Diagnosis of Metastatic Carcinoma by Bone Marrow Biopsy Versus Bone Marrow Aspiration

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ABSTRACT

Bone biopsy of the posterior iliac crest constitutes a valuable diagnostic tool in the evaluation of patients with carcinoma. Patient acceptance in 696 cases has been good. The material obtained is superior for histologic evaluation to the technique of smears and clot sections. Smears alone are deemed inadequate.

Introduction

The past twenty years have brought many advances in cancer therapy, placing a new emphasis on the complete evaluation of patients prior to instituting appropriate measures such as radical surgery, radiation or chemotherapy. Documentation of the presence or absence of metastases to the skeletal system is an important step in the evaluation of the patient with cancer. The presence of bone metastases has been quoted between 20 to 30 percent of cases.2,6,12 Furthermore, for some tumors such as breast cancer the metastatic rate has been reported from 47 to 78 percent.2,6 Radiologic evaluation of the skeleton for metastases has been demonstrated to have definite limitations, since only 48 to 57 percent of the metastatic deposits can be visualized.1,4 If other examinations can bridge this gap, they must be evaluated critically and applied in the appropriate manner in all cases.

In 1955, Hyman14 analyzed 66 cases in which tumor cells had been found on routine bone marrow aspiration from the iliac crest of which 37 percent were without radiologic evidence of bone pathology. Ackermann2 delineated the disadvantages of bone marrow aspiration as: (1) small sample, (2) single cells often questionable, (3) deep lesions not accessible and (4) sclerotic lesions which cannot be aspirated. Ackermann recommended bone biopsy as a superior alternative. To date, 12 different needles have been developed for bone biopsy.2,5,7,10,13,15,19,20,22,23,24,25

In the present study, only two needles have been used: the Westerman-Jensen10 and the Jamshidi15 needle. As a sampling site, the posterior iliac crest was routinely used since patient acceptance of this site is usually good. Rubinstein21 examining 100 cases of advance carcinoma by simultaneous sternal and iliac crest aspiration, found only four cases in which metastastic
tumor was present in the sample from the sternum but not in the iliac crest. These findings, in combination with patient acceptance, are responsible for our selecting the iliac crest rather than the sternum as the biopsy site.

The technique of the marrow biopsy is described in textbooks, and numerous papers. In our experience, the Westerman-Jensen needle (figure 1) was bent easily and became blunted during frequent use. The Jamshidi needle (figure 2) is quite sturdy and yields excellent results even in the hands of the less experienced operator. The specimens obtained are about 2.5 cm long and 2 mm wide (figure 3). After fixation for approximately one hour in 10 percent neutral formalin, decalcification is carried out. The decalcification solution is made up by adding 1.180 liters of 40 percent formaldehyde to 11.560 liters of distilled water and adding 4.260 liters of 88 percent formic acid. The time for decalcification in this solution is two hours for the average biopsy. If the specimen is fragmented or demineralized by disease, one

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**Figure 1.** Westerman-Jensen needle: (A) obturator, (B) cutting blade, (C) stylette and (D) needle.

**Figure 2.** Jamshidi needle: (A) stylette, (B) obturator and (C) needle.
hour should be adequate. Washing the specimen in running water for 20 minutes after decalcification is very important.

In our series of 1,195 bone marrow specimens, 499 were obtained by aspiration smear and clot section and 696 by needle biopsy and smear (table I). A 43 percent rate of inadequate specimens for either aspiration or bone biopsy compares well with other published series, such as the five percent reported by Ellis in 1445 cases biopsied with the Vim-Silverman needle. Though the number of specimens containing tumors are rather small, the change in technique from aspiration to biopsy in our series almost doubled the percentage of metastatic tumor deposits which were found (table I).

Of interest are some of the clinical data in the cases with tumor metastases to the bone marrow (table II). There appears to be a predominance of young women with widespread metastases. This occurred at a time when the discharge rate for breast cancer patients from the hospital declined from 6 to 3.7 percent. No ready explanation for this finding is apparent.

As has been pointed out by others, laboratory tests such as hemoglobin, leukocyte, and platelet counts may be normal even if metastases are present. Extensive replacement of marrow by tumor, or by tumor associated with myelo-fibrosis, is associated with anemia, thrombocytopenia and neutropenia. Large numbers of nucleated red blood cells may be present, as in some of the cases shown in table II. The frequency of these abnormalities is not sufficient to utilize them solely without bone marrow examination in the diagnosis of metastatic bone marrow disease.

The quality of tissue obtained by needle
biopsy is superior to clot section. No matter how many smear preparations are made, one rarely feels extremely comfortable in the evaluation of the limited amount of material. In figure 4 the material obtained in our series is contrasted by biopsy and by clot sections. The morphology of malignant cells on smears differs somewhat from the sectioned material. If the primary tumor is unknown, as in some cases, histologic evaluation of multiple sections combined with special staining has definite advantages, aiding in the histologic classification of the neoplasm.

Conclusions

Metastases to the skeleton are frequent enough in patients with malignant neoplasms that bone marrow biopsies, with a suitable needle, should be part of the work-up. The therapeutic approach may have to be altered if the marrow biopsy demonstrates metastatic disease.

References

15. JAMSHIDI, K. and SWAIN, W. R.: Bone marrow biopsy with unaltered architecture: A
Molecular Defects in Von Willebrand’s Disease and Hemophilia. Theodore S. Zimmerman, M.D. (Scripps Clinic and Research Foundation, La Jolla, CA)

Classic hemophilia and von Willebrand’s disease are the most common inherited disorders of blood coagulation associated with decreased Factor VIII procoagulant activity. Recent identification of an antigen (the von Willebrand’s disease antigen, Factor VIII-like antigen) which is decreased or absent in von Willebrand’s disease but present in normal amounts in hemophilia, has markedly simplified the differential diagnosis of the Factor VIII deficiency states. Current evidence indicates, however, that the molecule bearing Factor VIII procoagulant activity is distinct from that expressing the von Willebrand’s disease antigen, though they are probably complexed in normal plasma. A new solid phase immunoassay for the molecule bearing Factor VIII procoagulant activity provides evidence that there is a Factor VIII molecule present in classic hemophilia, though it is partially deficient in antigenic determinants. In contrast, there appears to be a true deficiency of otherwise normal Factor VIII in von Willebrand’s disease with a concomitant decrease in the von Willebrand’s disease antigen. An additional activity, designated the von Willebrand’s factor, is decreased in von Willebrand’s disease, though normal in classic hemophilia. This activity is required for adhesiveness of platelets to glass beads as well as for ristocetin induced platelet aggregation. Lack of von Willebrand’s factor is probably responsible for the prolonged bleeding time of von Willebrand’s disease and also serves to distinguish this disease from classic hemophilia.