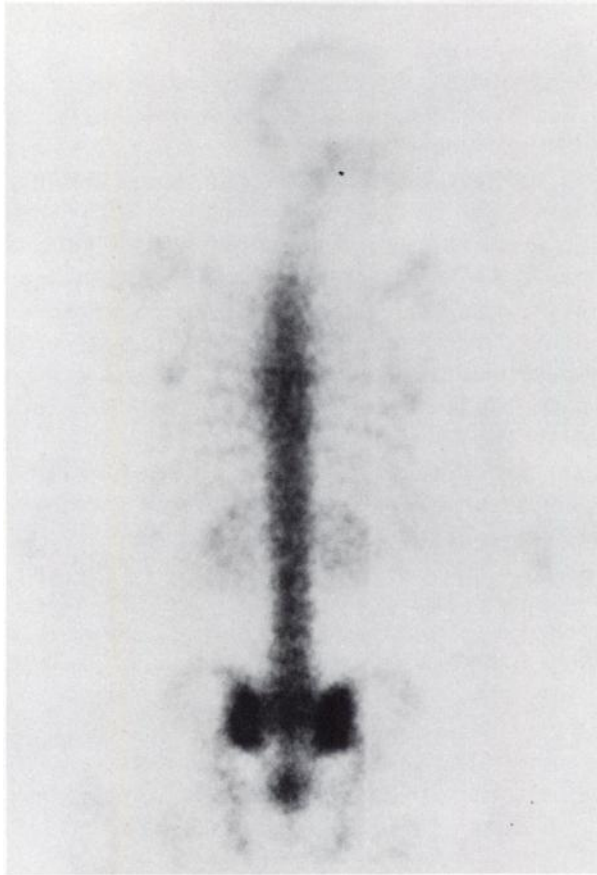


FIG. 1. Posterior view of bone scan with Tc-99m PPi in patient with active AS. Note increased uptake of radiotracer at sacroiliac joints, and in particular in dorsal spine. These findings can best be appreciated by comparison with Fig. 2; standard dose and scan factors are used.

sociated with radiographic evidence of sacroiliac disease albeit less commonly than we have found by this method.

Abnormal findings in the axial skeleton. In patients with AS it is sometimes possible to identify a diffuse increase in spinal uptake of the radiotracer centered most commonly (16% of patients with AS) on the low dorsal spine (Fig. 1). This is clearly difficult to show other than by scintigraphic techniques

in which the dose of radiotracer is related to patient's weight and other factors are controlled. More commonly (Table 1)—and uniquely in our experience with several kinds of arthropathy—it has been possible to identify a focal increase in uptake of radiotracer at multiple spinal apophyseal joints (Fig. 2). This finding is most common in the low dorsal and upper lumbar spine, and was present in 40% of patients with known AS. Oblique scintigraphic views have been used to establish the anatomic site of this abnormality at the apophyseal joints.

However, because the nature of AS is to result in bony ankylosis, we have observed that the spine in this disease behaves, for example in fracturing, more like a single long bone than does the normal spine. For the same reason scintigraphs of the spine, even if obtained to provide maximum resolution, often fail to illustrate clearly the normal segmental anatomy of the spine, and in relation to apophyseal arthropathy and the diskitis described below, deductions in relation to the level of disease involvement are most difficult without careful radiographic correlation. Conversely, scintigraphic findings indicating a loss of the normal segmental anatomy of the spine should suggest a diagnosis of AS.

While these findings add a degree of specificity to bone-scan findings, it is necessary to state that they are present only when the radiologic changes are well established and not at the time when sacroiliitis alone is suspect.

Diskitis. One unusual and particular manifestation of AS that has been recognized lately is a sterile diskitis (11–14). This finding is of importance clinically since treatment requires temporary rest rather than the more usual program of exercise. Three patients with late AS (one HLA-B27 negative) have been observed to have this complication, and scintigraphy led to the diagnosis in two patients. Focal abnormal uptake of the radiotracer across the width of the spine (Fig. 3) prompted tomography, which identified the process (Fig. 4) and explained the patient's exacerbation of symptoms. No biopsy has been obtained, but the response to conservative management in the absence of antibiotic therapy is

TABLE 1. COMPARISON OF JOINT INVOLVEMENT IN ANKYLOSING SPONDYLITIS AND RHEUMATOID ARTHRITIS

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	No. of patients	Percentage of joints involved on scan												
		Shoulders	Elbows	Wrist	Small joints of hands	Hips	Knees	Ankles	Tarsal	Small joints of feet	Sterno-clavicular	Manu-brio-sternal	Apophyseal	Diskitis
Ankylosing spondylitis	63	50	39	34	12	40	48	41	33	16	39	38	40	2
HLA-B27—Ankylosing spondylitis	13	54	15	13	0	46	23	8	19	0	58	62	8	1
Rheumatoid arthritis	24	77	71	92	79	44	73	63	58	58	50	17	0	0

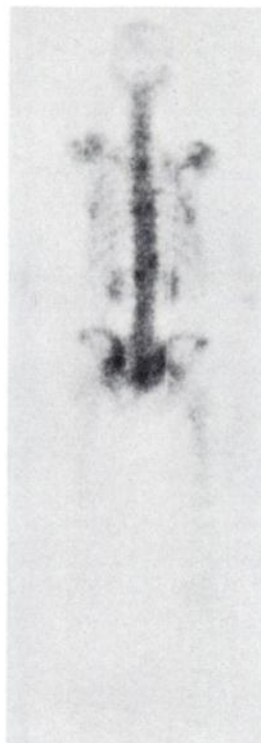


FIG. 2. Posterior view of bone scan with Tc-99m PPi in patient with late AS. Radiologically sacroiliac joints showed grade 2-3 findings and were not associated with corresponding abnormality on scan, although sacroiliac-to-sacral ratios were slightly elevated. Note particularly multiple sites of apophyseal arthropathy in axial skeleton.

in keeping with this unusual but recognized manifestation of the disease.

Peripheral arthropathy. The bone scan has revealed abnormal uptake of the radiotracer at many peripheral joints in the patients examined. The incidence of this finding is documented in Table 1 where comparison is made with the distribution of abnormal joints in rheumatoid arthritis. Not only is the peripheral arthropathy of AS less common than that in rheumatoid arthritis but the distribution is different. In the former condition, the proximal large joints tend to be more commonly involved than the distal, while in rheumatoid arthritis the reverse is true.

Other evidence of arthropathy. A recurrent feature of the scans reviewed was abnormal uptake of the radiotracer at sternoclavicular joints, both in patients with rheumatoid arthritis and with AS. More characteristic of AS (Table 1), although not unique to this condition, was a manubriosternal arthropathy (Fig. 5).

Abnormal uptake of radiotracer at the atlantoaxial joint was noted in a single patient of each group of those with AS and rheumatoid arthritis.

DISCUSSION

We have described what we believe to be a sensitive method for diagnosing sacroiliac disease. This is not, however, specific in its implications, since abnormal findings are present not only in AS but with different frequencies in rheumatoid arthritis, Reiter's syndrome, ulcerative colitis, Crohn's disease, uveitis, psoriasis, and, indeed, in some patients whose radiologic diagnosis is osteitis condensans ilii.

It is appropriate to document the other scintigraphic findings encountered in AS. This is partly because the specificity of the finding of sacroiliac disease may be increased, but also because such find-



FIG. 3. Posterior view of bone scan with Tc-99m PPi in patient with late AS who complained of exacerbation of back pain. Increased uptake of radiotracer at D12-L1 level is apparent.



FIG. 4. Radiograph subsequently obtained from same patient as Fig. 2, showing at the level of scan abnormality diskitis readily distinguished from more characteristic changes of AS at adjacent intervertebral-disk level.

ings may be important to recognize as incidental on bone scintigraphs obtained for other reasons in a patient with AS.

A description of multiple sites of arthropathy must clearly be at a disadvantage, since biopsy proof of such multifocal disease is difficult to justify ethically. Certainly the incidence and extent of the arthropathy revealed by scintigraphy exceeded that which was clinically evident. Nevertheless, the sites of joint involvement described here—especially those at the sternoclavicular and manubriosternal joints—are sites for which AS is known to have a predilection (15,16). The frequency of many of the findings suggests that they are not fortuitous observations. In keeping with the results reported, there has been one elegant correlation of scintigraphy and arthroscopy findings (17) that has revealed that bone scintigraphy is the most sensitive determinant of arthropathy, although this experience related to osteoarthritis.

Resnick (5) has reported a radiologic study of patterns of peripheral-joint involvement in AS in 25 patients with findings similar to those reported here, with the small differences potentially accounted for by differences in patient selection.

For the purposes of this analysis we have defined an arthropathy as a site of abnormal uptake of the radiotracer, symmetrical about a joint space. This does not indicate the mechanism involved. Whether

it be due to joint hyperemia alone or to the erosive changes and marginal periostitis in bone is uncertain. However, in AS involving the axial skeleton, the known propensity for new-bone formation is certainly a basis upon which the bone scintigraphic findings we describe could have been anticipated.

The differences in the scintigraphic findings between AS and rheumatoid arthritis further support the separation of these diseases already justified by the recognition of the association of one with the histocompatibility antigen HLA-B27 and the other with rheumatoid factor. Because neither of these associations is absolute, bone scintigraphy, among other techniques, may have a part to play in diagnosis.

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FIG. 5. Anterior view of bone scan with Tc-99m PPi in patient with active AS. Note peripheral arthropathy, and in particular involving sternoclavicular and manubriosternal joints. Not all sites were symptomatic or clinically abnormal.

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