

Diagnostic Accuracy of Core Needle Biopsy in Bone Tumors. Results of 100 Consecutive Cases from a Sarcoma Unit in Pakistan

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Abstract

Background: Histological diagnosis is the main step towards management of bone tumors. Although open biopsy is considered as gold standard but core needle biopsy is advantageous because of its low cost, low morbidity rates and less time consumption. The aim of this study was to determine the diagnostic yield of core needle biopsy.

Methods: From January 2016 to December 2018, 100 consecutive patients with suspected bone tumors underwent core needle biopsy in a single unit. Patients between 5 to 90 years of age were included in the study. Informed consent was obtained from all patients. Core needle biopsy was performed under Local or General anesthesia depending of the location of tumor and age. Multiple cores were obtained and were sent to a single histopathological lab.

Results: Out of 100 patients, 61 were male and 39 were females. The age range was from 5 to 73 years with a mean of 39 years. Diagnosis was made in 91% of cases with approximately 4% of them being negative and 5% of the patients had inconclusive results. Only 3 patients required repeat biopsy. None of our patients had any complications.

Conclusion: Core needle biopsy for diagnosis of bone tumors has high diagnostic and accuracy rates with minimal associated complications.

Keywords: Core Needle Biopsy; Bone Tumors; Sarcoma Unit

Introduction

Musculoskeletal tumors, like any other tumors, require a histopathological diagnosis before appropriate treatment is commenced. The combined use of clinical, radiological and histopathological data is necessary for accurate diagnosis and thus the treatment in a multidisciplinary setting. Open biopsy is considered as gold standard for obtaining samples [1]. However, it has some disadvantages including spillage of tumor cells, costly, potential morbidity, time consuming and high risk of infection [2]. The incision plane, if not placed appropriately, may complicate the subsequent surgical resection. Open biopsy has been reported to cause complications in 16% cases and in 8%, these complications are responsible for hampering further treatment [2,3].

Different biopsy techniques are used such as fine needle aspiration (FNA), core needle biopsy (CNB) and incisional or excisional biopsy, with variable reported diagnostic yield. It was postulated in the past that core needle biopsy for musculoskeletal tumors is ineffective due

to inadequacy of tissue obtained. In a survey by American College of Surgeons from 1983 to 1984, of 3457 patients treated for sarcoma, only 9% underwent a needle biopsy [4]. In another survey at the annual meeting of American Academy of Orthopedic Surgeons in 1999, only 40% of the Surgeons were using needle biopsy for diagnosis of mesenchymal tumors [5]. This suggested an increase in the use of core needle biopsy over the past 15 years.

The accuracy of Core needle biopsy is reported to be between 70% to 99%, due to improvement in histopathological techniques. Compared to open biopsy, core needle biopsy procedure is less expensive, less painful, faster and has less chances of morbidity and infection and also there are minimal chances of spillage of tumor cells [6]. The proposed advantage of CNB also includes a whole core from the lesion which incorporates normal, perilesional and lesional tissue, thus providing a whole spectrum of the lesion. The overall complication rate is between 1 - 10% [7]. In 1996, Mankin., *et al.* evaluated a study on 597 patients who underwent core needle biopsy for musculoskeletal tumors. 13.5% of the cases had major errors in diagnosis, 15.9% cases got complicated and 3% of the patients underwent unnecessary amputations [8].

There are a number of controversies in the literature regarding the yield of core needle biopsy.

Purpose of the Study

The purpose of this study is to determine the accuracy of core needle biopsy in the diagnosis of bone tumors.

Materials and Methods

Data was collected retrospectively from a prospectively held tumor database and all patients undergoing CNB from January 2016 to December 2018 were included in this study. All these procedures were performed by one oncology surgeon or a resident under direct supervision. Younger patients and difficult access lesions were biopsied under GA and where needed fluoroscopy was used.

Inclusion criteria:

- Patients between age 5 and 90 years.
- All patients with suspected skeletal tumors on examination/radiology.

Exclusion criteria:

- Patients not willing to participate in the study.

Procedure

All the patients had local and systemic staging performed prior to biopsy. The patients were given general anesthesia (GA) or local anesthesia (LA) depending upon fitness, age and location of lesion. A single dose of antibiotics (first generation cephalosporin) was given after tissue sample was obtained. Under image guidance a stab incision was made over the lesion site as shown in figure 1. The core needle was advanced and position was confirmed on fluoroscopy, where required. Three samples were taken from different zones of the lesion and were fixed in formalin and were sent to Histopathology lab. Samples were also sent routinely for culture. Patients were discharged home the same day and most of these cases were performed as day case procedures. Patients were called for follow-up with the biopsy result. None of the patients had any post-biopsy complications.

To minimize the bias, all the biopsy specimens were sent to a single histopathological lab to be examined by a pathologist specialized in musculoskeletal tumors. Results were classified as Positive (in which histopathological diagnosis was made as a tumor), Negative (in which diagnosis was not certain but definitely not malignant) and Inconclusive (where repeat biopsy was needed).

Results

A total of 100 consecutive patients were included in this study out of which 61 were male and 39 were female. The ages of the patients ranged from 5 to 73 years with a mean of 39 years. Based on the origin of tumor, 86 were diagnosed as primary while 14 were metastatic

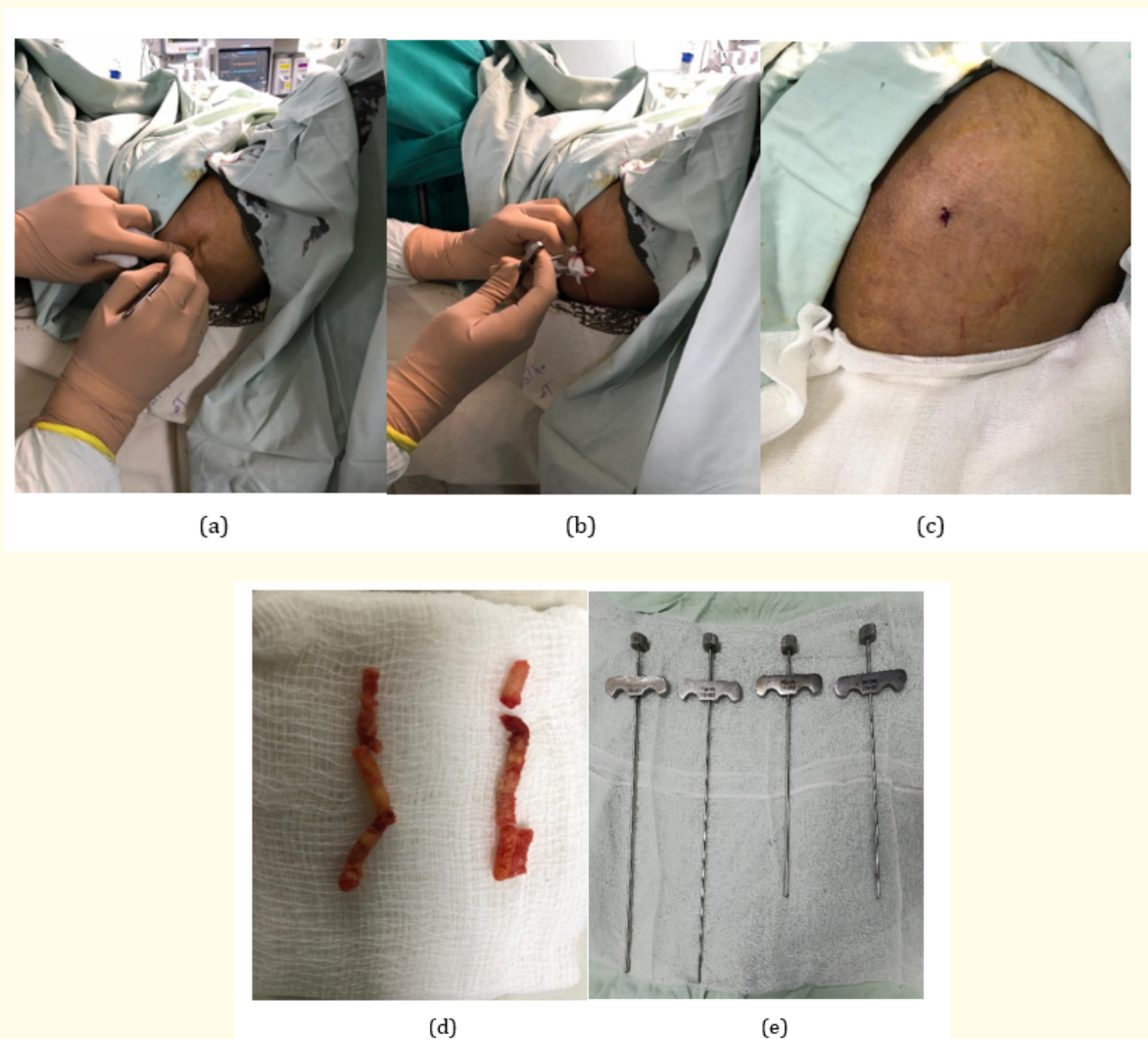


Figure 1: Core needle biopsy procedure. (a) Stab incision for biopsy from ischial tuberosity under GA, (b) Cores being obtained with a re-useable sterile, biopsy needle (8 mm), (c) Biopsy scar left after biopsy, (d) Cores obtained for HPE with CNB technique, (e) Different length and diameter biopsy needles.

lesions. The distribution of diagnosis in our study is shown in table 1. There were 17 benign and 83 malignant tumors. The most common bone biopsied was femur followed by tibia. Only 20 biopsies were performed under image guidance.

Out of 100 biopsies, 65 were performed by our oncologist surgeon while 35 were performed by residents under supervision of our oncologist surgeon. Histopathological diagnosis was made in 91% of cases with approximately 4 of them being negative (Figure 2). Only 5 patients had inconclusive results out of which only 3 required a repeated biopsy after discussion in MDT. The repeated CNB yielded positive results in all these cases. Repeat biopsy was required in periacetabular and pelvic lesions.

Diagnosis	Number
Osteosarcoma	32
Giant Cell Tumor	13
Ewing’s Sarcoma	10
Metastatic Tumors	14
Plasma Cell Tumor	04
Chondrosarcoma	09
Osteochondroma	02
Myeloma	05
Chordoma	03
Lymphoma	03
Others	05

Table 1: Distribution of diagnosis.

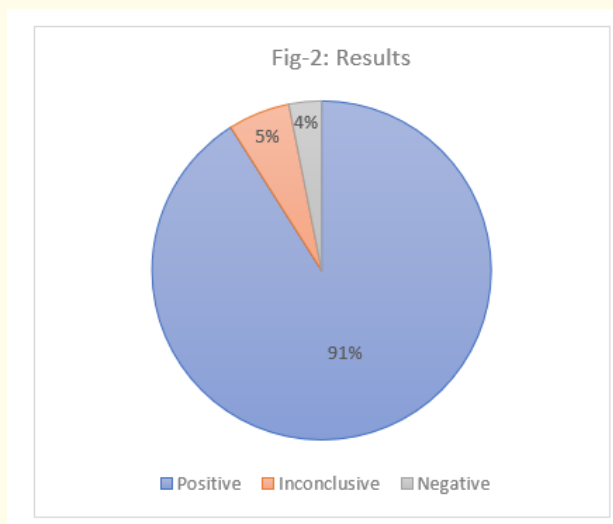


Figure 2: Results of Histopathological examinations following index biopsy.

When compared for grade of doctors, no significant difference was noted in yield of CNB. No significant difference was also noted in location of tumors and if fluoroscopy was needed or not. In summary, our positive yield for diagnosis was approximately 97%.

Discussion

The positive yield of core needle biopsy has been reported to be up to 97% for musculoskeletal tumors [9]. In a study conducted in Bangkok, open biopsy and core needle biopsy had diagnostic rates of 96.9% and 92.9% respectively, which are not significantly different [10]. According to some authors, core needle biopsy is more effective in bone tumors [11]. We performed core needle biopsy on 100

Gender	Male	61
	Female	39
Tumor Origin	Primary	86
	METS	14
Image Guidance	Used	20
	Not Used	80

Table 2: Frequencies of data.

patients and obtained a positive yield of 97%. This result can be compared favorably to the 94% reported by Seng., *et al.* [12] according to latest studies, the complications encountered during core needle biopsy ranges from 0 to 1.1% [13]. In our study we did not encounter any complication related to core needle biopsy. Four cases were negative and yielded Chronic Osteomyelitis and Tuberculosis. In order to prevent lower diagnostic yields, McCarthy was of the opinion that core needle biopsy should be performed in collaboration with radiologist, pathologist and orthopedic surgeon [14]. In addition, the surgeon performing the procedure should be well trained and aware of the anatomy and complication [15].

In our series, all these cases were performed by a sarcoma trained surgeon or under direct supervision only after all staging studies were performed. All these cases were discussed in a sarcoma specific MDT. All our cases were reviewed by an MSK Histopathologist.

Although open biopsy is considered as gold standard, due to its accuracy, however, it has complications like wound infection and dehiscence, seroma and tumor cells spillage in up to 16% patients [2]. These complications are reduced significantly in CNB. If non-diagnostic, core needle biopsy can be repeated easily or followed by an open biopsy without causing morbidity to the patient. In experienced hands, the complication rates can be as low as < 1% [13]. It is a reliable diagnostic tool provided that adequate tissue is obtained.

Conclusion

Core needle biopsy has high diagnostic yield for bone tumors. In addition, it is less expensive, less time consuming, has low morbidity and there are less chances of infection compared to open surgical technique.

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