

Detection of bone metastasis from breast cancer

An accurate, four-film, roentgenographic survey

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IN a patient suspected of having mammary carcinoma, the presence of skeletal or pulmonary metastases may dissuade the surgeon from planning a radical operation on the breast itself. The preoperative roentgenograms (posteroanterior and lateral) of the chest will reveal evidence of pulmonary metastasis and also display a number of bones that may be the site of skeletal metastasis. The addition of a plain film of the abdomen in the preoperative evaluation makes available more bony areas for scrutinizing. A so-called "bone survey," including radiographic examination of the skull, spine, chest, pelvis, and long bones, is often conducted in an effort on the part of the physician to determine the presence or absence of skeletal metastases not otherwise identified.

One of us (S.O.H.) wondered how often a complete bone survey actually discloses metastases not shown by chest films and a plain film of the abdomen. Bones that usually can be seen on 14 inch by 17 inch chest roentgenograms include ribs, some thoracic and cervical vertebrae, clavicles, scapulae, and humeral heads. Bones that ordinarily can be seen on a 14 inch by 17 inch roentgenogram of the abdomen include lumbar and sacral vertebrae, lower ribs, most of the pelvic girdle, and the heads and necks of the femurs. If the more complete examination of bones rarely yields more pertinent information, the patient could be spared unnecessary irradiation, inconvenience, and expense. To investigate this problem, a retrospective study of patients with carcinoma of the breast was undertaken, and the results are herewith reported.

Methods and materials

Two-hundred consecutive patients' charts coded with the diagnosis of metastatic carcinoma of the breast were reviewed. These were complete inpatient and outpatient records. They were started when the patient was first

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seen at this institution, and have been continued through all treatment obtained here or until death. These records, therefore, represent 200 different patients.

The roentgenographic records on the charts were read to see how many patients had bone metastases reported. When any bone metastases were present, the affected bones were noted. When the patient had had a bone survey, the results were recorded. Also, reports of coincidental lung metastases were noted. All of the pertinent roentgenograms were then reviewed by one of the authors (C.R.H.), a senior member in our Division of Radiology. This had a dual purpose: first to confirm the original reading, and secondly to give continuity and conformity to the interpretations of the roentgenograms.

Roentgenograms classified as positive, were those on which the diagnosis of metastatic bony abnormality was confirmed on the rereading. Several chest and abdominal roentgenograms had suspicious areas seen on the review, and further examination was requested. These roentgenograms were considered positive when the subsequent roentgenograms were obtained soon after and confirmed the evidence of metastases.

Of the 200 charts reviewed there were 82 in which there were radiographic reports stating that there was at least one site of bone metastasis present in each of the patients at some time during the course of treatment. On reviewing the roentgenograms of the 82 patients, the presence of osseous metastases was confirmed in 72 patients; in 10 patients the evidence was inconclusive and they have been grouped with those whose roentgenograms were negative for bone metastasis.

Location of bone metastasis

Of the 72 patients with confirmed bone metastases, in 68 (94.4 percent) the lesions were demonstrated in bones that can ordinarily be seen on a roentgenogram of the chest or of the abdomen or on both. Variations in body habitus prevent definition of a "standard field" in these roentgenograms, but a superior limit of the eleventh thoracic vertebra and an inferolateral limit of the intertrochanteric line of the femur were placed on the abdominal roentgenograms for the purpose of this study. Three patients (4.2 percent) had bone metastases demonstrable only in the skull. One patient (1.4 percent) had a solitary metastasis in the distal part of the femur. None of those four patients had evidence of pulmonary metastases. In three of the four patients, spot roentgenograms, ordered on clinical grounds, displayed the lesion.

The bone survey

Of the 72 confirmed cases of bone metastases, for 25 a bone survey had been made. Twenty-four of these surveys (96.0 percent) showed the bone lesion in the chest roentgenograms or in the abdominal ones or in both. Of these 24 surveys, 13 revealed no other additional bone sites of metastases. In

only one survey of the 25 bone surveys was there evidence of a metastasis that could not have been diagnosed from the chest and abdominal roentgenograms, and that metastasis was in the skull.

Of the 128 patients who did not have bone metastases, a roentgenographic bone survey had been made in 13. There was thus a total of 38 roentgenographic bone surveys made among the 200 patients. In only one of these 38 surveys (2.6 percent) was a bone lesion demonstrated which could not be seen on either the standard chest or abdominal roentgenograms, and this would have been shown on a lateral roentgenogram of the skull.

Of incidental interest is the fact that although of the 200 patients 21 had pulmonary metastases, there were only three among the 72 patients who had skeletal metastases.

Comment

In our institution a bone survey (skull, chest, pelvis, spine, and long bones) involves from nine to thirteen or more radiographic exposures, and costs the patient from \$80.00 to \$100.00. In contrast, a chest roentgenogram (postero-anterior and lateral) and an abdominal roentgenogram (KUB) involve only three exposures and cost about \$25.00. A lateral roentgenogram of the skull would add a fourth exposure at a cost of an additional \$10.00.

Professional ethics proclaim that expense itself should not deter the obtaining of tests essential for the best care of the patient, but the ethics of common sense also demand that we use judgment in selecting the studies to be done. Although it is true that, in regard to carcinoma of the breast, the presence of skeletal or pulmonary metastases at the time of proposed definitive therapy for the primary lesion may alter the plan of treatment, delay in their diagnosis will have little effect on prognosis. Skeletal metastases that require treatment will be suspected first on clinical grounds and then confirmed by the appropriate roentgenograms. Since, in a series of 38 bone surveys in patients with carcinoma of the breast there was only one instance (2.6 percent) of a lesion not shown by roentgenograms of the chest or abdomen, it would seem unnecessary to obtain the additional roentgenograms. If desired, a single lateral roentgenogram of the skull can be added to the roentgenographic study of the chest and abdomen. This combination of roentgenograms would have included 71 of the 72 proved bone metastases each accomplished with four exposures and at a cost of about \$35.00. We believe that additional roentgenograms of bone should be ordered only when clinical signs or symptoms suggest their need.

Summary

Records were examined of 200 consecutive patients who had been diagnosed as having carcinoma of the breast with metastases. Seventy-two patients had the presence of bone metastases confirmed by reviewing their roentgenograms. Of the 72 cases, in 68 (94.4 percent) the diagnosis of bone metastases

could be made from the posteroanterior and lateral roentgenograms of the chest or the plain abdominal films (KUB).

Bone surveys, including roentgenograms of the skull and long bones, were conducted for 38 of the 200 patients, and in only one case (2.6 percent) was a metastasis to the skull demonstrated in the absence of additional metastasis seen on the chest or abdominal roentgenogram. Thirteen of these surveys were entirely negative for metastases, including chest and abdominal roentgenograms.

Roentgenograms of the chest and abdomen provide sufficient accuracy (96.0 percent), in diagnosing manifested skeletal metastases, to justify omitting additional roentgenograms of the spine, skull, and long bones (bone survey) of patients with suspected or proved carcinoma of the breast. A single lateral roentgenogram of the skull may be taken for additional information, if desired, and would increase diagnostic accuracy to nearly 100 percent. Roentgenograms of other bone sites must always be obtained when clinical signs and symptoms so dictate.