ORIGINAL ARTICLE

Histopathological Study of Primary Bone Tumours and Tumour-Like Lesions in a Medical Teaching Hospital

Sunita A.Bamanikar[1], Pradhan M. Pagaro[1], Praveen Kaur[1], Shirish S. Chandanwale[1], Arvind Bamanikar[2], Archana C. Buch[1]

[1]Department of Pathology,[2]Department of Medicine, Dr. D. Y. Patil Medical College, Hospital and Research Centre, Dr. D. Y. Patil Vidyapeeth, Pimpri, Pune-411018 (Maharashtra) India.

Abstract

Objectives: Histopathological study of bone tumours to determine the spectrum of bone tumours at a Medical teaching Hospital and to correlate it with demographic features like age, sex of patients and anatomical site of tumours. *Material and Methods:* A retrospective and prospective study of all histopathologically diagnosed bone tumours over a period of 10 years was done. Patients were assessed by clinical examination, radiological investigations, histopathological examination and fine needle aspiration cytology (FNAC) whenever available. *Results:* A total of eighty-two cases of primary bone tumours were recorded, of which benign tumours were the most common 62 cases (75.61%) followed by malignant tumours with 13 cases (15.85%) and 7 cases (8.54%) of tumour-like lesions. FNAC diagnosis was available in 26 cases (31.71 %) with 68.96 % benign tumours, 17.24% malignant and 3.45% were tumour–like lesions. The concordance and discordance rate of histopathological diagnosis was 76.93% and 23.07 % respectively. On histopathological diagnosis, the most common benign tumour was osteochondroma 34.15% followed by Giant cell tumour 19.51%. Osteosarcoma was commonest malignant tumour 8.54%. Maximum number of bone tumours occurred in 11-20 years of age and the male to female ratio was 1.2:1. *Conclusions:* Bone tumours occurred predominantly in the second decade of life with a male preponderance. Osteochondroma was the most common benign tumour followed by Giant cell tumour and Osteosarcoma was the most common malignant bone tumour.

Keywords: Bone tumours*, Histopathology,* Giant cell tumour*, Osteochondroma*, Osteosarcoma*,*

Introduction:

The most important challenge in orthopaedic pathology is dealing with tumours. The histopathologist plays a vital role to guide an orthopaedic surgeon for the treatment of patients with bone tumours. Some relevant demographic features like age, gender and skeletal site are important factors while making a diagnosis [1, 2]. Various etiological agents including chemotherapy, radiation, trauma, infections and pre-existing bone lesions have been implicated. Common presentations are progressive pain, swelling, tenderness and in some cases, acute pathological fracture [3, 4].

The nomenclature and classification of primary bone tumours is based mainly on the pathway of tumour cell differentiation [5]. Most commonly the term benign or malignant bone tumour is

used for primary bone tumours. It is less applied to secondary or metastatic tumours found in bone. Primary bone tumours are uncommon malignancy, but they are important causes of cancer morbidity and mortality, especially among young people [6]. Primary bone tumours account for 0.2% of all tumours in humans and some of these tumours display marked inter- and intra-national variations in incidence, site and age distribution [7-9].

The present retrospective and prospective study was carried out to assess the pattern of primary bone tumours and tumour-like lesions and to categorize the occurrence of various histological types of bone tumours with respect to age, sex and site of origin.

Material and Methods:

This is a retrospective and prospective study undertaken in the department of Pathology, at a Medical teaching Hospital, during the period July 2004 to July 2014. This study includes a total number of 82 cases of tumour and tumour-like lesions of bone diagnosed in the Histopathology department. All the cases irrespective of age, sex with previously undiagnosed and radiographically proven bone lesions were included in the study. Patients with infective, inflammatory, metabolic and suspected local recurrence of primary or metastatic bone lesions were excluded from the study.

For the retrospective study, the case records of histologically confirmed primary bone tumors in the pathology department were retrieved. They were reviewed and analyzed for age, gender, site of tumor and histological types. For prospective cases complete gross examination was carried out and representative sections were taken for histopathology.

Fine Needle Aspiration Cytology (FNAC) was available in 29 cases which were performed with informed consent of patients. FNAC was performed using a 20G needle with 10 mL disposable syringe under aseptic precautions smears were prepared. Air dried smears were stained with Leishman's stain and wet fixed smears were stained with Haematoxylin and Eosin stain for cytological examination.

The biopsies and specimens received for histopathological examination were fixed in 10 % formalin after separating soft tissue. 3 to 5 mm thick sections of bone were cut and decalcification was done by placing the specimens in 5% nitric acid for 2 days. Decalcified tissue was processed by increasing concentrations of alcohol, Paraffin blocks were prepared. Sections were cut of 4 to 6 µ, stained with haematoxylin and eosin and examined under microscope for histomorphological evaluation of bone tumours. The WHO histological classification of bone tumours was followed in the present study with suitable modification in the light of current literature [10].

Results:

A total of 82 cases of primary bone tumours were identified in the period July 2004 to July 2014, which on histopathological diagnosis revealed 62

cases of benign tumours (75.61%), 13 malignant tumours (15.85%) and 7 of tumour-like lesions (8.54%). Radiographic appearance of bony lesions clinically suspected to be osteosarcoma showed sclerotic growth with lytic areas and periosteal reaction, while those clinically diagnosed as chondroblastoma and giant cell tumour revealed lytic bony lesions.

29 cases were available for FNAC diagnosis, of which 3 cases (10.34%) did not yield sufficient cellularity on aspiration and the remaining 26 cases (89.65%) yielded sufficient cellularity for the cytological diagnosis. Of the 26 cases, 20 cases (68.96%) were diagnosed as benign bone lesions, 5 cases (17.24%) malignant and 1 case (3.45%) was a tumour-like lesion namely aneurysmal bone cyst. The cytological diagnoses of benign tumours offered were osteochondroma 12 cases (41.38%), giant cell tumour 8 cases (27.58 %) followed by malignant tumours with 3 cases (10.34 %) of osteosarcoma and 2 cases (6.90 %) of Ewing's sarcoma. All the 26 cases were confirmed with histopathological diagnosis with concordant result in 20 cases (76.93%) of which 10 cases (38.46%) were osteochondroma and discordant diagnosis in 6 cases (23.07 %), 2 cases of osteochondroma on cytology turned out to be osteosarcoma on histopathological examination.

The age distribution of different bone tumours is shown in (Table 1).

Bone tumours were relatively more frequent in males than in females with an overall male to female ratio of 1.2:1. Among the 62 benign tumours, 34 were in males and 28 in females and out of the 13 malignant tumours, 9 were in males and 4 in females (Table 2).

In our study, the commonest site of bone tumours was found to be lower end of femur, 25 cases (30.49%) followed by proximal end of tibia and fibula, 17 cases (20 .73%). The site wise distribution is shown in (Fig. 1).

Table 1: Age (in years) of Benign, Malignant And Tumor-Like Lesions of Bone

Histological Type	0-10	11 to 20	21-30	31-40	41-50	51-60	61-70	70 and above	Total
Benign									
Osteochondroma	1	17	4	-	1	2	2	1	28
Chondroblastoma	-	3	0	0	-	0	-	-	3
Giant cell tumour	-	4	9	3	-	-	-	-	16
Osteoid osteoma	-	3	2	2	-	-	-	-	7
Osteoma	-	1	2	-	-	-	-	-	3
Enchondroma	-	2	1	-	2	-	-	-	5

Malignant									
Osteosarcoma	-	1	4	1	1	-	-	-	7
Ewing's sarcoma	-	2	-	-	-	-	-	-	2
Chondrosarcoma	-	2	1	-	-	-	-	-	3
Chordoma	-	-	-	-	-	1	-	-	1
Tumor-like lesions									
Aneurysmal bone cyst	1	-	1	1		1	-	-	3
Fibrous dysplasia	-	1	-	-	1	1	-	-	3
Solitary bone cyst	-	-	1	-	-	-	-	-	1
Total (%)	2(2.44)	36(43.91)	25(30.48)	7(8.54)	5(6.10)	5(6.10)	2(2.44)	1(1.22)	82(100)

Table 2: Frequency of Histological Types of Bone Tumours and Tumour-Like Lesions by Sex

Histological Type	Males	Females	Total	Percentage
Benign tumours				
Osteoid osteoma	5	2	7	8.54
Osteoma	1	2	3	3.66
Enchondroma	2	3	5	6.10
Osteochondroma	17	11	28	34.15
Giant cell tumour	6	10	16	19.51
Chondroblastoma	3	0	3	3.66
Total benign	34(54.84%)	28(45.16%)	62	75.61
Malignant tumours				
Osteosarcoma	5	2	7	8.54
Ewing sarcoma	1	1	2	2.44
Chordoma	1	0	1	1.22
Chondrosarcoma	2	1	3	3.66
Total malignant	9 (69.23%)	4(30.77%)	13	15.85
Tumour-like lesions				

Fibrous dysplasia	1	2	3	3.66
Aneurysmal bone cyst	1	2	3	3.66
Solitary bone cyst	1	0	1	1.22
Total Tumour-like lesions	3(42.86%)	4(57.14%)	7	8.54
Total	46(56.10%)	36(43.90%)	82	100

Table 3: Distribution of Bone Tumours and Tumour-Like Lesions into Groups Based on Histopathological Matrix

Tumour group		**Histological diagnosis**	**Total Numbers (%)**
Cartilaginous Tumours	Benign tumours	Osteochondroma	28 (71.79)
		Enchondroma	5 (12.82)
		Chondroblastoma	3 (7.69)
	Malignant	Chondrosarcoma	3 (7.69)
		Total in group 1	39(47.56)
Osteogenic Tumours	Benign tumours	Osteoma	3 (17.65)
		Osteoid osteoma	7 (41.18)
	Malignant tumour	Osteosarcoma	7 (41.18)
		Total in group 2	17(20.73)
Marrow tumours		Ewing sarcoma	2 (2.44)
Giant cell tumour		Giant cell tumour	16 (19.52)
Others		Chordoma	1 (1.22)
Tumour like lesions		Aneurysmal bone cyst	3 (42.86)
		Fibrous dysplasia	3 (42.86)
		Solitary bone cyst	1 (14.29)
		Total in group 3	7 (8.54)
		Total	82

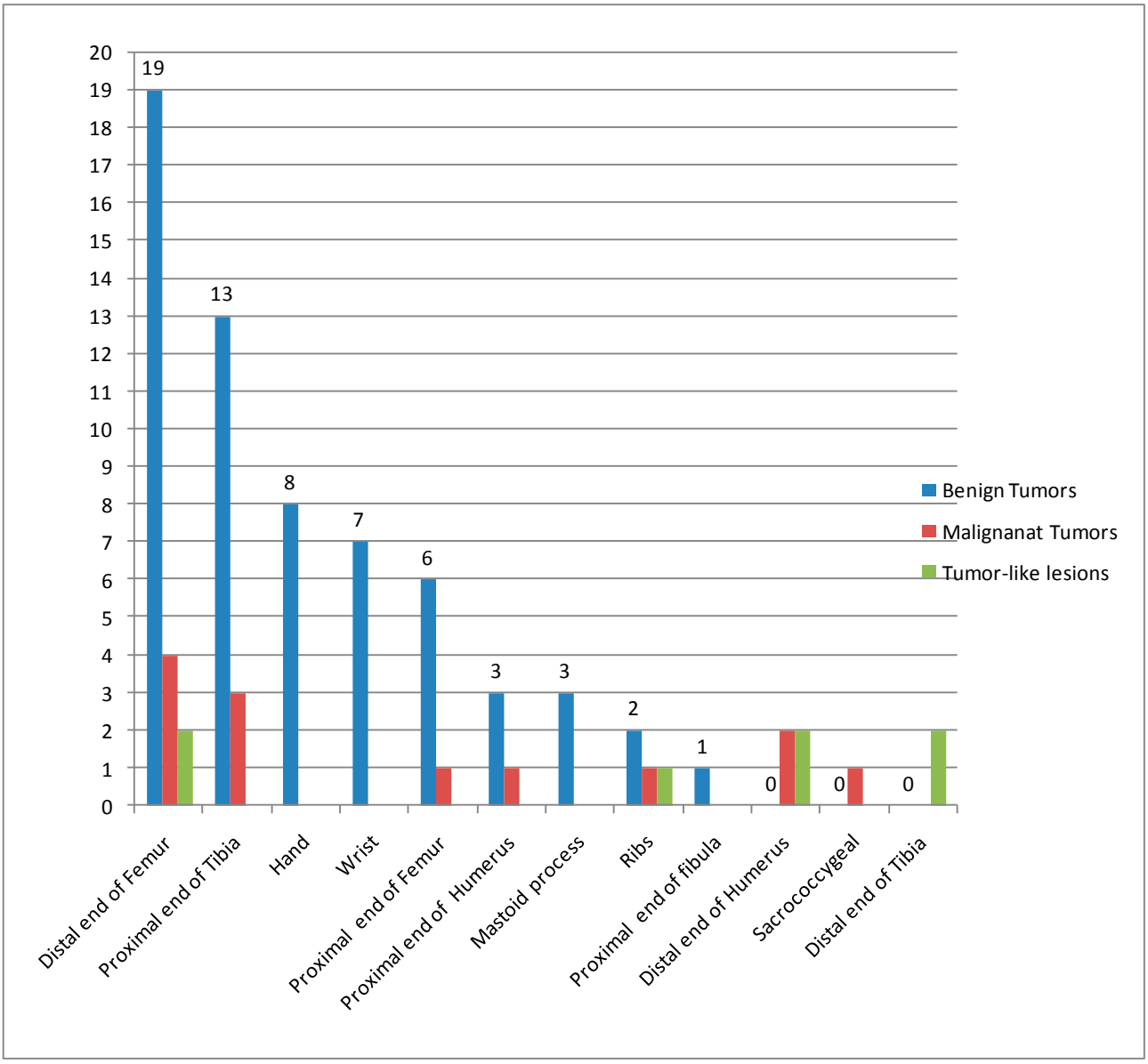

Fig. 1: Site Distribution of Benign, Malignant Tumours and Tumour-Like Lesions.

In our study, cartilaginous tumours accounted for 39 (47.56%) while osteogenic tumours accounted for 20.73% followed by giant cell tumours 19.52%, Ewing's sarcoma 2.44% and chordoma 1.22%. The remaining 7 (8.54%) were tumour like lesions. The most common benign tumour in our study was osteochondroma (Fig. 2) with 28 cases (34.15 %) followed by giant cell tumour (Fig. 3) with 16 cases (19.51%), both of which represented 53.65% of all tumours and 70.97% of all benign tumours. Amongst the tumour-like lesions, the commonest were fibrous dysplasia and aneurysmal bone cyst with 3 cases each (3.66%). In our study, osteosarcoma was commonest malignant tumour. Out of 13 cases of malignant tumours, 7 (8.54 %) were osteosarcoma (Fig. 4) followed by chondrosarcoma 3 cases (3.66%), Ewing's sarcoma 2 cases (2.44%) and chordoma 1 case (1.22%). Of the 7 cases of osteosarcoma 5 were reported as conventional osteosarcoma, while the remaining 2 were telangiectatic osteosarcoma. Amongst benign bone forming tumours, 3 cases of osteoma and 7 cases of osteoid osteoma were seen, constituting 3.66% and 8.54% of all bone tumours. Amongst cartilage forming tumours, osteochondroma was the commonest tumour (34.15%), in addition 5 cases (6.10%) of enchondroma and 3 cases (3.66%) of chondroblastoma were seen (Table 3).

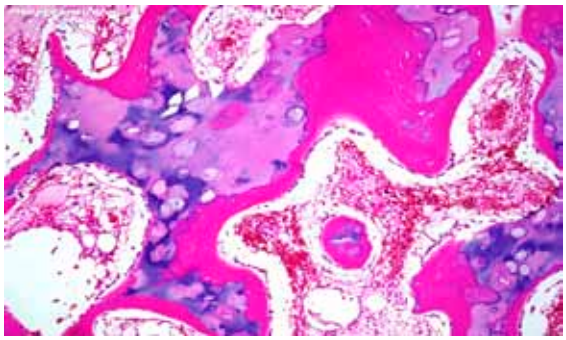

Fig. 2: Osteochondroma of Bone Showing Islands of Cartilage Embedded within the Underlying Cancellous Bone (H&E, x100)

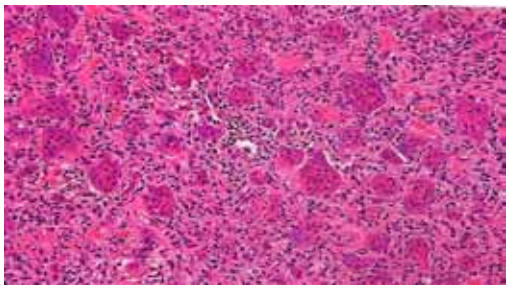

Fig. 3: Giant Cell Tumour of Bone Showing Multinucleated Giant Cells and Stromal Cells (H&E, x100)

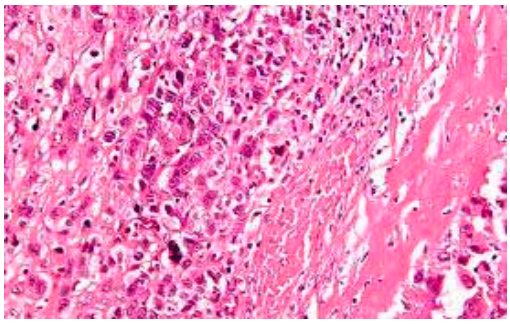

Fig. 4: Osteosarcoma showing Pleomorphic Tumour Cells with Osteoid. (H&E, X100)

Table 4: Comparison of Our Study with Other Studies

	Our Study	South India [13]	Nigeria [1]	Ethiopia[7]
Total Number of Cases	82	117	77	205
Males	46(56.09%)	41(64.96%)	51(66.2%)	111(51.3%)
Females	36(43.90%)	76(64.96%)	26(33.8%)	94(48.7%)
Benign	69(84.19%)	67(57.26%)	61(79.2%)	131(63.90%)
Malignant	13(15.85%)	--	16(20.8%)	74(36%)
Osteochondroma Commonest Benign Tumour Site	28(34.14%) Around Knee 17(60.71%) Wrist 5(21.42%)	26(22.22%)	34(44.1%) Around Knee 21 (61.6%) Wrist 6(71.6%)	45(21.95%)
Giant Cell Tumour Second Commonest Benign Tumour Site	16(19.51%) Around Knee 9(56.25%) Hand 3(18.75%)	24(20.51%)	18(23.4%) Around Knee 9(50.2%) Wrist 6(33.3%)	22(10.73%)
Osteosarcoma Common Malignant Tumour Site	7(8.53%) Around Knee 5(71.4%) Ribs 1(14.2%) Proximal Femur 1(14.2%)	13(35.14%)	7(9.1%) Around Knee 6(85.7%) Proximal Humerus 1(14.3%).	45(21.95%)

Discussion:

Histopathological examination is the "gold standard" used for definite diagnoses of bone tumors. Diagnoses of bone lesions by FNAC has its limitations [6, 11]. This study describes the pattern and frequencies of primary bone tumours and tumour-like lesions cytologically and histologically evaluated at a Medical teaching hospital over a ten year period. In our histopathological study, benign tumours were the commonest bone tumour which accounted for

75.61%. The malignant tumours were 15.85% followed by 8.54% of tumour-like lesions. There was an overall male preponderance with a male to female ratio of 1.2:1. These results were comparable to various studies (Table 4) in literature [1, 12, and 13]. In our study, maximum number of bone tumours occurred in the age group of 11-20 years and 21-30 years. Similar results were reported in studies held in tertiary care hospital of South India, where peak age of incidence of bone tumours was 11-20 years [13]. The commonest site of bone tumour in our study was lower end of femur with 25 cases (30.49%) followed by proximal end of tibia and fibula with 17 cases (20 .73%) which parallels with the results of another study carried out in South India [13]. The most common benign tumour in our study was osteochondroma with 28 cases (34.15 %) followed by giant cell tumour with 16 cases (19.51%) both of which represented 53.65% of all bone tumours and 70.97% of all benign tumours, which is in accordance with the previous reported series [1,6,13]. Osteosarcoma was the commonest malignant tumour with 8.54 % of all tumours occurring predominantly around knee (71.43%) followed by ribs and proximal end of femur (14.28% each). Similar results were reported in other studies with frequency of osteosarcoma ranging from 9.1% to 35.14%. [1, 6, 13].

Amongst benign cartilage forming tumours, osteochondroma was the commonest tumour (34.15%) in addition 5 cases (6.10%) of enchondroma, 3 cases (3.66%) of chondroblastoma were seen. Amongst malignant cartilage forming tumours, chondrosarcoma was second most common malignant tumour with 3 cases constituting 3.66 % of total primary bone tumours and was commonly seen in age group of 50-60 years with male to female ratio of 2:1. Commonly involved sites were lower end of femur and proximal end of humerus. In contrast, according to another study done in tertiary care hospital of South India, chondrosarcoma was the most common primary malignant bone tumour found in the age group of 40-60 years and was found to commonly involve pelvis, femur, ribs, shoulder girdle, and vertebra [13].

Ewing sarcoma is a highly malignant, undifferentiated, peripheral Primitive Neuroectodermal Tumour (PNET) occurring most commonly in the 0-20 years age group, with male predominance. In our study, Ewing's sarcoma accounted among 2 cases (2.44%) in lower end of femur with incidence of age between 11-20 years and M:F ratio was 1:1. In another study held at Addis Ababa University, Ethiopia on 205 cases, 11 cases (5.36%) of Ewing's sarcoma were noted while in a study held in South India on 117 cases, Ewing's sarcoma accounted for 5.13%. [13]. Our study, out of total 62 benign tumours, fibrous dysplasia and aneurysmal bone cysts were 3 cases each (3.66%) and were the commonest tumour-like lesions. These results were comparable to other similar studies in the literature [1, 6].

Conclusion:

The demographic pattern and distribution of bone tumors seen at our centre are similar to those reported from other national and international studies. Males were more commonly affected by bone tumours with a peak in the second decade of life. Osteochondroma and osteosarcoma were the commonest benign and malignant varieties respectively. To achieve a high rate of accurate diagnosis of bone tumours requires joint clinical, radiological and pathological team work.

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***Author for Correspondence**: Dr. Sunita Arvind Bamanikar, 5 & 6, Siddharth Estates, North avenue, Kalyani nagar, Pune 411006, Maharashtra, India Tel. 02026688811 Email: sunitarvind@hotmail.com*