CHAPTER **45**

BIOPSY GUIDELINES IN SUSPECTED BONE TUMORS

Mickey D. Stapp, D.P.M.

Gerard V. Yu, D.P.M.

Tumors of bones of the feet are relatively uncommon. Because of this, many physicians are not familiar with their diagnosis and treatment. If a suspected bone tumor is discovered, the management of this potential neoplasm should be handled by a physician familiar with the diagnosis and treatment of skeletal tumors. A team approach, consisting of the surgeon, radiologist, pathologist, and oncologist, if necessary, must be undertaken.

Tumors of bone may be primary, originating from tissues of the foot, or secondary, metastatic to the foot. Frequently, secondary bone tumors are the first indication of a metastatic carcinoma. While malignant tumors rarely metastasize to the bones of the foot, cancer of the breast, prostate, kidney, and lung may do so. Minimal screening in these patients should include chest and breast examination, prostate examination, complete blood count and urinalysis, prostate specific antigen, renal sonogram or CT, and serum electrophoresis.

Initial evaluation of a suspected bone tumor must include an extensive history and physical. Emphasis must be placed on onset, course, changes, age, occupational exposure, social history, and a thorough review of systems for systemic symptoms that may suggest metastatic disease to the foot.

Physical examination should include inspection, as well as gentle palpation of the lesion to determine consistency and extent of expansion. Routine roentgenology is of great value in evaluating tumors of bone. A CT scan may provide additional information not obtained from standard roentgenograms. Laboratory testing should be performed, but it must be remembered that they are not diagnostic for any bone tumor. The only laboratory procedure that will definitively establish a diagnosis is biopsy.

Lichtenstein, in 1954, provided us with certain basic principles entailed in the recognition and appropriate treatment of bone lesions that may be neoplasms. 1) If a patient presents with a chief complaint involving a skeletal part, obtain good roentgenograms promptly. If these disclose a significant skeletal lesion that may be neoplastic, do not guess at its interpretation, but obtain a reliable opinion. 2) The problem in diagnosis should be analyzed before surgery is undertaken, since the choice of procedure, whether it be conservative biopsy, curettement, resection, or amputation, varies with circumstances. 3) Definitive treatment should be predicated upon accurate pathologic diagnosis. 4) If roentgen therapy is the treatment of choice, employ the smallest dose calculated to be effective. 5) In dealing with what appears to be a malignant bone tumor, before resorting to radical surgery, obtain expert opinion if there is any doubt in regard to the diagnosis of sarcoma. More mischief is done through over-diagnosis than through failure to recognize malignant tumors promptly. 6) If, on the other hand, the malignant nature of a bone lesion has been clearly established, treat it without delay and as aggressively as may be necessary. The result of compromise and temporizing is usually complete therapeutic failure.

BIOPSY

There are a number of traditional techniques to obtain material for diagnosis by a pathologist for suspected bone tumors. Aspiration biopsy is used to withdraw fluid from a lesion. The presence of fluid in a bone lesion suggests a cyst. Cytologic preparations should be made from the aspirated fluid and the remaining fluid sent in a sterile container without any additives or preservatives. Inability to aspirate fluid from a mass suggests that the needle is not in the correct location, or that the tumor is solid.

Fine needle aspiration biopsy, performed either percutaneously or openly, can be used. A solid core of material can be fixed in formalin and sent for histologic study. While less traumatic than an incisional or excisional biopsy, there is risk of sampling error. The core of tissue obtained may not represent the tissue in question adequately.

Excisional biopsy is best utilized when the lesion in question is less than one centimeter in

diameter. The lesion, along with a thin rim of clinically normal bone, is removed.

When the lesion measures greater than one centimeter, an incisional biopsy can be performed. The lesion is openly identified and a representative portion of the lesion is submitted for histopathologic study. Often with bone, this proves impractical. Bone lesions are often removed via curettement or en bloc resection with diagnosis being made from these specimens. Further surgical and/or medical treatment can then be planned accordingly.

Bone tumors of unknown etiology should be cultured for bacteria, acid-fast bacilli, and fungi at the time of biopsy. The site chosen for biopsy should be placed so that it can be removed at the time of definitive resection if further surgery is required. The surgeon performing the biopsy must know the planned definitive resection prior to biopsy being performed.

More recently, four oncologic surgical margins based on the natural barriers to tumors, have been described and utilized in the biopsy and excision of bone tumors. These four margins must be understood in order to follow established guidelines for surgical management of suspected bone tumors. The determinations of margins may be established by inspection of the cut surfaces of bone during the biopsy procedure. Often times areas of questionably involved bone must be sent to the pathologist to determine whether the margins are normal or reactive at the level of resection. The four surgical margins include: 1) Intracapsular excision which is performed in a piecemeal type fashion within the pseudocapsule or confines of the bone tumor. 2) Marginal excision which is an en bloc excisional biopsy within the reactive zone. 3) Wide excision which is an en bloc excision done through normal bone beyond the reactive zone but within the bone of origin. 4) Radical resection which is an en bloc excision of the lesion and the entire bone of origin often times through a disarticulation procedure.

SURGICAL MANAGEMENT OF BONE TUMORS

Bone tumors may be classified as inactive benign, active benign, aggressive benign, low-grade malignant, or high-grade malignant. Inactive benign bone tumors are usually asymptomatic, are discovered incidentally, and are seldom related to a pathologic fracture or mechanical dysfunction. They grow slowly until they reach a point and then grow no longer. These tumors remain intracompartmentally within the bone of origin. Radiographically, they appear well marginated by a cortical shell without deformation or expansion. These inactive benign bone tumors include simple bone cysts, enchondromas, osteochondromas, osteomas, intraosseous lipomas and intraosseous ganglia. These are treated, if symptomatic, with intracapsular excision via curettage and autologous cancellous bone packing.

Active benign bone tumors are mildly symptomatic, discovered because of discomfort, and occasionally are associated with a pathologic fracture or mechanical dysfunction. These tend to grow steadily and continuously but remain encapsulated within bone. Radiographically, these bone lesions are well, but irregularly, marginated with cancellous bone that may show expansion or deformation. These tumors include unicameral bone cysts and osteoid osteomas. Since these have a significant recurrence rate after intracapsular excision, marginal excision is recommended.

Aggressive benign bone tumors include giant cell tumors, chondroblastomas, aneurysmal bone cyst, and osteoblastomas. They are most frequently found within the talus or the calcaneus if occurring within the foot. They are often symptomatic and discovered because of discomfort and/or a mass. They are often associated with a pathologic fracture when in a weight-bearing bone. These aggressive lesions readily penetrate cortical bone and articular cartilage with cortical destruction and periosteal Codman's triangles. These tumors are treated via wide surgical excision when possible. If these lesions occur in areas not practical for wide surgical excision, then marginal excision with adjuvant procedures should be performed. Extensive exposure and a large cortical window should be carried out to remove all gross tumor with curettage. After curettage and irrigation, an adjuvant procedure (phenol, liquid nitrogen, laser, cryosurgery, PMMA) can be performed followed by packing the defect with autologous cancellous bone.

Low-grade malignant tumors of bone are invasive yet have a low risk of distant metastasis. These tumors are slow, steady growing, painless masses that are seldom symptomatic. They are not inhibited by natural barriers such as bone and slowly erode through the cortex. They seldom extend intraarticularly. Radiographically, these lesions demonstrate a reactive rim of cancellous bone with external

Codman's triangles and endosteal scalloping. The low-grade malignancies of bone include chondrosarcomas. The treatment for these lesions should consist of wide excision when possible.

High-grade malignant tumors include osteosarcomas and Ewing's sarcomas. These are destructive symptomatic masses that are often associated with pathologic fractures. These rapidly growing lesions are uninhibited by natural barriers and extend extra-compartmentally. They erode through cortical bone and articular cartilage. The lesion and the surrounding bone is poorly marginated with patchy cortical destruction, small Codman's triangles, and ill-defined intramedullary extensions. Treatment of these malignant lesions involves wide or radical excision. Often, the radical excision requires amputation or disarticulation to achieve complete excision of the compartment of origin.

CONCLUSION

The biopsy of bone tumors should be performed in a timely manner on any suspicious skeletal change suggestive of a neoplasm. The biopsy should be diagnostic and if possible, therapeutic. The surgeon performing the biopsy should be well versed in the diagnosis and management of bone tumors. Second surgical opinions and a close working relationship with the pathologist, radiologist, and oncologist are necessary for the proper management and best potential outcome for the patient.

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