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Original Article

Pathology Section

Histopathological Study of Bone Tumours in 78 Cases from a Tertiary Care Hospital, Hyderabad

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ABSTRACT

Introduction: In comparison with neoplasms in other parts of body, bone tumours are relatively rare. Successful diagnosis and treatment plan of bone tumours involves team approach of pathologist, radiologist, surgeon, oncologist and radiotherapist. As histopathology diagnosis is confirmatory in bone tumours, it is very important to make treatment plan and estimation of prognosis in different bone tumours. Current study helps in understanding morphology of different bone tumours, also gives an idea about their age, sex distribution, relative frequencies and location of tumour.

Aim: To review the histopathology diagnosis in bone tumours and to evaluate the distribution of different bone tumours according to age, sex and anatomical location, also to evaluate their relative frequencies.

Materials and Methods: A cross-sectional study was conducted prospectively in 78 cases for a period of two years from October 2015 to September 2017, in Department of Pathology, Mehdi Nawaz Jung Institute of Oncology, Hyderabad, India and TB and Chest Hospital, Osmania Medical College, Hyderabad. Patients with suspicion of bone tumour on clinical and radiological examination, tissue specimens were referred to Department of Pathology along with essential clinical history such as the age, sex, anatomical site, radiological findings. Haematoxylin and Eosin (H&E) stain was done for all cases, followed by detailed microscopic study of H&E slides. Immunohistochemistry (IHC) marker analysis was performed in selected cases. Histopathology findings were noted. Age, sex, anatomical distribution and relative frequencies of different histological types of bone tumours were evaluated and analysed by comparing with other similar studies.

Results: Out of 78 cases of suspected bone tumours, 30 cases were primary malignant bone tumours, 22 were metastatic deposits, 24 were benign tumours, two were chronic osteomyelitis. Osteosarcoma was the most common primary malignant bone tumour and giant cell tumour was most common benign bone tumour. Bone tumours were more common in males than in females most common anatomical location for primary malignant bone tumour was femur followed by tibia secondary deposits were more common in spine followed by pelvis.

Conclusion: Histopathology diagnosis is confirmatory in bone tumours. Successful diagnosis of bone tumours is very important to make a treatment plan. Age, sex distribution and anatomical location of different bone tumours correlated well with other previous studies and provided an important role in the definitive diagnosis.

Keywords: Chondrosarcoma, Ewing's sarcoma, Giant cell tumour, Osteosarcoma

INTRODUCTION

In comparison with neoplasms in other parts of the body, bone tumours are relatively rare [1,2]. Bone is host to many diseases which are ranging from infectious/inflammatory, metabolic bone diseases, benign and malignant tumours. Bone tumours are one of the commonest complaints encountered in surgical oncology Outpatient Department (OPD's) which makes it important to differentiate between benign and malignant to make a proper treatment plan. Histopathology diagnosis is considered as the most definitive method in diagnosing bone tumours [3,4].

The successful diagnosis and treatment plan can be decided by the team approach involving pathologists, radiologists, surgeons, oncologists and radiotherapists in the management of bone tumours [5-8]. Bone lesions can affect all age group people and they can be sudden in onset or abruptly or they may even occur as a slow growing palpable mass. Bone tumour accounts for only 0.5% of total world cancer incidence [9].

It is important to be noted that few inflammatory lesions such as osteomyelitis can mimic malignant lesions and few of malignant lesions such as metastasis or myeloma can mimic benign. In some cases, it is difficult to differentiate between benign and malignant based on radiology [10]. Integrated approach involving pathologists, radiologists, surgeons, oncologists and radiotherapists are necessary to make an accurate diagnosis and management.

This present histopathological study helps us to understand the histomorphology of variety of bone tumours, role of immunohisto chemistry in diagnosis of bone tumours. The aim of the study was to obtain confirmatory diagnosis in bone tumours by histopathological and immunohistochemistry evaluation and to study their relative frequencies according to age, sex, anatomical distribution and to compare these findings with other studies.

MATERIALS AND METHODS

A cross-sectional study was conducted on bone tumours, from October 2015 to September 2017 for a period of two years, in the Department of Pathology, Mehdi Nawaz Jung Institute of Oncology, Hyderabad and TB and Chest hospital, Osmania Medical College, Hyderabad.

Inclusion and Exclusion criteria: Cases with clinical and radiological suspicion of bone tumours were included in the study. The tumour like lesions of bone, non neoplastic conditions and metabolic disorders of bone were excluded.

Study Procedure

In cases with suspicion of bone tumour on clinical and radiological examination, tissue specimens were referred to Department of Pathology along with essential clinical history such as the age, sex, anatomical site, radiological findings. Tissue specimens were immediately fixed in 10% buffered formalin. Decalcification was done after fixation by using 10% nitric acid and followed by routine processing. After paraffin block preparation, 4 um thick sections of formalin fixed, paraffin embedded material was obtained which were stained with H&E. Detailed microscopic study of H&E slides were done.

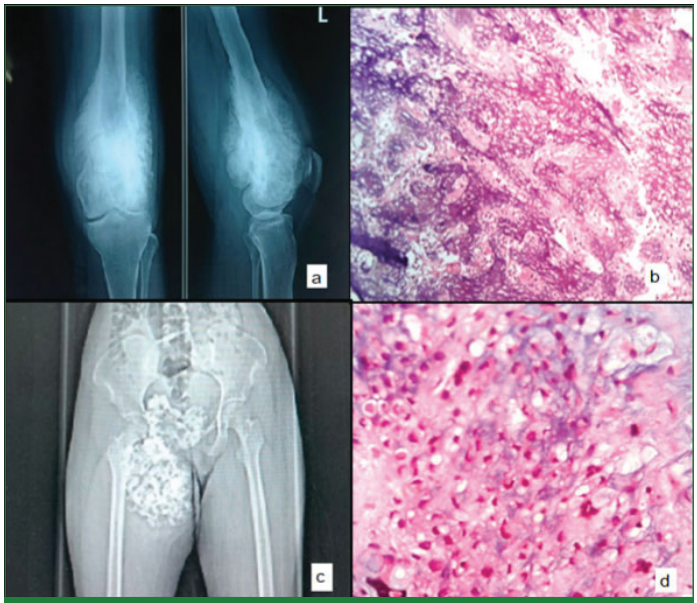
Histopathology findings and diagnosis were noted. IHC analysis was performed for selected cases IHC markers used were CD99, vimentin, Leukocyte Common Antigen (LCA), CD20, CD138, BCL2, Placental like Alkaline Phosphatase (PLAP). This was followed by evaluation of relative frequencies in different histological types of bone tumours, their distribution according to age, sex, anatomical location and these findings were analysed by comparing with other similar studies.

STATISTICAL ANALYSIS

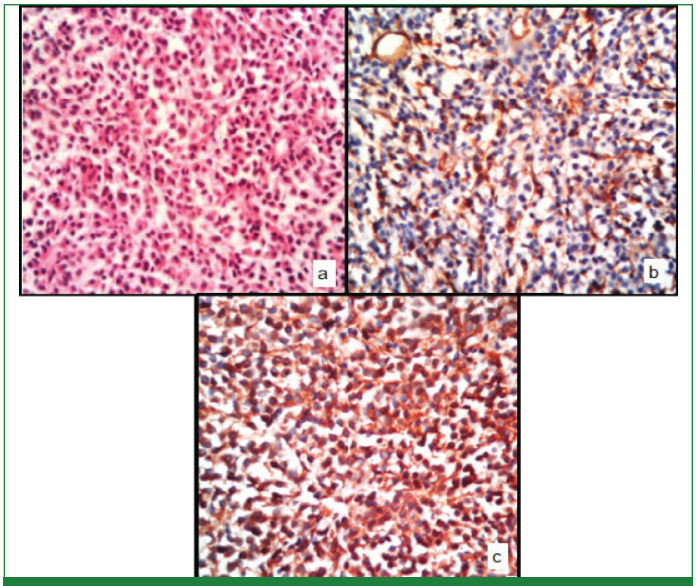
Statistical analysis was carried out by using Microsoft Excel and Epi info software to obtain the percentages of relative frequencies of bone tumours.

RESULTS

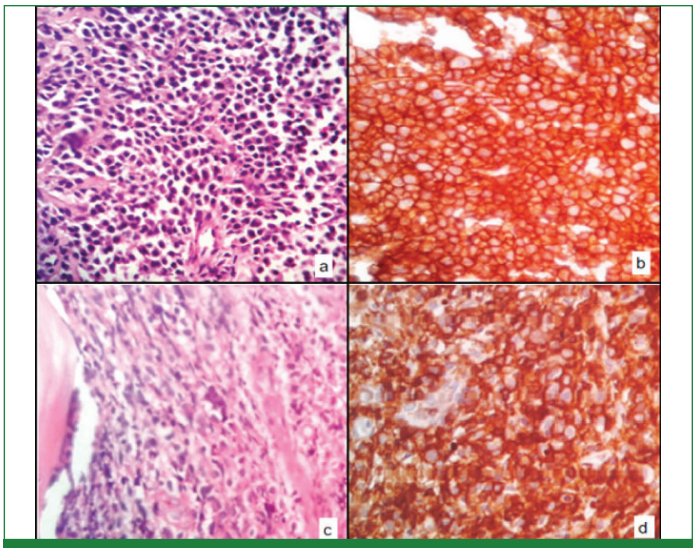
Out of 78 cases studied over a period of two years, 43 were males and 35 were females. Male to female ratio was 1.2:1. Average age ranging from 3-75 years. Out of 78 suspected bone tumours, 30 cases were primary malignant bone tumours, 22 were metastatic deposits, 24 were benign tumours, two were chronic osteomyelitis. In 30 cases of primary malignant tumours 13 cases were osteosarcoma [Table/Fig-1a,b], four were chondrosarcoma [Table/Fig-1c-d], seven were ewing's sarcoma [Table/Fig-2a-c], two were plasma cell neoplasm, one case was high grade NHL [Table/Fig-3a-d], one was chordoma, two synovial sarcoma [Table/Fig-4 a,b]. Metastatic deposits to bone were seen in older age above 50 years, except in one case that is metastatic deposits to spine from germ cell tumour, consisting of primitive polygonal cells with hyper chromatic nuclei, which was encountered in three year old female and this diagnosis was confirmed by using PLAP [Table/Fig-4c,d]. In 24 cases of benign bone tumours 11 were giant cell tumours, seven were osteochondroma, one osteoid osteoma, one chondroblastoma, two osteoblastoma, two enchondroma [Table/Fig-5]. In two cases which were radiologically suspected as osteosarcoma turned out to be chronic osteomyelitis on histopathological examination. In this study most common benign bone tumour was Giant cell tumour (11 cases out of 24 benign tumours, 45%) [Table/Fig-6a-b], and most common primary malignant bone tumour was osteosarcoma (13 cases out of 30 primary malignant tumours, 41%). Most common anatomical location for primary malignant bone tumours was femur (9 cases, 29%) followed by tibia and fibula (6 cases, 19.4%) and common location for metastatic deposits was spine (7 cases out of 22 metastatic bone tumours, 33.3%) [Table/Fig-7a-b,8].



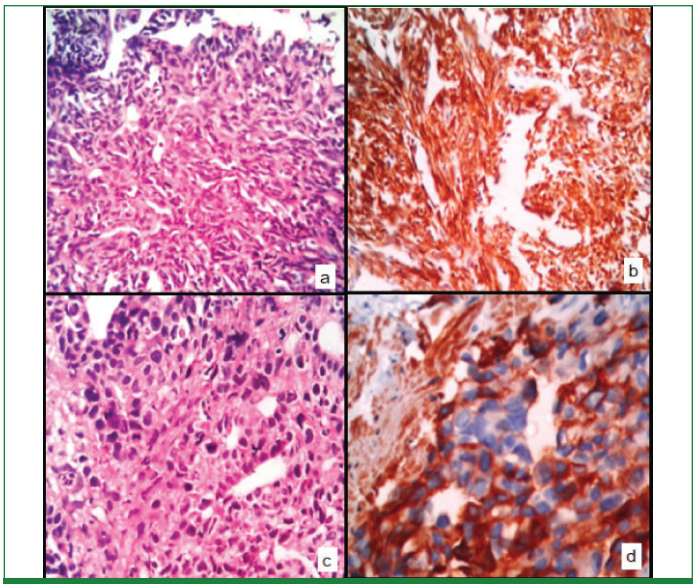
[Table/Fig-1]: a) Anteroposterior and lateral view of distal femur showing radiodense mass with medullary and cortical bone destruction with periosteal reaction of sunburst type; b) H&E stain 10X- Microscopic appearance of osteosarcoma showing characteristic basophilic thin trabeculae of neoplastic bone with an appearance of reminiscent of fungal hyphae; c) Radiograph of pelvis and femur showing tumour tissue with extensive popcorn calcification overlying right pubic ramus, acetabulum, greater trochanter of femur and involving soft tissue; d) H&E stain 40X- Microscopic picture of chondrosarcoma showing nuclear atypia.



[Table/Fig-2]: a) H&E stain 10X-Microscopic appearance of ewing's sarcoma showing uniform cells with darkly stained nuclei, very scanty cytoplasm and focal pseudo rosette formation; b) IHC stain 10X-CD99 positivity in ewing's sarcoma; c) IHC stain 10X-vimentin positivity in Ewing's sarcoma.



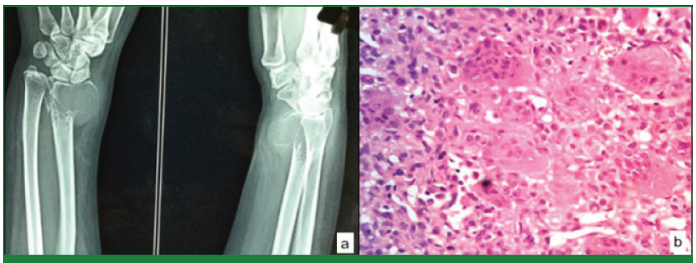
[Table/Fig-3]: a) H&E stain 10X-Microscopic picture showing sheets of plasma cells with abundant cytoplasm and eccentrically located nuclei; b) Pasma cell neoplasm showing IHC stain 40X- CD 138 positivity; c) H&E stain 10X-Microscopic picture of NHL showing centroblast like cells with indented nuclei and scattered small lymphocytes; d) IHC stain 40X-CD 20 positivity in Non-Hodgkin Lymphoma (NHL).



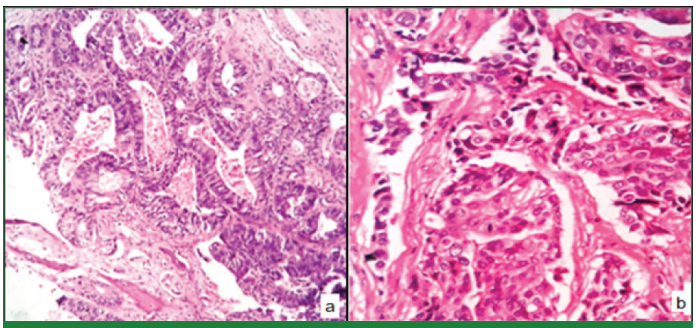
[Table/Fig-4]: a) H&E stain 10X Microscopic picture of synovial sarcoma showing spindle cell sarcomatous component and hemangiopericytoma like areas; b) IHC stain 10X-Bcl 2 positivity in synovial sarcoma; c) H&E stain 40X- Germ cell tumour; d) IHC stain 40X- PLAP positivity in germ cell tumour.

Histologic type of bone tumour	0-10 years	11-20 years	21-30 years	31-40 years	41-50 years	51-60 years	61-70 years	71 and above	Total
Giant cell tumour			6	3	2				11
Osteochondroma		1	5	1					7
Osteoblastoma			1	1					2
Chondroblastoma			1						1
Osteoid osteoma		1							1
Enchondroma				1	1				2
Osteosarcoma		8		3		2			13
Chondrosarcoma						3	1		4
Ewing's sarcoma		5		1		1			7
Chordoma					1				1
Synovial sarcoma			1	1					2
Plasma cell neoplasm					1	1			2
Non Hodgkin's lymphoma			1						1
Secondary bone tumours	1				1	7	9	4	22

[Table/Fig-5]: Age distribution of different histological types of bone tumours (n=76).



[Table/Fig-6]: a) Left wrist joint showing an expanded lytic lesion in subarticular position of distal ulna; b) H&E stain 40X-Microscopic pictures of giant cell tumour showing uniform cells and spatial distribution of osteoclast giant cells.



[Table/Fig-7]: a) H&E stain 10X- Microphotograph of adenocarcinoma metastatic deposits to bone; b) H&E stain 40X-Microphotograph of metastatic deposits from ductal carcinoma of breast.

Anatomical location of bone tumour	Benign	Primary malignant	Secondary deposits to bone
Femur	12	9	3
Tibia and Fibula	6	6	1
Radius and Ulna	1	--	--
Humerus and scapula	2	3	2
Spine	1	2	7
Skull	--	1	--
Pelvis	--	6	4
Ribs	--	2	2
Sternum	--	1	2
Tubular bones of hand	2	--	--
Clavicle	--	--	1

[Table/Fig-8]: Anatomical distribution of bone tumour (n=76).

DISCUSSION

Bone tumours account for a small fraction compared to tumours in other parts of the body. It is very essential to know all the clinical history like age, sex, location of tumour and radiological findings before giving a histopathology diagnosis of any bone tumours. Some benign bone tumours and non neoplastic bone lesions can be confused with malignant tumours clinically and on radiology, for example, osteomyelitis and Ewing's sarcoma, osteoblastoma and osteosarcoma, tuberculosis and malignancy [11,12]. In this study, two cases which were radiologically suspected as osteosarcoma turned out as chronic osteomyelitis on histopathological examination. So, histopathology diagnosis of bone tumours is essential and is gold standard for accurate diagnosis and helping the surgeon to predict the prognosis of different bone tumours.

In our study, of 78 cases of bone tumours, malignant tumours were more common (52 cases out of 78) than benign tumours, similar with study done by Bahebeck J et al., in 268 cases [11]. In some other studies benign bone tumours were more common than malignant [12,13]. In this study, males account for 55.1% of cases and females for 44.9% of cases, bone tumours are more common in males than females [14,15].

In this study, osteosarcoma was the most common primary malignant bone tumour (16.7%) and was similar with studies done by Bahebeck J et al., Baena-Ocampo Ldel C et al., [Table/Fig-9] [11,12]. In cartilage forming tumours osteochondroma was most common followed by chondrosarcoma.

The IHC analysis was done in cases which were diagnosed on H&E stain small round blue cell tumours such as plasma cell neoplasm, non-hodgkin lymphoma, ewing's sarcoma to confirm the diagnosis. Histomorphology of plasma cell neoplasm on H&E stain which was confirmed by using IHC markers and it was positive for CD 138 [Table/Fig-2b,c], [Table/Fig-3b,d].

Another case of small round blue cell tumour in a 26-year-old male patient which was diagnosed as malignant bone tumour by clinical and radiological examination, IHC analysis was done in this case to give definitive diagnosis, it was positive with markers LCA, CD 20 and this case was confirmed as Non-Hodgkin Lymphoma (NHL) [Table/Fig-3c,d].

In this study, ewing's sarcoma was second most common primary malignant bone tumour which was small round blue cell tumour with primitive neuroectodermal differentiation, IHC markers CD 99, vimentin were used to confirm diagnosis [Table/Fig-2a-c].

In this study, we encountered two cases with spindle cell sarcomatous component and haemangiopericytoma like areas on histomorphology, in these cases IHC analysis was done to confirm synovial sarcoma by using Bcl2 marker [Table/Fig-4a,b].

In this study, majority of bone tumours were observed between 11-30 years of age. Most cases of osteosarcoma (8 out of 13 cases) and ewing's sarcoma (5 out of 7 cases) were encountered between 11-20 years of age. Giant cell tumour and osteochondroma cases were detected commonly between 20-30 years of age.

In 52 malignant bone tumours most of cases were belonging to metastatic deposits (22 out of 52 malignant tumours- 40.3%), secondary bone tumours were more common than primary malignant bone tumours [Table/Fig-7a,b]. Secondary deposits were more common in axial skeleton than appendicular skeleton with most of cases located in spine (7 out of 22 metastatic deposits- 33.3 %) followed by pelvis. Spine is the most common location for metastatic deposits [16,17].

In benign tumours giant cell tumour was the most common in this study, accounting for 14.1% of total cases followed by osteochondroma (8.9%) [Table/Fig-6a,b].

In this study, histopathological features were analysed followed by evaluation of relative frequencies of different histological types of bone tumours, their distribution according to age, sex, anatomical location and these findings were analysed by comparing with other similar studies [Table/Fig-9] [1,3,11,14]. In this study, IHC was helpful in giving confirmatory diagnosis in small round blue cell tumours such as NHL, plasma cell neoplasm, ewing's sarcoma. The most common anatomical location of the bone tumours was femur (31%), followed by the tibia and fibula (16%) and most of tumours were observed between 11-30 years age, these findings are similar with studies done by Obafemi JA et al., and Rafiq M and Tanwanil AK, in which they also found that bone tumours were common in males [1,14], also similar with study done by Sajjanar AB et al., [3], and malignant tumours were more common than benign it is similar with study done by Bahebck J et al., [11].

Parameters	Present study 2021	Sajjanar AB et al., [3] 2019	Rafiq M and Tanwanil AK, [14] 2012	Obafemi JA et al., [1] 2018	Bahebeck J et al., [11] 2003
Total no. of cases	78	83	222	79	268
Males	43 (55.1%)	48 (57.8%)	150 (67.5%)	51 (64.5%)	166 (61.9%)
Females	35 (44.9%)	35 (42.2%)	72 (32.5%)	28 (35.5%)	102 (38.1%)
Benign	24 (30.7%)	33 (39.7%)	179 (80.6%)	61 (77.2%)	129 (48.1%)
Malignant	52 (66.6%)	9 (10.8%)	43 (19.4%)	16 (20.2%)	139 (51.9%)
Giant cell tumour	11 (14.1%)	10 (12.0%)	17 (7.65%)	18 (22.8%)	17 (6.4%)
Osteochondroma	7 (8.9%)	8 (9.6%)	15 (6.7%)	34 (43.03%)	26 (9.8%)
Osteosarcoma	13 (16.7%)	1 (1.2%)	7 (3.1%)	7 (8.9%)	48 (17.9%)

[Table/Fig-9]: Comparison with other studies [1,3,11,14].

Limitation(s)

In this study IHC marker analysis was limited to special cases in which histopathological diagnosis was not confirmatory.

CONCLUSION(S)

Histopathological study is important in understanding the nature of bone tumours, which can give definative diagnosis. Ancillary diagnostic methods like IHC analysis are required in special cases only. Clinical and radiological features will help in making differential diagnosis, misdiagnosis can mislead. So accurate diagnosis by histopathological examination in bone tumours is very important, it will help the surgeon to make a proper treatment plan and in predicting prognosis.

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