Bone Secondaries in Breast Cancer: The Solitary Metastasis

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The bone scan findings of 160 consecutive cases of breast cancer metastatic to bone presenting to Guy's Hospital between 1982–1987 were retrospectively assessed for number and distribution of lesions. Twenty-one percent of patients relapsed with a solitary bone metastasis. The spine was the commonest site for both solitary (52% of cases) and multiple (87%) metastases. Solitary bone metastases are more common than previously thought.

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Metastatic involvement of the skeleton is common in patients with breast cancer. Detection of these lesions has both prognostic and therapeutic significance, patients with bony metastases having a mean survival of only 2 yr (*1*). Isotope bone scanning is widely utilized for the detection of bony metastases and is generally accepted as having a high sensitivity but low specificity (*2*). It has been suggested that the low specificity may be improved by the consideration of the number of lesions, their location and distribution (*3*). Solitary abnormalities in cancer patients may be the result of malignant disease. However, it is generally stated that only 7–8% of metastatic malignant bone disease initially appears as a single focus (*3–6*). In the present study we have reviewed the bone scan findings of 160 women with proven bony metastases from carcinoma of the breast in order to evaluate these assertions as we feel that they have not been adequately addressed previously.

METHODS

One-hundred sixty consecutive women with histologically proven carcinoma of the breast whose first relapse of their disease was to bone were identified. All attended a single breast cancer clinic. Patients with direct involvement from local soft-tissue disease were excluded. All patients were thought to be free of metastatic disease at first referral to the breast clinic. The metastases were detected on an initial screening bone scan or during follow-up, most patients having scans at 6-mo intervals.

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All scans were performed ~4 hr after injection of 750 MBq of technetium-99m (^{99m}Tc) methylene diphosphonate. Scanning was performed with wide field of view gamma cameras utilizing either moving camera or static multiple image techniques. The moving camera technique imaged the entire skeleton whereas the multiple view technique imaged only the axial skeleton, skull, humeri, and femora.

The earliest abnormal scans were identified and the site of solitary abnormalities and the distribution of multiple abnormalities were noted. The scans had all been read by a consultant nuclear physician. The scan information was correlated with clinical, radiological and computed tomography data. Solitary abnormalities were only considered to represent metastases if radiographs showed typical features, most notably destruction. Of the 33 patients with solitary metastases, confirmation in 25 was by radiographic changes and serial scans showing increased tracer activity, and the later development of multiple lesions. Seven patients had typical radiographic changes. One patient had suggestive radiographic changes and later positive serial scans.

RESULTS

Out of a total of 160 patients 33 (21%) relapsed to bone with a single demonstrable metastasis. Twenty-nine (88%) of these lesions were sited within the axial skeleton (Table 1).

One hundred twenty-seven patients had multiple lesions present at relapse, the axial skeleton was commonly involved (Table 2). In only four cases (3%) were neither the spine nor ribs involved. No cases were seen in which there were multiple lesions within the appendicular skeleton without involvement of the axial skeleton.

Of patients with multiple metastases at relapse (n=127) 19 had these multiple metastases at initial attendance, 108 had them at follow-up after an average

TABLE 1
Anatomic Site of Solitary Metastases (n = 33)

Site	Number of cases	Percentage
Spine - Cervical	1	
- Thoracic	12	
- Lumbar	4	
Total	17	52
Pelvis	5	15
Appendicular skeleton*	4	12
Sternum	3	9
Rib	2	6
Scapula	1	3
Skull	1	3

* Two proximal humeri, one proximal femur, one tibia.

of 47 mo (range 4–250 mo). Patients who relapsed with a solitary metastasis (n=33) ten had this metastasis at the initial staging scan and 23 had a lesion discovered at follow-up after an average of 42 mo (range 5–186 mo).

DISCUSSION

Bone metastases from carcinoma of the breast are very common and have been demonstrated by post mortem studies in up to 70% of patients (*6,7*). Isotope scanning is the most sensitive screening procedure for the demonstration of bone pathology but it has low specificity (*2,8,9*). It has been suggested that the number, location and distribution of lesions on a bone scan may provide some guide as to the likely etiology of the lesions (*3*). Approximately 15% of patients with malignant disease have solitary bone scan abnormalities (*5, 10*) and between 25 and 65% of these may be shown to be malignant (*4,10,11*). Bone metastases presenting with a solitary lesion is said to be uncommon, a figure of 7% being quoted (*3,4*). This figure is derived from the paper of Corcoran et al. (*5*). Our findings are at variance with this observation. We found that 21% of patients with metastatic disease had a solitary lesion as the initial finding. This difference may be due to a number of factors. Our population was highly selected, representing only breast cancer patients with no other known metastases or recurrence. All our scans were performed with gamma cameras as opposed to the exclusive use, by Corcoran, of rectilinear scanners. Many of the solitary metastases we have demonstrated occurred in asymptomatic patients having screening or follow up scans. The majority of our patients were undergoing regular six monthly scans as required by protocols for therapy. It is therefore conceivable that if more frequent follow-up scans were performed then the proportion of solitary lesions might even rise, presumably showing that we are simply identifying an earlier stage in the disease process. In other respects our results are in agreement with previous studies. The commonest site for deposits is the axial skeleton (including ribs, sternum and clavicles) as demonstrated both by isotope scanning (*5,12*) and postmortem studies (*7*). We found that multiple metastases within the appendicular skeleton without axial involvement to be rare. As many of our images excluded the lower leg and forearm, it is possible that some cases were wrongly classified. However, metastases at these sites are rare, accounting for only 4% of all skeletal metastases (*12*).

TABLE 2
Anatomic sites involved by multiple metastases (n = 127)

Site	Number of cases	Percentage
Spine	110	87
Ribs	98	77
Pelvis	80	63
Appendicular skeleton	69	54
Skull	45	35
Sternum	25	20

Rib involvement was common (77%) in patients with multiple metastases but an uncommon site (6%) of solitary metastases, this agrees with previous findings (*13*). This may, in part, be due to the difficulty in differentiating malignant involvement from trauma or radiation damage. By adopting a cautious approach we may have under reported solitary rib lesions.

The clinical relevance of early detection of metastatic breast cancer has been discussed before (*1*). Premature death from metastatic disease is accepted as inevitable despite present treatments. However adjuvent systemic therapy does prolong survival. It seems logical therefore that if the prognosis of undetectable micrometastatic disease is influenced by treatment, then a small tumor burden detected by sensitive imaging tests, could respond similarly (*14*).

When considering a bone scan showing a solitary active bony lesion in a patient with breast cancer one should be aware that 21% of bony relapses occur in this manner. Plain film radiology, possibly supplemented by computed tomography and biopsy, should be obtained.

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