HISTOPATHOLOGICAL EXAMINATION WITH CLINICORADIOLOGICAL CORRELATION IN THE DIAGNOSIS OF BONE TUMOURS AND TUMOUR-LIKE LESIONS- A HOSPITAL-BASED STUDY

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ABSTRACT

BACKGROUND

Bony lesions are diverse in form and differ in their gross and histopathological features. The key to accurate recognition of bone tumours is utilisation of an integrated approach involving clinical data, radiological and histopathological findings.

The aim of the study is to study the incidence of bone tumours and tumour-like lesions in relation to age and gender among the patients by doing histopathological examination and by doing correlation between pathological diagnosis and clinicoradiological diagnosis.

MATERIALS AND METHODS

The study included 97 patients in between August 2014 to July 2015 with clinical and radiological suspicion of primary and secondary tumours and tumour-like lesions of bone, which require biopsy or surgical excision from the Department of Orthopaedics, Gauhati Medical College and Hospital, Guwahati. The tissues were received and evaluated for histopathological examination in the Department of Pathology, Gauhati Medical College and Hospital, Guwahati.

RESULTS

The lesions were found in the age range of 3 to 65 years. Benign tumours of bone were more common tumours than malignant tumours. Out of the 97 cases, 94 cases were diagnosed as bone tumours and tumour-like lesions. Out of the total 94 cases, osteosarcoma (24.47%) and giant cell tumours of bone (20.21%) are most common bone tumours amongst malignant and benign tumours, respectively.

CONCLUSION

Histopathological diagnosis have a superior role in the diagnosis of bone lesions as confirmed diagnosis can be given, which when correlated with clinical and radiological findings helps the clinicians to take the correct decision for proper management.

KEYWORDS

Histopathological Diagnosis, Bone Tumours, Tumour-Like Lesions.

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BACKGROUND

Bone lesions are diverse in size, gross and histopathological features and range in their natural history from innocuous to rapidly fatal. The diversity makes it critical to diagnose tumours and tumour-like lesions correctly, stage them accurately and treat them appropriately, so that the patients not only survive, but also maintain optimal function of the affected body parts.[1]

It is estimated that benign tumours and tumour-like lesions outnumber their malignant counterparts.[2]

They are classified on the basis of histological origin as chondrogenic, osteogenic, haematopoietic, histiocytic and fibrogenic type, etc. Also, tumours-like giant cell tumour, Ewing's sarcoma/PNET and notochordal tumour-like chordoma, etc. can be found.

Due to the complexity in radiologic and histopathological appearances and the serious consequences of inappropriate surgical treatment, clinical management of bone tumours and tumour-like lesions are best achieved through a multidisciplinary approach. The key to accurate recognition of bone tumours is utilisation of an integrated approach involving clinical data, radiological and pathological findings. Diagnosing bone tumours in isolation without pertinent clinical information is inappropriate and predisposes to diagnostic errors. Histopathological diagnosis helps the surgeon in planning limb salvaging surgery for early malignant and benign bone lesions.

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AIMS AND OBJECTIVES

- To study the histopathological features of bone tumours and tumour-like lesions.
- To evaluate the correlation between pathological diagnosis and clinicoradiological diagnosis.
- To evaluate the incidence of bone tumours and tumour-like lesions in relation to age and gender among the patients.
- To study the different types of tumours and tumour-like lesions of bone among the patients admitted in Gauhati Medical College and Hospital, Guwahati, for the period from August 2014 to July 2015.

MATERIALS AND METHODS

The present study was conducted in the Department of Pathology, Gauhati Medical College and Hospital (GMCH) during the period commencing from August 2014 to July 2015. A total of 97 patients with clinical and radiological suspicion of primary and secondary tumours and tumour-like lesions of bone, which required biopsy or surgical excision in the Department of Orthopaedics, Gauhati Medical College and Hospital were included in this study and the tissues were received and evaluated for histopathological examination in the Department of Pathology, GMCH.

Inclusion and Exclusion Criteria

All clinically diagnosed or suspected bone tumour cases irrespective of age, sex and site of involvement were evaluated histopathologically and correlated with clinical and radiological findings. A thorough history of each case was taken and clinical examination was done according to a proforma, which included details of the patients with chief complaints and clinical findings, which included general, systemic and local examination. Also, results of the radiological and laboratory investigations done were taken.

Histopathology Technique

1. Assessment of specimen and grossing-

The tissue is received in 10% formalin is verified by name, hospital number, registration number, MRD number and ward number and ward/OPD. The specimens received are either as biopsy specimen (open/excisional/curetted), wide resection, en bloc resection or amputated limb. In case of biopsy specimen, all soft tissue fragments were processed without decalcification. In case of wide resection, margins of resection were submitted separately. In case of en bloc and amputated specimen, the cut section of the bone bearing the tumour was examined properly (location of the tumour in epiphysis/metaphysis/diaphysis, the size of tumour, the extension into surrounding tissues, cut surface of the tumour, etc.). The total number of pieces of tissue received is noted along with the size, appearance, consistency and colour. The representative tissues were made 2-3 mm in thickness or if smaller, then whole tissue specimens are given as received and placed in vials with a serial number.

2. Fixation.

The tissue is fixed with 10 times its volume of 10% formalin and kept for 12-24 hours.

3. Decalcification.

Bony tissue is decalcified with either 5% or 10% nitric acid HNO_3 for 1-5 days. Decalcification is checked by a chemical test for calcium.

After grossing the specimen, the processing will be done and slides will be prepared using haematoxylin and eosin as a routine histopathological stain.

After staining the tissues were reported histopathologically as either primary or secondary bone tumours or tumour-like lesions of bone.

RESULTS

A total number of 97 (ninety seven) clinically diagnosed bone tumour and tumour-like lesions cases were studied with histopathological examination. Histopathological diagnosis was given according to the WHO classification of bone tumours 2008 and diagnosis was correlated with clinical and radiological diagnosis.

Age and Gender Distribution

Out of total 97 clinico-radiologically diagnosed/suspected bone tumours and tumours-like lesions cases, there were 58 (59.8%) males and 39 (40.2%) females with a male-to-female ratio of 1.5:1.

The age range in histopathologically diagnosed bone tumour and tumour-like lesions was from 3 years to 65 years. The maximum number of cases of bone tumour and tumour-like lesions occurred between age group of 10-19 years (29.9%), followed by 20-29 years (19.6%).

In the present study, it was observed that among the males, the maximum numbers of the tumours and tumour-like lesions cases occurred in the 10-19 years of age group (20 out of 58, 34.48%), and among females, the maximum number of cases occurred between 40-49 years of age group (11 out of 39, 28.2%).

Clinical Features

In the present study, pain with swelling was the most common presenting symptom, 48 patients out of total 97 cases presented with these features. Swelling of the affected site was the second most common presenting feature. Pathological fracture was the more common presenting complaints in patients of metastatic tumours.

Clinical Features	Number of Cases	Percentage
Pain and swelling	48	49.48%
Swelling only	28	28.86%
Pain only	14	14.44%
Pathological Fracture	7	7.22%
Total	**97**	**100%**

Table 1. Showing Distribution of Clinical Features Among the Cases

Site of Involvement

In the present study, distal end of femur was the most common site involved by both benign and malignant bone tumours, (30 out of 94, i.e. 31.9%), which was followed by

proximal end of tibia (19 out of 94, i.e. 20.2%). Multiple bones were involved in three benign and two malignant bone tumours.

In benign tumour cases, distal end of femur and proximal end of tibia were almost equally two most common sites of involvement in the present study. In case of malignant tumours, distal end of femur was predominantly involved site.

Clinicoradiological Diagnosis

In the present study, osteosarcoma, giant cell tumour and exostosis were the more common clinical and radiological diagnoses offered. Clinicoradiological diagnosis could not be offered in 4 cases.

Clinicoradiological Diagnosis	Number of Cases
Osteosarcoma	25
Giant cell tumour	21
Exostosis	16
Secondary deposits	7
Aneurysmal bone cyst	5
Chondrosarcoma	5
Ewing sarcoma	3
Osteoid osteoma	3
Synovial chondromatosis	2
Enchondroma	2
Simple bone cyst	1
Fibrous dysplasia	1
Chondromyxoid fibroma	1
Chronic osteomyelitis	1
Clinicoradiological diagnosis cannot be offered	4
Total	**97**

Table 2. Showing Distribution of Bone Lesions Based on Clinicoradiological Diagnosis

Case Distribution Based on Behaviour of Lesions-

Out of total 97 cases of clinicoradiologically-diagnosed/suspected bone tumours, 94 cases were diagnosed as bone tumours and tumour-like lesions histopathologically.

Benign tumours of bone were more common tumours observed than malignant tumours in the present study.

	Total Number of Cases	Percentage
Benign tumours	48	51.06%
Primary malignant tumours	31	32.97%
Metastatic tumours	6	6.38%
Tumour-like lesions	9	9.57%
Total	**94**	**100%**

Table 3. Showing Case Distribution Based on Behaviour of Bone Lesions

In the present study, benign tumours occurred most commonly in the age group of 10-19 years and 20-29 years. Primary malignant bone tumours were common in between 10-19 years of age group. Metastatic tumours of bone commonly occurred in fourth and fifth decades. Tumour-like lesions occurred more commonly in the age group of 10-19 years and 20-29 years.

Age	Benign	Primary Malignant	Metastatic	Tumour-Like Lesions
<10 yrs.	4	2	0	1
10-19 yrs.	11	15	0	3
20-29 yrs.	11	3	1	3
30-39 yrs.	8	4	1	0
40-49 yrs.	8	3	2	1
50-59 Yrs.	4	4	2	1
>60 Yrs.	2	0	0	0
Total	**48**	**31**	**6**	**9**

Table 4. Showing Age Distribution of Cases Based on Behaviour of Bone Lesions

Clinicopathological Diagnosis

Out of total 94 cases, osteosarcoma (24.46%) and giant cell tumour of bone (20.21%) are the most commonly observed bone tumours among malignant and benign tumours, respectively.

Sl. No.	Histopathological Diagnosis	Total Cases	Percentage
1.	Osteosarcoma	23	24.46%
2.	Giant Cell Tumour (GCT)	19	20.21%
3.	Osteochondroma	16	17.02%
4.	Aneurysmal Bone Cyst (ABC)	6	6.38%
5.	Metastatic tumours	6	6.38%
6.	Osteoid osteoma	5	5.32%
7.	Primary Malignant Lymphoma (NHL)	4	4.25%
8.	Chondromyxofibroma	4	4.25%
9.	Chondrosarcoma	3	3.20%
10.	Synovial chondromatosis	2	2.13%
11.	Ossifying fibroma	2	2.13%
12.	Chondroma/enchondroma	2	2.13%
13.	Ewing's sarcoma	1	1.06%
14.	Langerhans Cell Histiocytosis (LCH)	1	1.06%
	Total	**94**	**100%**

Table 5. Showing Histopathological Diagnosis Distribution

In the present study, it was observed that osteosarcoma was more commonly found in 19 years, 10-19 years of age groups. Giant cell tumour of bone was commonly found in 20-29 years and 30-39 years of age groups. Osteochondroma was found more commonly in 10-19 years of age group.

All three cases of chondrosarcoma were found above the age of 50 years.

Four cases of primary bone lymphoma cases were found. Two cases were found in the age group of 10-19 years and the other two cases of each were found in the third and fifth decades. Metastatic tumours of bone were found to be more common in 4th and 5th decades.

One case of Ewing's sarcoma was found in 11 years old male patient.

One case of LCH (eosinophilic granuloma) was found in 3 years old male.

Sl. No.	Histopathological Diagnosis	0-9 yrs.	10-19 yrs.	20-29 yrs.	30-39 yrs.	40-49 yrs.	50-59 yrs.	>60 yrs.
1.	Osteosarcoma	2	12	3	3	3	0	0
2.	Giant cell tumour	0	0	6	7	3	1	2
3.	Osteochondroma	3	9	2	1	1	0	0
4.	Chondrosarcoma	0	0	0	0	0	3	0
5.	Osteoid osteoma	1	1	2	0	1	0	0
6.	Aneurysmal bone cyst	0	3	2	0	1	0	0
7.	Chondroma/enchondroma	0	0	1	0	0	1	0
8.	Chondromyxofibroma	0	1	0	0	2	1	0
9.	Ewing's sarcoma	0	1	0	0	0	0	0
10.	Ossifying fibroma	0	0	1	0	0	1	0
11.	LCH	1	0	0	0	0	0	0
12.	Metastatic	0	0	1	1	2	2	0
13.	Primary malignant lymphoma	0	2	0	1	0	1	0
14.	Synovial chondromatosis	0	0	0	0	1	1	0

Table 6. Showing Different Histopathological Diagnosis Based on Age Distribution

Tumour-Like Lesions of Bone

Out of total 9 cases of tumour-like lesions of bone, 6 cases were diagnosed as Aneurysmal Bone Cyst (ABC), Robbins and Cotran.[1]

Histopathological and Clinic Radiological Correlation

Out of 97 cases, 94 cases were diagnosed as bone tumours and tumour-like lesions on histopathological examination. Rest 3 cases were diagnosed as granulomatous lesion, soft tissue tumour and nonspecific pathology. Out of these 94 cases, clinicoradiological diagnoses were offered in 90 cases. In 4 cases, no radiological diagnosis could be offered. This present study indicated that radiological diagnosis was confirmed by similar histopathological diagnosis in 73 out of 90 cases (81.11%) and the corresponding Cohen's Kappa value (0.84) showed excellent agreement between radiological and histopathological diagnosis of all bone tumours.

The sensitivity, specificity and true predictive value of clinicoradiological diagnosis when compared to histopathological diagnosis in case of malignant bone tumours were found to be 91.89%, 92.45% and 89.47%, respectively.

DISCUSSION

In the present study, age distribution of histopathologically diagnosed cases of bone tumour and tumour-like lesions ranged from 3 to 65 years. The maximum number of cases of bone tumour and tumour-like lesions occurred between 10-19 years followed by 20-29 years, which was similar with the studies done by Steven G. Silverberg, Ronald A DeLellis, William J Frable,[2] Odetayo et al (2001) and[3] Xu DL et al (2005).[4]

Gender Distribution

Out of total 94 cases of diagnosed bone tumour and tumour-like lesions, there were 55 male and 39 female cases. There was male preponderance found in the present study, which was similarly found in the studies done by Yopovino Rhutso et al (2013), Rasik Hathila et al (2013), Nagesh et al (2009) and Odetayo et al (2001).

The male-to-female ratio in the present study was 1.5:1, which was closely similar to the mentioned study.

Clinical Features

In the present study, pain with swelling was the most common presenting symptom affecting 48 patients (49.48%). Swelling of the affected site was the second most common feature presented by the patients followed by pain. Metastatic tumour of bone most commonly presented with pathological fractures.

The observation was similar with the studies done by Odetayo et al (2001),[3] Xu DL et al (2005),[4] Thomas et al (2003),[5] Abdul Kareem et al (2007),[6] Katchy et al (2005),[7] Samual et al (2005),[8] Karun Jain et al (2011),[9] Nagesh et al (2009),[10] Obalum DC et al (2009),[11] Baena Ocampo et al (2009),[12] Rasik Hathila et al (2013),[13] Ode M.B et al (2014)[14] and Yopovino Rhutso et al (2013).[15]

Site of Involvement of Bone Tumour

In the present study, distal end of femur (30 out of 94, i.e. 31.9%) was the most common site of involvement among

all bone tumours and tumour-like lesions followed by proximal end of tibia (19 out of 94, i.e. 20.2%).

This observation was similar to the study done by Yopovino Rhutso et al (2013),[15] Rasik Hathila et al (2013),[13] Obalum DC et al (2009),[11] Nagesh et al (2009),[10] Samual et al (2005),[8] Abdul Kareem Fb et al (2007)[6] and Odetayo et al (2001).[3]

Histopathological Diagnosis

Out of total 94 cases of histopathologically-diagnosed bone tumours, benign tumours of bone were found to be more common bone tumours accounting for 48 cases (51.06%) followed by malignant tumours (including metastasis) accounting for 37 cases (39.36%). Tumour-like lesions of bone accounted for cases (9.57%).

This observation of dominance of benign tumours over malignant tumours was similar to the studies done by Odetayo et al (2001),[3] Xu DL et al (2005),[4] Thomas et al (2003),[5] Abdul Kareem et al (2007),[6] Katchy et al (2005),[7] Karun Jain et al (2011),[9] Baena Ocampo et al (2009),[12] Rasik Hathila et al (2013),[13] Ode M.B et al (2014)[14] and Yopovino Rhutso et al (2013).[15]

In the present study, benign tumour (48 cases) and tumour-like lesions (9 cases) were more common in the age group of 10-19 years and 20-29 years, which was similar to the study done by Yopovino Rhutso et al (2013).[15]

Primary malignant tumours of bone (31 cases) in the present study were found to be more common in the age group of 10-19 years, which was comparable to the study done by Yopovino Rhutso et al (2013),[15] RasikHathila et al (2013),[13] Nagesh et al (2009),[10] Katchy et al (2005)[7] and Odetayo et al (2001).[3]

Metastatic tumour of bone (6 cases) in the present study was seen above fourth decade, which was comparable to other studies by Xu DL et al (2005),[4] Davor Thomas et al (2003),[5] Katchy et al[7] (2005) and Karun Jain et al (2011).[9]

Benign Bone Tumours

Out of total 48 cases of diagnosed benign tumours of bone, giant cell tumour of bone (19 cases, 39.5%) were found to be more common benign tumour in the present study followed by osteochondroma (16 cases, 33.33%). This observation as giant cell tumour and osteochondroma as two most common benign tumours was similar when compared to studies by Karun Jain et al (2011), Obalum DC et al (2009),[11] Baena Ocampo et al (2009),[12] Rasik Hathila et al (2013),[13] Ode M.B et al (2014)[14] and Yopovino Rhutso et al (2013).[15]

Malignant Bone Tumours

Out of total 37 malignant tumours of bone in the present study, osteosarcoma (23 cases, 62.16%) was found to be a predominant malignant bone tumour followed by metastatic tumour. This observation was similar to studies by Obalum DC et al (2009),[11] Baena Ocampo et al (2009),[12] Rasik Hathila et al (2013),[13] Ode M.B et al (2014)[14] and Yopovino Rhutso et al (2013).[15]

Tumour-Like Lesions of Bone

Among 9 cases of tumour-like lesion of bone, Aneurysmal Bone Cyst (ABC) was diagnosed in 6 cases (66.66%). Langerhans cells histiocytosis was diagnosed in one case.

CONCLUSION

Lesions of bones affect all age groups and have many common features. It is important to distinguish each entity and separate them for proper management and treatment. Diagnosing accurately is a challenging task. Most of the clinical features in bone lesions are nonspecific and may misguide in few instances. In most cases, radiography offers differential diagnosis. Histopathological diagnosis has a superior role in diagnosis of bone lesions, which when correlated with clinical findings helps the clinicians to take proper decision for management that ranges from simple curettage with bone graft, resection and reconstructions to amputation surgeries.

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