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Research Paper

Radiological Evaluation of Primary Bone Tumours & Correlation With Fnac & Biopsy At A Tertiary Care Centre

Medical Science

KEYWORDS : Bone Tumours, FNAC, Biopsy.

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ABSTRACT

Background- The relevance & appropriateness of radiological & pathological tests in the diagnosis of bone tumours has always been a question not adequately answered.

Objective- to study radiological features of primary bone tumours and to correlate lesions with Fine Needle Aspiration Cytology (FNAC) & Core Needle Biopsy (CNB).

Methodology- 100 Eligible patients were studied with radiological evaluation with FNAC & CNB during a period of 13 months at a tertiary care centre.

Observations- Radiological evaluation had diagnostic accuracy of 81%, FNAC- 86.3% and CNB was found to be having 96.9% diagnostic accuracy for the final diagnosis of primary bone tumours.

Conclusion- Radiological investigations are fairly accurate modalities for evaluation of primary bone tumours, and, with combined use of FNAC and/or CNB, are recommended for early diagnosis and subsequent typing/staging of the bone lesions.

INTRODUCTION

Primary bone tumours are relatively infrequent when compared to all other tumours of body, Indian evidence putting the estimate at about 0.5% [1]. Bulk of the bone lesions are contributed by metastatic origin. But they are important; since one may need to pay the price of delayed diagnosis with his/her limb. Poor prognosis in most of the malignant bone tumours & the practical difficulties experienced in diagnosing the malignant lesions from the benign & tumour like lesions demand early and accurate diagnosis.

Radiological features of the lesions are of prime significance in this respect. Well exposed roentegenograph may point to exact nature of the underlying disorder. CT scan is one of the major modality to detect the type of lesion, location of lesion and metastasis [2]. Bone scintigraphy is useful in depicting the multiplicity of lesions [3]. MRI is the modality of choice in staging bone tumours because it can accurately depict local spread of tumor to surrounding tissues [3,4]. Contrast-enhanced MRI may help in detecting viable post-treatment tumours [3,4].

The present study was carried out to study radiological features of primary malignant bone tumours and to correlate lesions with Fine Needle Aspiration Cytology (FNAC) & Core Needle Biopsy (CNB).

METHODOLOGY

- **Study design:** Prospective observational study.
- **Study setting:** Tertiary care Hospital.
- **Study duration:** 1st November 2011 to 30th November 2013.
- **Sample size:** Total 100 participants were studied.
- **Participant Selection:**

Inclusion criteria –

- Lesions appear neoplastic on radiological imaging.
- Normal appearing lesions on imaging but positive histopathology for malignancy.

Exclusion criteria –

- Lesions s/o infections
- Lesions occurring in k/c/o primary malignancy elsewhere.

Radiologic evaluation was performed thoroughly to characterize and carefully locate the lesion with respect to surrounding anatomy.

- **Procedures/Equipment/Materials:**
- X-Ray- Nucleotech Digital Radioggraphy
- Ultrasonography- Philips HD 11 XE
- CT Scan- Somatom Volume Access Multi-slice Spiral CT, Siemens
- MRI scan- Philips Achieva 1.5 Tesla
- Contrast media- For CT- Intravenous non-ionic contrast media For MRI- Gadolinium based contrast media.
- FNAC- Needle & CNB- Needle/Gun

Clinical history & preliminary examination of patient were conducted as per the pretested proforma. Then patients were subjected to suitable radiological evaluation, followed by FNAC and/or biopsy. All the bone lesions were categorized according to WHO classification [5] and final diagnosis was decided on the basis of open biopsy and/or surgical specimen whenever available. In rest of the cases, clinicoradiological features and response to therapy were considered as the decisive factors for final diagnosis. Final diagnosis was determined based on clinicoradiological evaluation of the patient at subsequent follow-up, because some of them were treated non-surgically with either chemotherapy and/or radiotherapy.

Data was analyzed to calculate sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracies of Radiological Investigations, FNAC and CNB. 2x2 tables were prepared considering nature of lesion i.e. benign or malignant.

Statistical analysis were performed using statistical software STATA (version 10.1, 2009) by applying Mc Nemar's chi- square test for paired data.

Written informed consent was elicited from the participants.

Necessary approval from the Institutional Ethics Committee was before conduction of the study.

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OBSERVATIONS

Radiological investigations were performed in all 100 patients. CNB was carried out in all 100 cases, out of which it was inadequate for interpretation in 2 cases. FNAC was performed in 90 patients out of total 100. Aspirate obtained was inadequate in 10 patients.

Maximum number of cases were in the age group of 11-20 years (28%), followed by 26% cases in age group of 61-70 years. History of swelling was the most common clinical presentation (66%). Lower end of Femur was the most commonly affected site (24.35%), followed by Pelvic bones (20.3%) and upper end of tibia (9.45%). Thus area around knee was the most predisposed site for bone lesions (34.80%). 19% cases were categorized as quasi malignant tumours (Giant cell tumour), while 81% as malignant tumours. Multiple myeloma was the most common malignant bone tumor (26%), followed by Osteosarcoma (22%). Most of the tumours were having male predominance except for Giant cell tumour which has female: male ratio 1.1: 1. Osteosarcoma has bimodal distribution with age at diagnosis at the extremes of 10 & 65 years.

Radiological evaluation was compatible with final diagnosis in 81 patients, giving diagnostic accuracy of 81%. Sensitivity, specificity, diagnostic accuracy, Positive Predictive Value (PPV), Negative Predictive Value (NPV) of radiological investigations in diagnosing nature of lesion were reported at 84.84%, 92.85%, 81%, 98.2%, 56.5% respectively. These findings were statistically significant, with a P-value of 0.012.

Table 1- Comparison of radiological diagnosis with final diagnosis considering the nature of lesion

Radiological diagnosis (80 cases)	Final diagnosis		Total
	Malignant	Benign	
Malignant	56 (TP)	01 (FP)	57
Benign	10 (FN)	13 (TN)	23
Total	66	14	80

Mc Nemar's chi- square test P-value- 0.012

Diagnostic accuracy of FNAC in bone lesions was found to be 86.3%. Sensitivity, specificity, PPV, NPV of FNAC in diagnosing nature of lesion were 87.87%, 92.85%, 98.3%, 61.9% respectively. The findings were statistically significant, with a P-value of 0.039.

Table 2- Comparison of FNAC diagnosis with final diagnosis considering the nature of lesion

FNAC diagnosis (80 cases)	Final diagnosis		Total
	Malignant	Benign	
Malignant	58 (TP)	01 (FP)	59
Benign	08 (FN)	13 (TN)	21
Total	66	14	80

Mc Nemar's chi- square test P-value- 0.039

Diagnostic accuracy of CNB was found to be 96.9%. Sensitivity, Specificity, PPV & NPV of CNB in diagnosing nature of lesion are 96.97%, 100%, 100% and 87.5% respectively. The findings were borderline significant, with a P-value of 0.05.

Table 3 - Comparison of CNB diagnosis with final diagnosis considering the nature of lesion

CNB diagnosis (80 cases)	Final diagnosis		Total
	Malignant	Benign	
Malignant	64 (TP)	00 (FP)	64
Benign	02 (FN)	14 (TN)	16
Total	66	14	80

Mc Nemar's chi- square test P-value- 0.05

DISCUSSION

Femur and pelvis were the most common sites involved by bone lesions, in the present study; with bones around knee joint being the commonest sites. This was in agreement with studies of Santini et al [6] & deSantos et al [7].

As for the relative frequency of respective lesions, our study found Multiple Myeloma the commonest & Osteosarcoma the 2nd most common lesion. This is in accordance with Dahlin [8] & Joseph et al [9] & less than that found in Barbosa CS et al [10], who found more incidence of osteosarcoma than multiple myeloma.

Regarding parameters of radiological evaluation, the sensitivity of 84.84% & the specificity of 92.85% in our study correlated well with studies by Alex et al [11], Oudenhoven et al [12], Tehranzadeh et al [13]. Thus our study further substantiated the available evidence.

In our study, adequacy rate of FNAC was found to be 88.63% which is comparable with that of Bommer et al [14], Agarwal et al [15], Chakrabarti et al [16]. Adequacy rate of CNB was found to be 96.77% in our study; which was comparable with that of deSantos et al [7], Pramesh et al [17], Duda et al [18] and in fact better than Puri et al [19], where adequacy rate of CNB was reported at 79.41%.

As for accuracy of CNB and FNAC, the present study, sensitivity and NPV are much higher than those found in study of Welker et al [20], while specificity and PPV are in accordance with those found in the same study. Diagnostic accuracies of CNB and FNAC were found to be largely comparable with other similar studies [6], [16]; consolidating the available evidence.

CONCLUSIONS & RECOMMENDATIONS

Radiological investigations are fairly accurate modalities for evaluation of primary malignant bone tumours and, with combined use of FNAC and CNB, are recommended for early diagnosis and subsequent typing/staging of the bone lesions.

Diagnostic accuracy of CNB is better than that of FNAC. Hence it should be performed routinely in preoperative work up of bone lesions.

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