

Original Research Article

Role of fine needle aspiration cytology in bone lesions

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ABSTRACT

Background: FNAC is considered an important procedure in the diagnosis of bone tumors because of its high accuracy. In our study FNA was performed in patients to study the role of FNAC in the diagnosis of bone tumors and to evaluate its usefulness as a diagnostic modality.

Methods: Fine needle aspiration was performed on 54 patients whose age ranged between 5 – 75 years with a male to female ratio 1.84 :1 presented with various bone lesions. The bone lesions included 42 (78%) primary lesions, 5 (9.3%) metastatic deposits and 7 (12.7%) malignancy of related structures involving the bone.

Results: 47 biopsy specimens were available for cytohistological correlation and cytological findings of 45 cases correlated with histopathology. The overall diagnostic accuracy was 95.92%, with 100% sensitivity and specificity. The predictive values of positive as well as negative test were 100%.

Conclusions: Thus FNA was found to be a safe and an extremely useful, rapid method in the preliminary diagnosis of bone lesions.

Keywords: FNAC, Histology, Bone tumors, Neoplasm

METHODS

INTRODUCTION

Bone tumors are diverse in gross and histological features and range in their biological potential from the innocuous to the rapidly fatal. This diversity makes it critical to diagnose tumors correctly, stage them accurately and treat them appropriately.

In the past, fine needle aspiration cytology (FNAC) had been used sporadically, but in recent years there has been a sudden spurt of interest on this procedure because of its high diagnostic accuracy. The aim of the present study was to assess the role of fine needle aspiration cytology (FNAC) in diagnosis of bone lesions and its impact on therapeutic decisions.

Bone tumors and tumor like lesions of 54 Patients (35 male, 19 female) admitted to the Orthopedic ward of Integral institute of medical sciences & research, and OPD & IPD of orthopaedic consultants in Lucknow were studied over a period of three years, initially by fine needle aspiration cytology, followed by histopathology. All the patients were clinically examined for symptoms, duration, onset, past illness, personal and occupational history and course of treatment.

Patients who presented with severe pain and inflammation were referred. Radiologically, anteroposterior and lateral view of the affected part was obtained and the skiagram was examined for site of the lesion, effect of tumor on cortex and medulla, and neo-osteogenesis or periosteal lifting, infiltration to soft tissue, articular surface involvement, osteoblastic or

osteolytic response and sclerosis or osteoporosis. For cytological examination smears were obtained by fine needle aspiration using 18-22 gauge needle (lumbar puncture needle for the deep seated lesion) attached to 20 ml disposable syringe and stained with haematoxylin and eosin, Leishman's stain and Papanicolaou. PAS and reticulin staining was done wherever needed. Statistical analysis was carried out using SPSS (version 14) software. Descriptive analysis was performed using frequency and percentages. In terms of malignancy, cytology was compared with histopathological findings by calculating specificity, sensitivity and concordance along with positive and negative predictive values (PV). The significance of various cytological categories in terms of benign, malignant and partially correct cases was analysed using Z test and chi-square test.

RESULTS

On FNAC, of the 54 lesions, 36 lesions (22 male; 14 female) were diagnosed as malignant and 18 (13 male; 5 female) as benign. In the malignant group, maximum number of patients (30.56%) was in the age group of 21-30 years followed by 19.44% cases in 31-40 years age

group. The most frequent site for primary malignant bone lesions was femur 22.22% followed by tibia 19.44%.

In the benign group maximum number of cases 61.11% were in 11-20 years age group followed by 16.67% cases in 21-30 years age group. The most frequent site of benign lesion was humerus and femur 22.22% followed by tibia 16.67%.

As shown in Table 1, cytological examination showed malignancy in 36 cases; primary was in 24 (44.44%), metastasis in 5 (9.26%), malignancy of related structure in 7 (19.26).

18 cases were benign in nature. Cytological findings could be correlated with histological findings in 47 cases only (Table 2). Out of 47 cases studies cytological diagnosis correlated well with histological diagnosis in 45 cases.

The overall accuracy rate of FNAC was 95.92% while sensitivity and predictive value of positive as well as negative test were 100%.

Table 1: Histologic distribution of cases.

Cytological Diagnosis	No. of Cases	Incidence
Inflammatory		
Chronic Nonspecific osteomyelitis	1	1.85
Tubercular osteomyelitis	2	3.70
Benign		
Osteoid osteoma	1	1.85
Osteoblastoma	2	3.70
Enchondroma + periosteal Chondroma	2	3.70
Osteochondroma	1	1.85
Chondroblastoma	1	1.85
Unicameral bone cyst	4	7.40
Aneurysmal bone cyst	1	1.85
Chondromyxoid fibroma	1	1.85
Eosinophilic granuloma	1	1.85
Fibrous dysplasia	1	1.85
Malignant		
primary		
Osteosarcoma	4	7.40
Chondrosarcoma	3	5.56
Ewings sarcoma	6	11.11
Lymphoma	1	1.85
Plasmacytoma	2	3.70
Secondaries	5	9.26
Locally malignant (osteoclastoma)	8	14.81
Malignancy of related structures Involving bone	7	12.96
Synovial sarcoma	3	
Ameloblastoma	4	
Total	54	

Table 2: Correlation of cyto-diagnosis and histologic diagnosis of cases.

Cytological diagnosis	No. of cases	Correlation with histological diagnosis		
		Correct	Partially correct	Incorrect
Tumours				
Osteoblastoma	2	2	-	-
Chondroma	1	1	-	-
Osteochondroma	1	1	-	-
Chondroblastoma	1	1	-	-
Aneurysmal cyst of bone	1	1	-	-
Chondromyxoid fibroma	1	1	-	-
Eosinophilic granuloma	1	1	-	-
Giant cell tumour	8	8	-	-
Osteosarcoma	4	4	-	-
Chondrosarcoma	3	3	-	-
Ewing's	6	6	-	-
Lymphoma	1	-	1	-
Plasma cytoma	2	2	-	-
Metastatic	5	5	-	-
Other malignancy of related Structures involving bone	7	7	-	-
Inflammatory	-	-	-	-
Chronic nonspecific	1	1	-	-
Tuberculous osteomyelitis	2	1	1	-
Inconclusive	2	-	-	-
Total	49	45	2	-

DISCUSSION

The cytological diagnosis in the present study was positive for malignancy in 36(66.67%) cases; 13 (24.07%) cases were diagnosed as benign tumours, and 3 (5.56%) as inflammatory. In 2 (3.70%) cases diagnosis could not be made due to in-adequacy of the material obtained. The overall diagnostic accuracy in this series was 95.92% including both the partially correct cases. Coloy et al reported 70-90% accuracy in 35 cases, Stromby and Akerman observed 67% accuracy in 94 cases.^{1,2} Akerman et al found 80% accuracy in 150 cases, Thommensen et al had 83% accuracy in 805 cases.^{3,4} Khoury et al reported 87.5% accuracy in 70 cases.⁵ Higher degree of accuracy (more than 90%) were reported by Kumar et al as 94.1% in 79 cases, Boomer et al as 97.1% in 385 cases.^{6,7} Agarwal et al as 95% in 200 cases.⁸ Jorda et al as 95% in 314 cases and Muktha et al as 95.2% in 103 cases.^{9,10} Wahane et al reported 90.5% accuracy in 122 cases.¹¹ Manna et al studied bone tumors in paediatric and adolescent age groups and found that FNAC was conclusive in 94.4% case.¹² Thus the accuracy observed in this study was in accordance with the accuracy observed by these workers. In our study accuracy in diagnosing benign and malignant lesions was just the same as it was observed in previous studies the accuracy in determining malignant or benign nature of bone lesions on fine needle aspiration smears varied from 52% in the series of Feldman et al to 100% in the report of James and Frable and Layfield et al.¹³⁻¹⁵ The predictive

value documented by Agarwal et al was 99.4% for positive result and sensitivity as 95%.⁸ Bommer et al also reported 99.6% positive predictive value and 95.7% specificity.⁷ Both the results are comparable to the present series. Nnodu et al reported 95% sensitivity 94% specificity.¹⁶

Out of 54 cases, two cases were diagnosed partially correct. One was a case of lymphoma bone which on histopathological examination and after PAS stain turned out to be a case of Ewing's sarcoma and the other diagnosed as osteomyelitis and a possibility of tubercular osteomyelitis was suggested on fine needle aspiration cytology later it was found to be a case of chronic nonspecific osteomyelitis. In this case biopsy was taken after giving therapy for three months which might be responsible for the histological diagnosis.

Inadequate material was obtained in 2(3.7%) cases. Inadequacy of material reported by Khoury et al, Agarwal et al, Feldman et al, Kricicberg et al and was between 3-10%.^{5,8,13,17}

Adequacy of the aspirate plays an important role in deciding this rate, which in turn depends on many factors, such as anatomic localization of the site, characteristics of the tumor, histologic grade of the lesion and adequacy of the clinical and radiologic data.¹⁸ The two inadequate samples obtained in our study were of benign lesions. This might be because of osteosclerotic lesions which

were difficult to aspirate. Thus aspiration cytology was found to be an outstanding procedure for early diagnosis of skeletal lesions. When utilized in context with the clinical history and radiographic findings, it was found to be a powerful tool in the multidisciplinary approach to the diagnosis and management of bone lesions.¹⁹ FNAC made it the possible not only to reach the correct diagnosis but also to locate the primary site in certain cases of metastasis to bone. We recorded one case of metastatic renal cell carcinoma which on further investigation was confirmed. Its ease of use, low cost, rapidity and accuracy makes it a useful tool in the diagnosis of bone tumors. We can avoid operations in cases of metastatic bone deposits when other treatment modalities are available. FNAC can also help us to grade the malignant tumour and to see the extension of malignant tumour if bone deposits are there. FNAC is a safe, less traumatic, rapid and easy as compared to open biopsy and it also minimize the risk of tumor spread in comparison to biopsy and does not require hospitalization.

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