

Histopathological Evaluation of Bone Lesions in Tertiary Care Hospital, Ahmedabad, Gujarat, India

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Abstract

Introduction: Bone tumours remain a diagnostic challenge to orthopedic surgeons and pathologists. This leads more concern in developing countries due to limited diagnostic and therapeutic facilities. We analyzed entire spectrum of bone lesions, their demographics like age, sex, anatomical site of occurrence, their relative frequency and histological features in a tertiary care hospital of India. **Aim:** To study spectrum of various bone lesions and their relative frequency at a tertiary care hospital, Ahmedabad, Gujarat, India. **Materials and Methods:** This is retrospective hospital based cross sectional study of 103 cases of bone lesions diagnosed on histopathological examination at department of pathology, tertiary care hospital, Ahmedabad, Gujarat over a period of one year. All data were retrieved from clinical case notes of patients. The data was entered in Microsoft excel sheet and analyzed using frequency distribution and percentages. **Results:** Out of the 103 cases of bone lesions, age ranged from 5 to 71 years with male to female ratio of 1:1. Nonneoplastic lesions were 62.2% with osteomyelitis as the most common pathology accounting 36%. There were 39(37.8%) neoplastic lesions with 59% benign tumours and 41% were malignant tumours. Osteoclastoma (07/23) 30.4% and osteogenic sarcoma (06/16) 37.5% were most common benign and malignant bone tumours detected respectively. Lower end of Femur (19.4%) followed by upper end of tibia (13.5%) were common presenting sites for bone lesions. **Conclusion:** Bone lesions were common at both extremes of age with no specific sex predilection. Primary bone tumours were mainly benign, occurred predominantly in second decade of life with male predilection. Femur and tibia were common involved sites. Chronic osteomyelitis was the commonest nonneoplastic lesion, while osteoclastoma and osteosarcoma were most common benign and primary malignant bone tumours respectively.

Keywords: Bone, Histopathology, Osteomyelitis, Osteoclastoma, Osteosarcoma.

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INTRODUCTION

Bone consist of cartilage, osteoid, fibrous tissue and bone marrow elements. The spectrum of bone lesions ranges from inflammatory, degeneration and metabolic diseases to neoplasm. [1, 2] Each tissue can give rise to benign or malignant tumors. Bone tumors are classified on the basis of cell of origin. Bone tumors can be primary or secondary. Etiologically, most bone tumors arise de novo from somatic mutation [3], but other factors have been implicated like chemotherapy [4], irradiation [5], preexisting bone lesions [6, 7] and less commonly trauma, foreign bodies and viruses. Primary bone tumours are uncommon and account for <0.5% of all world concern [8, 9]. Metastases to bone are more common at axial skeleton with primary tumours in lungs, breast, kidney, thyroid, prostate and gastrointestinal tract [1]. The biochemistry is not much useful in bony lesions for diagnosis while roentgenogram helps to detect location, but it has its

own limitations [10, 11]. To establish correct diagnosis with staging and diseases activity measurement, integrated approach of pathologist, radiologist and clinician is necessary. The purpose of this study is to determine pattern of bone lesions including their frequencies, age and sex distribution, anatomical sites of occurrence with histological features in a tertiary care hospital, Ahmedabad, Gujarat, India.

MATERIALS AND METHODS

This is a retrospective hospital based cross sectional study of 103 cases carried out at department of pathology at tertiary care hospital, Ahmedabad, Gujarat, India. The inclusion criteria were bone specimens of radiologically and/or clinically apparent bone disease sent to histopathology department. Tissue with extreme hemorrhage or necrosis, odontogenic and hematopoietic tumours were excluded in study. Detailed history was taken which mainly included age, sex, place of

residence, occupation, complaints of bone pain, swelling, non healing fracture, fever, weight loss, cough, haemoptysis or history suggestive of systemic involvement were retrieved from clinical case notes of patients.

The roentgenograms were collected from case records of department of radiology. The material was received by different methods such as open biopsy, closed biopsy, wide local excision of tumour or amputation of limb. Wherever required to have histopathology review, new sections from paraffin blocks were cut and stained with routine Haematoxylin and Eosin stain. The specimen was reported by two pathologists with consensus as inflammatory, benign or malignant. Neoplastic lesions were classified according to WHO histological classification of bone tumours [12]. The data was entered in Microsoft excel and analyzed with percentage calculation and frequency distribution.

RESULTS

A total of 103 bone specimens were received in the histopathology section of pathology department during the period of one year. By far the majority, 39 (37.8%) of the bone lesions were neoplastic; whereas

64 (62.2%) were nonneoplastic as shown in Table-1. Chronic osteomyelitis (36%) was the most common nonneoplastic lesion. Rest nonneoplastic lesions were tuberculosis (31.2%), synovitis (15.6%), non specific inflammation (10.9%), osteoarthritis (3.12%) and rheumatoid arthritis (3.12%). Benign lesions accounted for 23(22.3%) cases with osteoclastoma 30.4% as most common tumour followed by osteochondroma in 26%, aneurysmal bone cyst in 13% cases and neurofibroma, osteoma, simple bone cyst (8.7%) each. Malignant tumors comprises 16/39 (41%) cases with osteogenic sarcoma (37.5%) as most common tumour followed by chondrosarcoma and metastatic tumours in 25% each, while malignant fibrous histiocytoma and synovial sarcoma in 6.25% each. Primary malignant bone tumors (75%) were found to be more common than metastatic tumors (25%). As per Table-2, The age range of neoplastic bone lesions was from 8 years to 71 years, in which 27 (69.2%) were males and 12 (30.8%) were females with M: F ratio of 2.2:1 Table-3. Youngest was an 8years old male child with aneurysmal bone cyst in femur and oldest was 71year old male with metastatic adenocarcinoma with primary of prostatic carcinoma to L3 vertebra. The most common sites of tumor were lower end of femur in 20 (19.4%) cases followed by cases of upper end of tibia 14 (13.5%).

Table-1: Frequency of histological types of various bone lesions

Non Neoplastic	Cases	Neoplastic			
		Benign	Cases	Malignant	Cases
Acute/chronic osteomyelitis	23(36.0%)	Osteoclastoma (Giant cell tumor)	07(30.4%)	Osteogenic sarcoma	06 (37.5%)
Koch's (tuberculous) inflammation	20(31.2%)	Osteochondroma (Exostosis)	06(26.0%)	Metastasis	04(25.0%)
Synovitis	10(15.6%)	Aneurysmal bone cyst	03(13.0%)	Chondro sarcoma	04(25.0%)
Acute/chronic inflammation	07(10.9%)	Neurofibroma	02(8.7%)	Malignant Fibrous Histiocytoma	01(6.25%)
Osteoarthritis	02(3.12%)	Osteoma	02(8.7%)	Synovial sarcoma	01(6.25%)
Rheumatoid arthritis	02(3.12%)	Simple bone cyst	02(8.7%)		
		Fibrous Histiocytoma	01(4.34)		
Total non neoplastic lesions	64(100%)	Total benign lesions	23 (100%)	Total malignant lesions	16 (100%)

Table-2: Age wise distribution of various bone lesions

Age	Non Neoplastic	Neoplastic		Total
		Benign	Malignant	
<20	15	13	5	33
21-40	18	10	2	30
41-60	13	0	9	22
61-80	18	0	0	18
Total	64	23	16	103

Table-3: Sex wise distribution of various bone lesions

Gender	Non Neoplastic	Neoplastic		Total
		Benign	Malignant	
Male	24	15	12	51
Female	40	8	4	52
Total	64	23	16	103

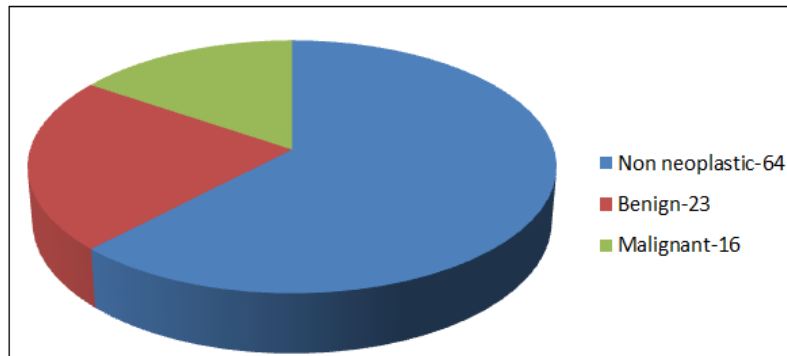


Fig-1: Distribution of various bone lesions

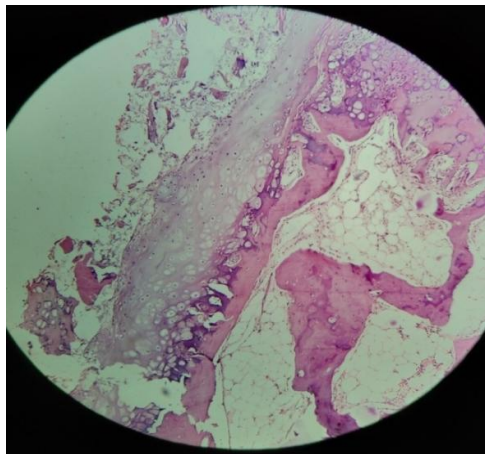


Fig-2: Osteochondroma, femur (10X, H & E stain)

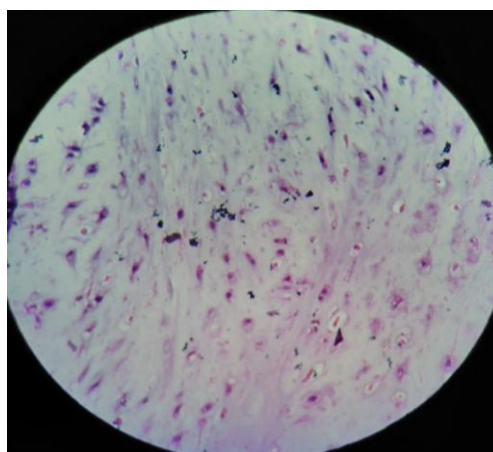


Fig-3: Conventional Chondrosarcoma (Grade I), Rib (40X, H & E stain)

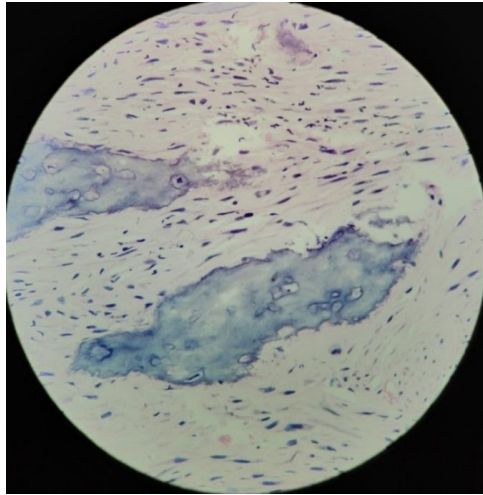


Fig-4: Osteogenic sarcoma, Lower end of femur (40X, H & E stain)

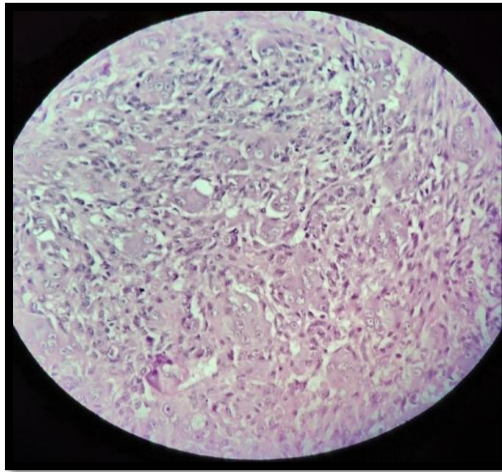


Fig-5: Osteoclastoma, Grade I, Tibia (40X, H & E stain)

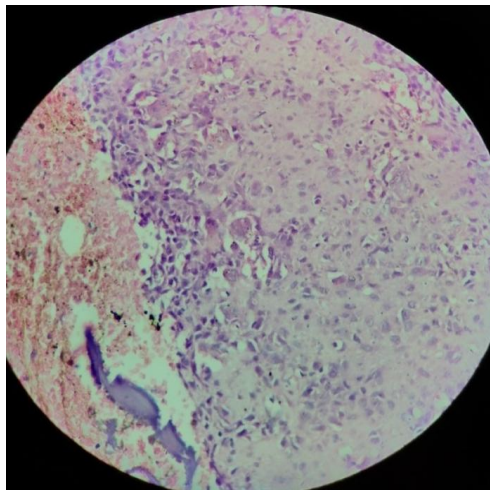


Fig-6: Aneurysmal bone cyst, Femur (40X, H & E stain)

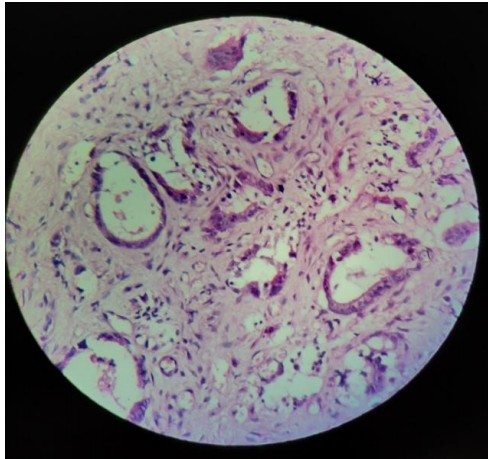


Fig-7: Metastatic adenocarcinoma with primary in prostate, L3 vertebrae (40X, H & E stain)

DISCUSSION

The bony lesions account to a small portion of all the lesions that exist in a population [9]. The complete clinical details like age, sex, site with radiological findings are the required for establishing the correct diagnosis of any bone lesion [8]. Biopsy is mandatory in all bone lesions as some benign entities like osteomyelitis can mimic malignancy, pathological fracture as traumatic fracture, osteoblastoma can mimic as osteosarcoma [11]. The histopathological diagnosis based on the different cytomorphological characteristics aids to predict the prognosis of bone lesion and to chalk treatment plan [13].

In our study, out of 103 cases of bone lesions, most common were non neoplastic lesions making 64 cases (62.1%) compared to 74% non neoplastic lesions in study by Modi D *et al.*, [14] and 59% by Karia KM *et al.*, [13]. The incidence of bone lesions was more common in younger age group (<20 years) similar to study by Kumavat P *et al.*, [15]. The incidence of the lesions were similar in males and females compared to the study by Karia KM *et al.*, [13].

Osteomyelitis implies inflammation of bone and marrow; it may be complication of any systemic infection but frequently manifest as a primary solitary focus of disease. All types of organisms including viruses, parasites, fungi and bacteria can produce osteomyelitis.

Pyogenic Osteomyelitis

Osteomyelitis was found in all age groups above ten years due to many organisms mainly by *Staphylococcus aureus* (80-90%), *Escherichia coli* and *Pseudomonas*, while *Klebsiella*, *hemophilus influenza* and group B streptococci in neonatal period. Infective osteomyelitis can mimic as malignancy so bone biopsy is mandatory to make correct diagnosis. We had 23cases (22.3%) compared to 14.7% study by Modi D *et al.*, [14].

Tuberculous Osteomyelitis

The affected individuals are usually adolescents or old ages. The organisms originate from primary focus of active visceral disease or by direct extension. The spine (47 % of cases, especially the thoracic and lumbar vertebrae) followed by the knee and hip are the most common sites. The osteolytic lesions of tuberculosis at multiple sites need to be differentiated from multiple myeloma, secondary metastasis, Ewing sarcoma, Lymphoma and bacterial osteomyelitis with help of bone biopsy. In this study 20/103(19.1%) cases were of koch's inflammation and found in old as well as young age groups similar to 19.6% in study by Modi D *et al.*, [14].

Chondrogenic Tumors

We had 10 cases (9.70%) of Chondrogenic tumors. Osteochondroma was the commonest benign tumor 06 cases (5.82%) similar to 4.0% in study by Modi D *et al.*, [14]. Chondrosarcoma 04 cases (3.83%) was the commonest malignant tumor similar to 2.31% in study by Kumavat P *et al.*, [15].

Osteochondroma: [Exostosis]

We had 06 cases (5.82%) of osteochondroma, commonly seen in 2nd decade with male predominance similar to study by Kumavat P *et al.*, [15]. Femur was the commonest site with 4 cases (66.6%). External surface shows lobulated cartilage cap covered by fibrous membrane that is continuous with periosteum covering the stalk. Histology, reveals cartilage cap composed of moderately cellular hyaline cartilage. At the junction with underlying cancellous bone, cartilage shows enchondral ossification (Figure-2).

Primary bone tumors (75%) were encountered more than the secondary bone tumors (25%) comparable to findings of study by Hathila RN *et al.*, [11] and Patel D *et al.*, [8].

Chondrosarcoma

Chondrosarcoma is the most common primary malignant cartilaginous bone tumour in the age group

of 40-60 years. It commonly involves pelvis, femur and ribs with male predilection [16, 17]. We had all 04 cases of conventional chondrosarcoma of grade I and II- 2 cases each. Rib was commonest site (2 cases) in this study compared to study by Kumavat P *et al.*, [15]. In most of the cases double nucleated cells, moderate atypia and lobulated appearance was seen (Figure-3).

Benign Osteogenic Tumours

We had 02 cases of (1.94%) of osteoma. Both of them were seen in >45years of age with female predominance similar to study by Boffano P *et al.*, [18] with female predominance and mean age 48 years. Histologically, revealed compact mature bone formation.

Osteogenic Sarcoma

We had 06cases (5.82%) of osteogenic sarcomas predominantly seen in 2nd decade (66%) with male predominance (Male:Female= 5:1) and commonly seen at the lower end of femur 66% [16, 17]. On gross examination, subperiosteal expansion, cortical destruction, tumour necrosis, haemorrhage and soft tissue invasion were seen. Morphologically, we had 05 cases of osteoblastic type seen in femur with 01 case of chondroblastic type sarcoma in rib. Histology, revealed neoplastic bone formation by tumour cells having spindle or oval shape with atypical mitoses. Malignant bone has coarse, lace like architecture and deposited as primitive trabeculae or broad sheets. Other matrices includes cartilage and fibrous tissue (Figure-4) [14].

Osteoclastoma (Giant cell tumour, GCT)

It is classified into benign (grade I), intermediate (grade II) locally aggressive (rarely metastasizing) and malignant (grade III) [15]. We had 07 cases (6.79%) of osteoclastoma (GCT) as commonest benign tumour similar to findings of 12.0% in study by Karia K. M *et al.*, [13]. It was seen commonly in the 3rd and 4th decade predominantly with a male predilection. These results were similar to Bamanikar SA study [19]. We had grade-I 04 cases with 03 cases of grade-II GCT. The commonest sites involved were tibia (50%) and femur (33.33%) [20]. Histology revealed moderately vascularised stroma with oval, spindle shaped mononuclear cells, uniformly interspersed with multi nucleated giant cells. The nuclei of the stromal cells were similar to the giant cells. They were found with regular outline and prominent nucleoli (Figure-5) [15].

Tumour like Lesions

We had 03 cases (2.91%) aneurysmal bone cyst in this study similar to 1.0% in Modi D *et al.*, [14] and 4.6% in Kumavat P *et al.*, [15]. The patients commonly affected were in 2nd decade of life similar to findings of Kumavat P *et al.*, [15]. Femur was the most common bone involved. Spongy or multilocular cystic lesion filled with blood is the classical gross appearance [15]. Histology, showed cystic spaces containing

blood, with septa showing multinucleated giant cells and spindle cells (Figure-6).

Metastatic Tumour

Metastatic bone tumours occur at particularly high rates in cancers of the breast, prostate, lung and kidney accounting for 75% of all patients [15]. Abrupt onset of pain associated with pathological fracture and neurological pain were common presenting symptoms in this study. We had 04 cases (3.88%) of metastatic tumours seen predominantly in 5th and 6th decade similar to Jain K study with male predominance [9]. Metastatic tumours account 3.88% in this study similar to 5.0% in Karia KM *et al.*, [13] and 3.0% in Modi D *et al.*, [14] studies. Vertebra was the most common site involved in all 04 cases (100%) compared to other studies [15, 21]. We had 01 case (25%) of metastatic adenocarcinoma with primary in prostate, histology of which showed malignant glands arranged in glandular pattern lying adjacent to the paratrabecular space (Figure-7). Prostate carcinoma with a high histologic grade (Gleason's score ≥ 7), high stage, large diameter and metastasis to pelvic lymph nodes has high chances of metastasis [20]. We had 01 case (25%) of squamous cell carcinoma of cervix, 01 case (25%) of non small cell carcinoma of lung and 01 case (25%) of ductal cell carcinoma, breast metastasizing to vertebrae.

CONCLUSION

The bone lesions were common in both extremes of life, young as well as old with no sex predilection. The incidence of non neoplastic lesions was more than the neoplastic lesions. The benign neoplastic lesions were more common than malignant lesions. Chronic osteomyelitis was the commonest non neoplastic lesion, while osteoclastoma and osteosarcoma were common neoplastic bone lesions. Lower end of femur and upper end of tibia were common involved sites. Primary bone tumours were mainly benign, occurred predominantly in second decade of life with male predilection. Primary bone tumours were more common than metastasis. The histopathological examination is crucial determining factor to diagnose bone lesions and to plan appropriate treatment but co operation among pathologist, radiologist and orthopedic surgeon is necessity of time.

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Competing Interests: Nil

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