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Original Research Article

RADIO-PATHOLOGICAL STUDY OF LYTIC BONE TUMORS

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Abstract

Background: Lytic bone lesions are the common radiological findings in various diseases of bone, which varies from inflammatory to neoplastic lesions. It is very hard to determine, whether a lytic bone lesion is benign or malignant by radiographic findings. In this paper, an approach involving both radiological and histopathological diagnosis is presented. It is observed that our approach is significant in accurate diagnosis of lytic bone tumors (LBT). The objectives are to classify lytic bone tumors as per Histopathological diagnosis, to find the concordance and discordance percentage of lytic bone tumors involving comparative analysis of Radiological and Histopathological findings. **Materials and Methods:** This study involves analysis of 80 bone tumor cases over a period of two years, possessing lytic features on radiography. Also, radio-pathological correlation was carried out. **Result:** In the present study, it was observed that the most frequent age group affected in lytic bone tumors was 11-20 years, with male preponderance (69%). In 80 cases of lytic bone tumors, 50(62.5%) cases were diagnosed as benign, 17(21.5%) cases were diagnosed as malignant and the remaining 13(16.2%) cases were found to be metastatic tumors. Osteochondroma and GCT were the most frequent LBT (13.7%). 81% cases showed radio-pathological concordance. **Conclusion:** Interdisciplinary approach combining radiology & histopathology has a significant role in accurate diagnosis and management of bone tumors.

INTRODUCTION

Lytic lesion is defined as the area in which the bone appears to have been eaten away, leaving a clear area. Majority of the bone lesions are lytic which could be as a result of inflammatory process/primary bone tumors/ secondaries. The differential diagnosis of bone tumors can often be limited by the radiographic appearance, age, location and number of lesions.[1] Lytic bone lesions can be classified as aggressive or non-aggressive according to their radiographic findings.

Non-aggressive lesions show well defined margins with sclerosis and periosteal reaction, whereas aggressive lesions show poorly defined margins with permeative bone destruction along with multi-lamellated periosteal reaction.[1-3] Zone of transition is an important x-ray finding to distinguish aggressive from nonaggressive lesions.[2] Radiographic appearance of metastatic tumors can be purely lytic (kidney, lung, colon), purely blastic (prostate & breast carcinoma) or mixed lytic & blastic (osteosarcoma).

Early diagnosis of bone tumors plays a crucial role in the treatment aspect of the patient. The first line of investigation is conventional x-ray, but it is difficult to determine the lesions with plain radiographic imaging, whether a lytic lesion is Benign / Malignant/Metastatic. Radiologically, benign process such as osteomyelitis can mimic as malignant tumors and metastatic conditions / myeloma as benign. Therefore an interdisciplinary approach, involving both radiology & histopathology has a prime importance in accurate diagnosis and management of bone tumors.

MATERIALS AND METHODS

This is a two years retrospective study conducted from 2017 to 2019 at VBMC-Kurnool. All patients with bone tumors having lytic features on radiography were included and analyzed for clinical details such as age, gender, anatomical location of tumor, and histopathological diagnosis. Non-neoplastic lesions having lytic features and inadequate biopsies were excluded from the study. Both biopsy and amputation specimen were studied. In all patients x-ray of the lesioned bone were investigated, CT scan and MRI were done only in few cases as per the Orthopedician advise.

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The lytic bone tumors were classified according to WHO classification standards. The clinical, radiological and histopathological features were studied, analyzed and compared with the results of other available studies. Concordance between radiological and histopathological findings were calculated using Cohen's kappa value.

RESULTS

In this article, a total of 80 cases were analyzed. Further, these cases were classified into three categories viz., benign (40 cases), malignant (27 cases) and metastatic (13cases) accounting to 50%, 33.7% and 16.3% cases respectively. It was observed that the male population was severely affected (68.7%) when compared to female population, where the male to female ratio was found to be 2.2 : 1.

Further analysis showed that lytic bone tumors had more predilection for younger generation, particularly in the age group of 11-20 years. The histogram distribution for this analysis is as shown in [Figure 1].

Patients reported frequent pain and swelling in case of benign and malignant tumors, whereas pathological fractures were commonly observed in patients with bone metastasis. In 80 cases of lytic lesions, 44 cases had well defined margins and 29 cases with ill-defined margins. On MRI 19 cases showed soft tissue extension.

Extensive analysis showed that Giant cell tumor (GCT) and osteochondroma accounted for 13.7% of the benign tumor cases followed by osteosarcoma which accounted for 12.5% of malignant tumor cases. 65 cases showed radio-pathological correlation with concordance rate of 81%. In 15 cases there was discordance between radiological and histopathological diagnosis accounting for 18.7% cases. The values are tabulated as shown in [Table 1].

Table 1: Correlation between histopathological and radiology findings

Benign tumors	**Total number of cases**	**Positive correlation (%)**	**Negative correlation**
GCT	11	10(90%)	1
Osteochondroma	11	11(100%)	0
Simple bone cyst	9	6(66.6%)	3
Fibrous dysplasia	5	3(60%)	2
ABC	2	2(100%)	0
Chondromyxoid fibroma	1	1(100%)	0
Enchondroma	1	1(100%)	0
Malignant tumors			
Osteosarcoma	10	8(80%)	2
Myeloma	9	4(44.4%)	5
Lymphoma	2	1(50%)	1
Ewings sarcoma	6	5(83.3%)	1
Metastatic tumors	13	13(92.3)	0
Total	80	65(81%)	15(18.75%)

Table 2: Radio-Pathological Discrepancy

No. of cases	**Histopathological diagnosis**	**Radiological diagnosis**
1	Giant cell tumor	Enchondroma
3	Solitary bone cyst	Giant cell tumor
2	Fibrous dysplasia	osteosarcoma
2	Osteosarcoma	Ewings sarcoma
5	Myeloma	Metastatic lesion
1	Anaplastic large cell lymphoma	Ewings sarcoma
1	Ewings sarcoma	Acute osteomyelitis

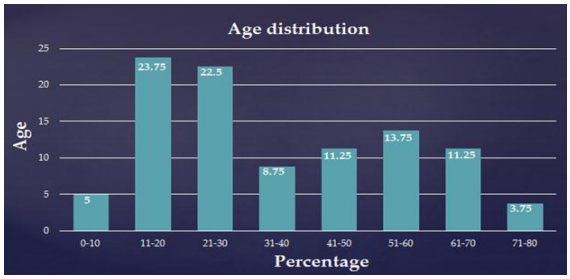

Figure 1: Histogram distribution of age group in case lytic bone tumors

DISCUSSION

For accurate histopathological diagnosis of bone tumors, clinical data such as age, gender, site and radiological findings are very critical. Pathologist must have fundamental knowledge regarding interpretation of bony lesions on imaging for appropriate diagnosis.[4] Histopathological diagnosis is mandatory in all bone lesions, as majority of bony lesions are clinically confusing with osteomyelitis and tuberculosis as they mimic malignancy.

On radiological findings metastatic tumors are classified into osteolytic, osteoblastic and intertrabecular pattern based on their appearance. Metastatic bone tumors with intertrabecular pattern are often missed by radiography and bone scan.[5]

Many of the bone tumors are hard to diagnose by routine histopathology alone. To overcome this Immunohistochemistry (IHC) studies are crucial for final diagnosis. In our study a single case of Anaplastic large cell lymphoma was reported based on IHC interpretation.

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Incidence of bone tumors in our study were more common in younger age group (11-20 years). These findings are comparable to a similar study carried out by Karia et al.[6] Predilection of the lesions were more common in males than females. Similar findings were reported in other studies.[7-9]

In our study, it was observed that Benign tumors were more frequent than malignant tumors which is a similar pattern in the other studies.[6,10,11] Also it was observed that GCT and osteochondroma were the frequent benign neoplastic lesions. This is similar to the study conducted by kethireddy et al, Sharma and Metha.[12,11]

Further observations revealed that, in malignant bone tumors, osteosarcoma was the common tumor. Similar findings were observed by Rafiq and Tanwani.[13]

81% cases showed radio-pathological concordance which is comparable with study done by Negash et al.[14] Discordant cases are tabulated as shown in [Table 2].

Enchondroma diagnosis is usually confused with GCT during radiographic analysis, due to the presence of lesions in small bone of the hands. In our study, a single instance of third metacarpal bone was identified. Both tumors can appear purely lytic with sclerotic margins on radiography.[15]

Three cases of Solitary Bone Cyst were diagnosed radiologicaly as GCT due to similar findings observed in both tumors i.e., cystic lesion involving the metaphysis and epiphysis of long bones and in all three cases the cortex was intact.

Two cases had expansile lytic lesions with cortical disruption and soft tissue extension. Hence these two cases were reported as osteosarcoma radiologically. So radiologist must have an idea that fibrous dysplasia can also show soft tissue extension, when it is locally aggressive. It is important to distinguish this entity from osteosarcoma as the treatment modality differs [16].

A radiological diagnosis of Ewings sarcoma was made based on the age factor (6 years and 11 years), and site (femur) in two cases respectively. The radiological findings observed in these cases was cortical disruption, periosteal reaction and soft tissue extension, but radio-pathological discrepancy between Ewings sarcoma and Osteosarcoma doesn't have significant difference as both entities are treated with chemotherapy and wide surgical resection.

5 cases of Myeloma were reported as metastatic deposits, as both the entities appear similar on imaging and are often indistinguishable particularly when the vertebral bodies are involved with multiple osteolytic lesions.

Primary bone lymphoma is a rare entity accounting for 5% of all primary bone tumors[17]. A single instance of Anaplastic large cell lymphoma was radiologicaly diagnosed as Ewings sarcoma by considering younger age group, in such case histomorphological findings and IHC aids in accurate diagnosis.

A child aged five years was radiologically misdiagnosed as osteomyelitis but on histopathology it was diagnosed as Ewings sarcoma. This was due to both the entities possessing similar findings i.e., cortical destruction, disorganized trabecular pattern with ill-defined bony lucencies. Case reports have revealed that osteomyelitis can be misdiagnosed as ewings sarcoma.[18,19]

CONCLUSION

Comparative analysis, of the obtained results in our approach was carried out with the existing approaches. It was observed that lytic bone lesion predominantly occurred in younger age group with male preponderance. Also the benign lesions outnumbered malignant lesions. We found that there was significant similarity between radiological and pathological diagnosis of lytic bone tumors at VBMC-Kurnool. In small centers where histopathology services are not available, it is better for the orthopedician to give differential diagnosis, considering the age and site especially in case of myeloma /metastasis.

Contributors

The authors certify that neither this manuscript nor one with substantially similar content under their authorship has been published or is being considered for publication elsewhere. The authors agree to allow the corresponding author to correspond with the editorial office, to review the uncorrected proof copy of the manuscript and to make decisions regarding release of information in the manuscript.

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