Application and utility of computed tomography-guided needle biopsy with musculoskeletal lesions

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Abstract A retrospective study was performed on 73 patients who underwent percutaneous computed tomography-guided needle biopsy between April 1998 and March 2003. All cases were treated by orthopedic surgeons at Nagoya Memorial Hospital. Diagnostic accuracy was examined statistically by anatomical location and diagnosis. The diagnostic accuracy for all 73 patients was 88% (64/73); and excluding patients with infection, it was 92% (55/60). No statistically significant difference was found by anatomical site. The accuracy was statistically significantly lower for primary bone tumors ($P < 0.005$) and infection ($P < 0.05$). The culture detection rate was 23% (3/13). No serious complications were seen. This report suggests that, with the advances in imaging technology and biopsy needles, one no longer sees the differences in diagnostic accuracy by anatomical site that result from the use of different biopsy needles for tumors of different locations and properties. Accuracy is thus determined largely by the disease. Infection was tuberculous in 4 of the 13 infection patients, and diagnosis was possible in all of these cases from the tissue examination. Needle biopsy seems useful in the sense that it can distinguish between tuberculous lesions in cases of spinal infection. In patients with a primary bone tumor, application of needle biopsy should be subjected to further consideration.

Key words Biopsy · CT-guided · Musculoskeletal lesion

Introduction

In the field of orthopedic surgery biopsies are often necessary to establish the treatment policy for musculoskeletal tumors or infectious diseases. Open biopsy provides a sufficient sample size for the diagnosis of these diseases and is associated with a high diagnosis rate (98%); thus, it was conventionally used as the standard technique. However, when tumors exist in the deep areas of the trunk, such as the spine or retroperitoneum, and are located next to major organs or neurovascular bundles, open biopsy is not only highly invasive but there is also the possibility of causing complications. In recent years, percutaneous needle biopsy and fine needle aspiration biopsy have come to be used in such cases. These are effective methods of low invasiveness and low cost. A high accuracy of 96% has been reported, with complications ranging from 0 to 6%.5–7,11,14,15 Especially with the computed tomography (CT) guided procedure, not only can the risk of damaging major organs or neurovascular bundles be avoided but the area where the tissue is extracted can also be confirmed. Most tumor treatment centers perform core biopsy under CT-guidance.1,4,6,7 We reviewed the accuracy of CT-guided percutaneous needle biopsy performed with 73 patients over the past 5 years in our hospital and herein report its utility and applicability.

Materials and methods

A retrospective study was performed on 73 patients who underwent percutaneous CT-guided needle biopsy between April 1998 and March 2003. All cases were treated by orthopedic surgeons at Nagoya Memorial Hospital. Local anesthesia was used in all patients except a 9-year-old boy who underwent intravenous anesthesia with ketamine (Ketalar) and a Craig needle biopsy for a lesion of the neck of the right femur. As a rule, 14-gauge Tru-Cut (Allegiance) biopsy needles were used for soft tissue lesions (Fig. 1). For small soft tissue lesions next to major organs or nerve plexuses, Temno (Bauer Medical International) biopsy needles were used (Fig. 2), whereas for bone lesions, 14 gauge Ostycut (Angiomed) bone biopsy needles were utilized. If an osteolytic lesion was suspected on images and it was judged that a sufficient amount of tissue was not ob-
tained with Ostycut bone biopsy needles, Tru-Cut biopsy needles were inserted through the hole made by the Ostycut needles to obtain the needed tissue reliably (Fig. 3). If a primary tumor was suspected clinically, Craig bone biopsy needles were used (Fig. 4). In cases of infection, tissue samples were removed with Tru-Cut biopsy needles and aspirations and were used for pathology and culture tests.

Excluding infection patients, cases in which results of a biopsy for suspected tumor lesions were negative (e.g., spine compression fracture, pubic osteolysis, transient osteoporosis of the hip) were classified as nontumor lesions, and the clinical course was observed to determine whether there was any contradiction with the pathological diagnosis. A decision was made as to whether there was any contradiction between the diagnosis based on the surgical pathology report and observation of the course to present versus the pathological diagnosis based on biopsy samples. Accuracy was examined statistically by anatomical location and diagnosis. Statistical analysis was done with the Mann-Whitney test, with a statistical difference of 5% or less considered significant.

Results

There were 38 male patients and 35 female patients with ages ranging from 9 to 87 years (mean 57 ± 17 years). The diagnosis was metastatic tumor in 23 patients, infection in 13 patients, primary bone tumor in 14 patients (7 benign, 7 malignant), primary soft tissue tumor in 11 patients (6 benign, 5 malignant), and nontumor lesions in 12 patients. The pathological diagnosis of the primary bone tumor was fibrous dysplasia in three patients, giant cell tumor in one patient, solitary bone cyst in two patients, chondroblastoma in one patient, osteosarcoma in four patients, chondrosarcoma in two patients, and multiple myeloma in one patient. The pathological diagnosis of the primary soft tissue tumor was neurinoma in five patients, mature teratoma in one patient, liposarcoma in one patient, malignant fibrous histiocytoma in one patient, multiple myeloma in one patient, gastrointestinal tumor in one patient, and carcinoma of the vermiform appendix in one patient. Classifying