Bone Scintigraphy in the Initial Staging of Patients with Renal-Cell Carcinoma: Concise Communication

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We reviewed the records of 40 consecutive patients who received bone scintigraphy in conjunction with the initial evaluation and staging of renal-cell carcinoma, to determine the role of bone imaging in this clinical context. Bone scintigrams were positive in three out of 40 patients at the time of diagnosis. In view of the low yield of bone imaging, it appears that routine scintigraphy is unwarranted in the absence of skeletal symptoms before the diagnosis of renal lesions. The presence of a positive bone image did not alter the indication for nephrectomy.

J Nucl Med 25: 289–291, 1984

Preoperative bone scintigraphy to determine the presence or absence of metastatic disease has become an accepted procedure in patients with undiagnosed renal lesions suggesting renal-cell carcinoma (*1*). There is no question that knowledge of the existence of metastases and accurate staging are imperative in determining the prognosis and 5-yr survival of patients with renal-cell carcinoma (*2*). However, the effect of such knowledge upon the choice of initial surgical therapy is controversial, with numerous authors advocating adjunctive nephrectomy despite the presence of metastatic disease of the skeletal system (*3–6*). The following retrospective study was therefore undertaken to evaluate the yield of bone scintigraphy before definite pathologic diagnosis of renal lesions, as well as to determine the effect that knowledge of metastatic bone disease had upon surgical therapy.

MATERIALS AND METHODS

All patients receive bone scintigraphy as part of the initial evaluation and staging of renal-cell carcinoma at our medical center. These patients' records were reviewed for the period from January 1, 1980 to July 1, 1982. All bone scintigrams were reviewed, and temporally correlated with the diagnosis and subsequent therapy of renal-cell carcinoma.

Received Sept. 8, 1983; revision accepted Oct. 10, 1983.

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Bone scintigraphy was accomplished with the patients receiving 20 mCi Tc-99m methylene diphosphonate intravenously. Anterior and posterior whole-body images, and pertinent additional views, were obtained 3 to 4 hr after tracer injection. All scintigrams were reviewed by nuclear medicine physicians, with correlative radiographic data and clinical material available.

RESULTS

Forty patients with renal-cell carcinoma (RCC) were identified. There were 32 males and eight females, age range 23 to 69 yr, mean 52.

Three of the 40 patients (7.6%) had bone scintigrams revealing metastatic disease at the time of RCC diagnosis (Table 1). One of these patients (No. 2) presented with bone pain as the initial symptom, and died shortly following the nephrectomy. A second patient (No. 3) presented with metastatic disease in lung as well as in bone. No nephrectomy was performed. The final patient with a positive bone scintigram (No. 8) was asymptomatic, with bone metastases as the only initial evidence of disease dissemination. He underwent a nephrectomy as the initial diagnostic and therapeutic procedure. A total of 11 (27.5%) patients were in Stage 4 at the time of diagnosis, with only one exhibiting bone disease as the sole evidence of dissemination. Nephrectomies were performed on 36 of 40 (90%) of the patients. Of those not experiencing nephrectomy, three were in Stage 4 and one in Stage 3, with multiple associated medical problems including markedly compromised renal function.

TABLE 1. CLINICAL RESUME: PATIENTS WITH METASTATIC BONE LESIONS

No.	Age (yr)	Sex	Dx/ Stage	Initial metas	Later metas	Nephrectomy	Initial bone image	Follow-up time (yr)	Image results
1	47	M	IV	Mediastinal nodes & lung	Bone 5 mo	Yes	Neg	5/12	Pos
2	51	M	IV	Bone		Yes	Pos	None	None
3	49	M	IV	Lung/bone	Liver 5 mo	No (mets)	Pos	9/12	Pos
4	51	M	IV	Percutaneous (back)	Brain-3 yr Bone-6 yr	Yes	Neg	6	Pos
5	52	M	I	—		Yes	Neg	1 7/12	Pos
6	52	F	IV	Subcutaneous kidney & pancreas	Bone 7 mo			7/12	Pos
7	45	M	IV	Cutaneous (chest wall & forehead)		Yes	Neg	$3^{3}/_{12}$	Pos
8	57	F	IV	Bone		Yes	Pos	2/12	Pos

Follow-up period for the patients in the series ranged from 2 to 8 yr. During this time, an additional five patients developed metastatic bone disease. In only one of these patients was the development of metastatic bone disease the only evidence of dissemination of the renal-cell carcinoma.

DISCUSSION

Our finding in three of 40 (7.5%) patients with evidence of metastatic bone disease upon the initial presentation and diagnosis of renal-cell carcinoma is considerably lower than that reported by Cole et al. in the most widely cited article referable to renal-cell carcinoma and metastatic bone disease (*7*). Cole reports that five of 12 (42%) patients with renal-cell carcinoma had positive bone scintigrams. However, he fails to correlate the occurrences of metastatic bone disease with the temporal course of the patients' disease. We are, therefore, unable to isolate those patients with positive bone scintigrams upon the initial presentation of renal-cell carcinoma. Parthasarathy et al. report a total of 16 patients with primary renal malignancies, eight of whom had evidence of a skeletal metastatic disease (*8*). Here again there is no correlation between the patient's presentation and the occurrence of metastatic bone disease.

In Abrahms' study of 1000 autopsies on patients with carcinomas of various kinds, 34 of the 1000 were for kidney primaries (*9*). Of these 34, eight patients were found to have bone metastasis at autopsy (24%). This percentage is therefore the upper limit that one should expect to find with bone imaging at the time of initial diagnosis.

Forbes examined 1,668 cases of RCC at the Mayo Clinic from 1964 to 1974 (*10*). Of these, 167 (10%) had bone metastasis by radiologic evaluation. Forbes divided the 167 into three groups: 63 patients had bone problems as presenting complaint leading toward the diagnosis of RCC; 24 had bone metastasis discovered at the time of RCC presentation; 80 patients developed bone metastasis at some time after the original diagnosis of RCC.

Analyzing Forbes's data from a slightly different perspective, we find that a total of 87 patients with renal-cell carcinoma exhibited evidence of metastatic skeletal involvement at the time of initial diagnosis (63 with additional bone symptoms and 24 patients with metastatic bone disease). This translates to an incidence of skeletal involvement of 5.2% (87/1,668) at the time of initial evaluation and diagnosis. The 5.2 percent figure bears remarkable resemblance to the parallel figure of $7^{1}/_{2}$% in our significantly smaller series.

Swanson et al. (*11*) reviewed the records of 947 patients with RCC, identifying 252 as having bone metastasis (26.7%) during the clinical course of the disease. Of the 252 with bone metastasis, 121 (48%) presented with related complaints that led subsequently to the diagnosis of metastatic RCC. A total of 130 patients had metastatic bone disease on presentation: 92 only in bone and 38 bone plus soft tissue. This represents 13.7% (130/947) of the total patient population with RCC analyzed.

The results of our retrospective survey of bone scintigraphy in conjunction with renal-cell carcinoma, as well as an analysis of the data presented by Forbes et al. and Swanson et al. (*10,11*), indicate that the incidence of metastatic skeletal disease at the time of diagnosis of renal-cell carcinoma is low. In addition, the presence of metastatic bone disease does not appear to have a significant impact upon the initial surgical diagnostic and therapeutic process. Furthermore, in Forbes's series, 72% of patients (63/87) with bone metastases had complaints referable to the skeletal system. Swanson reported that

48% (121/252) of patients with bone metastasis had skeletal symptoms as the presenting complaint leading to the diagnosis of RCC. Therefore, 121 of the 130 patients with metastatic bone disease, when first diagnosed, had symptoms of skeletal disease.

As a result of our series and an examination of Swanson's and Forbes's series, it appears that the routine use of bone scintigraphy in the absence of complaints referable to the skeletal system is a procedure that has low yield. It also fails to alter the diagnostic and therapeutic process in the patient who presents with a renal lesion likely to be RCC.

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