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Joint Bone Spine 72 (2005) 53–60
JOINT BONE SPINE
http://france.elsevier.com/direct/BONSOI/

Original article

Contribution of percutaneous biopsy to the definite diagnosis in patients with suspected bone tumor

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Received 13 March 2003; accepted 8 March 2004

Available online 07 June 2004

Abstract

***Objectives.* –** Percutaneous biopsy is widely used for the diagnosis of primary and secondary bone malignancies. The primary objective of this study was to evaluate the contribution of percutaneous biopsy to the definite diagnosis in patients with suspected bone tumor. The secondary objective was to assess the potential diagnostic benefits of a second percutaneous biopsy when the first failed to provide the diagnosis.

***Methods.* –** We retrospectively reviewed 108 percutaneous biopsies of bone lesions in 89 patients admitted to our rheumatology department from January 1994 to December 2001. There were 61 men and 28 women with a mean age of 59 years. The biopsies were done under computed tomography guidance in 68 patients and fluoroscopy in 21 patients.

***Results.* –** The diagnostic yield of percutaneous biopsies was 68.5% overall and was significantly higher in patients with metastatic bone disease (100%) than in patients with primary tumors (83%) or hematological malignancies (58%) ($P = 0.0004$ and $P < 0.0001$, respectively). Yields were higher for peripheral lesions (85%) than for vertebral (65%) and pelvic (60%) lesions. Yields were 87% for lytic lesions, 66% for sclerotic lesions, and 50% for mixed lesions. When soft tissues were sampled, the yield was 100%, as compared to 86% for biopsies composed only of bone.

***Conclusion.* –** Percutaneous biopsy of suspected bone tumors is a safe and inexpensive procedure that consistently ensures the diagnosis of bone metastases. The diagnostic yield is lowest in patients with bone lesions caused by hematological malignancies. When two biopsies fail to provide the diagnosis, further biopsies are unlikely to be helpful.

Keywords: Percutaneous bone biopsy; Bone tumor; Diagnostic value; Metastasis; Cancer

1. Introduction

The introduction of percutaneous biopsy has substantially benefited the diagnosis of skeletal lesions, obviating the need for open surgical biopsy in most patients. Percutaneous biopsy is now a crucial step in the management of primary and secondary bone tumors. This safe and well-standardized procedure should be planned carefully by a multidisciplinary team. We previously reported that percutaneous biopsy of vertebral lesions in patients admitted to our rheumatology department provided the correct diagnosis in most cases, the diagnostic yield being highest in the subgroup with metastatic vertebral disease [1]. However, a second biopsy done percutaneously or surgically was required in 7% of patients [1]. In the present study, our main objective was to investigate the diagnostic yield of percutaneous biopsy used to investigate suspected vertebral or peripheral bone tumors in patients admitted to our rheumatology department between January 1994 and December 2001. Our secondary objective was to determine whether a repeat percutaneous biopsy was helpful when the first biopsy failed to yield the diagnosis, with the goal of defining the role for open surgical biopsy.

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doi:10.1016/j.jbspin.2004.03.008

2. Patients and methods

2.1. Patient selection

Patients who underwent percutaneous biopsy of suspected bone tumors were eligible for the study, provided they had no evidence of bone or joint infection. Using these criteria, we identified 94 cases entered in our rheumatology department database over the 8-year period from January 1994 to December 2001, and we reviewed their medical records. The database information did not discriminate between percutaneous and surgical biopsies. The two patients with suspected muscle sarcoma as the reason for the biopsy were excluded. In the remaining 92 patients, the biopsy specimens were taken either from bone or from soft tissue adjacent to the suspected bone tumors. Of these 92 patients, three required immediate surgery, either for fixation of a lesion carrying a high risk of fracture ($n = 2$) or for excision of a tumor with a potential for metastatic spread ($n = 1$). This left 89 patients in whom 108 percutaneous biopsies of bone or adjacent soft tissue were obtained.

As shown in Table 1, there were 61 men and 28 women, with a mean (±S.D.) age of 59 ± 14 years (range, 15–86 years). Mean time from symptom onset to biopsy was 5.4 ± 8 months. The need for a biopsy was determined based on the history, clinical picture, laboratory parameters, and imaging study findings. The biopsies were done to determine the nature of the lesion and, in patients with suspected metastatic disease, to guide investigations aimed at identifying the primary. Before the biopsy, the suspected diagnosis was metastatic disease in 65 (73%) patients, hematological malignancy in 21 (23.6%) patients, and primary tumor in 11 (12.4%) patients; some patients had more than one suspected diagnosis. Of the 89 patients, 16 (18%) had a history of neoplastic disease, seven (7.8%) had hypercalcemia at the time of the diagnostic workup, and 51 (57.7%) had multiple lesions at presentation. Laboratory tests (erythrocyte sedimentation rate and/or C-reactive protein) indicated inflammation in 52 (59%) patients. The bone lesions were visible on plain radiographs in 74 (83%) patients. Overall, imaging studies (plain radiographs, computed tomography [CT], and/or magnetic resonance imaging [MRI]) showed lytic lesions in 73 (82%) patients, sclerotic lesions in three (3.3%) patients, and mixed lesions in 10 (11.2%) patients. The lesions were unclassifiable in the remaining three (3.3%) patients; the diagnoses were histiocytosis X of the spinous process of T3, osteoporosis manifesting only as a signal abnormality on MRI scans, and osteoid osteoma, respectively. The lesions were located in the spine in 43 (48.3%) patients, the pelvis in 27 (30.3%) patients, and the peripheral skeleton in 19 (21.3%) patients (Table 2).

Table 1
Characteristics of patients who underwent percutaneous biopsy of a bone lesion between January 1994 and December 2001

Patients	Characteristics
Total number of patients	89 patients
Men	61 patients
Women	28 patients
Mean age (range)	59 years (15–86)
Mean symptom duration (range)	5.4 months (1 week–72 months)
History of cancer	16 patients (18%)
Hypercalcemia at admission	7 patients (7.8%)
Laboratory evidence of inflammation at admission	52 patients (59%)
Multiple lesions at presentation	51 patients (58%)
Lesion visible by plain radiography	74 patients (83%)

Table 2
Site distribution of lesions investigated by percutaneous biopsy

Site	Number of patients
Spine	43
Cervical vertebra	2
Thoracic vertebra	13
Lumbar vertebra	18
Sacral vertebra	10
Pelvis	27
Femur	7
Tibia	1
Humerus	3
Rib	2
Scapula	3
Sternum	1
Clavicle	2
Total	89

2.2. Biopsy devices and procedures

Informed consent was obtained from all patients. All biopsies were performed by the same team of experienced skeletal radiologists, under local anesthesia or neuroleptanalgesia, in the presence of an anesthesiologist. The patients were in the fasting state. Before the procedure, blood-clotting tests were done and a venous line was inserted; premedication was administered 30 min prior to the biopsy.

Guidance was by fluoroscopy in 21 (23.6%) patients and CT in 68 (76.4%) patients. The choice between these two methods was based on the site of the lesion and presence of soft tissue spread: CT was preferred in patients with soft tissue spread, as well as in those with thoracic spine lesions to ensure visualization of solid abdominal organs. When CT was used, the patient was placed in the prone position. Fluoroscopic guidance was used in patients with cervical or lumbar spine lesions; the position of the patient was selected based on the site of the lesion and the organs located along the trajectory of the needle. The biopsy device and technique were selected according to multiple factors including lesion depth; whether the bone and/or soft tissues were involved; and whether imaging studies showed lysis, sclerosis, or both. The diameter of the needle varied with the site and accessibility of the lesion: smaller diameters were used when the lesion was small or difficult to access.