It is rarely difficult or impossible to extract sufficient material even with dense, sclerosing lesions which the needle cannot penetrate and it is often possible to extract the material after perforation with an electric or manual trephine.

We perform the combined cytologic study of the smears and the histological study of the paraffin-embedded material. We consider the smear to be a supplementary method of great value in studying the line details of cell structure, especially in conditions that involve the hematopoietic system. Moreover, it often permits differentiation of Ewing's sarcoma from osteomyelitis and eosinophilic granuloma. In many cases, however, a smear is not sufficient for accurate classification of either benign or malignant tumors or for differentiation between primary and metastatic malignant tumors. On the other hand, in some neoplastic growths, in Pagets disease, or in other lesions in which the fibrous connective tissue or bone-forming stroma predominates, smears have little or no useful cell content and consequently we do not take smears in these cases.

Moreover, with sufficient material obtained by percutaneous biopsy in adequate conditions, bacteriological and other complementary studies at present utilized and necessary for a more accurate diagnosis (histochemistry, immunohistochemistry, electron microscopy, cytogenetic, DNA image analysis and flow cytometric analysis) can be performed.

Although open biopsy provides an adequate and representative sample of tissue for diagnosis, our experience as well as that of others, (M.D. Anderson Institute in Houston; Rizzoli Institute in Bologna), justifies the recommendation of CNB. It is technically simple, is a less extensive procedure with minimum trauma, involves no risk to the patient and makes it possible to extract material from a tumor at different depths and to reach sites that are otherwise only accessible by major surgery. It saves time and money and can usually be carried out in the outpatient department, except in young children, when general anesthesia is often necessary.

Although technically a simple method, CNB nevertheless does require experience on the part of the orthopedic surgeon, radiologist and pathologist. We have observed that results from medical centers where this procedure is used regularly are superior in terms of the quantity and value of the material submitted to the results from clinics where lack of opportunity deprives the orthopedic surgeon or the radiologist of the necessary experience. Likewise, the pathologist's competence increases the diagnostic accuracy of the method.

In our laboratory, we counted 3,394 CNB from 1986 to 1997 with a diagnosis accuracy of 83%.

Although we use both methods (CNB and FNA), we give priority to the histopathological interpretation of the embedded material, with which we have obtained more satisfactory results.

Though open biopsy provides an adequate and representative tissue sample for diagnosis, our experience, as well as that of others, justifies the recommendation of this method, which has become the method of choice in our laboratory.

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Osteosarcoma of the bone

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Osteosarcoma can be defined simply as a malignant neoplasm in which the tumor cells can be shown to produce a matrix, either osteold or bone.

Experience over the last 20 years has shown that osteosarcoma of bone is not one clinicopathological entity but includes a variety of tumors with distinct clinical, roentgenographic and histological features. The most common type can be referred to as conventional osteosarcoma. This type occurs predominantly in children and adolescents, involving the metaphysis, and is almost always highly malignant in its histological appearance.

Although, by definition, all of these tumors produce an osteold or bony matrix, the amount of matrix is quite variable. Approximately half of all conventional osteosarcomas produce abundant osteold matrix and may be termed osteoblastic osteosarcoma. About a quarter of all osteosarcomas produce a prominent chondroid matrix and may be termed chondroblastic osteosarcoma. These chondroblastic osteosarcomas generally look more malignant than conventional chondrosarcomas. Bony matrix may be seen at the periphery of chondroid lobules or in the center. About a quarter of all osteosarcomas will have prominent spindle cell proliferation with only focal matrix production. These may be termed fibroblastic osteosarcoma. This distinction between osteoblastic, chondroblastic and fibroblastic osteosarcomas probably has no prognostic significance.

Most osteosarcomas apparently arise in normal bone. However, osteosarcomas may arise in a preexisting condition, such as Paget's disease. The incidence is probably less than one percent. Most osteosarcomas arising in Pagets disease are high-grade malignant tumors and are associated with a very poor prognosis.

It has been known for a long time that radiation therapy may be associated with the development of sarcoma after a latent period. This latent period is usually over 5 years but may be as delayed as 50 years. Most postradiation osteosarcomas are also high-grade malignant tumors. Postradiation sarcomas tend to involve surgically inaccessible sites such as the sternum, the pelvis and the spine. This

unusual localization results in somewhat poorer prognosis. However, the prognosis for postradiation sarcoma situated in long bones is no different from the prognosis of conventional osteosarcoma. Osteosarcomas may rarely arise in other benign conditions such as fibrous dysplasia.

Telangiectatic osteosarcoma is a rare variant in which the roentgenograms show a purely lytic destructive lesion and the histology suggests a diagnosis of aneurysmal bone cyst under low power. Cytologically, however, the spaces are lined with very malignant-looking cells. The prognosis in telangiectatic osteosarcoma is probably the same as for conventional osteosarcoma. Indeed, it appears that these tumors are extremely sensitive to chemotherapy and may be associated with a better prognosis.

Some osteosarcomas are extremely well differentiated. The neoplastic cells do not show overt signs of malignancy. This may lead to a mistaken diagnosis, especially of fibrous dysplasia. These well-differentiated osteosarcomas are locally aggressive lesions which do not usually metastasize.

Parosteal osteosarcoma is the most common type of osteosarcoma arising on the surface of bone. Approximately 80% of these occur on the distal end of the femur posteriorly. There is a slight female predominance. The roentgenograms show a heavily ossified mass situated on the cortex of the posterior femur. The tumor is composed of bony trabeculae in a parallel arrangement. Spindle cell proliferation is seen between the bony trabeculae. The spindle cells do not show overt signs of malignancy. Parosteal osteosarcoma is a locally aggressive disease with limited potential form metastasis.

Periosteal osteosarcoma is a rare variant of osteosarcoma appearing on the surface of bone. These tend to involve children and adolescents and there is a tendency to involve the shaft of a long bone. Roentgenograms show a lucent defect situated on the cortex of bone. Histologically, periosteal osteosarcoma is a moderately differentiated chondroblastic osteosarcoma. The prognosis seems to be just about as good as in parosteal osteosarcoma.

Rarely, a high-grade osteosarcoma may occur on the surface of bone. The distinction from a conventional osteosarcoma is made purely based upon roentgenographic features. The prognosis is about the same as for conventional osteosarcoma.

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The histological response to chemotherapy as a predictor of the oncological outcome of operative treatment of Ewing's sarcoma

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Seventy-four patients who had a Ewing's sarcoma of the bone were managed with preoperative and postoperative chemotherapy as well as operative resection, with or without postoperative irradiation. The primary objectives of the study were to determine the histological response to preoperative chemotherapy in terms of the percentage of tumor necrosis and to assess the relationship between the histological response and the oncological outcome.

The minimum duration of follow-up of the surviving patients who were continuously free of disease was 5 years. Sections of each operative specimen were examined and the histological response to chemotherapy was graded semiquantitatively. Grade I indicated necrosis of 50% of the tumor or less; grade II, necrosis of more than 50% but less than 90%; grade III, necrosis of 90-99% and grade IV, necrosis of 100% of the tumor. Of the 74 tumors, 44 (59%) were exquisitely sensitive to chemotherapy and had complete (grade IV) or nearly complete (grade III) necrosis. In contrast, 14 tumors (19%) had little or no response to chemotherapy (grade I) and 16 (22%) had a moderate degree of necrosis (grade II).

The' histological response to preoperative chemotherapy (p=0.001), followed by the size of the tumor (p=0.001) were the most important predictors of event-free survival. At 5 years, the rate of event-free survival was zero in 14 patients who had had a grade-I response, in six of 16 who had had a grade-II response, and in 37 (84%) of 44 who had had a grade-III or IV response. The risk of local recurrence was most strongly associated with the operative margins; there were only four local recurrences (6%) after 67 resections were negative margins. Local recurrence may also have been influenced by the histological response and the use of local radiation. There were no local recurrences after operative treatment of six tumors that had been associated with pathological fracture.

The histological response to preoperative chemotherapy and the size of the primary tumor are the most important clinical predictors of the outcome of operative treatment of nonmetastatic Ewing's sarcoma. These indicators should be used to identify patients who are at high risk for metastasis as such patients may be candidates for more intensive or novel therapies.

Enchondroma *versus* low-grade central chondrosarcoma

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The diagnosis of cartilage lesions depends on three factors. First, clinical and radiographic features must be considered. These include the age of the patient, symptoms, location in the skeleton and the pattern of bone destruction or mineralization. Second, low-power histological features must be carefully studied to learn the growth pattern of the lesion. Third, the cellularity and degree of nuclear atypia must be analyzed. This last factor, the so-called "cytologic grade', is the least important because there is considerable overlap in the cytologic features of the various cartilage lesions. Nonetheless, review of the spectrum of the three cytologic grades of cartilage should precede the study of specific diagnostic problems.

Distinguishing an enchondroma from a low-grade central chondrosarcoma is one of the most difficult problems in bone pathology. Making the correct diagnosis depends on close communication between the clinician and the radiologist before a biopsy is per-